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Systems and Products Guide for the Information Processing Executive

How can the Guide help you?

- **SAVING TIME**
As a concise, summary view of many information processing concepts, systems, and products, the Guide can save you time whenever you need introductory knowledge about unfamiliar areas of data processing.
- **REDUCING COMPLEXITY**
To provide guidance in today's increasingly complex information processing environment, this Guide suggests systems and product solutions for as many common situations as possible with a selected set of hardware and software. Where other solutions are more appropriate, the full IBM product line, including industry-oriented products, is, of course, available.

What's in the Guide?

- **CONCEPTS**
A tutorial summary of a number of key information processing areas such as application development and storage management
- **PRODUCT SELECTION GUIDANCE**
Introductory comparisons of alternative IBM product solutions to information processing needs
- **SOFTWARE DESCRIPTIONS – SYSTEM/370, 30XX, 4381, 9370**
Purposes, functions, and sources of additional information about software products; also, system installation productivity options that can reduce the time and effort required to install IBM systems
- **HARDWARE DESCRIPTIONS – SYSTEM/370, 30XX, 4381, 9370**
Purposes, functions, and sources of additional information about hardware products
- **MID-RANGE SYSTEMS AND WORKSTATIONS**
Hardware and software descriptions of the general systems – AS/400™, Series/1, System/36, System/38, System/88 – and personal computers, displays, and printers
- **OTHER OFFERINGS**
SolutionPacs™, office products
- **ABBREVIATIONS**
A convenient reference list of acronyms and other abbreviations used in this guide

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XENIX®	Microsoft Corporation
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Section 20. Concepts

Application Development

Introduction

Application development is the process of putting new applications on a computer system. The four approaches used by organizations to install new applications are:

- Application Offerings:
 - Acquiring application packages
- Information Center:
 - Having end-users develop applications
- Development Center:
 - Having DP professionals develop applications
- Workstation Resource Center:
 - Providing comprehensive end-user support and services

For most organizations, a combination of all four approaches works best. The nature of the applications in the backlog determines which approach is most appropriate in each case:

- Prewritten application packages should be used where they fit the need.
- End-users should be encouraged to write their own applications when their requirements consist of query, reporting, and problem solving; and to use packaged facilities for professional support and office functions.
- Basic operational business systems should generally be developed by DP professionals.

For maximum development productivity and user satisfaction, the four application development approaches described in this and the next four discussions should normally be considered in the following sequence:

- Application Offerings – prewritten application functions available for many cross-industry and industry specific application areas
- Information Center – an organization, usually within the information services (I/S) department, that provides non-DP end-users with the tools, packages, techniques, and assistance that will allow them to access their data and functions on a host, departmental, or personal computer in three areas:
 - Decision support
 - Business communications
 - Professional support

- Development Center – an organizational support function within I/S that focuses on improving application development productivity by maximizing the effectiveness of data processing development professionals. It is a combination of:
 - Hardware dedicated to application development
 - Selected software tools
 - A small but capable support staff
- Workstation Resource Center – an organization that provides comprehensive end-user support and services for workstations

IBM customers who have significantly increased development productivity and end-user satisfaction attribute their success to all three elements working together.

The effective use of the four approaches requires:

- Management commitment to the application development process itself as the most important application in the backlog
- An operational environment that provides adequate access to the system (computer resource, terminals, good response time, and hours of availability)
- Online access to a set of integrated complementary software tools appropriate to the application development approach
- Effective administration and control of the data used or developed in a well-managed data systems environment

Application Offerings

Introduction

As described in the "Application Development" topic:

- A data processing user has four major alternatives for putting applications on the computer system.
- Application Offerings is the first alternative considered.

Definition

Application Offerings are prewritten application functions available for many cross-industry and industry application areas. Office systems constitute a major set of cross-industry application offerings.

Alternative Approaches to Implementation

IBM offers application fee software ranging from limited function programs to comprehensive application systems. These include program products, program offerings, programming RPQs (PRPQs), and IBM personal computing programs.

Program products are the most sophisticated in terms of richness of function, versatility, IBM maintenance, and support.

The following catalogs of applications are available:

- Data Systems Environment G320-6271
- Field Developed Programs/Installed User Programs Small Systems, GB30-0521
- The Software Catalog:
 - Volume I – Cross-Industry Applications, G320-6531
 - Volume V – Distributed Systems
 - Volume VI – Industry Applications, G320-6536
- Series/1 Application Programs available from Non-IBM Sources, G320-0714
- Software Catalog
- System/38 Application Programs available from Non-IBM Sources, G360-0430
- Engineering and Scientific Application Programs Available from Non-IBM Sources, G320-6739.
- Engineering and Scientific Programs for IBM Personal Computers available from Non-IBM Sources, GC34-0588
- The Library of IBM Personal Computer Software Offerings, G520-1107
- Personal Computer Software – Vendor Logo Programs Available from IBM (Volume 2), GB30-2037
- Applications and Abstracts, G320-6131

Business Problems and Potential Benefits

All information services departments are under pressure to increase productivity in order to meet their programming commitments and to satisfy user demands for new programs. Management is usually interested in evaluating any application offering that can reduce the time, cost, and risk of implementation.

Application offerings may provide the following benefits:

- Earlier application implementation, resulting in the realization of user benefits sooner than if the application were designed and programmed in house
- High-quality code, particularly in the case of program products, which must meet specific standards of testing and documentation
- Reduced development and maintenance costs
- Decreased risk of schedule deferrals, cost overruns, and improper system design

End-users may be in a better position than the information services department to evaluate the applicability of some of IBM's application offerings. Therefore, they should be made aware of these offerings early in the "make-buy" decision process through the joint planning approach.

Information Center

Introduction

As described in the "Application Development" topic:

- A data processing user has four major alternatives for putting new applications on the computer system.
- The information center is the second alternative to be considered. The information center is an organization that supports end-user computing. It provides non-DP end-users with the consulting, tools and techniques, training, and assistance that will allow them to access data and computer resources directly.

Definition

The information center (IC) is a service approach and part of the end-user support structure that provides a direct interface between the information systems (I/S) department and the functional departments. The IC is a major component of an overall strategy and management system for end-user computing. Organizations are finding that for end-user computing to effectively support the objectives of the enterprise, it must be managed as a business activity as much as a technical activity. End-user computing requires both a support structure and a management system that deal with:

- Executive direction. Enterprise-level management direction for end-user computing.
- Planning for user needs. A way of identifying and ranking the needs of users, selecting the appropriate tools, and designing an effective delivery system.
- Support organization. A support organization to provide users with effective guidance, training, and on-going assistance.
- Workstation management. A way of providing each user the appropriate workstation and of managing the growth of workstations within the organization.
- Access to data. A process for giving users access to corporate data and other types of information.
- Justification. A way of justifying the investment of resources in end-user computing, budgeting, and accounting for the use of these resources and tracking the benefits gained.

The outlines of such a strategy are provided in the Management of End-User Computing program. The program comprises six modules that address these six issues and help overcome the inhibitors to effective growth of end-user computing that they represent.

"Information center" is a commonly accepted term for the support organization component. It can take different forms and provide varying services. End-

user support is usually distributed to some degree: a central support staff, functional support groups, and functional specialists in the user area. The support organization often includes a workstation resource center.

End-user requirements generally fall into two functional areas:

- Decision support. Used to improve the decision-making process. Examples include product sales analysis, expense-to-revenue analysis, investment option modeling, and portfolio management.
- Office support. Used to support the user in such things as calendaring, reminders and to-do lists, directories, document preparation, messages, notes, and personal record-keeping.

A successful Information Center will offer end-user computing that includes:

- Ability to access departmental, location, or central processing site files and data bases.
- Ease of system use with minimal data processing knowledge.
- A wide variety of application packages to assist the users in solving their problems.

Implementation Approaches

There are three approaches: 1) Centralized in-house system, 2) dedicated small, standalone, or interconnected systems, and 3) the IBM Information Network services.

Emphasis is on ease of use, ease of installation, and independence from complex data processing organizations.

Business Problems and Potential Benefits

Business professionals are faced with increasing demands on their time and skills and until they are given computing ability, staffs will continue to grow.

Business professional offerings can benefit the organization in the following ways:

- For end users:
 - A direct channel for demand processing
 - Reduced communication problems – direct focus on the problem
 - Greater productivity and enhanced effectiveness
- For the information services department:
 - Greater responsiveness to user needs
 - Transfer of development and maintenance activities, which can free DP programmer resource to be applied to new projects

Primary Product Offerings

- Decision support, host-based

For full-function decision support requirements, particularly where business planning, statistical analysis, query, report writing, graphics, or project management based on relational data or standard sequential data are needed, Application System (AS) is the recommended solution. AS release 5 supports DB2 as well as SQL/DS.

Query Management Facility (QMF) is the recommended query and report writer where data is contained in the relational data base products, DB2 and SQL/DS.

Info Center/1 is an APL-based query, reporting, and data analysis tool.

Cross Systems Product (CSP) is recommended for full-function application development by data processing professionals.

The table below lists the key product offerings for the business professional and the functions the products support.

Functions	AS	QMF	IC/1
Query	*	*	*
Report writing	*	*	*
Information management	*	*	*
Business graphics	*	*	*
Statistics	*		*
Financial modeling	*		*
Project management	*		
Application development	*		
Document preparation	*		

- Decision support, System/36 and System/38
 - Query/36
 - System/36 Business Graphics Utilities (BGU/36)
 - System/38 Worksheet/38
 - System/38 Data File Utility (DFU)
 - System/38 Query
 - System/38 Business Graphics Utility
- Business communication and professional support

See the "General Systems Product Selection Guidance" and "Office Systems Product Selection Guidance".

Related Product Selection Guidance References

- Interactive Systems
- General Systems
- Office Systems
- Graphics
- Engineering and Scientific Systems

Reference Material

- IC Brochure, G520-4002
- IC Documentation Examples, GG22-9268
- IC Administration, G320-6614
- External Data Access in an IC Environment, G320-6358

Development Center

Introduction

As described in the "Application Development" topic:

- A data processing user has four major alternatives for putting new applications on the computer system.
- The development center is the third alternative considered.

Definition

The development center is an organizational support function that focuses on improving application development productivity by maximizing the effectiveness of data processing development professionals. It is a combination of:

- Hardware dedicated to application development
- Selected software tools
- A small but capable support staff

IBM customers who have significantly increased development productivity and end-user satisfaction attribute their success to all three elements working together.

The Application Development Software System

The primary components that form the foundation of the application development system are interactive development, application generation, and data administration and control facilities. This combination of products and processes should be used together to achieve full development center benefits.

Application generators simplify application development through the use of precoded and/or pregenerated functions. They should be used for new application development, in preference to procedural languages, as a more productive alternative to traditional programming and as a means of involving the end users. Users report that these tools have helped increase implementation productivity by factors of two to ten, often require fewer high-skilled coders, are normally easy to maintain, and permit end-user involvement in much of the development process.

Hardware and Machine Resources

An important factor in the productive use of the application development system is a working environment in which access to computer resources is not limited. Availability of and ready access to terminals and sufficient machine resources to handle the development workload with good response time are essential ingredients.

The computer resource allocated for application development should be dedicated to that purpose. The resources may be provided via a centralized

system or via distributing application development functions using a variety of small processors in combination with a host system.

Support and Consulting Services

The success of the development center depends on the orientation of the support staff toward the management objectives of increasing developer productivity, application quality, and management control.

The development center staff designs, develops, and supports on an ongoing basis the application development production system.

Requirements for effectively implementing and gaining productive use of the development center are similar to those of other applications. They include:

- Analysis of requirements
- Selection of functions to be automated
- Selection of appropriate software products
- Development of procedural and/or programmed interfaces among the software products
- Determination of hardware requirements and configuration
- Development of standards, procedures, and utility programs to support the application development production system
- Training of professionals

The development center supports the application development production environment by:

- Ensuring that the appropriate software and hardware resources are allocated to application development
- Coordinating application development functions with data base administration, systems programming, and systems management
- Providing guidance in the general design of applications, including the selection of the appropriate development vehicle
- Training and assisting development personnel in the use of application development facilities and development techniques
- Investigating new methods, techniques, and products

Business Problems and Potential Benefits

The Challenge

The challenge of today's business environment in data processing is meeting requirements for new business applications. Most organizations have an identified backlog of justified applications that they want to implement. The problem lies in the length of time and amount of resources required to develop

Development Center

applications using traditional methods and the subsequent drain on development resources in maintaining applications once they are in production.

The Limits of Procedural Development

Since the introduction of computer systems, great strides have been made in improving development productivity. We have evolved from machine languages to assembler languages to high-level procedural languages, such as COBOL and PL/I. Methodologies and techniques, such as Improved Programming Techniques (for example, structured design and structured programming), have been developed that improve the productivity and manageability of application development projects. However, the fact remains that even in the most productive and well managed environment, traditional application development approaches are inadequate to meet the growing demand for new applications. Application development still simply takes too long and costs too much.

The continued improvement in the price/performance of computer systems both increases the demand for new applications and provides the means of dramatically improving application development productivity.

The Application Development Production System

Achieving significant breakthroughs in application development productivity requires new concepts and approaches based on the use of computer resources and software products that speed and simplify the development process. The objectives are to reduce the amount of work to be done and to increase the rate at which necessary tasks are accomplished.

To accomplish these objectives, application development should be treated as a production application in itself, and development personnel should be provided with computer resources and an operational environment similar to that provided to other parts of the business. That is, development personnel need:

- Online access to a set of integrated complementary tools that help them do their job more effectively
- Effective administration and control of the data used or developed in the performance of that job
- An operational environment that does not limit use of the system (that is, terminals, good response time, hours of availability)

Potential Quantitative Benefits

- Improved productivity of application developers
- Earlier application installation as a result of that improved productivity

Potential Qualitative Benefits

- Better data for management decision making
- New application functions that may improve a company's competitive position
- More rapid recovery from failures that disable an existing application (possible if techniques that reduce maintenance effort are implemented)
- The ability to use less skilled application development personnel
- Reduced turnover among application developers because they are more satisfied with their ability to get work done earlier and more accurately

Primary Product Offerings

Data System

- DB2 or SQL/DS
- IMS/VS DB or DL/I DOS/VS
- CICS or IMS/VS DC
- DB/DC Data Dictionary
- System/36 SSP or System/38 CPF

Application Generator

- Cross-System Product Set:
 - CSP/AD (Application Development) and CSP/AE (Application Execution) for CICS/VS, TSO, and VM/SP CMS
 - CSP/Query for CICS/VS, and VM/SP CMS
 - CSP/AD and CSP/AE for DPPX/SP
- IMSADF II
- SDFII or SDF/CICS
- System/36 Utilities and Query/36
- System/38, IDU
- Series/1 TPS

Interactive Program Development

- ISPF
- CMS
- TSO
- ICCF
- System/36 Utilities
- System/36 Programmer and Operator Productivity Aid
- System/38 Source Entry Utility
- System/38 Screen Design Aid
- System/38 Data File Utility
- System/38 Query Utility
- PC software
- Series/1 TPS

Related Product Selection Guidance References

- Interactive Systems
- Data Base Management
- Data Communications
- General Systems
- Office Systems

Workstation Resource Center

Introduction

The workstation resource center is a workstation support facility that provides organizations with a framework for workstation management. Whether it is part of an existing support group or a new one, it is the focal point for user support for all personal computers and workstations. It provides "the place" for evaluation, acquisition, consulting, technical and educational support for end users.

Definition

The workstation resource center (WRC) is an organizational focal point for the evaluation, acquisition, and support of all workstations for end-user computing. It provides end users with "one-stop shopping" and a wide range of consulting, administrative, technical, and information systems support. An already-established end-user support group, such as an information center that performs services for host-based user software packages, could be extended to support intelligent workstations. If no such group exists, a centralized support vehicle for intelligent workstations, the workstation resource center, should be considered.

A typical workstation resource center has four functional areas:

- Consulting
 - Product consulting. First, the WRC should provide in-house microcomputer industry expertise, along with knowledge of the customer's organizational functions and requirements. The microcomputer marketplace should be understood sufficiently to evaluate trends and make recommendations about future workstation needs. The many products available to microcomputer users should be evaluated and standards set, based on the current and projected customer organization needs. Standard configurations of all the workstations available through the WRC should be on display in a product exhibit area. Hardware and application packages which have been chosen as standards should be available for demonstration. In addition, a reference directory of support and services should be available.
 - User/application consulting. The WRC should be staffed to evaluate end-user requirements and provide advice and recommendations for appropriate application solutions which best meet both end-user needs and those of the organization. Demonstrations and "test driving" or trial runs of the potential application packages will help build user confidence in the solution and allow for a closer look at the application in terms of usability, ergonomics, and special features such as color or graphics. The

WRC should provide assistance in preparing business case justification if required for the purchase of hardware and software.

The WRC should interact with other areas of the organization in order to ensure a cohesive support system for the client (end user). Information on the center's resources and activities should be disseminated through newsletters, user groups, and guides in order to inform the end-user community.

- Education consulting. The WRC should evaluate all available workstation education offerings and make recommendations concerning those best suited to the organization. The center should interface with the existing in-house education department and provide advice on outside education offerings. Training curricula at various levels should be set up for management and end users, appropriate training plans developed, and class schedules worked out. In addition, new user orientation should be offered covering hardware and software, organization policies, computer standards, usage tips, data security, and backup.
- Administrative support. A number of administrative services regarding workstations should be provided by the workstation resource center: for example, verifying that orders are correct, obtaining necessary justification and signoffs, placing orders with the vendor, and utilizing existing or new volume purchase agreement. A centralized location for receipt of the equipment should be provided, as well as assistance in initial setup and component testing.

Input should be transmitted to a workstation inventory tracking system for auditability and future upgrading. In addition, a software library and stock of software, supplies, and hardware components should be maintained to fill requests resulting from new end-user requirements.

All maintenance contracts and volume purchase agreements should be managed in the workstation resource center itself. The center should provide maintenance service for problem diagnosis, and make replacement units available when necessary.

- Technical support. The WRC should establish one telephone number as a "response line" for all end users to call with any questions. This line would then channel the questions to the appropriate areas of intelligent workstation expertise in the organization. The technical support function would also provide end-user feedback on product requirements and recommended services, as well as major input to the center's newsletter. An additional interface to IBM service and support groups could be provided by establishing a technical coord-

dinator function. The IBM Technical Coordinator Program (available to customers with intelligent workstation VPAs or special bids), with access to IBM's ASKINFO data base, could also be managed out of the center.

- Information systems support. The WRC should play a supportive role to other groups responsible for key strategies and policies in the implementation of information systems. The center should support standards for the corporate mainframe environment and keep abreast of all standard computer mainframe communications and connectivity alternatives. Procedures should be established for data management policies relative to all intelligent workstations in the organization. Also, aspects of security involving these workstations must be determined, published, and adhered to.

Business Problems and Potential Benefits

The productivity gains which a customer organization may realize from the proliferation of intelligent workstations may fall dramatically short of potential due to lack of adequate guidance, coordination, and control. This problem may intensify as end users begin to interface with one another and the organization's data bases.

Some potential benefits of integrating a workstation resource center facility into an end-user computing support structure are:

- Providing a vehicle to manage large volumes of workstations productively in an organization
- Helping to ensure that the growth of desk-top computing is organized and consistent with the other decision support system offered
- Providing a centralized vehicle to obtain, distribute, and install workstations for end users
- Allowing the information system function to manage the use of intelligent workstations by setting standards, maintaining compatibility, controlling assets, and being the "service of choice" for their end users

Systems Application Architecture™

Introduction

IBM offers systems based on several different hardware architecture and control programs. By pursuing a multiple-architecture strategy, IBM has been able to provide products with price/performance ratios across an ever-broadening spectrum of customer requirements. Today, IBM's systems cover a nearly-thousand-fold capacity range, and support the information processing needs of people in very different environments.

To make movement between these systems easier, to facilitate multi-system distributed-processing use, and to bring the breadth of IBM's product line to bear on customers' needs in all environments, IBM offers Systems Application Architecture.

Definition

Systems Application Architecture is a collection of selected software interfaces, conventions, and protocols. Systems Application Architecture will be the framework for developing of consistent applications across the future offerings of the three major IBM computing environments:

- System/370 (TSO/E under MVS/ESA™ and CMS under VM/SP and VM/XA)
- System/3X
- Personal Computer (Operating System/2™ Extended Edition)

These interfaces, conventions, and protocols are designed to provide an enhanced level of consistency in the following areas:

- Programming interface — the languages and services that application developers use in building their software
- User access — the use of screen panels and user interaction techniques
- Communications support — the connectivity of systems and programs
- Applications — software built and supplied by IBM and other vendors

For each of these areas, IBM is establishing and will publish specifications — definitions of the elements that will be common across the SAA environments. Future IBM Systems Application Architecture products will then implement those specifications.

Business Problems and Potential Benefits

IBM's Systems Application Architecture will offer customers several advantages:

- User access to applications that is simpler and more uniform

- Programming skills that can be leveraged across multiple systems
- Applications that can be ported with less effort, or that can span systems in a distributed fashion

Both development costs and training costs should be reduced. Customers seeking broad solutions for their personal, departmental, and enterprise-wide data processing needs will profit. And independent software vendors who choose to build on IBM products will benefit as well.

Systems Application Architecture will facilitate an increased level of consistency and connectivity across the participating systems. As a result, SAA provides an excellent foundation for a user's future Enterprise Information System.

Those users who need access to data on one system today and another system tomorrow can benefit. The programs they run are similar, and the actions they perform while running those programs are more uniform. Screens, keyboards, procedure — their appearance and behavior will often be the same. With less relearning, users have faster and easier access to data, and business efficiency increases.

Programmers, too, benefit from this increased consistency. Skills learned in one environment are transferable to others, and there is less need for retraining or for system specialists. A programmer familiar with one environment can readily move to another and soon be productive.

Consistency means improved portability and enhanced distributed processing. Building applications for multisystem solutions becomes faster and easier. The source for a program built on one system can be taken to another system and implemented more smoothly. The effort expended in creating a general data processing solution is therefore lessened, along with development time.

Thus, there is much value in the growing consistency of the interface to the System/370, System/3X, and Personal Computer. The people who build the applications and the people who use the applications will all benefit.

In addition to these benefits, in each of the Systems Application Architecture environments IBM plans to continue to support the execution of existing applications, thus conserving customers' current investments.

Related Product Selection Guidance

- Additional information on IBM's Systems Application Architecture may be found in SAA: *An Overview*, GC26-4341.

- More detailed information on the components of the common programming interface is available in the following Systems Application Architecture manuals:
 - Application Generator Reference, SC26-4355
 - C Reference, SC26-4353
 - COBOL Reference, SC26-4354
 - Database Reference, SC26-4348
 - Dialog Reference, SC26-4356
 - FORTRAN Reference, SC26-4357
 - Presentation Reference, SC26-4359
 - Procedures Language Reference, SC26-4358
 - Query Reference, SC26-4349
 - Communications Reference, SC26-4399
- General programming advice may be found in:
 - SAA Writing Applications: A Design Guide, SC26-4362
- A definition of the common user access may be found in:
 - SAA Common User Access: Panel Design and User Interaction, SC26-4351
- More detailed information on common communications support can be found in the following manuals:
 - Document Content Architecture (DCA), SC23-0758
 - Intelligent Printer Data Stream (IPDS), SB0F-0038
 - 3270 Data Stream (3270DS), GA23-0059
 - Document Interchange Architecture (DIA), SC23-0759
 - System Network Architectural Distribution Services (SNADS), SC30-3098
 - Network Management (N/M), SC30-3346
 - Low-Entry Network (LEN), SC30-3422
 - LU6.2 Protocol, GC30-3084
 - Token-Ring/Local Area Network (TR/LAN), 6165877
 - X.25 Protocol, GA27-3345
 - Synchronous Data Link Control (SDLC), GA27-3093

SolutionPac™

Introduction

Surveys, both within and outside of IBM, have demonstrated that customers' buying criteria put a heavy emphasis not only on the application solution itself, but on the availability of resources to implement that solution. Customers are looking for total application solutions, including the ability to off-load some of the installation and education responsibilities to qualified resources. Solutions that assist in selecting, installing and, above all, productively using the products and services available from IBM, are provided by SolutionPacs – offerings designed to address these needs.

Where appropriate IBM SolutionPacs will also be marketed and supported by IBM-certified third party organizations such as MAPs (Marketing Assistance Program participants), value-added dealers, and PC dealers.

Definition

IBM SolutionPac offerings incorporate software, services, and/or support elements with hardware in appropriate combinations, so as to satisfy customer requirements for integrated solutions and to facilitate usage of IBM systems. SolutionPac's value-add is to provide a full range of services and/or support that would otherwise remain the customer's responsibility.

Potential Components

- Software
 - IBM-developed
 - Independent software vendor-developed
- Services/support
 - Planning/design
 - Installation
 - Test/verification
 - Systems training
 - End-user education
 - Customization
 - Single point of contact
- Hardware
 - As required or appropriate

Corporation.

Business Problems and Potential Benefits

Customers are faced with many challenges on how best to meet their requirements; they must resolve the problems of:

- Systems integration/implementation
- Compatibility/architecture

- Resources/skills
- Strategic planning

SolutionPacs provide answers and offer customers:

- Problem solutions
- Cost effectiveness
- Skilled support
- Timely implementation
- IBM standards/accountability

Primary Product Offerings

- Cross-industry SolutionPacs
 - NetView Implementation
 - Publishing System VM Edition
 - Office Series VM Edition
 - Office Series S/36 Edition
 - Expert Systems
 - Database Application Development
 - VSE/MVS Migration Assistant
- Industry SolutionPacs
 - Store Implementation
 - Branch Banking Automation
 - Integrated Banking Applications
 - Education Computing Support System
- PC SolutionPacs
 - Business Adviser Financial Accounting
 - CADwrite Design and Drafting System
 - Construction Industry Series
 - Doctor's Office Management
 - Legal Profession Series
 - Personal Publishing
 - Personal Typing

Data Systems

Definition

Data systems is a term that incorporates the concepts of data base, data communications, and data administration – the storage and retrieval of data, its transmission to terminals, and controls to provide adequate protection and ensure proper usage.

A data base manager is a general purpose software package designed to allow the user to gather existing data, which may be dispersed in many separate data files, into a smaller number of managed data bases. It facilitates data access and update for both pre-planned transactions and ad hoc queries. To achieve optimum performance and function, it must be highly integrated with both the systems software and the hardware on which it operates. Its value is also significantly enhanced by integration with application development and decision support products which contribute to more productive access to the data. Coupled with a data communications manager and interactive computing products, the data base management system supports data base sharing by multiple users.

Data administration, a customer responsibility, is necessary to represent the organization's best interest in deciding who uses what data and how. Data administration is supported by a data dictionary software package. The data dictionary represents a single place to gather all descriptive and usage information about every element of data existing in the installation.

A data communication manager can, among other functions, permit sharing of programs and sharing of terminals between applications, provide facilities for recovery/restart, and enable remote operation.

The security aspects of data systems are addressed in this section under "System Security, Auditability, and Control."

Business Problems and Potential Benefits

IBM's data systems products can directly improve the following areas:

- Data consistency throughout all reporting systems, which improves end-user confidence in the information services system and reduces time and confusion over accessing data
- Control of access to data
- Data integrity and recovery
- Productivity of application programmers, particularly when developing online interactive applications
- Maintenance requirements, by providing data and device independence and more stable application programs

Related Product Selection Guidance References

- Data Base Management
- Data Communications
- Storage and I/O
- Data Security
- General and Office Systems

Technical Computing

Introduction

Engineers and scientists must deliver new and improved products and technology in order to stay competitive and to meet their business objectives. This can be achieved through the use of computing tools which help the E/S professional to be more productive.

In the U.S., engineers and scientists represent roughly 3% of the work force (approximately 3 million people). Their work product can significantly impact the profitability of a corporation, the nation's economy and standard of living, and the quality of life in general. In 1984, U.S. corporations spent approximately \$12.5 billion and 20% of their computing power supporting the efforts of their engineering/scientific professionals. It is estimated that expenditures for E/S computer support systems will grow at a rate substantially higher than that projected for the industry as a whole.

Studies have shown that the E/S professional prioritizes and allocates his time across five major activity areas:

- Design
- Analysis and simulation
- Test and lab automation
- Personal computing
- Administration

Productivity savings in one or more of these activity areas could represent substantial reduction in overall product costs.

IBM offers an integrated solution with multiple applications on a large-scale or departmental system. The concept is to:

- Provide a single interface — a professional workstation connected to a large-scale or departmental system — to give the user access to all the applications that are needed
- Improve productivity of engineering and scientific end users
- Deliver application function tailored to the end user's discipline
- Offer state-of-the-computer tools, cross-discipline support applications, and system services through a standard end-user interface

Definition

Technical computing is any use of a computer by or for an engineer, scientist, or technical professional. Usually any application with a significant amount of mathematical computation is also considered technical computing.

Application Areas

Currently, the areas that are receiving special emphasis include:

- Interactive computing
- Engineering/scientific data base
- Design
- Analysis and simulation
- Test and lab automation
- Engineering/scientific and CAD/CAM workstations
- Technical documentation
- Graphics
- Software engineering

However, the area of technical applications is extremely broad and contains a very large number of distinct applications. A sample of major categories includes:

- Matrix manipulations
- Numerical analysis and calculus
- Structural representations
- Logic
- Statistical techniques
- Optimization
- Simulation
- Decision support systems
- Engineering (aerospace, electrical, civil, others)
- Biology
- Chemistry, Physics
- Earth sciences
- Economics
- Psychology, Sociology
- Computer science
- Networking
- Computer graphics
- CAD/CAM

A useful survey of application programs may be found in three catalogs: *IBM Applications and Abstracts* (G320-6131), *Engineering and Scientific Application Programs Available from Non-IBM Sources* (G320-6739), and *Engineering and Scientific Programs for IBM Personal Computers Available from Non-IBM Sources* (GC34-0588).

Alternative Approaches to Implementation

Alternatives to the systems described earlier in the Data Processing System Overview and Information Center sections of this publication are:

- Dedicated superminis (9370, 4300)
- Workstations, including RT Personal Computer
- Mixed-vendor networks
- Attachable OEM devices

Business Problems and Potential Benefits

(See also Business Problems and Benefits under "Information Center.")

Engineers, scientists, and technical professionals have a wide variety of requirements spread over many disciplines. It is quite common to find equipment sold by many vendors within departments. This variety of machines and programs often leads to incompatible data processing and inconsistent results.

IBM's engineering and scientific systems and application product offerings can provide the following benefits:

- Virtual Machine/Integrated System (VM/IS) – an integrated application system to support many work activities of engineers and scientists
- Single vendor support
- Common upward-compatible System/370 architecture
- A user-oriented VM/CMS-based application system (see "VM Installations" under "Interactive Systems Product Selection Guidance" in Section 30).
- An integrated vector-processing capability on the 3090 providing high performance for compute-intensive E/S applications
- A high-performance, full-function E/S workstation RT Personal Computer – 6150 based on AT&T Bell Labs' UNIX V System
- Integrated communications protocol (SNA)
- Comprehensive set of program products for engineering/scientific application areas
- Significant price/performance improvement
- Attachment to a variety of OEM equipment
- Standardized program offerings across processors (such as VS APL, VS FORTRAN)

The introduction and continued improvement of IBM products, systems, and support can provide the means to improve the productivity of engineering and scientific professionals.

Related Product Selection Guidance References

- Technical Computing

Knowledge-Based Systems

Introduction

Artificial intelligence (AI) is a very broad and general field encompassing all information systems disciplines involved in building computer systems able to emulate human capabilities. The area closest to commercial deployment is:

- Knowledge-based expert systems

This area is aimed at providing computer programs that imitate the behavior of humans in solving problems normally thought to require experts, or specialists, for their resolution.

There are other AI disciplines in various phases of research, development, and deployment, all of which are potentially closely interrelated. As the AI field grows and matures, these areas will begin to meld into one very close-knit discipline, and finally to integrate with other traditional data processing applications. Natural language processing and robotics are two of today's AI disciplines:

- Natural language processing

Programs used to understand the language used by people in everyday conversation are addressed by two fields in AI research. The first area deals with the understanding of written text, the syntactic and semantic knowledge of language. The second area deals with understanding the spoken language by identifying individual sounds and eventually combining these into a meaningful sentence structure of words.

- Robotics

Sometimes referred to as smart robots, this area addresses the use of robots in a constantly changing environment. Robots are programmed to "see" and "feel" changes in their environment as they move about and are able to respond to these new spatial references.

The AI field as an area of development (as opposed to research) is new, fluid, and is growing and taking shape very rapidly.

Implementation

Shells vs. Languages

Expert systems products may be placed in two categories — shells and languages. A shell is an interpretive program that presents a framework for the user to enter rules, edit, and design user interfaces. Programming knowledge is not a prerequisite. It may be used directly by domain experts, knowledge engineers, and programmers. Languages (LISP and

PROLOG) are used by AI programmers for problems that do not lend themselves to shell architecture or that require exceptional performance.

Applications

The applications listed below by no means represent a complete list of candidates, but offer a list of possible areas where commercially viable knowledge-based expert systems could be deployed today:

- Finance
 - Auditor manual
 - Credit card checking
 - Financial plan pricing
 - Hedging
 - Loan advising
 - Market advising
 - Market analysis
 - Reconciling payments/receivables
- Manufacturing
 - Automated circuit design
 - Automated factory
 - Hardware problem diagnosis
 - Make/buy decision advising
 - Preventive maintenance
 - Simulation advising
 - Welder qualification testing
 - Wind tunnel design
- Process
 - Chemical technician advising
 - Geological survey analysis
 - Refinery modeling
- Insurance
 - Claims adjustment
 - Claims reserves
 - Homeowner insurance
 - Insurance agents advising
 - Product design
 - Underwriting
- Transportation
 - Pilot assistance
 - Pilot simulation
- Distribution
 - Buying analysis
 - Cost/inventory
 - Gift advising
 - Merchandising analysis
 - Small business consulting
 - Store locator
- Utilities
 - Network load forecasting
 - Network problem determination
 - Plant scheduling
- Information systems management
 - DB dump analysis/recovery
 - DB naming
 - JCL error analysis
 - Network operations

Operating systems management
 Relational DB design
 Systems configuration

Primary Product Offerings

- Expert System Environment/VM
- Expert System Consultation Environment/VM
- Expert System Environment/MVS
- Expert System Consultation Environment/MVS
- IBM KnowledgeTool
- IBM Common LISP
- VM/PROLOG
- MVS/PROLOG

Expert System Environment

The expert system environment products are the products of choice to run on mainframes of the System/370, 30XX, 4361 and higher, and 9370 Model 40 and above.

Expert System Environment is an expert system shell — a general-purpose system. The motivation for designing this system arose from the difficulty of building expert systems — very often, one of a kind. Expert System Environment incorporates a set of procedures used to design a variety of applications. The designer-users insert their own rules into this empty or “shell” system to define their particular “knowledge base” and choose a reasoning method to select the “inference engine” that will apply the rules; the result is a specific expert system ready for the end user.

The Development Environment incorporates an editor with which a knowledge engineer can create a knowledge base in the form of English-like rules, parameters, and controls. It also has a screen editor with which users can design their own screens for prompts, explanations, and conclusions.

Expert system environment programs include a set of basic functions for processing knowledge. These algorithms provide proven methods for processing. One is backward chaining, in which a value for a goal is obtained from working backward to the given premises; another is forward chaining — proceeding from the given data to make inferences and draw conclusions or carry out actions. The program also enables the knowledge-base builder to break complex problems into smaller ones.

Once an expert system application has been written and tested, it can be replicated and executed on other computers by use of the Expert System Consultation Environment.

IBM KnowledgeTool

IBM KnowledgeTool is designed to support development and execution of high-performance knowledge-based systems applications. It supports a powerful

and versatile rule-based language that enables users to encode declarative statements within the framework of a procedural language. IBM KnowledgeTool provides language capabilities that are needed to develop knowledge-based systems, including working memory, rules that specify a set of conditions and a set of actions to be executed when the conditions are satisfied, debugging facilities, conflict resolution, subroutines of rules, and inferencing algorithms.

IBM KnowledgeTool has a translator and run-time libraries. The translator converts the source statements into PL/I expressions (PL/I source code) and rule files. The PL/I source code is compiled by the PL/I Optimizing Compiler into object code. This process results in a library of object modules and rule files. The library is used at run time and it constitutes the compiled form of the knowledge base.

The run-time libraries contain the debug facilities and inference engine. The inference engine builds an inference network out of the rule files produced by the translator. The object code produced by the PL/I Optimizing Compiler constitutes the procedural components of the rules.

The IBM KnowledgeTool source statements can be a mixture of rule constructs and PL/I statements. Rule constructs and PL/I statements can examine and modify data that reside in working memory. The knowledge in working memory, which can be viewed as “facts,” may have been obtained using PL/I data base access statements.

The results of the interaction between the rule constructs, procedural code, and working memory can be examined by the developer using the debug facility. The facility gives the user control over rule processing. The debug facility also allows users to define, initialize, and modify working memory. Whenever working memory is modified, the inference engine determines which rules should be processed again. This occurs without the programmer’s intervention.

Other programs can be called from the action parts of rules, controlling the processing of procedural routines through data-driven inferencing algorithms. Other programs can call IBM KnowledgeTool applications. This enables existing applications to use the IBM KnowledgeTool inferencing capabilities.

IBM Common LISP

Unlike conventional programming languages, LISP manipulates lists and symbols rather than numbers. This gives LISP programs their ability to imitate human thinking and makes it possible to tackle complex problems.

Knowledge-Based Systems

Over the past two decades, many different dialects of LISP have evolved. In 1984 an association among government, academia, and industry produced a standard dialect called Common LISP.

Today Common LISP is one of the most popular languages for developing AI applications. It is stable, portable, and powerful.

IBM Common LISP, developed by IBM and Lucid, Inc., provides a complete environment for developing and running LISP applications. Existing LISP applications can be run with a minimum amount of reprogramming.

The IBM Common LISP environment runs on a mainframe connected to one or more personal computers*. It delivers the memory and processing power of the mainframe with the fast response and convenience of intelligent PC work stations.

Through restricted access on the mainframe, IBM Common LISP also provides a secure environment for data and applications.

IBM Common LISP is an integrated family of products. With windows, menus, and mouse support on the personal computer, it is easy to use.

The application environment provides complete runtime support for compiled Common LISP applications. Through the application environment, non-technical users can use previously-written programs that provide for:

- Multiple windows
- Graphics
- Data base access
- Library management

The development environment provides all of the required development tools:

- Interpreter
- Editor
- Compiler
- Debugging facility

VMIPROLOG, MVSIPROLOG

PROLOG (PROgramming in LOGic) is a computer language based on predicate logic, in particular the clausal form of logic and resolution inference. PROLOG has become a major language for the development of artificial intelligence applications. This program offering can be used for research, development, and implementation of such artificial intelligence applications as:

Expert systems
Automated deduction
Theorem proving

Knowledge representation and processing
Natural language processing
Access to relational data bases

PROLOG has built-in mechanisms that may make it easier to code symbolic manipulation algorithms, so that the professional user can concentrate on the problem-solving process. This may increase programmers' productivity and thus save development costs.

* "Personal computer" or "PC" refers to the IBM Personal Computer or IBM Personal System/2™.

Office Systems

Introduction

Office systems is an area that is experiencing rapid growth. Many industry experts predict that the value of office systems shipments will meet or exceed shipments of traditional data processing systems by 1998.

Definition

Office systems comprise a set of applications that provide a wide range of functions to match user requirements. They integrate text and data and address graphics, image, and processing of voice communications.

Application Areas

- Decision support
- Text services
- Electronic mail
- Electronic filing
- Professional support services
- Data base access
- Business graphics
- Printing
- Application development
- Specialized applications
- Image processing

Alternative Approaches to Implementation

IBM makes available:

- At the workstation level:
 - Personal Typing System
 - IBM Personal System/2 family
 - IBM Personal Computer family
 - 3270 Personal Computer family
 - Personal Computer/370 family
 - 3270 family
 - Scanmaster for image applications
 - Other work stations, depending on user requirements
- At the departmental level, offerings such as:
 - Local area networks
 - System/36
 - System/38
 - 9370
 - 4300
- At the host level, offerings such as:
 - DISOSS
 - PROFS with PROFS Application Support Feature
 - Personal Services/TSO
 - Personal Services/CICS
 - DisplayWrite/370
 - Application System (AS)
 - Query Management Facility (QMF)

- Complementary office offerings such as:
 - DCF/DLF
 - ATMS III
 - STAIRS

Business Problems and Potential Benefits

IBM office systems can provide:

- Improved efficiency and effectiveness for all end users including secretarial and support personnel
- Improved return on data processing investment
- Improved communications among decision-makers
- More timely access to both text and data
- Improved storage and retrieval
- Reduced turnaround in the preparation of documents
- Better control and responsiveness

In addition, IBM office systems equipment permits the merger of text and data applications and offers the opportunity to base office systems solutions on existing data processing resources.

This can be done in an extraordinary manner because of the framework provided by IBM architectures:

- Systems Network Architecture (SNA)
- SNA Distribution Services (SNADS)
- Document Content Architecture (DCA)
- Document Interchange Architecture (DIA)

Related Product Selection Guidance References

- General Systems
- Office Systems

Storage Subsystem Management

Introduction

In an environment of rapid growth, the use of online data base systems will continue to expand as will the explosive growth in the requirement for storage capacity and increased performance.

In the latter part of the '80s, decisions about the effective use of storage affect user satisfaction more directly than ever before. Increased performance, improved system availability, and greater capacity within physical space constraints must be provided cost-effectively. To meet these requirements, the large system installations must take a systems approach to storage subsystem management — a plan that utilizes the best balance of devices and storage programs.

Definition

Storage subsystem management addresses the total cost of storage and the requirements of capacity, performance, availability, and environment through an interrelated set of:

- Storage hardware — a hierarchy of hardware devices
- Storage software — a series of interrelated program products and operating system features designed to manage data storage and movement more efficiently
- Storage planning — planning aids and tools that the IBM marketing team can use to assist customers in effective planning for the future

Alternative Approaches to Implementation

To support a systems approach to storage subsystem management, IBM provides a large selection of storage products and programs, including:

- The 3380, a significant advance in large system DASD including the direct channel attach Model CJ2
- The innovative 3480 cartridge tape system, which establishes a new product base for the entire spectrum of tape operations
- The 3375, an intermediate capacity DASD supported also by MVS/370 and MVS/XA
- The 3990 Model 3, which uses up to 256MB of cache storage and 4MB of nonvolatile storage and provides extended functions such as DASD Fast Write and Dual Copy. The 3990 Storage Control provides faster internal processing using an improved microprocessor and more efficient microprogramming.
- The 3880 Model 21 paging subsystem, which uses up to 64MB of cache storage and microcode algo-

ritms to provide improved and consistent page service times

- The 3880 Model 23, which uses up to 64MB of cache storage to provide significantly faster access to system and application data sets stored on 3380s and a lower-cost solution by allowing better utilization of the configuration's capacity

For MVS systems, the Data Facility family of software products provides synergistic benefits. It consists of the following four products:

- Data Facility Product (DFP), which provides data management, device support, program library management, program fetch, system and user catalogs, utilities, and other functions. It is the manager of active data in the system.

The Integrated Catalog Facility (ICF) provides significant performance and availability enhancements over VSAM catalog and OS CVOL. Future enhancements in catalog management will only be made to the ICF catalog.

The Interactive Storage Management Facility (ISMF) provides support for efficient interactions between the user or storage administrator and the storage management functions of MVS/XA DFP and MVS/DFP™. Optionally, the user may invoke data set functions of DFHSM, DFDSS, DFSORT, or the editing capabilities of ISPF/PDF.

- Data Facility Data Set Services (DFDSS), a high-performance data mover, which provides copy, dump-and-restore, and DASD space management functions. It is also a highly-effective tool for DASD migration and conversion.
- Data Facility Hierarchical Storage Manager (DFHSM), which provides automatic space and availability management among a hierarchy of storage devices including all models of 3380 DASD and 3480 cartridge tape systems. Migrated and backed-up data may be compacted and compressed, which extends storage capacity and reduces storage costs. DFHSM is the manager of low-activity and inactive data in the system.
- Data Facility Sort (DFSORT), a high-performance data arranger.

These products, along with RACF, form the strategic base from which IBM is evolving to a system-managed storage environment. In addition, MVS/DFP and other individual products of the Data Facility family, together with the RACF product, provide complementary functions that make up the Data Facility Storage Management Subsystem (DFSMS™). This subsystem simplifies the management and use of external resources by providing a device-independent means of requesting services by data set.

Business Problems and Potential Benefits

The major benefit areas of a systems approach to storage management are:

- Space management — automatic management of storage resources to utilize capacity more efficiently and reduce the number of people required in that process
- Performance — device and storage programs performance improvements, which contribute to overall system throughput and reduced response times
- Availability — enhanced device reliability, supported by new and enhanced storage programs, which provides increased availability of user data
- Capacity:
 - Storage devices that offer a decreased cost per megabyte
 - Programs and cache storage controllers that can provide better space management
 - Environmental benefits, such as improved space/capacity, power requirements, and heat dissipation, which help contain costs

Primary Product Offerings

Storage Hardware

- 3370/3375/3380 Direct Access Storage
- 3480/3422 Magnetic Tape Subsystems
- 3990 Storage Control Models 1, 2, and 3
- 3880 Storage Control Models 3, 21, and 23

Storage Software

- Data Facility Product (DFP)
- Data Facility Data Set Services (DFDSS)
- Data Facility Hierarchical Storage Manager (DFHSM)
- Data Facility Sort (DFSORT)
- IMS/VS Data Base Recovery Control
- Resource Access Control Facility (RACF)

Storage Planning Tools and Program Offerings

- DCAT
- Installation Aid/1 (IA/1)
- SNAP/SHOT
- Cache Analysis Aid
- DASD Space Analyzer
- Volume Mount Analyzer
- Large Capacity DASD Marketing Aid
- Cache RMF Reporter

Related Product Selection Guidance References

- Storage and I/O

Storage Management Publications

The MVS/XA Storage Management Library consists of the following guides. All manuals and a binder may be ordered through the single order number GBOF-1755.

- Focus on Storage Management, GC26-4260
- Leading an Effective Storage Management Group, GC26-4261
- Managing Data Sets, GC26-4263
- Managing Storage Pools, GC26-4264
- Configuring Storage Subsystems, GC26-4262
- Storage Management Reader's Guide, GC26-4265

Continuous Availability

Introduction

Enterprises have for the most part done the job of automating the routine, clerical tasks of the back office and are now at the edge of a new wave of automation that may change the way they are doing business. They are shifting their attention to the automation of their "mission critical" systems, systems that automate the essential elements of a company's operations.

These applications require fast, online transaction processing ("OLTP") and often involve direct interface with the company's customers, suppliers, dealers and professional staff. These systems can improve the efficiency and effectiveness of a company's operations.

An OLTP transaction usually involves "real time" updates to files in an environment where the update(s) resulting from completion of a transaction can affect the outcome of subsequent transactions. The workload in an OLTP system is almost always linearly related to business volumes.

Successfully implemented "mission critical" systems can provide significant competitive advantages, improved customer service, increased market share, reduced costs, and improved employee productivity. The risk or impact of a systems outage for one of these applications can be a significant loss of business – from tens of thousands to millions of dollars – loss of productivity, or harm to the company's image.

It is estimated that in the next 10 years, businesses will increase their data processing expenditures two to three times over current expenditures for the implementation of "mission critical" systems.

As the user community of these applications grows and changes, it is becoming quite evident to enterprises that the availability of the systems is crucial. High levels of system availability will continue to increase in importance as the automation of these applications continues. Availability is a business issue that should not and cannot be ignored. Availability is not just an issue for the information systems department but for the continued growth and success of the enterprise itself.

Telecommunications and networking will play an increasingly important role in the automation of these systems and in the availability of information needed for the user of the application. Rapid, reliable and available data communications between and among users and data bases is required. A single query for information may require access to multiple networks and interconnected systems.

Selection considerations for highly available online transaction processing solutions include:

- Level of availability required
- Need for continuous operations
- Desire for non-disruptive, modular growth
- Network availability/flexibility
- Device attachment/connectivity

Definitions

- Continuous availability: the appearance to the end user of no system outages
- High availability: masking unplanned, disruptive system outages from the end user
- Continuous operations: masking planned, disruptive system outages, required for growth or maintenance, from the end user
- Fault tolerance: product design that allows a computer system to continue to deliver service in spite of component failure primarily through duplicated hardware components
- Online transaction processing (OLTP): rapid processing of transactions (inquiries and updates) in real time. Customers are interested in availability, performance and cost per transaction. OLTP environments are:
 - Host complex: traditional data center environment. Typically; multiple, large hosts, online and/or batch processing, large data bases and terminal networks, and very high transaction rates.
 - Host front-end processing: processing that "front-ends" the host complex for transaction routing and stand-in processing if the host complex is not available. Dedicated to online transaction processing.
 - Distributed/departmental processing: OLTP on a separate, dedicated system with varying dependence on host facilities (application, data base) for the completion of a transaction
 - Networks, SNA or non-SNA: networks that include application-capable network processors that can route transactions, data, or messages through the network. May also provide protocol conversion, support connection of a variety of terminal types, and provide access to multiple applications and data bases.

Application Areas

There are applications that are commonly used in an industry and others that are specific to the individual company. Some common examples are:

- Manufacturing
 - Shop floor control
 - Time and attendance
 - Computer integrated manufacturing (CIM)

- Public sector
 - Computer-aided dispatching
 - Lottery systems
- Cross-industry
 - Telemarketing
 - Customer information and control systems
- Lodging
 - Hotel management/reservations
- Finance
 - ATM networks
 - POS network/credit authorization
 - Cash management
 - International funds transfer
- Securities
 - Trading systems
- Transportation
 - Dispatching/yard control

Potential Benefits

- A significant competitive advantage through improved product service or differentiation
- Improved customer service through faster, more complete information
- The ability to offer new services or products
- Increased revenue due to expanded market share and new services
- Streamlined operations
- Reduced costs because of fewer system outages and improved operations
- Improved employee productivity with rapid, reliable information from on-demand systems
- Elimination of potential significant loss due to unavailability of key mission-critical application or service

Primary Product Offerings

System/88 - See Section 61.

Extended Recovery Facility (XRF): Both IMS/XRF and CICS/MVS increase the availability of host transaction processing as seen by end users of XRF-supported terminals. Availability is improved by using additional resources to lessen the impact of certain events that disrupt service to the user. In the event of a disruption of service, the workload is automatically switched over to an alternate, synchronized, active system.

IMS fast path: Fast path improves data availability through large data base partitioning, record deactivation, multiple-area data set copies, and data sharing. It can also help improve system throughput.

Automated Recovery Techniques IMS/CICS/CMC: These use documented, automated CLISTS to speed recovery from outages in an IMS or CICS system or a CMC (Communications Management Configuration).

Related References

- So You Want to Estimate the Value of Availability, GG20-9318
- Systems Analysis for High Availability, An Availability Management Technique, GG22-9391
- Component Failure Impact Analysis, An Availability Management Technique, GC20-1865
- System Outage Analysis, An Availability Management Technique, GC20-1871
- IBM System/88 Digest, G520-6518
- IBM System/88 Software Solutions, G520-6519
- Automated Systems Operations For High Availability: Concepts and Examples, GG66-0260

Local Area Networks

Introduction

The customer information processing environment, over time, has become increasingly complex at both the establishment and enterprise level. Each level has developed its own set of requirements, which has led to the development of a number of network products to meet those needs.

The common thread that ties the network together is the desire to provide users access to data and applications. In the past, the network was relatively simple since data resided primarily in the host system. As technology advanced, applications and data were distributed to departmental systems within the network. The introduction of personal computers has allowed the distribution of information to every point in the organization. As a result, providing today's users with access to information and applications has become much more complex.

IBM has built systems and network solutions around Systems Network Architecture (SNA) to meet those complex needs. SNA has enabled products to work together to deliver advanced functions to users in an orderly manner. As new requirements have emerged, SNA has been enhanced to encompass these needs.

The IBM Token-Ring Network, along with baseband and broadband IBM PC Networks, provide users with local area networks (LAN) for communication within an establishment. The IBM family of LANs provides interconnection of a wide variety of local and remote devices, workstations, and systems. The IBM family of LAN offerings includes SNA-compatible network management and open architectures to allow the integration of most vendor products.

Definitions

A local area network (LAN) is a high-speed information transport system operating among a number of devices usually located on the same premises. ("High speed" is usually defined as one million or more bits per second.)

Local area networks tie computer systems together for the purpose of sharing information and resources with minimal disruption to the business.

The goal of IBM LAN offerings is to attach not only multiple types of devices but also multiple vendors. Users on a LAN should be able to access any other application in a network.

IBM's local area network offerings include the Token-Ring Network, PC Network Broadband, and PC Network Baseband. LANs are distinguished from other types of networks in that communications are generally confined to a moderate-size geographic

area. Data and information are locally managed and there is generally a need for an assortment of attached devices.

Where there is the need for frequent PC-to-PC data transfer, utilizing PC-based applications, shared resource requirements, specialized applications such as video, voice, or security, occasional-to-moderate access to host or departmental systems, and sharing applications or data between intelligent devices through a common transmission system, then a local area network provides a solution.

Alternative Approaches to Implementation

Currently, IBM offers three LAN solutions: the IBM Token-Ring Network, the IBM PC Network Baseband, and the IBM PC Network Broadband. Each of these LANs is designed and optimized for certain environments.

Two distinct local area network environments are evident. First are those environments where the network media support a "single" network service. That is, all devices connected to the LAN share a single, common channel with one service ... usually data. The Token-Ring Network appears in single-service environments.

The IBM PC Network Baseband is a baseband network that uses Carrier Sense Multiple Access with Collision Detection (CSMA/CD) and operates on the IBM Cabling System including telephone twisted-pair wire. It is designed for networks such as education or new businesses where applications are personal-computer-based and the primary requirement is for low-cost, small installations supporting only single services.

In the second environment, "multiple" services flow over the same network media. That is, any device connected to the LAN can select one of the multiple services or "channels." Users in this environment have access to different services such as video, voice, and data.

The IBM PC Network Broadband operates over CATV (cable television) media in multi-services environments. An example of this environment is a higher-education institution where users can take advantage of the multiple services offering for video, security, and data.

Local area networks classified as industrial LANs are always installed in environments where multiple services requirements are present. Examples include a factory floor where there may be video, robotics, or data requirements. All of these networks would operate over the same physical CATV network.

In general, the Token-Ring Network provides the best solution when there is the requirement for a high-function, establishment-wide solution and where communication among intelligent workstations, departmental systems, and hosts is required.

In general, PC Network Baseband provides an opportunity to organizations requiring a low-cost department or work-group solution for connecting IBM PCs only.

In general, PC Network Broadband provides an opportunity to organizations requiring multiple services such as video, data, voice, or image.

For those customers who require a LAN designed for adverse environmental conditions such as a plant or factory floor and who need to interconnect intelligent devices such as robots, industrial workstations and computers, multi-vendor devices, and process controllers, the best solution is the IBM Manufacturing Automation Protocol (MAP).

Potential Benefits

- Allow for control and growth of IBM personal computers
- Provide via the IBM PC LAN Program the ability to:
 - Share data files among users
 - Share printers among those who need print capability
 - Send electronic notes to others on the LAN
 - Provide security by limiting access to disk, directories, and printers on the LAN
- Enhance connectivity by allowing communications to other personal computers, departmental systems, host systems, and outside networks via a ROLM CBX, PBX, or public switched network
- Improve access to multiple applications on multiple machines from one workstation
- Provide for both local and centralized network management
- Are part of the SNA communications environment
- Have the NETBIOS, IEEE 802.2, and APPC/PC interfaces

Primary Product Offerings

- IBM Token-Ring Network
- IBM PC Network
 - Broadband
 - Baseband
- IBM Cabling System
- IBM Token-Ring Network Starter Kit/A
- IBM LAN Manager
- IBM PC 3270 Emulation LAN Management Program
- IBM LAN Support Program
- IBM PC Network Protocol Driver
- IBM Advanced Program-to-Program Communications for Personal Computers
- IBM PC LAN Program

- IBM PC Support/36
- IBM 3270 Workstation Program
- IBM Token-Ring Network Bridge Program
- IBM PC 3270 Emulation Program
- IBM Token-Ring Network/PC Network Interconnect Program
- IBM Asynchronous Communication Server
- IBM Asynchronous Connection Server
- IBM Remote NETBIOS Access Facility
- IBM Token-Ring Network Trace and Performance Program

Related Product Selection Guidance References

- Graphics
- Systems Interconnection – System/370, 30XX, 4300, 9370
- Data Communications
- Office Systems
- General Systems

Reference Material

- Token-Ring Network Starter Kit, G520-6205
- An Introduction to Local Area Networks, GC20-8203
- Local Area Network Concepts, G320-0161

Open Network Management

Introduction

The open network management structure allows IBM network users to manage IBM and non-IBM communication components by connecting them to the IBM network at defined IBM-supported entry points and service points. IBM has developed a conceptual structure that describes network management functions. This structure can be applied to all components of an information network, including SNA and non-SNA components handling voice, data, image, or other information. The concepts of focal point, entry point, and service point are defined below.

Definitions

Focal Point

The focal point provides centralized network management application support for all network components. It manages all of its remotely- and locally-attached network components with respect to one or more network management disciplines: for example, problem management, change management, or operations control. An IBM example of a focal point is a System/370 with any of the following applications:

- NetView — provides operations control, network automation, response time monitoring, and problem determination support.
- NetView Distribution Manager — provides library management and change management facilities to assist the customer in writing changes, scheduling change application, and transferring code and service to supported products.
- NetView Performance Monitor — provides performance management functions, such as network line availability and utilization information.
- INFO/Management — provides data management and presentation services for problem, configuration, and change management functions.

Entry Point

An entry point is a product that provides network management services for itself and attached communication devices. It also supplies general connectivity for the attached components to access end-user services provided by the network. An entry point is an SNA-addressable product that exchanges formatted network management messages, such as alerts and response-time monitor requests and responses, between its attached devices and a focal point.

Examples of IBM entry-point products are:

- System/36, System/38, System/88
- Series/1
- 3720/3725/3745 Communication Controllers

- 3174 Communications Control Unit
- 3708 Network Conversion Unit

Service Point

A service point is a product that provides network management support for IBM Token-Ring Networks, ROLM CBXs, selected PBXs, and non-SNA components for which entry-point support may not exist. A service point provides a connection through which network-management data can be converted to SNA formats and transmitted to the focal point for processing. The service point is SNA-addressable and can accept SNA-formatted network management requests from the focal point, convert them, send them to an attached network component, and then send the component's response back to the focal point.

Examples of IBM service-point products are:

- NetView/PC — provides base service point functions for operations control and problem determination for attached network components. It also provides an application program interface (API/CS) that allows users to write programs that communicate with NetView in a System/370. Such communication is used for transferring network management messages, such as alerts, commands, and responses, between NetView/PC and NetView.
- IBM LAN Manager — executes as a standalone program or as an application under control of NetView/PC and provides problem determination and control for the IBM Token-Ring Network and the IBM PC Network (broadband).
- NetView/PC ROLM Alert Monitor — works with NetView/PC and provides problem determination and alert management for ROLM CBXs.
- NetView/PC ROLM Call Detail Collector — works with NetView/PC and collects and logs call detail records from CBXs and selected PBXs. The program analyzes the records for alert conditions, sends an alert to NetView, if appropriate, and transmits the call detail records to a host for processing by the host voice network management application programs.

Reference Material

The *Introduction to IBM's Open Network Management* (SC30-3431) further describes these concepts and provides examples of their application.

Network Control

Introduction

Network control supports the needs of communications network end-users, applications, and terminals by providing:

- Establishment, authorization, and maintenance of logical and physical connections between terminals and applications, these connections being:
 - Application to application
 - Terminal to application
 - Application to terminal
 - Terminal to terminal
- Synchronization, routing, integrity, and recovery of data transmitted during the established connections

Network control should accomplish these functions while remaining transparent to the application developer and the application user and should be independent of the data structure.

Alternative Approaches to Implementation

To provide a base for expansion of communications capability for a wide variety of end-users with differing application requirements, while remaining transparent, the following are required:

- A communications architecture that determines the interfaces for the communications network and standards (protocols) for end-to-end communications
- Hardware/software combinations that allow the attachment of different terminal and application types to the network within the architecture
- Software that implements the end-to-end protocols to ensure application end-user compatibility

In recognition of these requirements IBM has developed:

- A common architecture, the Systems Network Architecture (SNA)
- Support for a wide variety of communications facilities for data transportation through the network with interfaces to international communications standards – for example, leased or switched analog or digital lines, X.25 public packet switched network (with the X.25 NCP Packet Switching Interface (NPSI) product and the Network Interface Adapter and/or with the X.25 SNA Interconnection (XI) product)
- Support for BSC (RJE/NJE) data to shape SNA network links (with the non-SNA interconnection product)
- Programmable terminal controllers with common communications functions (for example, 3600, 4700, System/36, System/38, Series/1, System/88)

- Programmable communication controllers with associated host-based network managers (for example, 3720, 3725, or 3745 with NCP, System/370/30XX with VTAM or TCAM) or communications adapters (for example, 9370 CA, 4331 or 4361 ICA) with associated host-based network managers (for example, ACF/VTAM)
- Networking capabilities for communications among processors (for example, 30XX, 4300, 9370, System/370, 8100, System/36, System/38, System/88, Series/1), and between independent SNA networks
- A set of application control software that provides the application interface to the communications complex (for example, CICS, IMS, System/36 SSP, System/38 CPF, Series/1 TPS)
- Network management products (for example, NetView, NetView Distribution Manager, DSNX, NetView/PC, Information/Management, and advanced function modems)

Business Problems and Potential Benefits

The network control function within Systems Network Architecture addresses the following business problems:

- Inadequate use of hardware resources due to incompatibility with application software
- Inability to take advantage of technological improvements because application software is directly tied to terminal characteristics
- Unproductive use of programming resource (education, modification, conversion)
- Excess hardware and line costs

SNA can provide the following benefits:

- Allow the user to concentrate on application program logic without reference to the physical characteristics of the network
- Allow different device and system types to be mixed on the same line and network
- Allow different terminal types to access individual applications
- Allow individual terminals to access multiple applications
- Provide comprehensive line attachment capabilities for cost effective network configuration
- Allow multiple, independent SNA hierarchical and peer networks to be interconnected

Primary Product Offerings

- SNA terminals and distributed systems (3270, System/88, Series/1, IBM personal computers, 4381, 9370, System/36, System/38)
- SNA communication controllers (3720, 3725 or 3745 with NCP, 9370 CA, Series/1)

Network Control

- SNA network access method (ACF/VTAM)
- SNA networking capabilities
- SNA supporting subsystems (for example, CICS/VS, IMS/VS, TSO, RJE, RSCS/SNA)
- Network management products (NetView, NetView/PC, NetView Distribution Manager, NetView File Transfer Program, NetView Performance Monitor, Information/Management, advanced function modems)
- System/38 CPF, 3270 DE, RJEF
- System/36 SSP, ICF, 3270 DE, MSRJE, CSMF
- Series/1 RPS/CM, EDX/CF, ARJE, RMU, SNA, PSNA
- High-speed DASD controllers (3880 Models 21 and 23) for use with TSO, CICS, IMS, and other applications

Related Product Selection Guidance References

- Network Control
- Systems Interconnection - System/370, 30XX, 4381, 9370
- Multisystem Networking - System/370, 30XX, 4381, 9370
- Data Communications
- General Systems
- Office Systems

SNA Network Interconnection

Introduction

With SNA Network Interconnection (SNI), terminals and applications in one network can access resources in other interconnected networks. This cross-network communication is transparent to the terminal user.

The SNI capability is provided by ACF/VTAM Version 2 Release 2 or later and ACF/NCP Version 3 or later. In addition, NetView provides operational and logical problem determination, respectively, for an SNI environment.

Potential Benefits

The ability to interconnect multiple SNA networks can be important to SNA users for a number of reasons, some of which include:

- **Company mergers.** Corporations that have merged may each have existing SNA networks. Divisions of one company may already have their own autonomous networks. SNI supports a corporate-wide level of communication so that the existing networks do not have to be physically merged and can remain autonomous in operations, naming conventions, and other characteristics.
- **Intercompany communications.** Organizations that have SNA networks and desire to exchange data can use SNI as the vehicle. Examples of this are access to customer or vendor applications/data and data exchange with or among governmental agencies.
- **Subdivision of a large network.** Because of subarea addressing constraints or the need for better management control, it may be desired/required to break a large network into smaller entities. SNI provides the same level of communication capability, while allowing for future network growth and perhaps a better network structure for operational control and management.
- **SNI can be used to consolidate and implement large networks of 9370s;** SNI would be a logical way to subdivide the network and tie it together.

Primary Product Offerings

- SNA-supported products
- ACF/VTAM Version 2 Release 2 or later
- ACF/NCP Version 3 or later
- NetView
- MVS/370 and MVS/XA
- Series/1 RM

Systems Interconnection -- System/370, 30XX, 4300, 9370

Introduction

The systems interconnection, multisystem networking, and distributed processing concepts relate to the distribution of data processing functions within an organization, while providing ease of use and the required application functions to the end-user. These concepts are complementary and may be used in combination. The concepts involve:

- The distribution of data processing functions between two or more processors in a single location without the use of communications facilities (see this description)
- The distribution of data processing functions between two or more processors in one or several locations using communications facilities (see "Multisystem Networking" in this section)
- The distribution of data processing functions towards the end-user, based on organizational, geographic, and data-related criteria (see "Distributed Processing" in this section)

Definition

The term "systems interconnection" refers to the coupling of multiple processors and the distribution of the system workload across the processing units. Communication between coupled systems usually occurs without manual intervention and is provided by the combined software and hardware supporting the interconnection.

Alternative Approaches to Implementation

The two basic forms of systems interconnection are:

- Tightly coupled multiprocessing, in which two processors share processor storage and a single copy of the control program
- Loosely coupled multiprocessing, in which systems are connected through a shared channel, control unit, or device, or through an IBM Token-Ring Network connection, and each processor has its own copy of the control program

Potential Benefits

The primary purpose of interconnected systems is to help improve workload balancing, ease of operation, and total availability over that offered by uniprocessors or multiple unconnected processors. In addition, depending on the approach selected, interconnected system complexes can:

- Provide data processing management with the control necessary to meet job turnaround and system availability requirements

- Provide systems programmers with the function and performance necessary to meet the operational needs of a growing computing facility
- Extend the useful life of purchased processors
- Provide the overall organization with a system complex that maximizes integrity and security

Related Product Selection Guidance References

- Systems Interconnection - System/370, 30XX, 4381, 9370

Multisystem Networking

Introduction

The systems interconnection, multisystem networking, and distributed processing concepts relate to the distribution of data processing functions within an organization, while providing ease of use and the required application functions to the end-user. These concepts are complementary and may be used in combination. The concepts involve:

- The distribution of data processing functions between two or more processors in one or several locations using communications facilities (see this description)
- The distribution of data processing functions between two or more processors in a single location without the use of communications facilities (see "Systems Interconnection - System/370, 30XX, 4300, 9370" in this section)
- The distribution of data processing functions towards the end-user, based on organizational and geographic criteria (see "Distributed Processing" in this section)

Definition

Multisystem networking is the interconnection of System/370 application processors to provide a single-system image of an organization's data processing resources. The resources shared by terminal users can include processors, subsystems, application programs, communications facilities, and special purpose hardware. The interconnection of processors at different locations is accomplished via communications links.

Alternative Approaches to Implementation

Multisystem networking as defined above can be performed at three different levels, which are not mutually exclusive:

- Session level, in which a terminal is connected to a particular application in a particular processor for the duration of a conversation, usually covering several transactions
- Job level, in which jobs are transmitted within the network to the processor in which they are to be executed and output is routed to the user
- Transaction level, in which transactions are routed within the network to be processed according to data content

Potential Benefits

Terminal users may request the desired resources or services and, once authorized, have access to the organization's library of online services without regard to the geographic location of the application

processor. Multisystem networking extends the availability of a new application to more potential users, thus helping to increase the return on programming investment. Chargeback/operating expenses can be spread in a similar manner to reduce usage costs for each department.

Specialized processing centers for subsystem functions (data base, application development, personal computing) can be established. Centralizing duplicate software in one location can reduce the number of software specialists required, lower systems programmer training costs, and simplify coordination of online system maintenance.

In a networking implementation, each location can determine its own unique local processing requirements, install the appropriate size processor, and share centralized resources justified by the specialized processing centers. Application systems can be run in any processor that has idle capacity within the constraints of data availability. The result is more effective utilization of installed computing power. This permits growth based on the total processing requirements of the organization.

System availability is increased, since processors in a remote location can provide backup for a failed processor, both for processing of work and access to data files. This type of backup permits recovery in the event of a catastrophic failure at one location, assuming that adequate backup exists for the data files.

Potential benefits of the different types of multisystem networking are:

- Session. Eligible terminal users can have access to all subsystems and online application programs in the network. Each of the subsystems can thus provide more services, in terms of the span of the data base, program libraries, etc., to a wider end-user audience than in a multiple unconnected processor environment.
- Job. Batch jobs and application data can be submitted at the requester's location. Jobs can be processed in a system where the proper resources, including the application programs and the data base, are available. Output can be returned to the requester or produced wherever the proper facilities are available. The result is that the integrity and the economics of valuable resources can be maintained while they are made available throughout the whole organization within a reasonable turnaround time.
- Transaction. Terminal users can have a single subsystem image in a distributed environment. The result is more flexibility in relocating the functions and splitting the data bases, while maintaining an appearance of simplicity to the end-users.

Multisystem Networking

Primary Product Offerings

- Session:
 - ACF/VTAM and ACF/TCAM for System/370, 30XX, 4300, and 9370 (ACF/VTAM and ACF/TCAM require the Multisystem Networking Facility and ACF/NCP)
 - SSP/ICF and 3270DE for System/36
- Job:
 - System/370, 30XX, 4300, 9370 – MVS/SP-JES2 Version 2 or 3, MVS/SP-JES3 Version 2 or 3, NJE for JES2, RSCS and RSCS/SNA Networking, JEP and FTP for VSE with VSE/POWER, and non-SNA interconnection
 - System/36 – MSRJE
 - System/38 – RJEF
 - Series/1 – RJE, ARJE
- Transaction:
 - IMS-MSD, CICS-ISC
 - System/36 ICF-DDFF, DDM
 - Series/1 TPS
 - System/38 DDM

Related Product Selection Guidance References

Multisystem Networking - System/370, 30XX, 4381, 9370

Distributed Processing

Introduction

The systems interconnection, multisystems networking, and distributed processing concepts relate to the distribution of data processing functions within an organization, while providing ease of use and the required application functions to the end-user. These concepts are complementary and may be used in combination. The concepts involve:

- The distribution of data processing functions towards the end-user, based on organizational, geographic, and data-related criteria (see this description)
- The distribution of data processing functions between two or more processors in a single location without the use of communications facilities (see "Systems Interconnection - System/370, 30XX, 4300, 9370" in this section)
- The distribution of data processing functions between two or more processors in one or several locations using communications facilities (see "Multisystem Networking" in this section)

Definition

Distributed processing refers to the distribution of processing function and data throughout an organization to the locations where they are needed. The elements of distributed processing may include a central processing complex, distributed small systems and programmable work stations for remote processing, a communications network with the ability to link the central and remote sites, and a network control system to manage the flow of information.

Alternative Approaches to Implementation

There is a wide range of distributed processing environments (see chart that follows).

A centralized system is based upon central system control of applications and data processing. Small systems, if used in a System/370 centralized environment, are used for basic functions and are connected to the host via leased communications facilities.

Small systems can also be used to provide centralized functions within a peer network of small systems and programmable workstations.

A decentralized data processing environment features standalone processors and information files that are dedicated to local applications. Its processors could be interconnected in a network that does not include an identifiable controlling host.

Hierarchical distributed systems involve a network of distributed processors that are connected to a central host computer by leased communications facilities

and that are heavily dependent on the host for data base references and/or processing functions.

Dispersed distributed systems involve a network of small systems and/or programmable work stations that primarily do local processing. The remote systems are linked to a central host system in a network or to a peer network, as appropriate to the required data transfer, which may involve leased or switched data/information facilities.

A distributed system may involve a communications subnetwork. In this environment, distributed small systems have communications links to other small systems and/or programmable work stations. A distributed system can communicate between the central host system and the other attached small systems. This implementation approach offers much flexibility in choosing the end-user interface and in applications access for the end-user.

The user should choose a solution that meets his local data processing requirements while satisfying the economic and functional requirements of the organization's overall information system. The user should also consider what software support for network management will be available within the limits of his chosen solution.

Centralized	Remote job entry, data stream compatibility to and from host
Hierarchical	Local processing with host update and host access Local processing and subnetworking with host access
Dispersed Distributed Systems	Intelligent data entry with file transfer Local processing with summary file transfer
Decentralized	Standalone system

Potential Benefits

- Provide local processing capability to solve business problems
- Give the user more operational flexibility and constant and reliable system service in an easy-to-operate environment
- Give the data processing organization the opportunity to offload processing activity and data from the central computer to remote locations

Distributed Processing

- Improve the value of the host data base by easing accessibility for the users
- Make processing capacity available wherever it is most appropriate

To implement the distributed concept, hardware and software are required that fit together and that are designed to:

- Offer support to individual applications
- Offer the user growth opportunity with systems that are modular in function, in performance, and in price
- Provide a communications architecture that can control this network, permit change, and, when implemented, provide the tools for effective network management – an objective that SNA was designed to meet
- Provide auditability of all hardware and software functions

Related Product Selection Guidance

References

- General Systems
- Office Systems
- Network Control
- Systems Interconnection - System/370, 30XX, 4381, 9370
- Multisystem Networking - System/370, 30XX, 4381, 9370

System Auditability, Security, and Control

Introduction

System auditability, security, and control help to assure the accuracy, completeness, and integrity of computer-based systems and data. Major considerations include:

- Protecting information from unauthorized, accidental, or intentional modification, destruction, or disclosure
- Providing features and characteristics of a system that aid in assessing the validity and accuracy of results, evaluating the adequacy of controls, and monitoring compliance with established standards
- Controlling the source of collected information and by whom it will be processed or accessed

Alternative Approaches to Implementation

The auditing of system security, control, and integrity should be continuous. It requires direct participation by executive management from information services and functional areas. System control decisions must be closely aligned with applications, data base and network design, installation planning, and systems, applications, and operations audits.

Business Problems and Potential Benefits

As establishments increasingly depend on computer systems as the single major repository of critical business information, the security of their information asset has become an important management concern. In addition, recent privacy legislation and regulatory proposals include a variety of security and control requirements for data systems.

For systems to operate securely, they should have the properties of integrity, auditability, and controllability:

- Integrity is the ability of a system to perform according to its specifications, and resist compromise of controls through misuse or manipulation. For example, in MVS this ability ensures that one program cannot access storage associated with another program without authorization. Data transmitted with encryption is encrypted at the original location and remains encrypted and unintelligible until it is decrypted by a similar encryption mechanism at the receiving location.
- Auditability refers to the features and characteristics of an information system that assist in or improve examining, verifying, or demonstrating the adequacy of control of the data processing system and verifying the accuracy and completeness of the results. To achieve this, the information system should be made up of modular, integral, and auditable subsystems that communicate with each other only across a limited number

of interfaces. All transactions taking place at those interfaces should be recorded in an integrated and secure log, which should indicate where, when, by whom, and for what reason each transaction was initiated

- Controllability is defined as the property of an information system that permits management to exercise a directing or restraining influence over it. Each user or process within the system should be able to control its own environment so that it passes to other users or processes only those objects, services, or resources for which they are authorized.

To help achieve these properties, many IBM products include the following functional capabilities:

- Identification of a potential user, terminal device, or program attempting to gain access to the system
- Subsequent authentication or verification that the potential user is a valid user
- Control of user access to system resources, such as commands, transactions, data, or processing time
- Delegation of the responsibility for changing the rules and circumstances of authorization and for adding, changing, or deleting users of the system
- Journaling or recording of significant events taking place within the system
- Monitoring resource use, security variances, and delegation activity to trigger timely and appropriate corrective action by management
- Additional hardware and software integrity features that address the protection of data files, programs, terminals, and the processors

System control within a data processing operation is a complex issue. In addition to the hardware and software aspects, a comprehensive program of controls should address:

- Additional hardware and software features that enhance the ability of the internal auditor to review and assess the functioning of the systems and applications
- Physical considerations
- Backup and recovery
- Vital records system
- Contingency plans
- Data ownership
- Data classification
- Data disposal
- Adequacy of internal controls
- Adequacy of security measures
- Monitored compliance with control practices and established standards

System Auditability, Security, and Control

In addition, management should systematically evaluate:

- Critical resources, including personnel and training
- Potential hazards – rate of occurrence and potential loss
- Possible protective measures – costs and risks

The determination of standards and criteria and what constitutes compliance is a subject that requires agreement by user management and members of both the internal and external audit community. The areas include:

- General controls and application controls; audit trails; limit and reasonableness checks; and data input, output, and transmission controls
- Systems and applications test facilities
- Systems and application descriptions
- Data descriptions
- Access control
- Resource utilization and management
- Programming techniques
- Network facilities
- Backup and recovery

Primary Product Offerings

System auditability, security, and control relates directly to a number of other areas that are addressed in other Concepts descriptions in this guide. These areas include Application Offerings, Network Control, Data Systems, Multisystem Networking, and Distributed Processing. Many of the products supporting these concepts are capable of providing support for system auditability and security measures.

Auditability and security features are included in:

- Communication subsystems:
 - 8100, 4381, 9370, and industry systems
 - System/36 SSP
 - System/38 CPF
- Communication terminals:
 - Most communication terminals
- Cryptographic Products:
 - 3848 Cryptographic Unit
 - Cryptographic Subsystem program products
 - Information Protection System (IPS) for VM
 - System/36 Finance Subsystem
 - System/38 Cryptographic Facility
- Processor control programs:
 - VSE, SSX/VSE, OS/VS1, MVS/370, MVS/XA (and RACF), MVS/ESA™
 - VM/SP (Directory Maintenance PP and RACF PP)
 - DPPX, DPCX
 - System/38 CPF
 - System/36 SSP
 - Series/1 RPS, EDX

- Magnetic storage units:
 - 33XX, 34XX, 8809, 6157, and 9347
- Interactive application service programs: addition, management should systematically evaluate
 - CICS/VS, IMS/VS, TSO, Information/System, Information/Management, SLR, ICCF, VSE Access Control – Logging and Reporting, DMS/DPPX, System/36 SSP
- Communication access methods:
 - ACF/VTAM, ACF/VTAME, ACF/TCAM, ACF/NCP, ANMP
- Data management:
 - IMS/VS
 - DL/I, Data Dictionary, VSAM, DPPX/DTMS, System/36 SSP
 - DB2
 - SQL/DS
 - Business Management Series (BMS)
 - Personal Decision Series (PDS)
 - MVS/Data Facility Product
 - Data Facility Hierarchical Storage Manager
 - Data Facility Sort
 - QMF
- Information systems management
 - Source Compare/Audit Utility
 - Information/MVS and VM-VSE
 - MVS Custom-Built Installation Process Offering
 - JES3 Monitoring Facility II

Related Product Selection Guidance References

- Data Security
- System Auditability

Graphics

Introduction and Definition

Computer-aided graphics is the process of converting machine-readable data into useful pictorial information for analysis, decision making, design, presentation, and documentation. It allows the user to perform job responsibilities faster, more cheaply, and with improved quality and quantity, and to accomplish tasks that were previously considered impossible. Gains in productivity through computer-aided graphics include the faster generation of geometric shapes, the ability to store, retrieve and reuse information, and the capability to edit an original drawing or adapt it to the user's current needs.

In computer graphics the computer communicates with the user in pictures, which makes it an effective tool for analysis, documentation, and design. The mind absorbs the information content of a displayed diagram much faster than it can take an array of numbers or words and mentally translate them into images.

Selection considerations for the type of graphics system and work station components include:

- The application itself, with the associated human factors
- The level of complexity of the desired graphics output
- The degree of interactivity required between the user and the device(s)
- The amount of graphics interaction required within and during the data processing aspects of the application
- Cost
- Access to data
- Flexibility

These considerations determine the amount of function required of the graphics device by the application and can assist the user in choosing among the IBM offerings.

Application Areas

Business Graphics

There is a considerable amount of overlap between the various categories of graphics, and certain dependencies exist between them. Nevertheless, business graphics is described as an application in which a picture is used to actually replace the data values and yet still reflect the trends, comparisons, and relationships of the data. It is typically associated with bar charts, pie charts, line charts, surface charts, histograms, and the like. Computer generated business graphics use the computer to convert machine readable data into useful pictorial information for analysis and decision making, presentation,

and documentation. Thus, business graphics is frequently divided into three major categories based on usage by the business professional: decision support, presentation, and text and graphics. Typical users include executives, managers, analysts, planners, secretaries, clerks, and all others who have the need to create charts and graphs. The functions that make frequent use of business graphics include:

- Financial analysis
- Inventory control
- Time series analysis
- Budgeting
- Forecasting
- Market analysis
- Manpower planning
- Sales
- Demographic analysis
- Presentation preparation

Analytical Graphics

Typical users include engineers, scientists, programmers, analysts, and all others who have the need to create high-resolution graphics and interact with the picture. Application areas include:

- Statistical analysis
- Mapping
- Structural analysis
- Presentation preparation
- Technical documentation
- Circuit design and analysis
- Page layouts
- Simulation modeling

Design Graphics

Typical users include engineers, drafts persons, and other technical personnel who require a high performance device, such as the 5080 Graphics System, with the 6150 RT PC, to generate drawings. Application areas might include:

- Mechanical design
- Numerical control
- 3-D design
- Drafting
- Facility layout
- Procedure manuals
- Bill of materials creation
- Piping design

Potential Benefits

The benefits derived from the use of computer-aided graphics are substantial and they apply to every functional area within an organization. They include:

- Lower cost. On the average, hand-drawn charts and slides cost between \$20 and \$200 each.
- Quicker turnaround. Most outside vendor services require two to five days to complete.
- Greater accuracy. Although the material given to vendors may be correct, the graphs are subject to human error. Computer graphs can be generated, modified, and represented in various way quickly and accurately.
- Improved management effectiveness. Graphics enhance the decision making process, and easy availability promotes their use by a wider range of users.
- Improved security. Access to confidential or sensitive information can be restricted to company employees.

Typical situations that can benefit from the use of computer-aided graphics include:

- Preparation of engineering drawings
- Meetings of any type, but particularly those in which difficult or complex information is discussed
- Applications that result in multipage printouts of tabular data
- The generation of presentation media (slides, transparencies, flipcharts)
- Planning or forecasting future results
- Creation of technical documentation
- Preparation of educational materials
- Creation of procedures manuals requiring illustrations
- Analysis of numerical data describing geometrical shapes
- Marketing and sales situation to customize a presentation to the client's interests or other factors
- The presentation of test results to an audience
- Any current use of manually created pictures

A study conducted by the Wharton Applied Research Center, University of Pennsylvania, and reported in the March/April 1982 issue of *Computer Graphics News* substantiates the value of computer graphics. The study sought to learn whether graphics were effective in altering the outcome of business meetings. The results were impressive:

- Meetings in which graphics are used are 28% shorter than others.
- Attendees make immediate decisions more often after seeing a presentation with graphics.
- Speakers who use visuals are headed 67% of the time, while equal speakers without graphics meet with roughly half that success.

- Speakers using graphics are perceived as significantly better prepared, more credible, more professional, more persuasive, and more interesting than speakers without charts.

Graphics convey a great deal of information at a glance. Potential benefits to the organization can be summarized by showing how pictures:

- Provide added insight to analysis and understanding
- Permit more effective communication
- Reduce decision turnaround time
- Result in better problem solving
- Yield very significant productivity improvements

Primary Product Offerings

The primary host offerings that take advantage of graphical output are described below. Many are based upon the graphical support provided by the Graphical Data Display Manager (GDDM). GDDM provides support for text, graphics, image, and alpha-numeric to programmers and end users across a wide range of workstations, printers, and plotters.

- 3192 Color Graphics Display Station Models G10, G20, G30, G40, GD0, GE0, GF0, GG0 (3192-G)
 - Image View Facility
 - Image View Utility
 - Presentation Graphics Facility (PGF)
 - Composition Utility
 - Professional Visual Aid Composer
 - Decision Support/VSE (DS/VSE)
 - Graphical Display and Query Facility (GDQF)
 - Application System (AS)
 - Query Management Facility (QMF)
- 3270-PC, 3270-PC AT:
 - All applications that run with the 3179-G and 3278/3279
- 3179 Model 2 or IBM PC with Version 2.1 of enhanced 5250 Emulation attached to the System/38:
 - The System/38 Office/38 Business Graphics Utility (BGU)
- 5080 Graphics System
 - All applications that run with the 3192-G, 3179-G, and 3278/3279 as listed above
 - Computer-Graphics Augmented Design and Manufacturing (CADAM™)
 - Computer-Graphics Aided Three-Dimensional Interactive Application (CATIA™)
 - Computer-Aided Engineering Design System (CAEDS)™
 - Circuit Board Design System (CBDS)™
 - Computer Integrated Electrical Design Series (CIEDS)™
 - Integrated Civil Engineering System – Structural Design Language – II (ICES-STRUDL-II), only for the 5080

- 4224, 3268, and 3287 color printers
- 6180, 6182, 6184, 6186, and 7372 plotters

The following offering supports computer-aided graphics on distribution/departmental systems:

- System/36 Business Graphics Utilities
- System/38 Business Graphics Utility

The following offerings support computer-aided graphics as intelligent workstations:

- IBM RT Personal Computer – 6150 Micro Computer System
 - Professional Graphics Series
 - Personal graPHIGS
- Personal Computer XT and Personal Computer AT with:
 - Personal Computer Engineering/Scientific Series
 - 5175 Professional Graphics Display
 - Professional Graphics Controller
 - Graphical Kernel System
 - Graphics Development Toolkit
 - Graphical File System
 - Plotting System
 - Graphical Terminal Emulator
- 5154 Enhanced Color Display and Enhanced Graphics Adapter
- Integrated Civil Engineering System – Structural Design Language – II (ICES-STRUDL-II)
- IBM Personal System/2 Models 30, 50, 60, and 80
 - CADwrite

Related Product Selection Guidance References

- Graphics

Section 30. Product Selection Guidance

Interactive Systems

Overview

Interactive systems provide the terminal-oriented facilities needed for engineering/scientific systems, office systems, the Development Center for DP professionals, and the Information Center for business professionals.

Primary Product Offerings

- CMS (Conversational Monitor System) of VM/SP
- TSO (Time Sharing Option) of MVS/ESA™ and MVS/XA
- ICCF – Interactive Communication Control Facility available with VSE
- System/36 – System Support Program (SSP)
- System/38 – Interactive Data Base Utilities (IDU)
- System/38 – Control Program Facility (CPF)
- Series/1 – Realtime Programming System (RPS) and Event Driven Executive (EDX)

Selection Guidance

The selection of an interactive system may depend on several principal factors: the type of function needed in the customer's total solution, the size of the user population to be supported, and the current operating system environment. Installations requiring high-function DB/DC and batch capability may need a different solution from that required by a department needing only a standalone interactive system.

VM Installations

For standalone interactive computing, VM/CMS is a very attractive option. VM/CMS offers the following advantages:

- Efficient support for large numbers of interactive users
- The ability to operate in the full range of System/370 architecture systems
- Easy-to-use interactive command language and interpreter
- Full support for application development and personal computing
- Attachability of OEM devices through the Standard OEM Interface (SOEMI), the 7171, and the ASCII subsystem controller for the 9370
- Simplicity of operation

- Support for guest operating systems (MVS/ESA, MVS, VS1, VSE, and VM/CMS itself), including the ability to control the resource allocation among guest systems and interactive users
- Networking facilities to permit the interchange of files between VM/SP and other IBM systems
- Pass-through facilities to allow terminals connected to the VM/SP system to access other interactive or DB/DC systems
- Highly tailorable system through service virtual machines, file system features, powerful system interpreter, programmable full screen editor, and other features
- SNA facilities (running in a guest virtual machine) to allow terminal and line sharing with other SNA-based systems
- Testing of new MVS releases as a guest operating system using the virtual machine facilities of VM/SP
- System and resource access control via RACF

MVS Installations

An installation may prefer to support all user activities under a single operating system. TSO provides support under MVS/ESA and MVS/XA for a wide range of users, including DP professionals and business professionals. TSO provides the following advantages:

- Full development facilities, including ISPF and ISPF/PDF for source creation and maintenance, and a full range of language processors
- Information Center Facility, which supports a variety of application programs and end-user languages and which facilitates Information Center implementation and administration
- Single-system image in a multisystem environment
- Native SNA support allowing full terminal and line sharing
- Easier access to data from the production environment
- Sharing of files among users and among processors via shared DASD
- System and resource access control via RACF

Interactive Systems

VSE Installations

To utilize CMS, VSE installations may run their production operating system under VM/SP. CMS provides a full range of facilities to support the Development Center, the Information Center, and engineering/scientific systems. VM/CMS provides these installations with the following advantages:

- VM/SP is designed to allow maximum throughput for its guest operating systems.
- The installation can dynamically vary the priority among guest operating systems and the CMS network.
- SNA support allows sharing of lines and terminals among CMS and the terminal applications running in the guest virtual machines.

For the VSE user without VM/SP, ICCF provides Development Center support for application development. There is limited support for the business professional in ICCF. The only support for application development for the OS/VS1 user is the application generators available under CICS and IMS. There is no VS1 support for an Information Center for business professionals.

System/36 Installations

Terminal-oriented application development facilities are provided through the System/36 System Support Program (SSP) and related optional program products. These products provide the developer with productive services having a consistent interface. System/36 SSP provides:

- Interactive as well as batch support for multiple concurrent development and application tasks
- Execution time binding of applications to system resources to eliminate resource/application table definitions
- Single job control language for interactive and batch with:
 - Dynamic debugging facilities
 - Extensive testing and Boolean logic capability for realtime control of procedure execution
- Situational HELP support for inclusion in application job control and programs (appropriate for online operational documentation, enabling the developer to assure documentation consistency with the version of the application)
- Multiple program libraries with integrated security that provides:
 - Separate operational libraries and development libraries
 - Control of use and modification of libraries

Optional program products are (see Section 63 for more details):

- System/36 Utilities:
 - Screen Design Aid (SDA) for development of application screen maps, menus, and HELP text

- Source Entry Utility (SEU) for creation and update of job control and high-level language source programs
- Data File Utility (DFU) for creation, update, and reporting of data files
- Development Support Utility (DSU), a full screen editor for creation and update of OCL statements, procedures, messages, display formats, and program source code

- BASIC
- COBOL
- RPG II
- Assembler and Macro Processor
- 3270 Device Emulation Feature of the System/36 SSP for access to host interactive facilities
- MSRJE Feature of the System/36 SSP for access to host batch development services
- Communications and System Management for access to host program distribution services (DSX) and Host Command Facility (HCF)
- Full range of office systems

System/38 Installations

The System/38 is a general purpose computer that uses the Control Program Facility (CPF) to interface with all system functions. It features integrated functions that support both interactive and batch environments in the same manner. CPF has an integrated data base function that allows the system software to be the data base manager. Spooling and telecommunications are also built into the CPF software. The single-level storage method of addressing main storage and disk as one area helps eliminate the programmer's need to understand the system hardware and allows for writing multiple-user, reentrant code as though it were being used by a single workstation. CPF controls the placement of programs and data in this virtual system via dynamic resource management. Other CPF functions that provide for programmer productivity are an interactive debug facility for high-level languages and test library and file creation.

The Interactive Data Base Utilities package consists of four aids designed to help programmers be more productive:

- Source Entry Utility allows a user to interactively create and maintain Control Language (CL) RPG III, COBOL, and BASIC programs and Data Description Specifications (DDS), Utility Definition Specifications (UDS), and text. SEU can create and enter into a new source file member or add, modify, delete, move, or copy statements in an existing member. Predefined formats and syntax checking are available for RPG III, COBOL, CL, DDS, and UDS entry and update.

- Screen Design Aid provides an interactive facility to design and maintain display screen formats, application menus, and Control Language programs to execute the menus. SDA has comprehensive display file capabilities without the need for detailed knowledge of DDS coding forms, keywords, or syntax. It provides a graphic representation of the display format being created or changed and allows for extended field definition and testing of displays, using the status of each conditioning indicator.
- Data File Utility is used to interactively enter, validate, and maintain data for System/38 data base files (logical and physical). DFU allows retrieval and display, with browse capability into any keyed file.
- Query Utility can be used to retrieve and display or print any data base file in a variety of ways. Query allows selection, ordering, summarization, and tabulating for reports and has two-dimensional (major/minor) table capability. Query does not require the knowledge of a high-level language.

Other productivity tools are available for both the programmer and the end user:

- Display Information Facility (DIF) allows for interactive single record data entry and realtime posting and updating of master files, as well as file maintenance. It can also be used to create search programs and file listings and to develop online information applications, such as inquiry against multiple files with user-designed displays, and paging capability. DIF provides user flexibility and supports calls to user routines written in any System/38 language. This product is a tool for the user who has programming skills and needs to develop online applications quickly.

System/38 also has available interactive application packages for such industries as manufacturing, distribution, hospitals, and hotels, as well as packages for cross-industry applications, such as Personal Services/38.

Series/1 Installations

The Series/1 is a family of low-cost, high-performance small computers designed for price/performance, configuration flexibility, and communications capabilities. They handle general-purpose, commercial and sensor-based applications in a multiprogramming environment.

Series/1 offers a modular approach to computing, and can be tailored to match the user's needs for equipment, programs and services.

Hardware: The Series/1 hardware menu offers a variety of standard rack-mounted and free-standing processing units, fixed and removable storage media, fast and efficient input/output attachments, and attachment features for a wide range of IBM and non-IBM terminals and equipment.

Architecture: Series/1 architecture includes:

- An efficient cycle-steal channel for servicing input/output devices
- Microprocessor device control for reducing the channel burden for most I/O units
- A comprehensive interrupt structure for high response and minimum overhead
- An extensive instruction set that provides flexibility for a variety of applications

Series/1 I/O architecture contains a system interface of high functional content and integrity. Up to 256 individually addressable I/O devices – both standard and custom built – may be attached to a Series/1 system.

Software: Series/1 software offers an extensive choice of systems programs and productivity tools. Programmers can select and implement only those functions needed to meet their application needs.

The full-function operating systems are the Realtime Programming System (RPS) and the Event Driven Executive (EDX). A wide variety of application programs – from both IBM and non-IBM sources – is available to address many operational requirements.

Communications: With either operating system (EDX or RPS), Series/1 software is available to meet a broad range of requirements for communicating with host systems, departmental systems, other Series/1s, and terminals, including the IBM Personal Computer and PC Local Area Networks. A number of specific program tools are available for unique system requirements.

Data Base Management

Overview

Data base management products should be evaluated as part of the complete data systems concept, consisting of data dictionary, data base, data communication, and data delivery products.

For System/38 and System/36, data base management is an integral part of the operating system.

All 8100 DPPX systems users should evaluate DPPX/DTMS as their data base management system.

Primary Product Offerings

- DB2
- IMS/VS-DB
- SQL/DS
- DL/I-DOS/VS
- DB/DC Data Dictionary
- System/38 Control Program Facility (CPF)
- System/36 System Support Program (SSP)
- System/36, Query/36

Other products to be considered are Data Base Management System Aids for data base designers and administrators. Section 42 of this guide contains descriptions and prerequisites for these products.

Selection Guidance – System/370, 30XX, 4381, 9370

Data Base Management

- In the MVS/SP and MVS/XA environments, DB2 is the recommended IBM data base management system (DBMS). It provides relational support for both operational and decision support applications. IMS/VS Data Base is provided for those operational applications with very large transaction volumes and critical response time and availability requirements. Many large users can be expected to use both IMS/VS and DB2.
- For all VM/SP users, SQL/DS is the recommended DBMS.
- Both DB2 and SQL/DS are highly integrated with IBM systems software and System/370 hardware. In the MVS and VM environments, they are supported by the following recommended products: Query Management Facility (QMF) for query and report writing, Cross System Product (CSP) for application development, Application System (AS) for decision support, Data Extract (DXT) for information portability, and Host Data Base View (HDBV) or IBM CMS or TSO/E Servers/Requesters for IBM Personal Computer access to System/370 systems. Together, these products provide a broad relational productivity solution for most customers.

- DB2/VSAM Transparency program offering can assist MVS/XA users in migrating to DB2 from VSAM files.
- Data Base Relational Application Directory (DBRAD) program offerings extend and enhance the use of the DB2 or SQL/DS catalog for application development, thus improving the DP professional's productivity while developing relational applications.
- For VSE users, SQL/DS is the recommended IBM data base management system for both operational and analytical applications, and is supported by both QMF and CSP. DL/I-DOS/VS is recommended where application packages require it.
- Users of older data base management systems such as CFMS, DBOMP, Vandal-1, or DL/I Entry are encouraged to migrate to a current DBMS. New applications and rewrites of old applications should be built on the current DBMS, with existing files and programs eventually converted. The conversion from CFMS or DBOMP to IMS or DL/I may be assisted by using the Chained File DL/I Bridge program or the COPICS-E application packages.
- DB/DC Data Dictionary is recommended to improve documentation, understanding, and control over the enterprise's data usage, particularly for the IMS/VS Customer.

Data Communications

Overview

- Data communications products should be evaluated as part of the complete data system concept, consisting of data dictionary, data base, data communication, and information delivery products.
- CICS/VS with SQL/DS and CICS/VS with DL/I are the primary data base/data communication products for VSE systems. For OS/VS systems, either CICS/VS or IMS/VS DC is recommended with either IMS/VS DB or DB2.
- Criteria for selection of either CICS or IMS-DC include terminal support, application package support, application generator requirements, and distributed data processing plans.
- CICS/VS is the primary recommendation for non-data base users in all operating environments.
- Users with CICS/VS installed should not convert to IMS-DC unless there are overriding functional reasons for doing so. Concurrent use of IMS-DC and CICS/VS with access available from the same terminal users via SNA or Multisystem Networking should be considered as an alternative to conversion.
- Wherever possible, IMS-DB or DL/I-DOS/VS should be used with CICS/VS, generally with data base management installed first.
- Conversion of existing online applications is not recommended unless major functional change is required.
- System/38 provides terminal and intersystem communications via its operating system. Operating aids, productivity aids, and installation aids are included.
- System/36 provides terminal, host, intersystem, and interprogram communications via the System Support Program and communication features of the operating system.
- Series/1 provides terminal, host, intersystem, and interprogram communications through the communication products available for each operating system (RPS, EDX). In addition, limited terminal management is available using the Transaction Processing System products. RJE to host system is available with the operating systems.
- DPPX/370 provides an integrated interactive, transaction, and batch environment well suited to a distributed processing environment where MVS is the highest logical unit. The base system embodies comprehensive data recovery options, key elements of high availability, and facilities to support unattended operations. Its central management features provide a platform upon which expertise and skills may be readily leveraged across a large network of processors.

Primary Product Offerings

VSE

- Data Communications:
 - CICS/VS
- Features/Extensions:
 - Intersystems Communication – CICS
- Program Generators:
 - CSP
 - CSP for DPPX
- Productivity Aids:
 - CICS Online Test Debug II
 - CICSPARS/VSE

MVS

- Data Communications:
 - IMS/VS-DC
 - CICS/OS/VS
- Features/Extensions:
 - Multiple Systems Coupling - IMS/VS
 - Fast Path - IMS/VS
 - High-Performance Option - CICS/VS
 - Intersystems Communication - CICS/VS
- Program Generators:
 - IMSADF II
 - CSP
 - CSP for DPPX
- Productivity Aids (IMS/VS):
 - BTS
 - IMSASAP II
 - IMSPARS
 - IMS/VS Queue Loader
- Productivity Aids (CICS/VS):
 - CICSPARS/MVS
 - Online Test Debug II
- Operations Aids:
 - IMS/VS Data Base Tools
 - Time-Initiated Input Facility - IMS/VS
 - Message Requeuer - IMS/VS
 - Queue Loader - IMS/VS
 - Routing Table Generator
 - Network Performance Monitor
 - NETPARS

System/36

- Data Communications:
 - System Support Program (SSP)
 - Interactive Communications Feature (ICF)
 - 3270 Device Emulation Feature
 - Communications Feature (BSC, SNA/SDLC, ASYNC, and X.21, X.25)
 - MSRJE (SNA/SDLC, BSC)
 - Distributed Data File Facility
 - Data Encryption Standard Subroutine for Banking

Data Communications

- Communications and System Management Feature
- Display Station Pass-Through (DSPT)
- Distributed Data Management (DDM)
- Advanced Peer-to-Peer Networking (APPN)
- Advanced Program-to-Program Communications (APPC)
- Distributed Host Command Facility (DHCF)
- SNA Distribution Services (SNADS)

System/38

- Data Communications:
 - Control Program Facility (CPF)
 - Remote Job Entry Facility (RJEF)
 - Advanced Program to Program Communications (APPC)
 - 3270 Device Emulation
 - Distributed Host Command Facility (DHCF)
 - BSC, SDLC, X.25
 - SNA Distribution Services (SNADS)
 - Display Station Pass-through (DSPT)
 - Distributed Data Management (DDM)

Series/1

- Data Communications:
 - EDX:
 - Communications Facility (CF)
 - Transaction Processing System (TPS)
 - SNA Support
 - RJE
 - ARJE
 - X.25 Support
 - Remote Manager (RM)
 - System/370, 30XX, 4300 channel attach support
 - Advanced Program-to-Program Communications (APPC)
 - RPS:
 - Communications Manager (CM)
 - Transaction Processing System (TPS)
 - SNA Support
 - ARJE
 - Remote Manager (RM)
 - Advanced SNA Remote Job Entry (ARJE)
 - X.25 support
 - Programmable Communications Subsystem support (PCS)
 - System/370, 30XX, 4300 channel attach support

DPPX/370

- Data Communications:
 - Multiple session 3270 pass-through (router)
 - Data Base Transaction Management System (DTMS)
 - Distributed Resource Manager (DRM)
 - Host transaction facility (HTF)
 - Remote job entry (RJE)
 - Problem Determination Application (PDA)

- Host data transfer (HDT/NetView DM)
- Host Command Facility (HCF)
- SDLC, X.25/SNA, X.25 Native Interface (OSI Model)
- Peer data transfer
- SNA distribution services (SNADS)

Selection Guidance – System/370, 30XX, 4381, 9370

DOS/VS, VSE, VM/DOS/VS, or VM/VSE Installed or Planned

- Use CICS/VS.
- To improve new online application development productivity, consider using CSP.

MVS, SVS, VS1 or VM/VS1 Installed or Planned

- Select IMS-DC or CICS/VS if IMS-DB is also required or IMS-DB Batch is installed.
- Select IMS Fast Path if the application requires high performance using a simple data base (MVS only).
- Consider IMS/VS Multiple Systems Coupling feature to extend IMS/VS use in all installations that have or are planning to have multiple IMS/VS licenses or multiple IMS/VS and CICS/VS licenses.
- Select CICS/VS if very high performance and no data base is required (CICS-HPO for MVS), if 3650 support is required, or if CICS/VS is a prerequisite for a particular application program product, such as DISOSS.
- CICS/VS Intersystems Communication should be considered for multiple CICS/VS installations. Do not convert from CICS to IMS if CICS/VS is already installed and there are no clear functional reasons for conversion.
- To improve new online application development productivity, consider using IMSADF or CSP.

Connectivity and Subnetworking

All small systems and programmable workstations have support for data communications to host based DOS/VS, DOS/VSE, and OS/VS systems. A number of small systems also support subnetworking between small systems, or between small systems and programmable workstations. Some examples of supported subnetwork data communications follow.

DPPX/370 (SNA/SDLC)

- 8100 DPPX
- Series/1
- Token-ring network
 - DPPX/370 (peer)
 - MVS
 - OS/2
- IBM Personal Computers
- System/36

System/36

- Series/1
- System/34
- System/36
- System/38
- IBM Personal Computers

System/38

- Series/1
- System/38
- System/36
- IBM Personal Computers

Series/1

- Series/1
- IBM Personal Computers
- 8100 DPPX
- System/36
- System/38
- DPPX/370

Technical Computing

Overview

Technical computing applications usually belong to one of the following classes: design, analysis, simulation, test and laboratory management, interactive problem-solving, or administration.

Primary Product Offerings

The systems that are most suited to handle technical computing applications are:

- 308X, 3090 processors
- 9370, 4381 processors
- IBM Personal Computer workstations, RT PC, 3270-PC/G and /GX, PC AT, and Engineering and Scientific (E/S) Series options
- VM/Integrated Systems (VM/IS)

Selection Guidance

When selecting the appropriate technical computing product for an application area, first it will be necessary to examine the application requirements, as more than one solution may be available.

The application itself is often marketed by independent third party software development vendors, some of whom may be IBM MAPs (Marketing Assistant Program participants).

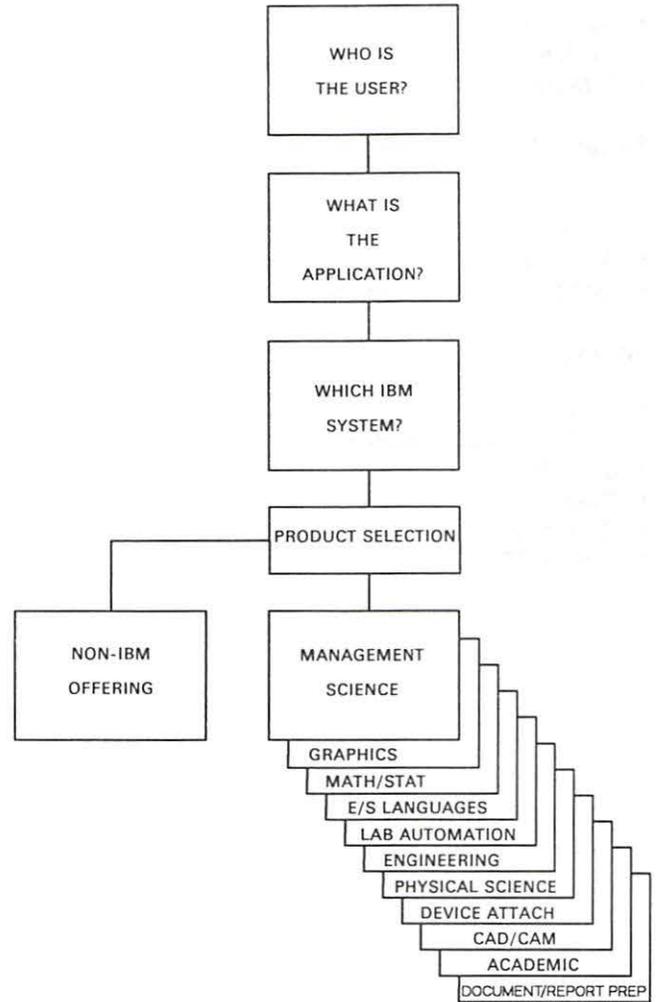
Who is the User?

The technical computing decision maker will most likely be located in the engineering or research department. The information services department may have little or no input to the decision process. The selection criteria will in most cases be determined by the engineering/scientific department. Often the technical computing system is selected without the knowledge of the I/S department, and the engineering department may have funds of its own. These users may have little experience with IBM equipment.

What is the Application?

It is important to understand the nature of the application for which the user needs a computer. Here are some of the questions to consider in reviewing the application requirements:

- Does it require large resources? A typical example is a complex simulation.
- Does it require high precision (many bits of data representation)?



- Does it process large amounts of data? Is this a "data base" application?
- Are communications involved? If so, are there special protocols that must be supported (ASCII, SNA/SDLC, binary synchronous, IEEE, RS-232)?
- Is the application written in FORTRAN with large amounts of interrelated data?
- Do two or more users access this application? If so, do they need to share data?
- Is it an interactive application? If so, fast response time may be a requirement. How many terminals must be supported?
- Is special I/O required, such as graphics displays, plotters, and printers?
- Will the system attach to a network with other vendors' systems and devices?

- Is the application running today? On what system? (There may be conversion issues to consider.)
- Must any of the application be written, or are programs available from a vendor? What tools will be used to produce the application if it requires in-house coding?
- Is the laboratory (sensor-base, X-ray, interrupt driven) involved? If so, are there special device attachment requirements? What are the data collection requirements? Is data reduction necessary?
- Is the application one that requires high reliability, such as defense?
- Is there a total solution that addresses the needs of many applications? Is this a departmental system?

Which System?

- 3090 Processors:
 - System/370 Extended Architecture (XA)
 - Engineering/Scientific (E/S) instruction set
 - High-speed multiply
 - Vector processing facilities
 - Improved add/subtract handling
 - Special circuitry for loop control
 - 64-bit data flow paths throughput
 - Overlapped instruction/execution elements
 - Most powerful computing facility IBM offers
 - Upward compatibility from System/360 and System/370, 308X, 303X, 4300 processors
 - Up to 96 integrated channels
 - Large processor storage (central and expanded)
 - Up to 256MB central
 - Up to 512MB expanded
- 308X Processors:
 - Configurations available with integrated multiple processors with a single-system image
 - System/370 Extended Architecture (XA)
 - Up to 48 integrated channels
 - Up to 128MB of shared central storage
 - Upward compatible from System/360, System/370, 303X, and 4300 processors
- 4381 Processors:
 - Model Groups 11, 12, 13, and 14
 - Upward migration path from 4341 Processors
 - Up to 18 I/O channels and 32MB of real storage
 - 64-bit arithmetic logic unit and data paths
 - Excellent performance for E/S workloads
 - Extensive use of microcode assists
- 9370 Information System:
 - Models 20, 40, 60, and 90
 - Rock-mounted System/370 processors
 - Integrated DASD/tape, workstation, and communication controller
 - System/370 block multiplexer channel(s)
 - Small footprint and office installation environment
 - VM, VSE, MVS, IX/370 support
 - ASCII device and local area network attachment
 - Air-cooled TCM packaging (Model 90)

- Excellent performance for engineering/scientific workload
- Customer (or IBM) setup installation
- Series/1:
 - Modular, field-upgradable
 - Communications applications (line switching, protocol conversion)
 - Specialized applications
 - Host-connect or standalone
 - Local multiuser batch and/or interactive processing
 - Flexible device attachment
 - Supports asynchronous (19.5K baud), BSC (56K baud), SDLC and HDLC (56K baud), and X.21/X.25 (56K baud) protocols
 - Extensive sensor-base I/O subsystem
- RT Personal Computer – 6150 Micro Computer System
 - High-performance, 32-bit workstation for engineers, scientists, and technical professionals
 - Advanced Interactive Executive (AIX) operating system based on AT&T Bell Labs' UNIX System V
 - FORTRAN 77, Pascal, C, BASIC, Assembler
 - 5080 Graphics System attachment
 - CAD/CAM, graphics, and professional productivity applications

For more detail, refer to the product description of the RT Personal Computer – 6150 Micro Computer System.

- IBM Personal Computer Engineering/Scientific (PC/ES) Series

The IBM Personal Computer Engineering/Scientific (PC/ES) Series and improved graphics capabilities consist of hardware and software products that can be used with the IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, and IBM Personal Computer AT to accommodate the need for:

 - Advanced color graphics featuring hardware and software products capable of generating vivid, high-definition graphics for presentations, simulations, CAD, and other specialized applications.
 - High-speed computation providing speed and precision for mathematical and statistical analysis, model building, and sophisticated computational applications.
 - Data acquisition and instrumentation extending the reach of engineers and researchers through versatile capabilities for both routine and advanced test and process control applications.

Users can select and install building blocks from these hardware and software capabilities to customize a workstation which is optimized for their specific needs.

Product Selection

Choosing the appropriate IBM product for technical computing application(s) normally requires an in-depth understanding of the IBM software product line. To simplify the process, concentrate on the most important product categories that are supported directly by IBM licensed program offerings.

- Management Science/Decision Support: Generally defined as the application of the most pertinent and effective scientific disciplines (such as quantitative techniques and modeling) to help define, analyze, and solve the serious problems confronting management.

Products:

AS	(VM/SP, MVS)
MPSX/370	(MVS, VM)

- Engineering/Scientific Graphics: (See "Graphics" product selection guidance in Section 30.)
- Engineering/Scientific Languages: For problem solvers who write their own application programs, IBM offers a variety of high-level language compilers and interpreters. The traditional language products (FORTRAN and Pascal) run in both the foreground (interactively) and background (batch mode). The interpretive languages (APL and BASIC) normally run interactively.

Products:

VS FORTRAN Version 2 (Vector support)	VM/SP HPO, MVS/XA
VS FORTRAN Version 1	VM/SP, MVS, SSX/VSE, VSE, VS1

IBM FORTRAN Language Conversion	MVS, VM/SP
Engineering and Scientific Subroutine Library	MVS/XA, VM/SP HPO
Pascal/VS	VM/SP, MVS, VS1
VS APL	VM/CMS, MVS
APL2	VM/CMS
IBM BASIC	VM/CMS, MVS/TSO

- Lab Automation/Data Acquisition: Today, in numerous quality control, analytical testing, and scientific laboratories, the need to capture data from experiments is becoming extremely important. Additionally, the data acquisition system must also be able to reduce, analyze, and display the results at a later time. A partial list of application areas includes mass spectroscopy, pH analysis, gas chromatography, mechanical vibration analysis, nuclear particle-counting systems, and pulse height analysis.

- OEM Attachability: Users who have old implementations of technical applications frequently use OEM computers that range in size up to the supermini class. Attachability to these OEM computers or to their I/O devices is an important consideration for these users. If the IBM computer is an addition to the installed OEM computer, the user frequently needs to transfer files and/or interactive data between the IBM and the OEM computer. If the IBM product replaces the installed OEM computer, the user will have OEM terminals and other I/O devices that he may want to attach to the new IBM computer.

Attachment between IBM and OEM computers usually requires high data rates and can be accomplished using parallel channel-like attachment, high-speed local area network attachment, or high-speed communications attachment. The DACU can provide any of these attachment techniques.*

Attachments between IBM processors and various OEM terminals are accomplished with the 7171, 4994 ASCII Device Control Unit, or DACU.*

Products:

Integrated 937X subsystems
Series/1
Device Attachment Control Unit (DACU)
7171 and 4994 ASCII Device Control Units
IBM Personal Computer, PC XT, PC XT/370,
PC AT/370, Portable PC, PC AT,
Engineering/Scientific Series options, 3270-PC,
3270-PC/G, 3270-PC/GX, 3270-PC AT, 3270-PC
AT/G, and 3270-PC AT/GX

- Engineering Applications: Many of the applications used by engineers are supported. These include structural, chemical, petroleum exploration and simulation, civil, industrial, electrical, mechanical, power and nuclear engineering, aerospace, expert systems, and communications applications. In some cases, usually when highly specialized mathematical or scientific algorithms or techniques are employed, IBM can provide additional customer support. For areas like software engineering or expert systems, ready-to-start packages are available.

See *Engineering and Scientific Application Programs Available from IBM in Europe, the Middle East, and Africa*, GE19-5349.

Where IBM does not have a licensed software offering for the technical computing application area, there is often a vendor-supplied program that may be used to satisfy the requirement. See the catalog of third party *Engineering and Scientific Application Programs Available from non-IBM Sources*, G320-6739 (U.S.) or GE19-5347 (Europe).

* With 937X processors, the system itself offers this connectivity.

- **Document/Report Preparation:**
Much of the work that engineers and scientists do involves preparing management reports, publishing reports about their work, and preparing articles and papers to be presented at conference and association meetings. It is estimated that no more than 20% of an engineer/scientist's time is involved in actual numerical calculations and programming.

Products that facilitate report preparation using sophisticated I/O devices (such as the 4250, 3800, 3820, and 3812 Printers) are important to the technical user.

Products:

Document Composition Facility (DCF)	VM/CMS, MVS/TSO
Script Mathematical Formula Formatter (SMFF)	VM CMS, MVS/TSO
Professional Office System (PROFS)	VM/CMS
DisplayWrite Series	Personal Computer Family
ICES-STRUDL-II	VM/CMS, MVS/TSO

Storage and I/O

Overview

Direct Access Storage Devices (DASD)

- Higher performance and reliability may be provided for large system users through the appropriate use of enhanced subsystem models of 3380 DASD, 3990 Storage Control, MVS/XA, and the data facility family of products.
- The choice of a DASD type, based on capacity, is influenced by performance requirements, cost per actuator, cost per megabyte, and lesser considerations such as block factors.
- For the large system user, a systems approach to storage management (see "Storage Subsystem Management" in the Concepts section) is recommended to select and manage an optimal device configuration.
- Data Facility Product, Data Facility Data Set Services, Data Facility Hierarchical Storage Manager, and Data Facility Sort are program products that provide efficient data management.
- For the intermediate system user, both fixed-block architecture (3310, 3370, 9332, 9335) and count-key-data architecture (3375, 3380 Model CJ2) are available.
- VSAM and ICF catalogs should be used for DASD access for functional benefits and to ease conversion between operating systems and DASD device types.
- MVS/XA provides 3380 performance gains through support of dynamic path reconnection (DPR).

Tapes

- Users with large numbers of 3380 DASD and 3MB/sec channels should obtain the greatest benefit from the 3480 Models A22 and B22.
- 3480 Models A11 and B11 provide cartridge tape capability and productivity and reliability improvements for intermediate systems users with less than 3MB channel.
- Dump/restore, interchange, and archiving functions are other uses for tape.
- Telex 1589 is a complementary product with medium-range performance for 9370 users only.

Printers

- For low-volume, channel-attached printer requirements, evaluate the 3262 Model 5.
- For typeset quality printing, consider the 4250 Electroerosion Printer.
- For intermediate- to high-speed requirements, consider the 4245 and 4248 Printers.
- For horizontal copy, faster speeds than the 4245, OCR, multipart forms 6- and 8-lpi intermix, and special forms consider the 4248.

- For OCR, multipart forms, and special forms consider the 4245.
- For high-quality, high-volume MVS applications, including both text and graphics, consider the 3800 Model 3 Printer.
- For distributed advanced function printing consider the 3820 Page Printer.
- For terminals, distributed systems, and low-volume print requirements, consider the 3262 Line Printer.
- For distributed intermediate- to high-speed requirements, consider the 4245 Model D printer.
- For System/36, and System/38 select the 4224 for line and graphic printing.
- For System/36 and System/38, consider the 4245 T models or 6262 T models for intermediate to high-speed printing requirements.
- For the 8100 System, select the 5210 for letter-quality printing.

Primary Product Offerings

DASD

3370	9332
3375	9335
3380	

Storage Control

3990 Models 1 and 2 Storage Control
 3990 Model 3 Cache Storage Control
 3880 Model 3 Storage Control
 3880 Models 21 and 23 Cache Storage Control

Tapes

3480	3422	3430	9347	1589
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Printers

3800 Model 3	4245	4224
3820	4248	4234
3262 Model 5	4250	6262

For storage and I/O products for general and office systems, see product descriptions for those products.

Selection Guidance – DASD

The following is selection guidance based on the DASD installed or planned.

3380

- Primary strategic DASD product for high performance
- Large capacity
- Environmentally efficient (space, power, heat dissipation)
- High reliability

- Single and triple capacity enhanced subsystem models that provide price/capacity alternatives
- In the MVS/XA environment, enhanced subsystem models that provide up to 33% improvement in seek times.

3380 Model CJ2

- Integrated cost-effective unit for intermediate system users
- Combines 1.26GB of storage and two storage control paths

3990 Storage Control

- The structure and features of the 3990 family are a logical extension and significant improvement over the 3880 family of storage controls. The 3990 Storage Control attaches all models of the 3380 Direct Access Control Devices (except A04 and early-serial-numbered AA4 models).
- The 3990 is available in three models:
 - 3990 Model 1 with two separate storage paths to DASD
 - 3990 Model 2 with four separate storage paths to DASD
 - 3990 Model 3 with four separate storage paths to DASD and 32, 64, 128, or 256 megabytes of cache and four megabytes of nonvolatile storage.
- In a dual-frame configuration, both the 3990 Models 2 and 3 provide eight separate storage paths to DASD. A single 3990 Model 2 or Model 3 can attach to up to 16 different channels and a dual-frame 3990 Model 2 or 3 can attach to up to 32 different channels.
- Each model can attach the 3380 Models AA4/B04 (except early-serial-numbered AA4s), AD4/BD4 and AE4/BE4, AJ4/BJ4, and AK4/BK4.

3880 Models 21 and 23 Cache Storage Control

Model 23:

- Access to system or application data sets, batch throughput, and response times for end-users can be significantly enhanced through appropriate use of the 3880 Model 23 application controller, especially in MVS/XA, VM/XA SF, VM/HPO, or MVS/370 environments. Increased utilization of the DASD configuration's capacity is possible because of the increased throughput capability of the Model 23. The dual frame configuration for the 3880 Model 23 provides improved availability for critical data sets. The Model 23 attaches to 30XX, 4341, and 4381 processors.

Model 21:

- Paging service times in MVS and VM systems can be reduced by using the 3880 Model 21 paging controller. The 3880 Model 21 controller can be converted to a 3880 Model 23.

3880 Models 1 and 3

- Control for 3333, 3340, 3350, 3370, 3375, 3380
- Optional two-, four-, and eight-channel switches
- Two storage directors

3880 Model 4

- Single storage director
- Control for 3370 or 3375
- Low-cost entry-level control unit for 4341 and 4331 Model Group 2

9332 Direct Access Storage

- Designed for small-to-intermediate-capacity requirements on mid-range systems
- Low capacity per actuator to maximize interactive performance
- Rack-mounted and standalone models
- Integrated controller

9335 Direct Access Storage

- Designed for intermediate-to-large-capacity requirements on mid-range systems
- Rack mounted

Selection Guidance – Tapes

3480/3422

Benefits are in improved reliability, higher levels of performance, increased operator productivity, and significant environmental savings.

- Intermediate systems. Migrate to 3480 Models A11 and B11.
- Large systems. Migrate to 3480 Models A22 and B22.
- Use 3422 for compatibility with the 10-1/2" reel environment.

3430/8809/9347

- 4300: For entry-level or DASD-oriented 4300 Processors, consider the 8809 for dump/restore and *limited* tape processing applications. For additional tape throughput, or compatibility with 6250 bpi densities, consider the 3430 and 3422.
- System/36: The 8809 can operate in streaming mode concurrently with interactive and batch applications. Save/restore of data files and libraries, as well as data interchange, is supported.

Storage and I/O

- System/38: For entry-level tape the 3410 should be considered. The 3430 and 3422 should be used for additional tape throughput.
- 8100: The 8809 should be used to provide dump/restore capability for 8100 processors.
- 9370: Consider the 9347 for dump/restore and limited tape processing applications. For additional tape throughput or compatibility with 6250 bpi, consider the 3430, 3422, or Telex 1589.

Selection Guidance – Printers

- For low-volume printing in an entry-level or new account using a 4300 Processor, consider the 3262. For low-volume printing for 4341 CAD/CAM, engineering, or scientific applications, consider the 3262 Model 5.
- For impact printing with VSE, VM/370, VS1, or MVS systems, use:
 - 4245 for System/370 up to and including the Model 148 (except Models 135, 145), 9370, 43XX, 308X, and 3090
 - 4248 for System/370 up to and including the Model 168 (except Models 155 II and 165 II), 9370, 43XX, 308X, and 3090
 - 6262 for 9370, 43XX, 308X, and 3090.
- If job networking is under consideration or installed, review the added advantages available to the entire user community through use of the 3800.
- If the print volume is more than 500,000 feet per month, or certain print jobs have critical printing deadlines, consider converting to the 3800.
- The 3800 Model 3 and Model 6 are supported attached to System/370, 43XX, 308X, 3090, and 9370 hosts.
- If the print volume is less than 500,000 feet per month, printing applications outside the I/S department should be evaluated for suitability for the 3800 Model 3 (for example, in-house publishing, outside printers).
- For large organizations that have duplication or in-house printing shops for heavy peak printing loads, or that have non-IBM processors, consider the 3800 Tape-to-Printing Subsystem feature.
- For the 8100 System, select the 5210 for letter-quality printing.

Operating Systems

Overview

When planning for operating systems, users consider many factors, including the rate of growth within their DP installations, networking and distributed processing plans, the growth of online data systems, and future needs.

These factors may require conversion from VSE or OS/VS1 to MVS/XA or MVS/ESA™, or the implementation of VM/SP for interactive facilities to supplement an existing intermediate operating system or complement an existing MVS system. Other situations may require a UNIX system or a UNIX application. The AIX family of products provides IBM solutions for UNIX requirements.

In any case, it is important that the operating system being used within the installation have the capabilities required and be able to support the kinds of growth and capacity that are needed for future applications.

This section is intended to assist in the selection of operating systems when there is more than one choice for the processor. It does not include systems for which there is only one choice. Information on these systems may be found in the product description sections.

Selection Guidance

Central Sites with Large Systems

There are several operating systems that address the central-site needs of large system users: MVS (MVS/370, MVS/XA and MVS/ESA), VM (VM/SP and VM/XA SP), and TPF2.

- MVS/SP Version 3 and MVS/DFP Version 3 (MVS/ESA™) provide support for Enterprise System Architecture/370™-based 3090™ E and the 4381 Model Group 91E and 92E processors. MVS/ESA is IBM's strategic operating system and is the base for growth into the '90's.
- VM/XA SP is IBM's premier VM operating system for the 3090. VM/XA SP provides a growth path for VM/XA SF and VM/SP HPO users. All VM/XA SF functions are supported. Using start interpretive execution (SIE) microcode, designed for 370-XA hardware and supported on all 3090 processors, a preferred guest operating system can run at near native performance.
- Processor Resource/Systems Manager (PR/SM™) is an optional feature of the 3090 E processor family. The PR/SM feature supports logical partitioning of the 3090 E. Up to four logical partitions (eight on multiprocessor models operating in physically partitioned mode) can be configured. The PR/SM feature, when used with VM/XA SP, sup-

ports concurrent multiple high-performance guests (one V=R and up to three V=F guest operating systems).

- MVS/SP Version 2 and MVS/XA DFP constitute the base for the MVS/Extended Architecture (MVS/XA) operating system. This system supports IBM processors operating in System/370 extended architecture mode. The MVS Time Sharing Option (TSO) provides many of the information center facilities. TSO is the most powerful base for the development of batch and data system (transaction processing) applications.
- MVS/370 (MVS/SP Version 1) supports batch applications, data systems (transaction processing) applications, and application development.
- VM/SP, with CMS, is IBM's primary dedicated end-user interactive operating system. When smaller systems are being put in place to support end-user needs in an information center, VM/SP should be considered as the primary offering. VM/SP can be an extremely powerful tool for system programmers. They can test multiple versions of any number of operating systems under VM/SP during their normal working hours. This capability is extremely valuable when changing operating systems (during DOS/VS, DOS/VSE, VSE, or OS/VS1 conversions to MVS, for example).

The VM/370 RSCS facility can be used to transfer files to remote systems, including MVS Job Entry Subsystems. VM/SP supports ACF/VTAM natively to participate fully in an SNA network. VM/SP can be used to distribute interactive capabilities from MVS and other VM/SP host systems.

MVS production guests may be run under VM/SP with Preferred Machine Assist (PMA) and the VM/SP High Performance Option. MVS/XA production and test guests require VM/XA SF or VM/XA SP. If MVS production guests are being considered as an interim step during operating system conversion, adequate resources should be available for present and future CMS and MVS workloads. VM/SP High Performance Option (HPO) is required to run VM/SP on the 308X and 3090 processors.

- Transaction Processing Facility (TPF) is IBM's primary high availability (99.5+%) and high-performance system for realtime transaction-driven applications. The availability and performance characteristics of TPF, which is capable of supporting both small and large terminal networks, are largely due to specialized management techniques designed to optimize system efficiency in the area of data communication, data base, and system resources.

TPF provides high-performance capabilities to its larger users through its support of high-capacity hardware configurations. TPF's tightly-coupled

Operating Systems

function capitalizes on IBM's central processor complex (CPC) machines by combining the effect of multiple processors using a single image of the TPF control program. The TPF/HPO feature's loosely-coupled function combines the processing effect of up to eight TPF control-program images. The use of these two functions with the 3090 Model 400E provides the ability to harness up to 32 tightly-coupled and loosely-coupled processors within eight CPC's. Although the processor power gain of this many engines is not linear, their combined effect serves to answer the ever-increasing throughput requirements of TPF's large system users.

Intermediate Systems

The following production operating systems are recommended for intermediate-size systems (4381, 9370, System/36, System/38) — VSE, VM/IS, VM/SP, MVS/XA, MVS/370, System/36 SSP, System/38 CPF, and TPF:

- VSE is IBM's primary commercial intermediate operating system and the operating system base for smaller distributed processing nodes.
- VM/IS provides an integrated software solution for intermediate and low-end System/370 environments.
- VM/SP with CMS offers a broad range of support for end-user needs in an information center.
- On the large intermediate processors (4381), VM/XA SP, MVS/370 or MVS/XA can be a preferred choice, offering the intermediate user the same advantages it offers the large user.
- System/36 SSP provides control programming functions for the 5360, 5362, 5363, and 5364 System Units of the System/36. The System/36 SSP is designed to provide comprehensive function with extensive prompted HELP facilities for an environment with little or no data processing skills.
- System/38 CPF is designed to complement and to extend the advanced capabilities of the System/38 machine to support simultaneously a wide range of operating environments, from interactive, workstation-oriented applications to concurrent processing of batch applications.
- For the large intermediate processor (4381), TPF can be the preferred choice, offering the intermediate user the same advantages it offers the large user (see "Central Sites with Large Systems" above).

There are many OS/VS1 or VSE users who need to add interactive and information center capabilities to their systems. They also may need to be able to grow beyond the architectural limits of these operating systems in the near term, before converting to MVS. In either case, VM/SP may be installed with the existing operating system.

Installing VM/SP and either MVS/370 or VSE as production guests makes CMS interactive capabilities available to systems programmers, application programmers, and information center users. It also enables the installation to run multiple copies of the operating systems in a production environment if sufficient capacity is available.

AIX™ Family — A UNIX Operating Environment

IBM Advanced Interactive Executive (AIX™) is a comprehensive, multiuser, multitasking operating system that supports a full range of IBM hardware systems from the PS/2™ Model 80 386, through the RT, 9370, 4381, and 3090. The AIX family of products provides a common set of system functions, communication capabilities, application-enabling interfaces, and end-user interfaces that will be in compliance with the IEEE 1003.1 standard for POSIX™ and embrace the UNIX® System V® and the Berkeley Software Distribution implementations.

AIX has been designed to provide a comprehensive set of UNIX tools, utilities, compilers, and application development software plus IBM enhancements to UNIX. AIX offers powerful networking capabilities and complements other IBM operating systems such as PC-DOS and VM that run on AIX hardware platforms.

Information on the AIX family of products may be found in Section 43.

Distributed Enterprise Processing

Emerging in many enterprises is the need for a middle-layer system to distribute applications, tools, and data to the appropriate levels of control. This environment tends to be oriented toward interactive applications, require transaction processing capability, and have office automation requirements. These organizations want enterprise-wide architectural capability, application portability, data sharing across all levels and central-site control.

VM/IS with CICS/VM and VM/DSNX provide a base to support the above requirements. Since VM/SP supports the entire System/370 product line and an SNA network natively, VM/SP can provide excellent enterprise processing support.

DPPX/370 is designed for centrally-controlled distributed processing remote from an MVS host. It provides flexibility, with a choice of the level of central control and support desired and with the capability to support autonomous standalone environments as well as the highly-interactive enterprise end-user environment. Central support is provided by the MVS host through NetView, NetView DM, and the Host Command Facility products. DPPX/370 was designed to support distributed processing where data processing expertise is leveraged from the host. Dynamic, nondisruptive configuration changes, built-in services to insure data recovery and integrity,

and facilities to minimize the impact of scheduled or unscheduled system outages are key system benefits essential to support a large distributed network.

IBM Token-Ring Network is the primary attachment mechanism for a DPPX/370-supported establishment. DPPX/370 executes on the 9370 Information System. Support includes the 9332/9335 integrated DASD, the 9347 and 1589 tapes, and connectivity through the IBM Token-Ring Network, the workstation controller, or channel-attached 3X74.

VSE/SP with the 9370 provides an excellent price/performance combination for centrally-managed distributed data processing.

When the benefits of VSE/SP:

- Automatic system start-up functions
- Conditional JCL
- Full-function transaction processing
- Complete data access support
- Interactive interface facilities and function

are combined with the optional products (DSNX, OCCF, NetView™), the combination provides:

- Strong central control of the network
- Full connectivity to an MVS host
- Downlink support for file and object transfer and change management
- Central control without an operator of the distributed node system

Series/1

There are two operating systems available for the Series/1:

- The Realtime Programming System (RPS) is the full-function operating system for Series/1. It offers:
 - Extensive operating system functions
 - Multiple processors with a single system image
 - Full range of I/O support
 - High-level languages
 - Powerful multiterminal command language
 - Reduced implementation costs
 - Potential for growth
- The Event Driven Executive (EDX) is an operating system for users who want the advantages of multiple interactive workstations and a general-purpose system. Optimized for ease of use and low overhead, the EDX is the most widely-used operating system for the Series/1. With it, users can start with a simple diskette system and expand to more complex disk-based operation and communication with other computers. EDX offers:
 - Complete storage residence
 - Simple system generation
 - Self-prompting utilities and commands
 - Powerful interpretive language
 - High-level language
 - Potential for growth

System/88

The System/88 Operating System provides advanced programming to span a wide variety of data processing environments.

The operating system is a multiprogramming, multi-processing virtual operating system designed for online transaction processing and high availability in a fault-tolerant environment. It supports the duplexed hardware to provide a fault-tolerant computing system. It is designed to manage the data and services of a configuration consisting of one or more modules connected in a system or in a network.

- Dynamic system resource allocation to each user as needed
- Concurrent system usage, including transaction processing, interactive processing, networking, batch processing, and online program development
- Automatic sharing of resources among users
- Hierarchical file system for sequential, relative, or fixed-file organization
- Multi-key indexed file access
- Output spooling
- Security controls for system access and authority
- Friendly, powerful command language
- Diagnostic subsystem for problem analysis
- Maintenance software for logging and reporting problems.
- Host Command Facility (HCF) support

Local Area Networks

Overview

A Local Area Network (LAN) is a high speed information transport system operating among a number of devices usually located on the same premises (see Section 20 for definitions).

From a single workstation, a user can access information from PCs on the local area network, departmental systems (9370, System/36), and host systems (System/370). Through the use of gateways, information outside the network can be accessed via a ROLM CBX, PBX, or public switched network. Network bridges and gateways allow access to other networks and can connect multiple networks.

Primary Product Offerings

IBM local area network products and offerings can generally be grouped into three categories:

- IBM PC Network
 - Broadband
 - Baseband
- IBM Cabling System
- IBM Token-Ring Network

These categories are not mutually exclusive, but complement each other.

Selection Guidance

IBM PC Network

The IBM PC Network allows peer-to-peer communications among IBM Personal Computers. It uses carrier sense multiple-access with collision detection (CSMA/CD) protocol and offers a 2M bit/sec transmission speed.

Broadband:

The IBM PC Network (Broadband) is designed for the multi-service environment where most applications are personal-computer-based, a requirement to share information and resources exists, and a requirement for broadband media to support video signals exists. It operates on standard CATV cable (television cable) and supports both the NETBIOS and the IEEE 802.2 interfaces to application programs

In order to operate a PC Network (Broadband), it is necessary to have a PC Network Adapter for each PC and one 5178 Translator Unit for the network. For installation of smaller networks, up to 72 PCs may be connected within a 1000-foot radius using IBM's low-cost 5178 Translator Unit and pre-configured cable kits. By using all three PC Network frequencies, the PC Network can support up to 3000 PCs within a

16,000-foot radius, using a non-IBM translator unit available from a variety of CATV component manufacturers. (OEM equipment requires customization by a qualified cable vendor.)

The PC Network Adapter has an "on board" micro-processor to manage network activity. A built-in RF modem isolates the digital data onto a narrow carrier band. This potentially allows most of the cable bandwidth to be used for other network services (such as another data network or closed-circuit TV).

The PC Network Adapter supports IBM Personal Computers. The PC Network Adapter II, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3 support IBM Personal Computers and the Personal System/2 Models 25 and 30. The PC Network Adapter II/A, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3 support all Personal System/2 except Models 25 and 30.

Baseband:

The IBM PC Network also supports the baseband wiring option that operates on the IBM Cabling System including telephone twisted-pair media. The IBM PC Network baseband option is designed for environments such as education and small businesses, where all applications are personal-computer-based and the primary requirement is for low-cost, small installations.

The IBM PC Network baseband option can support up to eight nodes using the attachment cable in a daisy chain structure with a maximum end-to-end distance of 200 feet. It can support a maximum of 80 nodes by interconnecting up to 10 of the daisy-chained legs using a Baseband Extender Unit. In a structured wiring environment, the baseband PC Network can support 10 to 15 nodes using the Baseband Extender Unit.

The PC Network Baseband Adapter supports IBM Personal Computers and the Personal System/2 Models 25 and 30. The PC Network Baseband Adapter/A supports Personal System/2 except the Models 25 and 30.

IBM Cabling System

The IBM Cabling System (ICS) is a wiring system that supports both voice and data with common connectors for all devices. It accommodates today's mix of products and topologies and is a basis for future high-speed communications systems. The IBM Cabling System is a structured information transport system that utilizes the physical star topology.

ICS can be implemented using a variety of wiring types to provide a range of functions. The higher-function wire types provide higher bandwidth, and larger numbers of devices can be attached.

The IBM Cabling System is the basis for IBM's integration of voice and data workstations into a common connection media. Part of this integration is the Token-Ring Network. IBM's Token-Ring Network provides for peer-to-peer communications, high-speed access, network management, highly-effective self-diagnostics and problem-isolation functions, and handling of a wide variety of information types. Also, LANs provide savings through shared services and connectivity.

Another part of the integration is the ROLM CBX. The CBX provides voice and data switching capability which optimizes the use of shared facilities. Data switching allows a casual end-user to gain access to a variety of applications instead of connecting a single device to a port on a controller. This enables a customer to optimize the use of port facilities through resource sharing for those users who access multiple applications and sources of information. The IBM Cabling System provides the transport media for switched data through the CBX.

There are a number of things to consider in making a decision to install ICS. If a user is constructing a new building or planning a major renovation, the IBM Cabling System should be a major consideration. The wiring plan becomes a part of the building's initial design, establishing the ICS as a corporate standard. In an existing building, when a new product is being installed, installing cable type that best fits the product is recommended.

The IBM Cabling System provides the prerequisite for controlled and future migration into integrated voice/data and the Token-Ring Network/LAN environments. The installation of the IBM Cabling System, with its cabling designed for the future, provides the user with a migration path to future communications needs.

IBM Token-Ring Network

The IBM Token-Ring Network is designed for peer-to-peer communications between intelligent workstations such as IBM Personal Computers, departmental systems (9370, System/36), other IBM Local Area Networks, and System/370 hosts. The IBM Token-Ring Network is a baseband network that uses a token-passing protocol.

The Token-Ring Network provides a wide selection of connection options. It operates on the IBM Cabling System, which includes telephone twisted pair as an option. The Token-Ring Network supports the NETBIOS and IEEE 802.2 interfaces. Up to 260 devices can be attached per ring using the IBM

Cabling System (Type 1, 2, and 9). If existing telephone wire is used (IBM Cabling System Type 3 specified), each ring can support up to 72 workstations. The network has a 4M bits/sec transmission speed.

Information is placed on the Token-Ring Network by using an application interface or by reading and writing directly to the network adapter hardware. LAN software, including Communications Network Management (CNM) is discussed in Section 65.

Two hardware components are required for operation of PCs on the Token-Ring Network once the transmission medium is installed: a Token-Ring Network Adapter for each PC and the 8228 Multistation Access Unit. Attachment of departmental systems (9370, System/36), the 3174, and 372X is discussed in Section 65.

The Token-Ring Network Adapter resides in the workstation, occupying one long slot (IBM PC, PC XT, PC AT, Personal System/2 all models, Portable PC, XT/286, 3270-PC, Industrial PC). This card has all the controls for the Token-Ring Network, both for the PCs on the LAN and for the 8228 Multistation Access Units. The Token-Ring Network Adapter, Adapter II, and Trace and Performance PC Adapter II support IBM Personal Computers and the Personal System/2 Models 25 and 30. The Token-Ring Network Adapter/A and Trace and Performance Adapter/A support all Personal System/2 except the Models 25 and 30.

The Token-Ring Network Starter Kit provides the necessary 8228 Multistation Access Unit, adapters, cables, network software, installation aid, and instructions for establishing a four-workstation Token-Ring Network. There are Starter Kits for IBM Personal Computers and Personal System/2.

Due to the controlled access protocols used by the IBM Token-Ring Network, performance on the network is predictable. Calculations can be made to determine how adding new devices on the Token-Ring Network will affect response time. Doing so avoids overloading the LAN. If the situation arises where there would be too much traffic, another ring can be built and a bridge put between them for ring-to-ring traffic.

The IBM Token-Ring Network conforms to existing national standards of ANSI/IEEE and international standards of ISO as recommended by ECMA. IBM has published the formats and protocols for the various interfaces available on the IBM Token-Ring Network. Chip sets are available from third-party vendors for companies wishing to build devices to attach to the Token-Ring Network.

Local Area Networks

Reference Material

- The IBM Cabling System, G520-5045
- IBM PC Network Brochure, G520-6022
- Positioning Local Area Networks, G520-5031
- Local Area Network Considerations, GG22-9422
- Personal System/2 Connectivity Products, G360-2739

Systems Interconnection -- System/370, 30XX, 4381, 9370

Overview

- Provide a single-system image for ease of operation
- Couple processors, within an organization, to provide improved function and flexibility
- Aim for hardware/software symmetry for organizational flexibility.
- Share DASD and network to improve availability
- Switch special purpose I/O to improve availability

Primary Product Offerings

Interconnection Method	Hardware	Required Software
Tightly Coupled Multiprocessing	MP, Dyadic, Dual, Triadic	MVS/ESA, MVS/370, MVS/XA, VM/SP with HPO, VM/XA SP
Loosely Coupled Multiprocessing	Channel to Channel Adapter	JES3 IMS MSC NJE/NJI** MVS/370 or MVS/XA ACF/VTAM V2 RSCS Networking VM/SP with HPO VM/XA SP
	Token-Ring Network	VM VTAM V3
	Control Unit/DASD*	JES3 JES2 VSE/POWER

* In addition, data can be shared through DASD device sharing under VSE, MVS/370, MVS/XA, or MVS/ESA.

** Incorporated into MVS/SP-JES2 and MVS/SP-JES3 Release 3.

Tightly coupled multiprocessing is also implemented in dyadic processors such as the 3090 Model 200 and 3090 Model 400 (with two tightly coupled dyadic processors). In the dyadic implementation, instead of connecting two individual processor units, two central processors are tightly coupled within a single processor unit. The dyadic approach offers advantages similar to those provided by attached processing configurations.

Each of these offerings provides different facilities and advantages. Combinations of tightly coupled and loosely coupled systems may be implemented depending on the major objectives of the installation in terms of single-system image, improved throughput, and availability.

Selection Guidance

The primary reasons for maintaining a single processor and upgrading it, in preference to installing multiple uncoupled processors, are:

- Price/performance
- Single application load that is not easily split
- Powerful single-stream performance requirements
- Physical space limitations
- Operational simplicity

This decision can be affected by the proportion of total network workload handled through distributed processing. Note that all the above also apply to tightly coupled systems.

The primary reasons for installing more than one processor in a single location without coupling are:

- Availability
- Requirement for different operating environments
- Implementation of critical applications on dedicated systems
- Near-term capacity requirement beyond single-processor growth capability
- Security

The primary reasons for interconnecting two or more processors are:

- Ease of operation
- Load sharing
- Data sharing
- Total system availability

Tightly coupled multiprocessing should be considered in environments that require:

- More capacity on a single multitasked application
- Increased processor storage/channels for an application
- A growth option with minimum impact on operating environment
- The availability/recovery capabilities of tightly coupled systems

Loosely coupled multiprocessing should be considered in environments that require:

- Single-system image and capacity beyond a single MP configuration
- Asymmetric processor growth

Additional considerations are as follows:

- JES2 Multi-Access Spool (MAS) is appropriate for all users who do not require the advanced scheduling and job management facilities of JES3.
- IMS/Multiple System Coupling (MSC) should be considered for a heavy IMS load that exceeds the capacity of a single processor.
- CICS Intersystems Communications (ISC) should be considered by CICS users with a medium or heavy interactive load that exceeds the capacity of a single processor.
- Many of the objectives of systems interconnection can also be achieved using multisystem networking and communication links between host systems in one or several locations.
- Always consider SNA with its Multisystem Networking Facility (MSNF) for balancing subsystems and applications between processors and for fallback. This will provide complete terminal accessibility to all processors.
- In the management of an MVS system, the installation must be cognizant of the data protection characteristics of other systems that may be connected to it. In particular, the installation must assess the exposures that could result from interconnection with systems with lower levels of security or integrity support.
- For additional MP and dyadic considerations refer to *Tightly Coupled Processors – The Continuing Evolution* (a presentation guide), G320-6412.

Network Control

Overview

- The objective of network control is to provide an access method that promotes:
 - Application development productivity through the use of high-level interfaces
 - Use of application programs or services, such as NetView Distribution Manager and RJE
 - Broadest possible access to online applications for each terminal and user
 - Effective use of processor resources
- SNA terminal products should be installed for new applications, new locations, and, over time, for old applications in place of non-SNA terminals, to gain maximum benefit from application and line sharing with SNA.

Primary Product Offerings

- ACF/NCP with ACF/VTAM
- NetView family of products
- 9370 Communications Adapter
- DPPX/370, HCF, HDT
- System/36 SSP, ICF, 3270 DE, MSRJE, DSX and DSNX, DDM
- System/38 CPF, RJEF, 3270 DE, DDM, APPN
- Series/1 RPS/CM, EDX/CF, RM, DSX
- DSNX/PC

Selection Guidance

The following is guidance based on the processor control program planned or installed.

VSE

- ACF/VTAM is the primary offering for 4381 and 9370 processors.

VM/SP

- ACF/VTAM is the primary offering for CMS access by SNA devices.

VM/VSE

- Guidance is the same for VM/VSE as for VSE.

MVS/370 or MVS/XA

- ACF/VTAM is the general purpose offering.

The following is guidance based on the system planned or installed.

System/370, 30XX, 4381, 9370

- New interactive applications should be developed under CICS, IMS, TSO, or ICCF. If none of these is appropriate, applications should be developed directly with ACF/VTAM.
- Current BTAM subsystems, such as CICS/BTAM, IMS, and RJE, should convert to ACF/VTAM. TSO should also be considered for conversion to ACF/VTAM, particularly if it is the only TCAM application.
- TCAM systems with CICS/TCAM, TSO, and user-written TCAM applications should convert to ACF/TCAM. New applications should use the ACF/TCAM subsystem interface.
- User-written BTAM applications should migrate to the subsystem environment described above that would be selected for that application today. If that is not possible, the BTAM network should be stabilized and considered a separate TP network that will not be able to take advantage of the application and line sharing benefits of SNA.
- NPSI (see NCP) should be implemented in the communication controller when attachment to an X.25 public packet switched network is required.

DPPX/370

The major role of DPPX/370 is to serve as a full-function transaction-processing system distributed from an MVS host. Centralized network management is a key element of the system. System maintenance and applications may be distributed across the network using the NetView Distribution Manager product. The programmed operator facility is used to automate operations whereby command lists or programs are invoked based on system, application program, or timer-scheduled events. Where human intervention is required, messages may be routed to a centralized host console using the facilities of Host Command Facility (HCF) and NetView. System errors are analyzed by DPPX/370 and generic alerts are forwarded to NetView on the System/370 host. Alerts may be user-defined to enable application programs to trigger this recording activity by DPPX/370. Central assistance is supported by full access to all system facilities from HCF on the host. In addition, where failures occur, the first failure data capture feature of DPPX/370 will record critical information related to the failure on the first occurrence automatically. This facility reduces the need to recreate problems in order to collect sufficient information to determine cause and required corrective service.

These facilities coupled with the integrated characteristics of the DPPX/370 components provide an environment that minimizes the need for professional data processing skills at the remote site and allows for faster diagnosis and correction of problems.

Network Control

System/36

- Use System/36 SSP for communication to:
 - 5250 SNA terminal printers and CRTs
- Use System/36 MSRJE to communicate to:
 - Host SNA spoolers: VSE/POWER, RES, JES2, and JES3
 - Host BSC spoolers: VM/RSCS, RES, JES2, and JES3
- Use System/36 SSP-ICF for communication to:
 - IMS/VS SNA/BSC
 - CICS/VS SNA/BSC
 - System/34, System/36, System/38, Series/1
 - Office products and systems
- Use System/36 3270 Device Emulation (DE) for interface to existing host subsystem application programs:
 - IMS/VS SNA/BSC
 - CICS/VS SNA/BSC
 - TSO
 - VM/370
 - System/38
- Use System/36 DDFF (Distributed Data File Facility) for transparent support for distributed System/34 access to System/36 data.
- Use Display Station Pass-Through (DSPT) to allow a user on a System/36 to sign on to another System/36 or a System/38.
- Use Distributed Data Management (DDM) to allow a user on a System/36 to access files on another System/36, a System/38, or a System/370 with CICS.
- Use System/36 Finance Subsystem to communicate to 3600 or 4700 finance controllers.
- Use System/36 alert support to provide network management by IBM Host processors (System/370, 30XX, 43XX)
- Use DSNX and DSX to maintain a network of System/36 systems.
- Use Host Command Facility (HCF) and Distributed Host Facility (DHCF) to allow a System/370 terminal user to sign on as a System/36 User.
- Use Advanced Program-to-Program communications (APPC) for a peer relationship between two System/36s, a System/36 and a System/38, and a System/36 and a System/370 with CICS.
- Use Advanced Peer-to-Peer Networking to communicate on a logical, point-to-point basis across a network of System/36s. System/38s can be peripheral nodes in this network. APPN is a dynamic routing facility for Distributed Data Management (DDM), Advanced Program-to-Program Communications (APPC), Display Station Pass-Through (DSPT), and SNA Distribution Services (SNADS).

System/38

- Use System/38 CPF to communicate to:
 - 5250 SNA terminal printers and CRTs
 - IMS/VS SNA/BSC
 - CICS/VS SNA/BSC

- System/34, System/36, System/38, Series/1
- Batch BSC terminals
- Use System/38 RJEF to communicate to:
 - Host multileaving BSC spoolers
 - Host spoolers via SNA
- Use System/38 3270 DE (Device Emulation) to communicate to:
 - IMS/VS SNA/BSC
 - CICS/VS SNA/BSC
 - TSO
 - VM/CMS
- Use Display Station Pass-Through (DSPT) to allow a user on a System/38 to sign on to another System/38. In a network of System/38s, the target sign-on system could be reached through up to 16 System/38s. DSPT also allows a System/36 user to sign on to a System/38.
- Use Distributed Data Management (DDM) to allow a user on a System/38 to access files on another System/38, a System/36, or a System/370 with CICS.
- Use Advanced Program-to-Program Communications (APPC) for a peer relationship between two System/38s, a System/36 and a System/38, and a System/38 and a System/370 with CICS.
- Use the System/38 as a peripheral node in an Advanced Peer-to-Peer Network. APPN is a dynamic routing facility for Distributed Data Management (DDM), Advanced Program-to-Program Communications (APPC), Display Station Pass-Through (DSPT), and SNA Distribution Services (SNADS).

Series/1

- Use EDX/CF and RPS/CM for central network control of a multiple Series/1 processor network for:
 - Routing of system errors
 - Remote console commands accepted and issued
 - Remote terminal application control, program initiation, or IPL
 - Transfer of files, programs, system dumps
- Use EDX/CF and CF/HOST to interface a Series/1 network to a CICS system.
- Series/1 networks can be BSC, SDLC, or X.25.
- Use Remote Management (RM) for central management. Available under both operating systems, RM will allow Series/1 networks to be centrally managed and operated through host communications and systems management functions that exist today for SNA with ACF. These host functions are provided by NCCF, NPDA, HCF, and DSX.
- Use DSX to maintain a network of Series/1 systems.

Multisystem Networking -- System/370, 30XX, 4381, 9370

Overview

- Use SNA-based telecommunications access methods to be able to take advantage of the ACF multisystem networking offerings.
- Consider the use of DB/DC, personal computing, and program development products as SNA subsystems to provide the foundation of applications for implementing multisystem networking.
- Where there are multiple processors in multiple locations, consider interconnecting them with networking offerings. This will make available the benefits of terminal, communications line, and application sharing throughout the network.
- The IBM multisystem networking offerings permit distributed processing that can take advantage of multiple host processor locations and their unique applications, data, or I/O devices.

Primary Product Offerings

IBM networking products can generally be grouped into three categories:

- Session networking
- Job networking
- Transaction (message) networking

These categories are not mutually exclusive, but complement each other. IBM's networking products can often be installed in combination to achieve different levels of networking function, thus providing the terminal user with different modes of access to the resources in the network.

Session Networking

The terminal or application program is attached to an application subsystem in one of the processors of a network for the duration of a conversation with that application by logging on and then logging off. The multisystem networking facility of the ACF products provides this capability. Primary products include:

- ACF/VTAM
- ACF/TCAM

Job Networking

Jobs are routed through a network of processors under the control of the job entry subsystems that are integrated into their respective System Products. Products and functions include:

- MVS/SP-JES2 or MVS/SP-JES3
- RSCS Networking for VM/370
- RSCS Networking Version 2 for VM/SNA
- JEP and FTP with VSE/POWER and VSE
- Non-SNA Interconnection

Transaction Networking

The networking system routes transactions to the appropriate application subsystem in the network on the basis of routing information or data content within the message itself. Products include:

- IMS/VS Multiple Systems Coupling (MSC)
- CICS/VS Intersystem Communications (ISC)

Selection Guidance

Session Networking

ACF/VTAM Version 2 and Version 3 and ACF/TCAM with MSNF, or ACF/TCAM Version 3 with ACF/VTAM Version 2 or Version 3 provide essentially the same networking functions in an SNA-based network. Users who have existing TCAM single processor networks have the ACF/TCAM MSNF migration path. All other users should consider installing ACF/VTAM Version 3. These systems provide the following cross-systems communication:

- SNA-SDLC device to application subsystem
- 3270 BSC device to application subsystem
- Application subsystem to application subsystem

Job Networking

The IBM job networking products may coexist in the network. MVS/SP-JES2 and JES2/NJE support job networking in an SNA environment in conjunction with MSNF. JEP and FTP provide SNA job and file transmission capabilities between VSE processors and other host processors. RSCS/SNA and RSCS Networking Version 2 provide them for VM/SP processors.

With the SNA networking implementation, job routing is accomplished via session networking, reducing the processor overhead, and the SDLC communications link is shared by all network traffic.

In addition, the Non-SNA Interconnection product provides the ability for selected BSC RJE devices and selected BSC NJE subsystems to transport BSC data over SDLC links in an SNA network.

All job networking products also have an interface via a binary synchronous communication link or channel-to-channel (CTC) adapter attached to a System/370, 30XX, 9370, or 4331/4341/4361/4381 block multiplexer channel for job receiving, routing, and transmitting. The BSC link or CTC adapter (when not MVS ACF/VTAM controlled) must be dedicated to the NJE function. Product selection is determined by the processor job entry subsystem, as follows:

- MVS/SP-JES2

Multisystem Networking -- System/370, 30XX, 4381, 9370

- JES2/NJE
- JES3 Networking
- MVS/SP-JES3
- RSCS Networking
- VSE with JEP and FTP
- VSE/POWER

Transaction Networking

IMS/VS Multiple Systems Coupling provides transaction routing within a network of processors over BSC facilities or channel-to-channel adapter between IMS/VS subsystems only. The BSC facility must be dedicated to the use of the IMS/MSD messages.

CICS/VS Intersystems Communication facilities provide for CICS/VS-to-CICS/VS communications between processors over SDLC communications facilities, or over the channel-to-channel adapter, both of which can be shared with all network traffic.

General Systems

Overview

In order to select a small or midrange system solution to address particular requirements, a high-level "first cut" should be employed. Possible choices for a given situation are:

- IBM personal computers
- 3270 Personal Computer family
- PC/370 family
- System/36
- System/38
- Series/1
- 8100
- 9370

Selection Guidance

A five-step technique to select the product that can best fit user requirements is recommended. In the case of multiple requirements, the selection may include several types of IBM small system solutions.

The five steps are the following:

1. Understand the Environment

A thorough knowledge of the organization and the environment is required as the first step in the small systems selection process. Many small systems can now directly satisfy requirements of end-user departments or divisions in the organization. In some cases, a decentralized solution simple enough to be implemented directly by local end-user management for their own department's use may be appropriate. If there is a desire to install remotely located systems, and the DP department is to have the major responsibility for implementation and support through a communications network, then a distributed systems implementation would likely best fit the situation. Distributed solutions may vary from tightly coupled application-to-application communication to loosely coupled local processing with the occasional transfer of summary files. There may be central or local application development, and the remote systems may be locally managed or controlled from the central site.

An understanding of the intended implementation, then, will be important in the product selection process. The IBM small systems product set can satisfy centralized, distributed or decentralized requirements. IBM systems have different strengths, however, with respect to these environments, so the selection must be done with the organizational philosophy in mind.

Other concerns, such as available DP skills (local and remote), financial justification, and compatibility with

currently installed systems, may also influence the selection process.

2. Understand Product Strengths

Each of the small and midrange systems products has some functional strengths that make it stand out over the others. Knowledge of these individual areas of strength should be a strong factor in the selection of a product to meet particular needs.

In addition, IBM's small and midrange systems products can be conveniently grouped into "families." The members of each family have similar characteristics and provide growth paths, in many instances, between smaller and larger systems within the family. Any future enhancements may in general be expected to be made consistent with the family's characteristics.

The families are:

- System/36 and System/38
- 9370 and 4381
- Series/1
- DPPX/370

Each of these family members offers connectivity to larger systems and to displays and intelligent workstations. Each offers text and professional capabilities.

Intelligent workstations include:

- IBM Personal Computer family — professionals
- 3270-PC workstations — professionals and clerical
- PC/370 family — professionals

Each provides local processing, host communications, user-friendly interfaces, and text/word processing facilities.

Now let us consider the major areas of strength for each specific product:

- IBM Personal Computer family:
 - Standalone personal computing
 - Wide variety of host attach capabilities
 - 16-bit microprocessor with high-quality display option
 - Extensive memory and disk storage options
 - Application support for professional, educational, and home use
- IBM 3270-PC family:
 - Cooperative processing between host and PC sessions
 - Strong host affinity (multiple host sessions)
 - Application support for professional, clerical, and office use
 - Range of graphics capabilities
 - Wide variety of input/output devices

General Systems

- Series/1:
 - General purpose processor with wide configuration granularity
 - Excellent connectivity: IBM and OEM
 - Horizontal and vertical growth
 - Broad communications support
 - Strong price/performance
 - Realtime interrupt-driven architecture – industrial automation/process control
 - Programmable controller
 - A good choice where tailored, communications-oriented applications are required
 - Plant floor data collection
 - Industrial automation
 - Broad SNA/SDLC connectivity
 - Comprehensive distributed data processing
- System/36:
 - Ease of use, installation, and operation
 - Integrated support for data processing, text, office management, business graphics, and professional support
 - Support for local and remote concurrent interactive and batch users
 - SNA, BSC, X.25 and async communication to host systems, peer systems, and down-line devices
 - Wide range of application packages and development tools
 - End-user tools for query and report writing
 - Limited DP skill to install or operate the system
 - IBM personal computer support
 - Local Area Network (LAN) Support
 - Good choice for remote locations or departments requiring packaged solutions, combined functions, and end-user tools not requiring DP skills
- System/38:
 - Superior application development productivity
 - Advanced virtual architecture
 - Integrated relational data base
 - Ease of implementation
 - SNA, BSC, and X.25 communications
 - Personal Services/38
 - Standalone applications, and those that augment central DP
 - Growth from System/36
 - IBM Personal Computer support
- DPPX/370:
 - Distributed processing system
 - Full 3270 extended data stream support
 - Designed for integrated transaction/batch processing
 - Central maintenance, release, application distribution
 - Programmed Operator Facility
 - Highly productive application generator (CSP)
 - Local library/folder services
 - Document/data distribution through SNADS
 - DISOSS library access
 - Full 3270-PC support including HLL API
 - X.25 SNA and Native Interface (OSI Model)
 - Major elements of high availability
- Shadowed DASD volumes
- Dynamic index reorganization and dataset extents
- Programmed IPL
- Multiple host links
- COBOL II, PL/I support with interactive map definition
- Multiple 3270 pass-through session support
- Full forward/backward data base recovery
- Application-transparent remote data base I/O and transaction routing between peer-connected 9370 processors with recovery synchronization
- Token-ring network support
- 9370 and 4381:
 - System/370 compatibility and growth
 - Engineering/scientific entry
 - Central control and support – NetView, DSNX
 - Reduced skills required with VSE/SP and VM/IS
 - Broad commercial function with VSE
 - Application development and professional support via VM/CMS
 - Office systems function with PROFS on VM
 - Office offering with compatibility to MVS and VSE
 - Wide language support
 - Special industry terminal support
 - Connectivity with SNA, BSC, ASCII, X.25, Ethernet, and token-ring

3. Evaluate Application Packages

The next step in the product selection process should be to determine if there are application packages available that can do the job. A packaged solution that either fits as-is or can be readily tailored to meet the user's needs will simplify both the cost justification and installation processes. Further, the time-consuming application development cycle may be avoided. In general, if such a packaged solution can be found on a system within the price requirements of the user, it is advantageous to choose that solution.

Packages can be categorized in three general areas:

- Cross-industry (applications)
- Office systems
- Industry applications

In each area a wide variety of IBM program products, program offerings, and non-IBM packages is available and should be evaluated.

Cross-Industry Applications

Cross-industry applications include:

- Office systems (see next topic)
- Data entry
- Remote Job Entry/Data Stream Compatibility

- BICARSA/GLAPPR (Billing, Inventory Control, Accounts Receivable, Sales Analysis/General Ledger, Accounts Payable, Payroll)
- Query/report writing
- Business graphics

These application packages are described in more detail elsewhere in this publication. The next few paragraphs outline offerings by system as a quick aid to product selection.

- **Data Entry:** The Series/1 provides the Series/1 Data Entry System (S1DES). Both the System/36 and System/38 have utilities designed to support data entry applications.
- **RJE/DSC:** Remote Job Entry and Data Stream Compatibility facilities are supported for the 9370, 4381, System/36, and Series/1. A BSC RJE capability is provided for the System/38.
- **BICARSA/GLAPPR:** This is a major application area for both the System/36 and System/38, with a wide range of packages available. The IBM Personal Computer also has BICARSA/GLAPPR application packages available.
- **Query/Report Writing:** The 9370 and 4381 support both Structured Query Language (SQL) and QMF. The Application System decision support program is supported in a VM/CMS environment. The System/38 query capabilities are designed as part of the relational data base type of support provided by the System/38's advanced architecture. Query/36 provides easy-to-use information retrieval that can result in data being displayed, printed, or saved in a disk file. In addition, both the System/36 and the System/38, with their respective PC Support products, offer PC-based query facilities that use an SQL-like interface. System/36 BRADS III provides easy-to-use end-user tools for query, report writing, and spread sheet analysis.
- **Business Graphics:** The 4381 and 9370 have extensive functional support for business graphics applications. Facilities include 3279-based color graphics, pie charts, bar charts, and access to DP files via the Graphical Data Display Manager (GDDM) and Presentation Graphics Feature (PGR) and GDDM's Interactive Chart Utility. GDDM runs in a VM/CMS or VSE/CICS environment.

Office/38 Business Graphics Utility (BGU) interactively uses the two components of System/38 Control Program Facility (CPF) graphics, Graphical Data Display Manager (GDDM) and Presentation Graphics Routines (PGR), to create bar charts, line charts, scatter diagrams, surface charts, histograms and pie charts. GDDM and PGR consist of groups of routines that are small, self-contained programs that can be called from application programs.

Business Graphics Utility (BGU) for the System/36 provides both interactive and batch interfaces for generating and plotting on a variety of devices and supports line and surface graphs, pie charts, side-by-side and stacked bar charts, text graphs, seven colors, and five fonts.

Office Systems

One of the most important application areas that can affect the selection of a small system is the group of requirements termed "office systems." The significant aspect of office systems is that it is a set of applications that cuts across:

- All user segments
- All industries
- The IBM product line
- The user's enterprise

It provides a wide range of functions matching the user's requirements in the areas of decision support, text services, electronic mail, professional support services, data base access, and applications. It integrates text, data, graphic, and image processing and also addresses voice communications.

See also "Office Systems Product Selection Guidance," Section 30.

Industry Applications

There are a variety of industry-specialized application packages that can affect product selection. Examples of such packages are:

- **Industrial Sector:**
 - Computer Aided Design/Computer Aided Manufacturing for the 9370
 - Plant Automation – Series/1 and Series/1 Programming services for Multimedia Industrial Terminals and GPAX programs and Series/1 Plant Automation Control Systems (PACS).
 - Production Planning – 4381 and 9370 COPICS and System/36 or System/38 MAPICS
- **Insurance:** Life Inquiry/Data Entry for 4381 and 9370
- **Public Sector:** Series/1 Vehicle Registration and Collection of Vehicle Registration Fees and Series/1 Fuel Pump Monitoring
- **Retail/Point of Sale:**
 - Retail Merchandise and Audit System (RMAS) for System/36
 - Point-of-Sale Data Collection and Distribution System for Series/1
 - Supermarket Energy Management on Series/1
 - Store Item Receiving (SIR) for Series/1
 - Store Item Management (SIM) for Series/1
 - Store Application Environment for Series/1

4. Partition by Price Range

If a system cannot be selected on the basis of the availability of prewritten application packages, then customized applications will have to be developed. The availability of system functions that can help to develop and support these applications with the least amount of effort will be a key selection criterion. Before considering each system's functional strengths in detail, it is helpful to divide the systems into logical groups based on price.

Since most applications today are terminal-oriented, a useful way to partition the systems is on the basis of the number of workstations supporting a given workload and the system price per workstation. The following lists the partitioning of IBM small and mid-range systems according to the number of workstations supported:

- One to four workstations:
 - Personal Computer
 - System/36 PC smaller configurations
 - Series/1 smaller configurations
- Five to 30 workstations:
 - Series/1 larger configuration
 - 9370
 - System/36
(Depending on the application, more workstations can be supported.)
- Eight to 50 (or more) workstations:
 - System/38
 - 9370
 - 4381

The ranges listed above are very rough guidelines. Clearly the number of workstations that can be productively attached to a system will be highly variable according to the mix of applications running on the system, the complexity of those applications, service-level requirements, workstation characteristics, and many other variables.

On the basis of the above partitioning, the functional analysis in the paragraphs to follow examines systems within each of the three ranges defined: low, medium, and high. It should be stressed, however, that the user's total cost is more than just hardware, software, and maintenance. Communications, application development, software maintenance and support, and on-going operations costs, for example, should also be considered. In cases in which there are a large number of remote locations, the leverage of central economies of scale — such as central application development — may be important. Where this is so, the total cost may be significantly different from that for a small number of systems.

5. Select by Function

The intent of this section is not to provide an exhaustive side-by-side comparison of systems, but to assist selection through the identification of a few key factors. Low, high, and medium terminal ranges will be treated in turn. The number of terminals supported in each range will depend on numerous factors, including the user's application, other concurrent work, transaction load, processor storage and model, and response time requirements.

- Low (one to four workstation range): Within this general range there are four possible system choices: an IBM Personal Computer, a 3270-PC, the System/36, and the smaller configurations of the Series/1. Where a general purpose low-end processor with broad configurability and programmable controller capabilities is needed, the Series/1 may be the best choice. A standalone business application orientation would tend to favor System/36, as would a strong requirement for integrated DP/WP. Professional use by end-users, casual host connect, very low cost, or the use of BASIC or other tools would indicate that an IBM Personal Computer would be a good choice.

In addition, differences in terms and conditions may also be important. The Series/1 and IBM personal computers are available only on a purchase basis.

- High (8 to 50-plus workstation range): Skipping for the moment to the high range of workstations, note that there is a choice in general among the 9370, the 4381, and the System/38. Key considerations are the data usage requirements, the user's DP control philosophy, and the availability of application development skills. First, if the system is to be used primarily for decision assist applications, by professionals, then VM/IS with CMS on a 9370 may be the best choice. These applications often require data extraction from a host system, such as a System/370 or 30XX, and data manipulation and computational analysis on demand.

Where the requirement is for an operational data system in a transaction-based environment, either the 9370 or System/38 may be a good choice. The selection can be based on how the users choose to control the data resource. If they choose to control data centrally, and if in particular they are using a System/370, 4381, or 30XX, a 9370 is probably the best choice. This is particularly true where System/370 compatibility or long-range growth is an important consideration.

If data is to be managed on a decentralized basis, where most data is owned by the division or department, the System/38's integrated data base may provide the most function on which to build. Finally, if application development productivity is an overriding factor, the System/38's advanced architecture can be an attractive choice.

- Medium (5 to 30 workstation range): Systems in the medium range can often support more than 30 workstations depending on workload and other factors. The above discussion about centralized versus decentralized control of data can be an important factor in this range as well. However, the first consideration in choosing among the 9370, Series/1, and System/36 should be the network control philosophy. If there is not a strong requirement to manage the communications network centrally, the System/36, with its ease-of-use characteristics and peer-to-peer networking strengths, may be the easiest to install. The System/38 might also be considered because of its low operational support requirements and peer-to-peer networking strengths. A 9370 with NetView and DSNX may be the correct choice for remote control and management and use of VTAM skills at a central site. Thus a decentralized or loosely coupled distributed control philosophy tends to favor the System/36 and the System/38.

Where strong centralized host control and network management, or broad communications configurability is important, the choice may be a 9370 or a Series/1. Both have change management, problem management, and operational support tools accessible from 3270 terminals attached to a System/370, 30XX, 4381, or 9370 host to help manage the network of remote systems. The 9370, Series/1, and System/36 also provide a programmed operator capability and automatic problem notification aids.

The Series/1 provides broad connectivity to non-IBM devices. Series/1 should be favored if the application includes use of 7456 terminals for plant floor data collection. To communicate with the 3651, 3684, or 4680 controllers, Series/1 is the recommended choice.

DPPX/370 runs on the 9370 Information System. It provides an integrated transaction-batch environment to support operational applications remote from an MVS host. The system is well suited for environments where local data processing skills or operational support are not desired.

Summary

The five-step process above will be most helpful if used in sequence. Understanding the organizational philosophy and environment, looking at the strengths of each system, and searching for existing application programs that can accomplish the job will in many cases be sufficient to make a choice. In some, it may be necessary to consider comparative system functions within a price class.

Office Systems

Overview

IBM office systems are aimed at providing end users with three essential functions:

- Productivity applications to allow users to create, print, process, and analyze information
- Access to information contained in system libraries and data bases
- Interchange of information with other users

These functions should be provided within a system or network of systems capable of spanning an entire organization, supporting the many types of users within organizations, and in the long term, dealing with information in all its forms: text, data, image, voice and graphics.

IBM's approach to office systems is to build on carefully planned architectures. These architectures are a set of well-defined rules that, when implemented across a variety of systems, workstations, and devices, allow these products to function together in a single network.

The key office architectures are:

- Systems Network Architecture (SNA) – Provides the communications backbone for office systems networks.
- SNA Distribution Services (SNADS) – Controls the distribution of information among systems in a multisystem network.
- Document Interchange Architecture (DIA) – Defines the rules for document distribution and library services: for filing, searching, retrieving, and distributing all types of information.
- Document Content Architecture (DCA) – Defines a standard set of controls for interpreting the contents of a document and presenting the document to a user.

As these architectures are implemented on IBM products, they offer several advantages including:

- Ability to select products that address different user needs, but that operate within the same network to provide users with full information access and interchange
- Potential for extended product life by providing a stable base that allows previously acquired products to coexist with newer ones
- Maintaining an open system that can make more products available to IBM customers

Primary Product Offerings

Office systems is a set of applications that cuts across the IBM product line from small to large systems. Product descriptions are found elsewhere in this guide.

SolutionPac Office Series

- System/36 edition
- VM edition

Host Systems

- System/370 hosts – MVS and VSE systems
 - Application System
 - DISOSS/370
 - DisplayWrite/370
 - Personal Manager/CICS
 - Personal Services/CICS
 - Personal Services/PC
 - Personal Services/TSO
 - Query Management Facility
- System/370 hosts – VM
 - Application System
 - DisplayWrite/370
 - PROFS
 - PROFS Application Support Feature
 - Query Management Facility
- System/36
 - DIA, DCA, SNADS
 - DisplayWrite/36
 - PC Support/36
 - Personal Services/36
 - Query/36
- System/38
 - DIA, DCA, SNADS
 - PC Support/38
 - Personal Services/38
 - Query/38

Text Systems

- DisplayWrite/370
- DisplayWrite/36
- Personal Services/38
- DisplayWrite 4

Workstations

- Personal Computer Family
 - Display Graphics
 - DisplayWrite 4 and 4/2
 - Personal Decision Series II
 - Personal Services/PC
- General-purpose displays
 - Application System
 - DISOSS/370
 - DisplayWrite/370
 - Personal Manager/CICS
 - Personal Services/CICS
 - Personal Services/TSO
 - PROFS

- PROFS Application Support Feature
- Query Management Facility

Workstation Clusters

- IBM PC Network
- Token-Ring Network
- 3274/3174 Control Unit

Departmental Systems

- Broad office function
 - System/36
- Supported by office architectures
 - System/38
 - IBM Personal Computer
 - 9370 (DPPX/370)
 - 9370 (VM/PROFS)

Interconnection

- Wide area networks
 - SNA – SNADS primary
 - X.25, BSC, asynch secondary
- Local area networks
 - IBM Cabling System
 - PC Network

Text Capabilities

- IPDT
- DCF
- ATMS III
- STAIRS
- PROFS

Voice/Data Switched Connectivity

- ROLM products
- IBM PC

Selection Guidance

Host Systems

A host, the largest system supporting an organization, plays several key roles in office systems. It should manage the sharing of data bases and document libraries, manage the network of systems and workstations, provide office and application support to intelligent and general purpose workstations, and allow the distribution of information among users in the network. Among IBM systems, the System/370, System/36, and System/38 provide host function for organizations of various sizes.

The System/370's major role is to allow general-purpose displays to fully participate in office networks along with departmental systems and intelligent workstations.

- System/370 hosts – MVS and DOS/VSE systems: The key office systems products in these environments are DISOSS/370 and Personal Services/370.
 - DISOSS/370 is the hub of System/370 office networks. It is essentially the implementation of the DIA and DCA architectures, together with the SNA and SNADS architectures, providing distribution services and the management of shared libraries to a wide variety of systems and workstations. Its ability to file, search, retrieve, and distribute information is not limited to text. It can handle many forms of information, as demonstrated by its support of Scanmaster image documents. With its multi-host implementation, DISOSS/370 can provide distribution services across even the largest organizations. The DISOSS-PROFS bridge is available to support the exchange of both final-form and revisable-form documents between the two systems. This capability significantly expands the business professional's ability to communicate with other workstations within an architected IBM network.
 - Personal Services/370 runs in conjunction with DISOSS/370 and is designed to be a general office application. It provides end-users with electronic messaging, personal in-basket, and file cabinet management, and document creation, storage, and retrieval services for 3270 and 3270-PC users. Personal Services/370 Release 2 adds support for DisplayWrite/370, the versatile text editor and formatter for the professional end user.
 - DisplayWrite/370 is a System/370 general-purpose software package that operates in conjunction with the Personal Services/370 licensed program on MVS/CICS and VSE/CICS systems. It also operates with VM/PROFS and in a stand-alone VM/CMS environment. This full screen text editor supports basic and advanced text functions for the professional end user. All DisplayWrite/370 users can edit and view RFTDCA documents and view FFTDCA documents.
- System/370 host – VM: PROFS is the key office-systems vehicle for professional services in the VM environment. It complements the information center and problem-solving applications in the VM environment and will continue to be a major entity among IBM office systems offerings.
 - DisplayWrite/370 offers high-function text capability for the professional end user.
- System/36 and System/38 hosts: These systems can economically support smaller organizations. For these environments, System/36 and System/38 are IBM's primary host offerings. It is IBM's intent to provide these host systems with office function similar to that on System/370. The System/36's

Office Systems

data processing function is augmented with integrated office systems offerings — DisplayWrite/36 and Personal Services/36.

- DisplayWrite/36 offers high-function text to attached general purpose displays and allows editable interchange with Displaywriter or with Personal Computers using one of the DisplayWrite series.
- Personal Services/36 and Personal Services/38 provide mail-handling, distribution, and calendar functions to both types of workstations.
- System/36 document distribution and System/38 document distribution with the Displaywriter are provided by DIA support.
- System/36 and System/38 will support both Personal Computers and general-purpose displays as office workstations.
- System/38's office systems include support of DIA, DCA, and support of SNADS for information distribution peer-to-peer, with the System/36 and to DISOSS/370. System/38 Document Library Services can be used by System/36 users.

Workstations

Office systems support will be provided to users of both intelligent workstations and of general purpose displays.

- The Personal Computer family is the set of intelligent workstations on which IBM will focus its office support. Its role is to provide the user with high-function office support, generally offering more function than general-purpose displays.
 - Personal Services/PC is an office-oriented mail management system that supports Personal Computers in a peer-to-peer environment as well as with various host connections. Personal Services/PC extends distribution services and library services by offering access to the DISOSS library function. In addition, Personal Services/PC users can distribute or receive DCA documents via DISOSS to or from any product supporting the DIA and DCA architectures. Personal Services/PC has been extended to the following workgroups, providing end users with integration of DISOSS functions:
 - IBM Token-Ring and IBM PC Network support
 - ROLM Juniper II connection through the ROLM CBX plus either a 3708/10 protocol converter or a 3725 Communications Controller with NTO.
 - The Series/1 can be a member of the DISOSS/SNADS distribution network. Library function for these users is also provided with the Series/1. Personal Services/PC and DISOSS combine to give the PC a full distribution and file cabinet function as well as integrating all PC users into the network.

- General-purpose displays will continue to play a key role in IBM office systems offerings. Existing systems, data networks, general-purpose displays, and the IBM office systems family of software allow many establishments to participate in office networks in a cost effective way. These displays also offer a lower cost alternative for users who do not require the additional function available on intelligent workstations.

The ability to mix Personal Computers and general-purpose displays in the office system, offering to the users of both the open access and interchange of information, is a key element in IBM's office offerings.

Workstation Clusters

- The IBM PC Network offers local area network function for the clustering of up to 72 Personal Computer workstations. Resource sharing capabilities are provided by the PC Network Program, allowing file sharing, printer sharing, and messaging functions.
- The IBM Token-Ring Network is a high-speed communications network for information-processing equipment that uses the IBM Cabling System, including the new Type-3 specified telephone media and a token-ring access protocol. The network has network management capability and permits data transmission at 4 million bits per second. The IBM Personal Computer is supported, and the Series/1 can be interconnected via the Personal Computer. The Personal Computer software that supports the network includes:
 - An IBM Personal Computer NETBIOS programming interface to the network, the PC Network Program, and the PC Network SNA 3270 Emulation program
 - An IBM Token-Ring Network/IBM PC Network Interconnect
 - An SNA application programming interface to the network that allows systems programmers to write application-to-application support
 - Printer support for the 3820 and the 3812 Pageprinter
- The 3274/3174 Control Unit can cluster Personal Computers, 3270s, or a mix of the two for attachment to local or remote System/370s running MVS, VSE, or VM.
 - Using DisplayWrite 4 and Personal Services/PC, the 3274/3174 attached Personal Computer can create text documents and utilize DISOSS/370 for distribution.
 - Using DisplayWrite 4 and PASF, users can move documents into PROFS for storage and distribution.
 - In MVS, VSE, and VM, 3270s can utilize PROFS on VM or Personal Services/CICS on MVS and VSE for library and distribution services.

- The advantages of the 3274/3174 cluster include:
 - Both local and remote connection to System/370. Locally attached, the 3274/3174 offers a high-speed connection for large amounts of information such as large documents or image.
 - No operator requirement at the department level. Operations are handled at the data center.
 - The capability to handle the extended 3270 data stream, graphics, and the 3270-PC.

Departmental Systems

The third means of clustering workstations is the use of departmental systems, combining office and data processing functions at the departmental level. The System/36 is a strong departmental offering based on ease of use, affinity to the Personal Computer, high-function office support, and local area network support. Consider the use of the System/36 and the System/38 in a departmental environment because of their peer networking strengths, Distributed Data Management support, Display Station Pass-Through support and the Document Library Services of the System/38.

- The 5520, 8100, and System/38 are supported by the office architectures and thus offer substantial office function. When users have a significant investment in specialized software or when a required application or function exists on only one of these systems, it should be considered for the departmental node. When used in this manner, office workstation support on these systems will be oriented to the Personal Computer.

Interconnection

- The IBM direction in wide area networks, used to connect the various locations of customer organizations, is to use SNA for the communications network backbone. SNA Distribution Services is the primary mechanism for information interchange among systems on the network.
- IBM will support other protocols off the backbone network – for example, binary synchronous, X.25, and asynchronous.
- The direction in local area networks (LANs) is to interconnect a wide variety of IBM products using the high-function token-ring protocol. The IBM Cabling System, now supporting many current IBM products, provides the media for the token ring. The PC network offers a local area networking function and the ability to be integrated with the token ring.

Text Capabilities

Broad functional support for larger and more sophisticated text management applications is provided by:

- ATMS III for advanced text entry and management functions as needed for large, complex documents, such as technical manuals, specifications, brochures, reports, and proposals
- The Document Composition Facility (DCF), which provides advanced text formatting facilities suitable for large documents and is designed to automate many document preparation and printing processes
- STAIRS, which allows the retrieval of text and portions of documents based on content with searches of either unformatted full text or formatted data made on the basis of parametric or contextual search arguments

The preceding facilities are provided as host-based applications on the System/370, 4300, or 30XX.

Voice/Data Switched Connectivity

ROLM products

- The major products in this environment are the ROLM Computerized Branch Exchange (CBX II), its associated desk-top products (Cypress and Juniper), and the ROLM PhoneMail System. They are integral components and provide potential for increased telephone productivity, communication cost management, voice messaging function, and connection of ASCII workstations in office systems networks. The ROLM CBX II can be locally attached via twin axial cable to the System/36 or the System/38, allowing access to most System/36 or System/38 applications from ASCII workstations connected to the ROLM CBX II.
- ROLM PhoneMail. ROLM offers two versions: one integrated with CBX II, and the other for non-ROLM PBX or Centrex environments, both supporting up to 8,000 users. PhoneMail is a voice messaging system that reduces "telephone tag," missed messages, and unnecessary memos.

IBM PC

- In non-ROLM environments, advanced telephony for IBM PC's is provided by versions of the IBM Personal Telephone Manager Program in conjunction with either the IBM Personal Telephone Manager Adapter or the IBM Personal Computer Voice Communications Option.

Data Security

Overview

Management should:

- Articulate security policy on an organization-wide basis, assign responsibility, and establish resource access control rules
- Ensure proper evaluation of IBM hardware and software to implement the policy, support responsible management, and enforce the rules
- Become acquainted with the wide choice of IBM products, features, and function and, in addition, take responsibility for selection, implementation, application, and adequacy
- Understand data security functions that can be used across the installation with minimum impact on usability
- Evaluate product alternatives or options so that the need for data security can readily be balanced against performance and generality
- Recognize that the products that provide data and system security are only part of a comprehensive systems control program for an organization
- Be aware of the need to monitor the effectiveness of existing data security and to ensure the adequacy of measures to meet that need

Primary Product Offerings

- Cryptographic Subsystem
- 3848 Cryptographic Unit
- Resource Access Control Facility (RACF)
- Information Protection System (IPS) for VM
- PC Data Encoder
- Interactive Computing and Control Facility (ICCF)
- VSE Access Control Logging and Reporting
- System/38 Cryptographic Facility

Other products to be considered are:

- MVS for user-to-user isolation
- VM for user-to-user isolation
- VM/Directory Maintenance
- IMS/VS for data and transaction access control
- 8100 Information System with DPPX and DPCX
- CICS for data and transaction access control
- System/36 SSP
- System/38 CPF

Selection Guidance

Security features and functions are an integral part of the software and hardware in general systems.

System/370, 30XX, 4381, and 9370 systems offer a variety of software and hardware products to provide data security.

User Identification and Authentication

- MVS: Consider RACF for large user populations, non-DP users, or users of TSO and JES. TSO may be adequate in other situations.
- IMS: RACF is recommended for IMS users who also use TSO or IMSADF II.
- CICS: RACF is recommended for CICS/OS/VS users.
- VSE: Consider ICCF, VM/SP, or CICS.
- VM: Consider RACF for large user populations. Directory Maintenance may be adequate for other situations.

Access Control for Data Sets (including Program Libraries)

- MVS: Consider RACF for tape and DASD data sets with sharing; if there are few data sets and limited sharing, consider VSAM passwords.
- VSE: Consider ICCF for sharing, POWER/VS Controlled Access Monitor for RJE, and VSAM for exclusive access.
- VM: Consider CMS for exclusive access; Shared File Manager program product for sharing, RACF/VM for VM minidisks, terminals, RSCS nodes and spool readers.

Access Control for System Resources

- MVS:
 - RACF for 3090 Vector Facility,
 - TSO/E account numbers, logon procedures, performance groups, and TSO user authorities,
 - Use of Bypass Label Processing (BLP)

Access Control for Records

- MVS: IMS-DL/I
- VSE: CICS-DL/I
- VM/SP: VM/IPS

Access Control for Fields

- Update: IMSADF II
- Read-only: QBE

Access Control for Volumes

- MVS: RACF
- VM/SP: RACF
- VM/XA SP: RACF

Access Control for Commands and Programs

- MVS/RACF: Program execution, program access to data, execute-only
- MVS/TSO/RACF: TSO commands

Access Control for Transactions

- MVS: IMS/RACF, IMSADF II, IMS, or CICS/RACF
- VSE: CICS

Access Control for General Applications

- MVS: Consider the use of RACF macros and supervisor call (SVC) instructions to build RACF access control into each application.
- VM: Consider RACF.

File Encryption Offline

- MVS: Consider the DFP REPRO utility and Cryptographic Subsystem for protection of sensitive files stored offline or offsite. The 3848 Cryptographic Unit should be considered for large volumes.
- VM: Consider Information Protection System (IPS) for protection of sensitive files stored offline or offsite.

File Encryption Online

- MVS: Consider use of Cryptographic Subsystem with user programs or DL/I exit routines. The 3848 Cryptographic Unit should be considered for large volumes.
- VM: Consider IPS for encrypting files to be transmitted.

Communication Encryption

- MVS, VTAM, TCAM: Cryptographic subsystem, VTAM encrypt feature, TCAM encrypt capability, 3274, 3600, 3776, and 3777 should be evaluated to provide end-to-end encryption for all or selected sessions. The 3848 Cryptographic Unit should be considered for large volumes.

Terminal Identification

- SDLC: VTAM, 3705 NCP
- RACF: Terminal protection for TSO, IMS, CICS, VM

Resource Classification

- RACF: RACF supports security classification (security levels and categories) for users, data, and other general resources.

Data Disposal

- VSAM: SCRATCH macro with ERASE parameter
- RACF: Erase-on-Scratch option for DASD data sets
- VM: DIRMAINT erase option

Process Isolation

- MVS, VM

Logging Security Activity

- MVS: RACF logging to SMF and the RACF Report Writer Facility
- VM: Directory Maintenance program product, RACF logging and reporting

Monitoring MVS and VM System Security

- MVS and VM: RACF Data Security Monitor (DSMON)

Logging Security Variances

- MVS: RACF, IMS, CICS
- VSE: VSE Access Control, Logging, and Reporting program product
- VM: RACF

System/36 and the System/38

Security is a standard, integrated part of the System/36 and System/38 operating systems. Both systems include the following security support:

- User identification and authentication
- Process isolation
- Access control to data sets and libraries
- Communication encryption (System/36 only)
- Terminal identification
- Logging security activity and variances

For additional Data Security Information, see:

- Information System Security: Executive Checklist, GX20-2430
- Staying in Charge, G505-0058
- Security Assessment Questionnaire, GX20-2381
- MVS Security, GC28-1400
- Security, Auditability, System Control Publications Bibliography, G320-9279
- VM/SP Security Features, SC24-5316

System Auditability

Overview

Management should:

- Be aware of the auditability characteristics of an information system — those attributes required to examine, verify, or demonstrate effective system controls, their use, and the documentation they produce.
- Evaluate IBM products that promote system auditability
- Recognize the need to monitor the system by using auditability features built into IBM products
- Understand that auditability is one part of a comprehensive systems control program for an organization
- Assume responsibility for balancing the optimum level of auditability and control with system performance

System auditability requires the capability to:

- Capture user and event-oriented data
- Analyze and document that data
- Feed it back to management

Primary Product Offerings

- System management facilities (SMF) of MVS
- Source Compare/Audit Utility
- Audit File Compare
- DB/DC Data Dictionary
- Resource Access Control Facility's (RACF's) Report Writer and Data Security Monitor Facilities
- Service Level Reporter (SLR)
- System Modification Program (SMP/E)
- Information/Management

Other products to be considered:

- MVS and VM: RACF
- VTAM for log-on journal
- VSAM for journaling exits, statistics, verify utility, and catalog
- IMS/VS for program isolation
- CICS/VS for file update protection

Selection Guidance – Data Capture

Log Hardware Events, for Example, IPL

- 30XX: SMF
- System/36 SSP
- System/38 CPF
- EREP

Log Job Accounting Data

- MVS: SMF
- VSE: VSE/POWER
- System/36 SSP
- System/38 CPF

Log Access Events

- MVS: RACF, IMS/VS, CICS/VS, VTAM
- VM/SP: CMS, Directory Maintenance, RACF
- System/36 SSP
- System/38 CPF
- VSE: VSE Access Control, Logging, and Reporting
- VMBACKUP-MS
- VMTAPE-MS

Log Data Base Update

- IMS, CICS: DL/I log
- DB2, SQL/DS
- System/38 Journal

Log Terminal I/O

- VM Realtime Monitor
- VTAM: Buffer Trace
- System/36 SSP
- System/38 CPF

Selection

Guidance – Documentation/Analysis

Document Data Base

- IMS/VS: DB/DC Data Dictionary

Document Displays

- IMS/VS: IMS/ADF
- CICS/VS: CSP
- SDF II, SDF/CICS
- System/36 SSP
- System/38 CPF

Document Programs

- MVS: ISPF, DCF, SMP/E
- VM/CMS: ISPF, DCF
- IMS/VS: JDS II, IMS/ADF, BTS II
- CICS/VS: CSP
- VSE: ICCF
- System/36 languages
- System/38 languages

Retrieve Performance Data

- MVS: RMF, SLR
- System/36 SSP
- System/38 CPF
- IMS Utilities:
 - VTAMPARS
 - CICSPARS
 - GPAR
 - NETPARS
- VM/SP: VMPPF
- DB2: DB2PM
- VMBACKUP-MS
- VMTAPE-MS

Retrieve Application Data

- QMF, IMSADF, CSP
- System/36 SSP languages and utilities
- System/38 CPF languages and utilities
- IMS Utilities and BTS II

Compare Source Programs

- MVS: Source Compare/Audit Utility

Compare Data Files

- OS/VS: Audit File Compare

For additional system auditability information, see:

- A Management System for the Information Business, GE20-0662
- Auditability Catalog, G320-6563
- Guidelines for Application Systems Control and Auditability, G320-6502
- Staying in Charge, G505-0058
- System Auditability and Control Study: Executive Report, G320-5791
- System Auditability and Control Study: Control Practices, G320-5792
- Software Catalog:
 - Volume 1, G320-6531
 - Volume 2, G320-6532
 - Volume 3, G320-6533
 - Volume 4, G320-6534
- Resource Access Control Facility (RACF) Auditor's Guide, SC28-1342
- Security, Auditability, Control Publications Bibliography, G320-9279
- Management Controls for Personal Computers: An Internal Auditor's Overview, G520-6081
- Audit and Control in a DATABASE 2 Environment, GE20-0783

Products for Managing Information Systems

Overview

The products listed on this and the following pages range from data processing problem determination aids to production schedules and include manage-

ment reporting applications. Each of these products is intended to support the activities necessary for the delivery of high-quality information services.

Products for Managing Information Systems

System/370, 30XX, 4381, 9370	Operating Environment		
	VSE	MVS	VM
Problem Management:			
Account Network Management Program (ANMP)	X	X	
Display Exception Monitoring Facility (DEMF)		X	
Generalized Trace Facility (GTF)		X	
Interactive Problem Control System (IPCS)	X	X	X
Information/VM-VSE	X		X
Information/MVS		X	
Information/Management		X	
Information/Access		X	
Network Problem Determination Application (NPDA)		X	X
Network Logical Data Manager (NLDM)		X	
Service Level Reporter		X	
Subsystem Information Retrieval Facility (SYSINFOREF)		X	
System Error Management Facility (SEMF)	X	X	
System Exception Report (SER)		X	
VTAM Network Control Application (VNCA)		X	
Change Management:			
Account Network Management Program (ANMP)	X	X	
Maintain System History Program (MSHP)	X		
Information/VM-VSE	X		X
Information/MVS		X	
Information/Management		X	
Information/Access		X	
Service Level Reporter		X	
Systems Modification Program Extended (SMP/E)		X	
Teleprocessing Network Simulator (TPNS)		X	
Processing Management:			
Distributed Systems Executive (DSX)	X	X	
File Transfer Program (FTP)	X	X	
Host Command Facility (HCF) for 8100 DPPX or DPCX	X	X	
Job Entry Program (JEP)	X	X	
Network Communications Control Facility (NCCF)	X	X	
Operations Planning and Control/Advanced (OPC/A)		X	
Operator Communications and Control Facility (OCCF)	X	X	
VSE/Interactive Computing and Control Facility (VSE/ICCF)	X		

**Products for Managing Information Systems
(continued)**

System/370, 30XX, 4381, 9370	Operating Environment		
	VSE	MVS	VM
Performance Management:			
CICS Performance Analysis Reporting System (CICSPARS)	X	X	
Generalized Performance Analysis Reporting (GPAR)		X	
IMS/VS Performance Analysis Reporting System (IMSPARS)		X	
Network Performance Analyzer-Host (NPA-Host)		X	
Network Performance Analyzer-3705 (NPA-3705)		X	
Network Performance Analysis and Reporting System (NETPARS)		X	
Resource Measurement Facilities (RMF)		X	
Service Level Reporter		X	
Systems Management Facilities (SMF)		X	
VM/370 Monitor/Reporting Program (VMAP)			X
VM/370 Real Time Monitor (VM/RTM)			X
VSE Performance Tool (VSE/PT)	X		
VTAM Performance Analysis and Reporting System (VTAMPARSII)		X	
VM Performance Planning Facility			X
Audit/Security Management: *			
DB/DC Data Dictionary	X		
Programmed Cryptographic Facility		X	
Resource Access Control Facility (RACF)		X	X
System Display and Search Facility (SDSF)		X	
Systems Management Facility (SMF)		X	
Source Compare Audit Facility		X	X
Capacity Management:			
Capacity Planning Extended (CPX)		X	
Service Level Reporter		X	
Teleprocessing Network Simulator (TPNS)		X	
VM Performance Planning Facility			X
Management Reporting:			
Account Network Management Program (ANMP) Information/Management	X	X	
Service Level Reporter (SLR)		X	

* Also see: System Security, Auditability, and Control Concept; Data Security Product Selection Guidance; System Auditability Product Selection Guidance

Functions for Managing Information Systems – General Systems

	Operating Environment		
	S/36 SSP	S/38 CPF	S/1

<u>Problem Management:</u>			
Hardware/Software Error Capture	X	X	X
Hardware/Software Error Reporting	X	X	X
Trace and Dumps	X	X	X
History Logs	X	X	X
<u>Change Management:</u>			
PTF Logs	X	X	X
TPNS on Host to Driver Systems	X	X	X
<u>Processing Management:</u>			
Automatic Response to Halts	X		
HELP Facilities	X	X	X
<u>Performance Management:</u>			
System Measurement and Reporting Facilities	X	X	X
<u>Audit/Security Management: *</u>			
Integrated Control and Reporting	X	X	X

* Also see: System Auditability, Security and Control Concept; Data Security Product Selection Guidance; System Auditability Product Selection Guidance

Graphics

Overview

Computer-aided graphics is the use of computers for entry and display of pictorial data. Such data can be entered into or created by the system. Once in the system, it can be manipulated to be presented or displayed effectively. It can then be stored and later retrieved and/or modified.

Primary Product Offerings

The three main components of most computer graphics systems are graphics application software, graphics displays, and graphics hard-copy output devices. The Graphical Data Display Manager (GDDM) is the foundation device support program product for text, graphics, image, and alphanumeric. It provides device support for a wide range of workstations, printers, and plotter in a host-based System/370 environment.

3192 Display Station Model G

3192 Models G10, G20, G30, and G40 have a one-year warranty, and Models GD0, GE0, GF0, and GG0 have a three-year warranty.

The 3192-G is a host-attached graphics workstation with feature improvements over the 3179-G. It has an all-points-addressable (720 x 384) alphanumeric/graphics display that can display seven colors on a black background. The user has a choice of 1920- or 2560-character screen capacity. Keyboards are offered with 122 or 104 keys with typewriter or typewriter/APL2 layouts. There is a local screen buffer that can store the complete APA display contents, freeing up the terminal immediately for continued interaction. There is also a print buffer for host-directed alphanumeric print only that permits printing to occur without interfering with other terminal activity.

The 3192-G supports the direct attachment of the Proprinter, Proprinter XL, QuietWriter and the Color Jetprinter. With the addition of the 3979 Expansion Unit, the 3192-G also supports the 5277 Mouse and the 6180-2, 6184, and 7372 Color Plotters.

The business and presentation graphics applications that apply to the 3192-G are:

Business Graphics

- Interactive Chart Utility (ICU), part of the Presentation Graphics Feature (PGF), or GDDM-PGF
- Business Graphics Utility (BGU)
- Application System (AS)
- Graphical Display and Query Facility (GDQF)
- Query Management Facility (QMF), using the ICU
- Decision Support/VSE (DS/VSE), using the ICU

Presentation Graphics

- Application System (AS)
- Composition Utility
- Professional Visual Aid Composer

Personal System/2 Family

The Personal System/2 display family incorporates advanced technology that, when coupled with the graphics support integrated in every model of the Personal System/2 family and new display adapters, provides a vast improvement in addressability and color capabilities.

Graphics Attachment Workstation

This workstation consists of a 3277 Model 2 with the Graphics Attachment RPQ 7H0284 installed. A direct-view storage tube with an optional thermal copier may be attached to the workstation in addition to a digitizer and a multicolor pen plotter (such as the IBM 618X Color Plotters). Software products available are:

- Graphics Attachment Support
- APL Graphics Attachment Support
- Panel 2
- Plotter and Digitizer Support
- Computer Aided Engineering Design System (CAEDS)
- Digital Interactive Graphics for Interpretive Mapping (DIGIMAP)
- Interactive Presentation Graphics
- Graphics Program Generator
- Integrated Civil Engineering System – Structural Design Language – II (ICES-STRUDL-II)
- Interactive Composition and Editing Facility
- Industry standard plotting commands
- Graphical Display and Query Facility (GDQF)

5080 Graphics System

The 5080 Graphics System is a high-resolution, high-performance graphics system for applications such as product design and analysis for electronics, mechanics, mapping, process control, and image manipulation uses. It utilizes raster technology with choices of color or monochrome displays.

A powerful set of application programs is available to satisfy this specific set of application needs:

- Computer-Graphics Augmented Design and Manufacturing (CADAM®)
- Professional CADAM®
- MICRO CADAM™
- Computer-Graphics Aided Three-Dimensional Interactive Application (CATIA®)

Graphics

- RT CATIA
- CAEDS™
- RT CAEDS
- CBDS™
- CIEDS™
- GDDM graPHIGS™ – an advanced programming interface based on the ANSI standard for the Programmer's Hierarchical Interactive Graphics System (PHIGS), and designed to simplify the programming of graphics applications such as CAD/CAM.

Application System (AS)

See Section 41 for description.

Large-Screen Projection Devices

Large-screen projection devices manufactured by a number of vendors can attach to the 3279 Model 3X equipped with the video output feature, allowing projection of all output that appears on the display onto a large screen suitable for boardrooms and large audiences. The 3179 Model G and 3192 Model G require a video adapter that can be purchased from a number of vendors to perform the large screen attachment function.

Graphics Hard-Copy Output Devices

Printers

- 4224, 3268, 3287
- 3800-3, 3820, 4250

Plotters

- 6180, 6182, 6184, 6186, 7372 – via IEEE488 or RS232C
- IBM XY750 – for the 3277GA

Electronic cameras

Selection Guidance

The selection of IBM products to provide a computer aided graphics solution requires an understanding of the hardware functions available with each device and the application aids provided by the software. Brief guidelines are provided in the following discussions.

3192 Models G10/G40, GD0/GG0

The 3192-G is recommended for medium-resolution (5080 being high-resolution) local printing of the screen content, host-interactive graphics, host offload, and host-directed alphanumeric print.

This workstation is typically used in applications that deal with the presentation of information pictorially. Some applications are typically considered passive, where the user only interacts with alphanumeric panels to modify the graphical display. Others allow manipu-

lation of graphical objects on the screen. These applications may be classified as presentation or management graphics.

- The GDDM Series is the primary software used to create pictures on IBM host-attached workstations. GDDM base consists of a library of subroutines that may be incorporated into an application program to generate pictures. GDDM-PGF (Presentation Graphics Facility) consists of higher-level subroutines to assist the programmer in creating graphs and charts. The interactive chart utility (ICU) within GDDM-PGF is a menu-driven application program that allows users to design their own graphs without the need for a programmer.
- Composition Utility is an interactive application that lets the user combine text and graphics on the same page, thus allowing easy creation of presentations, line art, graphics output for publishing or documents, or graphics files for other graphics applications. Users can combine business charts from GDDM ICU, simple line art, or graphic data files created from other applications with text for output to the 4224, 4250, 3268, 3287, 3800 Model 3, 3820, and GDDM-supported plotters.
- The Color Plotter Support for GDDM Graphics Data File product allows users to plot color charts developed by applications offering graphics data files as an output option on the 6180, 6182, 6184, 6186, and 7372 plotters attached to a PC, PC XT, PC AT, or Personal System/2.
- ICES-STRUDL-II is a structural analysis system that when used in interactive mode enables the graphical presentation of all or part of a structural model to check input and changes, as well as to present analysis results. It operates under VM/CMS or TSO. The incorporated database concept makes it easy to analyze design alternatives and engineering changes. It is also possible to switch from interactive to batch operation and back.
- Professional Visual Aid Composer is a program offering to assist in the creation, maintenance, and presentation of charts and visuals. The Graphics Editor is used for visuals of ideas and concepts, whereas the ICU is used for business charts. They can be mixed for presentations.

IBM RT Personal Computer Professional Graphics Series (6150 Professional Graphics Series)

Consists of four products that provide support for graphics program development as well as for end-user interfaces:

- Graphics Development Tool Kit
Provides a set of graphic device drivers for printers, plotters, and displays to provide device independence for programs. It also includes a set of graphics primitives that can be called by high-level languages to perform functions using the RT Personal Computer virtual device interface.

- **Graphics Terminal Emulator**
Allows the RT Personal Computer – 6150 Micro Computer System to emulate the Tektronix 4010 and 4100 protocols as well as the Lear Siegler ADM-3A protocols
- **Plotting System**
Is a subroutine library of functions designed to assist the user in developing programs to produce various types of charts and to develop interactive graphics applications
- **Graphics File System**
Is designed to facilitate the standardized retrieval, storage, and portability of two-dimensional graphics information. A metafile interpreter allows the retrieval of encoded graphic pictures that have been created in a virtual device metafile format and their routing to alternate devices.

Personal System/2 Family

The IBM Personal System/2 Model 30 integrates graphics function on the system board by using a new gate array chip called the multicolor graphics array (MCGA). The new MCGA is fully compatible with the IBM Monochrome Display and Printer Adapter and the IBM Color Graphics Adapter (CGA) and adds significant new function. An improved 8- x 16-character box is used. The MCGA also determines which type of display is attached and appropriately converts the image to 64 shades of grey for a monochrome display. This process is known as color summing.

The MCGA can display 256 colors from a palette of more than 256,000 colors. In entry-addressability color-graphics mode (320 x 200), the MCGA can display 256 colors simultaneously for television-like images. In high-addressability mode (640 x 480), high-quality graphics can be displayed with great clarity (two colors simultaneously). The MCGA provides software compatibility with CGA.

On the Personal System/2 Models 50, 60, and 80, the function found in the MCGA has been integrated with the function from the IBM Enhanced Graphics Adapter (EGA), a higher-addressability character box (9 x 16), and a 640 x 480 by 16-color APA mode into the Video Graphics Array (VGA).

Performance, addressability, and color variety have been significantly enhanced by the VGA compared to the EGA. The VGA provides software compatibility with CGA and EGA.

A display adapter provides users of IBM PCs, PC XTs, PC XT-286s, and PC ATs with the capabilities of VGA. A second display adapter provides functions beyond VGA for Personal System/2 Models 50, 60, and 80.

IBM Personal Computer Graphics Software

Building on the virtual device interface provided in the Graphics Development ToolKit and Graphical Kernel System, this graphics direction offers benefits

to both program developers and program users. The graphics programs provide for end-user application programs that may be used independently of the many I/O devices that can be attached to an IBM Personal Computer. They also help improve programmer productivity because many of the procedures and instructions no longer have to be written into an application. They can now be handled by prewritten, standard software.

- **IBM Personal Computer Graphics Development ToolKit**
The Graphics Development ToolKit is designed for high performance graphics application development. It includes a set of text and graphics functions and the virtual device interface which provides access to multiple device drivers.
- **IBM Personal Computer Graphical Kernel System (GKS)**
GKS enables portability of applications and improved programmer productivity by providing a high-level graphics language.
- **IBM Personal Computer Graphical File System**
The Graphical File System is an implementation of the proposed ANSI metafile standard. It provides for device-independent generation and storage of computer-generated graphics or pictures. It offers a standard format for transfer of pictures or graphic images between programs or systems.
- **IBM Personal Computer Plotting System**
This library provides a set of graphics plotting subroutines to help programmers develop software which will display data in many types of charts. It could also be used to develop interactive graphics applications.
- **IBM Personal Computer Graphics Terminal Emulator**
This software allows IBM Personal Computers to emulate:
 - Tektronix 4010 and 4100 protocols
 - Lear Siegler ADM3A
 These emulators allow the IBM Personal Computer to operate as the emulated terminal communicating with a System/370 or other host system. Many host-base graphics applications can then be used unchanged with an IBM Personal Computer.
- **IBM Operating System/2 Graphics Development Toolkit**
The IBM Operating System/2 Graphics Development Toolkit enables the development of a device-independent software environment for application developers. These software products provide new capabilities for customers who require concurrent execution of multiple application programs, larger areas of addressable memory, and system connectivity.

5080 Graphics System

The 5080 Graphics System offers high-performance, advanced graphics capabilities, including color and monochrome displays, in an interactive, compact workstation designed for use in the office environ-

Graphics

ment. The system is compatible with the 3250 Graphics Display System. It can be used to access 3270 application on an IBM host processor.

The 5080 Graphics System allows the user to access and interact with the computing power of the host for local or remote teleprocessing applications.

The system has the following major components: The 5081 Display, 5082 Projection System, 5083 Tablet, 5084 Digitizer, 5085 Graphics Processor, 5087 Screen Printer, and 5088 Graphics Channel Controller. Peripherals include an alphanumeric keyboard, an APL keyboard, a lighted program function keyboard, a set of dials and the tablet, plus 3270 and RS232C attachment compatibility.

Available in color and monochrome models, the 5081 offers a high-resolution, non-interlaced raster display with a steady, clear image. The user can choose up to 256 colors from a range of 16.7 million or up to 256 shades of gray.

The application programs that utilize the 5080 Graphics System are CADAM, CATIA, CAEDS, CBDS, and CIEDS.

Graphics Programming Support

- CADAM (Computer-Graphics Augmented Design and Manufacturing) is a licensed program that provides high-performance, easy-to-learn interactive graphics for both two- and three-dimensions, computer-aided design/computer-aided manufacturing (CAD/CAM) functions. CADAM applications can be operated on 9370, 43XX, and 30XX processors. These systems can either be dedicated to CADAM or be used as a host to CADAM and other applications.
- Professional CADAM is a licensed program that provides two-dimensional interactive functions for draftsmen, engineers, and other technical professionals. It can operate in a standalone mode or attached to a host CADAM. The Professional CADAM workstation is the 5080 with the RT Personal Computer 6151 Model 115 or 6150 Model 125 or B25. The Megapel Display Adapter may be used with the RT PC.
- CATIA (Computer-Graphics Aided Three-Dimensional Interactive Application) is a licensed program that provides a highly interactive, high-function 3-D geometry, numerical control, drafting, and solid modeler system for advanced CAD/CAM and robotic applications. The CATIA application can be operated on most 9370 and all 30XX and 43XX processors.
- RT CATIA is a subset of Host CATIA consisting of 2D design, drafting, and 3D curves and surfaces. The RT CATIA workstation is the 5080 with the RT PC 6150 Model 125 or B25.
- The CAEDS system, a licensed program, is an integrated computer-aided design system for performing conceptual geometric design and preliminary engineering analysis. It assists engineers in

solving problems relating to heat transfer, stress or dynamic situations.

CAEDS operates on 9370-, 43XX-, and 30XX-series computers.

- RT CAEDS offers the same function as Host CAEDS on a 5080/RT PC 6150 Model 125 or B25 workstation. The Megapel Display Adapter may be used with the RT PC.
- The CBDS system, a licensed program, is an interactive graphics computer-aided design tool that can speed the design and manufacture of printed circuit boards. It consists of two modules, the circuit pack system and the design verification system.
- CBDS can be used with 4300, 9370, and 30XX series computers. The CBDS product can use the following workstations for design functions: 5080 Graphics System, and 3277 Display Station with Graphics Attachment.
- Computer-Integration Electrical Design Series (CIEDS)/Design Capture Family provides powerful, easy-to-use schematic capture and design entry. A simple yet sophisticated application interface is consistent across three platforms, the PC AT, RT PC and host 43XX or 30XX systems. The integrated data base allows designs to be easily ported between systems.

Section 41. Information Delivery Software

Expert System Environment

Products Included

- Expert System Environment (ESE)
- Expert System Consultation Environment (ESCE)

Main Purpose

Expert System Environment consists of Expert System Development Environment and Expert System Consultation Environment. Expert System Consultation Environment may be ordered separately. Expert System Development Environment is used to build expert system applications and Expert System Consultation Environment provides the services to run the applications.

The Expert System Consultation Environment and the Expert System Development Environment programs operate on a System/370 under VM/SP or MVS.

Background

Expert systems are new and emerging applications of computers that offer great promise for the future. In the time that the concept has been under research and development (mainly in the academic community), it has demonstrated the potential for addressing problems that have been, up to this point, unapproachable. This class of problem has not been undertaken for several different reasons including:

- The amount of effort (cost) that would be required
- The amount of time required
- The risk of the undertaking
- The scope of the problem to be solved: too enormous to undertake using conventional programming concepts

The expert system concept introduces some different ideas about the inclusion of human knowledge into the application of data processing. Using traditional program development facilities, human knowledge was coded into programs using a specific programming environment. This was and is very labor-intensive and usually results in a very rigidly bound arrangement that does not lend itself to understanding or change.

The expert system approach attempts to keep the specification of the human knowledge separate from its execution, and by so doing, to keep it understandable, changeable, and manageable. The expert system approach encourages the introduction of human knowledge in something approaching human natural language so that it is natural at time of intro-

duction, and remains understandable to anyone versed in the area of expertise.

Use of the expert system environment tools may result in a substantial reduction in time, cost, and risk in the development and maintenance of expert systems applications, and may offer the opportunity to attack some of those problems that have defied implementation.

Overview

An expert system consists of two parts — a knowledge base and an inference engine. The knowledge base is a repository of information made up of facts about the subject, definitions, formal rules to describe relationships, and control information to focus on a specific problem solution. An important aspect of a knowledge base is the representation of the expert's heuristic reasoning. This knowledge represents the expert's rules-of-thumb, rules of good guessing, or rules of good judgment, and truly captures the application's expertise.

The inference engine is a generalized reasoning and dialogue manager. It contains the strategies used to solve problems, acquire knowledge, and interface with other systems, and provides explanations for the reasoning process.

Each combination of the inference engine with a knowledge base becomes a unique application, or expert system. Together, they act as a model of the expertise for the specific domain.

This area is aimed at providing computer programs that imitate the behavior of humans in solving problems normally thought to require experts, or specialists, for their resolution.

Key Functions, Facilities and Features

- Interchangeability of knowledge bases: Knowledge bases that are developed and executed with the Expert System Environment/MVS products can also be used with the Expert System Environment/VM products. Similarly, the knowledge bases developed with the Expert System Environment/VM products can be used with the Expert System Environment/MVS products.
- English-like rules: The rules are entered into the knowledge base using an English-like syntax rather than programming languages. This means that training non-programmers to use the product to develop solutions to even more complex problems is prac-

Expert System Environment

tical. Experts themselves can interact with the system. Knowledge-base builders can concentrate on actually solving the problems, rather than spending their time trying to learn a new programming language.

- **Special editors with automatic checking:** Specialized editors have been provided to facilitate the entry and modification of knowledge-base objects. The editors are tailored for the specific objects being worked on, and have built-in automatic error-checking capabilities to immediately notify the builder of many of the errors that might be made. This results in a high degree of productivity during the development process.
- **Explanation during consultation:** During consultation sessions the user can request explanations to clarify requests for information, or to better understand how the system arrived at a particular solution. During a dialog the user can ask "Why?" before answering any question being asked. After a result has been obtained the user can ask "How?" and will receive a detailed logical explanation of the reason behind the solution.
- **Debugging support:** During the testing of a knowledge base the builder can request a trace that will provide an exact roadmap through the reasoning process to aid in making corrections. The knowledge base can be printed for offline checking.
- **Two inference processes:** The system supports "backward" chaining, which is the process of reasoning backward from a goal to determine what facts must be determined from the consultation user before the result can be established. This is especially useful for selection, configuration, diagnosis, classification, or evaluation problems. It also supports "forward" chaining which is a data-driven reasoning technique. In forward chaining the discovery initiates the processing of a rule or rules that establish other facts, which in turn cause the initiation of more rules, and so on.
- **Incremental compilation of the knowledge base:** The objects entered into a knowledge base are "compiled" automatically into a form that reduces the amount of space required for their storage and improves processing performance.
- **Problem decomposition:** The control features of the expert system environment allow a complex problem to be broken into smaller, more manageable subproblems. These smaller problems can be solved independently, which greatly improves productivity and the quality of the resulting application.
- **User profiles for defaults:** The use of profiles allows defaults for many builder and consultation attributes to be invoked automatically, thus reducing the need for specific designation each time, but without eliminating flexibility.
- **Rerun and undo capabilities:** Any partially or fully-completed consultation can be stored and rerun. During the rerun any answers previously given can be changed to see their effect upon the solution. It is also possible during a consultation to undo or change a previously-entered response.
- **Access to external procedures:** The developer of a knowledge base can invoke an external procedure to acquire facts from an external source such as a database, to store results in a file for subsequent processing, or to actually perform intermediate processing.
- **User-designed screens option:** Expert system environment creates default screens for all dialog and presentation of results to a user during consultation. Knowledge base builders can, if desired, use an integrated screen editor to interactively design their own screens.
- **Online help:** In both the consultation environment and the development environment, there are extensive online help facilities available.
- **Data base access:** Expert System Environment contains built-in functions that can access outside data bases through SQL/DS and DB2 interfaces. Major SQL statements retrieve data for the reasoning process. Also, SQL or DB2 data can be created or updated from within the Expert System Environment.
- **3270 business graphics:** Expert System Environment's graphic features can improve the effectiveness of a consultation session with the end user. The screen layout facility can be used to create customized consultation screens to suit the needs of the application. Presentation graphics (pie charts, line charts, bar charts, and curve-fit charts) can be integrated with the custom screens to allow for a visual interpretation of data in color.
- **Graphical representation of knowledge hierarchy:** Expert System Environment allows the developer to view the reasoning hierarchy in a tree-like graphics form. This will provide a visual display of how a specific problem is decomposed.
- **Interfaces to external procedures in multiple languages:** Expert System Environment expands the languages used to interface to external procedures from Pascal to include COBOL, PL/I, Assembler, FORTRAN, and REXX (for VM only). If external procedures are written in COBOL, PL/I, Assembler, FORTRAN or REXX, only the VS Pascal library is needed. These routines can now be dynamically loaded at execution time.
- **Dynamic freeing of storage:** Expert System Environment allows the developer to flag knowledge base objects (focus-control blocks and associated rules and parameters) that are to be deleted from virtual storage after they are processed. This can significantly affect storage conservation and increase performance on large knowledge bases.

Prerequisite Products

Programming systems:

- The VM versions operate under the VM/System Product.
- The MVS versions operate in a Multiple Virtual Storage environment with TSO.
- The MVS versions can also run in an MVS/XA machine, but cannot exploit the extended-addressing capability of MVS/XA.

The following products must be installed:

- Graphics Display Data Management with PGF
- Pascal/VS

The following product is optional:

- Document Composition Facility

This product may be used to print a formatted copy of selected knowledge-base objects when used with ESDE, and screen images when used with ESCE. If the Document Composition Facility is not installed, the user may "edit-out" document formatting commands prior to printing the saved file.

Ordering Information

Expert System Environment/VM (ESDE and ESCE)

Program number: 5664-391

Expert System Consultation Environment/VM

Program number: 5664-392

Expert System Environment/MVS (ESDE and ESCE)

Program number: 5685-006

Expert System Consultation Environment/MVS

Program number: 5685-007

SolutionPac™

IBM SolutionPac Expert Systems

Program number: 5759-014

This SolutionPac is offered in order to accelerate the user's learning process and promote self-sufficiency with IBM expert system environment products, education, and professional consulting services (see also Section 72). The components are:

- Software products:
 - Expert System Environment/VM (5664-391) or
 - Expert System Environment/MVS (5685-006)
- Expert System Environment fee education – five enrollments distributed in any manner between:
 - Expert System Environment Workshop (WS172),
 - and

- Building Expert Systems (WS179)
- Consulting services:
 - One calendar week (one person for five consecutive days)

Reference Material

- The Knowledge-Based System Center, G520-6396
- ESE General Information Manual and Planning Guide, GC38-7000

Advanced Function Printing (AFP) Software

Products Included

- Print Services Facility (PSF)
- Graphical Data Display Manager (GDDM)
- Document Composition Facility (DCF)
- Overlay Generation Language (OGL)
- Print Management Facility (PMF)
- Font Library Service Facility (FLSF)
- Page Printer Formatting Aid (PPFA)
- Print Services Access Facility (PSAF)
- Image Handling Facility (IHF)
- Graphical Display and Query Facility (GDQF)
- Composed Document Printing Facility (CDPF)
- Fonts

Main Purpose

Advanced Function Printing (AFP) is a family of software products that provides for quality printing from data processing systems. AFP provides a collection of advanced functions such as electronic forms, text/graphics merge, bar codes, images, signatures, and logos that, when used with all-points-addressable printers, create more presentable output. AFP software utilizes the IBM-exclusive Intelligent Printer Data Stream to produce these advanced functions on the printer.

Key Functions, Facilities and Features

Print Services Facility (PSF)

Functions

Print Services Facility (PSF) is the print driver for the 3800 Models 3 and 6, 3827, 3835, 3820, and the 3812 in an MVS environment. Functions of PSF include:

- Interfacing to the spool
- Combining print data with fonts, images, and overlays
- Error recovery

IBM-supplied page definition, form definitions, and compatibility font objects are packages with PSF.

Capabilities

- PSF merges print data with resources
- Is a system interface program
- Provides default PAGEDEFs, FORMDEFs, and compatibility fonts
- Provides support for the following types of attachments:
 - 3800, 3820, 3827, and 3835 channel attach
 - Direct application
 - 3820 SNA/LU 6.2 on MVS and VSE and SNA channel

Operating Environments

Print Services Facility is supported under MVS-JES2, MVS-JES3, VSE/AF Version 2 Release 1.3, VSE/SP Version 2 Release 1.4, VM/SP, and VM/HPO.

Graphical Data Display Manager (GDDM) Release 4

Function

GDDM is a program that creates graphic images. It is the base for much of IBM's graphic software. GDDM is supported by a variety of user application programs (Interactive Presentation Graphics, CAD/CAM, and Interactive Chart Utility, for example) and supports printed output from these programs on a page printer. Applications include computer-aided design, business and presentation graphics, and engineering drawings.

For more detailed information see under GDDM.

Capabilities

- Converts vector format data to rasterized graphic images
- Generates rasterized patterns at either 240 pels per inch for the 3800 Models 3 and 6 or the 3820 printers or at 600 pels per inch for the 4250 printer
- Creates images that can be embedded in Document Composition Facility (DCF) documents, Overlay Generation Language (OGL) forms, or an application program
- Prints graphic output directly

Operating Environment

The GDDM software is supported under MVS and VM for all page printers.

Document Composition Facility (DCF)

Function

DCF, IBM's most powerful text composition program, is GML/SCRIPT-based. DCF supports both impact and page printers. It uses typographic fonts and allows for graphic images to be embedded within a document.

For more detailed information see under DCF.

Capabilities

- SCRIPT/VS and GML starter set for page composition
- Utilities to provide:
 - A font library index program
 - A dictionary maintenance program
- Proportional horizontal and vertical justification
- Intercharacter and interword spacing
- Typographic font management
- Graphic image placement

- Horizontal and vertical rules
- Character alignment: left, right, and centered
- Character-aligned tabs
- Orientation of text or pages at 0 degrees, 90 degrees, 180 degrees or 270 degrees
- Support for 600-pel and 240-pel printers.

Operating Environment

DCF is supported in the foreground environments of MVS (TSO and ATMS), VSE (ATMS), and VM (CMS). With the Document Library Facility installed, DCF runs in the batch environments MVS and VSE.

Overlay Generation Language (OGL)

Function

OGL is a batch utility program that generates electronic forms (called overlays). It "compiles" a user command stream into an overlay, which PSF sends to the printer upon request. The variable data from an application program is merged with the form data (the OGL overlay) in the printer. Overlay Generation Language can use the monospaced fonts and typographical fonts, or both, and supports the inclusion of page segments.

Eight overlays can be placed on a sheet of paper.

Capabilities

- Produces electronic overlays
- Can replace forms flash
- Supports design capabilities when creating an overlay that:
 - Vary the thickness of rules
 - Create boxes and shade them with 32 different densities
 - Justify text
 - Select fonts
 - Include images such as signatures and logos
 - Insert text in boxes

Operating Environment

OGL is supported under MVS/SP Version 1 (S/370) and Version 2 (XA), VSE Version 2 Release 1, VM/SP Release 3 and VM/SP HPO Release 3 for the 3800 and 3820 Page Printer.

Print Management Facility (PMF)

Function

PMF is an interactive MVS printer utility program that helps create form definitions (FORMDEFs), page definitions (PAGEDEFs) and page segments (images). PMF also has a number of font-manipulation abilities that are discussed below.

Capabilities

- Builds form definitions interactively. Form definitions provide PSF with information indicating the placement of logical pages on physical pages as well as numbers of copies, suppression data, and duplexing information.
- Builds page definitions interactively. Page definitions are required by all line (1403 and 3800 Model 1) print jobs. Page definitions instruct PSF as to the placement of the line data. Also, fonts can be specified as well as rotation of the output.
- Builds and modifies the 3800, 3827, 3835, and the 3820 fonts and creates new fonts. This includes modifying characters and adding or deleting code points.
- Creates page segments. PMF allows the user to create page segments. PMF will also format bit patterns or raster images (from a scanner) into the appropriate format so they can be used by Document Composition Facility (DCF) or Overlay Generation Language (OGL). PMF also provides some simple manipulation capability of page segments, such as rotation in 90° increments or doubling or halving the size.

Operating Environment

The Print Management Facility is supported under MVS/SP Version 1 (S/370) and Version 2 (XA), VM/SP Release 3 and VM/SP HPO Release 3. VS/APL and GDDM are required.

Font Library Service Facility (FLSF)

Function

FLSF is a batch and interactive font utility program that supports the 3820, 3827, and 3835 Page Printers and the 4250 Printer. Interactive System Productivity Facility (ISPF) can be used when FLSF is used as an interactive utility. FLSF enables the user to modify the fonts (add or delete characters, rotate characters, or customize code pages) and to list the contents of the fonts. FLSF only works on the object form of the font.

Capabilities

- Font library and management support by:
 - Listing contents of the fonts
 - Adding, deleting or rotating characters
 - Copying fonts, code pages and coded fonts
 - Customizing code pages

Operating Environment

The Font Library Service Facility is supported under MVS/SP Version 1 (System/370) and Version 2 (XA), VM/SP, and VSE for the 3800 as well as the other Page Printers shown above.

Advanced Function Printing (AFP) Software

Page Printer Formatting Aid (PPFA)

Function

PPFA is a batch program that creates both page definitions and form definitions.

Capabilities

- Builds form definitions in a batch environment. Form definitions provide PSF with information regarding the placement of the logical page on the physical page as well as copies, suppression data, and duplexing.
- Builds page definitions in a batch environment. Page definitions are required by all line (1403 and 3800 Model 1) print jobs. Page definitions instruct PSF as to the placement of the line data. Also, fonts can be specified as well as rotation of the output.

Operating Environment

PPFA is supported under MVS, VSE Version 2 Release 1, VM/SP Release 3, and VM/SP HPO Release 3 for the 3800 Model 3 or 6 and 3820 Pageprinter. The 3827 and 3835 Page Printers are not supported in the VM environment.

Print Services Access Facility (PSAF)

Function

PSAF is an interactive menu-driven program that schedules print jobs. PSAF is intended for end users. It allows the selection of up to 8 character sets and an electronic overlay in each job. It automatically creates the JCL and the required FORMDEFs and PAGEDEFs for a print job with a few simple instructions.

Capabilities

- Builds FORMDEFs and PAGEDEFs
- Routes data to different APA printers
- Supports an extensive online help facility

Operating Environment

The Print Services Access Facility software is supported under MVS/SP Version 1 (S/370) and Version 2 (XA), VM/SP Release 3 and VM/SP HPO Release 3 for the 3800 Model 3, 3827, 3835, and 3820 Page Printers.

Image Handling Facility (IHF)

Function

IHF is a licensed program primarily for use with Document Composition Facility (DCF). It can integrate major pre-press functions, such as page composition and document creation, into an automated publishing system. IHF accepts input from scanners and allows these images to be manipulated and merged with text in a paperless process. IHF supports 600-pel resolution and 255 shades of grey. The user may view the completed document on various workstations prior to

printing on all-points-addressable printers such as the 4250.

Capabilities

- Page composition support
- Document creation support
- Viewing on various workstations
- Scanning input
- Image manipulation
- Text and graphics merge

Graphical Display and Query Facility (GDQF)

Function

The GDQF program may be used to view CADAM models, APT Geometry (PUNCH) files, or Graphic Data Files (GDF) on a 3270 display device. GDQF may also be used to prepare output for the 3800 Models 3 and 6, 3827, 3835, and 4250 printers, and 737X plotters.

Capabilities

- 3-dimensional rotation and viewing commands
- Multiple view-parts to display different models simultaneously
- Batch and foreground support for 3282 and 4250 printers
- Merging displayed data with Script (DCF) onto hard copy devices
- Displaying CADAM® and APT Geometry models
- Displaying plot files from CADAM and CATIA®

Operating Environment

GDQF operates under VM/SP Release 2, VM/SP HPO Release 2, MVS/SP TSO Version 1 Release 3.2, and MVS/SP TSO Version 2 Release 1.0.

Composed Document Printing Facility (CDPF)

Function

CDPF is the print driver for the 4250 Printer. CDPF functions include:

- Combining print data with fonts and images
- Creating camera-ready masters

Capabilities

CDPF merges print data with resources and provides support for 3274 attachments.

Operating Environment

Composed Document Printing Facility is supported under MVS, VSE, and VM.

Fonts

The fonts referred to are typographic fonts available from IBM as licensed programs. The fonts range in size from 4 points to 72 points for the 240-pel printers and from 6 points to 72 points for the 4250 printer.

Fonts are available in either object or source format. If source format is chosen, Print Management Facility (and, therefore, VS/APL) must be used to "compile" the fonts into object format before they can be printed.

Primary Users

Advanced function printing software has two main applications:

- Advanced system printing
- Document publishing

Advanced System Printing

System printing includes the more traditional computer production of reports, billings, programmer listings, and memory dumps. Most of this work is produced on line printers. The most important single element in system printing is the print line (customer data) produced today from application programs. AFP provides functions and advantages without changing the application program.

Document Publishing

Document publishing is the presentation of formatted text and graphics on the printed page. Much of this output is not being produced on a computer today because document printing requires the quality output previously available only through photocomposers or graphic plotters.

Document publishing can be done in many ways that can be classified as:

- Product-support publishing
- Enhanced end-user publishing
- Graphics output and proofing

Potential Benefits

The benefits are divided into:

- Advanced system printing
- Enhanced office and end-user printing
- Graphics output and proofing
- Product-support publishing.

Advanced System Printing

The benefits that can be realized using AFP for Advanced System Printing fall into the general areas of condensed printing, electronic forms (overlays), external formatting of existing application output, and those benefits that either do not fit into one of these general areas or span several of them.

Condensed printing: Involves using AFP capabilities to reduce the amount of paper used to print an application's output. Applying condensed printing techniques with AFP can:

- Put the output from 14-7/8 inch by 11-inch paper onto 11-inch by 8-1/2 inch paper. This reduction in paper size makes these pages easier to file and eliminates large binders.
- Print two or four logical pages on a single physical page and print on both sides of the paper to redouble the paper reduction
- Reduce the corresponding usage costs for printing output on fewer physical pages
- Use typographic fonts for text applications that make the output readable when condensed and use bold and italic type to emphasize important information
- Use graphics to condense large quantities of numerical information into a few more comprehensive charts or pie charts
- Save the time and expense of reducing the information on a copier
- Reduce storage space for program listing, general ledgers, and administrative reports
- Reduce postage and labor costs for mailing computer output to a branch office or customer. Fewer pages weigh less than the traditional pale-green computer paper and contain the same information.

Electronic forms (overlays): Can replace many of the preprinted, multipart forms used in computer rooms today. (Some forms, such as preprinted forms with color, cannot be replaced by overlays.) Overlays are, however, printed on plain paper and are loaded into the printer automatically without operator intervention. Using electronic forms as part of the advanced systems printing application can do the following:

- Save money on the forms themselves. Preprinted forms can cost anywhere from \$35 to \$50 per 1000 forms, whereas plain paper can cost about \$7 per 1000 forms.
- Reduce the need for a computer operator to load forms.
- Alter forms electronically. Because the form is stored in the computer, the user can reduce storage space, inventories of forms on hand, scrapping cost when the form is obsolete, and the time it takes to move boxes of preprinted forms.
- Reduce the time needed to design, proof, revise, print, and ship a preprinted form when it has to be changed.
- Gain control over the form's change, implement that change in a few days, and ensure that the correct form is in stock.
- When color is needed (for example, the company logo) the standard preprinted form can be loaded and then customized for each application that requires the company logo.

External formatting of existing application output: Provides the advantages of AFP capabilities without changing the application program. It can be used to map current application output onto the page and as a technique for designing and writing new applications.

Advanced Function Printing (AFP) Software

Mapping existing applications onto the all-points-addressable page allows:

- Condensed printing techniques to format multiple pages on a single sheet of paper and have that formatting done outside the application program
- Changing the type style of the output line, rotating it, and placing it anywhere on the page

As a technique for future applications, the data produced can be independent of how that data will be formatted on paper. With all-points-addressability, the output record from the application can be produced as single string. Fields to be printed are selected from outside the program and then placed on the printed page. Programmer productivity is increased because:

- Programmers can concentrate on what information is to be printed, not on how it must look on the page.
- Program maintenance, resulting from format changes, centers on positioning and formatting information, not on program logic.
- Electronic forms and formatting program output can be designed and written by non-programmers.

Miscellaneous benefits of AFP Advanced System Printing: These include the ability to use:

- Cut-sheet paper and burst and trimmed output. Therefore, printed materials are available to the users more quickly.
- A distributed 3820 Page Printer. Information can be printed in an office environment and delivered faster to the people who need it.
- Personalized output with logos and signatures. This creates a quality appearance for reports and documents.

Enhanced Office and End-User Printing

Currently, most of the output produced in this AFP application is produced with a typewriter. Graphics are then pasted onto the typewritten text and duplicated to make multiple copies. AFP provides the following benefits in this application:

Typographic fonts and graphics enhance executive presentations. Reports can be composed or edited with a computer, and can be printed faster than with a typewriter. Professionals who create just graphics can now produce finished documents that combine text and graphics. Because typographic fonts use proportional spacing, information density on a page can be increased from 20% to 40%.

Distributed printers: Can be shared by multiple departments and can support many types of documents, eliminating the need for specialized equipment. Additionally, the user gets the information faster.

Product-Support Publishing

AFP enhances the product-support publishing application by enhancing documents with typographic fonts and by combining text and graphics, easing environmental concerns, customizing documents, and standardizing formats.

Typographic fonts: Range from 4-point to 36-point sizes (up to 72-point of the 4250 printer) providing the flexibility to use typography for emphasis, improve readability, and increase the amount of information on the page.

Prerequisite Products

Application	PSF	PMF/ PPFA	PSAF	PMF/ FLSF	Typo- graphic Fonts	DCF	GDDM	OGL
Advanced System Printing								
Condensed Printing	Req	Opt4	Opt4/5	Opt1				
Electronic Overlays	Req	Opt4		Opt1	Opt		Opt3	Req
External Formatting	Req	Opt4	Opt4/5	Opt1	Opt			
Document Publishing								
Text Only	Req	Opt4	Opt5	Opt1	Req1	Req1		
Text & Graphics	Req	Opt4	Opt5	Opt1	Req	Req	Req	
Office & End-User								
Text Only	Req	Opt4	Opt5	Opt1	Req1	Req1		
Text & Graphics	Req	Opt4	Opt5	Opt1	Req	Req	Req	
Graph Output/ Proofing								
CAD/CAM	Req	Opt4		Opt1	Opt2	Opt2	Req	
Business	Req	Opt4	Opt1	Opt2	Req	Req		
Illustrations	Req	Opt4		Opt1	Opt2	Opt2	Req	
Scanned	Req	Opt4		Opt1	Opt2	Opt2	Req	

- Opt Only required to use the new typographic fonts.
- Opt1 This program product is required to modify font objects.
- Opt2 DCF can be used to embed graphic images within a document. DCF requires the AFP typographic fonts for the 3800-3, 3820, and 4250 printers.
- Opt3 GDDM is used to create graphic images, which can be part of an overlay.
- Opt4 The default page definitions packaged with the PSF product will work in many cases; therefore, PMF, PPFA, or PSAF is not required. Unless the FORMDEF and PAGEDEF for an overlay are very simple, PSAF probably will not be useful.
- Opt5 PSAF provides menu-driven assistance in scheduling this output.
- Req This program product is required.
- Req1 If the output must be formatted by SCRIPT, DCF and the typographic fonts are required. If the output is from PROFs (designated as "1403"), the default FORMDEFs and PAGEDEFs are all that will be required.

Advanced Function Printing (AFP) Software

Products Supported

3800 Models 3 and 6 Page Printers
3827, 3835, and 3820 Page Printers
4250 ElectroCompositor

Summary of Program Products, Operating Environments, and Printers

Product Name	Operating Environment				AFP Printers					
	MVS	VSE 1.3	VSE 2.1	VM/SP	3800-3/6	3820	3827	3835	3812	4250
PSF	X	X	X	X	X	X	X	X	X	
OGL	X		X	X	X	X	X	X	X	
GDDM	X			X	X	X	X	X	X	X
DCF	X	X	X	X	X	X	X	X	X	X
PMF	X			X	X	X	X	X	X	
FLSF	X	X	X	X		X	X	X	X	X
PSAF	X			X	X	X	X	X	X	
PPFA	X		X	X	X	X	X	X	X	
CDPF	X	X	X	X						X

AFP Express

AFP Express provides assistance for rapid installation of AFP software in an existing MVS/XA or MVS/370 environment. It is tailored to the customer, based upon the customer's hardware and software configuration, and is delivered with an installation macro facility. Direct support of the installation will be provided to the customer via a 1-800 telephone number for 30 days after the package is shipped.

Ordering Information

Print Services Facility (PSF)

Program number: 5665-275 (for MVS)
5666-319 (for VSE)
5664-198 (for VM)

Graphical Data Display Manager (GDDM)

Program number: 5748-XXH

Document Composition Facility (DCF)

Program number: 5748-XX9

Overlay Generation Language (OGL)

Program number: 5665-308 (for MVS)
5666-324 (for VSE)
5664-293 (for VM)

Print Management Facility (PMF)

Program number: 5665-307 (for MVS)
5664-310 (for VM)

Font Library Service Facility (FLSF)

Program number: 5668-890

Page Printer Formatting Aid (PPFA)

Program number: 5666-327 (for VSE)
5664-199 (for VM)
5665-351 (for MVS)

Print Services Access Facility (PSAF)

Program number: 5665-340 (for MVS)
5664-312 (for VM)

Image Handling Facility (IHF)

Program number: 5785-DER

Graphical Display and Query Facility (GDQF)

Program number: 5668-905

Composed Document Printing Facility (CDPF)

Program number: 5668-997

Serif

Program number: 5771-ABA

Sans Serif

Program number: 5771-ABB

Pi + Special

Program number: 5771-ABC

Data1

Program number: 5771-ADA

APL2

Program number: 5771-ADB

Reference Material

- Advanced Function Printing Software General Information, G544-3415
- Advanced Function Printing Page Printer Facts Folder, G520-5102
- Print Services Facility Program Summary, G544-3519
- Graphical Data Display Manager General Information, GC33-0100
- Document Composition Facility General Information, GH20-9158
- Overlay Generation Language User's Guide and Reference, SH35-0079
- Print Management Facility User's Guide and Reference, SH35-0059
- Font Library Service Facility Program Summary, GC33-6165
- Page Printer Formatting Aid User's Guide and Reference, G544-3181
- Print Services Access Facility General Information, G544-3099
- Image Handling Facility User's Guide, SH20-7059
- Composed Document Printing Facility
 - Data Stream Interface-Typographic Fonts Interface, SC33-6134
 - Type Font Catalog, G520-0004
- IBM-Supplied Fonts for System-Attached Printers, G544-3328

DOS/VS Sort/Merge

Main Purpose

DOS/VS Sort/Merge Version 2, licensed program provides a high-performance disk sort that runs under the control of DOS/VSE with VSE/Advanced Functions or VSE/SP.

Key Functions, Facilities and Features

- Fixed-Block Architecture (FBA) devices can be used as input, output, work, or checkpoint files.
- VSAM-managed SAM files in control interval (CI) format can be accepted as input and output files. They may be accessed either as SAM or VSAM files. VSAM-managed files may be used as work files. It is also possible to mix managed and non-managed files.
- CMS files are supported in regular CMS or simulated VSE format. Simulated VSE support allows DOS sort applications to be developed under CMS without changing Sort/Merge control statements.
- If sufficient storage is available, command chaining can be used when the program reads SAM input or writes SAM output for count-key-data (CKD) devices and tape devices in sort applications. In most cases for which command chaining is used, significant performance improvements can be experienced. The smaller the input/output block sizes of a sort application, the greater the possibilities for performance improvements.
- Significant control card functions include:
 - ANALYZE – Optimization and capacity information can be obtained prior to actually sorting or merging.
 - INCLUDE/OMIT – Input records can be included or omitted from the output.
 - INREC – Input records can be reformatted.
 - OUTREC – Output records can be reformatted.
 - SUM – Equal-keyed records can be summarized.
 - EQUALS – Input order of records with equal control fields can be preserved.
 - COPY – An input file can be copied to an output file.
- Alternate collating sequences can be provided for control fields.

Potential Benefits

Sorting applications typically use 15 to 25% of a processor's resources. The elapsed time of these applications is an important factor in meeting job turnaround requirements, and the high performance of a sort product can be directly translated into dollar savings.

Prerequisite Products

Hardware

- System/370, 30XX, 4300, or 9370 processor
- Work storage – any device supported by DOS/VS, DOS/VSE, VSE, or OS/VS for program residence

Software

- DOS/VS Sort/Merge – DOS/VS Release 33 or 34 and DOS/VSE with VSE/Advanced Functions, or VSE/SP Version 2 or 3

Products Supported

- SAM input/output devices: 9332, 9335, 3310, 3370, 3375, 3380, 3350, 3340, 3330, 2314/2319, 2311, 3400, 2400, and 9347 tapes
- Work devices: 9332, 9335, 3310, 3370, 3375, 3380, 3350, 3340, 3330, and 2314/2319

Ordering Information

Program number: 5746-SM2

Reference Material

- General Information Manual, GC33-4043

Publishing Systems ProcessMaster

Main Purpose

Publishing Systems ProcessMaster is a host-based licensed program that provides a set of menus that simplify the use of the licensed programs used in the publishing application. It includes a document management facility as well.

Key Functions, Facilities and Features

- Customer-tailorable menus that lead users through the steps necessary to create a document
- Support for text entry and edit through an interface to the system editor XEDIT with a simplified tag-creation mechanism
- Viewing and editing of an entire BookMaster or GML document for checking document accuracy
- Graphics entry and edit through an interface to Publishing Systems DrawMaster and Interactive Chart Utility. Graphics files created on personal computer graphics programs GGXA and GGXC can be included as well.
- VM CADAM® engineering drawing conversion through an interface to the Graphical Display and Query Facility
- Image entry and edit through an interface to the Image Handling Facility program offering. Support for the Image Handling Facility program product will be provided at a later date.
- Composition services through an interface to the Document Composition Facility including the GML starter set, Publishing Systems BookMaster application, and the SCRIPT Mathematical Formula Formatter for text composition
- Library Management Services that provide access control interface, library administrator functions, file sharing with lockout for updates, and a library audit facility
- Utility Services, including spell checking with PROOF, communication facility to other users on the network
- Printer/display services supporting multiple printers, softcopy preview of documents, proof printing, batch or online formatting and printing, and conditional printing of documents based on DCF error conditions
- Support for workstation-attached PostScript® printers, such as the 4216, through an advanced function printing (AFP)-to-PostScript utility

Potential Benefits

Easy access to the IBM VM host publishing products for publication of large corporate technical documents.

Prerequisite Products

- VM/SP, VM/IS, or VM/SP HPO
- Publishing Systems BrowseMaster or the Graphical Display and Query Facility
- VM Batch Facility

Ordering Information

Program number: 5664-387

Reference Materials

- General Information, GC34-5031
- Creating Named Styles, SC34-5032
- User's Guide, SC34-5033

Publishing Systems BookMaster

Main Purpose

Publishing Systems BookMaster is a Document Composition Facility (DCF) Generalized Markup Language (GML) application for developing technical publications. Its rich GML vocabulary provides the tools to create complex document formats and is a superset of the GML starter set available with DCF. It is a key component of the IBM SolutionPac Publishing System VM Edition.

Key Functions, Facilities and Features

- GML vocabulary including tags for artwork, tables and directories, revisions, and others
- Over 600 modifiable style parameters to define the design of a document including page layout in columns, heading fonts and spacing, paragraph and list treatment, and font usage in general to produce documents in many different styles from a single source file
- Extensive symbol vocabulary with definitions for date, tab character, period, ampersand, GML delimiter, and non-keyable characters including international character sets
- Document Version Control Facility that allows users to produce many documents from one source by specifying conditions at run time
- PostScript® output support for printing on PostScript devices such as the 4216 Personal Pageprinter and typesetters

Primary Users

Corporate publishing departments, authors, and editors who produce large technical documents

Potential Benefits

Can improve the efficiency and control of the publication process by providing all the tools needed to create complex document formats

Prerequisite Products

- VM/CMS or MVS/TSO
- Document Composition Facility (DCF)
- If BookMaster formula tags are used, SCRIPT Mathematical Formula Formatter

Ordering Information

Program number: 5688-015

Reference Material

- General Information, GC34-5056
- Licensed Program Specifications, GC34-5007
- Creating Named Styles, SC34-5008
- User's Guide, SC34-5009
- MVS Support General Information, GC34-5006
- MVS Support Licensed Program Specifications, GC34-5007
- MVS Support Creating Named Styles, SC34-5008
- MVS Support User's Guide, SC34-5009

Publishing Systems BrowseMaster

Main Purpose

Publishing Systems BrowseMaster is a licensed program made up of utilities to assist in the preparation of documents formatted for IBM page printers (3800 Model 3, 3800 Model 6, 3820, 3812, or 4250).

Key Functions, Facilities and Features

- Composed Document Viewing Utility (CDVU) – the ability to view merged text and graphic output from Document Composition Facility (DCF), which has been formatted for a 3800 Model 3, 3800 Model 6, 4250, 3812, 3820, 3827, or 3835 on a 5080 Graphics System or a 3270 display
- The ability to display and crop GDF/ADMGDF files
- The production of 4250, 3800 Model 3, 3800 Model 6, and 3820 page segment files for the merging of displayed graphics with DCF data for output to the printers listed above
- The ability to import drawings from non-IBM CAD/CAM systems
- Ability to convert CALCOMP™ 925 plot tapes to GDF files
- Can be invoked from ProcessMaster

Primary Users

Publishing department people including writers, editors, and graphic artists who want to preview and proof their documents

Potential Benefits

As part of the IBM SolutionPac Publishing System VM Edition, it is an integral part of IBM's complete publishing offering. As a separate product, it is a valuable tool in the preparation of documents formatted for IBM page printers as noted.

Prerequisite Products

- VM/CMS or MVS/TSO
- GDDM/VM or GDDM/MVS

Ordering Information

Program number: 5688-009

Reference Material

Information about Publishing Systems BrowseMaster is included in the following:

- General Information: IBM SolutionPac VM Edition, GC34-5040
- General Information: IBM ProcessMaster, GC34-5031

Publishing Systems DrawMaster

Main Purpose

Publishing Systems DrawMaster is an application for creating, modifying, and displaying quality line art illustrations for publication.

Key Functions, Facilities and Features

- Provides a menu-driven line art drawing application for creating illustrations
- Allows the interactive creation and editing of illustrations containing line art and typographic text
- Contains a basic library of clip art that may be used as a starting point for illustrations
- Includes a library of 29 vector fonts for annotation
- Allows the use of 4250 typographic fonts for annotation
- Has a wide variety of editing and object manipulation facilities including scaling, rotating and editing
- Contains a detailed online HELP facility
- Allows users to specify various colors for text and line art objects for plotting or displaying on GDDM-supported color display terminals

Primary Users

Publications departments, graphic artists, technical illustrators, engineering/scientific and business professionals requiring high-quality illustrations for publications

Potential Benefits

The product produces quality illustrations with great flexibility in their design and high productivity for users. It complements a publishing system by providing a compatible illustration package.

Prerequisite Products

- VM/CMS
- APL2 or APL2 Application Environment
- GDDM
- If 4250 fonts are used in drawings to be included in DCF documents, DCF and the required 4250 fonts selected from the 4250 font library
- For creation of illustrations, several options including the Personal System/2 Model 50, 60, or 80 with 8514/A display adapter and 8514 color display with PC Workstation Support for Publishing Systems DrawMaster
- For DrawMaster to display illustrations, GDDM-supported displays

Ordering Information

Program number: 5664-388

Reference Materials

- General Information, GC34-5021
- Licensed Program Specifications, GC34-5020
- User's Guide, SC34-5022

Engineering and Scientific Subroutine Library (ESSL)

Main Purpose

The library provides a high-performance set of mathematical subroutines designed to provide high performance on the 3090 Vector Facility.

Key Functions, Facilities and Features

- Has 233 subroutines tuned to 3090 Vector Facility
- Provides many commonly used engineering and scientific mathematical subroutines
- Can be called from programs generated by VS FORTRAN, APL2, and Assembler H
- In addition to 3090 Vector Facility support, has scalar versions of all subroutines for development and testing of application programs in a scalar environment
- Subroutines include the following mathematical functions (most have both short and long precision)
 - Linear algebra subprograms
 - Matrix operations
 - Linear algebraic equations
 - Eigensystem analysis and eigenvalues/eigenvectors
 - Signal-processing – Fourier transforms, convolution, correlation
 - Sorting and searching
 - Interpolation
 - Numerical quadrature
 - Random number generation

Primary Users

- Engineers and scientists
- Application programmers supporting engineers and scientific applications
- Numerical analysts

Potential Benefits

- Provide high-performance execution for commonly used mathematical routines using of state-of-the-art algorithms
- Take full advantage of 3090 Vector Facility performance
- Help development of 3090 Vector Facility applications
- Develop and test in scalar environment and run production in vector processing environment

Prerequisite Products

- MVS/SP
- MVS/XA Data Facility Product
- VM/SP

- VM/XA System Facility
- VM/XA System Product

In all cases ESSL also requires the VS FORTRAN Version 2 Library.

Ordering Information

Program number: 5668-863

Reference Material

- General Information Manual, GC23-0182
- Vector Library Performance, GG66-0276

SCRIPT Mathematical Formula Formatter (SMFF)

Main Purpose

SMFF is an easy way to describe complex mathematical equations and scientific expressions to the text processing program Document Composition Facility (DCF). It allows the formatting and printing of these equations on all-points-addressable printers: the 4250, 3820, 3827, 3835, 3812, and 3800 Model 3. These equations can be printed, intermixed with text, and merged with graphics, without cutting and pasting. SMFF is an option in the IBM SolutionPac Publishing System VM Edition.

Key Functions, Facilities and Features

- High-level language to describe the equations
- Functions that are easy to learn and use
- Input that can be made from any terminal used for normal DCF text
- Syntax checking of formula formatter language input
- Ability to produce subscripts, superscripts, fractions, square roots, summation/integral symbols, and special characters such as DOTDOT, PRIME, TILDE, and VECTOR

Primary Users

- Corporate publishing departments producing mathematical and scientific documents
- Universities and research organizations
- High-technology companies

Potential Benefits

- Provides major productivity saving
- Can be used directly by engineers and scientists
- Reduces lead time to produce technical documents

Prerequisite Products

- MVS/TSO or VM/CMS
- DCF
- Appropriate all-points-addressable printer driver:
 - 4250: Composed Document Printing Facility
 - 3800 Model 3/3820/3827/3835: Print Services Facility/VM for VM/CMS or Print Services Facility/MVS for MVS/TSO
 - 3812: VM3812, IBM 3812 PagePrinter VM Support

- Typographic Fonts for the page printer font library:
 - 4250: Monotype® Times New Roman™; Typewriter and PI Fonts; Characters for Math and Science
 - 3820, 3800 Model 3, 3812, 3827, 3835: Sonoran Serif; Pi and Specials; Math/Science fonts

Ordering Information

SMFF Release 1.3

Program number: 5798-DPW

Reference Material

- Availability Notice, G320-9189
- IBM SolutionPac Publishing System VM Edition: Getting Started with Formula Formatting, SC34-5044
- Script Mathematical Formula Formatter User's Guide, SH20-6453
- Script Mathematical Formula Formatter Program Description/Operations Manual, SH20-0055

Mathematical Programming System Extended/370 (MPSX/370)

Products Included

- MPSX/370 (MVS and VM) Version 2
- MIP/370 (Mixed-Integer Programming Feature/370)

Main Purpose

MPSX/370 (a program product) and its optional feature MIP/370 are designed to help optimize operations and investments common to most organizations. Some of the best known applications include resource allocation, production scheduling, fleet scheduling, network management, portfolio selection, and the transshipment of goods.

Key Functions, Facilities and Features

- MPSX/370 helps solve linear, mixed integer, and separable programming problems.
- Interactive and batch facilities provide for problem revision, startup, selective printing of files, analysis of output and solutions, postoptimal parameterizations, and save/restart.
- Two control languages can be used to direct the optimization.
- The optional MIP/370 feature helps solve mixed integer linear programming problems in which designated variables must take integral values.
- Main characteristics of Version 2:
 - Expanded support for MVS/XA, extended addressing, enables larger problems to benefit from the use of the 3090 Vector Facility.
 - Additional preprocessing functions reduce problem solution time.
 - Up to 32,766 constraints (rows) are supported, double the capacity of Version 1.
 - The interactive mode enables the entry and editing of model data and control of the solution process.
 - Color graphics can be used to view representations of the model and the optimization process.

Primary Users

- Engineers, scientists, and other technical professionals
- Production planners
- Those involved in site selection for plants or warehouses
- Airlines, for fleet scheduling and gate scheduling
- Investment decision analysts
- Petroleum companies for refinery scheduling
- Chemical and other industries for distribution problems

Potential Benefits

- MPSX/370 helps provide least-cost/maximum-profit solutions.
- It simulates alternatives by postoptimal analysis.
- Potential changes in conditions and company policy can be analyzed.
- MPSX/370 provides management information that is essential to effectively plan and control business and government organizations.
- Depending on model size and complexity, Version 2 may provide significant run-time improvements over Version 1.

Prerequisite Products

For vector execution:

- VM/SP HPO Release 4.2
- VM/XA SP Release 1
- MVS/SP-JES2 or -JES3 Version 2 Release 1.3 with Vector Facility Enhancement or MVS/SP 2.1.7

For scalar execution:

- VM/SP Release 4
- VM/SP HPO Release 4.2
- VM/XA SP Release 1
- MVS/SP-JES2 or -JES3 Version 1 Release 3.5
- MVS/SP-JES2 or -JES3 Version 2 Release 1.3 (XA system)

If the interactive mode is desired:

- ISPF and PDF Version 2 Release 2

If graphics are desired:

- GDDM Version 2 Release 1

If the Extended Control Language (ECL) is employed:

- To compile — PL/I Optimizing Compiler Release 5.1 and PL/I Resident Library Release 5.1
or
PL/I Checkout Compiler Version 3 Release 3.1
- To execute — PL/I Transient Library Release 5.1

Ordering Information

Program number: 5668-739

Reference Material

- General Information Manual, GH19-6549

Dynamic Simulation Language/VS (DSL/VS)

Main Purpose

DSL/VS, a program offering, is a state-of-the-art modeling program for simulating continuous systems. DSL/VS is designed to assist in the development and operation of systems which can be described by differential equations. Many problems formerly solved by analog computers can be simulated with DSL/VS. Most models developed with CSMP III (5734-XS9) can be transported to DSL/VS easily.

The use of DSL/VS can significantly increase engineering productivity and reduce the cost of experiments, prototyping, and physical modeling.

Key Functions, Facilities and Features

DSL/VS is a high-level programming language for engineers and scientists. VS FORTRAN is a subset of the language.

DSL/VS is easily learned and applied to many types of problems in all science and engineering disciplines. Problems can usually be coded in a short time, executed, and evaluated quickly by inspection of graphic output. The ability to rapidly modify models provides a cost-effective method for evaluating many design alternatives.

Key features include:

- State-of-the-art algorithms
- Double precision calculations
- Graphics postprocessor with color options
- Functions easily integrated into the Engineering/Scientific Support System (E/S³)
- An extensive set of sample models
- Extensive set of EXECs (VM) and CLISTs (TSO)

Potential Benefits

- Enhanced productivity for engineers, scientists, and analysts
- Reduced cost of experimentation
- Ability to study a wide range of alternative solutions

Prerequisite Products

- VM/SP Release 3 or MVS/TSO
- VS FORTRAN
- GDDM (for color graphics)
- PL/I Transient Library

Products Supported

Graphics devices supported include:

- 3279 Model S3G
- 3277 Graphics Attachment RPQ
- 3287 four color graphics printer

Procedures are provided for supporting other graphics and plotting devices.

Ordering Information

Program number: 5798-PXJ

Reference Material

- Availability Notice, G320-0357
- Language Reference, SH20-6288
- Program Description/Operations Manual, SH20-6287

IBM Common LISP

Products Included

- IBM Common LISP Application Environment for MVS
- IBM Common LISP Development Environment for MVS

Main Purpose

IBM Common LISP, developed by IBM and Lucid, Inc., provides a complete environment for developing and running LISP applications. Existing LISP applications can be run with a minimum of reprogramming.

The IBM Common LISP environment is designed to run on a mainframe connected to one or more personal computers*. It delivers the memory and processing power of the mainframe with the fast response and convenience of intelligent work stations.

Through restricted access on the mainframe, IBM Common LISP also provides a secure environment from data and applications.

Overview

IBM Common LISP is the complete environment. It consists of the Development Environment to develop LISP programs and the Application Environment to run them.

Common LISP links a mainframe running MVS with one or more personal computers. It transforms a desktop personal computer into a dedicated LISP machine. The processing power of 31-bit addressing on the mainframe is combined with the flexibility of local development on the personal computer. With processing on the mainframe and development on the PC, the capabilities of both resources can be maximized.

The IBM Common LISP environment is easily entered by selecting IBM Common LISP from a menu on the PC. Once entered, windows appear showing the different features and tools of the environment. With IBM Common LISP and Microsoft® Windows, a traditional command language is not required. Selections are made from a menu using a mouse or keyboard. The windowing system makes it possible to switch from one window to another and move from application to application. It is even possible to work on two tasks simultaneously and integrate information from one to the other.

Key Functions, Facilities and Features

IBM Common LISP offers a complete implementation of Common LISP plus "flavors" for object-oriented programming. IBM Common LISP also provides many extensions to Common LISP as well as a full set of development tools.

LISP Extensions

The Data Base Interface

IBM Common LISP's data base interface allows programs to select or update records from DB2 relational data bases. SQL is available in LISP application programs to access the data already stored on the mainframe.

The Library System

Data can reside on either the PC or mainframe in special IBM Common LISP libraries. Common LISP extensions permit the user to access and manipulate these libraries under program control. Data can be moved between libraries on the PC and mainframe.

The Text Windows Capability

An IBM Common LISP program can open multiple windows in order to accept keyboard input and display text. This allows programs to organize information among different windows. By scrolling a window up or down, the user can view a complete history of input and output to that window.

The Graphics Capability

IBM Common LISP enables programs to generate multiple windows with mixed text and graphics. Programs can take full advantage of the graphics on the PC without using complicated I/O routines. Bar charts, pie charts, and other figures can be created.

Session Services

With IBM Common LISP, applications can be distributed between the mainframe and the PC. A program on the mainframe can start, stop, and communicate with programs running on the PC.

Interfaces to Other Languages

Functions written in other languages can be combined with Common LISP application programs to take advantage of the inherent strengths of each language.

Development Features

Selection from a window on the PC provides all the development tools of IBM Common LISP.

* "Personal computer" or "PC" refers to the IBM Personal Computer or IBM Personal System/2™.

IBM Common LISP

The Interpreter

The interpreter evaluates LISP expressions as they are entered. While the expressions are entered and displayed on the IBM PC, they are actually evaluated and executed on the mainframe at mainframe speed.

The Editor

The editor is a general purpose tool for modifying programs and other files on the PC or mainframe. With the editor, a mouse can be used to move a line or shift an entire block of code. Editor macros can be used to simplify editing tasks. Also, the editor helps to reduce programming time by tracking down unbalanced parentheses. Since the editor runs on the PC, files can be edited without using mainframe resources.

The Librarian

The librarian allow the user to create and maintain IBM Common LISP host and PC libraries from a PC. By making simple menu choices, the user can create, delete, move, copy, and perform other functions on libraries on both the PC and mainframe.

The Compiler

The compiler will compile a Common LISP program or function.

The Debugger/Tracer

The debugger helps the user to correct errors in a program. It works interactively with the execution stack to check LISP expressions. The tracer shows which functions are being evaluated and the values they return. The user can stop at any expression, change its value, and immediately see the results.

Prerequisite Products

Software

Mainframe Component

IBM Common LISP operates in a TSO/E environment under MVS and requires either:

- MVS/SP Version 1 (MVS/370)
- MVS/SP Version 2 (MVS/XA)

IBM Common LISP supports access to Version 1 DATABASE 2.

PC Component

- The operating system for the IBM Personal Computer must be PC-DOS version 3.2 or later.
- The operating system for the IBM Personal System/2™ must be PC-DOS version 3.3 or later.
- Microsoft Windows, a product of Microsoft, Inc., is available from IBM and is a prerequisite which must be installed on the PC prior to the installation of IBM Common LISP. Version 1.03 or later should be used.

- Microsoft Windows Toolkit and Microsoft C, both available from Microsoft, Inc., are optional. They are required only for developing the PC components of customer-written distributed applications.

Hardware

Mainframe Component

- IBM Common LISP is designed to operate on any IBM mainframe that meets the specifications of the MVS operating system.
- A minimum of eight megabytes of virtual storage is required.

PC Component

- The PC component operates on an IBM Personal Computer or IBM Personal System/2™ with 640K of main memory. A fixed disk is required.
- The PC must be equipped with:
 - Any high-resolution graphics adapter and color display or monochrome display combination supported by Microsoft Windows Operating Environment. A resolution of at least 640 × 350 (EGA mode) is required.
 - A 3278/79 Emulation Adapter or an IBM 3270 Connection.
- A mouse, although optional, is strongly recommended.

Ordering Information

IBM Common LISP Application Environment for MVS

Program number: 5665-425

IBM Common LISP Development Environment for MVS

Program number: 5665-426

PROLOG

Products Included

- MVS/Programming in Logic (MVS/PROLOG)
- VM/Programming in Logic (VM/PROLOG)

Main Purpose

PROLOG is used to:

- Develop expert systems, artificial intelligence programs that help to analyze and resolve specific problems. An expert system can combine the knowledge and skills of many people to assist in business decision-making.
- Design natural language interfaces for application programs. Interfaces written in PROLOG can let users issue application commands in plain English, filter commands and data for errors, or give advice to confused users. An interface can be written to any program written in a language that has an Assembler language interface, including COBOL, PL/I, and others.
- Approach old application program tasks in new ways. PROLOG programs can manage inventory, track expenses, and do other tasks performed by application programs written in languages like COBOL, FORTRAN, or PL/I. But with PROLOG, intelligence and problem-solving ability can be incorporated into traditional applications.

Background

PROLOG takes a different approach to programming.

To write a program, an inventory of the facts and relationships between facts that govern decision-making on a business problem is prepared. The program is built up out of individual program elements, called predicates, that record the facts and relationships. PROLOG can evaluate the facts and relationships and suggest the right decision to make.

To use a program written in PROLOG, the user asks it to evaluate one or more of the program elements that have been defined based on the current facts involved in the decision. PROLOG looks up the facts and relationships defined in the program elements, evaluates them, and returns the solution to the user.

Key Functions, Facilities and Features

PROLOG has facilities that make it easy to add it to an existing application development environment:

- PROLOG can store and retrieve data from relational data bases: SQL/DS in VM systems or DB2 in MVS systems.
- PROLOG can call exits written in the Assembler language to use existing application development tools or add new ones tailored to PROLOG.

- PROLOG offers a variety of ways of passing data, and in some cases commands, to and from programs written in other languages.

With PROLOG, the programmer might use Assembler language tools while writing the program, invoke the program from an EXEC or CLIST, retrieve information from a relational data base, and pass information to applications written in other languages.

Described below are some of the features that make MVS/PROLOG and VM/PROLOG versatile and easy-to-use tools for applications development.

- *Store and retrieve data in relational data bases.* MVS/PROLOG and VM/PROLOG speak SQL, the Structured Query Language. In MVS systems, MVS/PROLOG applications can retrieve and store data in DATABASE 2 (DB2) data bases. In VM systems, VM/PROLOG can work with SQL/DS data bases.
- *Communicate with the host system and programs in other languages.* Programs written in MVS/PROLOG and VM/PROLOG aren't isolated from the rest of an operating environment.
 - Programs written in MVS/PROLOG can:
 - Issue MVS and TSO commands.
 - Issue Interactive System Productivity Facility (ISPF) commands and use ISPF variables to pass data to and from other ISPF programs.
 - Read CLIST variables.
 - Programs written in VM/PROLOG can:
 - Issue CP and CMS commands.
 - Load and run other modules concurrently with VM/PROLOG.
 - Use REXX or EXEC2 variables to pass data to and from other programs invoked from an EXEC.
 - Exchange data and commands with programs written in LISP/VM, another artificial intelligence language.

MVS/PROLOG and VM/PROLOG can call EXECs and other programs.

MVS/PROLOG can be started from ISPF or from a CLIST. VM/PROLOG can be started from the command line, from an EXEC, or from an LISP/VM program.

- *Provide support for assembler language exits.* MVS/PROLOG and VM/PROLOG can be extended with Assembler language exits to make use of Assembler utilities that have previously been written, to write Assembly-language bridges to programs in other languages, or to add new functions to PROLOG.
- *Use program elements that are easy to update (dynamic predicates).* The elements of MVS/PROLOG and VM/PROLOG programs, called predicates, can be easily changed, added, or

PROLOG

deleted. Since MVS/PROLOG and VM/PROLOG are interpreters, a program can be changed without interrupting its execution or recompiling it.

Prerequisite Products

Hardware for MVS Systems

- The equipment necessary to install and run MVS/SP Release 1.3.2. To install MVS/PROLOG, a 1600 or 6250 bits-per-inch tape drive or a 3480 Magnetic Tape Subsystem, for 3480 tape cartridges
- 1.5MB of storage on a direct access storage device for storage of MVS/PROLOG product files

Software for MVS Systems

MVS/PROLOG runs as an Interactive System Product Facility (ISPF) application in the MVS and TSO/Extensions (TSO/E) operating environment.

- MVS/SP (MVS/PROLOG can be run in MVS/XA systems, but does not exploit the extended-addressing capability of MVS/XA.)
- TSO/Extensions (TSO/E)
- Interactive System Productivity Facility (ISPF)
- Interactive System Productivity Facility/Program Development Facility (ISPF/PDF)

Optional:

- DATABASE 2 (DB2)

Users of MVS/PROLOG must have virtual address space of at least 1Mb. 3MB of virtual storage space is recommended.

Hardware for VM Systems

- The equipment necessary to install and run VM/SP Release 3, including a 1600 or 6250 bits-per-inch tape drive for installing VM/PROLOG
- At least 250KB of storage space on a direct access storage device for the minimum set of VM/PROLOG product files, or at least 650KB of direct access storage for the complete set of VM/PROLOG product files.

Software for VM Systems

VM/PROLOG runs as a nucleus extension of the CMS operating system.

- VM/SP or VM/SP HPO

Optional:

- SQL/DS (Structured Query Language/Data System)
- LISP/VM

Users of VM/PROLOG must have virtual machines with at least 1.4MB of virtual storage. A virtual machine size of at least 3MB is recommended.

Publications

- MVS/Programming in Logic General Information and Planning Guide, G520-6009
- VM/Programming in Logic – Availability Notice, G320-9228
- MVS/Programming in Logic – Availability Notice, G325-0042

Ordering Information

MVS/Programming in Logic

Program number: 5798-DYL

VM/Programming in Logic

Program number: 5785-ABH

IBM KnowledgeTool

Main Purpose

IBM KnowledgeTool is a software tool for developing knowledge-based systems. The tool provides a rule-based language, inference engine, and application debugging environment that can be used to develop and integrate knowledge-based applications in a variety of environments. IBM-supported data bases can be accessed by KnowledgeTool applications. KnowledgeTool includes an inference engine that provides forward chaining, pattern matching, and conflict resolution. KnowledgeTool applications can call and be called by programs coded in many IBM languages. KnowledgeTool can be used by knowledge engineers and DP professionals to implement knowledge-based applications for a wide variety of application users.

Background

KnowledgeTool provides a knowledge-processing environment that can be used to develop and integrate expert system applications for the following environments: CICS/OS/VS, IMS/VS, MVS/XA, VM/SP, and VM/SP HPO. The developed applications can access IBM-supported data bases. Procedural programming techniques and rule-based constructs are integrated in this product. KnowledgeTool enables DP professionals to extend existing applications and implement new applications to take advantage of knowledge-based systems technology. KnowledgeTool also provides facilities for implementing high-performance knowledge-based system applications.

KnowledgeTool can be used by experienced DP professionals to develop knowledge-based applications for business professionals and other end users. It applies to all industries that have requirements for knowledge-based systems applications. KnowledgeTool is useful not just for knowledge-based systems applications, but also for traditional applications with complicated flow control requirements.

KnowledgeTool is usable by installations with high-level language programming expertise. It is especially useful for solving complex problems that require a data-driven inference capability and for process control systems. Applications developed under it may be embedded in existing programs. KnowledgeTool has connectivity to VM/CMS, MVS/TSO, MVS BATCH, CICS/OS/VS, IMS/VS, VSAM, DATABASE 2 (DB2), SQL/DS, DL/I, ISPF, GDDM, and IBM-supported languages.

Overview

KnowledgeTool is designed to support the development and execution of high-performance knowledge-based systems applications. It supports a powerful and versatile rule-based language that enables users to encode declarative statements within the framework of a procedural language. KnowledgeTool provides language capabilities that are needed to develop knowledge-based systems, including working memory, rules that specify a set of conditions and a set of actions to be enacted when the conditions are satisfied, debugging facilities, conflict resolution, rule subroutines, and inferencing algorithms.

KnowledgeTool has a translator and run-time libraries. The translator converts the source statements into PL/I expressions (PL/I source code) and rule files. The PL/I source code is compiled by the PL/I Optimizing Compiler into object code. This process results in a library of object modules and rule files. The library is used at run-time and it constitutes the compiled form of the knowledge base. It is suggested that KnowledgeTool source code be compiled separately from existing programs.

The run-time libraries contain the debug facilities and inference engine. The inference engine builds the inference network out of the rule files produced by the translator. The object code produced by the PL/I Optimizing Compiler constitutes the procedural components of the rules.

The KnowledgeTool source statements can be a mixture of rule constructs and PL/I statements. Rule constructs and PL/I source can examine and modify data that reside in working memory. The knowledge in working memory, which can be viewed as "facts," may have been obtained using PL/I data base access statements.

The results of the interaction between the rule constructs, procedural code, and working memory can be examined by the developer using the debug facility. The facility gives the user control over rule processing. The debug facility also allows users to define, initialize, and modify working memory. Whenever working memory is modified, the inference engine determines which rules should be processed again. This occurs without the programmer's intervention.

Other programs can be called from the action parts of rules, controlling the processing of procedural routines through data-driven inferencing algorithms. Other programs can call KnowledgeTool applications. This enables existing applications to use the KnowledgeTool inferencing capabilities.

Key Functions, Facilities and Features

- *Knowledge-based systems constructs.* KnowledgeTool contains language constructs, including condition-action rules, that are used by developers of knowledge-based systems.
- *Run-time efficiency.* The language supported by KnowledgeTool is translated into PL/I and then submitted to the PL/I Optimizing Compiler. At run time, the generated code exploits some specially-designed internal algorithms. These features contribute significantly to execution efficiency of applications developed under KnowledgeTool.
- *Embeddability.* KnowledgeTool applications can be developed for running in the IMS/VS and CICS/OS/VS environments.
- *Data base connectivity.* PL/I statements can be intermixed with the rules to retrieve data from data bases such as DB2, SQL/DS, and DL/I. KnowledgeTool applications running in the IMS/VS and CICS/OS/VS environments can access these data bases.
- *Rules subroutines.* Rules may call other subroutines made up of other rules, thereby providing nested inferencing. Rules may be nested inside the action parts of other rules.
- *Program organization.* Development of large knowledge-based systems is facilitated by segmentation of the knowledge base. Subroutines of rules can be compiled separately and link-edited together during production use.
- *Event driven facilities.* KnowledgeTool has timer facilities and exits for communicating with other application systems. The KnowledgeTool timer facilities are able to schedule events.
- *Calling.* KnowledgeTool applications can call and be called by programs written in PL/I as well as in VS COBOL II, VS Pascal, VS FORTRAN and Assembler H, using PL/I interlanguage communications.
- *PL/I.* PL/I statements may be embedded in the KnowledgeTool language, permitting the use of the PL/I interlanguage communications facility, PL/I data types, and the facilities of MVS/XA and VM/SP.

Prerequisite Products

When KnowledgeTool operates as CMS commands under VM/SP and VM/SP HPO, the following products are prerequisites:

- Operating system Virtual Machine/System Product
- OS PL/I Optimizing Compiler and Library
- Either:
 - VM/SP System Product Editor
 - ISPF/PDF

The following IBM products are optional:

- SQL/DS, which is required if an SQL/DS data base is to be used
- Applications produced by the following IBM program products may call or be called by KnowledgeTool rule procedures:
 - Assembler H
 - COBOL II Compiler and Library
 - VS FORTRAN Compiler and Library
 - VS Pascal Compiler and Library
 - OS PL/I Optimizing Compiler and Library

When KnowledgeTool operates in an MVS/XA environment, the following products are prerequisites:

- MVS/SP
- TSO/E
- OS PL/I Optimizing Compiler and Library

The following products are optional:

- ISPF/PDF
- DATABASE 2
- Applications produced by the following program products may call or be called by KnowledgeTool rules procedures:
 - Assembler H
 - VS COBOL II Compiler and Library
 - VS FORTRAN Compiler and Library
 - VS Pascal Compiler and Library
 - OS PL/I Optimizing Compiler and Library
- CICS/OS/VS
- IMS/VS

Machine Requirements

KnowledgeTool operates on all display terminals supported by VM/SP or MVS/XA operating systems with a minimum screen size of 24 lines by 80 columns.

VM/SP Hardware Requirements

- A 1600- or 6250-bpi tape drive or 3840 cartridge drive is required for product installation.
- A minimum of 15 cylinders of 3380 DASD space or the equivalent is needed for product installation and control information.
- A minimum CMS machine size of 5M is required to translate an application, and 2M is required for processing.

MVS/XA Hardware Requirements

- A 1600- or 6250-bpi tape drive or 3840 cartridge drive is required for product installation.
- A minimum of 15 cylinders of 3380 DASD space or the equivalent is needed for product installation and control information.

- The processor must have sufficient real storage to meet the combined storage requirements of the host operating system and required access methods.
- A minimum TSO region size of 5M is required to translate an application, and 2M is required for processing. An entire application can reside in extended private storage. KnowledgeTool applications are not re-entrant.

Publications

Product Brochure, G520-6453
Application Brief, GK20-2286

Ordering Information

Program number: 5798-RXD

FORTRAN (Formula Translation)

Products Included

- VS FORTRAN Version 2 Compiler, Library and Interactive Debug
- VS FORTRAN Compiler and Library
- FORTRAN Language Conversion Program
- VS FORTRAN Execution Analyzer

Main Purpose

FORTRAN is a mathematically oriented, high-level procedural language used primarily by mathematicians, engineers, statisticians, and business analysts to solve numerical problems. Applications range in scope from simple problem solving to large-scale numerical systems that employ either simulation or optimization techniques.

Key Functions, Facilities and Features

The FORTRAN language supported by VS FORTRAN encompasses and is compatible with the standards language for FORTRAN, ANSI X3.9-1978 and ISO 1539-1980, including its mathematical function provisions. VS FORTRAN also supports and provides compatibility with older programs written using the American Standard FORTRAN language X3.9-1966. The compiler also supports several IBM extensions to FORTRAN.

VS FORTRAN Version 2

Version 2 is an enhanced level of VS FORTRAN Version 1 that includes support for the 3090 Vector Facility. It has the ability to perform scalar, parallel, and vector processing with the same programs, and provides enhanced accuracy and improved mathematical routines. The included interactive debug support is an enhanced version of VS FORTRAN Interactive Debug (5668-903) having full screen capabilities, source listing windows, animation, and new cursor control commands. VS FORTRAN Version 2 combines in one product the VS FORTRAN compiler, the library, and the interactive debug facility. It is supported under MVS/XA, VM/SP High Performance Option, and VM/XA System Facility.

VS FORTRAN Version 1

The VS FORTRAN Compiler and Library, a licensed program, is supported under VM/SP, MVS/SP, MVS/XA, VM/PC, and VSE/Advanced Functions.. Cross compilation is supported. Valid source code that compiles and executes with one supported operating system will compile and execute using another

supported operating system without change. Distributed processing is facilitated, since object modules produced by VS FORTRAN in any supported environment may run in any other supported environment.

Many usability, productivity, and performance enhancements are included:

- Support for both FORTRAN 77 and 66 languages
- Optimization options similar to those of FORTRAN IV (H Extended) with the Enhancements IUP (5796-PKR)
- VSAM device support
- Free-form source input
- Reentrant compiler and object code and some library routines
- Internal files
- Extended CHARACTER data features
- Automatic precision increase (AUTODBL)
- Input/output improvements
- Structured programming aids
- Improved diagnostics
- Batch symbolic debug
- Debug packets
- Support for MVS/XA (extended architecture)

The VS FORTRAN compiler requires 1080K bytes (virtual) to process a typical 100-statement source program. Because the compiler is reentrant, it can be installed in a shared segment. This, in turn, significantly reduces the virtual storage requirement for each end user. No auxiliary storage is required for work files.

FORTRAN Language Conversion Program

This licensed program is a tool for converting FORTRAN IV (FORTRAN G1 and H Extended) and VS FORTRAN LANGLVL(66) source code to VS FORTRAN LANGLVL(77). The product upgrades FORTRAN programs so that they can be compiled at LANGLVL(77) by either VS FORTRAN Version 1 or Version 2. This enables the recompiled programs to use the constructs and capabilities of LANGLVL(77), providing some improvements and allowing exploitation of XA architecture. It may also be useful when evolving to a single-compiler installation to take advantage of possible future FORTRAN enhancements.

VS FORTRAN Execution Analyzer

When modifying an application program to reduce its execution time, it is important to know how the execution time usage is distributed within the application. The Execution Analyzer is a tool for determining the percentage of time spent in each subroutine and on each internal sequence number (ISN).

Primary Users

For the most part, technically-oriented individuals such as scientists, engineers, mathematicians, researchers, students, statisticians, and forecasters.

Prerequisite Products**VS FORTRAN Compiler, Library and Interactive Debug**

Operates under:

- VM/SP Release 3 or later, with or without VM/SP HPO
- MVS/SP Version 1, with TSO/E for interactive debugging
- MVS/SP Version 2 and MVS/XA DFP, with TSO/E for interactive debugging
- VM/XA System Facility Release 2

Execution of vector code under:

- VM/SP HPO with Vector Facility Support
- MVS/SP Version 2 Vector Facility Enhancement and MVS/XA DFP, with TSO/E for interactive debugging
- VM/XA System Facility Release 2

Execution of scalar code under:

- VM/SP Release 3, with or without VM/SP HPO
- MVS/SP Version 1, with TSO/E for interactive debugging
- MVS/SP Version 2 and MVS/XA DFP, with TSO/E for interactive debugging
- VM/XA System Facility Release 2

For full-screen mode interactive debugging:

- ISPF Version 1 and ISPF/PDF Version 1

For enhanced full screen mode interactive debugging:

- ISPF Version 2 and ISPF/PDF Version 2

FORTRAN Language Conversion Program

Operates under:

- MVS/SP Version 1 Release 3 or later
- MVS/SP Version 2 Release 1 or later and MVS/XA DFP
- VM/SP Release 3 or later

Ordering Information**VS FORTRAN Version 2 Compiler, Library and Interactive Debug**

Program number: 5668-806

VS FORTRAN Version 2 Library

Program number: 5668-805

FORTRAN Language Conversion Program

Program number: 5668-864

VS FORTRAN Execution Analyzer

Program number: 5798-DXJ

Reference Material**VS FORTRAN Version 2**

- General Information Manual, GC26-4219

VS FORTRAN and Interactive Debug

- Brochure, G520-3555 — describes the main characteristics and potential of VS FORTRAN
- General Information Manual, GC26-4114

FORTRAN Language Conversion Program

- General Information Manual, GC23-0154

VS FORTRAN Execution Analyzer

- Program Description/Operations Manual, SC23-0335

Application Prototype Environment

Main Purpose

The Application Prototype Environment licensed program provides a set of building blocks and design tools for interactive development of applications. It is intended to be used both by the professional programmer and by non-DP professionals (such as managers, planners, educators, scientists, and engineers) with some knowledge of APL.

The professional programmer will use it to develop prototypes of commercial DP applications or to build complete applications with APL as a base. The non-DP Professional will use it to rapidly and easily create the numerous small applications needed by today's business.

Key Functions, Facilities and Features

Application Prototype Environment includes a large number of useful tools for the development of APL applications by end users. It also enables the developer to utilize relational databases easily, with a full-screen table update facility and with query creation panels.

The product is particularly suited to application development that takes place in an Information Center environment, where the emphasis is on reducing the burden of programming in the I/S center by giving control of application development to end users, while affording users the ability to access production files and data bases.

The process of creating applications takes place in two phases: a specification phase followed by an operation phase.

Specification Phase

This phase involves the use of simple-to-use, interactive dialogs to design panels, charts, files, images, menus, lists, and queries, and to specify access methods. For example:

Creating Panels

A panel describes the fixed text and the fields to contain application data. Panels are created via an interactive dialog for specifying:

- The position and size of text fields, including a graphic field for a chart function
- Field types – input, output, character, numeric
- Field attributes – colors, highlighting
- Field names – automatic input and output of data

Declaring Files

Files are defined via an interactive dialog that allows users to specify:

- Record structure
- Data types – APL, character, numeric, packed decimal, binary
- Access method – APL Data, CMS, VSAM, QSAM, BDAM
- Number of decimal places

Creating Charts

Charts are created via an interactive dialog that allows users to specify:

- Chart type – plot, surface, bar, and pie with the ability to display more than one chart on the same axes
- Data
- Many chart options – colors, line types, axis options, and legends to describe different chart data, with defaults provided for most options so that only chart type and data need be specified

Operational Phase

Creating an Application Program

Once the basic design of the panel layouts, graphic displays etc. has been established, the next step is to use Application Prototype Environment's building-block functions to create the logic necessary for entering application data and controlling data movement between the application and the data bases.

Creating an Object Library

Finally, before the application is placed into production, an object library can be created for the following purposes:

- To create a master file of programs that can be used in common by many users
- To build large application packages capable of running in small workspaces
- To keep the active workspace free of infrequently used functions and variables

Primary Users

Non-DP Professional Users

They will typically approach the Information Center and request programmer help in building an application. Working together, they will sketch the panels and charts that are to constitute the application. As the building proceeds, the programmer adds the necessary code to make the application operational, and

through an iterative process changes are made to the design of panels, charts, files, images, menu's, lists, queries, and code.

After using the application in an initial production environment, the user may approach the Information Center requesting further extensions to the program.

Non-DP Professional Users with Novice APL Skills

The term "novice APL skills" refers to a level of knowledge in APL typically acquired from taking an APL self-study course. Users having these skills will build relatively complex applications in an interactive fashion, building panels, designing charts, writing code, testing, adding more panels, and so on.

Initially, this class of user may require assistance from APL programmers. As the APL skill increases, the degree of assistance required correspondingly decreases.

Expert APL Programmers

Individuals in this category will typically be employed in the Information Center. They support the non-DP Professional and novice APL users in their efforts to build applications.

Using Application Prototype Environment, they develop prototypes of commercial DP applications and build complete applications that have APL as their base. They also interact with the end user as described above.

Potential Benefits

- Application Prototype Environment allows for rapid, interactive development of APL application programs.
- The user is guided by menu selections supported by help screens and tutorials.
- Application Prototype Environment is usable for development of prototypes as well as "live" APL applications.
- It allows for easy integration of graphics into APL application programs.
- The Object Library facility allows for easy storage and retrieval of all types of APL and Application Prototype Environment objects.

Prerequisite Products

Hardware

- 4300, 303X, 308X, or 3090 processors
- APL workspace of 512KB minimum

Terminals Supported

- Dialogs under Application Prototype Environment are designed for terminals with a minimum of 1920 characters (24 lines).

- Chart design requires:
 - 3179
 - 3278 Model 2, 3, 4, or 5 with ECSA and PS features
 - 3279 Model S3G or 3X
 - 3290
- Hard-copy graphics output requires a 3287 or a 3268 printer.
- Application development requires a terminal with the APL feature.
- One terminal with the APL feature is also required for maintenance functions and one tape drive is required for installation.

Software

- VM/SP Release 3 with or without VM/SP HPO Release 3
- MVS/TSO: MVS/SP Version 1 Release 3 (MVS/370), or MVS/SP Version 2 Release 1.1 (MVS.XA)
- APL2 Release 1.2
- GDDM Release 4, with Presentation Graphics Feature (PGF).

Subsequent releases and modifications are supported unless otherwise stated.

Ordering Information

Program number: 5668-808

Reference Material

General Information Manual, GH19-6526

Application System (AS)

Overview

Application System is IBM's strategic high-function decision-support software product for business planning, statistical analysis, and project management.

Application System is available:

- As a licensed program (5767-032) for the MVS, VM/XA, and VM operating environments. A statement of direction indicates that the direction of future development of the AS product line is to provide support consistent with the need to use workstations that may have local intelligence.
- As a Remote Computing Service from IBM Information Network Services (INS) outside of the U.S. or from the IBM Information Services Information Network in the U.S.

Main Purpose

Application System is an interactive licensed program to help business people get their jobs done better and faster. Its powerful and integrated facilities make it a comprehensive system for decision support, personal computing, and generating departmental applications.

English language commands, conversational prompts, option windows, PF keys, and other facilities give AS flexible operation and help make it easy for users to:

- Collect and manage data
- Retrieve and analyze information
- Produce formalized reports
- Present information graphically
- Use statistical analyses and forecasting routines
- Develop business plans and evaluate alternatives
- Control large projects and draw critical path networks
- Create and format letters and manuals
- Develop a variety of applications for individual or general use

Key Functions, Facilities and Features

- **Data management:** Data can be entered and updated interactively at a terminal or loaded from another system. Data files can be combined, updated, reorganized, and summarized. Full data management facilities and data dictionary safeguard against inaccurate data entry through extensive verification and validation facilities.

In a VM operating environment, AS supports access to private AS data, CMS data files, VSAM data sets and relational data held in Structured Query Language/Data System (SQL/DS) tables. SQL/DS support provides for extra security, con-

current update, and authorized access to corporate data on tables up to 32 billion bytes in size. SQL/DS tables are accessed directly; AS does not have to import the data. AS can exchange data with other products in IXF (integration exchange format), and AS can also invoke DXT (Data Extract) to format and import data from external sources.

In an MVS environment, AS supports access to private AS data, OS data set, partitioned data set (PDS) members and VSAM datasets with RACF protection. In addition, AS supports access to relational data held in DATABASE 2 (DB2) tables. The DB2 interface, like the SQL linkage, enables maximum usage of relational technology without a detailed understanding of its concepts or terminology. DB2 tables are accessed directly; AS does not have to import the data. AS can exchange data with other products in IXF (integration exchange format), and AS can also invoke DXT (Data Extract) to format and import data from external sources.

Other features of AS in an MVS environment permit the user to access data that resides on one or over several AS systems in an SNA network, thus providing greater availability of data. Batch mode operation under MVS is also available.

- **Information retrieval:** The user can select the exact information desired and browse through it or display it in the most suitable form. Graphics or tabular summaries, comparisons, rankings, calculations, sorts, selects, and categorical analyses of data can be done.
- **Formal reporting:** The user can create formal reports using AS default formats or specify a design for tailored reports that can be repetitively generated with new data. Reports may include calculated data, statistical evaluations and modeling results, titles and headings, totals by row and column, and detailed or summary information. Upper- and lowercase letters, color and different typestyles can be used to give reports a professional appearance. An interactive version of the REPORT command is available. While the report is actually being displayed, the user can refine and change it using syntax-free facilities and context-sensitive help within a windowing interface.
- **Business graphics:** With a single command, data can be converted into one of several clear and powerful business graphics: line and scatter plots, histograms, pies, surfaces, radars, maps, and mixed charts. Skyscraper (tower) charts showing an apparent 3-D effect can be created using blocks, cylinders, wedges, or pyramids. AS will produce scaling, titles, and legends for the user, or the user's own can be specified. High-resolution graphics can be created with up to seven colors.

Interactive design using DRAW allows a syntax-free method for foil design, incorporating boxes,

- circles, lines, arrows, and positioning descriptive notes. DRAW can display in tabular format the summarized data on which the graph is based.
- **Statistics and forecasting:** The wide range of analytical and descriptive statistical functions built into AS include elementary statistics, correlations, regression analysis, trend analysis, time series forecasting, significance tests, four-component analyses, and more. AS also has integrated graphics for curve-fitting and linear trend analysis. Linear programming is supported.
 - **Business planning:** The built-in modeling facilities of AS can be used to evaluate plan alternatives. The user defines known or projected values for certain items in the business plan and specifies relationships between others. AS calculates values for all items on the basis of their interrelationships and displays results in a spreadsheet-like format. Then, the user explores "what-if" scenarios by changing values directly on the screen and allowing AS to redisplay the results with all updated values highlighted. The user can also enter goals, and AS will use backward iteration to adjust the model. Models of up to 12 dimensions can be created.
 - **Project control:** AS can process arrow and precedence networks on the basis of time or resource analysis. Network drawings can also be produced on the screen or plotted using four scales with multiple facilities for examining all or part of the network in selected detail. Gantt charts can be displayed on graphics screens or plotted. Free float as well as total float can be calculated. Resources can be assigned to tasks and analyzed to compare availability with usage, with a graphic display of the results. Probable completion distribution from risk analysis, by activity or globally, can also be displayed graphically. Other charts and a variety of standard project report formats can be created with this function.

Application System Project Management Costing (ASPMC) (5767-038) is a program offering that requires AS as a prerequisite. It is an application that complements the generalized functions of the AS product (in particular, the AS project management facility) by providing a project cost management tool. It has particular relevance to organizations who undertake government contracts but is also applicable in the private sector, especially where flexibility in reporting is a major requirement. See *Managing Project Costs with AS*, SH45-5018, for more information.

- **Text processing:** The flexible AS text processing function has features such as margin justification, multiple columns, section headings, control over spacing, indenting and paging, routines for standard tasks, preparation of figure lists and indexes, and creation of boxes or frames around text. Information from reports, graphs, and other AS functions can be included with a few key-strokes. The user can create text and include data at the same time.

- **Word processing:** The AS MEMO facility lets users prepare memos, letters, and reports using their own format. Other features let users highlight items, produce bulleted lists, include conditional text, use different typestyles, and incorporate AS data into documents.
- **Application development:** AS can produce results similar to those of traditional programming methods for successfully building and installing a variety of customized computer applications. Its capabilities provide for defining PF keys; designing input screens; designing menus with the ability to control cursor position, sense and take action based on cursor position, and provide windows; specifying levels of password protection for data and applications, using extensive data validation techniques, including pattern and mask functions; using arrays, logical operators, user-defined session variables, and global system values; creating and processing cyclic files; recalling command sequences with a single label; relating data from several files; prompting for values; specifying replaceable parameters; generating commands on the basis of conditions or test results; defining routines; and much more.

The Application Preparation Feature (APF) of AS has been developed in response to customer requirements to address the needs of new, inexperienced, and infrequent users of AS for a direct, easy-to-use means of preparing applications. It is a menu-driven application using APF commands and language statements available with AS Version 1.5.1. APF permits users to prepare simple applications without first learning AS syntax, through full-screen prompts and contextual help. APF is a no-charge optional feature of AS.

- **Hardcopy generation:** Printing of data files and screen images can be accomplished easily with a single program function key or with AS commands. AS offers a variety of printer options, including dot matrix, Displaywriter, and color printers. Superior quality printed output can be produced using the 6670 Information Distributor, allowing up to four typestyles within the same document.
- **National languages:** AS supports operation in numerous national languages in addition to English. Any user can change from the default language to another language either at start-up or at any time during a session.
- **Communication between ISPF and AS:** There is a two-way interface between AS and ISPF. The user can use any ISPF facility from within AS, and ISPF dialogs can pass commands and variables to AS. Via ISPF, AS offers an "open architecture." For example, AS can request service of REXX execs or COBOL programs and, alternatively, CLISTS or PL/I programs can invoke AS facilities.
- **The relational data base interface** allows the user to read, write, and update SQL/DS or DB2 data bases from within AS. It gives the user the power of AS with the capabilities of a relational data base.

Application System (AS)

- The Professional Office System (PROFS) interface allows the user to file and electronically mail final-form documents produced in AS, in both text and graphic form.
- AS can run QMF queries and import the resulting data.

Primary Users

AS can be used by a range of end users in business, industry, and government as well as by information services departments and Information Centers.

- Information users, such as managers, professional staff, and administrators, can use the AS breadth of function to help improve management, analysis, and decision making in fields like advertising, development, engineering, marketing, personnel, purchasing, and sales.
- Specialist users, such as financial analysts, project managers, business planners, and report writers, can use the depth of AS function to support specific application needs in areas such as construction, finance, planning, research, and document composition.
- Application providers, such as trained functional specialists, can use AS for quick and versatile application development to meet the needs of individuals and departments.
- Application users, such as executives, managers, clerks, and secretaries, can easily access and use AS applications developed by others. These applications can be structured entirely of questions, prompts, entry menus, and displays that are simple to follow and use. Such applications can also be accessed by PF key from a PROFS menu.

Potential Benefits

- Information services departments find that AS helps meet a number of requirements:
 - User requests: Programmers and analysts can use AS to help improve productivity over what it would be if using procedural languages for developing and maintaining a variety of applications and for fast turnaround on ad hoc requests for information.
 - Prototyping: Because AS can be an effective prototyping tool, users can be involved in the early stages of application development, testing functions, and recommending more effective approaches.
 - Internal requirements: AS can be used by the I/S department to identify, track, and present its own measurement data, personnel information, and financial considerations.
 - Managing DP projects: The comprehensive project control function of AS can be of significant value in helping management plan, track, and control the large development efforts and facility changes that frequently occur.

- Information Centers can simplify their software selection process with Application System, a single, integrated, multifunction product that can meet the sophisticated and diverse needs of a broad range of Information Center users. With AS, Information Center specialists need to install, learn, teach, and provide user assistance for only one product. That helps them provide Information Center services productively and the uniformity of AS helps foster a cohesive, self-sufficient user community.

Prerequisite Products

Hardware

AS Version 1.5.1 is designed to run on any System/370 processor that supports the VM or MVS operating system.

The configuration must include one 1600-bpi or 6250-bpi magnetic tape unit or 3480 cartridge and one terminal using 3270 protocols for maintenance functions. Between 33MB and 70MB of direct access storage in the VM environment (depending on how many national languages are being supported) or 100MB of direct access storage in the MVS environment is required for the AS system.

Software

For execution of AS in the VM/SP environments:

- VM/SP with or without High Performance Option
- GDDM-PGF Release 4 or GDDM/VM Version 2 and GDDM-PGF Version 2

For execution of AS in the VM/XA environment:

- VM/XA SP
- GDDM-VMXA

For execution of AS in the MVS environment:

- MVS/SP JES2 Version 1 or MVS/SP JES3 Version 1 or MVS/SP JES2 Version 2 or MVS/SP JES3 Version 2
- TSO/E
- ACF/VTAM
- GDDM-PGF Release 4 or GDDM/MVS Version 2 and GDDM-PGF Version 2
- ISPF
- SMP/E
- MVS/370 DEP (only needed for MVS/SP Version 1)
- MVS/XA DEP Version 1 Release 2 (only needed for MVS/SP Version 2) or MVS/XA DEP Version 2 (only needed for MVS/SP Version 2)

Ordering Information

Program number: 5767-032

Reference Material

- Installing AS, SH45-5013
- Managing AS in a VM Environment, SH45-5014
- Managing AS in an MVS Environment, SH45-5015
- The AS Library, GH45-5001
- AS General Information Manual, GH45-5000
- Relational Productivity Family, GK2T-0941
- Learning AS Release 5, SH45-5003

APL2

Main Purpose

APL (A Programming Language) is a powerful, interactive language including a wide variety of functions, and operator and debugging facilities that make it a simple-to-use, highly efficient, productive language.

This base, coupled with its file I/O capabilities, makes APL2 a good tool for both business and scientific applications. Experience has shown that APL can help the user install new applications more quickly, and at a lower cost, while bringing computing to the end user in the user's own language.

Key Functions, Facilities and Features

- Provides interactive language facilities (interpretive implementation)
- Runs under VM/SP, VM/SP High Performance Option, MVS/SP Version 1 (MVS/370), or MVS/SP Version 2 (MVS/XA)
- When under MVS/XA, APL2 takes advantage of extended addressing by:
 - Allowing user workspaces to be up to 128MB in size
 - Allowing the APL interpreter itself to reside above the 16MB line
 - Allowing the shared storage used by the shared variable processor to reside above the line. This allows the sharing of large variables with auxiliary processors
- When under TSO, APL2 can be invoked by ISPF, and APL2 applications can utilize ISPF services through an auxiliary processor supplied with ISPF
- A Session Manager, which greatly improves the usability of APL when using 3270 terminals. User interactions can be kept in a log file, which survives from session to session. Any lines in the log can be modified and re-executed. Any part of the log can be filed or printed. Commands give flexibility in displaying input and output transactions. Program function keys can be defined to generate any command or APL expression.
- A shared variable processor, which provides a generalized means of communicating with auxiliary processors or non-APL programs outside of the APL workspace environment. This is the standard way for APL to use external files and communication facilities.
- Auxiliary processors to:
 - Access to SQL/DS or DB2 relational data bases through SQL
 - Access to DL/I data bases
 - Access to GDDM for full screen support and control
 - Access VSAM files
 - Access various data sets under MVS, or CMS files under VM/SP
- Invoke selected host system commands or session manager commands
- Access main storage or an alternate input stack
- A set of included workspaces that provide:
 - Utility functions as application building blocks
 - Functions to simplify the use of shared variables and the auxiliary processors
 - Interactive creation of display panels
- Sample functions to illustrate APL programming techniques
- The comprehensive GRAPHPAK graphics functions for both scientific and business use
- Full screen editors, including XEDIT, for editing APL functions as well as variables, which are character vectors or matrices
- Selection of 12 national languages including English for APL system commands and for messages from commands and from APL language use
- General arrays
 - More flexible data structures in which each item in an array can itself be an array
- Mixed arrays
 - Characters, numbers, and logic variables (used in expert-system development) can be contained within a single array
- A four-byte character data type to accommodate large character sets such as Kanji
- Complex numbers
 - Treated as data elements processed directly by the language
- Character sorting to handle characters as well as numbers
- Generalized operators
 - Permitting users to define their own additional operators
- Selective specification of portions of arrays into which values are to be stored
- Picture format
 - An extension to the report formatting function to increase performance and to simplify report definitions
- Simplification of many expressions by allowing axes to be specified on functions such as "plus" or "minus" or "take" or "drop" or "ravel."
- Programmed error handling that provides response to errors and external events. This is an advantage for applications written for business professionals.
- Functions to aid in the conversion of applications to APL2
- Many APL applications available as FDPs, IUPs, IFPs, and POs
- Commentary permitted on every line in a defined function

Primary Users

- Problem solving by planners, analysts, forecasters, engineers, and scientists
- Data analysis by management support personnel, planners, and analysts
- Interactive program development by application programmers working closely with end users
- Interactive production computing by administrative and clerical personnel.

Potential Benefits

- Faster problem solving, data analysis, interactive program development, and interactive production computing.
- Reduced outside time sharing costs.
- Time and cost savings through new personal computing and end user applications.
- Provides interactive data analysis facilities to complement user's data base system.
- Flexibility in tailoring applications to suit user's individual needs.
- A direct end user language.

Prerequisite Products

APL2 operates under VM/SP, and MVS/SP with or without TSO/E. The functions of GDDM are required in order to use:

- Session Manager
- Session Manager Command auxiliary processor
- GDDM auxiliary processor
- Full-screen editor (for editing functions, vectors and matrices)
- The GRAPHPAK workspace

Info Center/1 operates under Application Prototype Environment under VS APL and APL2 running under VM/CMS or MVS/TSO. ADRS II operates with VS APL in all of its environments. APL/DI II operates with VS APL under VM/CMS and MVS/TSO.

Products Supported

- 3278, 3279, 3290, and 8775 display terminals with the APL feature.
- PC AT/370 and XT/370

Ordering Information

Program number: 5668-899

Reference Material

- APL2 General Information Manual, GH20-9214
- APL Personal Computing, G320-6130
- APL for the DP Professional, G320-6129
- List of APL Application Programs, G320-4267
- APL2 Migration Guide, SH20-9215

Screen Definition Facility (SDF)

Products Included

- SDF/CICS OS/VS
- SDF/CICS VSE
- SDF II MVS
- SDF II VM/SP

Main Purpose

SDF/CICS is an application development tool for the CICS/VS application programmer who wants to define or change maps and map sets for CICS/VS Basic Mapping Support (BMS). The online operation and the ease-of-use oriented functions of the program can enhance productivity by as much as 90% in map and map set development and maintenance.

Screen Definition Facility II (SDF II) is a tool for developing and maintaining screen and printer oriented objects (panels, panel groups, partition sets, AID tables and operator control tables) interactively for applications developed with or using CICS/BMS assembler macros, IMS/MFS utility control statements, ISPF panel definition, GDDM/IMD or CSP/AD (except edit and field validation).

SDF II takes advantage of the dialog manager ISPF for the IBM primary development environments MVS/TSO and VM/CMS. Customers wishing to develop and execute in a CICS environment should use SDF/CICS OS/VS.

Key Functions, Facilities and Features

SDF/CICS:

- Online definition of new maps and map sets: SDF screens are built by defining a screen layout online; the user need not code any macros.
- Online editing of maps and map sets: Maps and map sets maintained in the map specification library of SDF/CICS can be displayed, edited on the screen, and then transferred back to the library.
- A test function formats the SDF/CICS screen as it will eventually be displayed by an application program using the map.
- A demo session function allows the user to define and display a sequence of maps and pages for review.
- Two demos are included. The first shows how to create a map; the second, how to convert the map to color.
- Conversion of CICS/VS-BMS defined maps and map sets: Maps and map sets available in their CICS/VS-BMS defined macro source definition can be converted to SDF/CICS formats by means of a batch utility.

- Multiple device maps and map sets: The same map can be defined to support a selection of devices that are supported by CICS/VS-BMS.
- SDF/CICS supports extended attributes for devices (extended color, extended highlighting, programmed symbols, and field validation for 8775 only).
- Library for maps and map sets: The maps and map sets defined by the SDF/CICS user are kept in one or more specification libraries. Access to modify individual objects of the library can optionally be protected by passwords.
- Library directory support: The contents of the map specification library can be displayed to show the identification and type of library members and the date when they were created or last modified. The user can delete, rename, or copy objects; initiate the CICS/VS-BMS generation for map sets; and request printed listings of object details.
- CICS/VS-BMS map generation: CICS/VS-BMS compatible physical maps and symbolic description maps can be generated from map sets and their maps from the map specification library. The physical maps and symbolic description maps may be routed to the appropriate source and load libraries or to the library data set of VSE/ICCF.
- Page definition: A collection of maps can be assembled to form a page. The user can define, inspect, and test the page online.
- Session profiles of defaults: For an online SDF/CICS session, the user can define and establish a set of default values applicable for the session in map and map set definition and in map generation.
- Online help and tutorial: In an online error situation, the SDF/CICS system displays an error message. Pressing the program function key defined for the HELP function, the user receives additional information about the error.
- Batch utilities: The major functions of the online operation of SDF/CICS (map, map set, page, profile definition, map generation, library maintenance, and utilities) are also available in batch mode. If online operation is not possible, the user can continue to operate using the batch functions of SDF/CICS.

SDF II:

- Online SDF II functions operating under ISPF
- Productivity-oriented dialogs for the definition and maintenance of the following objects:
 - Panels (maps, format sets)
 - Panel groups (maps sets, map groups)
 - Partition sets (partition definition blocks)
 - Attention Interrupt Descriptor (AID) tables
 - Operator control tables

- For any of the following products (as applicable):
 - IMS/VS
 - CICS/VS
 - ISPF
 - GDDM
 - CSP/AD
- Migration/generation of panels in the following formats:
 - IMS/MFS utility statements
 - CICS/VS-BMS macros
 - ISPF panel definitions
 - Export file for GDDM and CSP/AD
- Conversion of panels among all the formats listed above
- LIST OBJECT functions
 - Generic search arguments
 - Sorting capability
 - Visible object descriptions
- Print utility support
 - Standard printers
 - Input for DCF
 - Utilization of 3287 features like color, extended highlighting (with GDDM print utility)
 - DBCS printer support
- Library support (SDF II objects are stored in ISPF libraries or in flat files (VM/CMS).)
- Online system administrator functions
 - Device table editor
 - National language translation support
- Usability features
 - Online help for all messages and for all data fields
 - All reference information online
 - Provision of a “fast path” facility for the experienced user
 - Ability to adjust functions to the user’s requirements by customizing window layout and by using ISPF’s features (such as PF-key assignment, split-screen mode)
 - Autosave facility
 - Provision of “included” panels that, for example, facilitate consistent panel layout by including header and footing parts
 - Skeleton panels, providing complete sets of defaults and skeleton layouts

Primary Users

SDF/CICS

CICS/VS application programmers

SDF II

- IMS/DC customers requiring an interactive screen definition tool with complete MFS support
- ISPF customers requiring an interactive editor for panel definition

- New CICS/OS/VS customers. CICS/DOS/VS customers with VM or customers who use CICS/CMS for application development on VM who have not used an interactive screen definition tool before should install SDF II.
- Existing SDF/CICS CMS customers should migrate to SDF II since SDF/CICS CMS will not be enhanced beyond CICS Version 1 Release 6.
- Existing SDF/CICS OS/VS customers can either migrate to SDF II if they want to exploit its functions, or may continue to use SDF/CICS OS/VS Release 5 during the currency of CICS Version 1 Release 7.
- Customers involved in the maintenance of CICS maps, IMS maps and ISPF panels. With the migration functions for CICS/VS-BMS macros, IMS/VS MFS language statements, and ISPF panels, old map or panel definitions can be migrated for further editing with SDF II, thus substantially reducing the maintenance effort for existing maps.

Potential Benefits

- Significant reduction in time spent on map definition – as much as 90%
- Opportunity to review and partially test final map formats during an SDF session
- Ability to review the sequence of maps and pages in user-defined order
- User knowledge of macro language not required
- Reduction in turnaround time over using CICS/VS BMS
- Reduced maintenance time of existing CICS/VS BMS defined maps
- Reduced education requirements as a result of tutorial and HELP functions

Prerequisite Products

Hardware

SDF/CICS

- A System/370, 9370, 4300, or 30XX processor supported by CICS/VS, MVS/TSO, or VSE/ICCF with VSE/Advanced Functions

SDF II

- A System/370, 9370, 4300, or 30XX processor supported by ISPF Version 2 Release 2 and MVS/TSO or VM/SP

Software

SDF/CICS

- CICS/VS and OS/VS1, MVS/370, MVS/XA, or DOS/VSE
- System assembler

Screen Definition Facility (SDF)

- System utilities:
 - DOS/VSE: MAINT, Linkage Editor
 - OS/VS: IEBUPDTE, Linkage Editor
- VSAM:
 - DOS/VSE: VSE/VSAM (5746-AM2), Release 34
 - VSAM Access Method Services
 - OS/VS: VSAM Access Method Services
- SMP (System Modification Program) in OS/VS
- MSHP (Maintain System History Program) in DOS/VSE

SDF II

- MVS/SP-JES2 or -JES3 Version 1 Release 3, or
- MVS/SP-JES2 or -JES3 Version 2 Release 1.1, or
- VM/SP Release 3 with or without VM/SP HPO Release 3
- ISPF Version 2 Release 2
- ISPF/PDF Version 2 Release 2

Products Supported

- SDF/CICS runs on all terminals with screen sizes of 24 x 80 supported for the definition of maps by the basic mapping support of CICS/VS.
- SDF II runs on all terminals with screen sizes of 24 x 80 supported by ISPF Version 2 Release 2.

Ordering Information

SDF/CICS OS/VS

Program number: 5740-XYF

SDF/CICS VSE

Program number: 5746-XXT

SDF II MVS

Program number: 5665-366

SDF II VM/ISP

Program number: 5664-307

Reference Material

- SDF General Information Manual, GH19-6087
- SDF Specifications, GH19-6115
- SDF II General Information, SH19-6457

Cross System Product Set

Products Included

- CSP/AD and CSP/AE for CICS/VS, MVS/TSO, MVS/XA TSO, and VM/SP CMS
- CSP/AD and CSP/AE for DPPX/370
- EZ-PREP and EX-RUN for IBM PC
- CSP/Query (CSP/Q)

Overview

Cross System Product is a fourth-generation language application generator that is productive and easy-to-use. It produces applications that are portable and easy-to-maintain. CSP/AD has demonstrated a significant increase in productivity over more traditional methods. CSP/AD and CSP/AE eliminate many of the steps required when creating applications using conventional methods.

Cross System Product/Application Development (CSP/AD) makes it simple for a programmer to completely define, test, and generate applications.

Cross System Product/Application Execution (CSP/AE) takes the generated program and executes it in a production environment.

EZ-PREP and EZ-RUN extend the power of the Cross System Product Set by allowing the creation of applications that will be executed in a PC or a local-area-network environment.

Cross System Product/Query (CSP/Q) allows people with no data processing training to be able to select specific data from VSAM or CMS files, format the data, and then print a report.

CSP/Application Development (CSP/AD), CSP/Application Execution (CSP/AE)

Main Purpose

- Cross System Product/Application Development (CSP/AD) is a licensed program that provides an interactive interface for defining, testing, maintaining, documenting, and generating application programs to execute with a CICS/VS, TSO, VM/CMS, or batch system. It is designed to allow both DP professionals and personnel with limited DP experience to define and generate applications via simple interactive techniques, thereby greatly improving application development productivity.
- Cross System Product/Application Execution (CSP/AE), a licensed program, provides the ability to execute any application defined and generated via CSP/AD.
- CSP/AD and CSP/AE for CICS/VS, TSO, and VM/CMS are members of the Cross System Product Set of programs. This means that with the exception of operating system differences, programs developed with the Cross System Product Set may be used in CICS/VS, TSO, VM/CMS, or DPPX/370 environments.
- CSP/AD Version 3 and CSP/AE Version 3 provide integrated support for both DB2 and SQL/DS. Version 3 of the Cross System Product Set is IBM's strategic fourth generation language for use by the DP professional in the CICS/OS/VS, MVS/TSO, VM/SP CMS, VSE/SP, and corresponding batch environments. The new version also adds improved library management and language improvements and provides support for the relational data base products.

Key Functions, Facilities and Features

CSP/AD

- Complete application program generator:
 - Interactive definition, test, documentation, and execution of application programs
 - Ability to easily prototype screens and applications
 - Trace/debug facility at development time
 - Execution of generated applications without terminating CICS
 - Integrated relational data base support for SQL/DS and DB2
 - MVS/XA exploitation
- Structured-programming support
- Concatenated source libraries for ease of development
- Self teaching:
 - Tutor mode for inexperienced users
 - Prompt mode for experienced users
 - HELP facility

CSP/AE

Operates as a transaction in a CICS/VS or SSX/VSE environment, and as applications in TSO and VM/CMS.

CSP/AD Version 3.2 and CSP/AE Version 3.2

- Improved performance
- Ease-of-use enhancements
- Application linkage improvements
- Increased batch utility and generation
- EZ-PREP and EZ-RUN as a CSP/AD feature
- LAN support

Primary Users

CSP/AD and CSP/AE are designed for those who need quick application development. The products are easy to learn, easy to use, and easy to install. They can also be used by central site personnel to generate applications quickly for distributed 4300, or 9370 systems.

Potential Benefits

- Rapid application development
- Prototyping to help ensure correct design
- Self-teaching
- Self-documenting
- Reduced time spent in testing and debugging
- Application portability among System/370, 8100, and IBM PC systems
- Host development of distributed applications
- Reduced maintenance workload

Prerequisite Products

CSP/AD Version 3.2 and CSP/AE Version 3.2

The following environments are supported:

- CICS/DOS/VS
- CICS/OS/VS
- MVS/TSO
- VM

Products Supported

CSP/AD operates in the following system configuration:

- A 4300, 9370, or 30XX processor with a minimum of 1MB of real storage
- Depending upon the operating system used, any direct access storage device supported by the Virtual Storage Access Method (VSAM) and the operating system

- Any magnetic tape drive supported by the operating system (required for installation only)
- A minimum of one 3270 1920-character display station or other compatible device with 12 program function keys

Ordering Information

Support for the MVS and MVS/XA environments is provided as an optional feature at an additional charge.

CSP/AD Version 3 for CICS/VS, TSO, and VM/CMS

Program number: 5668-813

CSP/AE Version 3 for CICS/VS, TSO, and VM/CMS

Program number: 5668-814

Reference Material

- CSP/AD and CSP/AE General Information, GH23-0500
- CSP/AD Users Guide, SH23-0501

EZ-PREP and EZ-RUN

Main Purpose

EZ-PREP and EZ-RUN are productivity tools designed for the data processing professional to extend the power and productivity of the Cross System Product Set of application generators to create applications for the IBM Personal Computer.

Key Functions, Facilities and Features

- Execution of Cross System Product host-developed applications on the IBM Personal Computer or PS/2 using DOS
- Efficient host maintenance and support of applications executing on the IBM Personal Computer or PS/2
- Support for sequential, relative record and indexed files on the IBM Personal Computer or PS/2
- Prompted inputs, HELP screens and field-level validation on entry
- Increased functions to provide most CSP Version 3 capabilities

EZ-PREP provides the capability to:

- Import and generate host Cross System Product/Application Development applications
- Import application message files
- Import and export application data files

EZ-RUN provides the capability to:

- Support local area networks
- Interpretively execute applications processed by EZ-PREP
- Import and export application data files

Use of EZ-PREP and EZ-RUN:

1. At a host processor the application developer defines and tests an application using Cross System Product/Application Development.
2. The application is prepared for transfer using the Cross System Product utilities at the host.
3. The application and any message or data files are transferred to the IBM Personal Computer or PS/2 using any file transfer utility appropriate for the user's system configuration.
4. The application is prepared for execution by EZ-PREP.
5. User application message or data files are converted for use by EZ-PREP.
6. The application is now ready for execution using EZ-RUN.

Primary Users

Organizations with a central data processing department and IBM Personal Computers installed.

Potential Benefits

EZ-PREP and EZ-RUN bring the power and productivity of the Cross System Product Set to the IBM Personal Computer environment. EZ-PREP and EZ-RUN provide the facilities to import, generate and execute applications that were defined and tested on a host computer using CSP/AD and CSP/AE. They also provide the facilities to import and export Cross System Product data files. EZ-PREP and EZ-RUN maintain the portability already established with the Cross System Product Set.

Prerequisite Products

Hardware

- One of the following IBM computers:
 - IBM Personal Computer
 - IBM Portable Personal Computer
 - IBM Personal Computer XT
 - IBM Personal Computer AT
 - IBM Personal Computer XT/370
 - IBM 3270 Personal Computer (3270-PC, 3270-PC/G, 3270-PC/GX)
 - PS/2
- 256KB for EZ-RUN and 320KB for EZ-PREP
- Two dual-sided diskette drives or one dual-sided diskette drive and one fixed disk drive (10MB minimum capacity)
- One monitor (monochrome or color) that can display at least 25 lines and 80 characters
- If printed output is desired, an IBM Personal Computer printer (or equivalent)

Software

- DOS 2.0 or later on the IBM Personal Computer or PS/2
- 3270/PC Control Program Version 1.2 on the 3270-PC
- Topview environment (optional) for running EZ-PREP and EZ-RUN
- PROFS Personal Computer Connection (PROFS/PC²) for invoking EZ-PREP and EZ-RUN (optional)
- A file transfer utility, appropriate for the user's host configuration, to transfer Cross System Product applications and data files to or from the IBM Personal Computer or PS/2
- The EZ-VU Runtime Facility (5604-157), required by EZ-PREP to provide an easy-to-use interface
- Applications defined by Cross System Product/Application Development

Ordering Information

EZ-PREP and EZ-RUN products and documentation are included as a part of CSP/AD.

Reference Material

Cross System Product Set, EZ-PREP and EZ-RUN brochure, G520-6004

Cross System Product/Query (CSP/Q)

Main Purpose

CSP/Q, a program product, is a query/report writer for the Cross System Product Set. It supports unplanned access to the same VSAM files and CMS files as CSP/AD-defined applications and allows the user to view the results of a query (in tabular or graphic format) at the terminal or in hardcopy form.

Key Functions, Facilities and Features

CSP/Q provides a means of dynamic interaction between users and their existing data. If desired, the data can be selected, formatted, and printed as a report. Further, the user may create a copy of the selected data in a new file. User interactions can be minimal to accommodate simple data requirements, or the user can use the more sophisticated query facilities in CSP/Q, which can accommodate other more complex information requirements.

CSP/Q requires minimum training to use. Menu and fill-in-the-blanks panels, together with online help panels, lead the user through every step in formulating a query and formatting its results.

Query Features

With CSP/Q, the user can query one or two files at a time. All the data items in the file(s) may be selected or the data items may be selected individually. New data items may be defined for the query results using the following features:

- Arithmetic functions:
 - Add, subtract, multiply, and divide
- Built-in functions:
 - MAX, MIN, SUM, AVG, and COUNT

Particular rows of data from the file(s) may be specified with selection conditions. Selection conditions in CSP/Q may include:

- Arithmetic functions
- Comparison operators:
 - Equal, Not Equal
 - Greater Than, Greater Than or Equal
 - Less Than, Less Than or Equal
- Special functions:
 - IN, BETWEEN, LIKE
- Logic functions:
 - AND, OR, NOT

Additional features of query are:

- Sorting up to five columns
- Descending sort
- Exclusion/inclusion of duplicate records

Formatting a Report

CSP/Q provides a number of useful features for controlling the appearance of the printed or displayed results of a query. The user can control the following aspects of the output format:

- Column headings
- Subtotals and totals
- Control breaks (up to five)
- Control break text
- Outlining
- Column width, decimal places
- Leading zeroes
- Column ordering and spacing
- Column exclusion
- Page heading and footing

Additional Features

CSP/Query provides simple, easy-to-use inquires to files because it features:

- Multiple user language styles, including menu-oriented dialogs and a subset of the SQL command language
- Menu-oriented report generation
- Results displayed online or printed
- Direct access to VSAM files
- Tabular view of data
- Saved query support
- Stored query results for later use by CSP/Query and other applications
- Access to CSP/Application Definition data definitions
- Extensive online help
- Easy-to-use interface to GDDM to display query results
- Reports formatted with SCRIPT commands
- External query results file

Primary Users

CSP/Q is designed for the non-DP trained users and for data processing professionals when unplanned access to CMS or VSAM files is required.

Potential Benefits

- Allows unplanned access to VSAM and CMS files
- Minimal training required
- Menu-oriented dialogs or command interface

Prerequisite Products

- CSP/Application Development (which requires CSP/Application Execution)
- GDDM (for graphics, which is supported by CSP/Q Release 2)

Products Supported

- CSP/Q is designed to operate in any System/370 processor with 1MB or more of processor storage.
- Any display terminal supported by CSP/AD and the underlying software environment operating in 3270 single-byte character mode may be used with CSP/Q.

Ordering Information

CSP/Q

Program number: 5668-918

CICS/OS/VS Feature

Reference Material

- General Information, GH24-5048

IMS Application Development Facility II (IMSADF II)

Main Purpose

IMS Application Development Facility II is a program product that aids in the development of application programs for data base/data communications systems. It works with IMS/VS and CICS/OS/VS to greatly simplify the task of application system development. It extends the capabilities of IMS/VS and CICS/OS/VS in the areas of data independence, access control, data integrity, and communication among application system users.

Key Functions, Facilities and Features

IMSADF II operates with IMS/VS DB/DC including DB2 and/or CICS/OS/VS with IMS/VS DB and/or DB2. It is composed of skeletal application programs, data bases, and additional modules of code and data. Applications are defined to the facility by specifications called rules, which define system access, screen formats, data base structure and segment layout, edit criteria, encode/decode of data, and the automatic transmission of messages when critical data base activity has occurred.

Interactive specification dialogs provide complete support for the development, testing, and implementation of IMSADF applications. IMSADF applications have the option of using DB2 relational data bases and/or DL/I hierarchical data bases, and VSAM data access is supported for CICS/OS/VS. An application end-user HELP facility allows the application developer to add text information which guides the end user in using the application.

Code for performing application function common to many data base/data communications (DB/DC) applications is supplied with the facility. It is these common code modules, which are selectively combined with skeletal programs under the direction of rules, that provide the desired application function. Since much code in DB/DC application programs is concerned with data organization, I/O processing, and other housekeeping, the use of common modules supplied by the system greatly reduces the amount of code that must be written to define DB/DC applications.

Key Release 2 Features:

- CICS/OS/VS processing environment support (MVS)
 - Equivalent in function to IMS/VS
 - Application portability and application compatibility
 - MVS/370 and MVS/XA support
 - CICS/OS/VS - DL/I
 - CICS/OS/VS - DB2
 - CICS/OS/VS - DL/I and DB2
 - CICS/OS/VS VSAM access support

- Pseudoconversational and nonconversational execution drivers
- BMP execution driver
- Re-entrant execution drivers
- MVS/XA exploitation
- Dynamic rule management
- National language support

Potential Benefits

IMSADF II is of special interest to the data processing director because it can help him to reduce (often by a factor of 10 to 1 or more) the manpower needed to develop applications. It can reduce elapsed development time and maintenance resources dramatically and decrease the dependence on high programming skill levels.

The application development manager and staff can benefit from:

- Simplified application programming:
 - Significant application function is obtained from common modules and is not coded for each application program.
 - Standardized menu screens and segment selection techniques permit access to data without using conventional IMS/VS and CICS/OS/VS application programs.
- Reduced program maintenance:
 - When changes are made to the specifications defining the data description, screen format, or common application code modules, only the specifications (rules) need be changed.
 - Program language statements are modified only when application-unique code is changed (usually less than 30% of an application system).
- Extended data independence:
 - All data base input and output is handled by the facility, external to application-unique code.
 - Data independence is provided at the field level.
 - Data descriptors are bound to application code at execution time.
- Comprehensive control of data base access:
 - Application users' authority to access the system and its data bases is controlled by user profiles.
- The ability to designate levels of data base access authority, from simple retrieval to the authority to delete root segments:
 - User profiles restrict data base access by transaction type, transaction ID, and intent of access (retrieve, delete, etc.).
- Flexible management of access and audit controls:
 - Input is checked for the authority of the user to enter it and the validity of its contents.

- Both user profiles and the values against which input is compared can be maintained online.
- Both the security profiles and edit criteria can be modified quickly as application requirements change.
- Automatic message generation:
 - Users of IMSADF II can establish and maintain the texts of messages and the criteria that define when and where messages are to be sent.
 - Automatic message generation occurs if previously specified changes are made to a data base.
 - Since message text and sending criteria are maintained online, both can be changed easily by an authorized user.
- A single implementation for batch and online applications:
 - Application logic is independent of input and output.
 - Batch applications can be converted to conversational online applications with a minimum of effort.

Prerequisite Products

MVS/370 or MVS/XA with IMS/VS and/or CICS/OS/VS

Products Supported

Support is provided by IMSADF II for the DB/DC Data Dictionary, for IMS Fast Path, and for color terminal operations, as well as for DB2, ISPF and PDF, RACF, and BTS.

Ordering Information

Program number: 5665-348

Reference Material

General Information Manual, GH20-6591

Info Center/1

Main Purpose

Info Center/1 is an APL licensed program that provides an integrated, unified, multifunction information center environment. It incorporates and extends the functions of the information center products: ADRS II, APLDI II, and FPS II. A full-screen interface provides access to five powerful general business functions needed by business professionals: query, reporting, data entry/validation, business planning, and business graphics.

Key Functions, Facilities and Features

Query

- SQL/DS and DB2 queries
- Inverted sequential files
- DIF files
- External data transfer files
- Stored reporting system applications
- Query/analysis using AND/OR logic including the ability to summarize, count, obtain frequency distributions, accumulate statistics, sort, cross-tabulate, rank, subtotal, and search
- Saving all queries for subsequent execution
- Consistent interface with help screens for all queries

Reporting

- Informal, formal, and patterned reports
- Defined reports including headers, trailers, computations, sorts, selection, and subtotals
- Optional automatic checkpointing
- Sixty financial routines
- Enhanced printing control via nickname files, where a nickname defines a destination
- Complete full-screen interface for all capabilities

Data Entry Validation

- Customized panel design for data entry and update, including:
 - Range checking
 - Limit checking
 - Table matching
 - Mask comparisons
 - Column relationships
- Data entry in table form

Business Planning

- Computational routines for math, finance, and statistics
- Integration with the reporting component

Business Graphics

- Graph types are:
 - Line graph
 - Surface chart
 - Histogram
 - Pie chart
 - Scatter plot
 - Bar chart
 - Stacked bar chart
- Color, pattern, and axis control
- Annotation

Primary Users

Info Center/1 can be used by all business professionals. They can do their own analysis with the system, implement applications for others to use, or use applications designed for them.

Potential Benefits

Info Center/1 offers an easy way for end-users to query, analyze and model data.

For customers with the predecessor products APLDI/ADRS/FPS installed, the potential benefits are:

- Ease of use (full screen, PF-key driven user interface with online help functions)
- National language support
- Ease of moving data from QS to RS
- SQL/DS and DB2 support
- DIF file support
- Data entry/data validation function
- Improved and extended financial routines (including FPS)

Examples of general benefits using Info Center/1 are:

- Business professionals can work more productively and test different alternative solutions to problems.
- Inexperienced end users can easily be introduced to data processing and soon be productive by using the online starter set.
- Skilled APL professionals can create sophisticated applications for other users to use.

Prerequisite Products

- VM/SP or MVS/TSO/E
- VS APL or APL2
- PL/I
- GDDM/PGF
- Application Prototype Environment
- SQL/DS or DB2 (requires APL2)

Products Supported

Terminals supported are 3270 Model 2 and above. APL keyboards are not required, except one for the systems programmer.

Ordering Information

Program number: 5668-897

Reference Material

- IC/1 General Information, GH20-0398

PL/I (Programming Language/One)

Products Included

- PL/I Optimizing Compiler: OS/VS, DOS/VS, SSX/VSE
- PL/I Checkout Compiler: OS/VS

Main Purpose

PL/I is a multipurpose programming language combining the best features of its predecessors: FORTRAN, ALGOL, COBOL, and JOVIAL. As such, it is a rich language containing more functions than most other languages. It serves many organizations as the primary language for commercial, scientific, and systems programming. It allows the professional systems programmer access to system functions, and it provides extensive facilities for dealing with storage allocation, tasking, and interrupt handling.

Key Functions, Facilities and Features

IBM's two OS/VS PL/I compilers are the Checkout Compiler and the Optimizing Compiler. They are compatible at the source code level and object modules from the two can be intermixed. The Checkout Compiler is normally used first for program creation and debugging, and the Optimizer is then used to create load modules, which are optimized for execution speed. Taken together, they provide a way to improve both programmer productivity and machine efficiency. (Both will accept source code written for earlier PL/I compilers with modifications for minor implementation differences.)

The Checkout Compiler's effectiveness is achieved through a combination of diagnosis of source program errors, program logic tracing capabilities (effective in batch and enhanced by dynamic, interactive monitoring and control facilities), and rapid response. It offers interlanguage communication.

The Optimizing Compilers for OS, DOS, and SSX/VSE bring a new level of capability and performance to the PL/I language user. They incorporate advances based on design features of proven PL/I, COBOL, and FORTRAN compilers and produce fast object code.

The DOS and SSX/VSE Optimizing Compilers offer a compatible subset of the OS PL/I Optimizer language. The principal omissions reflect differences in the operating systems.

Primary Users

As a multipurpose, procedural programming language, PL/I is suitable for commercial programmers, scientific programmers, and systems programmers, and for end users who need a personal computing language. Beginners can start with a meaningful

subset of the language, while systems programmers normally find the advanced language function they require.

Potential Benefits

PL/I Optimizing Compiler

- Problem-oriented rather than machine-oriented language because of:
 - Less hardware knowledge needed
 - Minimal machine and device dependence
 - Programmer ability to concentrate on application
 - Easier hardware conversions
- Faster overall programming
- Faster and better debugging/testing through a wide range of debugging aids
- Faster and easier maintenance through:
 - Better readability and comprehension
 - Testing facilities that may remain in the program
 - Identification of dead code and insufficient test data
- Savings in programming time and compilation and execution runs through interaction at various stages
- DOS to OS migration improved because of DOS/VS compatibility

PL/I Checkout Compiler

Increased programmer productivity in developing and debugging programs:

- During translation:
 - Extensive syntactic and semantic checking is provided.
 - Excellent diagnostic messages, in either full or shortened form, are available.
- During interpretation, the compiler acts as an execution monitor:
 - Detection and reporting of errors improves, including information such as names and values of variables in error.
 - In batch, the compiler can attempt to correct certain errors and continue processing.
 - Execution time errors can be reported in PL/I terms.
 - Flow of control can be traced.
 - Changes of value of selected variables can be monitored.
 - The PL/I Checkout Compiler is designed so that fast executing object programs can be provided.

Prerequisite Products

OS/VS PL/I Checkout Compiler

- MVS, SVS, VS1, VM/CMS, MFT, or MVT
- OS PL/I Transient Library

OS/VS PL/I Optimizing Compiler

- MVS, SVS, VS1, VM/CMS, MFT, or MVT
- PL/I Resident Library
- PL/I Transient Library

DOS/VS PL/I Optimizing Compiler

- VM/CMS, DOS/VSE, DOS/VS, or DOS
- PL/I Resident Library
- PL/I Transient Library

SSX/VSE PL/I Optimizing Compiler and Libraries

- SSX/VSE

Products Supported

OS PL/I Optimizing Compiler

- VS1, SVS, MVS, MFT, MVT, or TSO
- VM/SP

DOS PL/I Optimizing Compiler

- DOS/VS, DOS/VSE, or DOS
- Fixed block architecture devices for SAM and VSAM files, and compiler work files (VSE/VSAM is required)

OS PL/I Checkout Compiler

- VS1, SVS, MVS, MFT, MVT, or TSO
- VM/SP (programs compiled under CMS will execute under OS, but there are certain restrictions for CMS)

SSX/VSE PL/I Optimizing Compiler and Libraries

- SSX/VSE

MVS/XA

The OS PL/I Optimizing Compiler Release 5.1, OS PL/I Optimizing Compiler and Libraries Release 5.1, OS PL/I Resident Library Release 5.1, and OS PL/I Transient Library Release 5.1 enable users to use the 31-bit addressing capability of MVS/XA for PL/I transactions running under CICS/OS/VS Version 1 Release 6.1.

Ordering Information

PL/I Optimizing Compiler and Libraries – OS/VS

Program number: 5734-PL3

Optimizing Compiler – OS/VS

Program number: 5734-PL1

Resident Library – OS/VS

Program number: 5734-LM4

Transient Library – OS/VS

Program number: 5734-LM5

Optimizing Compiler and Libraries – DOS/VS

Program number: 5736-PL3

Optimizing Compiler – DOS/VS

Program number: 5736-PL1

Resident Library – DOS/VS

Program number: 5736-LM4

Transient Library – DOS/VS

Program number: 5736-LM5

PL/I Checkout Compiler

Program number: 5734-PL2

Reference Material

PL/I Optimizer

- General Information Manual:
 - OS, GC33-0001
 - DOS, GC33-0004
- Language Reference Manual:
 - OS, GC33-0009
 - DOS, GC33-0005

PL/I Checkout Compiler

- General Information Manual, GC33-0003
- Language Reference Manual, GC33-0009

COBOL (Common Business-Oriented Language)

Products Included

- VS COBOL II
- COBOL DOS/VS
- COBOL OS/VS
- COBOL Interactive Debug
- COBOL Report Writer Precompiler
- COBOL and CICS/VS Command Level Conversion Aid
- COBOL Structuring Facility
- VS COBOL Workbench™
 - CO-Maps™
 - CO-Reports™

Main Purpose

COBOL is a programming language, similar to English, widely used in the area of commercial data processing.

VS COBOL II

VS COBOL II is a licensed program for use in developing business-oriented applications in the MVS/370, MVS/XA, and VM/SP environments.

VS COBOL II allows the use of new hardware and system capabilities, to facilitate extension into other System/370 operating system environments, and to support new application development that coexists with the user's current library of applications developed under OS/VS COBOL. VS COBOL II includes many features which enhance programmer productivity. Significant features include support of 31-bit addressing, reentrant object code, structured programming language, interactive debugging capabilities, and improved object code optimization. Also included are improved interfaces with subsystem products such as CICS, IMS, and DFSORT.

COBOL Compiler and Library

The OS/VS COBOL language (except for the report writer module) and the DOS/VS COBOL language supported by IBM's program product COBOL language processors is American National Standard COBOL, X3.23-1974 (as well as X3.23-1968), as approved by the American National Standards Institute (ANSI). American National Standard COBOL is compatible with, and supported identically to, the international standard of the language.

COBOL Interactive Debug

COBOL Interactive Debug simplifies the debugging of COBOL object programs. It is used in conjunction with either the OS Full American National Standard COBOL Compiler and Library Version 4 (5734-CB2) or the OS/VS COBOL Compiler and Library (5740-CB1),

in the TSO foreground or under CMS. An interactive and batch mode symbolic debugging function is integrated into VS COBOL II, with a full-screen front end available under ISPF Version 2.

COBOL Report Writer Precompiler

This program offering allows continued use of Report Writer language with VS COBOL II (5668-958). It also assists in migration of OS/VS COBOL (5740-CB1) Report Writer source statements into COBOL source statements acceptable to VS COBOL II.

COBOL and CICS/VS Command Level Conversion Aid

The COBOL and CICS/VS Command Level Conversion Aid is a set of modules and commands designed to assist the user with the conversion of valid OS/VS COBOL Release 2 (5740-CB1) source code into VS COBOL II (5668-958) source code including CICS command-level statements; it is an effective tool in expediting this tedious and error-prone conversion process.

COBOL Structuring Facility

The COBOL Structuring Facility transforms "old COBOL logic" programs into structured programs.

VS COBOL Workbench

The VS COBOL Workbench development package is a PC-based mainframe application environment that provides the professional COBOL programmer with both IBM mainframe and IBM PC programming facilities, including interpretive execution of COBOL on the IBM PC. CO-Maps, a tool for creation of IMS/MFS and CICS/VS-BMS maps, and CO-Reports, a tool for designing reports, are PC-based products fully compatible with the VS COBOL Workbench.

Key Functions, Facilities and Features

VS COBOL II

- MVS/XA and VM/SP support
- Structured programming language
- Re-entrant object code facility
- Improved subsystem interfaces for CICS, IMS, and DFSORT
- Programs compiled with OS/VS COBOL executable with the VS COBOL II library. This allows gradual migration of program libraries to VS COBOL II.
- Improved object code optimization
- Full-screen interface to integrated interactive debugging capability

COBOL Compiler and Library – OS and DOS

Each compiler, in turn, will support the full language and features supported by previous versions of the Full American National Standard COBOL Compiler and Library. However, they contain additional enhancements, among them:

- **VSAM Support.** VSAM (Virtual Storage Access Method) is a high-performance access method equally adapted to online and batch processing, with a high degree of data security. Using COBOL, access can be sequential, random through indexing, physical sequential, or by relative record. Alternate indexes are also supported for an indexed data set.
- **FIPS Flagger.** Each nonstandard COBOL statement in a source program is identified by a FIPS flagger. This helps to ensure that COBOL source programs are written to conform to specifications defined by the Federal Information Processing Standard for COBOL.
- **Verb Profiles.** This facility eases the identification and location of verbs used in the source program. It is composed of two options: a verb summary feature and a verb cross-reference feature.
- **Execution Statistics.** This facility is both a debugging and an optimization aid. It consists of a summary of how often each COBOL source program verb is executed. All statistics are for an individual program execution and are printed at program termination. This is useful for knowing which sections of a program are heavily used and should be evaluated for efficient coding. It is of further use in monitoring whether all portions of a program have been executed during a debugging run.

COBOL Interactive Debug

COBOL Interactive Debug greatly simplifies the debugging of COBOL object programs compiled with the test option by providing facilities that assist in locating and correcting errors without recompilation. It operates in the TSO foreground or under CMS. The interactive debug user dynamically controls and monitors the execution of his COBOL program from a terminal. The interactive mode of operation is fully exploited, so that the user can temporarily alter the logic flow of his program, examine intermediate results, and experiment with various data values, without changing the source code or object code and without recompilation. The user can stop or resume program execution, even after abnormal termination of a program, at any point in time during execution.

COBOL Report Writer Precompiler

- Automatic invocation of the target compiler by the precompiler. Report Writer statements appear to be processed by the target compiler.

- A single consolidated source listing merging information from precompiler and target COBOL compiler listings.
- Translation of Report Writer source statements into non-Report Writer COBOL source code, acceptable as input to both OS/VS COBOL and VS COBOL II

COBOL and CICS/VS Command Level Conversion Aid

- Ability to convert most syntax differences between OS/VS COBOL programs and VS COBOL II
- Removal and/or conversion of BLL (base locator for linkage section) mechanism; this mechanism is used to pass addresses between OS/VS COBOL and CICS/VS. Each BLL is similar to a pointer for addressing areas with a maximum of 4096 bytes each.
- Conversion of BLL references to POINTER facility
- Elimination of conflicts between user-defined names and new VS COBOL II reserved words
- Conversion of both source programs and copy members
- A statement-by-statement diagnostic listing showing the result of the conversion process
- A facility for user tailoring and/or creating new COBOL conversion modules

COBOL Structuring Facility

- COBOL Structuring Facility uses computer science theory and artificial intelligence techniques to unravel "old COBOL logic" programs and transform them into structured form.
- It produces structured programs automatically, and provides reports that guide users in making improvements for better structuring.
- Structured procedures are easier to interpret than unstructured, thus providing potential improved quality and productivity of program maintenance.
- Modules of structured programs are identified for potential reuse in new program development.
- COBOL Structuring Facility helps enforce structured programming standards in new program development

VS COBOL Workbench

The VS COBOL Workbench package is designed to be a complete program application development system. It provides programming tools to rapidly develop, test, and run COBOL.

- Support for OS/VS (release 2.3 and earlier) and VS COBOL II (Release 1) languages or mainframe-targeted applications
- Support of unit testing of IBM host interfaces including IMS DB/DC, CICS/VS, DL/I, SQL/DS, and DB2 COBOL programs
- Features that assist in the conversion of OS/VS COBOL to the VS COBOL II environment

COBOL (Common Business-Oriented Language)

- Visual execution and debugging with the ANIMATOR COBOL source code analysis tool
- With the MICRO Focus Runtime License (6476246), COBOL programs may be distributed for departmental use on PCs.

CO-Maps

- Generates MFS and BMS macro definitions from screen images providing COBOL data division COPY statements.
- Existing BMS macro definitions can be downloaded into CO-Maps and modified to produce new maps and mapsets.

CO-Reports

- Interactive layout for printed reports on PC
- Automatic generation of COBOL data division code for report lines

Prerequisite Products

VS COBOL II

- Programs written for CICS execute with CICS/OS/VS Version 1 Release 6.0 or later.
- Programs written for IMS execute with IMS/VS Version 1 Release 2 or later. To use the extended addressing capabilities of MVS/XA, Release 3 or later is required.

DOS/VS COBOL Compiler and Library

- DOS/VSE, DOS/VS, or VM/370

OS/VS COBOL Compiler and Library

- OS/VS1, MVS (with or without TSO), or VM/370. MVS/XA requires Release 2.3 or later

COBOL Interactive Debug

- OS/VS COBOL Compiler and Library
- TSO or CMS
- MVS/XA requires Release 1.4 or later

COBOL Structuring Facility

Under MVS:

- MVS/SP Version 1 or MVS/SP Version 2
- VS COBOL II Release 1.1
- PL/I Transient Library Release 5.0 or later
- ISPF Version 2

Under VM:

- VM/SP
- VS COBOL II Release 1.1
- PL/I Transient Library Release 4.0 or later
- ISPF Version 2

Optional programs that can be helpful in operating COBOL Structuring Facility:

- ISPF/PDF Version 2 for MVS
- ISPF/PDF Version 2 for VM
- COBOL Conversion Aid (5785-AAT) or
- COBOL and CICS/VS Command Level Conversion Aid (5785-ABJ), which can be useful for ensuring input in VS COBOL II format

COBOL and CICS/VS Command Level Conversion Aid

- MVS Release 3.8, MVS/SP Version 1, or MVS/SP Version 2
- ISPF Version 2 and ISPF/PDF Version 2

VS COBOL Workbench

- DOS 2.1 or higher on an IBM PC, PC/XT, or 3270PC
- DOS 3.0 or higher on an IBM PC/AT or 3270-PC/AT

Ordering Information

VS COBOL II Compiler and Library

Program number: 5668-958

VS COBOL II Library

Program number: 5668-940

COBOL Compiler and Library – OS/VS

Program number: 5740-CB1

COBOL Library – OS/VS

Program number: 5740-LM1

COBOL Compiler and Library – DOS/VS

Program number: 5746-CB1

COBOL Library – DOS/VS

Program number: 5746-LM4

COBOL Interactive Debug

Program number: 5734-CB4

COBOL Report Writer Precompiler (Run-time Library Only)

Program number: 5798-DZX

COBOL Report Writer Precompiler (Precompiler and Library)

Program number: 5798-DYR

COBOL and CICS/VS Command Level Conversion Aid

Program number: 5785-ABJ

COBOL Structuring Facility

Program number: 5668-786

VS COBOL Workbench

Program number: 6205286

CO-Maps

Program number: 6476240

CO-Reports

Program number: 6476238

Reference Material

VS COBOL II

General Information, GC26-4042

COBOL Compiler and Library

- OS/VS General Information, GC28-6470
- DOS/VS General Information, GC28-6473

For a complete description of the COBOL language supported by IBM's program products, see:

- VS COBOL for OS/VS, GC26-3857
- VS COBOL for DOS/VSE, GC26-3998

COBOL Interactive Debug

General Information, GC28-6454

COBOL Structuring Facility

User's Guide and Reference, SC34-4080

COBOL Report Writer Precompiler

- Availability Notice, GC26-4316
- Programmer's Manual, SC26-4301
- Operations Manual, SC26-4302

COBOL and CICS/VS Command Level Conversion Aid

- Availability Notice, G320-9498
- Program Description and Operations Manual, SH20-7064

VS COBOL Workbench

- Brochure, GB34-3010

IBM Professional Work Manager

Main Purpose

The IBM Professional Work Manager provides developers and analysts with a bridge between an intelligent workstation and System/370 MVS or VM hosts. It is a cohesive integrated working environment in which developers can invoke, organize, and manage many of the functions, tools and services available on both PC and host. The Work Manager can give a data processing department a single base on which it can manage projects, create tasks, and automate activities.

Key Functions, Facilities and Features

- A consistent user interface to host and PC services
- The ability to deal with multiple hosts and the MVS and VM operating systems
- An execution environment on the PC for host and PC development
- The ability to off-load host functions to the PC, such as editing, compiling, syntax checking, debugging, or testing using PC software
- Simplified PC-to-host communications ready to tailor to your environment. Several models are provided, including:
 - Log on/log off
 - Upload/download
 - Initiation of host activity
- Automatic logging of all submitted activities
- Using the work queue, the ability to submit host or PC tasks for immediate execution or hold until a specific time
- The ability to take extensive notes
- Online tutorials, help panels, and windows
- Assistance in planning work to be done by individuals and departments
- Help in creating a "structure" tailored to the user's development process
- Easy "addition" and "deletion" of tools
- Easier standardization of work procedures
- Customization of panels, tools, and helps, using the EZ-VU II Development Facility

Primary Users

Host developers — programmers, analysts, and programming management.

Potential Benefits

The Professional Work Manager provides the ability to automate many of the routine functions performed by developers, thus reducing the level of complexity common in programming. It allows the user to select the most appropriate tool for development whether it is on the PC or the host. It can provide subsecond

response time while editing, raising the productivity of programmers due to significant improvement in the number of interactions per hour that they can perform.

Prerequisite Products

Hardware

The IBM Professional Work Manager is designed to run on a 3270 Personal Computer AT and will run on a 3270 Personal Computer Model 6 with a fixed disk and 640K of memory. The IBM Professional Work Manager functions, with the exception of the host interactions, will operate on the PC AT and the PC XT or equivalent.

Software

- PC DOS Release 2.1 or 3.1
- 3270 Personal Computer Control Program Release 1.22, 2.1, or 3.0
- 3270 PC High-Level Language Application Program Interface (HLLAPI)
 - EZ-VU II Runtime Facility (part number 6317025 — order number 5870-MMM — feature number 9384)
 - EZ-VU II Development Facility is required to customize the product's model panels. These modifications can be performed by one user for a group of users (part number 6317026 — order number 5785-MMM — feature number 9384)

Products Supported

- The EZ-VU Editor (many other editors will work)
- VS COBOL Workbench (trademark of MICRO Focus, Incorporated)
- The Professional Work Manager can invoke many PC products as long as there is adequate memory.
- The Professional Work Manager can send 3270 keystrokes to host applications responding to keyed input.

Ordering Information

IBM Professional Work Manager

Program number: 5798-DXX

Reference Material

Brochure, G320-9332

Report Program Generator II (RPG II)

Products Included

- DOS/VS RPG II
- SSX/VSE RPG II
- OS/VS RPG II

Main Purpose

RPG II is a programming language (offered as a set of program products) that is designed for a variety of commercial data processing applications. It provides an efficient, easy-to-use technique for developing programs.

Key Functions, Facilities and Features

- An integrated auto report feature that automates much of the tedious effort of report generation by:
 - Simplified specification of and automatic centering of headings
 - Easier code output specifications
 - A means of copying RPG II source statements from a library
 - A means of selecting and/or sorting records from a file, then processing those records
- Automatic assumption of input array decimal position values from the extension specification, without the need for the programmer to supply input specifications
- No need to specify input array decimal positions on the input specifications as the value will be taken from the extension specification
- TIME operation code to allow access to the system time of day as well as the system date
- CALL interface to high-level languages
- Device independence to allow greater flexibility in the assignment of input/output devices

DOS/VS RPG II only

- CICS/DOS/VS command level interface
- DL/I interface

OS/VS RPG II only

- Compiler under VS1 and MVS/370
- DOS/VS RPG II source compatibility for batch functions

Primary Users

- RPG II is important for those with responsibility for central application development for execution on smaller satellite systems.

- For DOS/VS RPG II, primary users are those who are currently using DOS RPG or DOS RPG II, or System/3 users migrating to a System/370 or 4300 processor.
- For OS/VS RPG II, primary users are those using DOS, DOS/VS, or DOS/VSE who are migrating to OS/VS or who want to have some compatibility between DOS and OS systems.

Potential Benefits

- Ease of use
- Increased productivity

Prerequisite Products

- DOS/VS or DOS/VSE
- SSX/VSE
- VS1 or MVS/370

Ordering Information

DOS/VS RPG II

Program number: 5746-RG1

SSX/VSE RPG II

Program number: 5666-274

OS/VS RPG II

Program number: 5740-RG1

Reference Material

General Information Manual, GC33-6120

Advanced Text Management System III (ATMS III)

Products Included

- ATMS III DOS/VS
- ATMS III OS/VS

Main Purpose

ATMS III is a program product providing a flexible and efficient system for the entry, editing, and document management of textual material. It offers direct interfacing with the SCRIPT/VS Formatter of the Document Composition Facility (DCF) or a separate ATMS III Formatter Feature. The Document Library Facility (DLF) can be used for archiving or for batch formatting by DCF.

Key Functions, Facilities and Features

- Provides text entry capability and the means to store and access previously entered text
- Provides extensive text document revision and formatting capability
- Can be customized with menus and validation prompts for structured keying and data handling
- Can be customized for structured correspondence with data integration from user files
- Designed for ease of use
- Contains a built-in interactive training module, LEARN/ATMS, and a lesson-authoring capability for user-generated training and help materials
- Provides output capability to archive documents and provides input to the Storage and Information Retrieval System (STAIRS/VS)
- Provides exits for integrating customer modules
- Offers a choice of formatters (DCF or ATMS)
- Offers input and output support for stations with recognition of Office System/6 language

Primary Users

- All industries
- Organizations that produce documents longer than letters on a regular basis (e.g., reports, contracts, manuals, brochures, price lists)
- Organizations with publications departments
- Organizations that produce large volumes of automated correspondence incorporating data from other application files

Potential Benefits

- Any supported terminal can be used for input and output and for transmission of messages.
- ATMS supports display terminals, which can increase productivity, particularly for editing corrections, changes, and revisions.
- The Generalized Markup Language allows the user to incorporate standard text and standard layout commands, which can reduce production time.
- The Text Feature keyboard provides improved typewriter keyboard layout, standard upper- and lowercase on the display, fast cursor, and five shift levels with ATMS user-assignable keys.
- ATMS can improve workstation productivity and reduce total production time, allowing earlier publication dates and more accurate documents.
- ATMS can reduce proofreading, saving professionals' time.
- A wide variety of output facilities are available.
- Data stored on magnetic cards and other application files can be read into the ATMS III data base.

The benefits of using ATMS in conjunction with DCF and DLF are mostly user-related:

- Fewer keystrokes are needed. Text, once entered, need not be reentered. Only changes or additions have to be entered.
- Proofreading is reduced, as only changed portions of text need to be proofread.
- Items such as tables of contents, figure lists, and references can be created and updated automatically by the system.
- No separate composition is needed for final copy. The makeup of pages for printing is a direct result of the process of document creation and markup.
- Finished material can be produced in less time. The time savings come from all of the process savings mentioned above.
- The same text can be extracted and used for other applications.
- Documents can be exchanged between computers. That is, once entered into one computer, a document can be transferred to another.
- Only authorized users can store and access information under DLF. No knowledge of operating systems is required.
- Productivity of people can be improved because:
 - Multiple copies of a document can be produced.
 - Documents are easily stored and retrieved.
 - Backup copies of documents can be made easily on demand.

Prerequisite Products

CICS/DOS/VS or CICS/OS/VS

Ordering Information

ATMS-III – OS/VS

Program number: 5740-XYL

Formatter Feature

ATMS-III – DOS/VS

Program number: 5746-XXU

Formatter Feature

Reference Material

General Information Manual, GH20-2404

Storage and Information Retrieval System (STAIRS)

Products Included

- STAIRS/VS
- STAIRS/DOS/VS
- STAIRS/CMS
- STAIRS DL/I (not available in U.S.)

Main Purpose

STAIRS is a family of program products for the storage and retrieval of text where contextual retrieval is required.

Key Functions, Facilities and Features

- Efficient and economical access to large numbers of documents
- Interactive system with rapid response
- Ability to retrieve a high percentage of relevant documents
- Step-by-step dialog making STAIRS suitable for use by professional staff or retrieval specialists
- Facilities for the creation of STAIRS data bases from machine-readable formats
- Availability of DCF spelling checker when DCF is used, to provide STAIRS-compatible input
- STAIRS-compatible input provided by Distributed Office Support System (DISOSS), ATMS III, and the Document Composition Facility (DCF) for a comprehensive text processing system
- Automatic indexing of words, as part of the data base creation process
- Full word indexing, facilitating retrieval based on document content
- Formatting of information, such as dates and personnel numbers, for selecting over ranges or within limits and for sorting
- Support of local and remote 3270 displays

Primary Users

- All industries with information retrieval requirements
- Government, legislative, judicial, and regulatory agencies
- Organizations that must record and comply with stated regulations, procedures, or practices
- Information centers for corporate records, correspondence, police files, research documents, technical manuals, journal and newspaper articles, or programming and application documentation
- Public, corporate, institutional, and school libraries
- Corporations involved in litigation

Potential Benefits

- Improved professional and management productivity
- Easy-to-use, conversational retrieval
- Interface to other text processing products

Prerequisite Products

- STAIRS/DOS/VS requires CICS/DOS/VS.
- STAIRS/VS requires CICS/OS/VS or IMS/VS.
- STAIRS/CMS requires VM/CMS.
- STAIRS also requires Sort/Merge and the PL/I Transient Library. For application of some PTFs, the PL/I Optimizing Compiler and Resident Library are required.

Products Supported

Full functional support for 3270 display system. Can operate with MVS/XA.

Ordering Information

STAIRS/DOS/VS

Program number: 5746-XR4

STAIRS/OS/VS

Program number: 5740-XR1

STAIRS/CMS

Program number: 5664-189

STAIRS DLII (not available in U.S.)

Program number: 5740-XR7

Reference Material

General Information Manuals:

STAIRS/DOS/VS, GH20-1832
STAIRS/OS/VS, GH12-5114
STAIRS/CMS, GH12-5147
STAIRS DL/I, GH12-5118

Document Composition Facility (DCF) and Document Library Facility (DLF)

Products Included

- Document Composition Facility (DCF)
- Document Library Facility (DLF)

Main Purpose

Document Composition Facility

DCF is a licensed text-processing program that is used in the preparation of printed documents. It consists of a text formatter (SCRIPT/VS) that can format documents that include SCRIPT/VS control words and Generalized Markup Language (GML) tags along with the text. The optional Foreground Environment Feature enables DCF to be used with MVS/TSO and VM/CMS as well as with CICS with ATMS III in an interactive environment. Once processed by SCRIPT/VS, these documents can be printed on any of a variety of character, line, or page printers.

Document Library Facility

DLF, a licensed program, supports the storage of text and data. When DCF is installed with DLF, SCRIPT/VS may be run as a batch job under MVS, OS/VS1, or DOS/VSE.

Key Functions, Facilities and Features

Document Composition Facility

- DCF provides for the markup, full-page composition, and printing of text documents on remote or local system printers. The text can be entered via terminals or displays interactively using ATMS III or the editing facilities available for CMS or TSO, or in the batch environment using the editing facilities available for VSE/ICCF or CICS. The formatted text can be printed on the 38XX family of Page Printers and the 4250/II ElectroCompositor, where several character sets can be intermixed, or presented on typewriter or display terminals.
- Advanced formatting functions include page layout with multiple columns, variable indentations, running headings and footings, multiple 38XX or 6670 type fonts, control of text and graphics integrating automatic generation of tables of contents and back-of-book indexes, footnote management, end-of-line hyphenation, and box outlines.
- General document handling functions include specification of revision codes, spelling verification, vertical and horizontal proportional spacing, the ability to imbed multiple source documents into a single base document, and the Generalized Markup Language (GML).
- Additional functions include table formatting, user modification of physical device tables, multipass

formatting, adjustable page margins, right revision codes, user-specified index collating sequencing, and table-of-contents and index page-break suppression. For page printers only DCF also supports typographic fonts, variable text capability, page segments as words in a line of text, and post-processor examples for multiple-up logical pages, variable text insertion and overlay creation.

- GML is used to identify the parts of the document without regard to the specific processing that is to be performed on the document(s). A starter set of GML tags is distributed with DCF to act as a sample, and it may aid the user in defining unique GML tags for documents. The advantages of using GML are:
 - Ease of document markup (GML tags)
 - Extensive formatting without extensive specification of detailed formatting codes
 - Alternative GML interpretation, with the ability to format a given document differently for different devices
- Formatting style is uniform.
- The document's structural elements are identified so that the document can be processed by other text applications.
- DCF provides an interface to the STAIRS/VS program products.
- DCF 3.2 provides the following additional functions:
 - GML tags for printing 10 bar code types on IBM Page Printers
 - Office Document Feature (ODF) which allows printing of RFTDCA documents on IBM Page Printers with AFP software functions
 - 3812 Page Printer support
 - PostScript® support

Document Library Facility

- The Document Library Facility is a repository of text or data.
- Input from many sources can be stored in the Document Library, such as:
 - Text prepared on interactive systems using a submit-to-batch facility
 - Text prepared by ATMS or other text processors
 - Input to or output from application programs
- Documents in the Library can be accessed by means of commands.
- DLF can invoke DCF to process documents that have been prepared directly for DCF.
- Data stored in the Library is protected by:
 - VSAM data set password protection
 - Passwords assigned to user documents
 - Passwords assigned to user libraries
 - A library structure that distinguishes private, project, and public libraries

Primary Users

Potential users range from secretaries and staff professionals to skilled DP users and publications professionals. Many of them currently handwrite their documents for secretarial typing.

They fall into two areas. While the two may overlap, their characteristics vary enough to warrant different considerations.

Application Development Documentation

This area represents the potential users who are currently users of DP systems. Although they are using online terminals to interact with the processor for their current tasks, they often utilize offline typing services to document their programs or work. This documentation can now be produced effectively on the same system used for their online development work.

Potential users include:

- TSO users, especially those with SPF or SPF-II
- VM/SP users, especially those with XEDIT or the Display Editing System
- CICS users with the CICS Source Program Maintenance Online II editor
- VSE/ICCF users
- APL Text Editor users
- Current users of SCRIPT/370 in CMS

These interactive systems currently have editing facilities, making it easy for the users of these systems to add document processing, complementing the other functions they are already performing on the terminal-based systems.

The current ATMS III user should consider installing DCF to benefit from the advanced formatting capabilities and 4250, 3800, 3812, and 3820 support.

The Office Document Feature (ODF) of DCF extends its powerful formatting capabilities to the office environment by converting RFTDCA documents into RFT/GML format and printing them on AFP Page Printers. These documents may be converted back into RFTDCA format for further office system processing.

Potential Benefits

- Fewer keystrokes are needed. Text, once entered, need not be reentered. Only changes or additions have to be entered.
- Proofreading is reduced, as only changed portions of text need to be proofread.
- Items such as tables of contents, figure lists, back-of-book indexes, and references can be created and updated automatically.
- No separate composition is needed for final copy. The makeup of pages for printing is a direct result of the process of document creation and markup.

- Finished material can be produced in less time. The time savings come from all of the process savings mentioned above.
- The same text can be extracted and used for other applications.
- Graphics and images can be merged with the text and printed on the 4250 and 38XX Page Printers in one pass.
- Documents can be exchanged between computers. That is, once entered into one computer, a document can be transferred to another.
- Only authorized users can store and access information under DLF. No knowledge of operating systems is required.
- Productivity of people can be improved because:
 - Multiple copies of a document can be produced
 - Documents are easily stored and retrieved
 - Backup copies of documents can be made easily on demand
 - Camera-ready copy is produced without further processing
- Ten bar code types can be created for printing on IBM Page Printers.
- DCF documents can be transformed to PostScript for printing on PostScript-supported devices.

Prerequisite Products

DCF

- For interactive use with MVS/TSO, VM/CMS, or CICS with ATMS III, the Foreground Environment Feature of DCF is required.
- For batch use under MVS, OS/VS1, DOS/VSE, or DOS/VS, DLF is a prerequisite. (Note that the Library does not operate under VM/CMS.)

DLF

- MVS, OS/VS1, or DOS/VSE for batch environments
- VSAM

Products Supported

Terminals

Terminals available for use with DCF are determined by the interactive environment supporting DCF (ATMS, CMS, or TSO).

Printers

- DCF output can be printed on the 4250 Electro-erosion Printer and 38XX Page Printers with the multiple font capabilities.
- Output can also be printed on the following line printers:
 - 1403, 3203, 3211, 4245, and 4248
 - Any printer functionally equivalent to the 1403 printer at the data stream level

MVS/XA

Release 2 and later releases of DCF and DLF can operate with MVS/XA.

Ordering Information

Document Composition Facility

Program number: 5748-XX9

Document Library Facility

Program number: 5748-XXE

Reference Material

- Executive Overview and Summary Card, GX20-2332
- DCF and DLF General Information Manual, GH20-9158
- DCF Executive Brochure, "About DCF," G520-6362
- DCF End-User Guide, "About GML," G520-6361
- DCF End-User Guide, "About Type," G544-3183

Distributed Office Support System/370 (DISOSS/370)

Main Purpose

Distributed Office Support System (DISOSS) is a licensed program that assists managers, professionals, secretaries, and support personnel in communicating, retrieving, and controlling job-related information. DISOSS is a host-based application which runs under MVS or VSE in the CICS environment and provides users with the ability to exchange electronic information (text, image, and data) via electronic mail and central filing. The DISOSS-PROFS bridge supports the exchange of both final-form and revisable-form documents between the MVS/VSE and VM systems.

Key Functions, Facilities and Features

Among the capabilities of DISOSS are:

- **Distribution Services:** the convenience of sending and receiving information electronically
- **Library Services:** the ability to store, search for and retrieve information electronically in a central host library. This can be text or image documents and data files.
- **Personal Services:** the facility to assist professional users with mail management, mail processing, and access to other applications (such as calendar and image mail processing) via the products Personal Services/370, Personal Services/36, and Personal Services/PC
- **Application Program Interface (API):** the facility to interface DISOSS and user-written CICS application programs

Primary Users

DISOSS/370, together with the 8100/DOSF system, 5520, Displaywriter, and Scanmaster I, is designed for use by all office staff personnel in all industries.

Potential Benefits

DISOSS/370 provides potential productivity for end users (administrative, professional, and managerial personnel) by eliminating redundant file, distribution, and retrieval activities:

- The mail processing functions allow the end user to review and respond to incoming mail. Documents can be transferred from the manager to the correct professional for further handling without any paper handling.
- A secretary can handle a manager's or professional's routine mail and note the action taken in the mail log. The manager or professional can then take care of the rest of the items.

- The time spent playing telephone tag with other people in the organization can be reduced greatly by the distribution services of DISOSS/370.
- Information is available to the user on a more timely basis, and physical file space can be reduced by storing documents electronically.
- Image documents, magazine articles, graphic illustrations, legal documents with signatures, or letters from outside customers can be sent through the network, thus providing almost full electronic mail capabilities.
- All types of documents (image and data) may now be stored, referenced, and retrieved from one library with one centralized, indexed storage medium to maintain and update.
- Application program interface allows users to access the document library and document distribution services to extract data or text from DISOSS/370 and distribute it to users.

Prerequisite Products

- CICS/VS/OS
- ACF/VTAM
- For 8100:
 - DPCX
 - DOSF with IBM Host Prep
 - DISOSS/8100/DOSF
- For Displaywriter:
 - Displaywriter Electronic Document Distribution licensed program (5608-SR8), which requires either TEXTPACK 4 or TEXTPACK 6
- For 5520:
 - 5520 Administrative Processing Program
- For 3270:
 - DISOSS/Professional Support

Products Supported

- 8100/DOSF/DPCX
- Interactive Display Text Facility (IDTF)
- 5520
- 5520 with IBM Personal Computer in 5253 emulation mode
- Displaywriter
- 3270
- Scanmaster I
- Operates with MVS/XA, MVS/370, or DOS/VSE

Ordering Information

On the host system:

DISOSS/370 (OS)

Program number: 5665-290

DISOSS/VSE

Program number: 5666-270

DISOSS/Professional Support (MVS)

Program number: 5796-PRH

DISOSS/Professional Support (VSE)

Program number: 5796-PWP

On each 8100 system:

DISOSS/8100/DOSF

Program number: 5661-172

On each Displaywriter:

Electronic Document Distribution Licensed Program

Program number: 5608-SR8

Reference Material

- General Information Manual, GC30-3085

DisplayWrite/370

Main Purpose

DisplayWrite/370 provides word processing functions for the professional end user. It includes a full-screen text editor/formatter that provides basic and advanced text functions for creation and revision of documents. Advanced document printing is supported for the majority of text and APA printers.

The new image and graphics feature allows inclusion of images and graphics from another document, or from the GDDM library, to produce composite documents.

Key Functions, Facilities and Features

Ease-of-use characteristics:

- Complete context-dependent help and tutorial
- The ability of users to set their own defaults
- Command lists to perform special tasks
- Split screen for viewing another or the same document
- UNDO/REDO of commands and local editing

Basic text entry and editing capabilities:

- Specifying line format and page format
- Inserting and deleting text
- Underlining, emphasizing, overstriking text
- Block commands (move, insert, copy, delete)
- Line commands
- GoTo (page number, line number)
- Tabs
- Automatic formatting/pagination

Advanced editing capabilities:

- Footnotes
- Alternating headers and footers
- Suppression of "orphan" and "widow" lines of text
- Global search/replace
- Finding and changing text
- Font selection
- Subscript and superscript
- Support for variable specification and merging
- Support for pattern letters
- Basic arithmetic functions
- Movable split point

Print Support:

- Support of the majority of text and APA printers
- Support of Intelligent Printer Data Stream (IPDS, part of SAA)
- Print selection menu in all environments
- Typographic fonts
- Printing during editing
- Immediate and batch print
- Printing selected pages

- Support of advanced print functions (such as super/subscript, proportional, drawer select, rotate, color)
- Use of DisplayWrite/370 advanced printing support by DISOSS, PS/CICS and PROFS

Multilingual linguistic aids (US, US Legal, US Medical, UK, Brazilian Portuguese, Catalan, Danish, Dutch, Finnish, French, Canadian French, German, Swiss German, Icelandic, Italian, Norwegian, Portuguese, Spanish, and Swedish):

- Hyphenation
- Spelling aid (compound word spelling aid available for German and Swiss German)
- Grammar support for US English, French and Canadian French, Norwegian, Spanish, and Swedish
- Synonyms function for US and UK English, French and Canadian French, Norwegian, Spanish, and Swedish
- Grade level analyser (US English)

National language support for all menus, HELP screens, and user messages: The following languages are supported: Brazilian Portuguese, Danish, Dutch, English, Finnish, French, German, Icelandic, Italian, Norwegian, Portuguese, Spanish, and Swedish. Languages can be selected by the user during the editing session (multilingual).

Image/Graphics feature:

- Support of composite documents with text and imbedded image and graphics components
- SHOW command, to display images and graphics
- Preview of complete documents prior to printing
- Scanning of images
- Image editing (such as scaling, inverting, rotating, mirroring)

Prerequisite Products

Hardware

- System/370, 4300, 30XX, 9370
- At least 4MB real memory
- One nine-track tape

Software

MVS:
MVS/370 or MVS/XA with either CICS/VS or TSO/E VM:
VM/SP or VM/SP HPO or VM/XA (toleration mode)
VSE:
VSE with CICS/VS

Products Supported

Hardware

- Any of the following terminals:
 - 3278 Model 2, 3, 4, or 5
 - 3279 Model 2, or 3
 - 3178, 3179, 3179G, 3180
 - 3191, 3192, 3193, 3194
 - 3290
 - 3270 PC
 - IBM PC or Personal System/2 with 3278/79 Emulation Adapter
- Any of the following scanners:
 - 3117
 - 3118
- Any of the following printers:
 - 3287 Model 1 or 2
 - 3262 Model 8 or 13
 - 3268 Model 2
 - 5210
 - 1403
 - 3800 Model 1, 3, 6, or 8
 - 4250 via DCF
 - 3812
 - 3820
 - 4224

Software

- Works with PS/370 on MVS/370, MVS/XA, or VSE with CICS/VS
- Works with PS/TSO or TSO/ISPF in the TSO environment
- Works with PROFS on VM/SP or VM/SP HPO
- Part of Document Management/VSE on VSE/SP
- The Image and Graphics feature is available under MVS-XA/CICS, MVS/TSO, MVS-XA/TSO, and VM

Ordering Information

For MVS (CICS/OS/VS)

Program number: 5665-382

For MVS/TSO

Program number: 5665-460

For VM

Program number: 5664-370

For VSE (CICS/DOS/VS)

Program number: 5666-338
(No image/graphics available)

Personal Services/370 (PS/370)

Main Purpose

Personal Services/370 is a licensed program which, together with DISOSS/370, provides office system functions for both the technical and non-technical business professional using either a 3270, 3270-PC, 3270-PC AT, or 3270-PC AT/G or AT/GX display terminal. Operating as a CICS/VS application, Personal Services/370 offers a wide range of automated office functions, including support for DisplayWrite/370.

Further, IBM intends to provide the capability for Personal Services/370 to run in a remote CICS/VS environment in the first half of 1987. This support will allow Personal Services/370 to run under a separate CICS from DISOSS/370 in the same CPU or a different CPU.

Key Functions, Facilities and Features

- Support for DisplayWrite/370
- Automatic delivery of incoming mail and status
- Support for DISOSS/370 conversion of RFTDCA to FFTDCA
- Document distribution to other PS/370 and DISOSS/370 users in a single- or multihost (SNADS) environment
- Print capabilities — personal and shared address books and distribution lists as well as documents
- Coordinator functions
 - Viewing shared documents
 - Printing shared documents
 - Printing lists of shared documents
 - Printing list of users
- implementation of in-basket and file cabinet for each user. In-basket holds recently arrived mail, documents, and messages the user wants to keep.
- Flags to indicate new mail and update status.
- Mnemonic fast path commands for the user to quickly move from task to task.
- Document library functions including:
 - Storage of documents
 - Addition of search terms to previously stored documents
 - The user can now specify a maximum number of documents to be found when the DISOSS/370 library is searched
 - Storage of references to external (nonsystem) documents
 - Deletion of documents from the DISOSS/370 host document library
 - Search and retrieval of documents in the host library
 - Display and printing of documents
 - PC files transfer
- Online user definition
- Creation and maintenance of shared documents
- Online maintenance of user defaults

- Fast-path processing of panels for experienced users
- Customizing of panels for end-user interface
- User-defined online HELP information
- Multiple distribution lists
- Online directories
- Printing of distribution lists and address books
- User exit extensions between CICS/VS applications and PS/370

Primary Users

PS/370 is designed for use by technical and nontechnical business professionals in all industries who require office systems functions.

Potential Benefits

Personal Services/370 provides potential productivity for end users (administrative, professional, and managerial personnel) by eliminating tasks and decreasing redundant activities:

- The mail processing functions allow the end user to review and respond to incoming mail. Documents can be transferred from the manager to the correct professional for further handling without any paper handling.
- The time spent playing telephone tag with other people in the organization can be reduced greatly by the distribution and message services of PS/370.
- Information is available to the user on a more timely basis, and physical file space can be reduced by storing documents electronically.
- Text and data documents may be stored, referenced, and retrieved from one library with one centralized, indexed storage medium to maintain and update.
- Application program interface allows users to access the document library and document distribution services to extract data or text from DISOSS/370 and distribute it to users.

Prerequisite Products

Hardware

Any System/370, 4341, 4361, 4381, or 30XX Processor with 4MB of real storage that meets the minimum requirements for either of the prerequisite operating systems, MVS (370 or XA in 24-bit addressing mode) or VSE, CICS/VS, and DISOSS/370.

Software

Personal Services/370 uses the existing interfaces of CICS/VS, DISOSS/370, and GDDM for display management. It operates with the following programs or subsequent releases, unless otherwise specified:

- MVS
 - MVS/SP-JES2 Version 1 Release 3.3
 - MVS/SP-JES3 Version 1 Release 3.3
 - MVS/SP-JES2 Version 2 Release 1.2 (supported in 24-bit addressing mode)
 - MVS/SP-JES3 Version 2 Release 1.2 (supported in 24-bit addressing mode)
 - ACF/VTAM Version 2 (MVS) Release 1
 - CICS/OS/VS Version 1 Release 6
 - DISOSS/370 Version 3 Release 3
 - GDDM Release 4
- VSE
 - VSE/SP Version 2 Release 1
 - VSE/Advanced Functions Version 2 Release 1
 - VSE/POWER Release 2
 - ACF/VTAM VSE Version 2 Release 1
 - VSE/VSAM Release 3
 - CICS/DOS/VS Version 1 Release 6
 - DISOSS/370 Version 3 Release 3
 - GDDM Release 4

Products Supported

Information Display System devices when attached via CICS:

- 3270-PC (supported in DFT mode only for file transfer)
- 3178
- 3179
- 3180
- 3278
- 3279
- 3290
- 8775

Printers in both 3270 and SCS mode:

- 3262 Models 3 and 13
- 3268 Model 2
- 3286 Model 2
- 3287 Models 1 and 2
- 5210 Models G01 and G02

DisplayWrite/370

Ordering Information

Personal Services/370 (MVS/370 and MVS/XA)

Program number: 5665-330

Personal Services/370 (VSE)

Program number: 5666-318

Reference Material

Introducing Personal Services/370, GC30-3292

Professional Office System (PROFS)

Main Purpose

PROFS is a licensed program that assists managers, professionals, secretaries, and support personnel in creating, communicating, retrieving, and controlling job-related information. The product also gives users the ability to access other electronic business tools such as graphics, engineering drawings, and spreadsheets. PROFS consists of VM/SP-based application programs that allow office functions to be performed on the same terminals used for interactive problem solving.

PROFS, with its application support feature, PASF, provides easy access to office, text, and decision-support application functions (see the PASF product description in Section 41).

Key Functions, Facilities and Features

Among the capabilities of PROFS are:

- Distribution services — The convenience of sending and receiving written communications (text, graphics, drawings) locally or over long distances electronically from an unlimited number of diversified workstations
- Library services — The ability to store and retrieve notes, documents, and statistics electronically at the host for instant accessibility at the workstation
- Personal services — Assistance in scheduling appointments, maintaining personal and departmental calendars, and providing automatic reminders and unlimited access to electronic telephone directories and bulletin boards
- Integrated information system — Providing the user with an increased ability to manage information quickly through improved communications channels
- Final-form and revisable-form document and note interchange with DISOSS and System/36 users
- Integrated interface to DisplayWrite/370 as an additional document preparation facility
- The PROFS PC Support Feature allows users of the IBM Personal Computer family to have access to the powerful functions of PROFS. Used in conjunction with PROFS at the host, this feature provides the intelligent-workstation user with access to many PROFS functions while using the PC.
- The PROFS Application Support Feature provides comprehensive host and PC-based integrated office solutions to deliver personal services, decision support, text, and data access in an easy-to-use system.

National Language Support

The variety of products available for use in the PROFS environment gives rise to concern when national language support issues are added. Readers should be aware of the differing levels of support available.

PROFS: Translated versions of PROFS are available for French, German, Dutch, Italian, Brazilian, Spanish, Canadian French, Portuguese, and Norwegian.

PC products: Products such as the DisplayWrite series and DOS are translated into five major languages only. These are U.K. English, French, German, Italian and Spanish. Availability and dates vary by product and should be checked prior to ordering.

The reader should exercise caution when ordering national language versions of products and at least ensure that any mix of languages in the interfaces presented to the end user will be acceptable.

Users whose languages are not supported by PC products may also encounter problems in the display and printing of language-specific special characters.

The PROFS environment that includes 3270, PC, and Displaywriter is a complex one. The reader is advised to consult an office systems specialist prior to ordering a mix of these products.

Primary Users

- All industries
- Executive, managerial, and professional end users, and their support staffs
- VM/SP-based departments and installations
- In-house information centers and time-sharing departments

Potential Benefits

PROFS functions enable specific productivity improvements for end users:

- Decrease redundant or wasteful activities such as excessive time spent searching for documents, incomplete telephone calls ("telephone tag"), proofreading for spelling errors
- Improve communications among end users via electronic mail functions
- Provide single-terminal access to text and data files
- Speed up decision cycles by providing faster access to needed information
- Broaden management's span of control by allowing information to be distributed to more people faster

- Reduce copier requirements for electronically managed documents
- Speed up document preparation cycle from initial entry through final output, using memo preparation facilities, draft document review, and final output on quality printers

Reference Material

- Introducing PROFS Version 2, GH20-6795
- PROFS Version 2 Specifications, GH20-6803

Prerequisite Products

Hardware

- A VM/SP supported System/370, 4300, 303X, 308X (in System/370 mode only, 3084 in a partitioned configuration only), or 3090 Model 150, 180, or 200 (in System/370 architecture mode)
- A DASD device supported by VM/SP
- One nine-track tape drive to install PROFS

Software

- VM/System Product
- RSCS Networking
- DCF and Foreground Environment feature for CMS
- VM/SP High Performance Option where required
- ISPF for control file and system administration aids

Products Supported

- 3270 display stations and printers
- 3101, 3161, 3163, and 3164 Display Terminals (in character transmission mode)
- 328X Printers through RSCS
- 5210 Model G1 or G2 Printer
- VM/SP or VM/Entry system printers
- An interface for adapting printer output for final printing on the 6670 Information Distributor
- The Displaywriter with 3277 Device Emulation/Document Transfer, supported as a 3277 Model 2 or, with the 3270 Attached Workstation Adapter Feature, supported as a 3278 Model 2. With the Host Displaywriter Document Interchange PRPQ (5799-BKE), document transfer between PROFS and Displaywriter is also supported.
- IBM Personal Computers through the PROFS PC Support Feature (5664-309) or PROFS Application Support Feature. A host PROFS session is required to transfer PROFS mail or other files, or to use PROFS or VM functions not available at the PC.

Ordering Information

PROFS Version 2

Program number: 5664-309

Professional Office System Applications Support Feature (PASF)

Main Purpose

The PROFS Applications Support Feature is a full-screen menu-driven facility that provides easy access to office, text, and decision-support application functions. This feature of PROFS further expands the product-integration capability provided in PROFS between PROFS and DisplayWrite/370 by integrating the major decision-support capabilities of Application System (AS) and Query Management Facility (QMF). When used with AS and QMF, it offers an integrated office, text, and decision-support application solution for both the enterprise-end-user and departmental-system environments.

PASF provides QMF integration and support for the IBM Personal Computer family as intelligent workstations with menus consistent with host support and transparent access to both host and personal-computer applications. Usability enhancements in the area of personal services and decision support are also included.

Key Functions, Facilities and Features

- PC menu interface to office, text, and decision support applications on both host and PC
- Ease of use in file transfer and exchange of documents between PC and host products
- Searchable online telephone directory
- Electronic bulletin board for the posting of company news items
- Full-screen desk calculator with electronic "paper tape"
- Fast path and quick exit
- Help screens and message helps
- Addition of PC applications and tailoring encouraged by menu structure
- Improved decision support options including application system project management menus
- Integrated relational data base access through QMF, which provides menu-driven query and report writing
- Additional usability enhancements

Prerequisite Products

Hardware

Host machine:

Any IBM System/370 Processor that meets the minimum requirements for the prerequisite operating system VM/SP, and for PROFS. One 9-track tape or 3840 cartridge is required for installation.

PC machine:

The PC interface of the PROFS Applications Support Feature is a DOS-based solution that supports Personal Computer XT, PC XT Model 286, Personal Computer AT, 3270 Personal Computer, 3270 Personal Computer AT, and Personal System/2 Models 30, 50, 60, and 80 in communication with a VM-based System/370 environment (on a 303X, 308X, 309X, 43XX, or 9370 system) running the PROFS Applications Support Feature.

Software

Host:

- VM System Product (VM/SP) Release 4 or 5
- PROFS Version 2 Release 2 Modification Level 1
- Interactive System Productivity Facility (ISPF)
- The 3270 File Transfer Program is required for the PC interface of the PROFS Applications Support Feature.

PC:

- IBM Personal Computer XT, Personal Computer AT, or PC XT Model 286 with:
 - IBM DOS 3.2 or higher
 - IBM PC 3270 Emulation Program, Entry Level 1.2
 - IBM DOS 3.30
 - 3270 Workstation Program 1.0 and 3270-PC High Level Language Application Program Interface
- 3270 Personal Computer XT or 3270 Personal Computer AT with:
 - IBM DOS 3.10 or higher
 - 3270 Control Program 3.0
 - 3270-PC High Level Language Application Program Interface Version 3.0
 - IBM DOS 3.30
 - 3270 Workstation Program 1.0 and IBM 3270-PC High-Level Language Application Program Interface Version 3.0
- IBM Personal System/2 Model 30, 50, 60, and 80 with:
 - IBM DOS 3.30
 - IBM PC 3270 Emulation Program, Entry Level 1.2
 - 3270 Workstation Program 1.0 and 3270-PC High-Level Language Application Program Interface Version 3.0
- EZ-VU Runtime Facility Version 2

Ordering Information

Program number: 5664-309

Reference Material

Getting Started with the Professional Office System
Applications Support, SH20-7250

Installing and Managing Professional Office System
Applications Support, SH20-7251

Licensed Program Specifications, GH20-7252

Voice/Text Message System (VTMS)

Main Purpose

VTMS is a program offering providing a complete messaging package for the VM-based environment. The Voice/Text Messaging System can be installed as a standalone program or can supplement other IBM products by providing one-stop messaging through the personal workstation.

Key Functions, Facilities and Features

The Voice/Text Messaging System provides the following message services:

- Timely and informative telephone message-taking facilities
- Flexible, full-function messaging services for subscribers
- No additional hardware requirements for users who already have 3270 full-screen device connected to VM or for users who have dial-up capability on line-by-line ASCII device
- PROFS note compatibility
- VM networking of messages (to another VM system or an MVS system)
- Two-way new-message notification with PhoneMail (one-way notification when using PROFS, from PhoneMail to PROFS)
- Retrieval of voice message header information from PhoneMail

Primary Users

- All VM-based environment users
- Organizations desiring a centralized message center for an establishment or department
- Organizations desiring to tie their voice and text messaging systems together (such as PhoneMail and PROFS)
- Organizations with 327X networks

Potential Benefits

- Provides quick, informative and friendly messaging services without additional hardware
- Provides PROFS-compatible incoming call messages
- Provides new voice mail notification through VM, which reduces the need for calls to PhoneMail from subscribers wanting their current mail status (particularly applicable to non-ROLM PBX installations)
- Provides messaging services on either a 3270 full-screen device or a device running asynchronously in line-by-line ASCII dial-up (for example, a 3101 Model 1 in character mode, an IBM PC, or many of the non-IBM CRT display terminals)
- Provides easy-to-use signout procedures

- Introduces non-VM users to the world of VM in a user-friendly manner

Prerequisite Products

Hardware

- VTMS will run on any IBM hardware system, including the 9370, that supports VM/SP Release 3 or above.
- Other hardware includes:
 - 3270
 - Display devices that emulate the 3270
 - IBM PC

Software

- VM/SP with REXX (Restructured Extended Executor Language) support

Ordering Information

Program number: 5796-PZB

Reference Material

- Program Description/Operations Manual, SH20-6524
- Installation Guide, SH20-6525
- Reference Card, GX20-0200

Section 42. Application Support Subsystems

DATABASE 2 (DB2)

Main Purpose

IBM DATABASE2 (DB2) is IBM's relational data base management system for the MVS/SP™ Version 3 (MVS/ESA™) and MVS/SP Version 2 (MVS/XA™) environments.

The DB2 licensed program is a complete, full-function, data base management system. It may be used to implement decision support systems as well as traditional applications, allowing greater productivity for both programmers and end users. It is also particularly useful where applications requirements and data structures are subject to frequent changes.

DB2 provides direct access to an enterprise's data resources (IMS, DB2, VSAM) for an ever-increasing number of data processing users (such as engineers, planners, forecasters, analysts, managers).

Key Functions, Facilities and Features

- DB2 provides full recovery capabilities in case of system, storage media, or application program failures.
- Multiple users can concurrently access and make changes to data (update, delete, and insert) within the same DB2 table. DB2 guarantees data consistency not only within the database but also as it is perceived by each of the multiple concurrently executing users.
- Authorization services ensure that all access to and manipulation of data (and other resources) is in accordance with specified constraints on both users and programmers and allows for specification of data security based upon data content.
- A user-accessible catalog, which is an active repository, contains information about all the system and user objects of interest to DB2.
- Access path selection is performed automatically by the system.
- A high degree of data independence allows many logical and physical changes to be made without requiring that application programs be recoded.
- The SQL language provides functions such as AVERAGE, MINIMUM, MAXIMUM, SUM and COUNT to improve programmer productivity.
- DB2's utilities can be invoked online and can execute without requiring that DB2 be quiesced.
- Partitioned data bases with partial recovery, as well as partial reorganization and partial backup, allow for faster recovery and greater availability.
- The DL/I Batch interface supports access to DB2 with read and write integrity.
- DB2 can be used in an XRF environment. Switching of DB2 transaction work to an alternate system is supported by either CICS/MVS or IMS/VS DC.

DB2 Version 2 Enhancements

- Relational enhancements
 - System enforcement of referential integrity
- Performance enhancements
 - Extended use of MVS/XA and MVS/ESA facilities resulting in improved efficiency of system resources
 - Significant improvements in transaction processing capabilities
 - Advances in query optimization, access path selection, and execution performance
 - Create-index enhancements offering increased tuning flexibility
 - Substantially faster sorting of large data volumes
- Operational enhancements
 - Flexibility of system control and authorization
 - DB2 governor to limit CPU resource consumed by a dynamic query
 - Selective audit trail capability
 - More flexible data storage organization technique
 - Enhancement to utilities across the entire recovery scenario
 - Improved unique index processing in the LOAD utility
- Reliability, availability and serviceability enhancements

Potential Benefits

- DB2 takes advantage of the facilities provided by the MVS/ESA and MVS/XA operating systems.
- DB2 supports the key online environments, TSO/E, IMS/VS, and CICS/VS.
- A single high-level data access language, SQL (Structured Query Language), is used for programming in either high level language or interactive mode. In addition, the same syntax is used to define and control the system.
- High-level interfaces to underlying subsystems (for example, VSAM) are provided to simplify DASD space allocation and VSAM data set definition.
- DB2 supports disk logging for automated recovery. Dual logging may optionally be used for availability.
- The extensive online HELP facilities assist all categories of users.

DATABASE 2 (DB2)

Prerequisite Products

The following is a partial list:

For Both MVS/XA and MVS/ESA Environments

- DFSORT Release 9
- To use DB2 Interactive (DB2I)
 - ISPF
 - ISPF/PDF
- SMP/E Release 4
- MVS/SP-JES2 or -JES3 Version 2 Release 2
- MVS/XA DFP Version 2 Release 3
- To use linear data set (LDS) support
 - MVS/XA DFP Version 2 Release 3
- MVS TSO Extensions Release 3

Products Supported

Hardware

An IBM processor supported by MVS/SP Version 2.2.0 or MVS/SP Version 3

Software

- Query Management Facility (QMF)
- Cross System Product (CSP)
- Application System (AS)
- DATABASE2 Performance Monitor (DB2PM)
- Data Extract (DXT)
- Data Base Edit Facility (DBEDIT)
- Information Management System/VS (IMS/VS)
- Customer Information Control System/OS/Virtual Storage (CICS/OS/VS)
- Customer Information Control System/MVS (CICS/MVS)
- Resource Access Control Facility (RACF)
- Info Center/1 (IC/1)
- The Information Facility (TIF)
- COBOL, PL/I, FORTRAN, Assembler, APL2, IBM BASIC/MVS
- IMS Application Development Facility II (IMSADF II)
- IMS Batch Terminal Simulator (BTS)
- Data Dictionary – DB2 Interface
- Data Base Migration Aid Utility
- Data Facility Hierarchical Storage Manager (DFHSM) in a MVS/XA DFP Version 2 environment
- DB2/VSAM Transparency (MVS/XA only)
- Data Base Relational Application Directory/MVS (DBRAD/MVS)

Ordering Information

Program number: 5665-DB2

Reference Material

- DB2 General Information Manual, GC26-4373

Data Extract (DXT)

Main Purpose

Data Extract (DXT) is a licensed program that allows the user to extract selected operational data on a periodic or one-time basis. The operational data may be in a DL/I hierarchical data base, a VSAM file, a physical sequential file, or with Version 2, a DATA-BASE 2 (DB2) or SQL/DS-VM relational data base. This extracted data may be put into a relational data base for easy access and reporting by products such as Query Management Facility (QMF). The extracted data may be moved from different subsystems on the same processor, between subsystems on different processors, or may even be stored elsewhere as defined by the installation's needs.

Key Functions, Facilities and Features

- End-user dialogs
Easy-to-use dialogs, similar to those of Query Management Facility (QMF), that allow end users without data processing experience to create extract requests. There are:
 - Panels that prompt the user for information needed to build an extract request
 - Model extract statements that may be tailored to the user's needs
 - Panels that help the user with JCL, including sample JCL
 - Object sharing to allow users to share a common set of saved JCL files, extract requests, and data description requests
 - JCL/JCS/subsystem nickname support to allow users to use a meaningful nickname when referring to the target location of a table
 - Model EXEC/CLISTS to facilitate the use of DXT by other products
- Extract from relational data bases
Using the Relational Extract feature, provides support for extracting from IBM's relational data bases, with DB2 in the MVS environment and SQL/DS in the VM environment.
- IMS partial path extraction
Allows extracting fields from a high-level segment occurrence even where there are no subordinate segment occurrences along the defined extraction path.
- Multi-file and multi-path
Provides for joining up to 16 files or paths.
- Data reformat utility
Transforms the byte record format, which is created when extracted data is written to an output job, into a one-row-per record format. This allows, for example, sorting on the data prior to loading it into a DB2 or an SQL/DS table.
- Integration exchange format
Can produce output in a self-defining format called integration exchange format (IXF), a data exchange format for relational use. Programs may read or produce IXF files to facilitate exchange of data without regard to specific database or file formats.
- Output enhancements and extensions
Permit specifying relational loader options for extract requests.
- List command for extract requests
Allows querying the EXTLIB for all extract requests meeting user-specified qualifications. This will help operations personnel make improved scheduling decisions for the data extract manager (what data to address, priority, and output limit). In addition, the user may determine the status of all submitted extract requests with one LIST command, rather than multiple STATUS commands.
- Limit field format error messages
An EXTRACT statement option to enable the extract request submitter to control how many field-format-error messages are generated during an extraction.
- Double byte character set (DBCS) names for target tables
In order to fully support the table names and column names supported by DB2 and SQL/DS, allows DBCS names as table and column names in the INTO clause.
- Support for relational data types. Date, time, and timestamp data types are supported for use with DB2 and SQL/DS. Single-precision floating point data type is supported for use with DB2.
- National language support enabling
- Full Boolean logic support for extract requests against nonrelational data. Full use of AND, OR, NOT, and parentheses is permitted within the WHERE clause of SQL statements.
- Bridge to Data Extract Assist Tool (DXTA) (5798-DZP)
- Japanese translation

Potential Benefits

DXT provides an easy-to-use, system-wide solution to data access requirements.

Data Extract (DXT)

Prerequisite Products

MVS/370 Environment

- OS/VS IEBCOPY Utility
- OS/VS Linkage Editor
- MVS/SP-JES2 Version 1 or later, or MVS/SP-JES3 Version 1 or later
- MVS/370 DFP
- ISPF-MVS Version 2 Release 2
- ISPF/PDF-MVS Version 2 Release 2
- SMPE or SMP4 for installation under MVS
- OS/VS TSO Data Utilities (DXT dialogs)

MVS/XA Environment

- MVS/SP-JES2 Version 2, or MVS/SP-JES3 Version 2 or later
- MVS/XA DFP Release 1.1 or later
- ISPF-MVS Version 2 Release 2
- ISPF/PDF-MVS Version 2 Release 2
- SMPE or SMP4 for installation under MVS
- OS/VS Data Utilities (DXT dialogs)

VM/SP Environment

- VM/SP with or without HPO
- ISPF-VM/SP
- ISPF/PDF-VM/SP

Products Supported

- SQL/DS
- DB2
- OS/VS DB/DC Data Dictionary
- IMS/VS
- RACF
- OS PL/I Optimizing Compiler
- OS/VS COBOL
- CICS/OS/VS
- QMF
- Data Extract Assist Tool
- IBM TSO/E Servers/Requesters
- Application System
- IBM CMS Servers/Requesters
- RSCS

Ordering Information

Data Extract Version 2

Program number: 5668-788

Graduated charges are available.

Reference Material

General Information Manual, GC26-4241

Data Language/I DOS/VS (DL/I)

Main Purpose

DL/I is a data base management system that provides a means of reducing application program and file maintenance while, at the same time, allowing more sharing of data by multiple programs and users. This should result in both improved programmer productivity and better service throughout the I/S organization.

DL/I should be considered for major new operational applications, or when a rewrite is necessary. DL/I is particularly suited to applications having complex processing requirements and highly structured, fixed data relationships.

SQL/DS, a relational data base management system, compliments DL/I in the VSE environment, and should be considered for applications where the data has a less complex structure and where end user access to data is important. For SQL/DS users, DL/I provides a documentation aid for DL/I data base definitions and a facility to generate extract definitions.

Key Functions, Facilities and Features

- Data independence means that new fields or segments of data can be added to existing data bases, and changes can be made to record sizes, blocking factors, space allocation, and access methods used – all without application program modification.
- Device independence allows the storage device used for the data base to be transparent to the application program. Supported devices include fixed block architecture DASD for 4300 Processors.
- Each application program is described in a program specification block (PSB). PSBs are used to provide central control over the data bases used, type of data used, and operations allowed on each used data base.
- Each data base structure and organization is described in a central data base description (DBD). This allows changes to be made just once instead of in every program using the data base.
- PSBs, DBDs, and data base structures are built by utility programs according to user's specifications.
- The application program issues a call statement to DL/I to gain access to a data base. DL/I controls actual access to data base(s).
- DL/I provides sequential, indexed sequential, indexed direct, and direct access to data.
- CICS application programs may access DL/I data bases. DMS/CICS/VS application programs may access DL/I data bases in a DOS/VS environment.
- Multiple partition support allows application programs in different partitions to access the same DL/I data base concurrently when it is used with CICS/DOS/VS.
- Program isolation allows concurrent updates of different data base segments of the same type, when DL/I is used with CICS/DOS/VS.
- Concurrent batch and online operation are supported by CICS/DOS/VS.
- CICS Intersystems Coupling is supported by DL/I DOS/VS.
- Through logical relationships, DL/I DOS/VS can simplify the processing of multiple data bases and eliminate maintenance requirements for the pointers that link them. With this capability, DL/I can handle network data structures.
- Through secondary indexes, multiple views of the same data can be provided by allowing any data element to be used as the key in direct access to data base records. This allows the use of an inverted approach to data structures whenever appropriate.
- A data security facility controls the data each application program is permitted to access and what kind of processing (delete, replace, insert) it is allowed to perform.
- Data base logging and recovery utility programs are provided to assist in data base reorganization and data reconstruction with the log being kept on tape or disk.
- DL/I programs may be developed interactively under VM/CMS or VSE/ICCF (DOS only).
- Interactive development of DL/I control blocks with the Interactive Macro Facility (IMF) greatly simplifies the task of preparing DBDs, PSBs, and ACTs (DOS/VS only).
- A high-level programming interface (HLPI) provides a simple, easy-to-understand and easy-to-use interface for COBOL and PL/I application programmers.

Primary Users

The use of a data base is recommended for all DOS/VS, DOS/VSE, or SSX/VSE users of System/370, 4331, 4341, 30XX, and 9370 either for batch user programs or for online transaction-oriented applications. DL/I and SQL/DS are IBM's primary data base management systems in the DOS/VSE and SSX/VSE environments.

Potential Benefits

- Reduced program maintenance due to data and device independence
- Simplified creation and maintenance of new applications
- Equipment flexibility because of device independence
- Improved programmer productivity
- Increased data integrity and security
- Reduction of redundant data
- More complete sharing of data throughout the organization
- Availability of a large selection of applications that use DL/I data bases

Prerequisite Products

- VSE/AF Release 3 (or later)
- VSE/VSAM Release 2 (or later)
- CICS/DOS/VS Release 1.6 (or later)
- Sort/Merge (5746-SM2)
- VM/370 for DL/I under CMS

Products Supported

- Cross System Product (CSP)
- Application program languages:
 - PL/I, COBOL, Assembler, RPG II
- DL/I DOS/VS Space Management Utilities (5746-PFK)
- DB/DC Data Dictionary
- Query.DL/I (5785-EDA)

Ordering Information

Program number: 5746-XX1

Reference Material

- General Information Manual, GH20-1246
- Guide for New Users, SH24-5001

Query.DL/I

Main Purpose

The Query.DL/I licensed programs extend the data systems environment by providing a user-friendly facility for making queries directly against DL/I data bases.

Key Functions, Facilities and Features

- Query.DL/I provides a facility for query against operational DL/I data bases including fast path data bases (IMS/VS) in MVS and VSE environments.
- Three versions of Query.DL/I run under IMS/VS, CICS/OS/VS, or CICS/DOS/VS.
- There is no requirement to learn a computer language. The user needs no prior knowledge of DP and will require minimal training.
- The new user is assisted by tutorials. There are help screens for the occasional user. More experienced users are provided with shortcuts through the dialogs where appropriate.
- The user need not be familiar with the physical organization of the data.
- Secondary indexes and logical relationships are automatically optimized.
- The input to a query may include the results of previous queries.
- The query definition may be saved for later reuse.
- Query.DL/I will optionally use the data definitions in DB/DC Data Dictionary.
- Each installation may tailor the screen content and format.
- The system is readily translatable to languages other than English, and may also function in multi-lingual mode.

Primary Users

For users with a need to query data that is up-to-the-minute, Query.DL/I complements other IBM data systems offerings by allowing online access to operational data in DL/I data bases.

Potential Benefits

Query.DL/I provides:

- A simple-to-use facility that allows the user to query DL/I data bases without involving the data processing department
- A means of creating up-to-date reports on operational DL/I data bases

- Users of DL/I-based application packages (such as COPICS) with the ability to enhance their systems without writing programs
- A powerful debugging aid for DL/I application programmers

Prerequisite Products

Hardware

Processors supported by Query.DL/I are those supported by MVS/XA, MVS/370, and VSE/SP, with a minimum capacity equivalent to 4381 Model Group 11.

Terminals supported by Query.DL/I are those that comprise the 3270 Information Display System.

Software

Query.DL/I will execute under the following programming system environments:

- MVS/XA
 - MVS/SP-JES2, Version 2
 - MVS/SP-JES3, Version 2
- MVS/370
 - MVS/SP-JES2, Version 1, Release 3
 - MVS/SP-JES3, Version 1, Release 3
- VSE/SP

Query.DL/I is designed to operate as an application program under the following DB/DC environments:

- IMS/VS-DB/DC
- CICS/OS/VS and IMS/VS-DB
- CICS/DOS/VS and DL/I DOS/VS

Ordering Information

Query.DL/I for CICS/OS/VS or IMS/VS

Program number: 5665-462

Query.DL/I for CICS/DOS/VS or VSE/SP

Program number: 5666-351

Reference Material

- Licensed Program Specification, CICS/DOS/VS, GH19-6571
- Query.DL/I Primer, SH19-6544
- Query.DL/I User's Guide, SH19-6545
- Query.DL/I Installation and System Reference for CICS/DOS/VS, SH19-6548
- Query.DL/I Training Guide, SH19-6561

Information Management System/VS Data Base Facility (IMS/VS-DB)

Products Included

- IMS/VS Version 1 Release 3
- IMS/VS Version 2

Main Purpose

- IMS/VS-DB is a full-function data base management system. It is the foundation of an IBM data systems environment. It is designed to allow large data processing installations to gain a high degree of file integration and data sharing as a base for the development of a wide range of business applications.
- IMS/VS-DB, although extremely useful in a batch-only operation for data storage, data manipulation and data protection, is most often combined with either IMS/VS-DC or CICS/OS/VS to achieve a complete data base/data communication (DB/DC) system. See also IMS/VS-DC and CICS/VS writeups.
- IMS/VS Version 2 contains the functions of IMS/VS Version 1 and further enhancements for operation under MVS/XA or MVS/370, including Extended Recovery Facility (XRF) support. XRF is an MVS/XA system level enhancement that increases availability of IMS/VS Version 2 DB/DC transaction processing as seen by end users. Availability is improved by using additional hardware and software resources to lessen the impact of certain events that disrupt service to end users. The time that end users cannot access the system is reduced, their involvement in the recovery process is simplified, and in many cases, they may be unaware of the outage.

Key Functions, Facilities and Features

- IMS/VS-DB executes as an application program under MVS/370 or MVS/XA.
- It interfaces between user application program(s) and data base(s).
- It separates physical description from the application program in order to get data and device independence.
- Each application program's view of the data base is described in a program specification block (PSB).
- A PSB specifies data bases used, type of data used, and operations allowed on each used data base.
- Each data base structure and organization is described in a data base description (DBD).
- PSBs and DBDs are built by utility programs according to user specifications.
- To gain access to a data base, the application program issues a CALL statement, or, in a CICS/OS/VS environment, an EXEC DLI request.

- DL/I executes actual access to data base(s).
- Multiple access methods support many application requirements by providing sequential, indexed, and direct access that allows selection of the correct access method to give optimum performance.
- Physical hierarchical storage places associated data close together on disk to provide high-speed retrieval.
- Three-level data definition separates physical data from programmer's view to ease programming and separates logical view from program's subset to provide high security. This allows modification of physical organization without change to application programs and protects data base against accidental or intentional damage.
- Field level sensitivity provides a mechanism to limit application program access to a subset of fields in a data base segment. This also gives the application program independence from the sequence of fields in a physical segment.
- Data bases can be linked through logical relationships to create networks and inverted files to meet the needs of complex applications. This allows existing data to be accessed in new ways by new and existing applications.
- High-level language support (DL/I call) allows language-independent call-level interface.
- IMS/VS-DB provides a comprehensive range of data base backup, recovery utilities, and reorganization utilities so that user programming is not needed.
- Secondary indexing allows sequential or skip sequential access to data base by any field. Multiple fields may be indexed, allowing full file inversion.
- Comprehensive logging supports complete data base integrity and provides information for accounting and auditing. The Logging Feature provides a DASD logging function for the IMS/DC environment. Log records are stored on DASD instead of tape. This can improve system recoverability and reduce operator involvement.
- The Data Base Recovery Control (DBRC) feature is an aid to data base recovery. It provides a mechanism for controlling IMS log tapes, image copies, and change accumulation data sets and ensures, when data base recovery is necessary, that all the correct inputs are used. DBRC is a fundamental tool and a prerequisite for data sharing. DBRC also generates the JCL required to run the IMS/VS log archive utility and monitors the status of the online and system logs used by the IMS/VS online system.
- The optional Data Base Surveyor Utility scans an IMS/VS data base (HIDAM or HDAM) to aid the user in determining the need for reorganization and provide a report describing the physical

organization and the free-space utilization. This utility complements and is intended to be used in conjunction with the partial data base reorganization utility.

Single lock manager support for IMS Release 3:

- Program isolation and deadlock detection will be handled either by PI (Program Isolation) or by the IRLM (IMS Resource Lock Manager), but not by both.

Version 2.1 Enhancements

- Extended Recovery Facility (XRF) support: IMS/VS Version 2 participates in the XRF environment by implementing the XRF functions for the IMS/VS Version 2 DB/DC user. This provides automatic recovery from many failures (both hardware and software) which would otherwise result in an interruption of IMS/VS service to its end users.
 - Transfer of the IMS/VS Version 2 workload to a synchronized backup IMS/VS Version 2 subsystem can be automatically initiated when certain disruptive events occur.
 - End users with SNA terminals connected to a 3725 boundary node can be automatically switched to the backup IMS/VS Version 2 subsystem without losing their sessions.
 - An IMS/VS Version 2 operator can initiate IMS/VS workload transfer to reduce the impact of some planned outages in the active system.
 - The alternate processor can do other work while it is tracking the active IMS/VS Version 2 subsystem.
 - Support of IMS/VS Version 2 interprocessor data sharing is provided by allowing sharing to continue on the backup system after a workload transfer.
- Data Availability Enhancements
 - Improved DL/I I/O error processing
 - Dynamic backout enhancements
 - DL/I scheduling changes
 - Data sharing improvements
- Data Base Recovery Control (DBRC) Feature enhancements
- DASD Logging Feature enhancements
- Virtual storage constraint relief use of extended addressing for:
 - Fast path
 - Security tables
 - IMS/VS Resource Lock Manager (IRLM)
- Support for VTAM session outage notification/class of service
- Dynamic data base allocation for batch environments
- MFS (message format service) support for 3290 partitioning and scrolling
- Larger block sizes for DEDBs (data entry data bases)
- Improved operator display commands.
- Fast path transaction retry.

Version 2.2 Enhancements

- Virtual storage constraint relief for IMS/VS DB/DC users in the MVS/XA environment
- Virtual storage constraint relief for fast path users in the MVS/XA environment
- Improvements in the sequential processing of IMS/VS full function data bases to improve performance
- Enhancement to data base level sharing
- Off-line dump formatting facility to increase availability and operational flexibility
- Added terminal support:
 - 3180 Display Station
 - IBM 5550 Multistation Family
- Enhancements previously made available to IMS/VS Version 2 Release 1
 - Change accumulation utility
 - IRLM data sharing
 - DL/I locking enhancement
- Extension of physical terminal (output) edit routine
- Improved processor support
- Reduction of I/O to the IMSVS.SPA data set
- Reduction of I/O to the IMS queue manager data sets
- Reduction of I/O to the IMSVS.ACBLIB data set
- IMS/VS priority dispatching
- System checkpoint interference reduction
- CICS/MVS and CICS/OS/VS support
- Query.DL/I support

Potential Benefits

Although IMS/VS DB and IMS/VS DC are described separately in this book, the potential benefits below particularly apply when they are used together:

- The data base is easily changed without impacting current programs (data independence), so that more resources can be freed for new application areas.
- Terminal and data storage equipment is easily changed without impacting current programs (device independence).
- Data is more available throughout the organization, while data security is improved.
- Information integrity is improved.
- Fewer data inconsistencies are encountered.
- Less time is needed to respond to new information requests.
- Less time is needed to plan and implement new applications.
- Currency of information is improved.
- Application programmer productivity is increased:
 - Faster application implementation
 - Reduced time for maintenance
- Required programmer skill level is reduced.
- Operational efficiency is increased:
 - Less data to handle because of data integration
 - Fewer setups and possibilities for error

Information Management System/VS Data Base Facility (IMS/VS-DB)

- A single copy of the data can be used to handle multiple applications and their different views of that data.
- Assistance is provided in determining the need for IMS/VS data base reorganization.
- Information is provided on data base physical organizations and free-space utilization of the IMS/VS data bases.
- Data integrity, backup/recovery, and control features are provided, which will be of interest to auditors.

IMS/VS Version 2 offers the additional benefit of XRF support:

- Less unscheduled service disruption to the end user. A typical large IMS installation may see a reduction in IMS recovery time, resulting in a higher availability of the system for the remote terminal user.
- A base provided by XRF to reduce the current scheduled maintenance window. By shifting the active workload to the alternate, the active hardware and software are freed for maintenance.

Prerequisite Products

Version 1

MVS/370 or MVS/XA, VSAM, SAM, ISAM, Data Facility Sort (DFSORT)

Version 2

- MVS/370 with MVS/370 DFD or MVS/XA with MVS/XA DFP
- For the XRF MVS/XA environment, MVS/XA Version 2 Release 1.7 or later
- Assembler H Version 2

Products Supported

Hardware

Disks: 333X, 3340, 3344, 3350, 3375, 3380, and 3850
Mass Storage Subsystem
Terminals: see the General Information Manual

Software

- PL/I, COBOL, Assembler
- DB/DC Data Dictionary
- IMSADF II

Ordering Information

IMS/VS

Caution: Before ordering an IMS release, carefully check the compatibility of the currently installed OS/VS release with the IMS order.

Data Base System Version 1 Release 3

Program number: 5740-XX2 (with special ordering group number)

Data Base Product Version 1 Release 3

Program number: 5740-XX2

Data Base System Version 2

Program number: 5665-332 (with special feature numbers)

Data Base Product Version 2

Program number: 5665-332

Note: The functions provided by the Logging and Data Base Recovery Control (DBRC) features are fundamental to the operation of IMS/VS Versions 1 and 2.

To use an alternate logging and/or data base recovery control program with equivalent function, there are two options:

- The IMS/VS Version 1 Release 3 or Version 2 Data Base Product may be ordered without the Logging and/or DBRC features.
- The IMS/VS Version 1 Release 3 or Version 2 Data Base System may be ordered with the Logging and DBRC features, and after installation the IBM Logging and/or DBRC features may be discontinued.

Since logging and data base recovery control functions are fundamental to the installation and operation of IMS/VS Version 1 Release 3 and Version 2, all IBM system testing includes these functions.

Reference Material

IMS/VS Version 1

- General Information Manual, GH20-1260

IMS/VS Version 2

- General Information Manual, GC26-4180

DBPROTOTYPE II

Main Purpose

DBPROTOTYPE II, a program offering, is a design and performance evaluation tool that provides performance statistics about IMS data base designs through the use of skeletal data bases and application program models. It provides many new features and ease-of-use facilities, including an analytic modeling facility to estimate data base space, processor, and input/output time requirements, and support of COBOL, PL/I, and Assembler for program modeling.

Key Functions, Facilities and Features

- Provides processor and input/output timings through an analytic modeling facility, reducing or eliminating the requirement to construct prototype data bases to obtain such data.
- Generates, according to control card specifications, a prototype data base that closely emulates the real data base. All valid DL/I data base structures are supported.
- Generates and executes call sequence prototypes against the prototype data base or actual data base.
- Prints detailed timing and performance statistics for analysis by the user. The initial run of DBPROTOTYPE II establishes a design base. Successive runs with varying design parameters allow analysis of alternative designs.
- Provides support to evaluate use of IMS/VS functions, including IMS/VS access methods, secondary indexes, program isolation, batch checkpoint/restart, and variable-length segments.

Potential Benefits

- Allows analysis of various data base design alternatives for IMS/VS applications without creation of actual data bases or tested application programs
- Assists users determine optimum data base call sequences for their IMS/VS application program
- Helps reduce the time and effort required to validate alternative designs
- Provides a means of estimating execution times for application programs that use IMS/VS
- Aids in understanding the effect of proposed data base or application changes before implementation
- Assists users in designing an optimum data base for their specific IMS/VS applications
- Assists auditors in developing test data bases
- Assists auditors in understanding future application data requirements

Prerequisite Products

IMS/VS-DB
OS/VS1, MVS/370, MVS/XA

Ordering Information

Program number: 5796-PJK

Reference Material

- Availability Notice, G320-5754
- Program Description/Operations Manual, SH20-1953
- Technical Report, G320-6256
- Auditability Catalog, G320-6563

Query Management Facility (QMF)

Main Purpose

Query Management Facility (QMF) is IBM's recommended relational query and report generation product. It is a licensed program designed to provide interactive data base facilities to users with little or no data processing background. The information that is the result of a query may be used to create customized reports and charts. QMF can also be highly useful to the data processing professional as a high-productivity programming tool for use in application development and prototyping. QMF provides many elements of the IBM Systems Application Architecture query interface in the MVS and VM environments as described in *Systems Application Architecture: An Overview* (GC26-4341).

Key Functions, Facilities and Features

QMF operates against DATABASE 2 (DB2) data in MVS/XA and MVS/370 environments. In the VM/SP and VSE environments, QMF operates against data in Structured Query Language/Data Systems (SQL/DS). QMF utilizes Interactive System Productivity Facility (ISPF) (not supported in VSE) and Graphical Data Display Manager (GDDM).

QMF provides an interface, designed principally for use by business professionals, to enable users to access the relational data base (SQL/DS and DB2). The following are some specific characteristics:

- Both Structured Query Language (SQL) style and Query-By-Example (QBE) style query and data manipulation capabilities
- Data definition functions through the SQL language
- An easy-to-specify interactive reports definition and generation capability
- A simple set of commands that allows handling of queries, report forms, and procedures

QMF Version 2 for MVS and VM environments additionally provides:

- An interface to the interactive chart utility (ICU), to graphically present data prepared using QMF. ICU is a facility that is provided with the GDDM Presentation Graphics Feature.
- Application support facilities to allow high-level languages to call QMF
- Office integration capabilities providing users the ability to insert a QMF report within a document being created or updated via PROFS, PS/TSO, XEDIT, ISPF edit, or CMS NOTE
- Data integration via the Data Extract (DXT) end-user dialogs, providing QMF users access within their QMF sessions to both relational and nonrelational data residing on the same system or at remote locations

- Extensive online HELP facility to assist in the composition of SQL and QBE queries, customized report generation, and chart creation
- Resource control facilities that enable the installation to control relational data base usage
- Integration Exchange Format (IXF) to support transferring data into and out of QMF via the IMPORT/EXPORT commands
- QMF SQL-style and QBE-style queries support of the date, time and timestamp data types in DB2 Release 3 and SQL/DS Version 2 Release 1. QMF provides formats for specifying data/time values. The SQL style query additionally supports date/time arithmetic and scalar functions that allow the user to manipulate date/time data
- Support for DB2 Release 3 and SQL/DS Version 2 Release 1 functions
- The INTERACT command to allow the display of QMF item panels from an application
- Japanese translation

Users of QMF can produce meaningful results utilizing only a portion of the SQL or QBE language facility and/or QMF commands. To facilitate the use of QMF, a set of help panels and sample SQL queries is provided.

The functions available within QMF support typical user tasks so that the performance of those tasks is easy for the end user who is not a DP professional. At the same time, QMF offers flexibility regarding the order in which the steps of such tasks are performed.

Typical functions that an end user might perform include:

- Ad-hoc query in SQL or QBE languages
- Report preparation
- Definition and execution of a procedure consisting of a series of query/report functions
- Graphic presentation of report data
- Definition of a data extract request in an interactive mode by dialogs that can invoke Data Extract (DXT)
- Creation of charts of report data

Ad-Hoc Query

Either SQL, QBE, or prompted query generation may be used to retrieve selected information that is formatted and displayed at the user's terminal. Scrolling commands may be used to browse through the data. The user may then display the original query and modify it in order to obtain different results. Subsequently, the user may save the data, print it, create charts of the report data, save the request that produced the data, or simply go on to another task.

Report Preparation

The results of executing a query will be displayed as a report. A FORM is generated that describes the default format for presentation of the result. Alternatively, a user-defined, prestored FORM may be specified at the time the query is run. The user can then describe the nature of the report (headings and other text, format, and summarization required) by filling and changing the values in the FORM. With only a few specifications, a variety of different report types, including listing, summary, or across-style reports can be produced. Once the FORM is satisfactory, the user merely requests that the selected data be redisplayed. QMF will format and display the report at the user's terminal. Since preparing a report can often be an iterative process, QMF makes it easy to move from one step to another, that is, display the report format and redisplay the data using the updated FORM by pressing a PF key. The user can also display the report graphically through use of the CHART command. Once the user is satisfied with the report or chart, he can print the report or chart and also save the report or chart description FORM.

Procedures

For periodic reports, users can create a procedure definition that allows the execution of a series of commands that can be invoked through a single command. The execution of both SQL and QBE style queries can be included in a single procedure.

Because QMF takes advantage of features of ISPF and GDDM, the creation and alteration of queries and procedures is easy. For example, corrections and insertions are simply typed over incorrect information or into blank spaces. Deletions can be made by simply blanking out the unnecessary data. Also, prompts and help panels are provided to guide the user as he performs a task.

QMF MVS/IXA and MVS/370, and QMF VMISP - Version 2

QMF for MVS and QMF for VM Version 2 provide resource control and offer new flexibility via QMF's application support facilities. These facilities enable the data processing staff to integrate QMF with Data Extract (DXT), Interactive System Productivity Facility (ISPF), Graphical Data Display Manager (GDDM), Professional Office System (PROFS), Personal Services/TSO, and Host Data Base View (HDBV), allowing QMF users access to a broad set of functions within these products. Applications written in high-level languages such as CLIST, REXX, PL/I, COBOL, FORTRAN, and APL2 can call QMF directly, have QMF commands executed, and have the resulting report returned to the application. When used in this manner, QMF becomes even more important in its ability to reduce the application backlog.

When used with Host Data Base View or with CMS or TSO/E Servers/Requesters via IXF formatted data, the extracted data that is the result of a QMF query may be downloaded to an IBM Personal Computer and the data made available to a wide variety of PC products, including popular spread sheets.

Primary Users

Individuals responsible for applications in areas such as:

- Engineering/scientific:
 - Agriculture and natural resources
 - Biological sciences
 - Engineering
 - Information sciences
 - Physical and earth sciences
 - Social sciences
- Marketing/sales:
 - Tracking and analysis
- Personnel:
 - Compliance
 - Skills and job tracking
- Education:
 - Institutional research
 - Budget preparation
 - Admissions/recruitment
 - Personnel tracking/analysis
 - User reporting requirements
- Media:
 - Name and address analysis
 - Total market coverage
- Industrial automation:
 - Plant information management systems
- Process industry:
 - Production planning
 - Purchasing analysis
 - Laboratory information systems
 - Clinical testing
 - Quality control analysis
- Finance:
 - Budget analysis
 - Profit and loss
 - Risk assessment
- Securities:
 - Business information systems
- Project management:
 - Checkpoint/milestone progress
 - Development and test status
- State/local government:
 - Finance and administration
 - Public safety
 - Management information and statistics
- EDP auditing:
 - Data verification
 - Installation configuration

Query Management Facility (QMF)

Potential Benefits

- SQL/DS and DB2 can provide an installation with a comprehensive development capability that can span a wide range of users and applications.
- The underlying relational data structure and concise interactive facilities permeate all aspects of QMF and provide the I/S department with a powerful yet easy-to-use alternative to add to its repertoire of application development tools.
- By doing much of the analysis and planning themselves, business professionals can begin using data more quickly. They can gain the benefits from its increased availability, getting more of the right data at the right time.
- From application specification to production operation, the productivity aspects of QMF affect virtually every phase of development, from the initial discussions with the user department, to building the data base, to validating the results with prototype queries.
- For applications that are constantly changing, have a short life cycle, or involve standalone nonintegrated data, QMF (and the relational data base approach) may offer the best development alternative at a lower cost.
- IBM Systems Application Architecture query interface elements provide a foundation for future query consistency across the major IBM computing environments – System/370, System/3X and personal computers.

Prerequisite Products

Hardware

QMF is designed to operate on an IBM processor supported by MVS/SP-JES2 Version 2, MVS/SP-JES3 Version 2, and MVS/XA Data Facility Product; or MVS/SP-JES2 Version 1, MVS/SP-JES3 Version 1, and MVS/370 Data Facility Product.

In VM, QMF is designed to operate on an IBM processor supported by VM/SP with or without HPO.

In VSE, refer to announcement letter.

QMF is independent of tape or DASD device type. It supports terminals supported by TSO, ISPF, and GDDM in the MVS/SP environment, by CMS, ISPF, and GDDM in the VM/SP environment, and by CICS in the VSE environment.

Software

In the MVS/370 environment:

- MVS/SP-JES2 Version 1 or MVS/SP-JES3 Version 1
- MVS/370 DFP
- TSO/E
- DB2
- ISPF

- ISPF/PDF for specific QMF functions
- GDDM with PGF
- SMPE or SMP4
- Data Extract for specific QMF functions

In the MVS/XA environment:

- MVS/SP-JES2 Version 2 or MVS/SP-JES3 Version 2
- MVS/XA DFP Release 1.1 or later
- Other products as for MVS/370

In the VM/SP environment:

- VM/SP with or without HPO
- SQL/DS
- ISPF
- ISPF/PDF-VM for specific QMF functions
- GDDM with PGF

In the VSE environment:

- VSE/Advanced Functions
- SQL/DS Release 2
- CICS/DOS/VS Release 1.5
- GDDM Release 2

Ordering Information

MVS/XA and MVS/370

Program number: 5668-721

VM/SP

Program number: 5668-AAA

VSE (Version 1)

Program number: 5665-292

Reference Material

- General Information Manual
 - GC26-4229 (MVS and VM)
 - GH24-5033 (VSE)
- Learner's Guide
 - SC26-4231 (MVS and VM)
 - SH24-5037 (VSE)
- User's Guide and Reference (VSE), SH24-5038
- Advanced User's Guide (MVS and VM), SC26-4243
- Systems Application Architecture: An Overview, GC26-4341

Structured Query Language/Data System (SQL/DS)

Main Purpose

SQL/DS is a complete, full-function, relational data base management system with integrated query and report writing facilities. It is designed for use with VSE and VM/SP systems, and is broadly compatible with DB2 in MVS environments.

SQL/DS is a licensed program that complements and extends the capabilities of IBM's data system offerings. It may be used as a base for decision support systems as well as for implementation of traditional data processing applications.

SQL/DS, with its relational data structure, supports application areas for which interactive query, report writing, and end-user data base facilities are desired. It addresses environments, such as planning and prototyping, for which data structure and application requirements are subject to frequent change. DP professionals and end-users in business, engineering, and scientific disciplines are provided direct access to data, thus allowing greater productivity.

For VSE, SQL/DS also provides an extract facility that enables DL/I DOS/VS users to select portions of DL/I DOS/VS data and copy them into SQL/DS tables.

In a VM environment, SQL/DS provides remote relational access support, which allows users on one CPU to access an SQL/DS data base on another locally- or remotely-connected CPU (requires VM/SP Release 5 and SQL/DS Release 3.5 or later).

Key Functions, Facilities and Features

- IBM Systems Application Architecture data base interface (SQL) compatibility
- Relational data model
- Structured Query Language
- Interactive query/report writing
- Online HELP facility
- Interactive program development with CMS or ICCF
- Support for applications written in COBOL, PL/I, FORTRAN, Assembler, APL2, and BASIC
- Integrated, user-accessible catalog/active repository
- Concurrent, online, interactive, and batch access to data for multiple users
- Security and authorization at user and data field levels
- Automatic, optimized access path selection
- Support for installation-defined archive/restore procedures
- Log archiving, selective log processing
- Directory verification option
- DL/I DOS/VS extract facility (VSE only)

- Date, time, and timestamp data types and operations
- Enhanced American National Standards (ANS) SQL compatibility

Potential Benefits

- SQL/DS supports a relational model of data. Data is defined and accessed in terms of tables and operations on tables.
- Basic reports can be developed without writing an application program.
- A single, high-level data access language, SQL, is used for programming in a high-level language or in interactive, online query access. The same syntax is used to define data and control user and data access.
- The interactive data access provided by SQL/DS allows application developers to prototype their application and data designs, report formats, and results before beginning the actual implementation phase.
- Authorized users can request, via SQL-like extract statements, that DL/I data be copied into previously defined SQL/DS tables (VSE only).
- Users can utilize the facilities of CMS or ICCF for interactive program development, compilation, execution, and testing of SQL/DS applications.
- Routines (a series of commands/SQL statements) can be user or installation defined. They can be used to define the terminal environment, issue a stored query, and execute one or more stored reports. An installation can also specify, save, and modify a profile of default characteristics for each authorized user.

Prerequisite Products

Hardware

- A processor supported by VM/SP or VSE, conditional swapping and extended-precision floating point that has at least 2MB of real storage.
- SQL/DS on an SSX/VSE system requires, for data base allocation, either two 3370 or four 3310 disk drives dedicated to SQL/DS.

Software

VSE Environment:

VSE/SP Version 1 Release 1 or later, SSX/VSE Release 3 or later, or VSE Advanced Functions Release 3 or later, and VSE/VSAM Release 2 or later. SQL/DS Version 2 requires VSE/AF Version 2 Release 1 or later with VSE/VSAM Release 2 or later.

Structured Query Language/Data System (SQL/DS)

The following related or equivalent products may be used optionally:

- For query/report writer and extract facility:
 - CICS/DOS/VS Release 5 or later
 - VSE/POWER Version 2
- For extract facility:
 - DL/I DOS/VS Release 6 or later
- For interactive program development:
 - VSE/ICCF Release 3

VM/SP Environment:

VM/SP-Entry or VM/SP Release 3 or later for SQL/DS Version 1. VM/SP Release 4 or later (with or without VM/SP HPO for SQL/DS Version 2).

Products Supported

- Query Management Facility (QMF)
- Cross System Product (CSP)
- COBOL, PL/I, FORTRAN, Assembler, APL2, IBM BASIC/VM, VM/SP Interpreter (REXX)
- Data Extract (DXT)
- Relational Design Tool (RDT) (5798-DQL)
- SQL/EDIT (5798-DPJ for VSE, 5798-DQY for VM/SP)
- DBEDIT (5798-DLL for VM/SP)
- RXSQL (5798-DXT) (Programming interface from the VM/SP System Product Interpreter (REXX) to SQL/DS)
- Info Center/1 (IC/1)
- The Information Facility (TIF) (5798-DYF)
- Application System (AS)
- Host Data Base View (HDBV)
- Decision and Information Support Productivity Facility/VSE (DISPF/VSE) (5666-361)
- INTELLECT (5796-PWA for VSE, 5796-PYH for VM)

Ordering Information

Program number: 5748-XXJ (Version 1)
5688-004 (Version 2)

Reference Material

- General Information for VSE, GH09-8030
- Concepts and Facilities for VSE, GH09-8031
- General Information for VM/SP, GH09-8043
- Concepts and Facilities for VM/SP, GH09-8044
- Release 3 Guide, GG24-1689
- Development Guide – Relational Applications, SC26-4130

DB/DC Data Dictionary

Products Included

- DB/DC Data Dictionary – DOS/VS
- DB/DC Data Dictionary – OS/VS

Main Purpose

The DB/DC Data Dictionary licensed program serves as a single source of descriptive data about files, data bases, programs, and user-defined resources and how they interrelate to each other. Therefore, it can supply, on demand, a complete picture of all the key processing elements of an I/S center. It also offers a means to:

- Improve DP control of how, when, and where data, programs, and other resources such as hardware, terminals, and staff are used
- Test the possible effects of change as data and program design are improved
- Implement an easy data processing control system
- Automate the implementation of a Business Systems Plan (BSP)

Key Functions, Facilities and Features

The DB/DC Data Dictionary is organized into six data bases:

- Data elements (fields)
- Data segments (records) with all their relationships and usages
- Programs – all information relevant to program modules (for example, PSBs for DL/I users), including cross relationships between programs and data
- Data bases (files)
- Systems, including jobs, modules, systems, programs, transactions, and PSBs for DL/I users
- An extensibility data base. This facility allows customization of the Data Dictionary by adding categories of subjects and relationships to those supplied by IBM

The other basic portion of the DB/DC Data Dictionary is a set of prewritten DL/I application programs. These programs process user commands that can enter, process, display, and update information in the dictionary data bases.

Special facilities are available to read existing DL/I data base descriptions and program specification blocks and allow them to be automatically stored in the appropriate data bases. Other commands will do the same for existing COBOL data divisions or PL/I data structures whether or not for a DL/I environment.

In this way, the data definitions pertaining to DL/I applications or to traditional programs written in PL/I

or COBOL can be automatically included in the dictionary.

It is also possible to prepare element and segment definitions on preprinted forms and enter them into the dictionary via a batch job stream. The forms may also be used to add descriptions to existing subjects.

Security facilities are provided that control access to dictionary information.

The Data Dictionary supports DL/I field-level sensitivity.

Using the appropriate commands, it is possible to obtain:

- Output reports, including a glossary (which can be a combination of some or all data descriptions) and an indented hierarchical report (which groups all elements and segments of a particular data base together)
- New program copy libraries for all three programming languages – COBOL, PL/I, and Assembler – automatically. Similarly, new DL/I DBDs and PSBs can be created. This means that once defined in the Data Dictionary, correct definitions are automatically available for documentation purposes, for programs, and for use in data base definitions.

In addition, a program access facility is provided that simplifies the creation of customized reports from the stored contents of the dictionary.

The Interactive Display Forms Facility with CICS/VS or IMS/VS-DC allows use of the dictionary in a conversational mode through a 3270 display station. The following features are particularly significant:

- Customized screen output
- Menu selections
- Self-prompting (fill in the blanks)
- A language preprocessor that can make the dictionary active during the application development phase

Primary Users

- I/S professionals, data base administrators, project leaders, I/S managers, and auditors
- End-users who can also take advantage of the existence of the dictionary to ensure that common naming standards are used and understood throughout the organization (especially helpful when a query language like QBE is used)

Potential Benefits

- The use of the DB/DC Data Dictionary can help improve I/S responsiveness in quality, timeliness, and provision of management information. Answering questions from management, planning new applications, and application maintenance are all data processing activities that can benefit from the use of the dictionary. It is a key tool in providing data base management and control.
- In a distributed processing environment in which remote locations are developing and running their own data and programs, the central control possible with the Data Dictionary becomes even more vital.
- The Data Dictionary can assist the auditor in determining the usage of specific data entities, transactions, and programs throughout an organization. This can help meet SEC requirements for internal controls to assure the security and integrity of computer programs and data files.
- It can be used to document and store key information about "flat" files and to manage and control changes and additions. Later, it can be the chief analysis tool in planning a conversion to a DL/I data base system.
- Once installed, it simplifies the entry of DL/I data base definitions and the data declarations for COBOL, PL/I, and Assembler language programs.
- Use of the Data Dictionary can help enforce naming standards, which can result in improvements in:
 - Data documentation
 - Data control
 - Auditing
 - Recovery
 - Data base design and maintenance
 - Speed of application development
 - Testing
 - Data security
- Programmers and end-users may benefit by:
 - Having a common understanding of data
 - Avoiding conflicting usage, duplicated definitions
 - Determining what data exists in what data base and in what system
- Using input from the data base design aid to the dictionary, and allowing the dictionary to produce the DBDs and PSBs and control the test versions of the data base, can reduce application development time.
- The reporting facilities, especially the Interactive Display Forms facility, provide I/S operations with rapid information to deal with problems.
- The self-prompting customized screens with menu selection can reduce training time and cost, decrease exposure from turnover, and increase the value of data as a resource.

- The ability to add user-specified data and the modular design make the dictionary a tool that can be used to automate the control of the entire information services establishment.

Prerequisite Products

OS/VS

IMS/VS-DB for batch use and IMS/VS-DC or CICS/VS for the Interactive Display Forms Facility

DOS/VS

DL/I DOS/VS for batch use and CICS/VS-DOS for the Interactive Display Forms Facility

Products Supported

Hardware

3270 terminals under IMS/VS-DC and CICS/VS

Software

- PL/I, COBOL, and Assembler
- DB2
- Report and File Generator (RFG) feature
- Data Dictionary Language Preprocessor
- IMSADF
- CICS Screen Definition Facility (SDF) and SDF II
- CSP/AD and CSP/AE
- Interactive Display Forms Facility (IDFF)
- Data Dictionary Job Stream Processor
- Data Extract (DXT)
- Data Base Design Aid (DBDA)
- ISPF for TSO users

DB/DC Data Dictionary-OS/VS can operate with MVS/XA.

Ordering Information

DB/DC Data Dictionary – OS/VS

Program number: 5740-XXF

DB/DC Data Dictionary – DOS/VS

Program number: 5746-XXC

Reference Material

- General Information Manual:
 - GH20-9104 (OS/VS)
 - GH20-9193 (DOS/VS)
- Implementation Primer, GG24-1682

Customer Information Control System/VS (CICS/VS)

Products Included

- CICS/DOS/VS
- CICS/OS/VS
- CICS/MVS (see separate product description in this section)

Main Purpose

- CICS/VS is a general purpose DC monitor that greatly reduces the effort otherwise needed for terminal-oriented transaction programming.
- CICS/VS interfaces between user-written application programs and TP access methods (BTAM, VTAM, TCAM, ACF/VTAM, ACF/TCAM) and data base managers (DL/I DOS/VS, SQL/DS in DOS/VS, IMS/VS/DB, and DB2 in MVS). The user can generate a CICS/VS system configuration applicable to specific needs and define the environment in which the system is to execute. User exits are provided within CICS/VS management modules for optional processing, as required for specific system operation.
- Multiregion operation (MRO) provides the ability to run multiple connected CICS/VS regions within a system (partitions in DOS/VSE and address spaces in OS/VS2), while sharing terminals, transactions, and other resources.
- Additionally, Intersystem Communication (ISC) provides the capability for connecting CICS/VS systems, through ACF/VTAM, or ACF/TCAM, such that a transaction running in one system may access files and DL/I data bases, initiate transactions, queue messages, or communicate directly with another transaction running in a connected CICS/VS system.

Key Functions, Facilities and Features

Performance/Resource Functions

- Dynamic multitasking to provide greater throughput
- Priority processing for maximum performance of key transactions
- Quasi-reenterable programming to optimize storage usage
- Multiregion operation (MRO) for multiple copies of CICS/VS within a system
- High performance option (HPO) for shorter path length in MVS
- Intersystem communications

Data Set/Data Base Capability

- DL/I hierarchical data base support
- SQL/DS or DB2 relational data base support

- Batch system access to online data bases, while maintaining data integrity
- Standard access method support (DAM, SAM, and VSAM) — only VSAM and SAM support with fixed block architecture DASD

Security/Integrity Features

- Operator security
- Exclusive control for protection of simultaneous online data usage
- Journaling and data recovery programs
- Automatic backout during emergency restart
- Backout data base recovery to undo data changes made by incomplete programs while CICS/VS continues to process other transactions
- RACF support

System Availability Features

- Warm start/emergency restart functions to minimize CICS downtime
- Resource Definition Online (RDO), which allows programs, transactions, maps, MRO and ISC sessions, VTAM terminals, and MVS operating system consoles to be dynamically added or changed without stopping the CICS system

Implementation

Ease of online program development capabilities within CICS/VS include:

- Execution diagnostic facility (EDF) and command level interpreter provide debugging ease and programmer productivity
- High-level programming interface eliminates need to know or use macrocoding
- Dynamic file open/close relieves the programmer of the need to code this in each transaction
- COBOL, PL/I, RPG II, and Assembler support
- CICS/DOS/VS optional report controller feature which provides the programmer with the capability to create, control, and print reports

Primary Online Operation

Random retrieval, update, add, browse, delete, and insert (DL/I, SQL/DS, or DB2 data bases and VSAM files).

Growth Capabilities

- CICS/VS supports a table-oriented structure, which is designed to allow faster incorporation of new hardware (for example, additional terminals) with a minimum of reprogramming to existing application programs.

Customer Information Control System/VS (CICS/VS)

- Terminal device independence
- Data independence (DL/I, SQL/DS, DB2)

Ease-of-Installation Options

- Use of processor console as CICS/VS terminal
- MVS CBIPO
- VSE/SP

High-Performance Configuration

Use of multiregion operation to exploit tightly coupled systems (such as the 3084Q)

Primary Users

All users of IBM System/370, 4300, and 30XX processors with online transaction processing requirements.

Potential Benefits

- Eliminates development cost of user-written TP monitor
- Reduces implementation cost
- Helps support a move to distributed data processing
- Simplifies installation and maintenance
- Provides high system responsiveness
- Provides operations and security controls
- Adapts readily to growing environment
- Reduces programming costs

For first-time users, the CICS/DOS/VS Small System Executive option is easy to use and reduces complexity and working set requirements to allow the initial system to become operational more quickly.

Prerequisite Products

Hardware

Start/stop transmission, BSC, or SDLC terminals connected via local attachment, switched, and non-switched line connections

Software

- For full data base functions, DL/I DOS/VS or IMS/VS/DB
- For relational data base support, SQL/DS (VSE) or DB2 (MVS)
- VSAM, DAM, and SAM (only VSAM and SAM with fixed block architecture DASD)
- VTAM, BTAM, TCAM

Products Supported

- CICS/DOS/VS is upward-compatible with CICS/OS/VS at the source level.
- CICS/OS/VS is object-level compatible between ACF/VTAM and ACF/TCAM V2, R2.
- IMS/VS/DB (DL/I), DL/I DOS/VS, SQL/DS, and DB2 data base organization and management functions are fully supported.
- CSP, DMS/CICS/VS, SDF/CICS, SPM II, ICCF, CICS/PL/I, COBOL, RPG II, and Assembler are supported.

CICS/OS/VS can operate with MVS/XA.

Ordering Information

CICS/OS/VS

Program number: 5740-XX1

CICS/DOS/VS

Program number: 5746-XX3

Reference Material

- General Information Manual, GC33-0155
- CICS/DOS/VS 1.7 Release Guide, GC33-0130
- CICS/OS/VS 1.7 Release Guide, GC33-0132

CICS/MVS

Main Purpose

- It is assumed that the reader is familiar with CICS/OS/VS (see separate product description in this section).
- CICS/MVS Version 2 is a CICS product designed for the MVS/XA environment. Its prime objective is to support the growth and functional requirements of transaction processing systems through the late 1980s and into the 1990s. Improved CICS system availability, systems connectivity, and access to data are key functional requirements for these systems. These requirements come from organizations implementing applications strategic to their basic objectives; applications with users inside and outside the organization dependent on their availability; users who are frequently customers, suppliers, agents, and distributors. In addition to these requirements, CICS/MVS Version 2 recognizes the need for a compatible and evolutionary growth vehicle for existing CICS applications. Addressing these needs and requirements on a proven architectural base is the primary objective of CICS/MVS Version 2.
- CICS/MVS Version 2 Release 1 (CICS/MVS 2.1) builds on the extended recovery facility (XRF) capabilities of MVS/XA, VTAM, and NCP to focus on improving the availability and recovery of CICS systems while maintaining the functional capabilities of its predecessor, CICS/OS/VS Version 1 Release 7.
- CICS/MVS Version 2 is the recommended CICS product, and path, for all CICS MVS customers and for CICS VSE customers migrating to the MVS environment. CICS/MVS 2.1 adds capabilities for recovery and availability to multiregion operation (MRO), intersystem communication (ISC) and other facilities of CICS/OS/VS 1.7, in both single- and multiple-processor configurations.
- Users may gain benefits from the enhanced availability support in CICS/MVS 2.1, in both single and duplexed configurations. In either configuration, the intent is to minimize end-user disruption by faster recovery from system failures. This new framework for high availability, together with performance, integrity, and the connectivity available with established CICS facilities like multiregion operation (MRO) and intersystem communication (ISC), deliver the basic foundation needed to address the evolving needs of CICS users. In addition, CICS/MVS 2.1 maintains application program compatibility with, and provides the functions of, CICS/OS/VS Version 1 Release 7.

Key Functions, Facilities, and Features

- Automatic detection of system component failure
- Automatic transfer to an alternate CICS/MVS 2.1 system on the same or another processor
- Automatic switching of remote VTAM SNA terminals to another system without loss of end-user sessions
- Recovery of non-switchable VTAM terminal sessions
- Support for automatic data set/data base transfers to an alternate system
- Capability to implement planned, automated recovery strategies
- Operator-initiated switch to an alternate system to reduce the impact of scheduled outages
- Improved virtual storage use, usability, problem determination, security, and integrity
- Compatible growth path for Version 1 CICS users

Potential Benefits

Use of CICS/MVS 2.1 in conjunction with multiregion operation (MRO) gives users the flexibility to structure a system to limit the effect of failures, and to optimize the recovery process according to the nature of the failure. MRO users can match any active CICS address space with its own alternate. This granularity allows varying recovery strategies from restart-in-place, where appropriate, to the complete switching of all active regions to the alternate system. Two possible scenarios illustrate how users can tailor these availability facilities to their specific installation objectives.

- Some users choose to isolate potentially unstable applications — perhaps old macro-level programs — into a separate MRO region. In this example, a switch or transfer of *all* regions to their alternates on failure of this one application-owning region may be undesirable. As an alternative, the installation may choose, through an overseer program, simply to have the failed region automatically restarted in place.
- In a single CEC, automatic terminal switching and session recovery alone can help to reduce restart time and impact on end-users. For example, a user could switch only the terminal-owning region. This would transfer the switchable SNA VTAM devices to the backup sessions and automatically initiate the session recovery process for the non-switchable VTAM terminals. Thus users could achieve the objectives of faster recovery with less impact on end users and without requiring any restarts or transfers of unaffected application-owning regions.

Compatibility and Migration

A key aspect of CICS/MVS Version 2 is its upward compatibility from CICS/OS/VS Version 1. The inter-communication capabilities of Version 1 are carried forward to Version 2 with the added functions for management and recovery described above. The functional isolation and granularity provided by MRO and ISC, supported by the availability enhancements, join to meet some of the Version 2 objectives for growth, system availability, system connectivity, and access to data. These facilities provide the capability for exploitation of multiprocessor CECs, application and data isolation, distributed processing, and virtual storage constraint relief.

Similarly, the upward compatibility of the vast majority of the application programming interface (API) and other management functions from CICS/DOS/VS to CICS/MVS 2.1 make CICS/MVS 2.1 the logical capacity and functional growth path for most VSE installations.

Prerequisite Products

Hardware

CICS/MVS 2.1 runs on any processing system that supports one of the operating systems listed below under "Software" and has enough processor storage to meet the combined requirements of CICS/MVS 2.1, the host operating system, access methods, and user applications.

Software

CICS/MVS 2.1 is designed to run with the following operating systems and their appropriate prerequisites:

- MVS/System Product-JES2 Version 2
- MVS/System Product-JES3 Version 2

CICS/MVS 2.1 will run with the following TP access method programs supported by the MVS/XA versions identified above.

- ACF/VTAM Version 3
- ACF/TCAM Version 2
- BTAM/SP

Ordering Information

CICS/MVS Version 2

Program number: 5665-403

Reference Material

- General Information Manual, GC33-0155
- CICS/MVS 2.1 Release Guide, GC33-0505

CICS/VM

Main Purpose

This member of the CICS family of products, together with other VM-supported functions, provides a transaction processing capability designed to satisfy the needs of integrated, multifunctional departmental systems. CICS/VM is for distributed VM systems where users characteristically need to perform a wide range of tasks, such as decision support and office systems, as well as commercial transaction processing, from a single workstation. Usability and smooth transition between applications are key characteristics. Systems in this distributed environment are intended to be managed from a central location.

Key Functions, Facilities and Features

- Provides a transaction-processing capability for the VM environment, where multiple functions are required in a fully-integrated system
- Supports a rich subset of the command-level application programming interface (API) of the CICS/VS and CICS/MVS products providing at source program level the capability to port applications from host to distributed system and vice versa
- Provides connectivity between the CICS functions and the host as a 3270 session to the host and uses VM dial facilities
- With a wide range of data access support, allows user application programs to access both local and remote data
- Provides dynamic logging for backout recovery facilities in much the same way as CICS/VS and CICS/MVS
- Provides a wide range of application programmer support including:
 - Translate and compile facilities
 - Translate-time verification and diagnosis of the CICS/VM API
 - BMS map generation and test support
 - A debug capability
 - Runaway-task detection

Potential Benefits

- Easy transition among office, decision support, and commercial transaction processing applications
- Single operating system environment
- Ability for users to build on their investment in application code
- Use of existing central site systems and application programming, which minimizes the need for these skills at the distributed location

Prerequisite Products

- VM/SP
- For relational data base support: SQL/DS
- For local file control support: VSE/VSAM
- If CICS/VM function shipping is used to access CICS/VS or CICS/MVS on a processor other than the local VM system, or if the 3270 Extended Data Stream is used: VM/Pass-Through Facility
- For function shipping to CICS/VS or CICS/MVS, one of the following programs running in the remote processor:
 - CICS/MVS
 - CICS/OS/VS
 - CICS/DOS/VS
- If SDF is used: SDF II
- If access to DL/I data at a remote CICS/VS or CICS/MVS system is required, CICS/VM supports DL/I calls, through both the CALL and EXEC DLI interfaces, to the following:
 - IMS/VS
 - DL/I DOS/VS

Products Supported

- CICS/VM supports applications written for some versions and releases of the following compilers/assemblers:
 - VM COBOL II
 - Note: CICS/VM does not support the national language facilities
 - OS/VS COBOL
 - PL/I
 - Assembler

Compatibility

Applications developed to run on CICS/VM are generally source-compatible with CICS/DOS/VS, CICS/OS/VS, and CICS/MVS, provided they use the CICS/VM command-level API and do not depend on internal control block structures or make use of native VM interfaces. CICS/VM applications requiring VS COBOL II cannot be ported to a CICS/DOS/VS system. BMS maps are also source compatible using BMS macros.

Applications developed on CICS/VM Release 1 will run unchanged on Release 2 without the need for retranslation or recompilation.

Applications developed for CICS/DOS/VS, CICS/OS/VS, and CICS/MVS are generally source-compatible with CICS/VM if they use only the subset of the CICS command level API supported by CICS/VM. Applications written in OS/VS COBOL or Assembler are portable between CICS/DOS/VS and CICS/VM if, in addition, they use only the common subsets of these languages.

CICS/VM

The CICS macro-level application programming interface is not supported by CICS/VM, either for translation or execution. CICS/VM is an integrated offering that runs in the VM/CMS Systems Application Architecture environment. This permits the intermixing of elements of Systems Application Architecture Common Programming Interfaces, such as SQL, with interfaces provided by CICS/VM and CMS.

Ordering Information

Program number: 5684-011

Reference Material

- General Information, GC33-0571
- Specifications, GC33-0572
- System Support and Administration, SC33-0573
- Application Programming, SC33-0570
- Application Programmer's Reference, SC33-0512

CICS Performance Analysis Reporting System (CICSPARS)

Main Purpose

CICSPARS, a program offering, collects and reports performance data for supported releases of CICS/DOS/VS and for CICS/OS/VS prior to Version 1 Release 7. (For performance information about CICS/OS/VS Version 1 Release 7 or later, CICSPARS/MVS (see separate description) should be used.) The reports generated help the user to better understand CICS/VS from both a system wide and specific application basis. The reports provide information regarding transaction rates, response times, paging rates, virtual and real storage utilization, and resource utilization.

The data used to generate the reports includes data collected by CICSPARS itself, page fault data collected by various operating system facilities, and data collected by the CICS/VS Monitoring Facility.

Key Functions, Facilities and Features

- Data collection
- Online displays
- Reports
- Graphs
- Compatibility with Performance Analyzer II (PA II)

Potential Benefits

- Assists in tuning and in showing the effects of environmental changes
- Identifies inefficient use of resources
- Provides capacity planning data for real storage
- Provides an analysis of page fault activity within the CICS/VS virtual storage address space
- Helps in the migration from Performance Analyzer II

Prerequisite Products

- CICS/VS (supported CICS/DOS/VS releases or releases prior to CICS/OS/VS Version 1 Release 7)
- System for Generalized Analysis Reporting (GPAR) FDP (5798-CPR) for OS/VS and DOS/GPAR (5798-DAA) for DOS/VSE

Ordering Information

Program number: 5798-DAB

Reference Material

- Availability Notice, GB21-2494
- Program Description/Operations Manual, SB21-2495

CICS/DOS/VS Performance Analysis Reporting System/VSE (CICSPARS/VSE)

Main Purpose

CICSPARS/VSE is a licensed program that provides performance and accounting information for CICS/DOS/VS Version 1 Release 7 systems. It provides online display capabilities, system alert monitoring functions, problem determination aids, and extensive batch reporting and analysis facilities. CICSPARS/VSE also incorporates functions previously provided by the CICSPARS (5798-DAB), Performance Analyzer II (5798-CFP), CICS/VS Online Test/Debug II (5796-AHJ), and DOS/VSE Generalized Performance Analysis Reporting (5798-DAA) program offerings.

For supported releases of CICS/DOS/VS prior to 1.7, the CICSPARS program offering (5798-DAB) should be used to obtain performance information about CICS/DOS/VS.

Reference Material

General Information Manual, GH20-6836

Key Functions, Facilities and Features

- Online CICS/VS performance monitoring and reporting capabilities
- Offline generation of reports and graphs
- Alert monitor
- Optional graphic displays
- Effective use of 3270 display capabilities
- Problem determination facilities
- Comprehensive HELP facility
- Batch reporting capabilities
- Monitoring up to 17 CICS sessions via 3270-PC

Potential Benefits

- Provides systems programmers, systems analysts, and operators with information to manage the performance and accountability of their CICS/DOS/VS systems.
- Helps users optimize resource utilization.
- Reduces terminal requirements in operations room

Prerequisite Products

- VSE/SP Version 3.1
- CICS/DOS/VS Version 1 Release 7
- DFSORT (for summary reports)
- GDDM (for online graphic displays)
- MSHP

Ordering Information

Program number: 5666-329

CICS/OS/VS Performance Analysis Reporting System/MVS (CICSPARS/MVS)

Main Purpose

CICSPARS/MVS is a licensed program that provides performance and accounting information for CICS/OS/VS Version 1 Release 7 and CICS/MVS Version 2 Release 1 systems. It provides online display capabilities, system alert monitoring functions, problem determination aids, and extensive batch reporting and analysis facilities.

CICSPARS/MVS also incorporates functions previously provided by the CICSPARS (5798-DAB), Performance Analyzer II (5798-CFP), CICS/VS Online Test/Debug II (5796-AHJ), and Generalized Performance Analysis Reporting for OS (5798-CPR) program offerings.

For supported releases of CICS/OS/VS prior to 1.7, the CICSPARS program offering (5798-DAB) should be used to obtain performance information about CICS/OS/VS.

Key Functions, Facilities and Features

- Online performance monitoring and reporting capabilities
- Offline generation of reports and graphs
- Alert monitor
- Optional graphic displays
- Effective use of 3270 display capabilities
- Problem determination facilities
- Comprehensive HELP facility
- Batch reporting capabilities
- Extended addressing support (MVS/XA)
- Monitoring up to 17 CICS sessions via 3270-PC

Potential Benefits

- Provides systems programmers, systems analysts, and operators with information to manage the performance and accountability of their CICS/OS/VS systems.
- Helps users optimize resource utilization.
- Reduces terminal requirements in operations room

Prerequisite Products

- MVS/370 or MVS/XA
- CICS/OS/VS Version 1 Release 7 or CICS/MVS Version 2 Release 1
- DFSORT (for summary reports)
- GDDM (for online graphic displays)
- SMP/E or SMP Release 4

Ordering Information

Program number: 5665-355

Reference Material

General Information Manual, GH20-6836

CICS/VS Online Test/Debug II (OLTD II)

Main Purpose

CICS/VS Online Test/Debug II, a program offering, provides the programmer with the facilities to test and debug application programs and files while CICS/VS is operating by entering command statements via a 3270 Information Display System.

Key Functions, Facilities and Features

- Display any location in processor storage
- Alter any location within the CICS/VS job step boundaries
- Stop the execution of a specific CICS/VS task at a specific address within an application program
- Display and alter storage records in any data set available to the CICS/VS job step
- Immediately change storage records in files (ISAM, BDAM, VSAM, DL/I, and temporary storage)
- Open or close files online
- Console-debug programs without interrupting the normal operation of the installation

Potential Benefits

- Provides the ability to make program changes without reassembling or relink-editing
- Allows programmer to step through programs displaying registers and data
- Enables forcing of transaction dumps
- Allows the display or alteration of any information in the CICS/VS job step boundaries
- Enables the programmer to set up data conditions on disk and set up processor storage conditions for testing
- Makes it possible to stop a CICS/VS task at a specific address within a program
- Allows programmer to step through a program one instruction at a time

Prerequisite Products

CICS/VS and a 3270 display device

Products Supported

- DL/I
- OLTD II can operate with MVS/XA in toleration mode
- CICS/OS/VS
- CICS/DOS/VS
- CICS/MVS

Ordering Information

Program number: 5796-AHJ

Reference Material

- Availability Notice, G320-5710
- Program Description/Operations Manual, SH20-1877

Information Management System/VS Data Communication (IMS/VS-DC)

Main Purpose

IMS/VS-DC is a data communication management system that supports multiple terminal-oriented applications using a common data base.

In cases for which high performance is needed and the full function provided by IMS/VS is not required, the fast path facility may be used to provide faster processing of transactions. Also, for improved performance, distributed data base processing, or distributed transaction processing and presentation management between IMS/VS and CICS/VS or IMS/VS and IMS/VS, the Multiple Systems Coupling facility with Intersystem Communication may be used for load balancing or mixed local and remote processing between processors.

See IMS/VS-DB for Version 2 description.

Key Functions, Facilities and Features

- Concurrent BTAM and VTAM support:
 - SNA and SDLC terminals
 - Simplified migration to SNA
 - 3290 terminal support
- Concurrent batch and online access to data bases:
 - Allows batch work to be run at the same time as online operation
 - Permits extended running of online system
 - Provides operational flexibility with high security
- Logical terminal management:
 - Gives programmer the same, simple call-level interface to terminals as he has to data bases
 - Provides operational flexibility in case of terminal or line failure
- Terminal and password security:
 - Two levels of security for transaction entry, enhancing system security
 - Checkpoint, restart, and recovery
 - Complete facilities for automatic and user-initiated checkpoint/restart, and data base backout and recovery
 - RACF support
- Dual logging and log write ahead for DB and DC:
 - Improves integrity by providing multiple copies of the system log and ensuring that log records are secure in case of storage loss
- Message format services:
 - Facilitates the programming required to handle terminal I/O
- High-level language support:
 - Allows online transactions to be written in high-level languages using call-level interface for programmer productivity
- IMS/DC residing in a separate region/partition, thus improving:
 - Integrity, by ensuring that programming cannot interrupt IMS system information, and that user programs cannot interfere with each other
 - Security, by ensuring that user programs cannot access and modify data that controls their data base access
- Program isolation:
 - Allows segment level scheduling and, therefore, potentially improved performance
 - Permits automatic resolution of deadlock
 - Improves integrity by allowing user programs to signify successful completion and have automatic backout in case of failure
- Online image copy utility:
 - Allows the user to copy data sets of a data base concurrently with online application
- Automated operator interface:
 - Allows a user-written program to issue a pre-planned set of IMS commands and to catch IMS messages
- Multiple Systems Coupling:
 - Supports SNA and provides the ability to connect IMS/VS subsystems together in one or more System/370 processors
 - Allows programs of one system to communicate with programs of all the connected systems
 - Is, with some minor exceptions, transparent to application programs, and maintains the same interface to end users as a single IMS/VS system
- Intersystem Communication:
 - Permits communications between IMS/VS and CICS/VS or a user-written subsystem that supports the LU6 protocol
 - Supports IMS/VS as either a back-end or front-end system
- Fast path:
 - Supports large data bases with partitioning
 - Supports record deactivation
 - Supports multiple area data set copies
 - Supports data sharing for data entry data base (DEDB)
 - Improves system throughput
 - Provides processor storage data base support
 - Improves field access in application programs, through new field call
- MVS/XA portability:
 - Support is provided to allow an IMS/VS system generated under MVS/370 to process under MVS/XA.
- DATABASE2 attachment support

Information Management System/VS Data Communication (IMS/VS-DC)

- Online change:
 - Provides the ability to dynamically add, replace, or delete IMS/VS data bases and security definitions, programs, transactions, fast path routing codes, and MFS formats online without the necessity of recycling the IMS/VS online system

Potential Benefits

The potential benefits of IMS/VS DB/DC are specified under "Potential Benefits" in the IMS/VS-DB product description.

The specific facilities of IMS/VS-DC and their potential benefits are:

- Logical terminal concept (device independence):
 - Programmers and system designers no longer concerned with physical terminal code, restrictions, and control
 - Increased operational flexibility
- Video paging:
 - Simplified browsing of multiple screen output without programming
 - Increased user productivity
 - Less system design and programming required
- System measurement statistics:
 - Easy to know who is using the system, how much, what transactions, how many times, response time, and data base activity without programming
 - Easy to tune system for improved performance
- Multiple region architecture:
 - Batch and online programs running together to help give increased throughput, flexibility, integrity, and control
 - Less storage required because of lower overhead
- Recovery support:
 - Dynamic online backout without operator intervention or programming
 - Transaction backout with utilities
 - Batch and online statistics recorded in same log for easier system debugging, tuning, and running
 - Data base dumps and recovery, and system recovery using simple operator commands without programming
 - Reduced system design necessary for application audit and recovery
- Data security:
 - Restrictions and security by function at the segment level and program level
 - Centralized control of data base description, program sensitivity, and function
 - Erroneous updates/deletions reduced
 - Log tape provided
 - Terminal and password security without programming

- Program isolation:
 - Fewer bottlenecks
 - Multiple program copies
 - Improved scheduling
 - Faster line response time
 - Improved data base integrity
- Multiple Systems Coupling:
 - Ability of IMS/VS users to distribute processing load within an overall coordinated design
 - In some circumstances, improved transaction response times through the offloading of other work
- Fast path:
 - Faster response due to reduced path length
 - Reduced I/O requirements due to processor storage data bases
 - Reduced resource contention when using processor storage data bases
 - Greater availability with record deactivation and/or multiple area data set support
 - Transaction retry

Prerequisite Products

IMS/VS-DB

Products Supported

Hardware

Terminals: see the General Information Manual

Software

- IMS ADF II
- Application program languages: PL/I, COBOL, and Assembler
- DB/DC Data Dictionary

Ordering Information

IMS/VS

See the IMS/VS-DB abstract.

Caution: Before ordering an IMS release, carefully check the compatibility of the currently installed OS/VS release with the IMS order.

Data Base System

See the IMS/VS-DB abstract.

Data Communication Feature Version 2

(Includes fast path and MSC)

Caution: Before ordering the IMS/VS-DC feature, carefully check whether the terminals to be installed are effectively supported by the release being ordered.

Reference Material

- IMS/VS Version 1 General Information Manual, GH20-1260
- IMS/VS Version 2 General Information Manual, GC26-4180

IMS/VS Queue Loader

Main Purpose

The IMS/VS Queue Loader, a program offering, is an IMS application program that runs in a batch message processing (BMP) region. It is capable of selecting messages from the IMS/VS system log, sorting the selected messages to obtain the correct segment and message sequence, and then reinserting them into the online system. The original source, destination, and date/time stamp of the messages are preserved.

Key Functions, Facilities and Features

Selection Criteria

- Enqueued messages
- Processed messages
- Unprocessed messages
- Conversational or nonconversational messages (select/exclude)
- The time stamp starting point
- The time stamp ending point
- Number of messages to be skipped from the starting point
- Number of messages to be inserted into the message queue
- Transaction code (select/exclude)
- Logical terminal name (select/exclude)

Log tapes can be processed multiple times using different selection criteria.

Improved System Availability

- Recovery of lost messages after an IMS/VS abend or system failure
- Recovery of unprocessed messages after a cold start
- Reprocess of IMS/VS application messages
- Migration from one IMS release to another

System Usability

- Ability to run concurrently with normal IMS operation — no increase in system downtime
- Ability to enter control statements from any logical terminal
- Optional use of selection criteria
- User exit for modifying, deleting, or adding messages
- Not dependent on DUMPQ

System Performance and Tuning

- Variable rate of message insert for performance evaluation
- Regression testing of IMS/VS or application programs

Potential Benefits

- Improves maintenance and tuning of the IMS/VS system.
- Is a valuable tool for migrating between IMS/VS systems.
- Provides the ability to stress-test IMS/VS systems and applications.

Prerequisite Products

- DFSORT
- IMS/VS DB/DC
- OS/VS1, MVS/370, or MVS/XA

Ordering Information

Program number: 5785-GAJ

Reference Material

- Availability Notice, GB21-3125
- Program Description/Operations Manual, SB21-3126

Batch Terminal Simulator (BTS)

Main Purpose

Batch Terminal Simulator, a program product, is a terminal simulator that allows online IMS/VS application programs to be tested in an IMS/VS batch environment without the use of telecommunications hardware. Extensive debugging facilities enable the user to test batch applications as well as those intended to run in a telecommunications environment.

Key Functions, Facilities and Features

- Supports conversational or nonconversational as well as BMP, MPP, and batch application programs
- Provides extensive debugging and trace facilities for both batch and telecommunications applications
- Permits the testing of online application programs without the installation of telecommunications hardware
- Supports the IMS/VS message formatting service (MFS) function for the IBM 3270 Information Display System
- Simulates the message queuing and application program scheduling functions of the IMS/VS data communications feature, thus allowing the support of conversational programming and program-to-program transaction routing
- Supports testing of application programs written in COBOL, Assembler, or PL/I
- Provides automatic program documentation by printing 3270 input and output formats and by tracing the interaction between IMS/VS and an application program
- Full-screen support for TSO simulating IMS/VS operation from 3270 terminals under TSO

Potential Benefits

The Batch Terminal Simulator supplies information about each transaction or message as it progresses through the IMS/VS system. It provides IMS/VS users with a comprehensive means of checking and debugging:

- Application program logic
- IMS/VS interfaces
- Telecommunications activity
- 3270 format control blocks
- Data base activity

Prerequisite Products

- IMS/VS (DC feature for 3270 formatting function)
- OS/VS1, MVS/370, or MVS/XA

Ordering Information

Program number: 5668-948

Reference Material

- General Information Manual, GH20-5522

IMSASAP II

Main Purpose

IMSASAP II, a program offering, is a performance analysis and tuning aid for IMS/VS data base and data communication systems. It provides key reporting and usability enhancements for users of IMS/VS.

IMSASAP II is a report program that executes under the system for Generalized Performance Analysis Reporting (GPAR). IMSASAP II processes IMS/VS DB and DC monitor data to provide summary, system analysis, and program analysis level reports that assist in the analysis of an IMS/VS system environment.

The monitor concept has proven to be a valuable aid in the performance analysis and tuning of IMS systems. IMSASAP II extends this capability by providing comprehensive reports, from management summaries to detail program traces, to meet a broad range of IMS/VS system analysis objectives.

Key Functions, Facilities and Features

- Produces a comprehensive set of reports, organized by level of detail and area of analysis, to satisfy a wide range of IMS/VS system analysis requirements
- Provides report selection and reporting options to satisfy individual requirements and to assist in efficient analysis
- Produces alphanumerically collated report items in terms of ratios, rates, and percentages to facilitate comparison of results without additional computations
- Reports on schedules in progress, including wait-for-input and batch message processing programs
- Provides reports on IMS/VS batch programs
- All requested reports are produced from a single pass of the IMS/VS DC/DB monitor; no sorting is required.

Potential Benefits

When used in an appropriate manner on a regular basis, IMSASAP II may help to:

- Improve system performance
- Increase productivity of analysts and programmers
- Provide ongoing system measurement and management reporting capability
- Assist in determining future requirements
- Enhance system and program documentation

- Provide preinstallation evaluation of applications and programs against installation standards
- Reduce requirement to run DFSUTR20 and DFSUTR30
- Provide auditors with valuable data for a number of potential audit tasks

Prerequisite Products

- OS/VS1, MVS/370, or MVS/XA
- GPAR (5798-CPR)
- IMS/VS (for producing IMS/VS log)

Ordering Information

Program number: 5798-CHJ

Reference Material

- Availability Notice, GB21-1792
- Program Description/Operations Manual, SB21-1793

IMS/VS Performance Analysis Reporting System (IMSPARS)

Main Purpose

IMSPARS, a program offering, is a performance analysis and tuning aid for IMS/VS DB/DC systems. IMSPARS is a tool for management as well as for systems programmers and technical support personnel. It provides management-oriented summary reports, as well as detailed information reports for those directly involved in improving system performance. The reports are derived from the IMS/VS log tape and provide information in the areas of transaction response times and IMS/VS system resource usage and availability.

Key Functions, Facilities and Features

- A set of optional reports, organized by IMS resource type, produced to give multiple views of response times, resource usage, and availability.
- Reports are designed for management, as well as for system administrators and programmers.
- All requested reports are produced from a single pass of the IMS/VS log tape; no sorting is required.
- IMSPARS runs under GPAR, using time selection and other features of GPAR's command structure.

Potential Benefits

When used in a regular manner on a regular basis, IMSPARS can help to:

- Improve transaction response times
- Make more efficient use of IMS/VS regions and message queues
- Reduce virtual and real storage requirements in buffer pools
- Increase availability of IMS/VS resources
- Provide preinstallation evaluation of applications and programs against system standards
- Provide ongoing system measurement and management reporting capability
- Improve productivity of analysts and programmers
- Assist in determining future system requirements
- Reduce the need to run IMS/VS utilities

Auditors find the data produced is valuable in gaining an understanding of the IMS environment.

Prerequisite Products

- GPAR (5798-CPR)
- OS/VS1, MVS/370, or MVS/XA
- IMS/VS (for planning IMS/VS log)

Ordering Information

Program number: 5798-CQP

Reference Material

- Availability Notice, GB21-2139
- Program Description/Operations Manual, SB21-2140

IMS/VS Message Requeuer (MR)

Main Purpose

MR, a program offering and one of the IMS/VS system availability products, reinserts input and output messages from IMS/VS log tapes to the message queues.

Key Functions, Facilities and Features

- Messages that would otherwise be lost following an IMS/VS cold start are reinserted.
- Shutdown prior to cold start may be:
 - Planned, where messages come from DUMPQ checkpoint log records
 - Unplanned, where DUMPQ and subsequent log records are analyzed to select messages that remained on IMS queues at IMS system failure
- Messages retain source terminal ID and entry chronology.
- Reinsertion may be selective.
- Messages may be reassigned. This may be required by system redefinition.
- Messages that cannot be reinserted because of a new system definition being in effect are recorded for audit purposes.

Potential Benefits

- Messages that might otherwise be lost following a cold start can be processed to completion.
- Selected input messages may be reinserted for reprocessing of traffic previously processed by an erroneous application program.
- A mass insertion of input messages for multiple log volumes can provide a processing load for an IMS/VS system for stress tests and integration tests.

Prerequisite Products

- IMS/VS
- DFSORT
- MVS/370, or MVS/XA

Ordering Information

Program number: 5796-ATP

Reference Material

- Availability Notice, G320-6071
- Program Description/Operations Manual, SH20-2106

IMS/VS Time-Initiated Input Facility (TIIF)

Main Purpose

TIIF, a program offering and one of the IMS/VS system availability products, generates IMS/VS transactions, commands, and message switches based on time-of-day or time after IMS startup, as specified by the user in one or more scripts.

Key Functions, Facilities and Features

- The user can schedule events according to user-defined time plan.
- Timer function runs in IMS/VS control region using a standard interface.
- TIIF can initiate transactions, commands, or messages.
- Control can be given to user routines for more dynamic inputs to message queues.
- Events may optionally occur at IMS initialization or at intervals after initialization rather than at a specified time of day.
- A generalized user exit routine and a script verification utility are included.
- Scripts may be dynamically updated without restarting IMS.
- Output is routed to a user-defined destination.
- Automatic IMS/VS startup scripts are allowed.
- Special weekend/holiday scripts are allowed.
- Operator override control is provided.
- Script verification utility detects scripting errors before online execution.
- TIIF can be used in conjunction with IMS/VS Master Terminal Operator Assist (5798-CLK) to submit command procedures automatically.

Potential Benefits

- Repetitive daily operations functions may be performed at set times, relieving the master terminal operator of the responsibility of initiating those actions.
- More consistent, timely, and accurate control of the IMS/VS online environment is possible.
- Reliable time-dependent execution of application function can be achieved.
- TIIF allows a varying degree of user involvement according to the requirements of the task performed.

Prerequisite Products

- IMS/VS DB/DC
- MVS/370, MVS/XA

Ordering Information

Program number: 5798-CWF

Reference Material

- Availability Notice, GB21-2255
- Program Description/Operations Manual, SB21-2256

IMS/VS System Utilities/Data Base Tools (DBT)

Main Purpose

IMS/VS System Utilities/Data Base Tools (DBT) is a combination of IMS/VS data base management system utilities consolidated into a single package. DBT includes predecessor product functions plus improvements to those functions and new functional enhancements, including Fast Path data entry data base (DEDB) support.

Predecessor products that form the basis of this product are SMU II (5796-PJJ), IMSMAP (5796-PBC and 5796-PCY), VSAMZAP (5796-PJQ), and High-Speed Sequential Retrieval (5787-LAC).

DBT is a collection of several IMS/VS data base management system utilities that are designed to assist system programmers and data base administrators in the management, monitoring, tuning and repair of IMS/VS DL/I and Fast Path data entry data bases.

Key Functions, Facilities and Features

- Full Function Space Management Utilities include:
 - HD Pointer Checker. This monitors space utilization and detects and reports physical or logical pointer problems. HD Pointer Checker runs as an OS batch job and can use as input either an image copy of the data base or actual VSAM, OSAM, or ISAM data sets. Printed dumps of data base blocks can be provided and formatted in a way that will be easy to use while debugging data base errors. Each dump includes a map of all segments and free space detected in the block. HD Pointer Checker also provides many reports that describe the conditions of your data bases. These reports can be used for tuning and performance analysis.
 - HD Tuning Aid. This program produces reports that are useful when HDAM data bases are being tuned and provides information that is helpful for converting a HIDAM data base to HDAM. Using this information along with the statistics from the HD Pointer Checker can help determine when the data base needs to be reorganized. Before reorganizing a data base, this information can be used to evaluate how DBD changes would affect randomization.
 - HDAM Physical Sequence Sort/Reload. This utility takes the output from the IMS/VS HD Reorganization Unload utility (or one of the DBT HSSR Unload utilities) and passes the root keys through the user's randomizing routine. It then sorts on the randomized address. The sorted file is used as input to the IMS/VS HD Reorganization utility, and reload is done in physical sequence. HDAM Physical Sequence Sort/Reload is most effective during a reorganization in which the physical sequence of the data is changing. This happens whenever the HDAM parameters change. Conversion from non-HDAM data bases to HDAM data bases is made easier via this utility.
- DB Segment Restructure. This utility unloads and reloads data bases and changes the structure (format) of an existing data base. When a data base design changes, the DB Segment Restructure utility can often eliminate the need to write a program to reformat segment data. The Segment Restructure program unloads a hierarchically contiguous portion of a data base to a sequential file. The entire data base can be unloaded, or a start SSA and an end key feedback compare string can be specified to determine a subset of the data base. A new data base can be created using the sequential file produced by the unload program as input, and structural changes can be made using the reload program.
- High Speed Sequential Retrieval (HSSR). This feature's advanced buffering techniques can help improve performance and decrease processing time for IMS/VS applications running under HSSR. By using HSSR when sequentially retrieving data from large IMS/VS data bases, significant reductions in CPU, I/O and elapsed time can be achieved. HSSR calls may be substituted for some basic DL/I calls in IMS/VS batch application programs. HSSR calls are transparent to the program and give the same results as DL/I calls.
- Fast Path utilities include:
 - DEDB Pointer Checker. This feature scans all orphan segments, invalid pointer values, and broken pointer chains. The DEDB Pointer Checker can be used with a very fast "hashing" algorithm, or it can do slower "full checking" to verify integrity. DEDB Pointer Checker also provides many reports that describe the condition of data bases. These reports can be used for tuning and performance analysis.
 - DEDB Tuning Aid. This feature uses the data previously extracted by the DEDB Pointer Checker through a shared common report generation module. With the DEDB Tuning Aid, the data base modeling process can be iterated, then the physical data base attributes that best meet the user's performance and space utilization needs can be selected. Such things as UOW parameter values, root parameter values, control interval sizes, number of data base areas, and randomizing module can be changed.
 - DEDB Unload/Reload. This feature is capable of concurrently unloading and reloading multiple areas of an IMS/VS DEDB. It operates independently of the IMS/VS control region. The unload processor can also be used to unload an area of a DEDB for subsequent "read

only" sequential processing. This approach can significantly reduce resource requirements and elapsed time for offline report generation.

- DBD/PSB Mapper. This is a documentation aid that produces diagrams of data base structures. It can be run with no additional user data or involvement each time an IMS/VS DBD or PSB is changed. This procedure ensures that a current picture and description of the data base is produced each time the structure is changed in any way.
- VSAM Zapper. This feature can be used to verify and replace any data in any type of VSAM data set without modifying the VTOC. VSAM Zapper can be used for both IMS/VS and non-IMS/VS data sets. It operates in the same manner as the MVS AMASPZAP (Superzap) function and supports the following types of VSAM data sets:
 - KSDS – Key sequence data sets
 - ESDS – Entry sequenced data sets
 - RRDS – Relative record data sets

Potential Benefits

DBT provides ease of installation and maintenance and a comprehensive set of utilities to help perform some tasks more efficiently, including:

- Repairing broken data bases
- Retrieving data and reorganizing data bases rapidly and efficiently
- Modifying VSAM data bases via the "zapping" method
- Analyzing performance and tuning information
- Understanding physical and logical views of data bases

It provides enhanced operational improvements through ease of use and improved consistency in report formats, documentation, and message handling to achieve:

- Better data integrity
- Improved data base performance
- Increased availability of data bases
- Increased programmer/analyst productivity

Prerequisite Products

- OS/VS1, MVS/370, or MVS/XA
- IMS/VS Version 1 Release 2 or Release 3, or later
- IMS/VS DC (for DEDB utilities)
- DFSORT
- SMP-E or SMP Release 4

DBT is coded in assembler language. Assembler H Version 2 (5668-962) is required to install DBT.

Ordering Information

Program number: 5668-856

Reference Material

General Information Manual, GH20-6579

TSO Extensions (TSO/E)

Products Included

- TSO/E (including information center facility)

Main Purpose

The TSO Extensions licensed program is the base for all TSO enhancements and provides TSO users with additional function, improved usability, and improved performance.

Release 2 contains facilities to support the information center environment and integrates the functions previously provided by the TSO Session Manager program.

Release 2.1 provides virtual storage constraint relief in an MVS/XA environment.

Release 3 broadens TSO/E support for non-DP professionals and for personnel supporting them, by significant enhancements to the TSO/E Information Center Facility. Release 3 also extends System/370 to IBM PC Enhanced Connectivity support to MVS/XA host systems allowing IBM Personal Computer users and applications to effectively utilize host system resources and services.

Key Functions, Facilities and Features

Release 1 contains:

- All the facilities of the TSO Command Package (5740-XT6)
- TRANSMIT and RECEIVE commands to simplify sending data between nodes in a network
- Full screen logon for 3270 users
- ALLOCATE command enhancements to allow allocation of new data sets based on the attributes of an existing model data set
- Performance improvements for the SUBMIT command when the input job stream is to be entered from a terminal or is contained in a CLIST
- PROMPT HELP during command entry
- Reduced I/O operations during LISTBC and SEND command execution
- Support for testing programs at addresses above 16MB when running under MVS/XA

Release 2 contains the following additional facilities:

- Information center facility to allow an MVS installation to install and maintain end-user facilities
- CLIST performance improvements
- CLIST enhancements including command output management, built-in functions and control variables, text handling support, and program access to variables
- TSO service facility including program interface to TSO commands and an authorized service facility
- Integration of the facilities available in the TSO Session Manager program (5740-XE2)

- Extension of the ALLOCATE and ATTRIB commands to support the 3800 Printing Subsystem
- Improved LOGON performance by reducing contention for the broadcast data set

Release 2.1 contains the following additional facilities:

- Virtual storage constraint relief
- Logon extended region support
- Help facility enhancements
- Session manager enhancements
- Enhancements to the OPERATOR and SEND commands
- Command scan and parse acceptance of double-byte character set (DBCS) data

Release 3 contains the following additional facilities:

- Enhancements to the information center facility
- A facility allowing VM/PC users access to MVS/XA host system resources
- A variety of CLIST enhancements including direct access to information describing data sets, and performance improvements
- Enhancement of the TSO service facility
- Additional operands for the ALLOCATE command
- Improvements to processing for the TRANSMIT and RECEIVE commands including support for PROFS notes
- Elimination of SYSGEN or IOGEN to set TSO/E parameters
- Enhanced Connectivity Facility in TSO/E with the MVS/XA feature:
 - Support under the TSO/E MVSSERV command
 - A host server-requester programming interface (SRPI)
 - Comprehensive RAS facilities
 - Support for IBM Personal Computers with a number of host attachment options including local area networks (LAN)
 - Support for the 3270 Personal Computer

Release 4 contains the following additional facilities:

- Enhancements to the information center facility
- Enhanced connectivity facility updates:
 - Local server routing capability
 - User-written access method driver interface
 - User trace interface
- Installation simplification
- Reduced contention for the broadcast data set
- Definition of TSO/E users through RACF
- Maintaining the broadcast data set
- Printing capability
- CLIST additions and enhancements
- Support for testing programs that use the 3090 Vector Facility
- Ability to display auxiliary storage manager (ASM) information

- Improvements to transmitting and receiving data
- New installation exits

Version 2 with the MVS/ESA™ feature contains the following additional facilities:

- REXX language support
- Utilization of Enterprise Systems Architecture/370™
- Installation simplification enhancements including dynamic updates to TSO/E defaults in SYS1.PARMLIB and a table look-up service to access the TSO/E Version 2 command tables
- Enhancements to the application manager function of the information center facility
- Dynamic definition of CLIST and REXX exec libraries
- Simplified method for testing APF-authorized programs
- Dynamic definition and freeing of output descriptors
- CALL command enhancement to support mixed-case parameters

Version 2 with the MVS/XA feature contains the following additional facilities:

- REXX language support
- Table look-up service to access the TSO/E Version 2 command tables
- CALL command enhancement to support mixed-case parameters

Information Center Facility

The information center facility provides TSO support for non-DP professionals in the MVS/370 and MVS/XA environments. The primary objective of the information center facility is ease of use. Additionally, facilities are provided to allow the information center staff to administer the system.

Among the key features provided in Release 2 are:

- A hard-copy user's guide on getting started
- Primary selection panel listing the services available
- Conduit dialogs to allow the user to access the applications installed in the information center
- Computer-based training function
- User enrollment facilities for the information center administrator
- News facilities to allow users to view installation-provided information, including administrator functions to maintain the news file

Release 3 offers new facilities for direct support of MVS information centers:

- Significant extensions to the NAMES facility
- Dialogs and services to assist with printing in an information center
- A service to assist with data set space management

- User application access to these information center facility services
- Support for additional IBM licensed programs with new conduit dialogs
- Improved function and usability for dialogs offered with Release 2
- National language translations of information center facility dialogs

Release 4 enhancements provide:

- Support for interactively adding and maintaining products
- Fast method for accessing products
- Additional printing capabilities
- Enhancement to user enrollment
- Service to list data set names

Version 2 with the MVS/ESA feature provides enhancements to the application manager dialogs to allow administrators to:

- Create installation files from existing applications
- Replace applications without first deleting them
- Specify CLIST and REXX exec libraries required by each application

Primary Users

In addition to the users identified for TSO, TSO/E is aimed at the non-DP professional and the personnel supporting them, providing a rich environment for interactive applications on MVS systems.

Potential Benefits

Most significant are the facilities for the application programmer intended to improve programmer productivity and the performance and usability of TSO. Additionally, the information center facility provides extensive enhancements specifically for the non-DP professional.

The enhanced connectivity facility provides connectivity between the PC and the host computer running MVS/XA. In an MVS/XA environment, TSO/E also provides virtual storage constraint relief.

Prerequisite Products

Hardware

- For TSO/E Version 2 with the MVS/ESA feature, any IBM processor supported by MVS/SP Version 3
- For TSO/E Version 2 with the MVS/XA feature and TSO/E Release 4 with the MVS/XA feature, any IBM processor supported by MVS/SP Version 2 or Version 3
- For TSO/E Release 3 with the MVS/XA feature, any IBM processor supported by MVS/SP Version 2
- For TSO/E Version 1 with the MVS/370 feature, any IBM processor supported by MVS/SP Version 1

TSO Extensions (TSO/E)

- For full-screen logon, the interactive data transmission facility, the session manager, the information center facility, the enhanced connectivity facility, and the appropriate terminal or PC

Software

- For TSO/E Version 2 with the MVS/ESA feature, MVS/SP Version 3, Release 1.0, or later, with its corequisites
- For TSO/E Version 2 with the MVS/XA feature, MVS/SP Version 2, Release 2.0, or later, with its corequisites
- For TSO/E Version 1 running MVS/XA, MVS/SP-JES2 or -JES3 Version 2 Release 1.2 or later and the corresponding corequisite MVS/XA Data Facility Product
- For TSO/E Version 1 running MVS/370, MVS/SP-JES2 or -JES3 Version 1 Release 3.2 or later
- ISPF version 2 Release 2 (for TSO/E Version 1)
- ISPF Version 2 Release 3 or later (for TSO/E Version 2)
- Some functions in TSO/E Release 4 require later releases of MVS (see *TSO/E Licensed Program Specifications*, GC28-1123)

Products Supported

- 3275 Models 2 and 12
- 3276 Models 2, 3, 4, 12, 13, and 14
- 3277 Model 2
- 3278 Models 2, 3, 4 and 5
- 3279 Models 2A, 2B, 2X, 3A, 3B, 3X, S2A, S2B, and S3G (in base-color mode)
- 3178 Display Terminal Models C1, C2, C3, and C4
- 3179 Display Terminal Model 1 and Model G (alphanumeric mode)
- 3180 Display Terminal Models 100 and 110
- 3191 Display Station Models A30, A40, B30, B40, D, E, and L
- 3192 Display Station Models A, B, C, D, F, G, L, and W
- 3194 Display Terminal
- 3290 Information Panel
- 5550 family (as a 3270 PC)
- Any other IBM terminal that functions in compatibility mode with the terminals listed above
- 3270-PC (except Models 24 and 26)
- 3270-PC AT
- IBM Personal Computer
- IBM Personal Computer XT
- IBM Personal Computer AT
- IBM Personal Computer XT/370
- IBM Personal Computer AT/370
- IBM Personal System/2

The information center facility supports the following licensed programs with selection panels, help panels, tutorials, and conduit dialogs. These programs must be ordered separately:

- Application System (AS)
- Query Management Facility
- Info Center/1 (requiring APL/VS or APL2)
- The Information Facility
- IBM BASIC/MVS
- APL2
- VS APL
- Graphical Data Display Manager including:
 - The interactive chart utility
 - The vector symbol editor and
 - The image symbol editor
- Interactive Instructional Presentation System
- Interactive Instructional Authoring System
- Personal Services/TSO

Ordering Information

TSO/E Version 1

Program number: 5665-285

TSO/E Version 2

Program number: 5685-025

Reference Material

- TSO/E General Information, GC28-1061
- System/370 to IBM Personal Computer Extended Connectivity Facilities Introduction, GC23-0957
- Introducing TSO Extensions Release 4, GC28-1293
- TSO/E Licensed Program Specifications, GC28-1123
- Introducing TSO Extensions Version 2, GC28-1868

Conversational Monitor System (CMS)

Main Purpose

CMS is a component of VM/SP and VM/XA SP. Together with the control program, it provides a high-performance, interactive computing system suitable for general problem solving and program development. It can also serve as a base for interactive applications.

VM can be used in VSE and MVS production environments and can also provide time sharing and programmer support facilities for MVS systems.

Key Functions, Facilities and Features

Primary Functions

- Gives the user programmer and non-DP professionals a wide range of functional capabilities
- Creates and maintains source programs
- Compiles and executes directly many types of VSE and MVS programs, and supports a wide range of compilers
- Gives the user testing and debugging functions to monitor and control program execution dynamically
- Provides full compile, link-edit, and execute job streams for processing with VSE or MVS virtual machines, or directly under CMS
- Provides full time sharing in either a distributed system or a centralized environment with a dedicated processor, or in conjunction with other operating systems

Key Features

- Disk space is managed efficiently.
- Access to VSAM/E files and DL/I DOS files is available.
- Command language is simple, flexible, and English-like.
- EXEC processor has logical capabilities and can be used to define new commands and to create a personalized environment.
- An MVS or VSE environment can be created.
- EDITOR has a comprehensive and powerful set of subcommands.
- Complete set of utility commands is provided to move files: disk to disk, disk to tape, and so forth.
- Languages available are Assembler, COBOL, FORTRAN, PL/I, BASIC, APL, RPG II, and Pascal.
- Symbolic debugging capabilities for FORTRAN, COBOL, BASIC, and PL/I are available.
- CMS batch facility allows the user to execute any CMS program in batch mode, freeing the user's virtual machine for other uses.

- Text processing facilities are made possible by the Document Composition Facility (DCF), which includes SCRIPT/VS.
- A wide range of application packages is available to run directly under CMS (for example, Interactive Instructional Systems for computer-based training).
- Cross System Product/Application Development (CSP/AD) provides an interactive interface for defining, testing, maintaining, documenting, and generating application programs.
- ISPF and ISPF/PDF for VM/370 provide function, display formats, and operations compatible with the ISPF and ISPF/PDF for MVS (TSO). A utility is included to permit library files transfer from MVS/TSO.

Bimodal CMS

- The VM/XA SP Release 1 CMS, which is an extension of the VM/System Product (VM/SP) Release 5 CMS, takes advantage of the capabilities of Extended Architecture, including 31-bit addressability for both programs and data.
- This single CMS can execute on either System/370 or XA virtual machines.
- When CMS is invoked in XA mode, applications may benefit from XA capabilities to varying degrees. The greatest benefit will be to applications enhanced to utilize XA architecture, including XA I/O capabilities and storage addressing for both programs and data above the previous 16-megabyte addressing limit. Engineering and scientific users will benefit by the 31-bit capability of VS FORTRAN Version 2 and the Engineering and Scientific Subroutine Library. Applications that have not been enhanced to fully utilize the 31-bit capability may execute and reference data below the 16-megabyte addressing limit and still benefit from XA I/O advantages. Applications that cannot execute above the 16-megabyte limit may co-exist with XA-capable applications.
- Programs running on CMS can take advantage of XA virtual machine sizes that are greater than 16 megabytes (up to the current 999-megabyte CP restriction) through the following enhancements:
 - A program linkage mechanism replacing SVCs 201 and 202 is provided via macros (CMSCALL and CMSRET). These macros allow programs to call other programs or CMS services anywhere within the addressing range of the CMS virtual machine. Programs using SVCs 201, 202, and 203 continue to function below the 16-megabyte line.
 - Program-handling functions support 31-bit addressing.
 - Program-load and module-generation facilities support module relocation at load time.

Conversational Monitor System (CMS)

- The CMS storage management facility supports and takes advantage of 31-bit addressing. Management of free storage uses a subpooling scheme that allows storage related to a common subpool to be manipulated as a single entity. Macros assist assembler applications in gaining access to these facilities.
- The CMS programming interfaces have been enhanced to support programs which require more than 16 megabytes of storage for execution and data.
- Enhancements to the CMS programming interfaces enable an application to be coded so that it can be independent of whether it is running in a System/370 virtual machine or an XA virtual machine. In addition, programs running in XA virtual machine can choose to execute with either 24-bit addressing or 31-bit addressing, or dynamically switch between the two.
- Details of incompatibilities and conversion considerations may be found in the following publications:
 - Bimodal CMS for VM/XA Systems, GG24-3174
 - VM/XA SP Application Conversion Guide, SC23-0403

Potential Benefits

CMS is designed to optimize the productivity of end users and I/S professionals:

- End users can write and run their own programs without I/S department involvement.
- The portion of I/S resources used in program maintenance is minimized.
- The effectiveness of the application design and programming activity is maximized.
- Early application payback is achieved.
- CMS is easy to learn, install, and operate.
- Data security/integrity is increased.

Prerequisite Products

Hardware

- 4300 Processor
- 30XX Processor
- System/370 Model 135 or larger (minimum 384KB)

Software

- CMS is a component of VM/SP and VM/XA SP.

Products Supported

Hardware

- Any terminal supported by VM/SP or VM/XA SP as a console, such as local 3270 or remote 3270 (BSC only)
- 3277 APL Graphics Attachment

- DASD including 3330, 3340, 3344, 3350, 3310, 3370, 3375, 3380, and 3850
- Tape units including 3420

Software

- PL/I, COBOL, FORTRAN, Assembler, RPG II languages, and CP/AD and DES for program development
- Instructional Systems, MPSX/370, DCF, VM/Interactive File Sharing, and VM Directory Maintenance and other application products
- VS APL, APL2, and BASIC languages for personal computing
- VM/VTAM or VCNA provides SNA support for CMS terminals
- VM/Pass-Through Facility, allowing CMS 3270 terminals to connect to another system over BSC lines (see "VM/Pass-Through Facility" topic)

Ordering Information

CMS is part of VM/SP and VM/XA SP.

Reference Material

- VM/370: Introduction, GC20-1800
- VM/370: CMS User's Guide, GC20-1819
- VM/370: Release 5 Guide, GC20-1831

CICS/Conversational Monitor System (CICS/CMS)

Main Purpose

CICS/CMS is a program product that can be used to develop command-level application programs for CICS/DOS/VS or CICS/OS/VS. CICS/CMS executes as a single terminal user system in either a host VM/SP or a VM/PC environment. Applications can be developed using Assembler, COBOL, or PL/I and can access standard files such as VSAM or databases such as DL/I DOS/VS or IMS/VS DB.

Key Functions, Facilities, and Features

- Permits the application developer to perform source program editing, command level translation, assembly or compilation, and unit test execution, all within a VM/CMS environment
- Provides the application developer the use of both CICS/VS and VM/CMS application development aids, such as CICS execution diagnostic facility (EDF) or VM/CMS dump and trace facilities
- Provides emulated facilities for VSAM, transient data and temporary storage in the host VM/SP or VM/PC environments, or actual facilities in native CICS/VS program product environments via the CICS/CMS remote server capability
- Provides testing access to DL/I DOS/VS or IMS/VS DB databases in native CICS/VS program product environments via the CICS/CMS remote server capability
- The CICS/CMS remote server can provide linkage to a native CICS/VS program product environment executing in either a VM/SP guest machine or a native (real) MVS or VSE machine.

Potential Benefits

- Enables the programmer to perform most application development tasks within a VM/CMS environment, which can improve concentration and productivity
- Makes faster application development time possible because of fewer delays (such as waiting on test machine availability)
- Can offload some/all application development from host mainframe to a PC/370, either an AT/370 or an XT/370
- Can improve programmer productivity using PC/370 during periods where host mainframe facilities are not available
- Gives programmer choice of using either host or PC/370 facilities (such as compile on host but edit to test on PC/370)

Prerequisite Products

- VM/SP
- VM/PC if PC/370 is to be used
- VS COBOL II
- OS/VS COBOL
- PL/I Optimizing Compiler
- Assembler H
- VM Pass-Through

Products Supported

- CICS/OS/VS
- CICS/DOS/VS

Ordering Information

Program number: 5668-795

Reference Material

General Information Brochure, GC33-0284

VSE/Interactive Computing and Control Facility (VSE/ICCF)

Main Purpose

- VSE/ICCF is the interactive time sharing facility for VSE. It makes the computer available to multiple terminal users (remote/local) at the same time.
- VSE/ICCF is a productivity tool which can improve users' DP productivity, especially through interactive program development, testing, and maintenance.
- VSE/ICCF provides functions to support data security. Logging, auditing, and reporting are provided by a complementary program product: VSE/Access Control – Logging and Reporting.

Key Functions, Facilities and Features

- VSE/ICCF may be viewed as an integrated system of productivity tools for:
 - Program development and maintenance
 - Editing full screen and line content
 - Documentation
 - Security
 - Usability
- An online library stores programs, jobs, and data.
- VSE/ICCF has online source program and data entry, update, and maintenance facilities.
- An online library maintenance tool provides copy, purge, insert, rename, and resequence functions, data compression capability, library change control, and auditing functions.
- A powerful editing function – Context and Full Screen Editor – provides for efficient correcting and updating of programs, jobs, and data in the VSE/ICCF libraries.
- A direct job processing facility provides interactive compile-load-and-go capabilities in all VSE programming languages, with results received at the terminal or at the central printer/punch.
- Most existing VSE batch programs (single task) can be run in any VSE language as interactive programs, replacing card input and printer/punch output equipment with terminals.
- A VSE/POWER facility provides submit-to-batch to initiate jobs from the terminal for later batch processing with printed results available at the terminal or at the main system printer, or both.
- Conditional job execution can be performed by macros and procedures.
- Data can be retrieved from the the VSE/POWER reader queue by a VSE/ICCF terminal user.
- Three macros are supplied to move VSE/ICCF members easily into the VSE/Advanced Functions library and vice versa.
- A procedure processor with logic capabilities allows the installation and the users to build their own commands and procedures.

- Dynamic disk space allocation frees the installation from having to preallocate and predefine files.
- The ability to share terminal devices with CICS/VS eliminates the need for separate terminal networks and duplicated terminal control functions.
- System data security facilities enable the user to select the most appropriate security provisions.
- VSE/ICCF creates a set of data for each security-related event. These data can be recorded into a security file on disk and printed by the VSE/Access Control – Logging and Reporting program.

Primary Users

VSE/ICCF is the primary interactive facility for VSE users.

Potential Benefits

- Ease-of-use in areas such as operations, system maintenance and online application development
- Reduced application development cost
- Reduced system maintenance cost
- Operations and system security control for batch and interactive users
- Availability of the computer to multiple terminal users at the same time
- Online entry of data and programs
- Text manipulation capabilities
- Increased total DP productivity
- Interactive execution of those programs that have been designed for batch processing

Prerequisite Products

- VSE/Advanced Functions Version 2
- BTAM-ES or ACF/VTAM
- CICS/VS
- VSE/POWER Version 2 Release 2 or later

Products Supported

Hardware

- VSE/ICCF libraries may reside on any DASD supported by VSE.
- All tape units supported by VSE are supported by VSE/ICCF; however, no tape unit is required for operation of VSE/ICCF.
- Terminal support is provided through CICS/VS, with the option to use ACF/VTAM for TP access.

Software

- VSE/VSAM, DL/I/DOS/VS
- RPG II, COBOL, PL/I, FORTRAN IV, VS BASIC, Assembler
- VSE/DITTO
- DOS/VS Sort/Merge
- VSE/Access Control – Logging and Reporting

Reference Material

- General Information Manual, GC33-6066
- Program Summary, GC33-6200

Interactive System Productivity Facility (ISPF)

Products Included

- ISPF
- ISPF/PDF

Main Purpose

ISPF provides dialog management services in the MVS/TSO, MVS/XA TSO, VM/CMS, and VSE/ICCF environments to users of 3270 Display Terminals. Dialog management services may be used by an application developer to produce interactive applications in the form of menu-driven dialogs and dialog functions that make the application easy to use by a non-DP user.

ISPF/PDF (Program Development Facility) is a dialog application that provides application development services to both the DP and non-DP professional. It is used to create and maintain both source programs and text data. ISPF/PDF provides interfaces to many system facilities via easy-to-use menus, relieving the users of the need to know the specific command syntax of the interactive system they are using.

Only the ISPF program product is required to execute dialog-oriented applications. The ISPF/PDF program product requires ISPF. ISPF and ISPF/PDF replace the System Productivity Facility (SPF) program product.

Key Functions, Facilities and Features

ISPF

- Operates under MVS/TSO, MVS/XA TSO, VM/CMS, and VSE/ICCF
- Provides dialog management services for ISPF/PDF and installation-written dialog-oriented interactive applications
- Allows a wide variety of dialog organizations so that the end-user at a display terminal can approach an application in a natural, comfortable way
- Manages dialogs that consist primarily of:
 - Selection panels (menus) from which the user selects a particular processing option
 - Functions (command procedures or programs) that perform the requested processing option
 - Data entry panels on which the user supplies additional information needed for the application
 - Data display panels on which the application provides information to the user
 - Message services to notify the user of errors or the status of a dialog operation within an application

ISPF/PDF

- Support for multilevel programming libraries, which facilitates maintenance and tracking of program segments under development at different version and modification levels
- Full-screen context editing that allows additions and changes to multiple lines in a single interaction, with simple one-character edit commands used for inserting, deleting, duplicating, or rearranging lines of code
- Forward, backward, or sideways scrolling of source data or listings, plus the ability to locate information by character string or line number
- Interfaces to utilities for specification and maintenance of ISPF libraries, data sets, catalogs, and DASD volumes
- Interfaces to standard language processors (compilers, assembler, and linkage editor) for execution in the foreground or background
- Document preparation support, including text editing features and an interface to the Document Composition Facility program product
- Online tutorial for instruction or reference, which can be especially valuable for the novice or occasional user
- A MODEL facility that simplifies the task of testing new dialogs and improves dialog development productivity
- Interactive Dialog Test Facility

Primary Users

ISPF: application programmers, system programmers, and users of dialog applications

ISPF/PDF: application programmers, end-users, and dialog developers

Potential Benefits

ISPF and ISPF/PDF take advantage of the features of 3270 display terminals, including full-screen editing and extensive support for the optional program function keys to reduce user keystrokes.

ISPF/PDF supports the creation of dialogs and dialog functions to produce menu-driven applications that will run under ISPF.

The menu-driven design and library management facilities of ISPF/PDF are oriented toward improved programmer productivity.

Prerequisite Products

Hardware

ISPF and ISPF/PDF-MVS run under MVS with TSO. ISPF and ISPF/PDF-VM runs under VM/SP Release 1 or later with CMS. ISPF and ISPF/PDF-VSE run on all configurations supporting VSE/Advanced Functions Release 3.5 or later.

Software

With MVS, ISPF operates with TSO under MVS/370 or TSO/E under MVS/XA. Also required are BPAM, BSAM, TSO/TCAM or TSO/VTAM, ACF/TCAM or ACF/VTAM.

With VM/370, ISPF operates as a CMS command under the VM/System Product (VM/SP).

If ISPF is to be used with VM/370 and SNA 3270 displays, VM/VTAM Communications Network Application (VM/VCNA) must be installed.

With VSE, ISPF operates with ICCF under VSE.

Products Supported

Hardware

3270 terminals and any IBM terminals that function in compatibility mode with 3270 terminals.

Software

Under MVS, ISPF/PDF provides interfaces to the following IBM processing programs and object code generated by them for foreground and batch execution:

VS2 Assembler	(available with MVS)
Linkage Editor	(available with MVS)
TSO Assembler Prompter*	
COBOL Compiler and Library	
TSO COBOL Prompter*	
COBOL Interactive Debug*	
VS FORTRAN Compiler	
TSO FORTRAN Prompter*	
FORTRAN Interactive Debug*	
PL/I Checkout Compiler (Rel 3)	
PL/I Optimizing Compiler (Rel 4)	
PL/I Resident Library	
PL/I Transient Library	
PL/I Optimizing Compiler and Library	
Pascal/VS Compiler (IUP)	
Document Composition Facility*	
(with the Foreground Environment Feature)	

* Foreground only

Under VM/370, ISPF/PDF provides interfaces to the following IBM processing programs and object code generated by them for interactive and CMS batch execution:

VM/370 Assembler	(available with VM/370)
COBOL Compiler and Library	
COBOL Interactive Debug*	
VS FORTRAN Compiler	
FORTRAN Interactive Debug*	
PL/I Checkout Compiler (Rel 3)	
PL/I Optimizing Compiler (Rel 4)	
PL/I Resident Library	
PL/I Transient Library	
PL/I Optimizing Compiler and Library	
Pascal/VS Compiler (IUP)	
Document Composition Facility*	
(with the Foreground Environment Feature)	

* Interactive only

Internal interfaces are provided to the RSCS Networking licensed program. This program is not required to operate ISPF/PDF, but it must be installed if spooled output is to be sent to another node in the network.

Under VSE, ISPF/PDF provides interfaces to the following IBM processing programs and object code generated by them for batch execution:

VSE Assembler	(available with VSE)
Linkage Editor	(available with VSE)
COBOL Compiler and Library	
VS/FORTRAN Compiler (Release 3)	
PL/I Optimizing Compiler and Libraries	
RPGII Compiler	

Ordering Information

ISPF for VSE

Program number: 5668-960

ISPF/PDF for VSE

Program number: 5666-281

ISPF for MVS

Program number: 5665-319

ISPF/PDF for MVS

Program number: 5665-317

Interactive System Productivity Facility (ISPF)

ISPF for VM

Program number: 5664-282

ISPF/PDF for VM

Program number: 5664-285

Reference Material

- ISPF and ISPF/PDF General Information:
 - VSE, GC34-2078
 - MVS, GC34-4146
 - VM/370, GC34-4036
- IBM Systems Journal reprint, "Full Screen Testing of Interactive Applications," G321-5194

Enhanced Connectivity Facilities (ECF)

Products Included

- IBM CMS Servers/Requesters
- IBM TSO/E Servers/Requesters

Main Purpose

The main purpose of the IBM System/370 to IBM Personal Computer enhanced connectivity facilities (ECF) is to extend the intelligent workstation (IWS) environment to include resource sharing facilities with the host computer and access to data and data bases stored on the host computer. The ECF software allows the host and the IWS to work together in a cooperative processing environment.

IBM ECF PC Requesters are offered as a feature of the host servers.

Key Functions, Facilities and Features

Access to Host Data

- ECF provides a powerful online data base access to IBM's strategic relational data bases, DB2 and SQL/DS. The PC user can retrieve data from the host data bases and make that data accessible to PC applications in one of several PC data formats. In addition, the data extracted from the host data base can be stored on the PC or on the host computer.
- Batch data extraction is provided by ECF working in conjunction with Data Extract (DXT). The PC user can submit predefined data extract requests to extract data from IMS/VS DL/I and IMS/VS fast path data bases, DB2 or SQL/DS data bases, VSAM data sets, and MVS and CMS sequential files.

Extension of Resources

- The ECF virtual disk facility allows the PC user to define host DASD to be used as PC disk space. Data is stored on a virtual disk in PC format and is accessible by PC users and PC application programs.
- The virtual print facility allows the PC user to route printer output to a host printer. The PC user chooses a PC printer format to be emulated on the host printer. Only alphanumeric characters are supported.
- ECF's virtual file facility allows the PC and host computers to share data files, which are stored on the host in host format. The PC user's application programs can access MVS sequential or CMS sequential files or members of an MVS partitioned data set as if the host files were PC files.

File Copy

- ECF provides a file copy facility that allows for files to be copied between the PC and host computers. Binary, text, and formatted file copies are allowed. In the formatted file copy, that data is reformatted according to the PC user's specifications.

Run Host Procedures and Commands

- ECF provides a facility that allows the PC user to invoke host programs and procedures from the PC.

ECF Interfaces

ECF provides two interfaces for the PC user. For the casual user, ECF provides a full-screen menu interface, which allows the PC user to use the ECF services and features by selecting options from the full-screen and pop-out menus. Extensive online help is available.

For the PC application developer or the more experienced ECF user, ECF provides a command-level interface. Each ECF service or feature is available to the PC user in command form. The ECF commands can be treated as extensions of the PC DOS library of commands. These ECF commands can be issued from the PC DOS command line, from within a .BAT file, or from within PC application programs.

Primary Users

ECF is designed for the business professional or end user in an organization whose primary function is to analyze and present information. Currently, the end user is a CMS user, a TSO user, a PC user, or a user of no computer facility at all.

Potential Benefits

Customer Benefits

- ECF is a simplified method of connecting unlike systems over a variety of communications protocols and connections.
- A Personal Computer user with ECF installed on the workstation can request information or services from both an MVS and a VM host (one at a time).
- Investment in communications programming skills can be minimized or avoided.
- The need for the Personal Computer user to reenter data because of different file formats and data structures is eliminated.

Enhanced Connectivity Facilities (ECF)

- ECF shields application programmers from changes to the communications protocols.
- Current Personal Computer programming investments are protected.

Benefits to the Personal Computer User

- Information formerly available only in the System/370 environment is available to the Personal Computer user.
- Host sequential files can be accessed and updated transparently and directly from an existing PC application.
- The user is able to utilize the most current host information directly in PC applications.
- Multiple PC printers can be emulated and the output directed to be printed on host printers.
- ECF is easy to use and learn for the casual user and has a "fast path" entry available for more experienced users.
- Information can be shared easily between PC users.
- ECF provides for the easy transfer of information back and forth between a host and a Personal Computer.
- The PC user automatically benefits from host backup and security procedures.
- ECF helps the Personal Computer user to become more productive and self-sufficient.

Benefits to the Information Center Manager

- ECF helps the Info Center Manager support a wide variety of end-user demands with a single product.
- A wide variety of System/370-to-PC file-transfer and data-access products may be replaceable.
- ECF aids in increasing end-user satisfaction.
- The productivity of the information center personnel may be increased by reducing the number of products that must be mastered and then taught to the end users of the organization.

Benefits to the Application Development Manager and Data Base Manager

- ECF helps reduce the application programming backlog because of the functions provided in the product.
- ECF has the ability to distribute program function between the Personal Computer and the host.
- ECF assists in increasing end-user satisfaction while helping to maintain control of host information.
- Application investment may be protected by utilizing the strategic functions of ECF.

Hardware Configurations

For the IBM CMS or TSO/E Server:

- Processor: Any IBM processor that meets the minimum requirements for MVS/System Product, Version 2, Release 1.2 or any IBM processor that meets the minimum requirements for VM/SP Release 4.0 or 5.0 or later.

For the IBM PC Requesters:

- Selected models of:
 - IBM PC
 - IBM PC XT
 - IBM PC AT
 - IBM 3270 PC
 - IBM 3270 PC AT
 - IBM Personal System/2
- Communications adapters
- Disk drives
 - Two diskette drives, or one diskette drive and a fixed disk. To use the full-screen interface of the IBM PC Requesters, a fixed disk is required.
- Displays
- Keyboards
- Printer
 - A PC printer is not required but is recommended to make installation of the PC Requesters easier.
- Memory adapters
 - Some configurations require an Expanded Memory Adapter (XMA) to use the full-screen interface of the PC Requesters.

Software Configurations

The following lists the software prerequisites required for the IBM TSO/E Servers, IBM CMS Servers and IBM PC Requesters.

IBM TSO/E Servers will run on any processor capable of running TSO/E Release 3 with the MVS/XA feature. The software prerequisite licensed programs are:

- TSO/E with the MVS/XA feature
- MVS/System Product and MVS/XA Data Facility Product
- Interactive System Productivity Facility (ISPF)
- IBM 3270-PC File Transfer Program

IBM CMS Servers will run on any processor capable of running VM/SP Release 4 or 5. The software prerequisite licensed programs are:

- VM/IS or VM/SP. The VM/SP High Performance Option is optional.
- ISPF
- IBM 3270-PC File Transfer Program

IBM Personal Computer software prerequisite licensed programs are as follows:

- An emulation program
- IBM PC DOS
- EZ-VU II Runtime Facility

Ordering Information

IBM CMS Servers/Requesters

Program number: 5664-327

IBM TSO/E Servers/Requesters

Program number: 5665-396

Reference Material

- IBM Personal Computer Enhanced Connectivity Introduction, GC23-0957
- IBM TSO/E Servers and IBM CMS Servers: Installation and Programmer's Guide, SH20-9677
- IBM Enhanced Connectivity Facilities: Getting Started with the PC Requesters, SK2T-0002
- IBM Enhanced Connectivity Facilities: PC Requesters Reference, SK2T-0003
- IBM Enhanced Connectivity Facilities: PC Requesters Quick Reference Summary, SH20-9679

VMTAPE Management System (VMTAPE-MS)

Main Purpose

VMTAPE-MS is an automated system for managing tape drives and tape volumes. It maintains a database of information about tape volume contents, locations, and physical attributes. VMTAPE-MS substantially decreases operator tasks while offering complete control. Comprehensive reporting and auditing for the VM environment is provided.

VMTAPE-MS is an IBM licensed program developed by VM Software Inc. of Reston, Virginia, USA.

Key Functions, Facilities and Features

- VMTAPE-MS runs as a service virtual machine. Although it is usually run in disconnect mode, it can be run in connect mode.
- VMTAPE-MS supports multiple CPUs with shared DASD, sharing the tape management catalog (TMC) among any number of CPUs.
- VMTAPE-MS configuration file allows the installation to specify various operating parameters to VMTAPE-MS. This provides both security and full control by the installation, while permitting a high degree of flexibility.
- Several optional user exits are available for local customization. They are loaded dynamically and therefore do not require changes to VMTAPE-MS.
- The configuration file contains a list of tape drives for allocation by VMTAPE-MS. Upon initialization, VMTAPE-MS obtains CP information about the tape drives, such as device type and density. At initialization and at each mount request, VMTAPE-MS also determines the availability of the tape drive. Availability is determined by the use of the tape drive anywhere within the VM environment, not just by VMTAPE-MS. When multiple tape drives are available, VMTAPE-MS balances usage of tape drives to avoid reusing a single drive repeatedly.
- VMTAPE-MS contains a bin/slot system that enables installations to associate an arbitrary external tape label with an internal VOL1 label. This allows the installation to easily handle tapes created externally that do not fit into the installation's series of tapes.
- Enhanced VMBACKUP-MS/VMTAPE-MS interface allows VMTAPE-MS to manage backup tapes or provide full scratch mount capabilities.
- A typical VMTAPE-MS mount scenario follows:
 1. A user issues the MOUNT subcommand.
 2. VMTAPE-MS uses the configuration file authorization records to verify that the user is authorized for the options specified on the MOUNT subcommand.
 3. The TMC is accessed to ensure that the user is authorized for the specified access to the requested tape volume.
- 4. If VMTAPE-MS determines that no tape drives are available, it notifies the operator and waits for a tape drive to be made available.
- 5. VMTAPE-MS attaches an available tape drive to itself.
- 6. VMTAPE-MS sends a message to the tape operator requesting that the specified tape volume be mounted, with or without a write ring, as appropriate.
- 7. The tape operator mounts the specified tape volume on the designated tape drive.
- 8. If the mount request was for a non-labeled, BLP (bypass label processing), or foreign tape, VMTAPE-MS prompts the operator to provide the external volume serial number. For read/write mounts, the VOLSER must be entered twice to ensure that the correct volume serial number was entered.
- 9. After verifying that the mounted tape is the correct tape volume with the correct write ring status, VMTAPE-MS updates the TMC and audit file.
- 10. VMTAPE-MS detaches the tape from itself and attaches it to the requesting userid. The user now has control of the drive and can position the tape to the desired location.
- 11. VMTAPE-MS sends mount completion messages to the user and to the operator indicating the volume serial number and drive information.
- 12. When the user is finished with the drive, he detaches the drive. Once the drive is detached, VMTAPE-MS can allocate it to another user.
- A single command (VMTAPE) permits communications with VMTAPE-MS. Subcommands of the VMTAPE command are available for users, operators, and tape librarians.
- The subcommands available to users allow them to:
 - Request a tape volume to be mounted, specifying parameters
 - Request the mount of a tape not in the TMC
 - Request a mount for another userid, such as by an operator for a user (subject to authorization)
 - Request that a tape be saved for another user
 - Cancel a tape mount request
 - Change certain data in the TMC for any tape file on a tape
 - List information concerning tapes
- The operator subcommands allow operations personnel to control and manage the tape environment:
 - Issue a MOUNT subcommand for a user
 - Query drive allocation status and tape volume status
 - Query pending mounts and requests
 - Reply to a VMTAPE-MS request
 - Reject a pending mount request
 - Suspend and resume VMTAPE-MS operation

- Execute any CMS subset or CP command from the VMTAPE-MS console
- Shut down the VMTAPE-MS system
- Terminate VMTAPE-MS and cause a dump
- Rebuild the VMTAPE-MS pointer file
- The tape librarian subcommands allow easy access to the TMC:
 - List information about a tape or a group of tapes for any user
 - Change any data element in the TMC
 - Display any data element in the TMC.
- VMTAPE-MS provides various utilities for use by system management and maintenance personnel.

Potential Benefits

- VMTAPE-MS protects and retains tape volumes based on passwords and expiration dates stored in the TMC.
- VMTAPE-MS maintains an audit trail of all transactions to the TMC. This file can be used to recreate the TMC in the event that it is destroyed.
- VMTAPE-MS permits use of any number of tapes in any series. A pointer file that contains pointers into the TMC permits quick access to tapes.
- Users can issue requests to mount tapes and list tape information without affecting other events in VMTAPE-MS.

Ordering Information

Program number: 5664-292

Reference Material

- General Information Manual, GH20-6240

VMBACKUP Management System (VMBACKUP-MS)

Main Purpose

VMBACKUP-MS is an automated system for managing the DASD backup process. It is used for the cyclical copying of minidisks to tape or disk and for performing archival storage of CMS files, with emphasis placed on retention by expiration date.

A subsystem of the VMBACKUP-MS provides an archival storage system for the VM environment. It provides end-user-driven copying and storage of CMS files for a specified period of time. Files may be stored on disk, tape, or both. Users need not be concerned with the location of data.

VMBACKUP-MS is an IBM licensed program developed by VM Software Inc. of Reston, Virginia.

Key Functions, Facilities and Features

- VMBACKUP-MS performs four key functions: backup, restore, archive, and recall. The backup and archive processes move data from minidisks to alternative storage media; the restore and recall processes move data from alternative storage media to the original minidisks. VMBACKUP-MS also performs the functions of backup, restore, archive, and recall on data residing on the shared file system.

	Initiated by User	Initiated by Installation
Backup	Never	Periodically
Restore	After error	After disaster
Archive	When desired	Never
Recall	When desired	Never

- The backup process is typically done by the operations staff. It is primarily insurance against a DASD problem or a user erasing a critical file.

The VMBBackup subsystem performs logical dumps of CMS minidisks and shared files and physical dumps of non-CMS minidisks. Either type of dump can be full or incremental.

- The restore process is performed by the operations staff in the event of a disaster or by the user in the event of the loss of a critical file.

A key feature of the VMBBackup catalog is its ability to reconstruct minidisks and shared files from several incremental dumps. When a minidisk or shared file must be restored as of a certain date, VMBBackup uses its catalog to assemble the correct data from multiple backup tapes. VMBBackup can also reconstruct minidisks and shared files if the

catalog is not available by using information on the backup tapes. This is useful in disaster recovery situations when the VMBBackup catalog is not available.

- The archive process is performed by a user to move infrequently-used files off a minidisk or to store different versions of files.

Upon receiving an archive request, VMArchive determines if the requesting userid is authorized, and ensures that sufficient resources are available to satisfy the request.

- The recall process is performed by a user when an archived file is required again.

If the file to be recalled is on a STAGE or ONLINE storage area, VMArchive immediately moves the file directly to the user's minidisk, shared file, or virtual reader. If the file is on an archive tape volume, VMArchive creates a request to restore the file.

- VMBACKUP-MS also provides the following functions:
 - Restart recovery provides for backups to restart if interrupted by a system failure. The backup will restart automatically when VMBACKUP-MS is initialized.
 - Backups can be performed from a remote location, controlled and monitored by a single operator within a TSAF collection.
 - Backup will recover when it encounters a permanent I/O error on tape by continuing on another tape volume.
 - Backup and restore jobs can be run simultaneously.
 - Many full-screen menus are provided for easy use of functions.
 - Enhanced VMBACKUP-MS/VMTAPE-MS interface allows VMTAPE-MS to manage backup tapes or provide full scratch mount capabilities.

Potential Benefits

- Reduce time and resources for DASD backups and restores:
 - VMBACKUP-MS performs full or incremental backups for all types of DASD, including those formatted for guest system control programs such as MVS or DOS/VSE, without interrupting service to users.
 - With appropriate authorization, users can recover their own files by using a full-screen capability to browse through the online catalog and select the files to be restored.

- Provide an alternative way to store CMS files:
 - By using simple commands or a full-screen interface, users can move infrequently-used or non-critical files to an archive storage media.
 - VMBACKUP-MS saves considerable disk and tape space by using a compressed data format for archived data.
- Allow user-initiated file recovery:
 - With appropriate authorization, users can restore their own files that have been backed up in full or incremental backups.
 - A user can recall CMS files that were previously archived to online DASD storage or offline tape storage.
- Provide added integrity and security of DASD data:
 - VMBACKUP-MS verifies CMS files as they are backed up or archived. When a CMS minidisk is backed up, VMBACKUP-MS verifies that the minidisk file directory matches the information within the actual blocks of minidisk data. When a file is archived, VMBACKUP-MS ensures that it conforms to the CMS file system conventions. This ensures that files that are backed up or archived can be recovered.
 - As added protection, a backup process can create up to four additional copies of each tape.
 - VMBACKUP-MS supports multiple authorization levels to control use of backup and archive facilities.
 - For additional security, VMBACKUP-MS can encrypt sensitive data during the backup process.

Ordering Information

Program number: 5664-291

Reference Material

- General Information Manual, GH20-6248

Teleprocessing Network Simulator (TPNS)

Main Purpose

TPNS is a telecommunications testing package that allows a user to test and evaluate application programs, communications access methods, control programs, subsystems, and networks by providing controlled generation of message traffic into a telecommunications subsystem or application without using large amounts of terminal hardware and terminal operator time. TPNS may be used for performance and stress testing of telecommunications application programs with volume messages to evaluate reliability and approximate performance characteristics under expected operating conditions. TPNS may also be used to monitor subsystem availability and performance, and to provide capacity planning and tuning information. Hardware, such as processors, communication controllers, lines, switches, and modems may be tested with TPNS.

Key Functions, Facilities and Features

- Connection to an IBM Token-Ring Local Area Network
TPNS supports the simulation of Type 2.1 nodes and PU Type 2 nodes and their resources connected to an IBM Token-Ring Local Area Network.
TPNS will simulate one physical address on the ring per IBM Token-Ring Local Area Network Interface Coupler (TIC) installed, but multiple logical link stations can be simulated per TIC.
- Simulation of a Type 2.1 End Node
System Network Architecture (SNA) low entry networking is an enhancement for peer communications. It supports peer-to-peer communications between SNA Type 2.1 nodes. TPNS supports the simulation of a Type 2.1 end node. The node can be link-attached to the system under test.
- TPNS/NetView Operator Interface
TPNS offers an operator interface between TPNS and NetView™. This interface allows one or more NetView terminal operators to control TPNS networks. Communication between TPNS and NetView is accomplished with an ACF/VTAM session between the two programs. This interface is available in the MVS and VM/SP environments.
- Enhanced Script Generating Support
 - Application Test Processor: The TPNS Application Test Processor (TPNS/ATP) utility eases the planning, definition, and maintenance of TPNS message generation scripts for application systems based on the 3270 Information Display System and IMS/VS. TPNS/ATP allows users to interactively define test cases from Message Format Services (MFS) – defined screens or panels that are then converted into TPNS

message generation scripts. These scripts may be used for functional, regression, or stress testing.

TPNS/ATP does not depend on the capture of “live” data during the application’s execution. Instead, the TPNS/ATP editor (executing under ISPF/PDF) is used to build and display the screen images and input the data to be transmitted or received on that screen.

- Batch Terminal Simulator Conversion Utility: TPNS provides a script conversion utility (ITPBTS) to convert Batch Terminal Simulator input statements into TPNS message generation scripts that may be used for functional, regression, and stress tests. Batch Terminal Simulator is an IBM licensed program that allows execution of IMS/VS DB/DC applications in a TSO or batch environment.
- Enhanced Simulation Run Analysis
 - Display Monitor Facility: TPNS provides a facility for viewing simulated 3270 display images on a 3270 monitoring device during a simulation run.

The TPNS Display Monitor facility is supported by ACF/VTAM.

The Display Monitor facility may be used to facilitate the debugging of TPNS scripts. Using this facility to monitor a device as it processes TPNS message generation can help identify errors which would, otherwise, require the execution of the loglist utility ITPLL to detect.

- Service Level Reporter Support: TPNS provides support for the Service Level Reporter (SLR) licensed program for the processing of TPNS response time data. Data sent and received by a TPNS-simulated device can be written to a log dataset and analyzed following the simulation run by the TPNS response time utility ITPRESP.
- X.25 Support
TPNS X.25 support has been enhanced to conform to the 1984 CCITT Recommendation X.25 (Malaga-Torremolinos). This level of X.25 support is provided in addition to the support available in previous releases of TPNS.
- Support for the 3720 Communication Controller
TPNS has been enhanced to support the execution of a TPNS control program in a 3720.
- Availability Monitor
Availability Monitor (AVMON) is a network management tool that monitors the availability and performance of real network subsystems. AVMON consists of a set of TPNS scripts previously available as part of the Network Management Productivity Facility program offering. A modified version of these scripts is now available in TPNS. A TPNS-simulated resource logs onto the subsystem to be monitored and periodically sends a

message. When the simulated resource detects that the subsystem is unavailable, a message is sent to the operator console alerting the operator to the problem. Additionally, TPNS times the response returned from the subsystem and reports when a user-specified threshold is exceeded.

AVMON increases the overall availability of complex subsystems and networking environments. Through the constant monitoring of subsystem and network resources, AVMON provides quick alert of failures and performance problems, in addition to availability and response-time measurements.

Primary Users

Most TPNS potential customers will be large MVS/370, MVS/XA, or VM/SP (with or without VM/SP High-Performance Option) users who have installed or planned interactive applications or systems.

Potential Benefits

- TP applications can be tested better, faster, and less expensively, reducing the risk of failure in both function and schedule.
- Potential performance inadequacies can be detected in time to take corrective actions when TPNS is used to predict the system behavior under an expected future load. More confidence in the system can be gained by performing stress testing.
- The effect of various tuning techniques can be evaluated without an adverse impact on the users.
- Increased stability of the system operation can be achieved by regression testing (using repeatable tests) whenever a change is made to the system environment.
- The auditing of the system functions can be made more extensive.
- TPNS can be used before the installation of the actual network as well as during actual operation.

Prerequisite Products

Hardware

TPNS is designed to run in a virtual storage environment in any IBM system configuration that supports MVS/370, MVS/XA, or VM/SP (with or without VM/SP HPO). It is designed to operate on System/370, 303X, 308X, 309X, and 43XX processors.

For TPNS simulation runs, DASD storage space is required for the following partitioned data sets:

- User network/message definition records
- TPNS CPU and control program load modules
- Rate tables (optional)

For execution as an ACF/VTAM application program, TPNS requires no communications controller or other unique hardware in addition to the processor in which it is executing.

For the simulation of remote terminals or cross-domain communication via SDLC links, TPNS requires a 3725, 3720, or 3705 Communication Controller that will execute a TPNS control program. For cross-domain communication, TPNS may be channel-attached to a 3725, 3720, or 3705 and share an ACF/NCP with other SSCPs.

For the simulation of resources connected to an IBM Token-Ring Local Area Network, the appropriate IBM Token-Ring Local Area Network subsystem hardware and microcode is required for a 3725 or 3720.

Software

TPNS is designed to run with the following operating systems:

- MVS/370 (MVS/SP Version 1) for System/370
- MVS/XA (MVS/SP Version 2) for System/370 extended-architecture processors
- VM/SP Release 4 (with or without VM/SP HPO)

To support communication with a TPNS control program or ACF/NCP running in a 3725, 3720, or 3705, TPNS Version 2 Release 4 requires the loader and dump utilities of the appropriate-level ACF/System Support Program (ACF/SSP).

Ordering Information

Program number: 5662-262

Resource Access Control Facility (RACF)

Main Purpose

RACF is a licensed program that provides a full-function access control system unique to the VM/SP, VM/XA SP, MVS/370, MVS/XA, and MVS/ESA™ environments.

RACF permits control of access to system-managed resources. These resources include DASD and tape volumes and data sets, terminals, and IMS and CICS transactions and transaction groups. Many standard features provide flexibility, usability, and performance options.

RACF can replace product-local security measures such as transaction password protection by providing a single system for control of users and their access to system and subsystem resources.

Key Functions, Facilities and Features

RACF performs four major functions:

- User identification and verification. This is done by checking userid and password provided by users at VM logon, TSO logon, or IMS and CICS sign-on. JES propagates a validated userid to jobs submitted to MVS via the internal reader. Job cards can also contain RACF userid and password information. Time-of-day, day-of-week, application, and terminal checking can also be performed.
- Access authorization checking. This can be performed for protected resources:
 - DASD and tape data sets (different levels of access can be authorized)
 - DASD and tape volumes
 - VM Batch Subsystem
 - Terminals (IMS, CICS, TSO, CICS, and VM)
 - Transactions (IMS and CICS)
 - CICS programs, files, and other resources
 - VM minidisks, spoolreaders, RSCS nodes
 - Installation-defined
- Logging and reporting function:
 - Access events by class of resource
 - Access events by individual resource (successful or unsuccessful attempts) by user.
 - Realtime violation notification
- ISPF panels or commands for control and security administration

RACF also provides:

- ISPF menu and entry panels for RACF administration
- Reporting on the status of MVS/RACF implementation via the RACF data security monitor (DSMON)
- Dual user registration support for VM/SP
- Installation exits to extend installability and adaptability of RACF

- Additional functions provided under MVS/XA:
 - Program control, including execution control and program access to data
 - Enhanced tape support, including:
 - Tape data set protection
 - Tape bypass label processing (BLP) control
 - Erase-on-scratch for DASD data sets
 - Elimination of SYSGEN on install
 - Enhanced TSO/E support, including:
 - TSO user segment (UADS information) in the RACF user profile
 - RACF resource classes for TSO/E
 - Profile field and segment authorization checking
 - Automatic allocation/de-allocation of the RACF data set
 - Data Security Monitor (DSMON) authorization
 - System authorization facility (SAF) 31-bit addressing for all RACF services
 - VSCR (Virtual Storage Constraint Relief)
 - RACF code in ELPA, 320000 bytes above 16MB
 - RACF buffers in ECSA, approximately 40000 bytes
 - RACF and CICS 1.7 RACLISTed profiles in ELSQA, variable
 - Support for MVS/DFP Storage Management Subsystem

Primary Users

- For I/S functional management, RACF offers a tool to implement and control security policy, and an effective technique to reduce inadvertent damage to, or misuse of, system resources.
- For user functional management, or owners of applications, it offers a way to manage and control access to their own data.
- For non-I/S professionals, it introduces security fences that isolate user communities from each other's resources.
- For internal auditors, it provides a control and audit trail system to I/S operations.

Potential Benefits

- Improve management control of access to the system and its resources.
- Improve data security:
 - Common technique for all direct access data
 - A system that permits centralized control with one security function or decentralized with security controlled by group/user
 - Support for security classification and categories for users and resources.

- Provide better information for control/audit:
 - Which users have accessed data (and how accessed)
 - Which users have entered system
 - Last user of a data set
 - When data set was last used
- Report on the status of key system control elements via the RACF Data Security Monitor
- RACF provides all these functions in a single system.

Prerequisite Products

RACF can be used with MVS/System Product (MVS/SP) Version 1 Release 3 or later, MVS/SP Version 2, VM/SP Version 4 or later, VM/XA SP Version 1 or later, and MVS/ESA.

Products Supported

- DFP and MVS/XA DFP support the always-call facility of RACF

The following products use RACF: MVS/370, MVS/XA, VM/SP, VM/XA SP, IMS, IMSADFII, BDT, RMDS, CICS, DB2, ISPF, DFHSM, NCCF, DLF, TSO/E, DFDSS, DFP, MVS/XA DFP, FTP, and OPC/A. RACF may be used to control access to any installation-supported resource. RACF performance may be significantly enhanced by caching the RACF data set with the 3880 Model 23.

Ordering Information

Program number: 5740-XXH

Reference Material

- Specifications, GC28-0732
- RACF General Information Manual, GC28-0722

Service Level Reporter (SLR)

Main Purpose

SLR, a licensed program, is a flexible reporting tool to provide management information about the performance of the Information System. System management reports are provided for central site and network for:

- Service levels
- Availability
- Performance and tuning
- Capacity planning
- Operations
- Problem and change management
- Accounting

Various system logs and other data sources are collected and summarized according to user specifications in the SLR data base. Reporting can be done online through a series of menu panels for standard reports, or through a report generation facility for ad hoc reports. Batch reporting is also available. In both online or batch modes, reports can be generated in tabular or graphic form.

Key Functions, Facilities and Features

- Data base content and reports that can be specified by user
- Summaries, trends, toplists, and exception reports in the form of tables, bar charts, or graphs
- Capacity planning facility
- Simple menu interface to standard reports
- Support for all graphic terminals supported by GDDM
- Menu-driven installation procedure
- Ability to combine data from several data sources
- ISPF and SPF interfaces to TSO for ease of use
- Extensive set of sample reports and adaptations to data sources
- New functions in SLR Version 3:
 - New logs processed
 - Performance management application
 - Availability schedules
 - Multiple SLR data bases
 - I/S accounting application
 - New table report capabilities
 - Forecasting

Primary Users

- I/S functional management and I/S operations management for determining current service levels and availability
- I/S operations management for IMS availability

- End-user line management for service received
- I/S functional management for performance evaluation and capacity planning

Potential Benefits

- Provides one reporting tool that combines all system management data in one place
- Gives accurate, current and understandable information on host and network service, resource utilization, and other important management areas
- Improves planning and control of the I/S organization through reports that compare actual achievements to objectives
- Enables management to identify problems and bottlenecks through exception reporting
- Provides historical, as well as up to date, information
- Helps management to prevent crises by means of trend reports and forecasts
- Provides an accounting system for billing I/S users

Prerequisite Products

- MVS Release 3.8, MVS/SP Version 1 Release 3, or MVS/SP Version 2
- VSAM or the VSAM component of DF/EF or DFP
- IBM Sort/Merge or equivalent
- System Modification Program Release 4 or SMP/E
- TSO if SLR data base is to be accessed from a terminal
- GDDM/PGF for graphical reports
- ACF/VTAM if used with color or graphics terminals

Products Supported

SLR Version 3 processes log data sets produced by:

- SMF, OS/VS2, MVS/SE, MVS/370, and MVS/XA
- RMF, OS/VS2, MVS/SE, MVS/370, and MVS/XA
- IMS/VS including Fast Path Utility records
- CICS/VS, DOS/VSE and OS/VS (CICS journal and SMF records)
- EREP, History File, OS/VS LOGREC, DOS/VSE, VM/370
- Networks
 - NetView
 - NCCF
 - NPDA
 - NLDM
 - NPA/NPM
 - VNCA
- DB2
- Information/Management
- VM, Accounting data and the VM Monitor log

- VMMAP
- HSM
- Any sequential data set

Ordering Information

SLR Version 3

Program number: 5665-397

Reference Material

- General Information Manual, GH19-6529

Operations Planning and Control/Advanced (OPC/A)

Products Included

- OPC/A Production Control System (PCS)
- OPC/A Event Manager Subsystem (EMS)
- OPC/A Network Event Communicator (NEC)

Main Purpose

The OPC/A licensed programs plan, control, and automate a data center's MVS batch production work load. OPC/A monitors the flow of work through the data center in realtime. The status of operations at any work station, or of any application in the center is immediately available to the center personnel via terminals. OPC/A automates error prone and repetitive operator tasks, such as ensuring that jobs are run in the correct order and submitted at the right time.

Key Functions, Facilities, and Features

- OPC/A drives and controls the MVS batch workload by tracking the flow of events and by directing the processing of operations so that it conforms to the business priorities established in the current plan:
 - Automatic event monitoring and control
 - Automatic job submission
 - Automatic job dependency control
 - Automatic job recovery
 - Dynamic replanning
- OPC/A plans:
 - Automatic production of long-term plans, high-level schedules of processing activities for the forthcoming weeks and months
 - Automatic production of short-term daily plans, detailed work plans including the individual operations, their dependencies, planned start and end times, deadlines, priorities, and resource requirements
 - Management reports on operations performance
- OPC/A provides for manual event reporting and control:
 - Online work station plans with ready-list
 - Access to job status by job name
 - Online operator instructions
- OPC/A also provides:
 - Online data base creation, maintenance, and inquiry/update using ISPF based dialogs
 - Plan-driven job control language (JCL) preparation
 - Browse and edit functions in OPC/A dialogs use ISPF/PDF
 - Remote site control using an ACF/VTAM application program
 - Standardized security functions using RACF
 - Log for all updates to the current plan

Primary Users

- Data center operations managers
- Data center production personnel, such as:
 - Shift supervisors
 - MVS console operators
 - Work station operators
 - Data center security coordinators

Potential Benefits

Improvements and potential savings can be achieved in:

- Production planning – long-term and short-term planning
- End user communication – firm production plans and online inquiry
- Documentation – online production data bases
- Increased automation – automate the driving and planning of the batch work load. OPC/A can handle errors automatically
- Increased Productivity – operations personnel can use their time more efficiently
- Improved end user satisfaction – higher service levels, including faster response to problems and special requests
- Improved service availability and quality – optimized use of resources by using OPC/A as a planning and scheduling tool
- Security – using standard RACF, nearly all resources can be protected

Prerequisite Products

- MVS/SP Version 1 Release 3.1 (MVS/370), or MVS/SP Version 2 Release 1.1 (MVS/XA)
- Job Entry Subsystem may be either JES2 or JES3
- Installing and maintaining OPC/A requires SMP4 or (SMP/E)
- ISPF Version 2 Release 1. Version 2 Release 1.1 if the 5550 family is to be used for input of DBCS data.
- ISPF/PDF Version 2 Release 1. Version 2 Release 1.1 if the 5550 family is to be used for input of DBCS data.
- TSO/E Release 2
- OS/VS Sort/Merge, DFSORT Release 6, or an equivalent sort program
- To use OPC/A remote job tracking functions (OPC/A NEC) requires ACF/VTAM Version 2
- To use OPC/A user authority support functions requires RACF Release 1.6 or an equivalent access control program

Ordering Information

Program numbers:

- OPC/A Event Manager Subsystem: 5665-371
- OPC/A Production Control System: 5665-372
- OPC/A Network Event Communicator: 5665-373

Reference Material

- General Information Manual, GH19-6444

Information/System

Products Included

- Information/System
- Information/MVS
- Information/VM-VSE
- Information/Management
- Information/Access

Main Purpose

- Information/System is a licensed interactive retrieval program and data base manager with related utilities. It provides systems programmers with keyword access to selected technical information contained in either companion product – Information/MVS or Information/ VM-VSE (collectively referred to as Information/ Data). It is also the base product for Information/ Management and the Information/Access program product.
- Information/MVS is a collection of selected IBM technical data of interest to information services staffs who are responsible for planning, installing, supporting, and tuning IBM systems, subsystems, and components pertinent to the MVS/XA, MVS/370, VS1, VM/370, or VSE environment.
- Information/VM-VSE is a similar offering for the VM/370 and VSE environments.
- Information/Management provides interactive systems management applications for problem, change, and configuration management, which can be useful to all personnel in an enterprise who are involved in managing or operating business systems.
- Information/Access provides direct customer access to the Customer Software Support Facility (CSSF) data base. That data base contains Authorized Program Analysis Report (APAR) and Program Temporary Fix (PTF) information, APAR fixes and PTFs, and preventive service planning information.

Key Functions, Facilities and Features

Information/System

- The Information/System base program includes the keyword retrieval facility, load program for loading the Information/Data files, utilities for data tailoring and insertion of user data, and ease-of-use features.
- Information/System Version 3 provides TSP (terminal simulator panel), which may be used to control the processing of Information/System and its related program products. TSP simulates an Information/System terminal user. Using TSP,

IBM-supplied functions and user-written functions may be specified and intermixed to produce an entire Information/System session. TSP provides capability to satisfy most users' archiving needs.

Information/Data

- Information/Data contains consolidated technical information relating to a wide variety of IBM products commonly used in a data processing installation. Sources for that information include:
 - Selected IBM system support center flashes, memos, question and answer logs, and technical articles produced by support organizations (worldwide)
 - Announcement letters for recent IBM software products
 - Corrective information through Program Temporary Fix (PTF) cover letters, Program Level Change (PLC) information, Systems Engineering Communication (SECOM), and Early Warning System (EWS)
 - Status information on selected licensed products and program offerings
 - Selected Systems Reference Library (SRL) abstracts, technical newsletter (TNL) inventories, and SRL tables of contents
 - Education course descriptions and schedules
- An update to Information/Data is distributed to licensed users 10 to 12 times a year
- A user can search documents, specifying one or more previously assigned keywords connected by Boolean operators – and, or, not. The search can include all the document types or can be restricted to selected ones (for example, announcement letters or EWS information). The user can display or print the complete stored text of the documents or the titles only.
- An interactive help file is provided to assist the user in making the most effective use of Information/System. A part of that file is a self-instruction tutorial for new users of the system.
- A keyword glossary is included, giving alphabetical access to all keywords used in Information/Data entries, enhancing the user's ability to select keywords for developing searches.

Information/MVS Direct Load and Information/VM-VSE Direct Load

These separately priced licensed program features provide a significant file load time performance improvement. This is a total data base replacement of the Information/Data files. Data content is identical to the base Information/MVS and Information/VM-VSE products.

Information/Management

- Information/Management supports:
 - Problem management reporting, including problem reporting, assignment, and tracking
 - Management of change requests, including change planning, implementation, and tracking of change approvals
 - Configuration management, including a single source of current, accurate information about system components with interrelationships among hardware and software components
 - Financial and inventory management
 Interactive inquiry and report capabilities are provided for all the above.
- Integrated applications relate problem, change, and configuration management information.
- Input validation reduces data entry errors.
- Customized reporting facility satisfies the additional reporting needs of individual installations.
- Journaling of data base changes provides an audit trail.
- Data base integrity and recovery facilities protect the installation's investment in the data base.
- An NPDA interface eliminates unnecessary keying of communication network problem data.
- Panel modification and customized reports permit installations to tailor the product to their standards.
- The system availability management (SAM) eliminates unnecessary keying of availability data.

Information/Access

- Through access to CSSF, users are provided information about their IBM licensed programs. The programs must be currently serviced by the IBM National Service Division but a maintenance agreement is not required.
- Information/Access provides three major functions:
 - APAR search, which enables users to search CSSF for APAR information to assist in determining whether a problem is already known to IBM
 - APAR and PTF request, which enables users to:
 - Obtain APAR or PTF descriptive data needed to resolve a problem at the installation
 - Obtain APAR fixes and selected PTFs prior to PUT tape availability
 - Submit a request for a corrective fix not currently available
 - Obtain notification of subsequent changes to APAR or PTF status
 - Preventive service inquiry, which enables users to obtain planning information about IBM software preventive service upgrades
- All information can be transmitted to a customer location electronically. DLS or PSR (Programming Support Representative) intervention is not required.

Primary Users**Information/Data**

Information services professionals responsible for planning, installing, supporting, and tuning IBM systems, subsystems, and components

Information/Management

- Primary users include network and central site operations personnel who can use problem management on a day-to-day basis to track problems.
- Other primary users are systems and application programmers who can utilize change management for change control.
- Configuration management can be used by operations personnel, for understanding the connectivity of the network as they do problem determination, and by systems programmers interested in the interrelationships between hardware and software components.
- Reports concerning problems, changes, and system configuration can be used by management for analysis and decision making.
- Financial managers can use the inventory and financial features of the configuration application for various accounting functions.

Information/Access

- Systems programmers at MVS installations who need assistance in the resolution of suspected IBM software problems, the transmission of corrective PTF/APARs, and the planning of preventive service changes to IBM programs
- MVS users of Information/System and Information/Management

Potential Benefits**Information/Data**

Information/System with either Information/MVS or Information/VM-VSE can increase productivity for the I/S professional by:

- Providing an easy-to-use organized approach to locate technical documents when needed
- Broadening the amount of technical information available to users
- Making the data available to the user, online on the user's system
- Keeping the information up to date by adding new data and by purging the out-of-date material
- Reducing the time it takes to answer technical questions

Information/System

Information/Management

- Centralization of problem and change management activities
- Increased I/S productivity through increased problem and change awareness, faster problem resolution, and improved service coordination
- Improved communications between functions affected by a change activity
- Online up-to-date inventory and configuration information, which is essential for timely problem resolution as well as effective change planning and financial management

Information/Access

- Less time spent in IBM software problem resolution
- Simplified and faster corrective service
- Improved delivery of preventive service planning information

Prerequisite Products

MVS Environment

MVS/XA or MVS/370		
TSO and ISPF		
Information/System		
Information Access	Information Management	Information/MVS (or VM-VSE)
Access to CSSF	Problem Change Configuration	Software Data Planning Information

DOS/VSE Environment

DOS/VSE	VM/370 or VM/SP
ICCF	CMS
Information/System	
Information/MVS or Information/VM-VSE	
Software Data Planning Information	

VM Environment

VM/SP	
CMS and ISPF	
Information/System	
Information/Management	Information/MVS or VM-VSE
Problem Change Configuration	Software Data Planning Information

- Information/System is the base product required by each of its associated products.
- Information/System executes as an interactive application under:
 - TSO with ISPF on MVS Release 3.8 and subsequent releases
 - CMS and ISPF in VM/370 Release 6 with VM/Basic System Extensions, VM/System Extensions, or VM/SP
 - ICCF on DOS/VSE with VSE/Advanced Functions
- Either Information/MVS or Information/VM-VSE can be installed with the Information/System retrieval facility for MVS, VM/370, and VSE base products.
- QSAM is used to read the distribution tape; VSAM to write the data.
- Sort Merge (5740-SM1) or equivalent may be required if all the functions of the MVS products are to be utilized.
- Sort Merge (5746-SM2) or equivalent is required for the VM Information/System products.

- DASD space requirements for the data features may be controlled by the user when the data is loaded. For planning purposes, consider Information/VM-VSE to require approximately 45 to 80 megabytes of direct access storage; Information/MVS, approximately 100 to 150.
- One tape drive supporting 9-track 6250 or 1600 bpi is required to read the distributed Information/MVS or Information/VM-VSE tape.
- 3270 terminals with screen sizes of 80 columns and at least 24 lines are required. When a larger screen is used, Information/System runs in 3277 Model 2 compatibility mode, using a 24 x 80 matrix. Program function keys are supported. Information/System in conjunction with the host environment supports locally or remotely attached display units.
- For Information/Access, CSSF is accessed through a 3705, 3720, or 3725 Communications Controller:
 - Switched (manual or autocal)
 - Point-to-point
 - 4800 bps

Ordering Information

Information/System Version 3 for MVS

Program number: 5665-384

Information/System Version 3 for VM

Program number: 5664-323

Information/VM-VSE

Program number: 5668-919

Information/MVS

Program number: 5665-955

Information/Management Version 3 for MVS

Program number: 5665-383

Information/Management Version 3 for VM

Program number: 5664-322

Information/Access Version 3

Program number: 5665-266

Information/Library

Products Included

- Information/Library
- Library/MVS

Main Purpose

- Information/Library with Library/MVS provides MVS/370 users with online facilities that can help them locate information in MVS Systems Reference Library (SRL) publications.
- Information/Library is a system management program product designed to provide search, retrieval, and data base utility functions for its companion data base program product Library/MVS. Information/Library provides for designating the publications to be included in Library/MVS, the addition of user-selected publications to Library/MVS, and the inclusion of multiple versions of the same publications. Library/MVS contains MVS SRL information that reflects the structure of the publications. It consists of:
 - Titles
 - Tables of contents
 - Indexes
 - Abstracts
 - Full text of selected manuals
- Information/Library and Library/MVS are designed to provide the data base organization with search, retrieval, and support functions required by the highly structured organization of SRLs. The programs are optimized for ease of operation, ease of use, and quick results. Data processing professionals and inexperienced personnel should be able to improve the productivity and completeness of their information gathering activities.

Key Functions, Facilities and Features

Information/Library

- Context search based on manual-like structure:
 - Search on title (including order number)
 - Search on abstract
 - Search on heading
 - Search on index
 - Search on heading and index
 - Search on various combinations of these
- Text profiling to help determine search result relevance:
 - Display of table of contents above a result heading
 - Display of all index terms associated with a result heading

- Word fragment searches:
 - Use of words with characters missing from the beginning, end, or in between
 - Use of word roots
- SRL browse function, permitting display of:
 - All publication titles
 - Abstract for a title
 - Tables of contents for a title
 - All index terms for a specific heading
 - Text for a specific heading (when available)
- Dialog capabilities for easy, efficient inquiries:
 - Small number of comprehensive but easy-to-use functions
 - User guidance by fill-in panels
 - No need to learn any command syntax
 - Extended search terms – phrases and word fragments
 - Search operations based on previously obtained results
- Online tutorial and HELP facilities:
 - Education panels
 - Help panels, available at any dialog step
- Offline printing:
 - Parts to be used selectable by user
 - Print information directed to specific SYSOUT data sets

Library/MVS

- Library/MVS is a separately licensed set of Information/Library optional materials. These optional materials are a data base that contains MVS system reference and program logic publications information. This information reflects the structure of the publications and consists of titles, abstracts, tables of contents, headings, indexes, and full text of selected manuals. VSAM is used for the Library/MVS data base organization.
- Library/MVS data base is maintained by IBM:
 - No data preparation
 - No data maintenance
 - No data base creation
 - Updated three to four times a year
- Release 2 and its associated update tapes currently provide over 80 full-text publications with special emphasis on message and code manuals as well as other high-usage manuals geared to the large audience of application programmers. These manuals support either MVS/370 or MVS/XA environments.

Primary Users

Information/Library with Library/MVS is designed to increase the productivity of systems and application programmers, systems analysts, data base administrators, operators, and librarians working with MVS.

Potential Benefits

- Easy information retrieval
- Greatly reduced search time
- Fewer false starts and program runs due to missing information
- Improved performance of MVS-associated tasks
- More frequent and more efficient use of MVS documentation

Prerequisite Products

NCCF or TSO under MVS

Products Supported

NCCF, TSO, and MVS

Ordering Information

Information/Library

Program number: 5665-277

Library/MVS

Program number: 5665-294

Reference Material

- Brochure, GC28-1125
- General Information Manual, GH12-5136

Relational Design Tool

Main Purpose

Relational Design Tool is a program offering for use with SQL/DS in both the VM/SP and VSE environments. It recommends to data base administrators and other users which table columns should be indexed for cost-effective processing of SQL statements. The Relational Design Tool considers both performance and storage requirements in formulating its recommendations.

Key Functions, Facilities and Features

- Provides an ordered listing of indexing recommendations containing a summary (by table) of columns upon which clustered and nonclustered indexes should be established
- Provides the estimated cost of each SQL statement and of each subquery involved in the SQL statement for each index analyzed
- Computes the estimated cost of updating both the recommended indexes and the actual data
- Reports the access path(s) used and estimated number of rows that would be returned in satisfying the SQL statement
- Reports the estimated number of storage pages required for the storage of recommended indexes
- Provides a simple method for inputting new frequency rates so that the user may examine the effect of varying the frequency at which SQL statements are executed, and may weight high-use interactive queries that require fast response
- Provides a convenient means of inputting new table and/or column statistics to determine the effect of growth statistics on performance

Primary Users

Information services professionals – primarily data base administrators or persons with data base administration knowledge

Potential Benefits

- Enables most efficient use of SQL/DS
- Assists data base administrator in design of SQL/DS data base

Prerequisite Products

VSE Requirements:

- DOS/VSE AF3
- SQL/DS Release 2
- PL/I Optimizer Transient Library

VM Requirements:

- VM/SP Release 3
- SQL/DS Release 2
- PL/I Optimizer Transient Library

Ordering Information

Program number: 5798-DQL

Reference Material

- Software Update, G320-0654
- Program Description/Operations Manual, SH20-6415

DB2 Performance Monitor (DB2PM)

Main Purpose

DB2PM is a licensed program that will assist in managing the performance of DATABASE 2 (DB2), IBM's relational data base management system for the MVS environment. DB2PM, operating interactively, provides multicolor graphic information and a comprehensive set of background tabular reports based on DB2 performance data collected by DB2.

DB2PM processes the performance data added by the enhancements to the DB2 instrumentation facility in Release 2 of DB2 as well as the performance data collected in Release 1 of DB2.

Key Functions, Facilities and Features

DB2PM's graphic information and comprehensive set of tabular reports provide DB2 performance information, in varying levels of detail, to:

- Determine total DB2 system performance and efficiency
- Tune DB2
- Identify and remove potential bottlenecks
- Maintain a satisfactory service level to users
- Identify exception conditions
- Measure an application's performance and resource cost
- Measure an application's effect on other applications and the system

Primary Users

- DB2 users
- DP management
- Systems and data base administrators

Potential Benefits

DB2PM's interactive environment for requesting reports, specifying control information, and providing online HELP facility makes the product easy to use and increases user productivity.

DB2PM's capability to save the results of the input data reduction process for later use and subsequently restore that data and generate reports may eliminate the need for processing the original input data multiple times. This is very important when processing large amounts of DB2 performance data.

Prerequisite Products

- MVS/SP Version 1 or MVS/SP Version 2 is required.
- For functional ease of use and for graphic support, MVS TSO, ISPF Version 2, and ISPF/PDF are required.

- To utilize the graphics capability, GDDM and GDDM/PGF are also required.
- Either SMP Release 4 or SMP/E for MVS is required for installation.

Ordering Information

Program number: 5665-354

Reference Material

General Information Manual, GH20-6856

System Display and Search Facility (SDSF)

Main Purpose

SDSF is a licensed program that provides detailed information about the jobs and resources in an MVS-JES2 system. It consists of interactive panels that help authorized users efficiently monitor and control jobs, printers, queues, and other system resources.

SDSF is IBM's recommended licensed program to help increase the productivity of end users and data processing personnel who work in an MVS-JES2 environment.

Key Functions, Facilities, and Features

By using SDSF panels and commands, authorized users can:

- Control job processing (hold, release, cancel, and purge jobs)
- Monitor jobs *while* they are being processed
- Display job output *before* deciding to print it
- Manage the system's work flow
- Control the order in which jobs are processed
- Determine the number of output jobs and the total number of records to be printed
- Control the order in which output is printed
- Control printers and initiators (start, stop, and halt printers and initiators)
- View the MVS system log online and use commands to search for specific information in the log
- Issue MVS and JES2 system commands

SDSF supports a variety of environments. It can be used as an ISPF option, TSO command processor, or TSO terminal monitor program.

Primary Users

Primary users of SDSF include:

- System programmers who need to monitor system performance and manage problems
- Operators who are responsible for controlling work load and output scheduled for printing
- End users (including application programmers, engineers, scientists, and other office professionals) who need to monitor the progress of their jobs and view their output online before deciding to print or purge it

Potential Benefits

- Operators and system programmers can use SDSF to manage system resources more effectively. For example, they can use SDSF to:
 - Schedule jobs to make optimal use of the system's resources

- Better manage output that is ready to be printed
- Control remote printers and schedule output to be printed at remote locations
- Reduce problem management time by viewing the system log online and searching for specific information in the log using SDSF commands
- Avoid printing the system log
- Avoid using commands that fill the system log. Responses to some JES2 commands fill the system log. By using SDSF to display that information instead, the system log will be more useful in problem management because it will contain fewer extraneous commands and responses.

- Authorized end users can use SDSF to control their own jobs, which may help them increase their productivity. By using SDSF, for example, end users can:
 - Hold or release their jobs
 - Cancel their jobs
 - Find out if their jobs are being processed or waiting to be processed
 - View their output before it is printed
 - Print *selected portions* of their output
 - Purge their output

Prerequisite Products

To use SDSF, the JES2 component of MVS/SP-JES2 must be at one of the following release levels:

- Version 1, Release 3.6 or later (program number 5740-XYS)
- Version 2, Release 1.5 or later (program number 5740-XC6)

To use SDSF as an ISPF option, Interactive System Productivity Facility (ISPF) is required. ISPF Version 2 is required to use some SDSF functions.

To install SDSF using SMP/E, System Modification Program/Extended (SMP/E) is required.

Products Supported

SDSF can be used on any processors and devices supported by the MVS products described above.

Ordering Information

Program number: 5665-488

Reference Material

SDSF General Information, GC23-0406

MVS Custom-Built Installation Process Offering (MVS CBIPO)

Main Purpose

MVS CBIPO, a part of the SMP/E licensed program, provides improved productivity for system programmers during installation of MVS systems and subsystems. Customers can select from approximately 200 IBM licensed programs to obtain a replacement system for MVS/ESA™, MVS/XA, MVS/370, NCP, data base systems (IMS and DATABASE 2 (DB2)), or CICS. They will receive the programs and PTF service integrated into one package. Jobs and documentation are provided as part of the MVS CBIPO related installation materials (RIM) to assist in the installation of MVS systems and subsystems.

Key Functions, Facilities and Features

- System-oriented packaging
- Selection of approximately 200 IBM licensed programs
- Integrated PTF Service
- IPOGEN, which uses the SMP/E GENERATE facility to provide an easy way to install IBM licensed programs that do not have SYSGEN support
- Step-by-step installation jobs and guidance for the installation of MVS and subsystems
- Extensive information derived from the use of many MVS/ESA-, MVS/XA-, and MVS/370-related products
- Installation Verification Procedures (IVPs) to assist in validating the installation
- Experience-oriented documentation that addresses planning, installing, and extending MVS systems and subsystems

Primary Users

MVS CBIPO is intended for customers installing the following:

- MVS/ESA and associated IBM licensed programs
- MVS/XA and associated IBM licensed programs
- MVS/370 and associated IBM licensed programs
- ACF/NCP and associated IBM licensed programs
- Data base systems (IMS and DATABASE 2 (DB2)) and associated IBM licensed programs
- CICS and associated IBM licensed programs

New MVS users installing MVS for the first time will require an MVS driver system to drive the MVS install process. The MVS CBIPO Drivers (5665-343) are provided for this purpose and can be used to install an MVS/ESA, MVS/XA, or MVS/370 CBIPO (MVS feature) on 3350, 3375, or 3380 DASD devices. See the *Software Manufacturing General Information* manual, GC23-0351, and *MVS Custom-Built Offerings Planning and Installation* manual, SC23-0352, for planning and configuration information. Customers can initially install MVS using CBIPO and then upgrade their

systems with function and service using Custom-Built Product Delivery Offering (CBPDO), or, if desired, by periodically replacing them using CBIPO. Customers may order CBIPO and CBPDO as a part of the SMP/E licensed program.

Potential Benefits

- Reduction of the skill and time required to install because the IBM licensed programs are packaged by IBM into the standard MVS distribution library format
- Reduction of the skill and time required for prerequisite service research because the IBM licensed programs and recent service are integrated into the MVS CBIPO by IBM
- Reduction in complexity that can allow new system programmer personnel to become productive sooner

Ordering Information

Program number: 5751-CS1

US only:

The MVS CBIPO must be ordered using the HONE configurator aid, CFPROGS. CFPROGS provides ordering instructions and order checklists that can be printed and completed by the customer. The order checklists and NEWS file are kept up-to-date to communicate enhancements and changes to CBIPO.

Reference Material

- Software Manufacturing General Information, GC23-0351
- MVS Custom-Built Offerings Planning and Installation, SC23-0352

MVS Custom-Built Product Delivery Offering (MVS CBPDO)

Main Purpose

MVS CBPDO, a part of the SMP/E licensed program, provides improved productivity for system programmers by enhancing the distribution process for MVS and MVS-related licensed programs. It enables customers to order a custom-built offering to incrementally add licensed programs and program temporary fix (PTF) service to their existing MVS systems or subsystems. PTF service provided with CBPDO is more current than that provided by the program update tape (PUT) process. CBPDO, a mechanism for system upgrade, complements CBIPO, a mechanism for system replacement (see abstract in Section 42).

Key Functions, Facilities and Features

- Single package for adding licensed programs, including most current service, and/or service for programs already installed under the same customer number
- Service more current than provided by PUT
- Recommendations about which service to install
- Preventive Service Planning information (PSP buckets) in machine-readable form
- Program directories and documentation in machine-readable form

Primary Users

MVS CBPDO is intended for customers upgrading the following:

- MVS/ESA™ and associated IBM licensed programs
- MVS/XA and associated IBM licensed programs
- MVS/370 and associated IBM licensed programs
- ACF/NCP and associated IBM licensed programs
- Data base systems (IMS and DATABASE 2 (DB2)) and associated IBM licensed programs
- CICS and associated IBM licensed programs

Customers can initially install MVS using CBIPO and then upgrade their systems with function and service using CBPDO, or, if desired, by periodically replacing them using CBIPO. Customers may order CBIPO and CBPDO as a part of the SMP/E licensed program.

Potential Benefits

Service content and recommendations in a CBPDO should reduce the effort to install MVS-related IBM licensed programs and PTF service on an existing MVS system or subsystem.

Ordering Information

Program number: 5751-CS3

US only:

The MVS CBPDO must be ordered using the HONE configurator aid, CFPROGS. CFPROGS provides ordering instructions and order checklists that can be printed and completed by the customer. The order checklists and NEWS file are kept up-to-date to communicate enhancements and changes to CBPDO.

Reference Material

- Software Manufacturing General Information, GC23-0351
- MVS Custom-Built Offerings Planning and Installation, SC23-0352

VM/SP System Offering

Main Purpose

The VM/SP System Offering (5750-AAK) is similar to previous VM/SP System IPO/Es in that it consists of the VM/System Product and a comprehensive selection of optional feature products. It provides a simplified and productive interface to assist in the installation and installation verification of VM/SP and the supported optional feature products.

Key Functions, Facilities and Features

The VM/SP System Offering (VM/SP and a selection of optional feature products) consists of:

- Sample system definitions (Directory, DMKRIO, DMKSNT, and DMKSYS), which users may accept unless they tailor the system to match their own requirements
- An EXEC, DISKMAP, for use in summarizing the minidisks defined in a CP directory by volume and identifying overlapping minidisks and gaps between minidisks
- New EXECs, PPPREP and INSTPP, to format product-related minidisks and to manage the installation of the optional feature products
- New support for:
 - Full screen interface for updating CP directory passwords (PASSMOD EXEC)
 - Maintaining the CP directory
 - Security enhancements
 - Re-execution capabilities
 - Execution history file
- Support for VM/SP High Performance Option Release 5

Potential Benefits

- Installation and installation verification procedures require fewer steps and fewer CMS IPLs than previous System IPO/Es.
- Improved documentation, contained in the VM/SP Installation Guide, eliminates the need for the previous unique System IPO/E documentation.
- The optional feature products supported by the System Offering will be shipped with all the product files.
- Specific directions are provided for loading of service files to upgrade/apply service.

Primary Users

The VM/SP System Offering is intended for:

- Users who will be installing a selection of the optional feature products and want to take advantage of the product installation features of the offering

- Users installing VM/SP and selected optional feature products and having no need to tailor the system differently from that supplied by the provided sample layouts

Products Supported

The VM/SP Release 5.1 System Offering supports the installation of the following products:

Communications and Networking Support	Program Number
Advanced Communication Function/ Network Control Program Version 4.2	5668-854
Advance Communication Function/ System Support Program Version 3.2	5664-289
Advanced Communication Function/ Virtual Telecommunication Access Method Version 3.1.2	5664-280
Cooperative Viewing Facility Version 2.1.1	5664-296
Emulation Program	5735-XXB
NetView Version 1.2	5664-204
Pass-Through Facility	5748-RC1
Remote Spooling Communication Subsystem Version 1.3	5748-XP1
Remote Spooling Communication Subsystem Version 2.2	5664-188
TCP/IP	5798-FAL*
Engineering/Scientific Problem Solving	Program Number
Composition Utility Version 2	5798-RWL
Elementary Math Library	5799-BTB
FORTRAN Utilities	5798-DFH
GDDM/VM Version 2.1	5664-200
GDDM-PGF Version 2.1	5668-812
GDDM-IMD Version 2.1	5668-801
Graphic Display and Query Facility	5668-905
High-Accuracy Arithmetic Subroutine Library	5664-185
VS FORTRAN Compiler, Library, and Debug Version 2	5668-806
3277 Graphics Attachment Support	5799-AXX
Intelligent Workstation Support	Program Number
CMS Servers	5664-327
Virtual Machine/Personal Computer Host Server	5664-319
3270 Virtual Machine/Personal Computer File Transfer Program	5664-281

VM/SP System Offering

Languages and Application Development	Program Number		
APL2	5668-899	Interactive Productive Facility Version 2	5664-318
IBM BASIC/VM	5668-996	VM Backup Management System	5664-291
Cross System Product/Application Development Version 3.1	5668-813	VM Tape Management System	5664-292
Cross System Product/Application Execution Version 3.1	5668-814	Virtual Machine Monitor Analysis Program	5664-191
Interactive Instructional Presentation System	5668-012	Virtual Machine/Realtime Monitor	5796-PNA
VS/Pascal	5668-767*		Program Number
PL/I Transient library	5734-LM5	Dialog Management	
PL/I Optimizing Compiler and Libraries – Composite Product	5734-PL3	Application Prototype Environment Version 2	5668-808
VS COBOL II	5668-958	Display Management System/CMS	5748-XXB
		Interactive System Productivity Facility Version 2	5664-282
Business Professional and Text/Office Support	Program Number	Interactive System Productivity Facility/Program Development Facility Version 2	5664-285
Application System	5767-032		
Document Composition Facility	5748-XX9		
Display Write/370	5664-370		
Host Displaywriter Document Interchange	5799-BKE		
Info Center/1	5668-897		
Professional Office System Version 2	5664-309		
		*New product support	
	Program Number		
Printer Support			
Font Library Service Facility	5668-890		
Overlay Generation Language	5664-293		
Page Printer Formatting Aid	5664-199		
Print Services Access Facility	5664-312		
Print Services Facility/VM	5664-198		
VM3812 Pageprinter VM Support	5798-DTE		
	Program Number		
Data Management			
Contextual File Search/370 for VM/CMS	5664-329		
Cross System Product/Application Query	5668-918		
Query Management Facility Version 2	5668-AAA		
Structured Query Language/Data System	5688-004		
Virtual Storage Extended/Virtual Storage Access Method	5746-AM2		
VM File Storage Facility	5798-DMY		
	Program Number		
System Support			
Directory Maintenance	5748-XE4		
Environmental Recording, Editing, and Printing Version 3	5654-260		
Virtual Machine/Integrated System Productivity Facility	5664-283		
VM Batch Facility	5664-364*		
VM/DSNX	5684-009*		

VM/Integrated System (VM/IS)

Products Included

- VM/IS BASE
- VM/IS – Productivity Facility
- VM/Remote System Programming (VM/RSP) Support Offering

Main Purpose

VM/Integrated System (VM/IS) provides an integrated software solution for intermediate and low-end System/370 environments. It consists of VM/IS BASE and nine optional application packages containing 30 licensed programs. This combination, VM/IS BASE and optional packages, provides an integrated base for business, office, data base and engineering/scientific applications. Utilizing VM/IS results in an easy-to-install system preconfigured for selected 4300 and 9370 processors and containing pre-applied software maintenance.

VM/IS BASE is a licensed program that includes full VM/SP Release 5 functions. It provides an integrated set of system management and use functions designed to be administered by someone with minimal system programming skills.

VM/Remote System Programming (VM/RSP) Support Offering provides support for the licensed programs available in VM/IS. The VM/RSP Support offering is available for a fee to VM/IS customers with a requirement for VM system programming skills. IBM provides this expertise remotely through the VM/RSP Support Center.

Migration aids are provided to migrate from VM/IS Release 5 to VM/IS release 5.1.

Key Functions, Facilities and Features

VM/IS BASE Release 5.1 Functions and Optional Packages

- Core
 - System control
 - Hardware error recording
 - Directory maintenance
 - System administration
 - End-user and application access menus
 - Screen manager
- Performance monitor
- Performance reporting
- General language support routines
- Shared user files
- Background execution
- Graphics support
- Text formatter

Transaction Processing:

- CICS/VM
- VS/COBOL II
- VSE/VSAM*

Networking Support:

- ACF/VTAM
- NetView
- VSE/VSAM*
- RSCS*

Support Services:

- VM/DSNX
- VM Backup-MS

Engineering/Scientific Program Development Support:

- ISPF/PDF
- VS FORTRAN

Text/Office Support:

- PROFS (with Application Support Feature)
- PROFS Note Maintenance Feature
- DW/370
- VM3812
- PL/I Resident Library*
- AS

Application Development:

- CSP/AD
- CSP/AE
- VSE/VSAM*

Data Base Query:

- SQL/DS
- QMF/VM
- DXT
- RXSQL
- DBEDIT
- PL/I Resident Library*

Intelligent Workstation Support:

- 3270 PC File Transfer
- CMS Servers (ECF) (Enhanced Connectivity Facility)

Remote Communications Support:

- RSCS
- PVM
- CVIEW
- TCP/IP

*Only one copy of the PL/I Resident Library or RSCS or VSE/VSAM will be licensed.

VM/Integrated System (VM/IS)

VM/IS BASE Features

- Easy to install, learn and use

The VM/IS BASE core is provided in a DASD Dump Restore (DDR) format. The Networking Support package is also provided in DDR format to allow much faster installation. The remaining functions are provided in the stacked tape format. The system administrator restores the system from tape and then, using the VM/IS BASE functions provided, tailors it to the account's unique requirements using the system support facilities included.

- Selection of 4300 and 9370 processor configurations

Available in predefined I/O configurations for the 4300 processors with 3370/3380 DASD and 9370 processors with 9332/9335 DASD.

- Integrated system function

This fully operational VM/IS BASE operating system includes the following system support facilities:

- Hardware error recording
- Directory maintenance
- System administration
- Screen manager
- End-user and application access menus
- Performance monitoring and reporting*
- General language support routines*
- Shared user files*
- Background execution*
- Graphics support*
- Text formatter*

* Only those functions ordered will be integrated and shipped.

- Primer library, additional media and application development publications
- Optional packages added to VM/IS Release 5.1

Transaction Processing (TP). CICS/VM, VS/COBOL II, and VSE/VSAM have been added to provide a transaction processing capability designed to satisfy the needs of an integrated, multifunctional, departmental system. CICS/VM is intended for a distributed VM user who might be performing a wide range of decision support/office tasks, as well as commercial transaction processing, from a single workstation. System and application programming skills for CICS/VM are expected to be available from the central site.

Support Services (SS). Contains the VM/DSNX and VMBACKUP-MS products, providing support for the central site management of a network of distributed VM/IS and VM/SP systems. A new publication *VM/IS: How to Support Your Distributed System* has been added to provide guidance, samples, and examples for central site operations staff.

Application Development Support (ADS). Through the use of CSP/AD, CSP/AE, and VSE/VSAM pro-

ducts, provides the user with the ability to define, test, generate, and execute applications developed through a simple question-and-answer technique.

- Updated optional packages available

Text/Office Support (TXTO). This optional package offers an integrated office and text environment.

Intelligent Workstation Support (IWS). Provides enhanced facilities for interconnecting PC's and VM/SP by the addition of CMS Servers (ECF). The user can also transfer files between the PC terminal and a VM system, and communicate with other PC users.

Engineering/Scientific Program Development Support (E/SPDS). Aids the engineer and scientist in developing programs and creating two- and three-dimensional graphics.

Networking Support (NTWK). Is composed of ACF/VTAM, RSCS Networking, VSE/VSAM, and NetView. ACF/VTAM has been updated to Release 3.1.2. NetView offers a full set of services for centrally managing the SNA network. This package comes with a reduced DASD option for remote systems not handling the full network support functions.

Database Query (DBQ). Allows the customer to create and manage a relational database. This package has been enhanced with the addition of RXSQL and DXT. RXSQL allows REXX users to access SQL/DS data bases. DXT can be used to extract and to load data.

Remote Communications Support (RCS). Adds computer network support for sending and receiving information between sites, logging on to remote systems and establishing teleconferencing sessions with other users. CVIEW provides computer teleconferencing capability, with the ability to connect up to 12 users in a conference session or two users in a consulting session. The IBM Transmission Control Protocol/Internet Protocol for VM (TCP/IP) has been added to provide connection support to Ethernet® and other LANs.

- Products added to optional packages

The following products have been added to the VM/IS optional packages: CICS/VM, VS/COBOL II, VM/DSNX, VMBACKUP-MS, TCP/IP, CSP/AD, CSP/AE, CMS Servers (ECF), DXT, and RXSQL.

- Products up-leveled in optional packages

A new version of SQL/DS has been included.

The following products have been up-leveled to a new level: NetView, QMF, VS FORTRAN, AS, and DW/370.

- Additional VM products

The following products, while not contained in the nine VM/IS optional packages, form a group that:

- Can be ordered through the VM/IS configuration aid panels
- Are tested to install without error in the VM/IS 5.1 environment

Unlike the products in the nine optional packages, these products are not contained in the *Learning to Use Your System* and *Primer* publications. (Skill level to install these products may be more than for products in VM/IS Optional Packages and is determined by the specific product installation method).

This group of products consists of:

- ACRITH
- Application Prototype Environment
- APL2
- CFSearch/370
- Comp Util Ver 2
- CSP/Query
- DMS/CMS
- EML
- EP
- FLSF
- FORTRAN Utilities
- GDDM-IMD
- GDQF
- HDDI
- IBM BASIC
- Info Center/1
- IIPS
- ACF/NCP
- OGL
- Pascal/VS
- PL/I Comp Lib Debug
- PL/I Lib
- PL/I Comp Lib
- PPFA
- PSAF
- PSF/VM
- PSF/VM 3800 Feature
- PSF/VM 3820 Feature
- RSCS V1
- ACF/SSP
- VM/PC Host Server
- VMTAPE-MS
- 3277 (GASP)

- Migration aids for VM/IS Release 5 users

These aids are provided to assist customers in upgrading from VM/IS Release 5. The aids will retain in the customer's new system any products no longer offered in VM/IS Release 5.1. The migration EXECs will retain all non-VM/IS customer files and data.

- Programmable operator enabled.

Assistance is provided to customers wishing to take advantage of programmable operator function of VM/IS BASE.

VM/IS – Productivity Facility

- VM/IS-PF is a full-screen, menu-driven facility that provides easy access to system applications.
- It provides an online introduction to supported applications, menus to help navigate to the applications, and online help screens.
- It can be tailored by the user to reflect the customer's unique environment.

VM/RSP

- IBM VM/RSP Support Center staffed by experienced professionals who provide VM system services
- Single electronic toll-free interface for VM/IS support

The VM/RSP Support Offering provides, for a fee, a VM/RSP Support Center to serve as a single point of contact for both defect- and usage-related questions on the licensed programs included in VM/IS.

The Cooperative Viewing Facility (CVIEW), a licensed program available in the Networking Support Package, allows the VM/RSP customer to follow along while a VM/RSP Support Center representative is logged on to the customer's system to collect additional problem information or apply corrective fixes.

Data gathering, analysis, and tuning assistance for system performance problems is also provided by the VM/RSP Support Center.

The VM/RSP Support Offering should be considered when there is a desire to operate a VM/IS system with limited system programming skills available.

Reference Material

- VM/IS General Information, GH24-5119

Ordering Information

VM/IS BASE

Program number: 5664-301

VM/IS – Productivity Facility

Program number: 5664-283

VM/RSP Support Offering

Program number: 5750-EXT

VM/Interactive Productivity Facility

Main Purpose

The VM/Interactive Productivity Facility is designed to simplify the user interface to the VM/SP System. VM/IPF communicates with the user through dialogs (panels) that support administrative, operations, and general user functions, and can reduce the skill level required to use the system while improving user productivity.

VM/IPF Version 2 Release 3 provides support for VM/SP Release 6 and additional support for shared file system and single point of entry.

Key Functions, Facilities and Features

Panel-Driven Directory Maintenance Functions

Support is provided by panels for the administrator to:

- Work with a user directory to enroll, change, and remove users, and to change a user's password or storage size
- Add, change, extend, or delete minidisks
- Provide directory status information by listing DASD space, checking directory integrity, or checking status of users
- Correct directory maintenance problems by rebuilding the directory from back up, initializing the directory, or enabling a disabled directory
- Use the CP directory map to create, browse, or print the directory map of DASD space
- Perform general housekeeping functions.

Problem Reporting and Management Facility

The Problem Control Facility (PCF) is used to report, answer, close, and update problems, and to generate problem reports. The facility helps correlate system dump problem reports with user problem reports, and can be used to control problem reports from multiple systems.

Network Communications Support

Panels are provided to support the operator or administrator in the Remote Spooling Communications Subsystem (RSCS) environment to initialize networks, add or delete links and routes, and query networks for status.

Accounting Functions Support

Via panels, the user can select accounting parameters for automatic execution by the VM/370 accounting program.

CMS File Communications Support

Panel support is provided for the CMS communication EXECs: NOTE, TELL, and DEFAULTS. A panel interface is provided for the NAMES, SENDFILE, and RDLIST EXECs.

Operator Dialogs (Panels)

Panels are available to help the user attach devices, set logs, control spool files (that is, reader, punch, or printer), query system status, and back up or restore data.

The operator can define a schedule for automatic backup of DASD volumes, or exercise this schedule, via panels, at intervals of his choice. The saved data is then available on tape if data recovery is required.

CP/CMS Command Entry Facility

A facility is provided to allow EXECs and CP/CMS commands to be entered from the command line of most panels. This facility also:

- Prevents certain matching-destructive CP/CMS parameters, commands, or options from being executed from the command line if the user selects "protective" environments
- Redispays unsuccessful and incorrect commands
- Maintains a history of successfully completed commands for display and reuse

Indexing to Tasks

The indexing facility provides the user the ability to select from a table a function or task to be executed without the need to progress through each level of the hierarchy.

Improved Human Factors for Panels and Documents

The panels and documentation have been structured to improve readability, eliminate unnecessary words, and use concrete words and phrases in place of complex or abstract terms.

System Tailoring Support

Panels are provided to:

- Specify when accounting reports are automatically printed
- Add a real disk to DIRMAINT resources list
- Initialize or label a real disk
- Specify the default printer for automatic start at IPL time
- Change FCB/UCS parameters and printer spool classes of the default printer

Task-Structured Documents

Task-structured documents, which are task- rather than function-oriented, are provided for administrators, operators, and general users. Task orientation has been shown to increase usability and user acceptance. The following task-structured documents are available:

- General Use Guide
- Administration Guide
- Operation
- Problem Control
- System Reference

Additional Functions in Version 2 Release 3

- Shared file system administrative support to:
 - Provide a centralized interface for file pool maintenance
 - Provide file pool authorization from MAINT userid
- Shared file support for VM/IPF modules:
 - BROWSE and FLIST will work on CMS files residing in a file directory or on a CMS minidisk
- Single point of entry for user administration, function added:
 - Centralized administration to enroll users into VM/SP related products, like PROFS or SQL/DS
 - Updated default directory entries for ACCOUNT/DIST; IPL statements
 - Automatic format of A-disk space
 - Dialogs to add other products to VM/SP
- Distributed support for single point of entry for user administration:

The system administrator can choose to enroll a user or a list of users to the local system or to any VM system attached in the network. From one userid, a single administrator can manage the system directory and other VM products that require unique enrollment.

- Support for VM/SP Release 6

Potential Benefits

To assist the user in selecting tasks to be performed, a series of menu panels is available. These panels are organized in a hierarchical structure. The user selects the desired task from the menu. This leads to the execution of system functions. Through an indexing function, the experienced user can select the task directly, without having to go through each level of the hierarchy.

Through data entry panels, the Interactive Productivity Facility prompts the user for information required to execute system functions. Using a fill-in-the-blanks technique, the user supplies the necessary system parameter information. IPF then transforms it into the appropriate system input format and invokes the necessary system functions.

The Interactive Productivity Facility is designed to relieve users from many tedious, error-prone tasks, and to improve productivity. For the new or infrequent user who requires additional information, most menu and data entry panels are supplemented with help panels.

Prerequisite Products

Hardware Requirements

VM/IPF is designed to operate in those IBM processors supported by VM/SP with at least 1MB of storage. Terminals required are 327X or an equivalent.

Software Requirements

The Interactive Productivity Facility is designed to operate with VM/SP, VM/Interactive Problem Control System (IPCS) Extension, VM/Directory Maintenance, and RSCS.

The interactive System Productivity Facility (ISPF) is a prerequisite for the VM/Interactive Productivity Facility.

Ordering Information

Program number: 5748-MS1

Reference Material

Licensed Program Specifications, GC24-5235

Virtual Storage Extended/System Package (VSE/SP)

Main Purpose

VSE/System Package is a pregenerated, ready-to-use interactive system containing aids to simplify the installation, usability, serviceability, and day-to-day operation of 4300 and 9370 VSE systems.

It consists of component programs including the necessary system control program and optional programs.

Key Functions, Facilities and Features

VSE/SP Version 3 consists of:

- VSE/System Package, a pregenerated and ready-to-run interactive system, delivered primarily in object code
- The VSE/SP Generation Feature, a standard no-charge feature that provides generation capability for the VSE/Advanced Functions and CICS/DOS/VS components
- VSE/SP Optional Programs to complement VSE/SP according to the customer specific needs in areas such as application development, data base management, systems networking, and DDP support. They have been tested at a synchronized service level with VSE/SP and are installation and service supported by VSE/SP.
- VSE/SP-unique functions, aimed at improving the usability and installability of VSE/SP. They include:
 - Interactive interface
 - Installation support services
 - Online problem diagnosis aids
 - Networking and DDP support
 - Intelligent workstation support

Usability:

- Enhanced usability is provided for full function VSE systems through an interactive interface, consisting of task-oriented dialogs tailorable to the individual user. This interface provides:
 - Consistent and simple access to system functions
 - Simple handling of VSE/VSAM files, VSE/POWER queues, and VSE/ICCF library members through function lists.
 - Comprehensive online problem determination aids for CICS/DOS/VS programming
 - Resource Definition Dialogs for I/O devices and terminals
 - Resource monitoring capability
 - Installation, service, and operation dialogs
 - Networking and DDP facilities
 - Comprehensive HELP facilities
- Operation support is provided through the online console message explanation file and remote operator console.

- A system startup facility provides procedures and jobs for performing a fast and efficient startup. In most cases, no operator intervention is required, except for IPL.
- Task-oriented documentation is provided with "how to" descriptions for system installation, operation, problem diagnosis, migration, and communication.
- Support of intelligent workstations is provided by a set of interactive utilities, allowing file exchange between VSE/SP and the 3270-PC, and between VSE/SP and the PC with 3278/3279 emulation.
- Functions of the VM/VSE feature on the previous VSE/System IPO/E are integrated into VSE/SP with the addition of improvements in VM/VSE support.

Installability:

- Installation of the pregenerated VSE/SP can normally be done in about 2 hours.
- Automatic device sensing eliminates most user responses at initial IPL.
- Devices and terminals which are not sensed automatically are configured via dialogs.
- Installation of the Generation Feature, if desired, is accomplished via a system-supplied dialog.
- Optional programs are installed via dialogs included in VSE/SP.

Serviceability:

- Faster problem diagnosis is possible through fixed system layout and online problem information.
- Service for Generation Feature users has been made as easy as for users of the pregenerated base system through unified service dialogs for both environments.
- Once the Generation Feature is installed, service for those components without a generation capability continues as if the Generation Feature were not installed.
- Service upgrades are simple through a fast service upgrade process. Installation-specific parameters are saved so that complete reinstallation is not necessary.

Primary Users

- VSE is IBM's operating system for small- to intermediate-sized host System/370 data centers, distributed nodes, and departmental systems where commercial transaction processing and batch are the primary data processing requirements.
- 4300 and 9370 users who install VSE or VM/VSE should do so by installing VSE/System Package with its significant ease of installation, maintenance, and user facilities.

Potential Benefits

- System programmers:
 - System installation assistance through pregeneration, component synchronization and preapplied service
 - A more stable system through standardized configurations, system validation, and verification
 - Interactive dialogs, which simplify installing and maintaining the system, thereby reducing the potential for errors
- Application programmers:
 - Highly productive preinstalled or easy-to-install tools such as SQL/DS, CSP, and VSE/ICCF, which can considerably shorten application program development cycles
 - Interactive dialogs to improve the productive use of the system, while developing, testing, and installing new applications
- Computer operators:
 - The message manual is online for quick, easy access.
 - The optional product VSE/OCCF provides message translation, message suppression, and automatic reply.
 - Interactive dialogs interface to system utilities and VSE/VSAM Access Method Services
- The DP department in general:
 - A preconfigured package with integrated components that can reduce the installation and service tasks of the DP staff, thereby freeing resources for the addition of new applications
 - A reduction in complexity that can allow new DP personnel to become productive earlier
 - Extensive documentation

Prerequisite Products

Systems

VSE/SP 3.1 supports the 9370, 4321, 4331 (all model groups with a minimum of 1MB of real memory), 4341, 4361, 4381 (except Models 3, 14, and 24), System/370 (Models 138-158 with a minimum of 1MB of real memory), 3031, 3033, and 3090 E-models with PR/SM. VSE/SP 3.1 is supported on any processor when running under VM as long as VM supports that processor.

VSE will use up to 16MB of processor memory. When IPL'ed on a uniprocessor that contains more, it will not use more than 16MB.

DASD

All DASD volumes required for VSE/SP 3.1 installation and service must be of the same device type.

The minimum DASD volumes required are listed below. Included in these volumes is a starter library for optional programs.

DASD Type	Minimum Actuators
9332-400	2*
9335	2
3350	2
3370	2
3375	2
3380	2

*For the 9332 DASD model 400, an additional layout with reduced system file definitions is provided for an entry-type user. 3310, 3330, and 3340 are supported for user data, but cannot be used for initial installation.

Ordering Information

VSE/System Package 3.1

Program number: 5666-345

Product Content	Program Number (1)
VSE/Advanced Functions	5666-301
VSE/SP Unique Base Functions	5666-345
ACF/VTAM	5666-313
BTAM-ES	5746-RC5
CICS/DOS/VS and Report Controller Feature	5746-XX3
VSE/ICCF	5666-302 (2)
VSE/POWER	5666-273 (3)
VSE/VSAM	5746-AM2
VSE/VSAM Space Mgmt	5746-AM2
VSE/VSAM Backup/Restore	5746-AM2
DITTO for VSE and VM	5668-722
VSE/Fast Copy	5746-AM4
BTAM SCP	5747-CG1 (4)
EREP SCP	5656-260 (4)
OLTEP SCP	5656-092 (4)
Device Support Facility SCP	5747-DS2 (4)

Notes:

The option of taking VSE/SP Version 3 without a full complement of base components will be available.

- (1) All VSE/SP components (with the exception of the VSE/SP-unique functions) are also available outside the VSE/System Package under the individual program numbers shown in this column.
- (2) VSE/ICCF Version 2 does not include the Terminal Transaction Facility (TTF), formally available with VSE/ICCF Version 1.
- (3) The former VSE/POWER Shared Spool Feature is integrated into VSE/POWER.
- (4) The SCP components BTAM SCP, EREP, OLTEP, and DSF are delivered together with the pregenerated VSE/SP. They are, however, not part of the licensed program specifications of VSE/SP Version 3.

Virtual Storage Extended/System Package (VSE/SP)

Optional Programs	Program number	Optional Programs	Program number
System Control		Office Support	
VSE/Access Control —		Personal Services/CICS	5666-318
Logging and Reporting	5746-XE7	DISOSS/370	5666-270
VSE/OCCF	5746-XC5	DisplayWrite™/370	5666-338
		DM/VSE	5666-339
Network Control*			
ACF/NCP (3725)	5668-854		
ACF/SSP for VSE	5666-322		
ACF/NCP Version 4 Subset	5668-754		
EP for 3725	5735-XXB		
NCCF	5666-285		
NPDA	5666-295		
TARA Feature			
for 3600/4700	5666-295		
NLDM	5668-971		
Compilers and Tools			
SORT/MERGE II	5746-SM2		
DMS/CICS	5746-XC4		
AGF Feature	5746-XC4		
DOS/VS COBOL + Libs	5746-CB1		
DOS/VS RPG II	5746-RG1		
DOS PL/I			
Compiler/Libs	5736-PL3		
Optimizing Compiler	5736-PL1		
Resident Library	5736-LM4		
Transient Library	5736-LM5		
FTP	5668-932		
SDF/CICS	5746-XXT		
SDF/CICS Kanji feature			
CICSPARS/VSE	5666-329		
Remote Control Support			
DSX	5668-915		
DSNX	5666-284		
Data Base			
SQL/DS	5688-004		
DL/I DOS/VS	5746-XX1		
QueryDL/I	5666-351		
DP and Business			
Professional Support			
DISPF/VSE	5666-361		
CSP/AD	5668-813		
CSP/AE	5668-814		
CSP/Q	5668-918		
GDDM™-IMD	5668-801		
GDDM/VSE	5666-328		
GDDM/VSE NL feature			
GDDM-PCLK feature			
GDDM-PGF	5668-812		
GDDM-PGF NL feature			
GDDM-IVU	5668-723		
GDDM-IVU NL feature			
INFO/System	5735-OZS		
ISPF	5668-960		
ISPF/PDF	5666-281		
QMF/VSE	5666-292		
QMF/VSE NL feature			

* The respective NCP programs — ACF/NCP Version 2.1 (5735-XX9), ACF/ISSP Version 2.2.1 (5735-XXA), including NCP/ISSP SCP EP feature (5747-CH2) — for 3705 support can be ordered and installed outside VSE/SP 3.1.

Reference Material

VSE/System Package General Information Manual, GC33-6176

Section 43. System Control

Advanced Interactive Executive (AIX™)

Products Included

- IBM AIX/370
- IBM AIX/RT
- IBM AIX PS/2™

Main Purpose

The AIX family of products provides a compatible operating system environment from the PS/2 Model 80 through the RT, 9370, and 4381, to the 3090 to address a customer's requirements for a UNIX® system or a UNIX application. The hardware platforms provide increasing capabilities in terms of number of users supported, DASD, memory, and processing power. AIX provides consistent user and application interfaces, as well as specific features and functions that take advantage of these hardware system capabilities. The result is a series of offerings with a broad range of function, performance, capacity, and price, enabling a customer to select and implement the most appropriate solution for a variety of requirements while preserving a common UNIX operating system environment.

Key Functions, Facilities and Features

IBM Advanced Interactive Executive (AIX™) is a comprehensive, multiuser, multitasking operating system that supports a full range of IBM hardware systems. The AIX family of products provides a common set of system functions, communication capabilities, application enabling interfaces, and end-user interfaces that will be in compliance with the IEEE 1003.1 Standard for POSIX™ and embrace the UNIX® System V® and the Berkeley Software Distribution implementations.

AIX supports IBM hardware systems ranging from the Personal System/2 to the 3090 with Vector Support.

The family of AIX products includes:

- AIX PS/2™ – for the IBM Personal System/2 Model 80
- AIX/RT – for the RT
- AIX/370 – for VM-based System/370 and Extended Architecture systems such as the 9370, 4381, and 3090.

With AIX, a customer can take full advantage of IBM products and services to develop a flexible, productive UNIX operating environment that can be easily expanded to meet individual computing needs and business requirements.

Standard UNIX Features

AIX has been designed to provide a comprehensive set of UNIX tools, utilities, compilers and application development software including:

- Multiuser and multitasking capabilities allowing users to work in the same system while performing several tasks at the same time
- Open architecture and UNIX application portability
- A hierarchical file system enabling files to be expanded dynamically
- Application development tools providing high-level languages, a symbolic debugger, a source code control system, a lexical analyzer, and document production tools
- Additional applications and utilities including text editors and formatters, text processing aids, and electronic mail

AIX Enhancements to UNIX

AIX also provides a wide range of enhancements:

- The Transparent Computing Facility allows the distribution of data, processes, and devices
- Distributed services provides end users or application programmers access to the programs and data files stored on other systems
- IBM DOS server program interfaces PCs to AIX systems

AIX enhancements also include:

- Virtual storage support
- X-windows support
- Transmission control protocol/Internet protocol (TCP/IP) support
- Support for the Network File System® protocols
- INTERACTIVE Systems Corporation enhancements, such as INed/INmail/INnet/FTP™
- IBM Personal Computer Disk Operating System (IBM DOS) support

Affinity with Other IBM Operating Environments

AIX complements other IBM operating systems such as the personal computer IBM DOS and VM that run on AIX hardware platforms. Commands have also been provided to enhance this partnership.

AIX Family Definition

The AIX Family Definition is a collection of interfaces, conventions, and protocols supported across a broad range of IBM computer environments. The AIX

Advanced Interactive Executive (AIX)

Family Definition encompasses popular UNIX and industry standards, and includes IBM extensions. The AIX Family Definition is a framework for building portable, consistent AIX applications now and in the future for System/370, Reduced Instruction Set Computer (RISC) architecture, and Personal System/2 80386 computing environments. Most of the functions and interfaces initially identified in the AIX Family Definition have been announced for the AIX Family products — AIX/370, AIX/RT, and AIX PS/2.

Systems Application Architecture Relationship

To enhance communication with Systems Application Architecture (SAA) systems, it is IBM's intent that AIX will provide appropriate interconnection protocols between AIX and SAA systems. To enhance porting of applications between AIX and SAA environments, the AIX Family Definition will provide C and FORTRAN interfaces that are compatible with the SAA definition for these languages.

As the AIX Family Definition and Systems Application Architecture evolve, IBM will expand the interconnect capabilities and the compatible programming interfaces. Where conflict exists between AIX and SAA, IBM will give priority to maintaining consistency in the UNIX environment.

TCP/IP Support

TCP/IP is a set of popular communication protocols among users of UNIX operating systems. TCP/IP functions include:

- Simple mail transfer protocol (SMTP) to send/receive mail to/from other systems
- File transfer protocol (FTP) to send, retrieve, delete, or rename files sent between the user and a server or between two systems
- TELNET protocol to allow remote login to another system
- Network services commands to support network definitions, maintenance, and problem determination
- Trivial file transfer protocol (TFTP) to read and write files or mail to and from a remote server
- Ethernet™ and IBM Token-Ring Network support

X.25 Support

- PS/2 software support to attach the PS/2 as an end terminal (data terminal equipment (DTE)) to an X.25 packet-switched data network (PSDN)
- Connection to X.25 networks through either TCP/IP or Transparent Computing Facility (TCF)
- Application program interface (API)

Network File System Support

The Network File System provides support for the NFS 3.2 protocols developed by SUN Microsystems, Inc. NFS support allows the sharing of files and

remote services between AIX systems and other UNIX-based equipment that supports the Network File System via an Ethernet network.

Distributed Services

Distributed services offers file and data transparency on the IBM Token-Ring Network and Ethernet network. This allows resource sharing of files, programs, printers, and communications. AIX distributed services also connects Transparent Computing Facility clusters.

Designed for large numbers of IBM AIX systems, distributed services preserves the stand-alone characteristics of the workstation environment. At the same time, it provides key mainframe benefits without requiring a large CPU complex in the network.

Transparent Computing Facility

AIX provides the Transparent Computing Facility for a cluster of System/370 and PS/2 Model 80 processors connected with either the IBM Token-Ring Network or the Ethernet network. Users work with a consistent, single-system image, so they can access system resources, including files, from any point in the system without having to learn new commands. This can help simplify operation and increase efficiency.

DOS Server

DOS server allows applications running under DOS Version 3.3 and users on an appropriately-attached IBM Personal Computer or IBM Personal System/2 running the AIX Access for DOS Users licensed program to access the AIX file system.

- The AIX file system appears as additional IBM DOS virtual files.
- Files may be transferred between the disk drives of the DOS-based workstation and the AIX file system.
- Users can use the AIX storage facilities and/or access data and programs maintained under AIX.
- DOS users can also utilize the AIX printers.

Editors

AIX provides the standard UNIX line editors (ed, sed, and ex) and the following full-screen editors:

- INed, a high-function, full-screen text editor that allows users to view and edit files, with multiple windowing for a single file or for multiple files
- vi, a full-screen editor that provides flexible text-oriented functions and the capability to execute system functions while remaining in editor mode

Program Development Tools

AIX contains the following program development tools:

- Subroutine libraries
- Symbolic debuggers (sdb, dbx)
- Advanced programming development tools such as lex, yacc, lint
- Shared library support
- UNIX operating system tools and utilities
- SCCS, a collection of programs that manages changes to files
- History records maintained to assist in keeping system consistency and program level control

Text Processing

AIX supports UNIX commands and utilities for text processing:

- *eqn* – Formats mathematical text for *nroff* and *troff* commands
- *mm* – Displays or checks documents, manual pages, view graphs, and slides
- *nroff* – Formats text for printing devices
- *spell* – Finds spelling errors
- *tbl* – Formats tables for *nroff* and *troff* commands
- *troff* – Formats text for photo-typesetting devices

End-User Interfaces

AIX supports the Bourne shell, which is a command interpreter that serves as an interface between the user and the operating system. The Bourne shell is familiar to users of UNIX.

In addition, AIX provides an implementation of the C shell that is familiar to users of Berkeley Software Distribution systems.

X-Windows

X-windows is a windowing system that provides simultaneous views of several executing programs or processes on high-resolution graphics displays.

Networking and Mail Facilities

INmail/INnet/FTP functions provide for the queued transfer of files and electronic messages, and for interactive execution of file-oriented commands on remote systems.

INmail provides electronic mail manipulation facilities, INnet provides the communications facilities that permit users on separate but interconnected systems to exchange electronic mail, and the File Transfer Program (FTP) enables a user to interactively transfer files between systems and to interactively enter commands to be executed on remote systems.

AIX Workstation Functions

- Workstation host interface program:
 - 3270 display station emulation
 - 3270 printer emulation
 - Multiple ASCII terminal support
 - National language support
 - High-speed file transfer between System/370 AIX workstation
 - High-function application-to-application interface
- Usability services:
 - Easy-to-use, full-screen, menu-driven interface to many of the AIX operating system functions
 - A subset of the AIX commands and parameters supported through a command bar and pop-up menus
 - Access to options on the command bar and menus with an optional pointing device (mouse) on the console terminal
 - When used with X-windows, initiation of usability services from multiple concurrent windows on the console terminal, allowing switching among multiple active tasks
- Asynchronous terminal emulation (ATE):
 - Allows AIX workstation to emulate an ASCII terminal attached to a host computer
 - Provides automatic dialing and/or predefined connection configuration data
 - Sends/receives files via XMODEM protocol
- ORACLE™ Relational Data Base Management System (RDBMS)

The ORACLE RDBMS uses Structured Query Language (SQL) and is compatible with the SQL ANSI Standard. ORACLE provides information management and transaction processing. The following features are included in the RDBMS:

- Support for views and joins
- Multistep transaction support
- Help in recovering from crashes and media failure
- Dynamic index management
- Query optimization
- Hierarchical data commands
- Extensive numeric, text, and logical functions
- Support for shared data base access by multiple processors

In addition to RDBMS, the following ORACLE programs are available:

- SQL*Plus
- SQL*Forms
- SQL*Menu
- SQL*Net
- SQL*Net TCP/IP Protocol Device Driver
- Pro*C Programming Interface
- Pro*FORTRAN Programming Interface

SQL*Plus is a fourth-generation-language interactive interface enhanced with report writing and data transfer capabilities.

Advanced Interactive Executive (AIX)

SQL*Net provides distributed data base capabilities and allows users to distribute processing by connecting applications on one computer with data bases on another.

- INGRES™ Relational Data Base Management System

INGRES is a distributed SQL relational data base system. Application tools are closely integrated with the relational data base system and include a fourth-generation application-development environment and end-user decision-support tools. INGRES is designed to operate in a distributed environment, and facilities are provided for both networking and distributed data base.

The following features are included in the INGRES Relational Data Base Management System:

- Support for views and joins
- Multistep transaction support
- Recovery from crashes and media failure
- Dynamic index management
- Query optimization
- Extensive numeric, text, and logical functions
- Support for shared data base access by multiple systems

In addition to the INGRES Relational Data Base Management System, the following INGRES programs are available:

- INGRES/APPLICATIONS
- Embedded SQL preprocessors for FORTRAN
- Embedded SQL preprocessors for Pascal
- INGRES/NET
- INGRES/STAR
- INGRES/PCLINK

Reference Materials

- AIX Family, flyer, G580-0917
- AIX/370, fact sheet, G580-0931
- AIX/RT, fact sheet, G580-0932
- AIX PS/2, fact sheet, G580-0933

AIX/370

Main Purpose

The Advanced Interactive Executive/370 (AIX™/370) licensed program is the System/370 member of the IBM AIX family of operating systems. AIX/370 is a multiuser, multitasking virtual-memory operating system providing an environment with large files and high-end computing capability to satisfy a user's mid-range to large systems UNIX requirements. AIX/370 runs as a guest under VM/SP (with or without the High Performance Option) or VM/XA SP and can coexist with CMS and other guest operating systems such as MVS on the same processor. AIX/370 is designed to be compatible with AT&T UNIX System V Release 2 and with 4.3 Berkeley Software Distribution (BSD), with enhancements developed by IBM and vendors under contract to IBM. It is IBM's intention that AIX/370 will conform to the IEEE 1003.1 standard for POSIX (Portable Operating System for Computer Environments).

Key Functions, Facilities, and Features

- System functions:
 - Consistent with UNIX System V.2 function
 - Consistent with 4.3 Berkeley Software Distribution function
 - 24-bit and 31-bit addressing modes
 - 8 megabytes of user process size in 370 mode
 - 768 megabytes of user process size in XA mode
 - Support for 3090 Vector Facility
- Connectivity facilities:
 - AIX/370 provides a wide range of connectivity facilities that support exchange and sharing of data and programs for peer-to-peer and workstation-to-host environments. AIX/370 supports the following:
 - Transmission control protocol/Internet protocol (TCP/IP) for Ethernet and IBM Token-Ring
 - X.25 support via a PS/2 Model 80 with AIX PS/2
 - Network File System for Ethernet and IBM Token-Ring
 - Transparent Computing Facility for Ethernet and IBM Token-Ring
 - DOS server
 - Local/remote file transfer support (NJE/RSCS)
- Application programming interfaces:
 - Optimized C compiler
 - Assembler
- Editors
 - Standard UNIX line editors (ed, sed, ex)
 - INed full-screen editor
 - vi full-screen editor
- Program development tools
- Text processing tools

- End-user interfaces:
 - Bourne shell
 - C shell
- X-windows client support
- Networking and mail facilities:
 - INmail/INnet/FTP
- Online documentation
- ONCMS:
 - Access to CMS programs
 - Commands in UNIX or CMS syntax
 - CMS output piped to AIX program
- Future functions:
 - IBM has announced intention to provide distributed services, VS FORTRAN and Engineering/Scientific Subroutine Library (ESSL) support, and ONTSO for AIX/370

Primary Users

AIX/370 is an AIX offering for the midrange to high-end processors. It should be considered when additional processor resources or a System/370 operating environment is required. The range of System/370 processors (9370, 4381, 3090) makes available to customer applications extensive disk storage, processor storage, and CPU processing capability. In addition, the 3090 Vector Facility provides support for large-scale, numerically-intensive computing. AIX/370 is well suited for a centralized processing and administration environment. It should also be considered when accessibility to VM function and applications is desired.

Prerequisite Products

AIX/370 is designed to operate as a guest with the following programs:

- VM/SP
- VM/SP HPO
- VM/XA SP

Products Supported

AIX/370 runs on any processor supported by VM, from the 9370, through the 4381, to the 3090 processor with Vector Facility. In addition to the requirements for VM, each AIX/370 guest machine requires 4 megabytes of real storage.

- Console
 - 3278 or equivalent display station
- Disk
 - 3380
 - 3370, 9332, 9335 (with VM/SP)
- Tape
 - 3420, 3422, 3430, 8809, 9347
- Printer
 - Any printer supported by VM, with the proper character set for translated ASCII characters

- Terminals

AIX/370 has been designed to offload terminal control cycles from the host to an intelligent workstation. Terminals are supported by AIX/370 when they are attached to an AIX workstation such as the PS/2 Model 80 or RT, or as a DOS workstation such as the IBM Personal Computer or IBM PS/2, and connected to the System/370 by a LAN. The workstation can be connected via transparent computing facility, TCP/IP, X-windows, or AIX Access for DOS Users.
- LAN attachment
 - 8232 LAN Channel Station attached to a block multiplexor channel on any System/370 processor
 - For 9370 processors:
 - IEEE 802.3 LAN Subsystem Controller
 - IBM Token-Ring Subsystem Controller

Ordering Information

AIX/370

Program number: 5713-AFL

AIX/370 Network File System

Program number: 5688-046

Reference Material

AIX/370 General Information Manual, GC23-2062

AIX/RT

Main Purpose

The Advanced Interactive Executive/RT Operating System (AIX™/RT) licensed program for the RT is a member of the IBM AIX family of operating systems. AIX/RT is a multiuser, multitasking virtual-memory operating system. It can operate as a single-user or multiuser system with up to 32 concurrent users. The AIX/RT Operating System is designed to be compatible with AT&T's UNIX® System V Release 2. AIX/RT includes many Berkeley Software Distribution 4.3 extensions, plus enhancements developed by IBM and vendors under contract to IBM.

Key Functions, Facilities and Features

System functions

- Support for 32 users
- 1-terabyte virtual memory addressability
- National language character support
- Mail facilities
- Program development tools

AIX/RT Connectivity Facilities

The AIX/RT operating environment provides a wide range of connectivity facilities that support data and program exchange and sharing for peer-to-peer and workstation-to-host environments. AIX/RT supports the following:

- Transmission control protocol/Internet protocol (TCP/IP)
- Distributed Services
- Network File System (NFS)™
- DOS Server
- Workstation Host Interface Program
- INmail/INnet/FTP
- Asynchronous terminal emulation
- SNA services support for LU 1, 2, 3, and 6.2
- NETWORK 3270-PLUS (SNA)
- NETWORK 3270-PLUS (BSC)
- NETWORK RJE-PLUS (SNA)
- NETWORK RJE-PLUS (BSC)
- 3278/79 emulator

Application Programming Interfaces

- C language
- VS FORTRAN
- VS Pascal
- Text editors (INed, vi, sed)
- BASIC compiler and interpreter
- RM/COBOL
- FORTRAN 77
- Common LISP

Graphics Support

- Advanced display graphics support library
- Personal graPHIGS
- Graphics Development Toolkit
- Graphics Terminal Emulator
- Plotting System
- Graphical File System

User Interfaces

- Bourne shell
- C shell
- Usability services
- X-Windows

DOS Support

- DOS services
- Personal Computer AT coprocessor services
- PC AT Simulator
- DOS Server: Virtual file and print server for DOS workstations

Data Base Support

- ORACLE Relational Database Management System
- INGRES Relational Database Management System

Primary Users

AIX/RT for the RT is a midrange AIX offering. It supports a wide range of communication capabilities to both UNIX and non-UNIX systems. AIX/RT has an extensive library of applications for users in commercial and engineering/scientific environments, especially those requiring high-function graphics or numerically-intensive computing.

Prerequisite Products

- RT Virtual Resource Manager

Products Supported

Hardware

- IBM RT system with any supported console display

Optional hardware supported

- Printers (partial list):
 - 3812 Pageprinter
 - 3852 Color Jetprinter
 - 4202 Proprinter™ XL
 - 5201 PC Quietwriter® Printer Model 2
 - 5202 Quietwriter III Printer

- Plotters (partial list):
 - 7371 Plotter
 - 7375 Color Plotter Model 1 or 2
 - 6180 Color Plotter
 - 6186 Color Plotter
- Streaming tape drive
 - 6157 Model 1
- Terminals
 - 3151 ASCII Display Station (in 3161 mode)
 - 3161 ASCII Display Station
 - 3163 ASCII Display Station (in 3161 mode)
 - IBM Personal Computers using 3101 Emulation
 - PS/2 Models 50 and 60 using 3101 Emulation
 - ASCII terminals that adhere to ANSI 3.64 protocol as implemented by DEC VT100® and DEC VT 220® or equivalent

Additional Hardware

- 6192 Expansion Unit
- 5080 Graphics System
- Disk storage
 - 9332 Direct Access Storage
 - 6156 Portable Disk Drive

Software

A wide variety of AIX/RT, RT, NETWORK RJE-PLUS and 3270-PLUS, RM/COBOL, Common LISP, ORACLE, SQL*, PRO*, INGRES, APPLIX, SAMNA, SOLOMON III, UNIRAS, IMSL, CADAM, CAEDS, CATIA, CIEDS and other programs are available for use with AIX/RT. (See front matter for trademark acknowledgements.)

Ordering Information

AIX/RT Version 2.2

Program number: 5601-061

Reference Material

General Information, GC23-0783

AIX PS/2™

Main Purpose

The AIX (Advanced Interactive Executive) PS/2 Operating System licensed program is a member of the IBM AIX family of operating systems. AIX PS/2 is a multiuser, multitasking virtual-memory operating system for the Personal System/2 Model 80. It can operate as a single-user or multiuser system with up to 16 concurrent users. The AIX PS/2 Operating System is based upon the AIX/RT Operating System and is designed to be compatible with AT&T's UNIX System V Release 2. AIX PS/2 includes many Berkeley Software Distribution 4.3 extensions, plus enhancements developed by IBM and vendors under contract to IBM.

Key Functions, Facilities and Features

System Functions

- Support for 16 users
- 4-gigabyte virtual memory addressability
- National language character support
- Mail facilities
- IBM PC XENIX Release 2.0 source code compatibility

Connectivity Facilities

The AIX PS/2 Operating System provides a wide range of connectivity facilities that support data and program exchange and sharing for peer-to-peer and workstation-to-host environments. AIX PS/2 supports the following:

- Transmission control protocol/Internet protocol (TCP/IP)
- Distributed services
- Network File System (NFS)
- Transparent Computing Facility
- DOS Server
- Workstation Host Interface Program
- INmail/INed/INnet/FTP
- X.25
- Asynchronous terminal emulation

Application Programming Interfaces

- Application development toolkit
- C Language
- VS FORTRAN
- VS Pascal
- Text formatting system
- Text editors (INed, vi, sed)
- Graphics support library

Advanced Interactive Executive (AIX)

User Interfaces

- Bourne shell
- C shell
- Usability services
- X-Windows

DOS Support

- DOS merge: Allows multiple users to execute DOS applications
- DOS server: Virtual file and print server for DOS workstations

Data Base Support

- ORACLE Relational Database Management System
- INGRES Relational Database Management System

Primary Users

AIX PS/2 for the PS/2 Model 80 is the entry-level AIX offering. It should be considered in situations requiring a small, single- or multiuser UNIX system or workstation, in migrations from XENIX, or when a high degree of affinity with IBM DOS is required.

Products Supported

Hardware

- PS/2 Model 80 with a minimum of 2MB of memory
 - Models 041, 071, 111, 311 with any of the supported displays

Optional Hardware Supported

- Printers
 - 3852 Color Jetprinter Model 2
 - 4204 Proprinter XL
 - 5201 Quietwriter Model 2
 - 5223 Wheelprinter E Model 1
- Plotters
 - All IBM plotters that are supported on PS/2

Streaming tape drive

6157 Model 1

Terminals

- 3151 ASCII Display Station (in 3161 mode)
- 3161 ASCII Display Station
- 3163 ASCII Display Station (in 3161 mode)
- IBM PCs using 3101 Emulation
- Personal System/2 Models 50 and 60 using 3101 Emulation
- ASCII terminals that adhere to ANSI 3.64 protocol as implemented by DEC VT100® and DEC VT220® or equivalent.

Software

A variety of AIX PS/2, INGRES, ORACLE, and other programs can be used with the AIX PS/2 Operating System.

Ordering Information

AIX PS/2 Operating System

Program number: 5713-AEQ

Reference Material

General Information Manual, GC23-2055

Virtual Storage Extended (VSE)

Products Included

- VSE/Advanced Functions Version 2
- VSE/POWER Version 2

VSE/Advanced Functions

Main Purpose

VSE/Advanced Functions Version 2 provides major functions and enhancements to the disk-resident Virtual Storage Extended (VSE) operating system.

Key Functions, Facilities and Features

The routines of VSE are stored on disks in system libraries; they are thus directly accessible for loading into main storage. They provide:

- Initial program load
- Resource management
The supervisor of VSE, which is loaded into processor storage by the initial program load function, controls the total system operation. Primarily, the supervisor controls the utilization of system resources by problem programs and VSE programs.
- Job control
Before a problem program can be processed, the supervisor loads job control. This routine determines which of the system resources will be used by a problem program.
- Linkage-editing of programs for execution
Processes language translator output to make it executable.
- Paging management
Controls the use of main memory according to specified partition priorities and the varying memory demands of programs which are multiprogramming under VSE.
- Library management
Allows programs and procedures to be cataloged in several VSE libraries. They also handle subsequent alterations, updates, additions, and deletions.
- Library services
Provides services such as cataloging of programs and procedures, deleting and updating them as required. These programs are prompted if they are running under VSE/ICCF.
- Data management
The input/output and file organization routines of VSE relieve the programmer of the detailed coding otherwise required to effect the transfer of data between I/O devices and user programs.
- System-to-operator communication

Allows the operator to monitor system operations and respond quickly to situations which require human intervention.

- System utilities
Perform needed functions such as tape and DASD initialization and copying, and restoring DASD volumes.
- System serviceability
RAS routines are provided which detect and correct most processor-related malfunctions.
- Debugging aids

Advanced functions include:

- Hardware support
 - Up to 12 partitions
 - Up to three virtual address spaces, each of which can be up to 16MB in S/370 mode with a maximum total of 40MB
 - VM linkage for VSE under VM/SP
 - DASD sharing of up to 31 processors
- Usability
 - Asynchronous operator communication
 - Dynamic partition balancing
 - Area for job to job communication
 - Automated system initialization
 - Online system generation
- Performance
 - 208 tasks
 - DASD and tape channel switching
 - Fast B and C transient fetch
 - Fast open of hardcopy file
 - High-level SDL search
 - Multiple extent page data set
- Librarian
 - Easy-to-use command language
 - Libraries that can be spread over multiple DASD extents
 - Copy functions between libraries residing in DASD of different architectures

Potential Benefits

- Environment to make full use of the functional capabilities of 4300 and 9370 Systems
- Greater productivity for end users, programmers, and operating personnel
- New ease-of-use facilities for system installation, development, operation, and maintenance with new and unique program facilities when used as a component of VSE/System Package

Prerequisite Products

- VSE/OLTEP
- VSE/EREP
- Device Support Facilities

Virtual Storage Extended (VSE)

Products Supported

Hardware

- Processors: 4321, 4331, 4341, 4361, 4381 (except Models 3, 14, and 24), System/370 through Model 158, 3031, 3033, 9373, 9375, and 9377.
- DASD, fixed-block architecture: 3310, 3370, 9332, 9335
- DASD, count-key-data: 3330, 3340, 3350, 3375, 3380
- Printers: 3203, 3262, 4245, 3211, 4248, 3820, 3827, 3835, 3800 Model 3, 5203, and 6262
- Terminals: 3640, 3650, 3680, 4700, 3270, and most pre-SNA terminals
- Tape Units: 8809, 3410/11, 3420, 3430, 3480, 9347

Software

- Spooling: VSE/Power
- Interactive: VSE/ICCF and VSE/Access Control—Logging and Reporting
- DB/DC: CICS/DOS/VS and DLI/DOS/VS, SQL/DS
- Languages: PL/I, COBOL, FORTRAN, RPGII, Assembler, and VS APL under CICS/VS
- Files: VSE/VSAM, ISAM, DAM and SAM, (ISAM support for the 3310 and 3370 is through VSE/VSAM via the ISAM IIP)
- Terminals: ACF/VTAM for SNA terminals in a network; BTAM-ES for BSC and start/stop terminals
- Office: Personal Services/CICS, DisplayWrite/370, DISOSS/370, and GDDM

VSE/POWER

Main Purpose

VSE/POWER is the spooling system for VSE. It provides the user with automatic staging of unit record input and output, and priority scheduling of all programs executing under its control.

In a multiple-processor configuration, two or more VSE/SP systems can share a single set of VSE/POWER files. In addition, VSE/POWER's networking facilities can be used to process jobs on other systems and exchange files or use VSE/ICCF library members among systems.

Key Functions, Facilities and Features

- VSE/POWER maintains I/O queues on direct access storage; it is transparent to programs executing under its control.
- It provides a standard interface to allow other programs to control spool data and remote terminal printers.

- The master operator controls VSE/POWER activity by displaying job status, releasing jobs from hold status, altering job priorities, deleting jobs from queues, terminating jobs, or releasing jobs queued for execution, printing, or punching.
- Up to 14 printers and 14 punches can be defined for each partition.
- Jobs can be assigned to I/O classes.
- Job queues are partition-independent, regardless of the number of partitions controlled. VSE/POWER maintains only one read queue, one list queue, and one punch queue, giving greater scheduling flexibility.
- VSE/POWER controlled partitions may reside in any of the available address spaces. VSE/POWER itself occupies a portion of each address space.
- The cross partition interface provides the capability of addressing the VSE/POWER spool files from any application running in another partition.
- Source library inclusion allows VSE job control and data to be called from the source statement library.
- The output for a job can be started before all the output for that job has been spooled.
- Output can be retained in the queue so that additional copies can be obtained.
- Backup facilities permit restart of VSE/POWER after system shutdown.
- Common VSE/POWER files can be shared between two or more VSE/POWER systems.

RJE

- The remote terminal user can submit a job to the VSE/POWER RDR queue for later execution in a partition controlled by VSE/POWER, or to the XMT queue for transmission to another node in the network.
- The remote terminal user can send messages to, and receive messages from, the central operator, any remote operator, and any other interactive user, either on the local or remote system.
- There can be up to 250 output destinations (user identifications) in SDLC mode (including up to 100 BSC lines).
- SDLC support is provided for the 8100 under DPCX.
- Up to 25 RJE lines can be active concurrently.
- System security is by password and user identification.
- Inquiry facilities allow the central operator to determine the status of any RJE line.
- "Hot writer" support allows a terminal to receive data without operator intervention. As soon as the terminal is ready, the line is available and the output is queued at the central location.

Potential Benefits

- Increased system availability
- With the autostart facility, initialization of VSE/POWER and startup of VSE/POWER controlled partitions with minimal operations effort
- Efficient real storage and unit record I/O utilization
- Increased throughput and more effective system utilization
- Ease of operation through controlled job scheduling
- Output management through class and priority scheduling with multiple copies if needed
- Reduced punching requirements through an internal reader
- An efficient way to distribute data processing to remote sites through centralization of I/O
- Extension of batch computing facilities of the central facility to remote terminals

Prerequisite Products

- VSE/Advanced Functions Version 2
- ACF/VTAM when operating in SNA mode
- ACF/NCP if the involved terminals are linked via a channel-attached controller

Ordering Information

VSE/Advanced Functions Version 2

Program number: 5666-301

VSE/POWER Version 2 Release 3

Program number: 5666-273

Reference Material

VSE/SP

General Information, GC33-6176

VSE/Advanced Functions

Flyer, Version 2, Program Summary, GC33-6189

VSE/POWER

Program Summary, GC33-6273

Operator Communication Control Facility (OCCF)

Products Included

- VSE/OCCF
- MVS/OCCF

Main Purpose

- VSE/OCCF, a program product, provides facilities to ease the complexity of operating a VSE system by reducing the operator interaction necessary to run the system. The functions provided are useful in both standalone and distributed environments, in which the VSE system is connected to another system that can be running VSE or MVS. In a distributed environment, the central site operator can control multiple remote VSE systems.
- MVS/OCCF, a program product, is designed to simplify the operation of MVS systems and allow one or more remote MVS systems to be operated from a host MVS system. It resides in the remote system(s) and optionally in the host.

Key Functions, Facilities and Features

VSE/OCCF

- Allows a user to code a table with programmed responses to system and subsystem messages, to suppress information-only messages, and to reduce operator interaction
- Provides table-driven facilities to substitute user-written message text for IBM-supplied text
- With the Network Communication Control Facility (NCCF), directs messages to an NCCF operator console for system interaction and responses

MVS/OCCF

- Allows commands to be issued at the host to remote locations for execution
- Permits intercepting messages at remote locations and routing them to the host for replay or information
- Permits predefined replies for write-to-operator with replies
- Provides generation of a series of commands through a command list (CLIST) capability
- Provides 3275 data stream emulation support for ROCF in 4300 Processors

Potential Benefits

- Reduced skill level for system operators
- Less time needed to operate the system
- Use of foreign languages in operator messages
- Centralized, remote operations for multiple-use systems

Prerequisite Products

VSE/OCCF

VSE/OCCF operates in any IBM system supported by DOS/VSE with VSE/Advanced Functions. When connected to another VSE location over telecommunication lines, VSE/OCCF requires at the VSE location the 37XX Communications Controller, the Communications Adapter for the 4321, 4331, and 4361 Processors or the telecommunications subsystem of the 9370. The operator console must be a display operator console. In the telecommunications environment, the following program support is needed:

- Local system:
 - DOS/VSE with VSE/Advanced Functions
 - NCCF (and its requirements)
 - VSE/OCCF
- Remote console:
 - NCCF (and its requirements)

MVS/OCCF

- MVS/OCCF operates in any IBM processor supporting MVS/SP-JES2 Version 1 or 2. For remote IPL/IML of a 4300 system, MVS/OCCF must be installed in the host and the remote processor must be a 4300 Processor with ROCF and VSE or MVS installed.
- The following programming support is required:
 - MVS Release 3.8
 - MVS/SP-JES2 Version 1 or 2
- For remote operations, the following additional programs are needed:
 - NCCF Release 2
 - ACF/VTAM Release 2 or 3 with MSNF or ACF/TCAM Version 2 Release 2 or 3 with MSNF

Products Supported

All software products that produce console messages.

Ordering Information

VSE/OCCF

Program number: 5746-XC5

MVS/OCCF

Program number: 5665-288

Reference Material

General Information Manuals:

- VSE/OCCF, GC33-6113
- MVS/OCCF, GC24-5225

File Transfer Program (FTP)

Products Included

- File Transfer Program (FTP) Version 2 for MVS and VSE
- File Transfer Program (FTP) Version 2 for VM

Main Purpose

File Transfer Program Version 2 for MVS and VSE is a general-purpose program product to transfer and update all sizes of VSAM and sequential disk or tape files between VSE, and MVS based systems in a SNA network.

File Transfer Program Version 2 for VM enables the VM installation to transfer or update files between FTP Version 2 network nodes.

They both support distributed data processing and the increasing demand of powerful file transfer capabilities with high performance and ease of use.

Key Functions, Facilities and Features

- High transmission performance
 - Direct file-to-file transfer without intermediate spooling
 - Data compression
 - VTAM exception response mode
 - Dynamic transmission data block (RU) adjustment to network route limitations
 - Support for transmission data blocks (RUs) from 256 bytes up to 32K bytes to reduce the control data portion on the link, minimize the processor utilization by VTAM, and promote the usage of fast links such as satellites
- Checkpoint/restart facilities
 - FTP Version 2 initiates session recovery from short link interference.
 - Checkpoint/restart data set enables restart, even if the exchange was broken unverifiable.
 - FTP Version 2 for VM queues transmission requests to its virtual reader.
 - FTP Version 2 for VM transmission requests are re-queued and are candidates for automatic re-scheduling if a session outage unrecoverable by FTP occurs or CP link fails due to the fact that the output CMS virtual disk has been in read/write mode by another user. FTP Version 2 for VM send and receive requests can be scheduled under control of execution-time parameters.
- File handling
 - Tape, sequential disk, and VSAM file support is provided.
 - Two levels of data access are available.
 - VSAM KSDS support enables, in addition to full data set transmission, adding and deleting by key

- A file handler user exit provides the opportunity to access other file organizations
- File characteristics can be fully defined at the local or the remote location by the use of FTP Version 2 file control parameters. FTP Version 2 uses this information to dynamically allocate the data set during the file open process.
- During the file transfer process, the type of data set organization can be changed.
- Parameter controlled data access of FTP Version 2 for VM includes:
 - CMS virtual disk support via GCS QSAM interface with the option to write to a new allocated CMS virtual disk file
 - VSAM ESDS/KSDS data set support, including a KSDS update facility
- Ease of use
 - Ready-to-run: FTP Version 2 is parameter-driven and requires no generation process.
 - Cross operating system product: All VSE-based, MVS-based and VM/SP systems running FTP Version 2 are supported.
 - Resident session partner (RSP) that enables consecutively sending or receiving multiple files. When one data set is transmitted (successfully or unsuccessfully) RSP becomes available for the transmission of another data set. This allows, together with dynamic file allocation, unattended operation during off-shift or night time.
 - Notification support to interactive users on ICCF or CMS.
 - Easy customizing of messages.
 - For VSE systems, a prompter facilitates job preparation.
- Data security and integrity:
 - The access control facilities of VTAM, VSAM, RACF, and VSE/AF access control are supported by FTP Version 2 statement extensions.
 - A transmission log is provided at the sending and the receiving location.
 - FTP Version 2 transfers directly from the source to the destination data set in one step.

Primary Users

- Current MVS and VSE users of FTP Version 1 or CDNDT (Cross Domain Network Data Transfer, 5798-DAE)
- Users requiring file transfer between MVS, VSE, and VM systems in either direction
- Users requiring data compression, checkpoint/restart, and large RU sizes for the transfer of medium-size and large files

Potential Benefits

- FTP Version 2 complements networking in all areas requiring bulk data transfer for:
 - Distribution of data for local batch or interactive processing
 - Data collection at a divisional center or corporate headquarters
 - Regular update or refresh of data bases
 - Distribution of data to be processed with special resources
 - Program maintenance and distribution of programs
 - Load sharing
 - Data exchange between enterprises
- FTP Version 2 supports solutions with decreased complexity, increased data availability, and enhanced local performance.
- FTP Version 2 offers file transfer with increased reliability, increased performance, ease of installation, and ease of use.

Prerequisite Products

Hardware

FTP Version 2 runs on any IBM processor supported by the system control programs listed under Software below.

Software

- VSE/SP Version 1, VSE/SP Version 2, and VSE/SP Version 3 Systems:
 - The required products are components of the packages.
- VSE/AF Version 1, VSE/AF Version 2 Systems:
 - VSE/VSAM
 - ACF/VTAM Version 1 including MSNF, ACF/VTAME, ACF/VTAM Version 2, or ACF/VTAM Version 3
 - For the prompter facility:
 - VSE/POWER
 - VSE/ICCF
- MVS Systems:
 - MVS/SP Version 1 or Version 2
 - ACF/VTAM with MSNF or ACF/VTAM Version 2

Note: In an MVS/XA environment, FTP Version 2 supports 24-bit virtual addressing.
- VM Systems:
 - VM/SP Release 4 with the Group Control System
 - VSE/VSAM
 - ACF/VTAM Version 3

Ordering Information

FTP Version 2 for MVS and VSE

Program number: 5668-932

FTP Version 2 for VM

Program number: 5664-315

Reference Material

- FTP General Information Manual, GH12-5141

VSE/Access Control -- Logging and Reporting

Main Purpose

VSE/Access Control – Logging and Reporting is part of the access control functions offered for all users of VSE. It records and reports user access information in an installation.

Key Functions, Facilities and Features

- Security-related events (such as data set access, library access, and program access) are logged to a sequential disk file called the security log file.
- Logging is optional and is performed asynchronously by a VSE subtask attached to the VSE/Interactive Computing and Control Facility (VSE/ICCF).
- Reporting provides a printout of selected data from the security log file for auditing purposes.
- Selection criteria are provided to the reporting module during program processing by means of control statements.
- Several reports corresponding to various selection criteria can be obtained in one program run.
- Security-related data may be dumped onto a tape file for archiving purposes or restored from tape for deferred reporting.

Prerequisite Products

Hardware

- At least one tape unit

Software

- VSE/Advanced Functions
- Sort/Merge

Ordering Information

Program number: 5746-XE7

Reference Material

- General Information Manual, GH12-5130

VSE/Virtual Storage Access Method (VSE/VSAM)

Main Purpose

- VSE/VSAM is the access method for VSE for direct and sequential processing of fixed, variable-length and spanned records on direct access devices, including functions for fixed block architecture devices.
- VSE/VSAM is the access method employed by DL/I DOS/VSE. It can also be used as an access method under VM/CMS.
- VSAM files created under VSE, MVS, or CMS can be accessed by either of the other two systems. VSAM files created under VSE can be accessed by MVS or CMS (except for MVS access when VSE/VSAM unique facilities are used).

Key Functions, Facilities and Features

- Records in a VSAM file can be in:
 - Logical sequence by a key field (key sequence)
 - Physical sequence in which they are written (entry sequence)
 - Sequence of relative record numbers
- The user can read, add, delete, and modify records.
- Direct sequential, or skip sequential access via key, relative byte address, or relative record address is available.
- Retrieval and update on basis of ascending or descending key values, relative byte addresses, or relative record number can be used.
- Distribution of free space throughout a key-sequenced file at creation time allows for fast data insertion.
- Free space is made available when a key-sequenced record is deleted.
- VSAM is shareable between partitions of regions.
- There are four levels of password per file.
- Alternative indexes permit file access via multiple key fields.
- Support for master and user catalogs is provided.
- Optional VSAM catalog recovery is available.
- Multifunction service program, Access Method Services, (AMS) replaces many older utility programs.

Also:

- AMS cancel command
- Support of fixed block mode for 3310, 3370, 9332 and 9335
- Support of 8809 and 9347 Tape Units in streaming mode
- Block sizes for count key data devices 0.5KB to 8KB in multiples of 0.5KB. Some block sizes may not be compatible with MVS.
- Fixed-head support
- Control area split integrity

- VSE/VSAM catalog and file sharing between VSE systems
- Space classes that allow device independent method of physically grouping files: for example, under DASD, fixed head areas
- Default volume selection
- Partition independent file names
- Options Backup and Restore Feature with high performance and low processor utilization for VSAM, and SAM files in a VSAM space
- Optional VSE/VSAM Space Management Feature for SAM files

Potential Benefits

- Single common access method can help to reduce training and conversion costs.
- DASD device independence and ease disk conversions.
- Data portability between VSE and MVS can ease conversion and coexistence.
- The use of distributed free space through a key-sequenced VSAM file results in consistent performance and less frequent reorganization.
- VSAM has more functions, better random performance, better data integrity and security, and improved data organization compared to previous access methods.

Prerequisite Products

VSE/Advanced Functions, or VM/CMS and VM/SP.

Products Supported

Software

Assembler, COBOL, PL/I, VS APL, and RPGII

Hardware

3310, 3330, 3340, 3350, 3370, 3375, 3380, 9332, 9335

Ordering Information

Program number: 5746-AM2

Reference Material

- General Information, GC24-5143

Virtual Machine System Control Programs

Products Included

- VM/XA System Product
- VM/System Product (VM/SP)
- VM/SP High Performance Option (VM/SP HPO)
- Associated products:
 - VM/Pass-Through Facility
 - VM Inter-System Facilities
 - Virtual Machine Monitor Analysis Program (VMMAP)
 - VM/Directory Maintenance
 - RSCS Networking
 - Interactive System Productivity Facility (ISPF)
 - ISPF/Program Development Facility (ISPF/PDF)
 - VM Performance Planning Facility (VMPPF)
 - RACF
 - VM/XA Realtime Monitor

Main Purpose

VM/XA System Product

VM/XA System Product is the recommended VM operating system for XA-capable processors. VM/XA SP Release 1 supersedes all releases of VM/XA Systems Facility (VM/XA SF) while providing a migration path for VM/XA SF customers. All VM/XA Systems Facility functions are supported including single-image n-way, vector processors, partitionable expanded storage, and block paging. In addition to offering new function and additional device support to VM/XA SF customers, it offers an interactive environment capable of supporting large numbers of users. It also provides a bimodal CMS that will operate in either System/370 mode with 24-bit addressing or XA mode with 24- or 31-bit addressing capability. Additionally, program interfaces have been defined to allow the development of applications which are portable between System/370 and XA CMS virtual machines. VM/SP HPO customers will find that VM/XA SP Release 1 offers an attractive growth path to IBM's larger processors running in single-image mode and relief to user growth constraints.

VM/XA SP Release 1 provides a CMS-intensive environment using the native CMS allowing 31-bit addressing and supporting larger interactive user communities than previously possible. VM/XA SP Release 1 removes growth constraints such as spool file limits for VM/XA SF customers. It provides single-image support for IBM's full family of n-way processors and removes real and virtual storage constraints of VM/SP HPO allowing support of additional interactive users. VM/XA SF customers are provided with enhanced function, new device support and additional key CMS licensed program support with such applications as PROFS.

VM/XA SP Release 2 provides support for SNA networks and will be an attractive growth options for large VM/HPO customers with SNA networks.

VM/SP

VM/SP is a system control program, with four main components:

- Control Program (CP)
- Conversational Monitor System (CMS)
- Remote Spooling Communication Subsystem (RSCS)
- Interactive Problem Control System (IPCS)

VM/SP is recommended for program development or personal computing via CMS for VSE or MVS users. An additional processor with VM/SP is a recommended support system for many MVS users for interactive time sharing or testing.

CP manages a real computing system, making all its resources (processor time, real storage, and I/O devices) available to many users at the same time. Each user has at his disposal the functional equivalent of a real, dedicated computing system: a "virtual machine."

CP provides an environment in which multiple independent virtual machines can run concurrently under control of different operating systems or different releases of the same operating system.

CMS provides a high-response interactive capability for program development and time sharing users. (See description of CMS in Section 42.)

RSCS transfers unit record files between virtual machines and remote stations connected via switched or nonswitched lines. It may act as a work station or as a host.

IPCS is intended to reduce the time expended by systems programmers in managing and resolving programming problems and to reduce the necessity of doing problem management, problem determination, and problem isolation using hard-copy documentation.

The following licensed programs are available to enhance the VM/SP environment:

VM/SP High Performance Option (VM/SP HPO)

In conjunction with VM/SP, the VM/SP High Performance Option licensed program offers a wide range of functional performance, operational, and RAS enhancements in the large system environment. VM/SP HPO is a prerequisite for operating VM/SP on 308X and 3090 Processor Complex families and is highly recommended for dual processors.

Associated Products

- *VM/Pass-Through Facility*. This licensed program allows VM/SP users connected via local or remote 3270 display terminals to interactively access applications in another system via 3270 Binary Synchronous (BSC) protocol. With VM/Pass-Through Facility (PVM) Release 4, SNA Links are available to PVM via advanced program-to-program communications/VM (APPC/VM) support in VM/SP Release 6. (See description of VM/Pass-Through Facility in Section 43.)
- *VM Inter-System Facilities*. This licensed program is designed to help in achieving a single, larger, system environment for an end-user community. VM Inter-System Facilities is the basis for extending current system capacity for users in single-system environments who want to grow to multisystem environments. It allows for a processing environment in which four Virtual Machine/System Product High Performance Option (VM/SP HPO) Release 4.2 and/or Release 5 systems are coupled in a complex. It offers the capabilities of VM inter-system LINK (shared minidisks), VM inter-system spool, and VM inter-system directory synchronization. (See description of VM Inter-System Facilities in Section 43.)
- *Virtual Machine Monitor Analysis Program (VMMAP)*. This licensed program can aid in performance and capacity planning. It enables the system programmer to monitor system utilization, identify performance bottlenecks, discover trends in performance, and plot VM system growth. (See description of VMMAP in Section 43.)
- *VM/Directory Maintenance*. This licensed program provides easy-to-use, efficient, and secure interactive facilities for management of the VM system directory by the system administrator. Some changes may also be made by the general user.
- *RSCS Networking*. This licensed program enhances the RSCS component of VM/SP to allow job transmittal from a VM/SP system to other systems. (See description of RSCS Networking in Section 43.)
- *ISPF and ISPF/PDF* are related program products. ISPF/PDF requires ISPF. Together, they are designed to increase user productivity in application development by taking advantage of the features of display terminals. They contain special functions for development and implementation of interactive applications. If the main usage of CMS is for program development, ISPF/PDF is recommended. ISPF/PDF is also recommended for installations with a requirement for compatible editors in a mixed TSO-CMS environment. (See description of ISPF in Section 42.)
- *VM Performance Planning Facility (VMPPF)*. This licensed program is an analytic model that provides planners and managers with data on the performance and capacity of their installed system as

well as a variety of projected system environments. (See description of VMPPF in Section 43.)

- *Resource Access Control Facility (RACF)*. RACF provides access control functions of user identification/verification; resource authorization; and logging and reporting of access events. RACF is supported for VM/SP and VM/XA SP.
- *VM/XA Realtime Monitor (VM/XA RTM/SF)*. This licensed program provides systems monitoring facilities for VM/XA SP. It can be used to help detect and diagnose problems and analyze performance. It can be used in realtime on any display supported on the system.

Key Functions, Facilities and Features**VM/SP Release 6**

- Provides enhanced support focused on application enabling
- Provides an extension to CMS called shared file system (SFS):
 - File-level sharing of CMS files. Sharing is at file level, providing multiple readers and one writer access to a file at the same time.
 - Control over sharing based on user authorization by the file creator (owner) or administrator
 - Distributed file access support across VM systems. Files in SFS may be shared across multiple VM systems. This sharing is provided by advanced program-to-program communications/VM (APPC/VM) enhancements provided in VM/SP Release 6.
 - DASD space management. SFS physical space is dynamically allocated or reclaimed as needed.
 - Hierarchical directory support. This support allows CMS users (and applications) to organize their files in multiple, hierarchically-structured directories. One file can be registered in multiple directories.
 - Dynamic backout and system restart recovery. Supports files in SFS and allows coordination of updates to multiple files in multiple directories.
 - Compatibility for CMS applications. Most current CMS applications will continue to operate correctly against SFS files. Applications that use and exploit update-in-place (file mode 6) are an exception.
- Can coexist with minidisk support
- Provides bimodal CMS programming interfaces, which is the VM/XA SP support description for bimodal support with additional extensions.
- Shared segment management support. This support enables multiple logical saved segments to be *packed* together and managed as a single physical saved segment.

Virtual Machine System Control Programs

- Provides enhanced connectivity
 - APPC/VM communications enhancements. APPC/VM programs in a TSAF collection can communicate over SNA LU Type 6.2, using ACF/VTAM 3.2.
 - Common programming interface for communications (CPI communications). VM/SP CPI communications provides a call interface for high-level language APPC/VM application programs in a VM/SP Release 6 CMS environment. CPI communications provides Systems Application Architecture (SAA) defined functions for APPC basic and mapped conversations for high-level language programs. The callable routines are stored in the callable services library described below.
 - APPC/VM usage by PVM. PVM Release 4 uses APPC/VM to communicate with its counterpart PVM on another VM system.
- Callable services library. This VM/SP Release 6-supplied library provides the high-level-language programmer with access to VM functions and services without requiring the programmer to write Assembler subroutines. The languages supported are COBOL, FORTRAN, PL/I, C, and REXX as well as Assembler.

Routines provided in the library include:

- A call-REXX function
- Access to REXX program variables
- Extract/Replace – for access to CMS control blocks
- Shared file system
- Common programming interface (CPI) for communications

VM/SP High Performance Option Release 5

VM/SP HPO Release 5 complements the function of VM/System Product (VM/SP) Release 5 for the large processor environment and provides additional function. VM/SP HPO Release 5 is designed to support large CMS-based interactive user communities, for running guest MVS/370 production systems under VM, and for supporting environments such as information centers. VM/SP HPO Release 5 merges the functions provided by VM/SP Release 5 along with unique VM/SP HPO Release 5 functions:

- Support for up to 9,900 spool files per user, which relieves the previous constraint of 9,900 spool files per system
- Improved storage management and simplified tuning
- Scheduler algorithm enhancements resulting in more consistent system performance
- Improved paging allocation order
- National language support features
- Less than 16MB dynamic paging area load relief
- Improved system lock utilization
- SPTAPE overflow toleration
- PUT ON REQUEST

VM/XA System Product

The VM/XA SP Release 1 is designed to support the following operating systems as virtual machines, either in a V=V or a V=R preferred machine or a V=F preferred machine (3090 E-model only, with the required software and hardware features):

- MVS/SP Version 1 (MVS/370)
- VMS/SP Version 2 (MVS/XA)
- VM/SP
- VM/SP HPO
- OS/VS1 with BPE
- VSE/Advanced Function
- VSE/SP
- VM/XA Systems Facility (V=V only)
- VM/XA System Product (V=V only)
- MVS/ESA™ guest support will be provided in December 1988 on VM/XA SP Release 2
- AIX/370

VM/XA SP Release 1 licensed program incorporates all the functions of VM/XA Systems Facility and offers enhanced function and additional device support.

Significant enhancements over VM/XA Systems Facility provided by VM/XA SP Release 1 include:

- Support for all XA-capable processors
- Support for 3090 expanded storage and vector facility
- Functional improvements in VM/XA to support CMS-intensive environments along with support for additional key CMS (System/370 and/or XA) licensed programs
- Bimodal CMS providing a 31-bit addressing capability
- Incorporation of a performance monitoring facility
- VM/XA real-time monitor support
- Logged-on user-limit enhancements
- Support for Structured Query Language/Data Systems (SQL/DS)
- Resource Access Control Facility (RACF) Support
- IBM Professional Office System (PROFS) Support
- Support for a programmable operator facility and single console image facility (SCIF)
- Enhanced user class definition
- RAS enhancements
- Spool file limit relief
- Additional device support
- Ease-of-use improvements in object code maintenance
- National language support for CMS
 - Language enabling
 - System default language
 - Multilingual capability
- In Release 1, support for multiple high-performance guests running concurrently with other virtual machines. In addition to the virtual = real (V=R) preferred guest virtual machine, three additional virtual = fixed (V=F) preferred guests are supported along with multiple concurrent CMS

users and test or maintenance virtual machines. This capability is supported on 3090 Processor Family enhanced models that have the PR/SM™ feature installed.

- In Release 2, support for SNA networks. Release 2 contains the VM/group control system (GCS), which supports the installation and operation of VTAM and NetView. These facilities allow VM/XA SP to control and participate in SNA networks and also offer native support for SNA devices. This release of VM/XA SP is intended for VM/SP HPO users who require the additional processor capacity offered by VM/XA SP and who also need to provide for native VM support of SNA networks.

Primary Users

- VM/SP with CMS and associated products provides an attractive set of functional capabilities that can significantly improve the productivity of both end users and DP professionals. VM/SP is of great value to:
 - Application programming and maintenance
 - Systems programming
 - Operations
 - Enterprise end users
- Users who require remote data or job entry to the VM/SP system will use RSCS.
- Users who require data or jobs on multiple systems will use RSCS Networking.
- VM/SP HPO should be considered if an installation:
 - Plans to migrate to a larger processor
 - Supports a large number of users
 - Needs the following performance enhancements or functions provided by VM/SP HPO:
 - Improved system management
 - Additional processor support
 - Additional I/O support
 - Improved performance and function for MVS guests
- VM/XA SP should be considered if an installation requires:
 - Support for XA-capable processors
 - Extended XA growth capabilities
 - Larger addressing
 - Larger processors
 - XA I/O and channels
 - Bimodal CMS
 - Multiple preferred guest support for improved guest performance

Potential Benefits

Overall benefits of a VM/SP system are in three complementary areas:

- DP professionals can avoid tasks that are no longer essential (for example, conversion).
- DP professionals can more effectively perform remaining tasks (for example, use of CMS, VS APL).

- Non-DP professionals can perform their work interactively via CMS and languages, such as APL, or packages, such as AS, PROFS, or the Engineering/Scientific support package.

In detail, VM/SP allows:

- Easier system growth, conversion, and release-to-release transition
- Better availability of systems via terminals
- Good overall system optimization due to a more efficient use of processor resources
- Improved testing and training capabilities
- Excellent reliability of the system due to virtual machine protection/isolation: high-level systems/data security
- Optimized productivity of end-users and DP professionals
- Better DP service to users and improved manageability in a centralized or distributed environment

VM/SP HPO includes:

- Functions provided by VM/SP
- Functions provided by previous releases of VM/SP (VM/SP HPO does not support the VM/SP small CP option)

Migration to VM/XA SP provides potential benefits for:

- VM/XA SF users running guest production who require either the new device support, new function, or newly-supported licensed programs in VM/XA SP Release 1
- VM/XA SF or VM/SP HPO users who need guest and interactive environments and who need to combine multiple central processing complexes (CPCs) onto one larger single-image CPC (for instance, may combine VM/XA SF with an MVS/XA guest and VM/SP HPO on a VM/XA SP CPC)
- Current VM/SP (with or without HPO) interactive users experiencing growth constraints
- Users currently running VSE guests who wish to migrate to MVS/XA while retaining CMS capabilities
- Scientific/engineering users requiring very large storage working sets

Prerequisite Products

VM/SP High Performance Option

- VM/SP

VM/XA System Product

- Hardware – All 4381 and 3090 Processors capable of operating in 370-XA mode
- Software – Assembler H Version 2 with the Vector Facility enhancement or equivalent to:
 - Generate XA instruction streams

Virtual Machine System Control Programs

- Generate and service VM/XA System Product
- Generate Vector Facility instructions
- EREP (5654-260)

Products Supported

Hardware

VM/SP:

- 9370 Processors
- 4300 Processors in System/370 mode
- DASD, including 3350, 3375, 3380, 3850, 3310, 3370, 9332, and 9335
- Tapes, including 3410, 3420, 3430, 3480, 8809, and 9347
- Terminals, including 3270 (SNA mode requires VCNA or VM/SP with ACF/VTAM)
- 3800 Models 1, 3, and 8; 3820

VM/SP High Performance Option:

Supported in System/370 architecture mode on the 4381 (Model Groups 1, 2, 3, 11, 12, 13, 14, 21, 22, 23, 24, 91E, and 92E) and the 3090 Processor Complex family (except for Models 300E, 500E, and 600E), which may include the Vector Facility. The 3090 Models 280E, 400, and 400E are supported in partitioned mode.

VM/XA System Product:

While the VM/XA System Product supports virtual machines, its functions are not equivalent to any of the VM/SP products. It supports all models of the 4381 and 3090 processors operating in 370/XA mode:

- N-way processors, (4381, 3090), including 3090 Models 280E, 300E, 400E, 500E, and 600E
- 3380 Models J and K
- 3880 Models 11, 13, 21, and 23
- 5080 Graphics System device (dedicated)
- Vary channel path
- 3480 Magnetic Tape Subsystem
- 3890 Document Processor (dedicated)
- Enhanced IUCV
- 3720 Communication Controller (dedicated)
- Full support for 3090 Expanded Storage and a block paging facility
- 3290 Information Panel
- 3278 Model 5 Display Station

Software

VM/SP:

- VM/SP runs multiple concurrent operating systems, including VSE, VS1, SVS, and MVS/370.
- The general purpose interactive system CMS can operate concurrently with batch applications.
- VM/SP has the capability of performing system generation, maintenance, and system and applica-

tion testing concurrently with other work via guest operating systems.

VM/XA System Product:

- PROFS
- RSCS Networking
- VM/Pass-Through Facility
- VM/XA Migration Aid Remote 3270 Display Option
- VS FORTRAN
- IBM FORTRAN Language Conversion Program
- FORTRAN Utilities
- GDDM
- 3090 Vector Facility Simulator
- CMS Extended Data Array Capability (CMS/EDAC)
- Engineering and Scientific Subroutine Library (ESSL)
- Elementary Math Library (EML)
- VM/Data Collector
- Interactive System Productivity Facility (ISPF)
- ISPF/Program Development Facility (PDF)
- Document Composition Facility (DCF)
- IBM VS COBOL II
- OS PL/I
- High-Accuracy Arithmetic (ACRITH) Subroutine Library
- Graphics Access Method/SP (GAM/SP)
- Graphical Data Display Manager/graPHIGS™ (GDDM/graPHIGS)
- Scientific Engineering Application Director (SCENAD)
- IBM 'C' for System/370
- VM/XA Real Time Monitor/Systems Facility (RTM/System Facility)
- VSE/VSAM
- RACF
- SQL/DS
- QMF
- VM Batch Facilities
- TCP/ZP
- DCF

VM/XA SP

- Details of incompatibilities and conversion considerations may be found in the *VM/XA System Product Application Conversion Guide*, SC23-0403, and the *VM/XA System Product Conversion Notebook*, SC23-0357.

Ordering Information

VM/XA System Product

Program number: 5664-308

VM/SP

Program number: 5664-167

VMISP High Performance Option

Program number: 5664-173

Reference Material

VMISP

General Information Manual, GC20-1838

VMISP High Performance Option

- Announcing VM/SP High Performance Option, Release 5, brochure, GC19-6221
- What's in VM/SP High Performance Option, Release 5: A System Programmer's Perspective, GC23-0384

VM/XA System Product

Product Guide, GC24-3173

General Information Manual, GC23-0362

Bimodal CMS for VM/XA Systems, GG24-3174

VM Batch Facility

Main Purpose

VM Batch Facility provides users with the ability to submit, schedule, query, and execute batch jobs in a VM environment. VM Batch is controlled by a supervisory virtual machine that dispatches, controls, and monitors other virtual machines in which the batch jobs are processed.

Key Functions, Features, and Facilities

Some of the features of the VM Batch Facility include:

- An easy-to-use set of commands to submit a job, check its status, change parameters, and cancel the job
- A full-screen interface with extensive helps and tutorials
- Scheduling a job automatically using specified date and time criteria
- The ability for users to direct VM Batch Facility to autolog virtual machines to execute jobs
- An interface to submit batch jobs from RJE stations through RSCS
- REXX user exits for installation tailoring
- Workload balancing
- Ability to control up to 32 task machines, 256 job classes, and other fine-tuning installation parameters, without shutdown

Primary Users

VM Batch Facility should be considered by installations who use VM Batch Subsystem, CMS Batch, competitive batch programs, user-development batch programs, and by current and new VM installations with a potential for a batch application.

Potential Benefits

The VM Batch Facility allows a user to submit jobs to be executed on other virtual machines. By submitting batch jobs, the user frees the display for other work. VM Batch Facility will manage numerous batch jobs. This capacity allows jobs to be processed in the background during nonpeak periods, maximizing system resources.

Prerequisite Products

Hardware

VM Batch Facility runs on all IBM processors for which VM support is provided. The initial system, as shipped by IBM, has a monitor and two task machines defined. The storage requirements to install this initial system are:

- 30 cylinders of 3380 disk space
- 2MB of virtual storage for the monitor and each task machine

Software

- VM Batch Facility requires one of the following VM operating systems to be installed:
 - VM/SP (with or without VM/SP HPO)
 - VM/XA SF
- Installation of the following corequisite products will provide additional function:
 - Interactive System Productivity Facility (ISPF) for VM
 - Resource Access Control Facility/VM (RACF/VM)
 - Remote Spooling Communications Subsystem (RSCS)

Ordering Information

Program number: 5664-364

Reference Material

- General Information Manual, GC34-4091
- Licensed Program Specifications, GC34-4092

VM Realtime Monitor (VM/RTM)

Main Purpose

This program offering provides comprehensive performance monitoring and statistical analysis, which is presented in realtime on any terminal or display supported by the VM/SP or VM/SP HPO control program. This information can help operators and installation management detect realtime problems, analyze system performance, measure the effects of system changes, and improve control of the entire VM/SP or VM/SP HPO system.

Key Functions, Facilities and Features

The VM Realtime Monitor provides:

- Realtime performance monitoring and analysis
- Interactive debugging including 22 basic commands and 19 types of interactive displays
- Automatic anomaly detection - threshold monitoring of critical system variables relating to the processor, I/O system, paging system, storage, and users
- Trace sampling and analysis, at specified intervals, with summary data on the overall system
- I/O sampling and analysis for all channels and devices, including telecommunications lines and unit record devices
- Virtual machine state and execution sampling for all logged-on users, with summary data for individual and combined users
- User data and resource usage on processor, I/O, paging, storage, spooling, and drum usage
- System resource summary data for each interval and averages for up to a 24-hour period
- Big picture monitoring – a single display that contains over 200 variables relating to channel activity, most active users, and system resource usage over short intervals and averages for up to 24 hours
- Operations support and management – periodic messages on system operation (such as interventions) that can also assist in workload scheduling and resource allocation
- Missing I/O interrupts detection
- Automatic event scheduling by executing specified CP commands

Primary Users

- New VM/SP or VM/SP HPO installations
- VM/SP or VM/SP HPO installation management
- VM/SP or VM/SP HPO operations personnel

Potential Benefits

VM/RTM can help to:

- Detect realtime problems and correct them before they cause bottlenecks or serious performance difficulties
- Simplify realtime analysis by providing insight into the relationship between performance variables
- Evaluate the effects of system changes
- Simplify control by providing information on active users, system performance, system operations, and other vital data

Prerequisite Products

This program runs on any IBM processor that supports VM/SP and VM/SP HPO.

Ordering Information

Program number: 5796-PNA

Reference Material

- Availability Notice, G320-6165
- Program Description/Operations Manual, SH20-1337

VM Monitor Analysis Program (VMMAP)

Main Purpose

Virtual Machine Monitor Analysis Program (VMMAP) is a licensed program that can aid in performance and capacity planning for VM/SP and VM/HPO systems. By reducing data collected by the VM/Monitor Facility, it enables the system programmer to:

- Monitor system utilization
- Identify performance bottlenecks
- Discover trends in performance
- Plot VM system growth

Key Functions, Facilities and Features

- Has functional compatibility with the VM Performance Monitor Analysis Program (VMAP) Field Developed Program (FDP)
- Creates reports, statistical summaries, and graphics with simple commands
- Provides user exits
- Allows user to specify which reports, analyses, and plots are to be created
- Provides data reduction and analysis of one or more files created by the MONITOR facility of VM
- Requires no programming or compilation to use the parameter data files supplied with the program
- Enables user to save and easily compare historical data to determine trends
- Maintains long-term trend information to assist in capacity planning
- Analyzes processor, storage, paging, and I/O activity, including response times by virtual user and by I/O device
- Provides history data reporting
- Includes in its documentation a "walk-through" procedure to help in system analysis

Other features are:

- User exits
- Installation EXECs
- User definition of ACUM file format
- Exclusion of USERIDs from response time analysis
- Consistently weighted data
- Consistency with Virtual Machine Performance Planning Facility (VMPPF) licensed program
- Separate message module

Primary Users

- New VM installations
- Systems analysts
- Information services management
- Capacity and performance management personnel

Potential Benefits

- Improve user satisfaction by providing the information needed to detect potential problems early and maintain high system performance
- Make informed decisions based on measured system performance data
- Enhance capacity planning by maintaining long-term trend information and historical data as well as enabling the user to measure the effects of changes on the system
- Save time and effort in creating reports and graphs

Prerequisite Products

Hardware

- A System/370 mode processor that supports VM/SP or VM/SP HPO is required.
- Additional hardware requirements are:
 - Tape drive to load the product
 - Terminal to enter commands or edit parameter files
 - Printer for installations requiring hard copy output
 - 3279, 3290, 3270-PC/G, or 3270-PC/GX color terminal for using the color graphics interface
 - 3287 Model 2C Printer for installations printing the color graphs
- VMMAP runs as a problem program CMS application and uses:
 - Minimum of 2MB of virtual storage
 - 12 cylinders of 3380 (or equivalent) for the VMMAP operational system and output
 - 9 cylinders of 3380 (or equivalent) for the user exit system

Software

- VMMAP runs as a problem program CMS application in the virtual machine environment of:
 - Any supported release of VM/SP
 - Any supported release of VM/SP HPO
- VMMAP is a PL/I program requiring the OS/VS PL/I Transient Library Release 4. For the assembler language user exits, the OS/VS PL/I Resident Library is required. For the PL/I user exits, both the OS/VS PL/I Resident Library and Optimizing Compiler are required.
- For color graphics, GDDM with PGF Release 3 or 4 is required. To use the 3270-PC/G or 3270-PC/GX color graphics, Release 4 of GDDM is required.

Products Supported

VMMAP generates reports and graphs portraying the performance and utilization of:

- VM/SP Release 5 or lower
- VM/SP High Performance Option (VM/SP HPO), Release 5 or lower, in conjunction with VM/SP

VMMAP reduces the VM/Monitor facility files from any of these systems.

Ordering Information

Program number: 5664-191

Reference Material

General Information Manual, GC34-2164

VM Performance Planning Facility (VMPPF)

Main Purpose

VMPPF, a program product, is an analytic model that provides planners and managers with data on the performance and capacity of their installed system as well as a variety of projected system environments. It can be used to predict the effect of changes before they are implemented, such as workload movement across processors, and changes in IBM processor type/model, processor storage size, I/O, and growing workloads/users.

Key Functions, Facilities and Features

- Model build and execution to produce performance estimates
- Automatic extraction of data from VM Monitor files
- Data reduction/reporting on current system performance
- Color graphic display output
- Output compare capability that combines output of several model executions into a single format for easy comparison
- Model that can be used for near-term capacity planning
- Input data from VM Monitor that can be modified by analyst
- Full-screen interface via ISPF
- Model that is extensively validated against real configurations and workloads
- Fast execution – many iterations possible in short time
- Estimates of system resource utilization, average throughput, and response times
- Ability to run data reduction (PRED) in “batch” mode

Primary Users

- Systems analysts/planners
- Performance management/capacity management personnel
- I/S management/installation management
- Financial/budget personnel

Potential Benefits

VMPPF can:

- Improve user satisfaction by optimizing the performance of current systems
- Provide management with reliable data for budget and equipment forecasting
- Enhance presentation of capacity and performance information by representing the data in specified color chart formats
- Identify bottlenecks

- Determine effect of changes before they are implemented
- Help understanding of VM relationships
- Add confidence to major decisions about system
- Save valuable systems programmer/analyst time by quickly and easily doing projections
- Provide many alternatives to choose from through fast execution of numerous “what if” system environments

Prerequisite Products

Software

- VM/SP or VM/SP HPO
- VS APL including APL full-screen auxiliary processor
- VS FORTRAN Library
- Graphical Data Display Manager (GDDM)
- Interactive System Productivity Facility (ISPF)

If graphics output is to be produced, VS APL GRAPHPAK is required. It is distributed as part of VS APL.

Hardware

The APL/Text Control Function feature is required for 3274 or 3276 control units. The ISPF and APL panels will run on any 3270-compatible terminal with at least 24 lines of 80 characters. The 3279 Model 3 color display is required for use of the graphics capability and is recommended for emphasizing the input/output fields on the ISPF and APL panels. A 3287 Model 2 is needed to print the graphics output.

Products Supported

- IBM processors, and DASD devices supported by VM/370 Releases 1 to 6, VM/SP Releases 1 to 5, and VM/SP High Performance Option Releases 1 to 5, including uniprocessor, attached processor, and multiprocessor configurations with up to 64MB of processor storage
- APL2 Release 2
- Modeling of remote service request (TSAF)
- Modeling of asynchronous service – VMs (local and remote)
- Multiple VM systems
- Tape I/O (partially), if a channel is dedicated to tapes
- 3340 emulation on the 4331 Model Group 1
- 3880 Models 21 and 23 Cache Controllers

In the system environments of all currently supported releases of VM/SP and VM/HPO, VMPPF provides modeling capability for:

- Single-threaded virtual machines, such as CMS
- Multi-threaded virtual machines, such as 370-mode operating systems (these models employ simplifying assumptions)
- Dedicated resources in which a portion of the VM system's hardware resources are assigned to a particular virtual machine, such as a dedicated batch facility

Ordering Information

Program number: 5664-179

Reference Material

- General Information, GC34-2126

Distributed Processing Program Executive/370 (DPPX/370)

Products Included

- DPPX/370

Related program products:

- DPPX/370 Interactive Map Definition (DPPX/370 IMD)
- DPPX/370 COBOL II Facility
- Cross System Product/Application Execution for DPPX/370

Main Purpose

DPPX/370 is a layered operating system providing common application services across resource managers supporting interactive, transaction, and batch processing. This offers maximum flexibility for customers to develop applications and tailor the system to meet business objectives. The key services accessible to applications running in any resource manager are:

- Command execution
- Interactive dialog execution
- Data base management and recovery services
- Device mapping services
- Central message handling and a system-wide programmed operator
- File access
- Device-independent communications (SDLC, X.25)

Central to the system's role as a distributed system is a comprehensive set of support services. For host operational control of the distributed network, full access to all system services through HCF/TAF, access to all system datasets through Netview DM, the ability to route messages to a "host" operator for notification or response, programmed IPL, and alert forwarding are provided.

To enable application development, the CSP application generator, the Interactive Map Definition facility, the Dialog Development Facility, the Host Transaction Facility (HTF), and COBOL II are provided.

CSP offers a productive interactive development capability supporting complete application development and testing facilities. CSP is source-compatible with corresponding versions that execute under CICS, TSO, CMS, and PC/DOS.

HTF offers a high-level application interface for DPPX applications to communicate with IMS, CICS, or applications residing on a peer-connected DPPX system. Support for synchronous, asynchronous, and batched communications is provided.

System availability and data integrity are key elements of distributed processing. DPPX/370 provides broad support in this area through dynamic transaction backout, audit file services, multikey file

integrity, deadlock detection, dynamic index reorganization, support for up to 205 data set extents, and the shadow file manager.

Shadow file support allows the system to continue uninterrupted processing after a disk failure. Once the failing disk is repaired, shadow processing is resumed with synchronization occurring while the system is in use.

To support casual office applications, the Distributed Work Station Support (DWSS) application is provided. Personal Computer users may store and retrieve PC files in a DWSS folder. Any terminal user may print, send, delete, copy, or browse DWSS objects. Distribution is provided between peer-connected DPPX systems and through DISOSS using SNA Distribution Services. Access to the central DISOSS library is provided to search, file, retrieve, and delete documents.

DPPX/370 executes on all models of the 9370 Information System. SNA communications with an MVS or VSE host are provided for point-to-point and multi-drop configurations using SDLC and for point-to-point configurations using permanent or switched virtual circuits in an X.25 packet-switching network.

DPPX/370 supports the IBM Token-Ring Network and may coexist on the network with 3174 control units, PS/2 workstations, and other 9370 processors. In addition, device support is provided by the 9370 integrated workstation controller, channel-attached 3174 control units, ASCII terminals through the 3708 network interface unit, and telecommunications attached devices supporting SNA/SDLC or X.25/HDLC.

Key Functions, Facilities and Features

DPPX/370 provides:

- Supervisor services:
 - Storage management
 - Storage protection
 - Interrupt processing
 - I/O services
 - Task dispatching
 - Lock management
 - Linkage services
- Ease-of-use facilities:
 - Command Facility Extension:
 - Define dialog panels
 - Develop dialog programs
 - Test dialogs
 - Interactive Productivity Facility, which simplifies and enhances operations for:
 - Developers
 - Operators
 - Administrators
 - Systems management personnel

- Programmed Operator Facility, which:
 - Is customized by installation
 - Intercepts system messages
 - Provides programmed responses
 - Routes to host operator
 - Routes to lead operator
 - Broadcasts messages
- Sorting:
 - Batch sort/merge
 - Record selection capability
- Transaction processing and data base management:
 - Transaction Processor:
 - Storage management
 - Scratch pad facilities
 - Asynchronous scheduling
 - Terminal I/O
 - Priority scheduling
 - Host communication via HTF
 - Data Base Manager:
 - Data security
 - Transaction backout
 - Data base recreation
 - File sharing
 - Data base utilities
 - PC and Displaywriter servers
 - Library services
 - Printer services
 - Distribution services
 - Program distribution services
- Host communications:
 - Router:
 - Support to IMS/VS, CICS/VS, TSO
 - No change to host programs
 - SDLC
 - Multiple active sessions
 - “Hot-key” switching between applications
 - RJE Workstation Facility:
 - SDLC multiple logical unit workstation
- Distributed resource manager:
 - DPPX/370 to DPPX/370 communication
 - Transaction routing
 - Application-transparent data base I/O
 - Full forward/backward recovery
- Peer data transfer:
 - File transfer between DPPX/370 systems
 - Interactive initiation
 - Invocation of CLIST on remote DPPX/370 system
- Problem determination:
 - Sends alerts to host
 - Warns of hardware or program failure
- Interactive command facility:
 - Command processing
 - Data set creation and deletion
 - System maintenance
- Interactive editor:
 - Program preparation
 - Data editing
- Interactive debug services
- Shared printer facility
- Batch queue monitor

- Data set utilities
- Host interface to CICS/VS, IMS/VS (HTF)
- Packaging, installation, customization, and service
- RAS facilities:
 - Distributed systems environment test
 - Error log summary and archive
- Workstation support
 - Message and document handling
 - DISOSS support
 - Personal library services
 - SNA distribution services
- X.25 packet-switching network

DPPX-related program products provide:

- Program development:
 - DPPX/370 COBOL II Facility:
 - High-level commercial language
 - Extensions for DTMS
 - Native verbs for terminal communications
 - Compile on MVS or DPPX/370
 - Cross System Product for DPPX/370:
 - Screen definition
 - Data definition
 - Program logic definition
 - Generates DTMS transactions
 - DPPX/370 IMD:
 - Device independence
 - Interactive screen definition
- Central management facilities:
 - NetView Distribution Manager (DM)
 - Central host library support
 - Program transmission facilities
 - PTF and storage dump transmission
 - Data set transmission
 - HCF
 - Host command facility
 - Logical connection verification
 - Concurrent control of multiple DPPX/370 systems
- Performance analysis/problem alerting:
 - DPPX/PT Monitor collects accounting data, monitors, and reports on:
 - 8100 processor usage
 - Real storage usage
 - DASD device usage
 - Transient module usage
 - Data set usage
 - DTMS transaction usage

Primary Users

End-user departments in branch offices, warehouses, stores, hospitals, schools, plants, claims offices, and other locations remote from the central data processing site

Potential Benefits

- Provides a flexible choice of strict or limited central control
- Can avoid minicomputer problems of:
 - Duplication of DP skills
 - Overlapping programming effort
 - Hardware redundancy
- Can improve DP service level by:
 - Offloading host
 - Reducing response time
 - Improving availability
- Provides local or central program development
- Can shorten application development cycle by:
 - Avoiding central project backlog
 - Providing interactive development tools
 - Reducing application development effort with Cross System Product/Application Development

Prerequisite Products

- Host communications require VTAM/TCAM, NCP, SDLC
- RJE requires JES2 or JES3

Products Supported

- 9370 Processors

Ordering Information

DPPX/370

Program number: 5660-292

DPPX/370 Interactive Map Definition (DPPX/370 IMD)

Program number: 5660-294

DPPX/370 COBOL II Facility

Program number: 5660-299

Cross System Product/Application Execution for DPPX/370

Program number: 5660-295

Reference Material

- DPPX/370 General Information, GC23-0640
- DPPX/370 Migration Planning Guide, GC23-0641

Multiple Virtual Storage (MVS™)

Products Included

- MVS
- MVS/System Product (MVS/SP)
 - JES2 (MVS/SP-JES2)
 - JES3 (MVS/SP-JES3)

Note: MVS/SP is a generic term for MVS/SP-JES2 and MVS/SP-JES3. MVS/370 refers to MVS Release 3.8 and MVS/SP Version 1. MVS/XA refers to MVS/SP Version 2. MVS/ESA™ refers to MVS/SP Version 3.

Main Purpose

MVS

MVS is the virtual storage operating system designed to perform the system control programming functions in large-system customer environments.

The architecture and design of MVS accentuate the integrity, data security, high availability, and performance of the system. These characteristics are important in heavily-utilized online, interactive environments in which response time, flexible resource utilization, and operational controls are required.

MVS/SP Version 1 – MVS/370

MVS/SP provides enhancements to the MVS Release 3.8 system control program and JES2 (in MVS/SP-JES2) and JES3 (in MVS/SP-JES3). It also includes the enhancements provided by MVS/System Extensions (MVS/SE) Releases 1 and 2. MVS/SP Version 1 supports processors from the 4341 through the 3090 in System/370 mode.

MVS/SP Version 2 – MVS/XA

- MVS/SP Version 2 operates in System/370 extended architecture (370-XA) mode. MVS Release 3.8 with MVS/SP Version 2 and the MVS/XA Data Facility Product (DFP) comprise the MVS/Extended Architecture (MVS/XA) system. MVS/XA's architectural enhancements provide the capability to expand current operating environments as business requirements expand.
- MVS/XA is the base for support of processors operating in 370-XA mode.
- MVS/XA is designed to support increased large-system capacity requirements through improved management of resources.

MVS/SP Version 3 – MVS/ESA

- MVS/ESA consists of MVS/SP Version 3 and MVS/DFP Version 3.
- MVS/SP 3.1.0 expands addressing capabilities and provides enhanced data-handling capabilities, faster data access, enhanced services for application development, and improved reliability and serviceability.
- MVS/ESA is the primary delivery vehicle for future MVS and DFP functional enhancements and constraint relief.
- IBM intends to enhance major IBM subsystems (CICS/MVS, DB2, IMS, TSO/E, JES2, JES3) using the facilities provided by MVS/ESA.

Key Functions, Facilities and Features

MVS

- Virtual storage operating system supporting uniprocessor, attached processor, and tightly or loosely coupled multiprocessor configurations
- Individual address space for each TSO user
- System resource manager (SRM) for dynamic workload management
- System-wide dynamic allocation/deallocation of data sets
- VSAM master catalog and user catalogs
- Virtual input/output (VIO) for temporary data sets
- Functional recovery routines for system components
- Job entry functions supported by standard job entry subsystems JES2 or JES3

MVS/SP Versions 1 and 2 (see also below)

- Cross memory services, a method for inter-address space communication, which when used by IBM subsystems, can reduce assigned common virtual storage and reduce subsystem overhead
- Global resource serialization to allow resource serialization across processors
- A message suppression facility to allow user-defined control over informational messages at the system console
- Improved online problem determination via extensions to operator command facilities

MVS/SP Version 1 – MVS/370

- Support for up to 64MB in 308X and 3090 processors
- Improved system RAS through software enhancements
- Base Control Program (BCP) support of 3880 Storage Control Models 21 and 23

Multiple Virtual Storage (MVS)

- BCP and JES2 support of the Interactive Data Transmission Facility

MVS/SP Version 2 – MVS/IXA

- Support for 3880 Models 21 and 23
- Support for 31-bit virtual storage addresses (2 gigabytes)
- Support for 31-bit real storage addresses
- Enhanced RAS features
- Enhanced usability
- Compatibility for MVS programs
- Support of the dynamic channel subsystem I/O architecture of System/370 extended architecture
- Data-in-virtual, an interface for application processing of selected data
- Enhanced global resource serialization
- Symptom recording service, which can be used to record data about exceptional conditions
- Constraint relief in virtual storage, real storage, and channels
- Support of the 308X and 3090 processors
- Support of the 3090 Vector Facility
- Support for the extended recovery facility (XRF)

MVS/SP Version 3 – MVS/IESA

- Enhanced data-handling capabilities
- Increased addressability
- Faster data access
- Enhanced services for application development
- Over 75 functional RAS enhancements
- More than 25 user-group requirements satisfied

MVS/SP-JES2 Version 1—MVS/370

- Operation in a separate address space
- Parameterized initialization during IPL
- Support of journaling for MVS checkpoint/restart
- Support for TSO batch job submission
- Full SMF (System Management Facilities) support
- Alternate procedure library support
- Extended output control on printing and routing
- RJE (remote job entry) facilities via VTAM, ACF/VTAM, ACF/TCAM V2 R2, or RTAM
- JES2 Multi-Access Spool (MAS), which provides shared spool and checkpoint data set control for a maximum of seven uniprocessor or tightly coupled multiprocessor configurations, all running MVS with JES2
- The network job entry (NJE) facility which:
 - Provides for the transmission of selected jobs and in-stream data sets, SYSOUT data sets, job oriented operator commands and messages, and job accounting information, from one computer system (called a node) to another across a generalized communication link
 - Supports the interconnection of JES2 nodes via BSC lines, channel-to-channel adapters, and SNA

- Dynamic addition and deletion of JES2 spool volumes via operator commands without restarting JES2
- Spool offload facility to dump and later restore spool data from a tape, DASD, or MSS virtual volume
- Use of the MVS Bulk Data Transfer (MVS/BDT) program product (5665-302) or File Transfer Program (FTP) program product (5668-932) is suggested for transferring bulk data between nodes. These are JES-independent VTAM applications that utilize an SNA network. MVS/BDT transfers data between MVS/JES2 or MVS/JES3 nodes, FTP transfers data between MVS, VSE, or VM nodes.
- Improved spool manageability, recovery, and reliability
- User exit facilities
- Network Job Entry (NJE) for JES2 incorporated into MVS/SP-JES2 Version 1 Release 2
- Extensions to NJE and RJE

MVS/SP-JES2 Version 2 – MVS/IXA

- Support for 31-bit virtual storage addressing
- Dual checkpoint data set configuration which:
 - Uses two checkpoint data sets in an alternating manner
 - Uses a change log to provide a record of changes to the checkpoint
 - Provides checkpoint data set error recovery either dynamically or through predefined backup definitions
 - Has improved output processing
 - Offers additional JES2 RAS

MVS/SP-JES2 Version 3 – MVS/IESA

- Increased job and output queue limits and job number range
- Output-processing-constraint relief
- Expanded NJE/RJE limits and NJE/RJE functional enhancements
- Dramatically reduced elapsed time for JES2 restarts
- Virtual-storage-constraint relief
- Improved serviceability
- Continuous systems operations enhancements
- New and enhanced user exits
- More than 37 user group requirements satisfied

MVS/SP-JES3 Version 1 – MVS/370

- JES3 allows an installation to couple independent processors together via channel-to-channel adapters and shared DASD, providing a single-system image.
- JES3 loosely coupled multiprocessing installations consist of a global MVS processor, and 0 to 7 local processors.

- The JES3 processors operate in a hierarchical relationship; the global processor controls the activity of all the processors in the complex.
- More specifically, the function of the global processor is to perform:
 - Preexecution processing – reading jobs into the system (input service), interpreting their JCL (converter/interpreter service), setting up their I/O requirements (device setup), and scheduling the jobs for execution (generalized main scheduling)
 - Postexecution processing - printing or punching the output of the job (output service), and purging the job from the system (purge)
 - Job entry housekeeping activities such as spool space and queue management, and synchronization and maintenance of the system checkpoint data set
- The other processors (local processors) perform job execution only. Optionally, jobs may execute in the global processor. Jobs entered into the system may be eligible for execution in any of the processors in the complex, based on processor affinity, operating system type specification, and/or resource availability.
- Communication between the global and local processors is established via channel-to-channel adapters (CTC) for control information, and shared DASD (spool, checkpoint) for jobstream data.
- JES3 optionally uses an additional address space (JES3AUX) for data storage using cross memory services.
- Dynamic systems interchange of global and local functions allows recovery when the current global processor is removed from the complex.
- Full SMF (system management facilities) support is provided.
- JMF II (JES3 Monitoring Facility II) 5796-PLW is a software monitor that provides the ability to measure and evaluate the performance of an existing IBM system operating under JES3 Release 3.
- JES3 Networking function provides job networking facilities compatible with NJI, NJE, and RSCS networking via SNA or BSC lines or channel-to-channel connections.
- Output writer multitasking provides improved utilization of multiprocessors and dyadic processors.
- JES3 provides support for functional subsystem address spaces to offload job entry subsystem conversion interpretation and support of 38XX page-oriented printers advanced function printing.
- Use of the MVS Bulk Data Transfer (MVS/BDT) program product (5665-302) is suggested for transferring bulk data between nodes. It is required for JES3 SNA networking. It is a JES-independent VTAM application that utilizes an SNA network.
- Optional reduction of JES3's usage of virtual storage (CSA) is available by using cross memory services.
- JES3 networking PRPQ is incorporated.

- JES3 3800 enhancements are incorporated.
- Early volume release for tape is provided.
- Dynamic device reconfiguration for shared tape is provided.

MVS/SP JES3 Version2 – MVS/XA

- Support is provided for 31-bit virtual storage addressing.
- JES3 messages and commands can be processed by the MCS-managed console. Therefore, the complex does not require separate JES3 consoles.
- JES3 initialization stream checker receives data from MVS configuration program to detect inconsistencies between JES3 I/O definition and the MVS I/O configuration.
- IPCS allows the installation to view JES3-related data online or on hard copy.
- Enhancements to the internal reader are provided.
- JES3 uses generalized trace facility (GTF) to trace message traffic in the installation.

MVS/SP-JES3 Version 3 – MVS/ESA

- Increased job number range
- Dramatic reduction in global processor resource consumption
- Dramatic reduction in JES3 restart elapsed time
- Management of multiple printers in an FSS (functional subsystem) address space
- Output-processing-constraint relief
- Enhanced monitoring/diagnosis
- Continuous systems operation dynamic support for JES3 networking
- JES3 spool maintenance facility replaced by enhanced commands
- Support for the Data Facility Storage Management Subsystem (DFSMS™) functions of the MVS/Data Facility Product (MVS/DFP™) Version 3
- Improved catalog locate support
- New and changed user exits
- More than 30 user group requirements satisfied

Potential Benefits

MVS

- MVS provides unrestricted multiprogramming – given adequate hardware (real storage, channels, and I/O).
- The support of multiprocessor (MP) and dyadic configurations by MVS offers important additional advantages. These advantages are increased internal performance (AP and MP are generally 1.8 times the UP) and greater configuration possibilities with real storage, channels, and I/O devices. The coupled-systems environment also offers greater flexibility, easier operation, peak load handling, device pool management, availability, and ease of growth.

Multiple Virtual Storage (MVS)

- The system resource manager (SRM) monitors and dynamically controls the service level for different categories of work as a function of total actual system loading. SRM is designed to meet the customer-specified objective for each work category and to use system resources as effectively as possible.
- The job entry subsystem (JES2 or JES3) maintains journal files to support system restart, automatic job step restart, and checkpoint/restart. These features significantly reduce restart and rerun costs.
- Virtual input/output facility (VIO) for temporary data sets uses a combination of buffer space within an address space and the paging mechanism, instead of allocating space and storing the data as unique data sets on direct access storage devices; it will use expanded storage when available.
- System software errors are handled with a set of functional recovery routines (FRRs). MVS has an FRR for each system component with the objective of detecting and recovering from software errors. If recovery is not possible, the FRR isolates and records the error, thus limiting the effect of the error to one user (address space).
- MVS system integrity features help prevent any unauthorized problem program from bypassing store/fetch protection, bypassing password checking, or obtaining control in unauthorized state.
- Improved control over systems algorithm selection is provided.
- Improved SRM interface for DB/DC subsystems is provided.
- Improved recording of system activity data, including collection of data for privileged users, is provided.
- More efficient management of real storage
- Extended channels, such as, 3090 with 96 channels, or 3083B or 3083J with 24 channels
- Extended virtual storage (2.3-2.6MB more available in lower 16MB of virtual storage)
- Larger definable configurations
- I/O capacity and/or I/O response time improved up to 30% with 3380 using dynamic path reconnect function
- Capacity increase possible for I/O- and virtual-storage-constrained systems
- Enhanced system RAS, with software IPLs reduced by up to 30%
- Productivity of systems programmers, application programmers, and operations personnel improved
- A base for future RAS and productivity enhancements
- IOGEN elimination, which allows I/O configurations to be defined without having to modify system code or go through the SYSGEN process
- Enhanced IPCS

MVS/SP-JES2 Versions 1 and 2

- JES2 performs early syntax checking.
- TSO batch submission is handled by JES2 internal readers.
- Job output is queued automatically for a printer with the required forms and carriage characteristics, improving operability and throughput. Output printing is handled on a system-wide basis, with the objective of optimized printer utilization and minimized operator intervention.
- Spool data set integrity checking by maintaining data set identifier checks on SYSIN/SYSOUT data.
- In some cases, execution batch scheduling, a special JES2 facility, allows improved system performance by reducing the overhead associated with processing numerous individual jobs.
- The automatic command processing (ACP) facility of JES2 allows the user to enter a JES2 command, or a series of JES2 commands, through a console or a reader, to be executed at a specified time or at a periodic interval.
- RJE and NJE usability and capability are improved.
- Operator productivity is increased through improved control of output.
- Spool offload facility can reduce spool space utilization by allowing selective offload to tape or other DASD and will also simplify future migrations.
- In a multi-access spool configuration (MAS), input may come from any processor and be processed on any processor (subject to specified job/processing affinity), providing flexibility of job scheduling control.
 - Because all systems in a JES2 MAS complex are independent, if one system fails, the others will normally continue processing from the common queue. Only work in process on the

MVS/SP Version 1 – MVS/370

- Simplification of operator problem determination can speed problem recognition, diagnosis, and recovery.
- Improved operator productivity results from large console screens, color on screen, and reduction in informational messages.
- Improved system performance is achieved from support of extended addressing.
- Improved RAS for JES spooling provides improved system RAS.
- Enhanced MVS RAS occurs through improved programming that addresses the causes of unscheduled outages.

MVS/SP Version 2 – MVS/IXA

Version 2 includes all the benefits of Version 1, as well as:

- Expanded system capacity:
 - Extended real storage support, such as for the 3090 with 384MB

failed system is interrupted. In the event of a prolonged system outage, a JES2 command allows another system to do a restart on behalf of the system that failed.

- The sharing of the job input queue in a MAS configuration allows better load balancing than with uncoupled systems. In addition, a job may be scheduled according to its priority within the whole system.
- NJE for JES allows end users to access data and programs in separate computer facilities through a single input/output facility, thereby:
 - Providing the ability to specialize individual processor configurations, data files, and programs
 - Providing a technique for distributing work among several computer centers
 - Supporting conversion between major processor control programs
 - Improving resource utilization

MVS/SP-JES2 Version 2 – MVS/IXA

- Checkpointing can be done of JES2 queues of spool data sets that can be controlled through an operator dialog if a checkpoint I/O error occurs.

MVS/SP-JES3 Versions 1 and 2

By centralizing resource control in the MVS global processor, JES3 gains the following advantages:

- Both JCL syntax checking and interpretation are performed on the global processor.
- I/O resource allocation, volume mounting, and verification are performed by the global processor, which controls the pool of I/O devices available to all processors. Thus, the global processor schedules jobs to an appropriate system, selects I/O devices for the jobs, and logically switches the devices to the processor. The decision for workload balancing among processors is made by the global processor using installation-supplied parameters.
- System-wide data set integrity is provided by JES3 for the devices, volumes, and data sets it manages. That is, JES3 uses the data set use specification provided with the JCL to prevent jobs from being scheduled in parallel that may simultaneously update a given data set (for example, DISP=OLD or NEW).
- Deadline scheduling allows the installation to specify a deadline time for initiating a job no matter how low its selection priority when it enters the system. The priority level is automatically increased (at installation-supplied intervals) if it appears that the job will not be scheduled on time.
- Dependent Job Control (DJC) allows a user to specify the order in which a series of jobs is to execute. DJC ensures that the running sequence of the jobstream is adhered to.

- Output processing is performed by the global processor, using printers started by the operator, or a specific forms and carriage output for a dynamic writer started by JES3 when no suitable printer with matching output requirements is running.
- Local processor failure can be recovered by MVS checkpoint/restart supported by JES3.
- Dynamic system interchange (DSI) makes it possible to recover from global processor failure by allowing a suitable local processor to assume global functions, through operator commands on the selected local processor and manual switching of unit record, TP, and JES3 console functions.
- The JES3 address space in the global processor may be hot started without re-IPL if DSI is not required.
- JES3 is supported by the MVS concept of functional recovery routines (FRR) for error isolation and recovery.
- JES3 offers a single-system image to the user of a configuration composed of multiple processors. The advantages in both operations and scheduling are:
 - The use of a single job queue ensures that the next job to be run is the highest-priority or best next job in the installation, and not simply the highest-priority job in a particular processor.
 - There is automatic scheduling of jobs to the processor having access to the necessary devices, volumes, and data sets, without requiring manual intervention.
 - There is a single master console through which all communications to and from the operator take place, whether the communications pertain to one or more processors.
 - The capability exists to assign a single console to support a functional area, such as a tape mounting, independent of the number of processors.
- Optional virtual-storage-constraint relief can either provide more private area space or allow installation of additional subsystems without having to allocate more common system area (CSA).
- Improved operator productivity results from larger console screens and use of color on screen.
- Enhanced use of processor resource is provided in a tightly-coupled environment.

MVS/SP-JES3 Version 2 – MVS/IXA

- The operator can control the installation from an MCS- (multiple console support-) managed console that is attached to the global.
- Spool manageability, recovery, and reliability are improved.

Multiple Virtual Storage (MVS)

Prerequisite Products

MVS Release 3.8

Hardware:

- System/370 Models 158 and 168 in uniprocessor, attached processor, and tightly coupled multiprocessor configurations
- All 303X configurations

MVS/SP Version 1 – MVS/370

Hardware:

- The System/370 Extended feature is required for Model 158/168 UPs, APs, and MPs.
- The System/370 Extended Facility of the 3031, 3032, or 3033.
- For the 4341 and 4381, ECPS:MVS must be selected at initial microprogram load. The 3081, 3083, and 3090 Models 150, 180, and 200 are supported. Also, the 3084 and 3090 Model 400 are supported in partitioned mode.

Software:

- MVS/SP Version 1 is supported by MVS Release 3.8.
- MVS/SP Version 1 requires Processor Support 2 (SU 64).

MVS/SP Version 2 – MVS/XA

- Hardware: The 370-XA mode of 3090, 308X, or 4381 Processors.
- Software:
 - MVS/SP Version 2 is supported by MVS Release 3.8
 - Requires the use of MVS/XA DFP

Products Supported

MVS/SP Version 1

- Direct access storage devices include 3330, 3340, 3344, 3350, 3375, and 3380. (The 3375 and 3380 also require the DFDS or DFP.)
- 3850 Mass Storage Subsystem
- Tape devices include 3420 Models 4, 6, 8, the 3422, and 3480.
- 3800 Printing Subsystem Model 3

MVS/SP Version 2 – MVS/XA

3090, 308X, or 4381 Processor operating in System/370 extended architecture mode.

MVS/SP – JES2

- JES2 input/output devices:
 - Printers: 1403, 3211, 3800 Models 1 and 3, 3203, 4245, and 4248. 3800 Model 3 support is in full-

- function (page) mode through the Printer Services Facility program product (5665-275)
- Spooling devices: 3330, 3340, 3344, 3350, 2305, 3375, and 3380 (the 3375 and 3380 require DFDS or DFP)
- MVS/SP-JES2 RJE devices:
 - Via 3704, 3705, or 3705 (EP) over non-switched point-to-point lines: 8100
 - Via 3704, 3705, or 3725 in NCP mode (VTAM or ACF TCAM V2, R2): 8100
- MVS/SP-JES2 NJE:
 - Interconnection of JES2 nodes via BSC lines, channel-to-channel adapters, and SDLC lines
 - VSE systems via VSE/POWER
 - JES3 systems via the MVS/SP-JES3 SNA or BSC lines or channel-to-channel adapters
 - VM/370 nodes via RSCS Networking

MVS/SP – JES3

- JES3 input and output devices:
 - DASD: 3330, 3340, 3044, 3350, 3850
 - Tape: 3410, 3420 (Models 4, 6, 8), 3422, and 3480
 - Printers: 1403, 1443, 3211, 3800 Models 1 and 3, 3203, 4245, 4248, and 3800 Model 3 and 3820 supported via PSF (5665-275)
 - Remote workstations: via 3704 (EP), 3705 (EP), 3725 (EP), 8100, and SNA via VTAM
 - Spooling devices: 3330, 3340, 3350, 3375, 3380 (the 3375 and 3380 require DFDS or DFP)

Ordering Information

MVS Release 3.8

Program number: 5752-VS2

MVS/SP-JES2 Version 1

Program number: 5740-XY5

MVS/SP-JES3 Version 1

Program number: 5740-XYN

MVS/SP-JES2 Version 2

Program number: 5740-XC6

MVS/SP-JES3 Version 2

Program number: 5665-291

MVS/SP-JES2 Version 3

Program number: 5685-001

MVS/SP-JES3 Version 3

Program number: 5685-002

MVS/SP Custom-Built IPO

Program number: 5751-CS1

Reference Material

- OS/VS2 MVS Overview, GC28-0984
- MVS/SP Version 1 General Information Manual, GC28-1025
- JES3 Introduction, GC23-0039
- MVS/SP Version 2 General Information Manual, GC28-1118
- MVS/SP Version 2 General Information Manual, GC28-1500
- MVS/SP-JES2 2.2.0, JES Migration Considerations, GG66-0263
- MVS/SP-JES2 1.3.6/2.1.5 Migration Considerations, GG66-0236
- MVS/XA Conversion Notebook, GC28-1143
- MVS/SP-JES2 3.1.1 JES2 Overview, GG66-0296
- MVS/ESA JES3 Introduction, GC23-0077
- MVS/ESA JES3 Conversion Notebook for System Product Version 3.1.1, GC28-1417
- MVS/ESA JES3 Conversion Notebook for System Product Version 3.1.2, GC23-0078
- MVS/ESA General Information for System Product Version 3, GC28-1359
- An Introduction to MVS, GC28-1823
- MVS/ESA Conversion Notebook Volume 1, GC28-1567
- MVS/ESA Conversion Notebook Volume 2, GC28-1568

Extended Recovery Facility (XRF)

Main Purpose

XRF is an MVS/XA system, IMS/VS, ACF/VTAM, and ACF/NCP enhancement that increases availability of IMS/VS Version 2 DB/DC transaction processing as seen by end users with XRF-supported terminals. Availability is improved by using additional resources to lessen the impact of certain events that disrupt service to end users. The time that end users cannot access the system is reduced, and their involvement in the recovery process is simplified.

XRF function has been implemented by enhancing the following five products that execute in an MVS/XA environment: IMS/VS Version 2, MVS/SP Version 2 Release 1.7, ACF/VTAM Version 3 for MVS/XA, ACF/NCP Version 4, and MVS/XA DFP Version 2. The XRF enhancements are standard in these five programs.

Key Functions, Facilities and Features

With XRF, additional hardware and software system elements are used to create an alternate IMS/VS Version 2 subsystem and keep it synchronized with the active subsystem. If any of certain disruptive events occur, the alternate IMS/VS Version 2 subsystem takes over the workload of the active IMS/VS Version 2 subsystem. It is the installation's option whether the takeover is initiated automatically or is under operator control.

The end user's perception of the takeover depends upon the type of terminal being used and how it is communicating to the IMS/VS Version 2 subsystem. The ways in which different users in an XRF environment see the takeover are described below.

- Users of SNA terminals owned by ACF/VTAM Version 3 for MVS/XA that receive boundary network functions from ACF/NCP Version 4 can be switched without session reestablishment.
 - Users of SNA terminals connected via Logical Units SLUTYPE1 and SLUTYPE4 may be requested to reenter the last transaction if a workload transfer occurred during transaction input.
 - Users of SLUTYPE2 terminals will usually be required to re-enter the last transaction following a workload transfer.
 - Users of SNA terminals connected via programmed Logical Unit FINANCE and SLUTYPEP may require changes to their controller programs to have full switch support in an XRF environment. With appropriate user programming in the controller, workload transfer can be made transparent to the end user.

- Users of other VTAM supported terminals (including MSC and ISC connections) can be switched, but their sessions must be reestablished.
- Locally attached terminals, as well as BTAM/SP supported terminals, must be connected to the new IMS/VS subsystem using existing procedures.

After the takeover is complete, the IMS/VS Version 2 master terminal operator can establish a new alternate subsystem.

Disruptive events that XRF helps to mask from the IMS/VS Version 2 end user are:

- Unplanned outage: Failure of a system element that has been duplicated in the alternate system. Elements that may be duplicated are:
 - The central electronic complex (CEC), including channels
 - MVS/SP Version 2 Release 1.3 with the Availability Enhancement
 - IMS/VS Version 2
 - ACF/VTAM Version 3 for MVS/XA
 - MVS/XA DFP Version 2
- Planned outage: For example, an operator may initiate a workload transfer so that MVS service or hardware preventive maintenance can be applied to the active system. After service has been applied, the old active can be brought up as an alternate for the new active.
- Some operator errors: For example, the operator accidentally resets the machine supporting the active IMS.

Generic Logon:

ACF/VTAM Version 3 provides the capability to access the active IMS/VS Version 2 subsystem in an XRF environment without the end user needing to know which IMS/VS Version 2 subsystem is currently active. A generic application name may be specified instead of the real application name. ACF/VTAM Version 3 will route the request to the application the application name variable identifies. This generic logon capability will be provided in ACF/VTAM Version 3 for MVS/XA, MVS/370, VM, and VSE. This will allow terminals owned by ACF/VTAM Version 3 for MVS/370, VM, and VSE to access the active IMS subsystem in an XRF complex. However, only SNA terminals owned by ACF/VTAM Version 3 for MVS/XA that receive boundary network functions from ACF/NCP Version 4 have XRF session switching support.

Primary Users

Any IMS DB/DC installation with critical availability objectives.

Potential Benefits

One key XRF benefit is reduced — unscheduled service disruption to the end user. A typical IMS installation could see a reduction in IMS recovery time, which could result in a higher availability of the system for the remote terminal user.

XRF also provides a base to reduce the current scheduled maintenance window. By shifting the active workload to the alternate, the active hardware and software are freed for maintenance.

In addition, XRF could be used to provide operational flexibility in a multiprocessor environment — workloads can be switched less disruptively in an XRF environment when it becomes desirable to better match the changing workloads with available resources.

Products Supported

- The active and alternate IMS/VS Version 2 subsystems can be on different processors. In this case the two processors need not be identical. A 3090 could be the alternate for a 3084, for example.
- Active and alternate IMS/VS Version 2 subsystems may be on the same processor. In this configuration, however, IMS/VS Version 2 is the only system element that is duplicated. Therefore, XRF will only provide recovery from an IMS/VS Version 2 failure. This configuration is recommended for a test environment only. The processor will need enough virtual and real storage to run two IMS/VS Version 2 subsystems.

The alternate IMS/VS Version 2 subsystem is dedicated for monitoring and tracking the active, and cannot perform other work. However, the alternate processor can support other work. Available resources in the alternate (such as storage and processor cycles) will determine takeover speed and ability of the alternate system to accept the workload transfer. The nature and amount of the other work depends on processor capacity and real and virtual storage available. For optimum takeover speed, work running in the alternate should be such that it can be swapped out if the active IMS/VS Version 2 workload is transferred to the alternate.

- SNA terminals owned by an ACF/VTAM Version 3 for MVS/XA that receive boundary network functions from ACF/NCP Version 4 can receive full XRF session switching support (that is, they are switched without session loss). This includes LUs that are attached with user line control (if those LUs were defined in the NCP generation by physical unit (PU) and logical unit (LU) definition statements). Note that switched SNA devices only receive full XRF support if the SSCP-LU session remains active, as would be the case if the terminal is not owned by the failing active IMS host.

Also note that NTO- and NRF-supported terminals do not receive XRF session switching support.

Prerequisite Products

Hardware

- The active and alternate processors must be MVS/XA-capable, but need not be the same model.
- For SNA terminals that are to have their sessions preserved across automatic switching, the communication controller at that terminal's boundary node must be a 3725 or equivalent, and must have a path to both active and alternate processors.
- Shared DASD volumes are required for some IMS/VS Version 2 data sets.
- Hardware requirements for each of the programs that comprise XRF must be met.

Software

- MVS/SP Version 2 Release 1.3 with the Availability Enhancement
- IMS/VS Version 2
- MVS/XA DFP Version 2
- ACF/VTAM Version 3 for MVS/XA is needed for the following nodes in an XRF environment:
 - Owner of the primary logical unit (PLU), whether the PLU is the primary or alternate application
 - Owner of the secondary logical unit (SLU)
 - Any system services control points (SSCPs) on the session setup path of the backup session.
- ACF/NCP Version 4 is needed in the 3725 or equivalent at the boundary node for any terminal that will have its session preserved across automatic switching. ACF/NCP Version 2 or Version 3 may be used in other communication controllers. An NCP gateway node is not required to be at the Version 4 level unless it also contains the boundary network function for a terminal with XRF session switching support.
- ACF/SSP Version 3 is required to generate ACF/NCP Version 4 with XRF capability.
- NCCF Version 2 Release 2, while not required, is recommended to ease communication of switch-related information throughout the network. NCCF should be used to collect messages from VTAM relating to the switch and to broadcast commands throughout the network about the switch. An example is commands to modify VTAM application name values that are different because of the switch to the alternate IMS/VS Version 2 subsystem.
- To shorten the takeover time and simplify operational procedures, a Communication Management Configuration (CMC) on a third processor is recommended for an XRF environment.

Extended Recovery Facility (XRF)

Ordering Information

The XRF enhancements are standard in the following individual products that together make up the XRF environment:

- IMS/VS Version 2
- MVS/SP Version 2 Release 1.7
- ACF/VTAM Version 3 for MVS/XA
- ACF/NCP Version 4
- ACF/SSP Version 3
- MVS/XA DFP Version 2

They must be ordered for both active and alternate processors.

Reference Material

- MVS/XA Planning: Extended Recovery Facility (XRF), GC28-1139

Resource Measurement Facility (RMF)

Products Included

- RMF Version 2 (for MVS™/370)
- RMF Version 3 (for MVS/XA™)
- RMF Version 4 (for MVS/ESA™)

Main Purpose

Users invoke RMF to collect and report on specific aspects of system performance. It provides data input for performance measurement and capacity planning. RMF monitors provide online display capability and the ability to archive, analyze, and report on collected information.

The analysis of RMF reports can provide the basis for tuning the system to user requirements and can also be used to track resource utilization.

Key Functions, Facilities and Features

RMF measures the following activities:

- Processor usage
- Address space usage
- Device activity and contention for following devices:
 - Unit record
 - Graphics
 - direct access storage
 - Communication equipment
 - Magnetic tapes and cartridges
 - Character readers
- Detailed system paging
- System workload by performance group
- Page/swap data sets
- Enqueue
- Auxiliary storage manager (ASM)/real storage manager (RSM)/System resource manager (SRM) trace

Version 2 (for MVS/370 only)

- Channel activity
 - Request rate and service time per physical channel
 - Logical to physical channel relationships
 - Logical channel queue depths and reasons for queuing

Version 3 (for MVS/XA only)

- I/O device measurements including average time in each stage of I/O request
- Detailed I/O queuing for logical control unit groups
- Moving RMF data areas and RMF code to an extended area of virtual storage
- Virtual storage usage
- A workload delay monitor, which locates contention points for workloads

- System Availability Management (SAM) to record, track, and report software and hardware availability

Version 4.1 (for MVS/ESA only)

- Provides disabled reference storage, page delete, and slot constraint relief for MVS/SP Version 3
- Allows user to obtain device activity by storage group
- Supports Processor Resource/Systems Manager™ (PR/SM™) operating with MVS/SP Version 3

Version 4.1.1 (for MVS/ESA only)

- Includes Monitor III operations support:
 - Interpretive job reports
 - System status indicators in the workflow/exceptions (WFEX) report
 - Color highlighting
 - Improved threshold reporting
 - Two additional delay categories
- Two additional Monitor III storage reports
- Monitor III capability to write a new storage SMF record

Primary Users

RMF should be used on all MVS systems. The primary users are:

- Systems programmers with responsibility for performance measurement and capacity planning
- Operation-support and help-desk personnel with responsibility for monitoring system activity and resolving bottlenecks

Potential Benefits

RMF allows the MVS user to:

- Evaluate system responsiveness:
 - In addition to processor, channel, and device activity, a trace can be obtained that samples important ASM/RSM/SRM fields.
 - The workload activity is divided into many sub-reports.
 - The granularity of internal response time for an application or a group of applications has proven to be very useful for an installation.
- Identify bottlenecks:
 - The detailed paging report associated with the page and swap data sets activity can give a good picture of the behavior of a virtual storage environment.
 - A tracking of the contention indicators can refine the user's global system understanding.
- Check the effects of tuning:
 - The results of tuning can be measured.

Resource Measurement Facility (RMF)

- Results can be observed dynamically on a screen or by postprocessing facilities.
- The flexibility of RMF allows dynamic modification of RMF control options.
- Perform capacity planning evaluation:
 - RMF should be used to track resource utilization.
 - The workload activity reports include the interval service broken down by key elements, such as processor, input/output, and real storage service.
 - The analysis of the resource monitor output (for example, system contention indicators, swap-out broken down by category, average ready users per domain) helps in understanding users' environments and forecasting trends.
 - The postprocessing capabilities make the analysis of peak load periods and trend analysis easier.

Version 3 (for MVS/XA only) provides:

- I/O data measured rather than sampled
- Measurement reflecting amount of data transferred
- Same unit used to report I/O activity as SMF
- Hardware-collected data about management of path contention by the I/O queuing facility
- Information about the use of virtual storage
- Realtime exception capability and analysis to identify performance problems and resource contentions as they occur
- System availability management component to measure availability of both hardware and major subsystems in terms specified by the user

Version 4 (for MVS/ESA only) provides:

- Ease-of-use improvements such as cursor-sensitive flow
- Operations improvements
- Additional reports
- Improved storage and improved operations support, which provide ease of use for better help-desk performance

Prerequisite Products

- RMF Version 2 Release 4 requires MVS/SP Version 1 Release 2 or subsequent releases.
- RMF Version 3 Release 4 requires MVS/SP Version 2 Release 1.3 or 1.5.
- RMF Version 3 Release 4.1 requires MVS/SP Version 2 Release 1.7.
- RMF Version 3 Release 5 requires MVS/SP Version 2 Release 2.
- RMF Version 4 Release 1 and Release 1.1 require MVS/SP Version 3 Release 1.

Ordering Information

RMF Version 2

Program number: 5740-XY4

RMF Version 3

Program number: 5665-274

RMF Version 4

Program number: 5685-029

Reference Material

RMF Version 2

General Information Manual, GC28-0921

RMF Version 3

General Information Manual, GC28-1115

RMF Version 4

General Information Manual, GC28-1028

System Modification Program Extended (SMP/E)

Main Purpose

SMP/E is the basic tool for effecting software changes — new function, corrective and preventive service, and user modifications — in MVS/ESA™, MVS/XA, MVS/370, and VS1 systems. SMP/E controls changes to the system at the element (module or macro) level. From a large number of potential changes, SMP/E selects the proper levels of elements to be installed, invokes system utility programs to accomplish the installation, and maintains records of the installed changes and of the function and service levels of every element in the system.

Key Functions, Facilities and Features

SMP/E provides significant product usability enhancements, along with additional product function and improved RAS. The enhancements of SMP/E are intended to improve the productivity of the system programmer engaged in software change management who uses SMP/E to install new function, service, and user modifications into an MVS/ESA, MVS/XA, MVS/370, or VS1 system.

The major enhancements of SMP/E include:

- Improved product usability:
 - SMP/E interactive capability via dialogs that operate with the Interactive System Productivity Facility (ISPF) and the Interactive System Productivity Facility/Program Development Facility (ISPF/PDF). The dialogs, available only to MVS/370, MVS/XA, and MVS/ESA users, provide:
 - Assistance in the construction of SMP/E jobs for installing software function and service
 - A query capability against SMP/E data sets to aid in researching system status
 - Assistance in establishing and administering the SMP/E data sets
 - Dynamic allocation support for SMP/E data sets and for target, distribution library, and temporary data sets. Dynamic allocation is available only to MVS/370, MVS/XA, and MVS/ESA users.
 - Automatic management of inputs having exceptional conditions, such as PTFs in error (PEs), or PTFs or functions requiring actions outside normal SMP/E processing
 - List and report enhancements
- Extended product capability:
 - Additional SMP/E processing selection options, such as the ability to direct SMP/E processing to:
 - Modifications pertaining to only a single function or to a user-defined set of functions
 - A single modification type (FUNCTION, APAR, PTF, USERMOD)

- Modifications from a defined source, such as a product tape ID, a cumulative service tape ID, or a PUT tape number.

Use of these selection options, singly or in combination, facilitates the subsetting of SMP/E processing. The new selection options consolidate within SMP/E, and provide enhancements to, the programming functions currently provided on PUT tapes.

- The capability of restructuring load modules (delete CSECTs) during an SMP/E installation of a SYSMOD
- Product RAS enhancements:
 - Improved management of SMP/E data sets
 - New product function and usability characteristics
 - Additional error diagnosis aids
- Custom-built offerings (CBIPO and CBPDO). See Section 42.

Potential Benefits

- Improved systems programmer productivity:
 - The new or occasional user can accomplish meaningful work without knowing such details as the syntax of the SMP/E control language, input constructs, and the system library structure.
 - The experienced user has more flexibility in controlling SMP/E operations, more ability to manage the SMP/E control data, and enhanced query and list capability to facilitate research.
 - CBIPO and CBPDO are available as a part of the SMP/E licensed program. For details see CBIPO and CBPDO.
- Automated management of such exception conditions as PTFs in error (PEs).
- A formalization within the SMP/E product of the software installation and service processes, and documentation of those processes in the SMP dialogs and publications
- Enhancement of the MVS system generation (SYSGEN) process by GENERATE, which facilitates the installation of products that do not have SYSGEN support
- Two installation alternatives to SYSGEN for MVS/XA and MVS/ESA:
 - Using SMP/E, MVS/ESA and MVS/XA can be installed in an MVS system via Stage 1 SYSGEN and SMP/E APPLY processing. The SMP/E APPLY leaves all other products and services in the system, eliminating the requirement to reinstall optional products that do not have SYSGEN.

System Modification Program Extended (SMP/E)

- The other alternative, where a system replacement is permissible, is the use of GENERATE. Using Stage 1 SYSGEN, SMP/E GENERATE will install all the products – both with and without full SYSGEN support.

Prerequisite Products

If the SMP/E dialogs are to be used, the following products are required:

- ISPF (5665-319 or 5668-960)
- ISPF/PDF (5665-317 or 5665-268)

Ordering Information

System Modification Program Extended (SMPIE)

Program number: 5668-949

MVS Custom-Built Installation Process Offering

Program number: 5751-CS1

MVS Custom-Built Product Delivery Offering

Program number: 5751-CS3

Reference Material

- Software Manufacturing General Information, GC23-0351
- MVS Custom-Built Offerings Planning and Installation, SC23-0352
- Program Packaging Guide, SC23-0221

Transaction Processing Facility (TPF)

Main Purpose

Transaction Processing Facility Release 2 Version 4 (TPF2.4) provides a responsive, efficient, available, and fully-expandable transaction-processing system. To achieve its full potential, TPF2 along with the user-created application programs will normally run stand-alone in one or more processors. However, with the new PR/SM™ feature on a multiprocessor complex, the user can run other operating systems as well. TPF2 is used today by customers whose dynamic transaction processing environment requires a manageable and predictable performance, high systems availability, and competitive price/transaction. TPF2's high efficiency and dedication to real-time transaction processing make it an excellent price/performer and the industry leader in the high-volume transaction-processing environments (HVTP). Operational TPF2 installations successfully process hourly transaction peaks ranging from a few transactions per second to well over 1500. Examples of applications utilizing TPF2 today range from simple message routing to credit verification, debit card processing, and complex travel planning and reservations for transportation and accommodations world-wide.

Key Functions, Facilities and Features

Key features of TPF2 include:

- Simple first-in-first-out (FIFO) message control process
- A simple macro-based applications interface along with a fixed-length-record data-base access method
- Performance accelerators to improve response time and avoid bottlenecks during peak loads:
 - Dynamic data caching in processor memory via the TPF2's virtual file facility (VFA)
 - Exploitation of record caching in 3880 Storage Control Units
- Transaction volume expanders that allow TPF2 to match the required processor horsepower to the growth in workload:
 - Ability to run multiple message streams in a multiple processor complex such as 3090 Model 200E, 280E, 300E, 500E, or 400E under the control of a single TPF2 control program (single TPF2 image). This is referred to as tightly coupled (TC) support.
 - Ability to loosely couple (LC) up to eight TPF2 message processor complexes or images to share a common TPF2 data base
 - Ability to interconnect to other TPF2 systems via TPF2's unique high-performance Multi-Processor Interconnect Facility (MPIF). This facility allows independent TPF2 systems to be channel connected via a 3088 Multisystem

Channel Communication Unit (channel-to-channel switch), which further expands its capacity to handle application complexity as well as additional transaction loads.

- Advanced communication support for full participation in SNA network environments
- Availability enhancement facilities, including:
 - Duplicate data-base capability with full transparency to applications. When used, TPF2 will also spread read accesses across both copies for performance and provide nondisruptive removal capability of a failed module as well as appropriate online copy capability to recreate a failed duplicate.
 - Automatic checkpointing of key system and application data as well as full recovery capability in case of system failure
 - Automatic (TPF2-initiated) restart in the event of a failure. This is designed to be as quick as possible, usually within eight minutes. Similarly, a hardware switch and TPF restart occur within three minutes.
- Extensive operator information to permit monitoring the system operations at all times
- User exits to accommodate user-provided system code that customizes the system to the user's unique requirements

Primary Users

TPF2 is used in transaction environments that require efficient (competitive) systems solutions that meet the most stringent customer performance and availability requirements.

TPF2 users today can be found in transportation, finance, securities, media, and public sector industries. Currently-installed applications include electronic funds transfer, loan payment processing, bank teller transactions, credit card authorization and switching, emergency police car dispatching, country-wide prescription management, airline and train seat reservations, hotel room reservations, and travel planning.

Potential Benefits

- High system responsiveness
- 7-day-per-week, 24-hour-per-day operation
- High system availability with fast restart time in standalone and loosely-coupled environments
- Realtime data update for data currency to all users
- Data integrity and availability by data duplication (mirrored data base)
- Comprehensive system measurement statistics
- Recovery support:
 - Online data base capture/restore
 - Online data record/transaction logging

Transaction Processing Facility (TPF)

- Multiple system networking, SNA, non-SNA, and SNI
- Support for a large terminal network with over 90,000 terminals
- Support for a large centralized data base with over 800 modules of 3380s
- Price-effective solutions
- Typically, response time consistently less than two seconds, with system availability of 99.8% for 24-hour-a-day operation and one- to three-minute system restart time.

Prerequisite Products

- MVS/370 or MVS/XA is required for offline batch support and utility functions.
- PL/I Optimizing Compiler (5734-PL3) is required for compilation of TPF data reduction, recoup, and directory maintenance programs.
- Assembler H (5668-962) is required for TPF program assemblies.
- HPO requires ACF.
- The MVS/ACF/VTAM Version 3 system is required when using the 3725 Communications Controller. ACF/VTAM Version 3.2 is a requirement for peripheral host node session establishment.
- TPF Version 2 Release 4 requires the ACF/TPF2.4 feature as a prerequisite for connection to SNA networks.
- The ACF/TPF2.4 feature requires a communications management configuration (CMC) with an ACF/VTAM Version 3 system at a release level compatible with the ACF/NCP used to provide peripheral host node (Type 2.1) services or gateway services.

Products Supported

Hardware

- Processors:
3090 Models 600E, 400E, 300E, 200E, 180E, 150E and 120E; 9190, 9083, 9081, 3083, 3081, and 4381
- Storage control unit:
3880, 3990 Models 1 and 2
- Direct access storage devices:
3350, 3380, 3375
- Magnetic tape devices:
3420, 3480 Models A22 and B22 (compatibility mode)
- Terminals:
4505, 3270 SDLC, 3600, 4700

Software

- Application Program Languages:
 - Assembler Language
 - PL/TPF (Program Language/Transaction Processing Facility (5796-PTN))

Ordering Information

TPF Version 2

Program number: 5748-T12

Reference Material

- General Information Manual, GH20-7450

Data Facility Hierarchical Storage Manager (DFHSM)

Main Purpose

DFHSM is a licensed program that manages low-activity and inactive data in a hierarchy of storage devices having different costs, capacities, and access attributes.

As a continuously running task under MVS/XA or MVS/370 with JES2 or JES3, it enables active data sets to be kept on fast-access storage devices, such as DASD, and the less active data sets to be compressed and moved to a lower-cost-per-byte device, such as the 3480 Magnetic Tape Subsystem. It also allows backup to 3480, 3420, 3422, or 3430 Magnetic Tape Subsystem. DFHSM also may be used to assist in migrating from 3330 or 3350 to 3375 or 3380 DASD.

Significant storage space can be saved by the use of data compaction and compression during space management and backup operations.

Key Functions, Facilities and Features

- DFHSM manages five types of volumes:
 - Primary volumes, containing data sets directly accessible to the user and under control of DFHSM
 - Level 1 volumes, to which DFHSM moves low-activity data sets from primary volumes
 - Level 2 volumes, to which DFHSM moves low-activity data sets from level 1 or primary volumes
 - Dump volumes, to which DFDSS invoked by DFHSM copies primary volumes to tape dump volumes
 - Backup volumes, to which DFHSM copies one or more data set versions for recovery purposes
 - Spill volumes, to which DFHSM moves all but the most current valid backup copies of data sets, whenever additional space is needed on a DASD backup volume
- DFHSM has seven major functions that provide space and availability management capability:
 - Data migration, which automatically moves less active data sets off primary volumes
 - Recall, which automatically moves migrated data sets back to primary volumes when they are referenced
 - Automatic backup, which copies data sets to backup volumes
 - Restore, which restores data sets from the dump volumes by command
 - Recovery, which recovers data sets from the backup volumes by command
 - Retirement, which provides for data set deletion if a backup copy exists
 - Automatic deletion, which will delete unused data sets at the user's option

- Data conversion, which moves and optionally reblocks data sets to different DASD devices via immediate recall
- Reblocking options when data sets are recalled
- DFHSM provides for the automatic backup of changed data sets, with facilities to control the backup cycle, number of versions, frequency, backup, media, and deletion of backup copies. Facilities are provided to merge backup copies on tape and to recycle tapes. Up to 15 concurrent backup tasks are permitted.
- Maintains control of data sets that contain information about the processing done by its major functions. These control data sets are updated as activity occurs in DFHSM.
- Multiple copies of control data sets may be backed up automatically.
- Reports about the processing done by DFHSM major functions may be produced.
- User exits are available to customize DFHSM operation and to ease tape handling.
- The data compaction option compacts data sets during all DFHSM migration to level 1, backup-to-DASD, and backup-to-tape operations.
- End users' optional access to DFHSM's interactive space maintenance functions via the interactive storage management facility (ISMF) panels of MVS/XA DFP Version 2 is supported.
- A facility is provided to forward merge and consolidate DFHSM tapes.

Potential Benefits

- Automates and centralizes routine storage management tasks
- Automates and centralizes routine availability tasks with its DFDSS-invoked and incremental backup functions
- Allows the cost relationship in the hierarchy of storage devices to be exploited by keeping data sets under system control
- 3480 support for space management allows inactive or seldom-used data to be archived to tape. Use of single file format allows greater utilization of cartridge capacity.
- More efficient use of storage through data compaction and compression
- Provides a means of converting current DASD volumes to new volumes through its migrate/recall/convert and free volume commands
- Automatic backup of data sets that have been changed since the last backup was made
- Automatic backup support at the changed data set level, instead of at the volume level, for all data sets, and the ability to select tape, DASD, or MSS as the backup medium

Data Facility Hierarchical Storage Manager (DFHSM)

Some installations using the data compaction algorithm have documented an average byte compaction ratio of approximately two to one during migration. This, combined with maintaining higher levels of occupancy on migration and backup volumes and compressing out unused space within data sets, should enable users to put three to four times as much data on these volumes.

Prerequisite Products

Hardware

DFHSM operates on all systems supported by MVS/SP.

Software

- MVS/SP Version 1 (MVS/370) or MVS/SP Version 2 (MVS/XA) is required.
- RACF data protection and always-call support require RACF Release 7 with MVS/XA DFP or MVS/370 DFP facility (SAF) and "always call" support.
- ISMF support requires DFHSM, MVS/XA DFP, and ISPF.

Products Supported

Hardware

- 3380 (all models), 3375, 3350, and 3330 (primary, migration, and backup volumes)
- 3480 (with Automatic Cartridge Loader feature), 3430, 3422, and 3420 (migration and backup)
- 3880 Models 13 and 23 cache

Software

- SAM, PAM, and movable DAM and EXCP data sets
- VSAM data sets for backup and VSAM data sets cataloged in ICF catalogs for migration
- MVS/XA DFP and MVS/370 DFP
- DFDSS for automatic dump function
- DB2

Ordering Information

DFHSM Version 2

Program number: 5665-329

Reference Material

General Information Manual, GH35-0092

Data Facility Data Set Services (DFDSS)

Main Purpose

Data Facility Data Set Services Version 2, a licensed program, assists MVS/370 and MVS/XA users with the movement and management of data on DASD, including all models of the 3380. It is the primary vehicle for data migration between storage devices, high-performance backup and recovery, and it provides space management functions that improve DASD space utilization.

Key Functions, Facilities and Features

- A COPY statement moves most data set types between like or unlike device types. Full volumes, selected tracks, and groups of data sets may be copied. Data sets may optionally be renamed, reblocked, or deleted. Data set COPY will update the catalog and RACF information as appropriate.
- The DUMP command specifies the backup of data on DASD or MSS virtual volumes to tape or another DASD or MSS volume. Full volumes, ranges of tracks, or data sets may be specified. Time required for the dump can be significantly reduced through optional optimization of the DASD input. Space on the dump tape can be minimized by dumping only the used space and employing run-length compression. Data sets may be optionally deleted or uncataloged. Multiple output copies can be made.
- A RESTORE command causes a previously created dump data set to be recovered to DASD. Full volumes, ranges of tracks, and data sets may be restored. Data sets from a logical data set dump may be restored to device types other than that on which the data previously resided. Data sets may be optionally renamed.
- Logical data set processing on dump and copy eliminates the need to specify input volumes and removes device dependencies.
- The DEFrag command allows consolidation of the fragmented free space on a volume. No intermediate devices, tape or disk, are required for a DEFrag operation.
- The RELEASE command to release allocated but unused space in SAM and PAM data sets and the COMPRESS command to perform PDS compression, together with the DEFrag command, provide a centralized DASD space management function.
- Expanded data set selection criteria allow tailoring of the DFDSS COMPRESS, COPY, DEFrag, DUMP, RELEASE, and RESTORE commands to operate against data sets with specific attributes.
- A standalone RESTORE capability allows a volume or selected tracks to be restored in event of a system failure. It operates in both 370 and extended architecture mode.

- An application interface allows DFDSS to be invoked by another program.
- Support is provided for the 3380 Extended Capability models.
- COPYDUMP provides copies of backup tapes.
- A PRINT command supports printing of selected tracks, data sets, or the VTOC.
- VSAM data cataloged in an integrated catalog facility catalog is supported. Also, VSAM and non-VSAM multivolume data sets are supported.

DFDSS Version 2 Release 2 provides additionally:

- Interactive invocation of DFDSS commands through the interactive storage management facility (ISMF) of MVS/XA DFP Version 2 Release 2
- Backup and recovery enhancements
 - Restore data sets to unlike device types from logical dump tapes
 - Restore to a larger preallocated data set
- Improved performance
 - Faster movement of VSAM ESDS and RRDS data sets
- Buffer placement above 16MB virtual in an MVS/XA environment
- Device conversion
 - Copying DB2 data sets to unlike device types
 - COPY to a preallocated data set when the new REPLACE keyword is specified
- Enhancements to the application interface
- Security and productivity enhancements
- New physical blocksize support for VSAM

Potential Benefits

- High performance backup is achieved through decreased backup/restore time, reduced I/O activity, and concurrent multiple execution.
- Defragmentation provides larger contiguous free areas in which new data sets can be allocated.
- Extensive filtering and selection criteria permit data migration, backup and recovery, and space management to operate on data sets with specific characteristics.
- User exits permit tailoring of DFDSS functions.
- Data Facility Data Set Services, together with other software products, contributes to the implementation of a total storage management plan (see "Storage Management," Section 20).
- The interactive panel support available through ISMF eliminates the need to know DFDSS command syntax.
- The COPY function provides a single tool to move data between old and new DASD, thus easing device conversion.

Data Facility Data Set Services (DFDSS)

Prerequisite Products

- MVS/SP Version 1 or Version 2
- MVS/370 DFP or MVS/XA DFP
- Release unused space and unmovable data set support both require the function available in MVS/XA DFP Version 2.
- To use the ISMF panels that support DFDSS requires MVS/XA DFP Version 2 Release 2 and ISPF Version 2 Release 2.

Products Supported

Hardware

Devices supported include 3330 Models 1 and 11, 3340 and 3344, 3350 (native mode and 3330 compatibility mode), 3380, 3375, 3330V (virtual volumes within the 3850 Mass Storage System), and 3880 Models 13 and 23.

Software

The Indexed VTOC option of Data Facility Product is supported.

Ordering Information

Program number: 5665-327

Reference Material

General Information Manual, GC26-4123

Data Facility Product (DFP)

Products Included

- MVS/XA DFP
- MVS/370 DFP

Main Purpose

The DFP licensed programs, MVS/XA DFP Version 2 and MVS/370 DFP, provide data management, device support, program library management, utility functions, and user and system catalog support for the MVS/370 and MVS/XA operating system environments.

This support includes the functions formerly available in the following:

- Data Facility Device Support (DFDS) – (5740-AM7)
- Sequential Access Method – Extended (SAM-E) - (5740-AM3)
- Data Facility Extended Function (DFEF) – (5740-XYQ)
- Offline 3800 Utility (5748-UT2)
- Access Method Services (AMS) Cryptographic Option (5740-AM8)

These programs have been functionally stabilized and have been withdrawn from marketing. Further enhancements in these areas have been provided in DFP only. Since DFP includes the functions of the preceding program product, no attempt should be made to apply them to an MVS/XA or MVS/370 system with DF8 installed.

Key Functions, Facilities and Features

Both MVS/370 DFP and MVS/XA DFP provide:

- Data Management. They control operations associated with input/output devices, such as allocation of space on volumes, storing, naming, and cataloging data sets, and movement of data between real and auxiliary storage.
- Access methods:
 - VSAM
 - Sequential – BSAM and QSAM
 - BPAM
 - BDAM
 - Indexed sequential – BISAM and QISAM
- Virtual I/O
- VSAM global serialization
- Shared DASD
- Checkpoint/restart
- System Support Programs:
 - Linkage editor
 - Program fetch
 - Loader
 - System utilities
- Data set utilities

- Tape label and tape file structure:
 - ISO 1001-1979
 - ANSI X3.27-1978
 - FIPS 79
- Resource Access Control Facility (RACF) data management support including “always call,” and “erase-on-scratch.”

Additionally, MVS/XA DFP Version 2 Release 2 provides:

- Support for the interactive storage management facility (ISMF). Allows invocation of data set functions of MVS/XA DFP, DFHSM, and DFDSS under a common and consistent interface. Runs as an application of ISPF.
- Virtual storage constraint relief, by moving the catalog processing functions of DFP to a separate address space
- Expanded VSAM block sizes (n x 512), up to 32KB
- 3480 block-count checking
- Support for the extended recovery facility, enabling an IMS subsystem workload to be switched from a failing system to a recovery system
- Tape data set protection and erase-on-scratch support provided in conjunction with RACF Release 7
- Exporting VSAM ESDS (Entry Sequenced Data Set) data in device format, thereby supporting movement of DATABASE 2 data

MVS/XA DFP Version 2 Release 3 provides the following enhancements:

- SYSGEN simplification
- Integrated catalog facility recovery enhancements
 - Automatic reorientation after recovery
 - Locking facility
 - Alias support during EXPORT/IMPORT
 - SMF recording on EXPORT
- System constraint relief
 - VSAM 31-bit addressing mode enhanced
 - DADSM 31-bit addressing mode support
 - Support for scheduler work area (SWA) above 16MB virtual
 - More than 1635 data definition statements
 - Expiration dates beyond 1999
 - Concatenation enhancement
- VSAM enhancements
 - AIX synchronization
 - Local shared resource support enhanced
 - Linear data sets
- Enhancements to the ISMF data set application
- ISMF volume application
- Enhancement to catalog address space (CAS)

Data Facility Product (DFP)

Potential Benefits

Integration of data management support into a single package facilitates installation and simplifies the refresh and update process. This can eliminate prerequisite maintenance and program products.

MVS/XA DFP is the foundation product for the evolution toward system-managed storage.

The ISMF facility of MVS/XA DFP Version 2, introduced in Release 2 and enhanced in Release 3, offers a common interface that can improve storage administrator productivity. Many storage management functions can be initiated against lists of data sets generated through powerful and extensive filtering and selection criteria. Many of the same storage management functions can be performed on an entire volume.

Prerequisite Products

- For MVS/XA DFP:
 - MVS/SP-JES2 Version 2 or MVS/SP-JES3 Version 2 or later
ISMF additionally requires ISPF Version 2 Release 2. Use of the SUBMIT capability requires TSO/E Release 2.
- For MVS/370 DFP:
 - MVS/SP JES2 Version 1.3 or MVS/SP-JES3 Version 1.3 or later
(Some functions require later release levels.)
- Assembler H Version 2
- For users of the Access Method Services REPRO encryption/decryption, the functions provided by one of the following or functional equivalent are required:
 - Programmed Cryptographic Facility
 - Cryptographic Unit Support and its prerequisites.

Products Supported

- 3330/3333, 3340, 3344, 3350, 3375, and 3380 DASD
- All models of 3880 Storage Control
- 3480 Magnetic Tape Subsystem in both 3420-compatibility and full-function modes
- 3430, 3420, and 3422 Magnetic Tape Subsystems
- 3800 Printing Subsystem Model 3 in both all-points-addressable mode and 3800 Model 1 compatibility mode.
- 4245, 4248, and 3262 Model 5 Printers
- For MVS/XA DFP, any processor supported by MVS/SP Version 2 or later
- For MVS/370 DFP, any processor supported by MVS/SP Version 1.3 or later

Ordering Information

MVS/XA DFP Version 2

Program number: 5665-XA2

MVS/370 DFP

Program number: 5665-295

Reference Material

- MVS/XA DFP General Information Manual, GC26-4142
- MVS/370 DFP General Information Manual, GC26-4050

Data Facility Sort (DFSORT)

Main Purpose

Data Facility Sort (DFSORT), a licensed program, is a high-performance sort that sorts blocked or unblocked sequential data sets containing fixed-length or variable-length records. DFSORT can also merge from 2 to 16 previously-sorted data sets into one data set and copy records from one data set to another. DFSORT runs under the control of MVS/370, or MVS/XA.

Key Functions, Facilities and Features

- An advanced algorithm, the blockset technique, is used to process (sort, merge, and copy) records efficiently. In order to achieve the most efficient performance, the blockset technique is designed to:
 - Exploit the IBM DASD device geometry, processor memory, and processor cache
 - Take advantage of MVS/XA extended addressing
 - Utilize the MVS/XA sorting instructions if installed on System/370 Extended Architecture processors
 - Support the VS COBOL II FASTSORT compile-time option
- An extended COPY function provides a fast means of copying files without any sorting or merging. The COPY function can be used in conjunction with the record level editing capabilities of DFSORT which will allow users to copy a subset of the input file, pad or truncate input records, or reformat input records.
- An IEBGENER filter facility allows the use of the more efficient DFSORT COPY function for qualifying IEBGENER jobs.
- An installation exit facility allows installation tailoring of the execution time environment.
- For the MVS/XA environment, programs and user-written exits can invoke DFSORT from either below or above the 16MB line.
- Exits may be written in COBOL, improving productivity.
- Application programmer productivity functions eliminate the need for many customer-written sort exit programs. They are compatible with DOS/VS Sort/Merge Version 2 and are:
 - INCLUDE/OMIT
 - SUM
 - INREC
 - OUTREC
- Dynamic allocation of disk workspace relieves the user from calculating and specifying, through JCL, the amount of intermediate storage required.
- In the MVS/XA environment, sort processing code and internal work areas can both reside above the

16MB line, providing both virtual storage constraint relief (VSCR) and enhanced performance.

- Secondary extents for disk workspace and SORTOUT space can be automatically allocated if primary extents are insufficient.
- Over-allocated disk workspace and SORTOUT space can be automatically released.
- Disk work data sets can be allocated on mixed device types.
- Data on processing characteristics may be written to the SMF log.
- The OPTION control statement provides the means to override installation or program-specified options at program execution time.

Potential Benefits

Sorting applications typically use 10% to 30% of a processor's resources. The elapsed time of these applications is an important factor in meeting job turnaround requirements, and the high performance of a sort product can be directly translated into savings.

The evaluation of the performance of a sort product offering should be substantiated in the environment in which it will be used. By conducting a benchmark, the performance of DFSORT can be evaluated and cost-justified.

Prerequisite Products

Hardware

- System/370, 30XX, or 4300 Processor
- Work storage – any device supported by MVS/370 or MVS/XA, for program residence

Software

- MVS/370 or MVS/XA, all current and subsequent releases until otherwise announced. DFSORT also executes with these systems when running as a guest under VM/SP, VM/SP HPO, VM/XA Migration Aid, VM/370, or VM/XA.

Products Supported

- Input/output: any device used by QSAM or VSAM
- Intermediate storage:
 - In tape applications: 3420, 3422, 3430, and 3480 (or 2400 series)
 - In direct access applications: 3380, 3375, 3350, 3340, 3330, and 3850

Data Facility Sort (DFSORT)

Ordering Information

Program number: 5740-SM1

Reference Material

- General Information Manual, GC33-4033
- DFSORT Benchmark Guide, GG24-3019
- Getting Started with DFSORT, SC26-4109

Graphical Data Display Manager (GDDM™) Series

Products Included:

- GDDM/VM
- GDDM/MVS
- GDDM/VSE
- GDDM-PGF
- GDDM Interactive Map Definition
- GDDM-IVU

Main Purpose

The Graphical Data Display Manager (GDDM) Series consists of GDDM/VM, GDDM/MVS, GDDM/VSE, GDDM-PGF (Presentation Graphics Facility), GDDM Interactive Map Definition, and GDDM-IVU (Image View Utility) licensed programs,

GDDM is IBM's primary device support and host graphics program, supporting graphics and images on displays, 3270-PC family, 5080 Graphics System, 3117 and 3118 Scanners, and printers.

Application programs call GDDM routines to do full-screen alphanumeric or images, or to create business charts. Applications may also use graphic input and display to perform functions with information such as cartographic data that is meaningful only when a pictorial format is used.

The interactive chart utility (ICU) of GDDM-PGF allows users to create and customize business charts and graphs without the need to write application programs.

Key Functions, Facilities and Features

GDDM/VM, GDDM/MVS, and GDDM/VSE

GDDM contains a set of user-callable subroutines that provide graphic functions and management of alphanumeric fields for terminal display stations and printers. GDDM generates the symbols necessary to make up the display/printer picture, manages the complex data stream required for transmission, and minimizes the data stream lengths through compression. GDDM subroutines provide:

- Screen format control
- Alphameric display and input
- Graphics construction and display (lines, arcs, text)
- Control of attributes (color, line type, line width, symbols, shading patterns)
- Control of graphic input
- Control of display partitions
- Display and printing control

GDDM also contains the image symbol editor (ISE) utility, which permits the user to interactively define, edit, and save sets of images. ISE can create pro-

grammed symbol sets that can be saved by the utility and later loaded by GDDM or another program that provides the symbol set load capability. ISE can also create patterns, markers, and larger image symbols that can be used by GDDM applications.

GDDM-PGF

PGF contains a comprehensive set of high-level presentation graphics and charting callable routines oriented toward business graphics. They provide support of the following functions:

- Chart types:
 - Bar charts
 - Tower charts
 - Histograms
 - Line graphs
 - Pie charts
 - Surface charts
 - Venn diagrams
- Functions available for specifying:
 - Position and size of the chart
 - Headings
 - Axes
 - Lines and grids
 - Key symbols to identify chart components
 - Attributes (line types, marker symbols, color shading patterns, and symbol sets)
 - One of ten character sets
 - Degree of curve smoothing
 - Chart annotation

GDDM-PGF also includes two utilities:

- The interactive chart utility (ICU) enables a user either to create business graphs and charts without application programming or to call the utility from an application program. Assisted by menus that are presented on the display, the user can:
 - Enter data
 - Create and customize the same types of charts and graphs that can be created by the callable subroutines
 - Save, for subsequent use, information about the chart format and data
 - Print charts
- The vector symbol editor provides the user with the ability to construct vector symbol sets for use by GDDM. Symbols have the following characteristics:
 - They are defined by a series of lines or curves drawn from point to point in a defined space.
 - They can be used by calls to GDDM from an application program or from the interactive chart utility.
 - They can be scaled to desired size, sheared, colored, and drawn at an angle/direction by calls to GDDM.

GDDM Interactive Map Definition

GDDM Interactive Map Definition enables interactive definition of alphanumeric screen and printer layouts known as maps. The maps can be used in conjunction with GDDM application programs and can contain a graphics field (but not an image field).

GDDM Image View Utility

GDDM-IVU adds ease of use to the GDDM base image application programming interface (API) by providing higher-level processes for handling images. GDDM-IVU can be accessed interactively by end users or by user-written application programs.

The image processes facilitate user tasks such as:

- Input: import/scan/load
- Process: projection definition/image manipulation/viewing
- Output: export/print/file

Primary Users

- Non-I/S professionals who wish to present their data in graphical form. (They will use the interactive chart utility of GDDM-PGF.)
- Application programmers extending application programs to a more meaningful graphic presentation.

Potential Benefits

GDDM with GDDM-PGF provides a means to generate graphic representation of data on displays, printers, scanners, and storage with minimal application programmer and systems analyst effort. Items of major importance are:

- Ease of use:
 - Application program interface provided between the application and terminals
 - Programmer shielded from complex data stream generation, buffering, and communication programming
 - Presentation of data allowed in a graphic form that facilitates the interpretation of that data
- Support for advanced 3270 functions: the Programmed Symbols (PS) feature, color, and extended highlighting
- Unique system generation not required
- Terminal user provided with a character set design function through GDDM's inclusion of the image symbol editor utility
- Print capability provided by GDDM-supplied utility functions for supported environments

Prerequisite Products

- GDDM and GDDM-PGF subroutines are callable from application programs written in S/370 Assembler, BASIC, COBOL, FORTRAN, PL/I, VS APL, APL2. These application programs will run in a System/370, 30XX, or 4300 Processor with sufficient storage utilizing:
 - CICS/OS/VS with MVS/370 or MVS/XA
 - IMS/VS with MVS/370 or MVS/XA
 - CICS/DOS/VS with VSE/SP or VSE/Advanced Functions
 - TSO ACF/VTAM with MVS/370 or MVS/XA
 - CMS with VM/SP
- GDDM is a prerequisite for GDDM-PGF.
- CICS/VS does not support applications written in FORTRAN.
- GDDM provides VS APL and APL2 in TSO and CMS environments with the ability to communicate with displays and printers. APL supplies a graphic work space that provides access to GDDM functions.
- Interactive Map Definition is not supported by IMS/VS for scanners and plotters.

Products Supported

- 3192-G and 3179-G vector-to-raster displays
- 3193 image display
- 3278, 3279, and 8775 with programmed symbols displays
- 3270-PC family
- 5080 Graphics System
- 3268, 3287, 4224 Models 2XX, 4250, 3800, and 3820 Printers

These devices should be attached only to a 4331 or faster processor.

Ordering Information

GDDM/VM

Program number: 5664-200

GDDM/MVS

Program number: 5665-356

GDDM/VSE

Program number: 5666-328

GDDM-PGF

Program number: 5668-812

GDDM Interactive Map Definition

Program number: 5668-801

GDDM Image View Utility

Program number: 5668-723

Reference Material

- General Information Manual, GC33-0319
- Release Guide, SC33-0320

graPHIGS™

Products Included

- GDDM/graPHIGS™ for the mainframe environment
- Personal graPHIGS™ for the RT Personal Computer

Main Purpose

The graPHIGS programs are comprehensive development tools. They provide an easy-to-use graphics application interface that simplifies the programming of technical/professional graphics applications such as those related to computer-aided manufacturing, computer-aided engineering, architecture/engineering/construction, mapping, and geo-facilities areas.

They also provide for device-independent coding, use of advanced workstation capabilities, and application portability between the mainframe and the RT Personal Computer.

Key Functions, Facilities and Features

- Based on the proposed ANSI standard for the Programmer's Hierarchical Interactive Graphics System (PHIGS)
- Support FORTRAN, PL/I, Pascal, C and Assembler under VM/SP, VM/XA, MVS/SP, and MVS/XA on IBM mainframes
- Support FORTRAN, Pascal, and C under the Advanced Interactive Executive (AIX™)
- Support the 5080, 3250 and selected 3270-family devices on mainframes and the 5080
- Provide a common graphics programming interface for MVS, VM, and AIX
- Provide over 300 graphics subroutines for device-independent coding including:
 - Multiple levels of transformations — of the model components, the total model, the model as viewed by an observer, and of the result mapped to a window or viewpoint of a display
 - Color selection for all primitives
 - Polyline, polymarker, polygon, and pixel operations
 - The ability to fill polygons with solid colors and multicolor fill patterns, including application-defined patterns
 - Multiple line styles, markers, and text fonts
- Provide significant aids to simplify interactive modifications of graphics data structures
- Provide viewing and transformation aids to simplify modification of the appearance of the model
- Allow synchronous and asynchronous input operations
- Allow simultaneous input and output

- Allow geometric articulation. The application program can coordinate the movement of separate parts of related objects.
- Provide the ability to pick (select) and edit parts of graphic structures
- Support logical input devices — keyboard, valuator, choice, locator, pick, or stroke — mapping to available real devices on active workstation
- Are designed to take full advantage of the 5080's local graphics intelligence including:
 - Full 5080 three-dimensional data stream
 - Window and viewpoint transformation and clipping
 - Arbitrary 4x4 matrix transformations and utility functions (scale, rotate, and translate)
 - Re-execution required only of modified parts of a model, in most cases
 - Ability to drag or move graphical objects, using 5080 local graphics functions
- Supports data entry through the keyboard, valuator, choice device, locator, pick, or stroke

Primary Users

Application programmers who have the need to support two-dimensional and/or three-dimensional complex, interactive graphics applications.

Potential Benefits

The graPHIGS programming interface provides a "toolbox" of over 300 functions accessible from popular high-level programming languages. This high-level interface is designed to provide the following benefits:

- Increased programmer productivity: The hierarchical data representation, with its instancing capability, simplifies application programming and reduces data replication. The programmer can easily define and manipulate geometrically related model components, avoiding time-consuming lower-level instructions. Thus, applications can be developed faster and maintained more easily, reducing costs for development and maintenance.
- Application portability: The same graphics functions available with the GDDM/graPHIGS Programming Interface are available on the Personal graPHIGS system. When compatible compilers exist on both systems, applications can be transferred between systems with little or no modification.
- Device independence: The impact of change is minimized with support of a range of graphics devices. For example, GDDM terminals are supported for a low-cost solution, while the system exploits the intelligence of high-function graphics devices, such as the 5080 system.

- Protected software and hardware investments: By writing applications so that they remain hardware-independent, they can capitalize on new products or features as soon as they are made available.

Personal graPHIGS Programming Interface

- Licensed Program Specification, GH23-0003
- Installation, SC33-8106

Prerequisite Products

Because of the range of operating systems, programming languages, and workstations supported by the graPHIGS Programming Interface, the exact prerequisites may vary greatly from one installation to another. Refer to announcement letters, sales manuals, and the product installation manual for applicable prerequisites.

Products Supported

- Operating System: Refer to announcement letters for specific service levels.
 - VM/SP and MVS/SP (GDDM/graPHIGS Programming Interface)
 - AIX (Personal graPHIGS Programming Interface)
- Programming Languages: Refer to announcement letters for specific service levels.
 - FORTRAN
 - PASCAL
 - C
 - PL/I (GDDM/graPHIGS Programming Interface only)
 - Assembler (GDDM/graPHIGS Programming Interface only)
- Workstation types:
 - 5080 Graphics Workstation
 - 3250 Graphics Workstation
 - Selected GDDM-family displays (GDDM/graPHIGS Programming Interface only)
 - IBM RT PC native displays/consoles

Ordering Information

GDDM/graPHIGS Programming Interface
Program number: 5668-792

Personal graPHIGS Programming Interface
Program number: 5669-167

Reference Material

graPHIGS Programming Interface

- General Information, SC33-8100

GDDM/graPHIGS Programming Interface

- Licensed Program Specification, GH23-0001
- Installation, SC33-8101

NetView™

Products Included

- NetView for MVS/XA
- NetView for MVS/370
- NetView for VM
- NetView for VSE

Main Purpose

NetView Release 2 is part of IBM's strategy for providing System/370 system and network automation, in addition to being the network management product for System/370 host processors. NetView provides the basis for effective management of network and systems operations from a central site.

For network operations, NetView together with NetView/PC and Open Communications Architecture provide a cohesive end-to-end management approach, allowing the customer a framework for managing SNA and non-SNA components. NetView's rich function and ease of use combine to allow overall improvement of network operations and availability.

For systems operations, NetView's capability to filter messages and automatically execute command lists is essential. With the Inter-System Control Facility and the Inter-System Control Facility/PC program offerings, NetView facilitates the remote IML (warmstart) and IPL of target systems.

Key Functions, Facilities, and Features

Components

- **Command Facility**
The NetView command facility provides command, message, CLIST, and other capabilities to ease system and network management. The command facility supports single-domain, multiple-domain, or interconnected SNA networks, which allow system operations to be centralized at a single location or distributed to different points. CLISTS and other customization facilities (command processors, exits, subtasks, and service macros) allow users to automate and simplify many of the operating system, subsystem, and network management activities.
- **Session Monitor**
The NetView session monitor provides access to such network session information as session partner identifications and time stamps, session configuration data, session response time as measured by the response time monitor (for example, the feature in 3174 Subsystem Control Unit or 3274 Display Controller), session trace data, and data useful for accounting or other purposes. NetViews, or NetViews and NLDMS, in multiple domains of a network or in interconnected SNA networks share data, often without explicit operator action.
- **Hardware Monitor**
The NetView hardware monitor collects and displays alerts, events, and statistical data to assist in identifying failing resources in the network, determining a probable cause, and recommending action for specific problems related to alerts or events. The NetView hardware monitor includes the 4700 support facility (except for VM). Alerts, events, and statistical data collected in other domains that are running NetView or NPDA Version 3 in a multiple domain network or in an interconnected SNA network environment may be displayed.
- **Status Monitor**
The NetView status monitor allows an operator to access network data through an hierarchical set of interactive panel displays. The "domain-at-a-glance" panel, through its associated hierarchy, allows the network operator to view the status of all domain resources.
- **Online Help Facility**
The NetView online help facility provides operator information without requiring the use of the operation reference library. The help facility describes the operation and syntax of commands and CLISTS of NetView's components, SNA sense codes, recommended action codes, and general information. The help facility panels may be customized to provide dynamic network and system information.
- **Help Desk Facility**
The NetView help desk is an online guide that provides problem diagnosis and effective network operation techniques. The help desk also provides a structure that assists network help-desk operators in providing end-user assistance.
- **Network Log and Data Set Browse**
The messages in the network log are chronologically ordered, can be browsed by the operator, and are easily located through a FIND command. Through user specification, messages being flagged by an "important message indicator" may be color coded or highlighted to designate severity, type, or source.

The NetView Browse function allows full screen display of the CLIST library, the NetView and VTAM definition libraries, and other commonly-used libraries that describe the network and system configuration or operational parameters. Data set selection is a customer option at NetView installation time.

Automation Support

NetView provides functional support for operating system, subsystem, and network automation. The support includes:

- **MVS Subsystem Interface (SSI) Support**
NetView for MVS/370 and MVS/XA is defined as a subsystem using the subsystem interface (SSI), which enables NetView to provide the following functions:
 - The ability to issue MVS system and subsystem commands from any NetView CLIST or operator station
 - Remote entry of MVS system commands from a NetView in another domain
 - Access to message attributes, such as job-name, that are associated with messages received on the SSI
 - Support for NetView CLISTs and line-by-line commands entered on an MVS console

NetView scope checking (the ability to restrict operation command access) is provided for MVS and subsystem command verbs.

NetView Release 2 removes the need for the MVS/OCCF licensed program to access the MVS subsystem interface.

For VM systems, function similar to that provided for the MVS subsystem interface is available for messages and commands via the programmable operator (PROP) facility. Interfaces are provided between PROP and NetView to forward information to a remote host console when it cannot be processed locally.

For VSE, NetView uses the facilities provided by the VSE/Operator Communication Control Facility (OCCF).

- **Automation Message Table**
NetView provides the capability to invoke a NetView CLIST or command processor based on any operator message. The NetView automation message table facility extends this support by providing enhanced message parsing and selection capability. The support permits the specification of criteria which must be satisfied before a specified CLIST or command processor will be initiated. The criteria may include the presence of specific message text data, job-id, or other message attributes.
- **Automation Task**
The automation task support provides the ability to respond to operating system, subsystem, and network messages without operator intervention. The task design permits NetView to execute whether or not VTAM is active. The automation task also supports:
 - Multiple concurrent automation tasks
 - Quiescing NetView functions requiring VTAM when VTAM ends
 - Starting NetView functions requiring VTAM, after VTAM becomes active

- The use of MVS WTO and WTOR routing, descriptor codes, and other message processing options within a user-written CLIST, to direct messages and to solicit replies from system operators

- **NetView Commands from MVS Consoles**
NetView commands may be entered on an MVS/370 or MVS/XA console, using the designator character for the NetView subsystem. NetView functions that require the full-screen mode of operation, such as session monitor, status monitor, and many hardware monitor functions, will continue to require a NetView console.

Entry of NetView commands at a VM or VSE console is not supported.

- **Hardware Monitor Alert Automation**
The NetView hardware monitor component provides information in operator alert notification messages to allow a CLIST to be written to automate the operator action that is appropriate in response to the alert.

The NetView Release 2 automation facility, in conjunction with the Inter-System Control Facility and the Inter-System Control Facility/PC program offerings, enable the user to develop automation tasks such as the initialization and restart of a target system.

NetView for VM and VSE provides CLISTs that support message and alert notification routing. The user may tailor the CLISTs to allow important messages and alert notifications to be routed from a distributed system to an operator at a NetView focal point. This enhanced function, along with current NetView facilities, provide the NetView focal point operator with the capability to monitor an unattended system. Based on the message or alert notification, the focal point operator can take appropriate action. NetView automation facilities can be incorporated at both the distributed system and at the focal point.

The NetView CLIST will permit the user to take advantage of the subarea dial capability available in ACF/VTAM for VM and VSE.

NetView message and alert notification routing support for MVS/370 or MVS/XA systems are available via a NetView small programming enhancement (SPE) (first quarter, 1988).

- **DASD Conservation Option**
NetView offers its VM and VSE users a new installation option that conserves DASD space for program library storage by eliminating most panel information. This installation option should only be used in a distributed NetView environment where operator access to the distributed NetView is through a focal point. The NetView operator at the focal point will access session monitor and hardware monitor data at the distributed system using NetView cross-domain services and format

that data using panels from the complete NetView library at the focal point.

This option continues to provide local NetView operator support at the distributed system for the NetView browse facility.

- **Generic Alerts**

A generic alert is a Systems Network Architecture (SNA) format of the network management vector transport (NMVT) record. The generic alert record contains code points that are used to identify a failure, its causes, and the actions to correct or further isolate the failure. The NetView hardware monitor component processes the generic alert record by converting the code points to text and displaying the text, on its alert, event, and recommended action displays.

The use of generic alerts enhances problem analysis by enforcing standard terminology in the reporting and procedures to correct problems. The use of generic alerts eliminates the need to maintain a library of product-specific descriptions and panels.

In support of IBM's open network management (see Section 20), the NetView hardware monitor provides a facility for user-specified code point text tables. This feature allows a user to create an alert that may contain both IBM-architected code points and user-defined code points. The hardware monitor will process the user-created generic alert, accessing both the IBM- and user-created text tables.

Generic alerts are also supported by NetView/PC.

- **Service Point Command Service**

The NetView command facility enables NetView to exchange requests and replies with a service point. NetView/PC is an implementation of the service point concept.

The NetView service point command service (SPCS) enables the network operator to enter commands from the NetView host to be executed by an application program at the service point.

The NetView SPCS commands are supported by NetView/PC.

- **Session Monitor SNA Type 2.1 Node Support**

The NetView session monitor with ACF/VTAM provides session support for primary logical units (PLUs) that are not in the VTAM Host, an SNA Type 2.1 (T2.1) node support feature.

- **Communications Network Management (CNM) Router Function**

The NetView CNM router function centralizes the routing of unsolicited CNM data in the command facility. Unsolicited network management vector transport record (NMVT) data and other records, for example, RECMS and RECFMS, are directed to a NetView component based on the identification in the record. The user can intercept all data by specifying an exit on the CNM router task definition, or may intercept the data under responsible

subtasks by writing a communications network management interface (CNMI) input exit or an unsolicited command processor.

- **Message-Driven Alerts**

NetView provides the user with the ability to create an alert based on any system, subsystem, or network message that is received by the command facility. Through normal hardware monitor processing, the alert may be stored in the hardware monitor data base and displayed on the alerts dynamic display.

- **Local Area Network (LAN) Support**

The NetView hardware monitor support for LAN data has been enhanced to include the logging of fault domain alerts, the display of LAN errors based on adapter addresses, and filtering based on adapter addresses and adds support for the following products that transmit LAN-related error data:

- System/36
- IBM LAN Manager
- VTAM Support of the 9370 Token-Ring Subsystem Controller
 - VTAM Version 3 Release 1.2 and Version 3 Release 2 for VM
 - VTAM Version 3 Release 2 for VSE
- 3174 Subsystem Control Unit
- VM/SP 9370 Token-Ring Alert Support
- IBM PC 3270 Emulation LAN Management Program

A fault domain is used to isolate a failure to that part of the LAN located between two adapters. The hardware monitor identifies the addresses of the two adapters, provides a cross-reference between the adapters and the SNA resource identified in the failure record, and makes available a recommended action display to aid the user in recovering from the failure.

The hardware monitor uses its cross-reference between adapters and SNA names when the user requests a total events or most recent events display based on an adapter address. For the total events display, the hardware monitor will provide a count of all records in the events data base in which the specified adapter was identified. For the most recent events display, the hardware monitor will display the associated event descriptions.

A hardware monitor filter option permits the logging of data based on the adapters identified in the input record. The adapter filter is used to control both which records are stored in the hardware monitor data base and the content of the adapter cross-reference.

- **Hardware Monitor CNMI Time-Out Function**
NetView hardware monitor has been enhanced to provide an automatic time out when a response to a command that solicits data from a resource is not received. The time out allows the operator to continue entering hardware monitor commands without having to first terminate the hardware

monitor session. The time interval used for the time-out function can be modified when installing NetView.

NetView Tutorial

Learning about NetView is an interactive tutorial on diskette. Using color graphics, animation, and NetView simulation, the tutorial shows operators and administrators how NetView can be used to manage the network.

The NetView tutorial runs on an IBM Personal Computer.

Primary Users

- Customers who have data communications networks installed or planned and who use, or are candidates, for using VTAM
- Customers interested in improving the operation of their computer installation (especially, those customers who have a significant number of terminals), or who have multiple SNA domains

Potential Benefits

Overall reduction of operational costs and improvement of system availability.

Prerequisite Products

Hardware

NetView for MVS/XA, MVS/370, VM, and VSE are designed to run in a virtual storage environment in any IBM system configuration with sufficient storage that supports:

- MVS/XA and ACF/VTAM for MVS/XA, or
- MVS/370 and ACF/VTAM for MVS/370, or
- VM/SP, VM/SP HPO, or VM/XA and ACF/VTAM for VM/SP, or
- VSE/SP and ACF/VTAM for VSE

Software

NetView is designed to run as an application on ACF/VTAM.

- NetView for MVS/XA* will operate on MVS/XA (MVS/SP Version 2).
- NetView for MVS/370* will operate on MVS/370 (MVS/SP Version 1), or on MVS/XA (MVS/SP Version 2) in 24-bit mode.
- NetView for VM will operate on VM/SP with or without High Performance Option (HPO) or on VM/XA SP in 24-bit mode.
- NetView for VSE will operate on VSE/Advanced Functions.

*NetView is installed as an MVS subsystem.

The NetView SNA Type 2.1 node support requires ACF/VTAM and NCP for 3720 or 3725.

NetView for VM and NetView for VSE require VSE/VSAM.

For processing system messages and certain automation tasks – for example, VTAM initialization and restart – in a VSE environment, the VSE/Operator Communication Control Facility (OCCF) is required.

Products Supported

Hardware

- Any 3270 terminal with a keyboard and at least a 1920-character screen size as a communications network operator station
- Light pen input on selected items and color display output

Software

NetView operators may control Teleprocessing Network Simulator (TPNS) networks using the TPNS/NetView Operator Interface provided by TPNS. Communication between TPNS and NetView is accomplished via an ACF/VTAM session between TPNS and the NetView DST (data services task).

The NetView operator can access, through the terminal access facility, these IBM products and facilities:

- CICS/VS
- IMS/VS
- Host Command Facility
- VM/SNA Console Support (VSCS) facility of ACF/VTAM
- TSO and TSO/E
- ACF/System Support Programs (SSP) for 3710 configuration data
- ACF/TCAM
- Distributed Systems Executive (DSX)
- Network Performance Monitor (NPM)
- Cross-domain NetView systems

NetView Release 2 provides the same level of support as NetView Release 1 and NPDA Version 3 for Information/Management Version 2 (MVS only). NetView Release 2 provides the same level of support as NetView Release 1 and NCCF Version 2 for:

- MVS/Operator Communication Control Facility
- Information/Systems Version 1 Release 2
- VM Programmable Operator Facility
- 3728 Matrix Switch Host Facility

NetView

Ordering Information

NetView for MVS/XA

Program number: 5665-362

NetView for MVS/370

Program number: 5665-361

NetView for VM

Program number: 5664-204

NetView for VSE

Program number: 5666-343

Reference Material

- Systems and Network Operations Automation Using NetView Release 2, GG22-9112
- NetView General Information and Planning, GC30-3463
- IBM Personal Computer tutorial diskette, Learning about NetView, SK2T-0292
- Network Program Products General Information, GC30-3350
- Network Program Products Planning, SC30-3351
- Network Program Products Bibliography and Master Index, GC30-3353
- NetView Licensed Program Specifications, VSE, GC30-9602

Integrated Network Management Products

Products Included

- NetView/PC
- NetView/PC ROLM Alert Monitor
- NetView/PC ROLM Call Detail Collector
- NetView/PC IDNX Alert Monitor
- NetView/PC and IBM LAN Manager
- IBM PC 3270 Emulation LAN Management Program

Main Purpose

Architected end-to-end network management includes components of SNA as well as non-SNA networks. NetView™ and its related product line can provide the necessary hardware and software to manage data, voice and integrated voice/data networks. This extension of the CNM tools provides an integrated view for network management that spans both data and voice networks from a centralized control point.

NetView/PC

NetView/PC is an extension of the NetView communication network management (CNM) services to support IBM LANs, voice networks (CBX, PBX), non-SNA and non-IBM communication devices. It provides a means of forwarding generic alerts to NetView and of exchanging formatted commands between NetView and NetView/PC device-dependent applications.

NetView/PC represents the first implementation in IBM's Open Communication Architectures strategy. It provides the capability to satisfy the multivendor, end-to-end network management requirement. NetView/PC makes it possible for a system/network control center based on the use of NetView to be able to manage not only data network devices, but also devices in voice networks and integrated voice/data networks.

In addition, NetView/PC provides an interface for application software to include in SNA network management CBXs, PBXs, LANs, statistical multiplexers, T1 multiplexers, and other non-SNA components supporting voice and/or data. The Application Programming Interface/Communication Services (API/CS) allows the extension of CNM services to non-IBM devices.

Program number: 5669-024

Reference material: *Licensed Program Specifications*, GC30-9600; *NetView/PC API/CS Reference Manual*, SC30-3313

NetView/PC ROLM Alert Monitor

NetView/PC ROLM Alert Monitor is a NetView/PC application that integrates problem determination for IBM and ROLM CBXs into IBM's comprehensive network management system. The Alert Monitor provides service point functions for IBM and ROLM CBXs, periodically polling CBXs for their error tables, processing alerts, and optionally transmitting the processed alerts to NetView.

The ROLM Alert Monitor supports IBM and ROLM CBXs Releases 7, 8004, 9004.0, 9004.1, 9004.2, and NetView/PC. Version 1.2 of the ROLM Alert Monitor, available in second quarter, 1988, adds the IBM 9751 CBX and Redwood Model II systems to the list of products supported. Dial or direct connections are periodically scheduled between the NetView/PC and the CBX for the retrieval of the CBX error tables. Error categories include data errors, telephony errors, and T1 errors. If the Automatic Facilities Test System (AFACTS) feature is installed on the CBX, the errors detected by AFACTS will also be processed as alerts.

Alerts are formatted using Network Management Vector Transport (NMVT) protocols. Alerts are stored and displayed locally on the NetView/PC or optionally transmitted to NetView. Version 1.2 of the ROLM Alert Monitor, available in second quarter, 1988, allows for editing of the Alert Monitor error description file.

ROLM Alert Monitor is ordered by ROLM.

Reference material is available from an IBM/ROLM systems branch office.

NetView/PC ROLM Call Detail Collector

The ROLM Call Detail Collector is a NetView/PC application that dials out on a scheduled basis to Call Collector 3 pollable storage devices attached to IBM and ROLM CBXs or other PBXs. The call detail records (CDRs) are retrieved and stored on NetView/PC. Up to ten CBX/PBXs may be supported for CDR collection from one NetView/PC. ROLM Call Detail Collector supports NetView/PC.

In addition to remote retrieval, one IBM or ROLM CBX may be directly connected to the NetView/PC. With direct connection, CDRs are passed to the Call Detail Collector as they are created by the CBX.

On a scheduled basis, the CDRs are transmitted to a host processor using the CICS/DDM transaction program or 3780 RJE emulation program. The records are then available at the host for billing, analysis, and network design applications.

ROLM Call Detail Collector is ordered by ROLM.

Integrated Network Management Products

Reference material is available from an IBM/ROLM systems branch office.

NetView/PC IDNX Alert Monitor

The IDNX Alert Monitor is a NetView/PC application that centralizes monitoring of IDNX network status and performance at the NetView console in an IBM SNA environment. It provides conversion of IDNX alarms and events into SNA-defined alerts.

At initial installation, the customer has a choice of using default information on how alerts and alarms are collected or customizing how the information is collected. If customization is preferred, the user can select which alarms to collect, what nodes to collect them from, which alerts to display at the NetView console, and how often the events and alarms are to be polled.

NetView/PC and IBM LAN Manager

The IBM LAN Manager is designed to execute as an application under control of NetView/PC or as a standalone program. It supports the IBM Token-Ring Network and the IBM PC Network (broadband). The LAN Manager runs on a dedicated PC under PC DOS 3.3.

In the Token-Ring Network environment, the LAN Manager incorporates all the functions of the Token-Ring Manager Version 1.1, which provides problem determination and error recovery assistance for single-ring networks. It also provides alert forwarding to a CNM (communications network management) System/370 host through NetView/PC. The LAN Manager extends these capabilities to multiring networks (in conjunction with the IBM Token-Ring Network Bridge Program) and offers a single point of control for bridges and rings in the network.

LAN Manager support for the PC Network (broadband) is designed to run under NetView/PC or as a standalone program. It provides a set of functions to manage a station, using the IEEE 802.2 logical link control (LLC) protocol in a single-bus network. These functions include problem determination, problem reporting, and critical device lost notification. As an application of NetView/PC, alerts also can be sent to a CNM host.

IBM PC 3270 Emulation LAN Management Program

The IBM PC 3270 Emulation LAN Management Program provides small and remote Token-Ring Networks or PC Networks (with no LAN Manager program) the capability for centralized network management. The program, residing under an IBM PC 3270 Emulation Program gateway, monitors the LAN for error conditions and provides automatic alert forwarding to a NetView host.

- Accumulates soft error information for the Token-Ring Network
- Monitors the Token-Ring Network for hard errors
- Monitors the PC Network for hot carrier, no carrier
- Builds LAN-related alerts for transport to NetView

NetView™/Access Services

Main Purpose

NetView/Access Services (NetView/Access) is a Multiple Virtual Storage (MVS) licensed program that enables users of an SNA network who are connected to NetView/Access to use a number of Virtual Telecommunication Access Method (VTAM) applications concurrently from a single terminal. NetView/Access protects the network and applications against unauthorized use and performs automatic logon to, and logoff from, those applications the user is authorized to access, based on user profiles.

NetView/Access, together with SAMON, is designed to extend the scope of IBM's NetView family of communication network management products to the area of application access services.

NetView/Access and SAMON provide an interface to each other, allowing NetView/Access users to selected SAMON functions.

Key Functions, Facilities and Features

- Single access control to the SNA network and to applications: NetView/Access provides access control to the network and to applications, verifying a user's identification (user-id and password) prior to granting access. NetView/Access has a single logon procedure. This procedure provides the means to control access to all the applications, and is referred to as "single access control."

RACF or an equivalent security management program is used by NetView/Access to verify a user's id and password.

- Automated logon to, and logoff from, applications based on user profiles: NetView/Access performs automatic logon to, and logoff from, applications. All steps required to gain access to applications are performed by NetView/Access.

Some applications may need a greater degree of security, and therefore will not allow an automatic logon. In these cases, NetView/Access can prompt the user to log on manually.

- Multiple concurrent application sessions at a single terminal: NetView/Access enables users to work with a number of applications concurrently from a single terminal when working with applications in relay mode.

In these cases, the terminal is connected to NetView/Access, and NetView/Access is, in turn, connected to each of the applications.

- Multi-terminal sessions by the same user: Normally, a user is restricted to one terminal at a time. There are, however, end-users having the

need to use the same applications from more than one terminal at the same time without wanting to log off and then log on each time.

NetView/Access allows authorized users to be logged on at more than one terminal at a time. However, only one of the terminals can be active with a specific application at any time.

- User access administration: User access administration is supported through structured administrator functions and panels.

The NetView/Access system administrator defines the applications that can be used through NetView/Access, as well as relevant procedures for automatic logon and logoff.

- Productivity/ease-of-use functions:
 - Terminal lock: It is possible to disconnect from NetView/Access and keep one or more sessions active. When logging on again, the user is prompted for the user-id and password and, after positive verification, is reconnected with all sessions.
 - Session transfer: Specifically authorized users can transfer active sessions from one terminal to another by logging on to NetView/Access from that other terminal.
 - Screen copy: The content of fields of one screen can be copied into fields of another screen within either the same application or a different one.
 - Resource sharing: Shared access control blocks (ACBs). For example, if 10 users want to connect to TSO, they can all use the same ACB.
 - Operating facilities
 - Starting and stopping traces
 - Terminating system immediately
 - Terminating system in quiesce mode

NetView/Access-SAMON Interface

Through the NetView/Access-SAMON interface the following SAMON functions are available to the NetView/Access users:

- Display application status: A pseudo application, STATUS, can be defined to the NetView/Access selection menu. When a user selects this application, control will be passed to SAMON and the SAMON application status panel will be displayed to the NetView/Access user. This panel displays the status of all active and all inactive applications in the network that the particular user is authorized to see.
- Display application information: The NetView/Access-SAMON interface allows a NetView/Access user direct access to the SAMON application information panel. If, for example, a

NetView/Access Services

NetView/Access user wants to get information on a specific application displayed on the NetView/Access selection menu, the appropriate command can be entered.

- Display network news: The NetView/Access-SAMON interface allows a NetView/Access user direct access to the SAMON network news panel. If, for example, a NetView/Access user wants to get general information about the entire network, the appropriate command can be entered on the NetView/Access selection menu.
- Select a user's "home" NetView/Access: The NetView/Access-SAMON interface allows selection of a user's "home" NetView/Access via a SAMON node overview panel (a variation of the SAMON application status panel). This capability is useful when the user is working at a location other than his home location.

Security

NetView/Access has several complementary functions that enable a customer to choose the desired level of security. In order to use these functions, a suitable security handler, such as RACF, must be installed.

- Control of user-profile access: Different classes of users can have different change and update privileges authorized by NetView/Access.
- Different levels of automated logon to applications: NetView/Access permits users to choose the level to which logon procedures are automated. These levels are:
 - NetView/Access performs the whole logon sequence.
 - NetView/Access performs all of the logon sequence except for the password, which the user enters manually.
 - NetView/Access performs no automatic logon. The user logs on manually.
- Automated logoff
- Password protection
- Timing out: There are a number of ways users can be timed out from an application, or from NetView/Access. A time out causes a user to be logged off without requesting it. This prevents users' information from being displayed for a long period of time when they are called away from the terminal.

Primary Users

Customers using data communications with MVS VTAM, particularly customers with a significant number of terminals or with multiple SNA domains

Potential Benefits

- Easy switching among applications
- Reduced workload for users using automated logon
- Improved security procedures

Prerequisite Products

Hardware

- Processors

NetView/Access supports all IBM processors compatible with MVS/SP

- Display Stations

NetView/Access supports all information display systems belonging to the 3270 family and having 24 rows and 80 columns, or display systems emulating the 3270 data stream with a display format of 24 rows and 80 columns. All display systems must be supported by VTAM.

- DASD Devices

NetView/Access supports all DASD devices compatible with MVS/SP.

Software

- Operating Systems

NetView/Access is available for operation under the following operating systems:

- MVS/SP-JES2 Version 1 or 2
- MVS/SP-JES3 Version 1 or 2

NetView/Access runs under MVS/XA in 31-bit addressing mode.

- Telecommunication Access Method

NetView/Access operates under ACF/VTAM.

- Resource Access Control

NetView/Access requires Resource Access Control Facility (RACF) Release 1.6 or later or an equivalent resource access control program to provide security.

Ordering Information

Program number: 5665-365

Reference Material

Licensed Programming Specifications, GH12-5284
Using NetView/Access, SH12-5193
NetView/Access Administration, SH12-5194
Installing and Operating NetView/Access, SH12-5195

SNA Application Monitor (SAMON)

Main Purpose

SNA Application Monitor (SAMON) is an MVS licensed program that enables terminals to display the status of all VTAM applications within a network and to connect the terminal to one of the applications. In addition, SAMON provides the end-user with status information about both an individual application and the entire network.

NetView™/Access together with SAMON is designed to extend the scope of IBM's NetView family of communication network management products to the area of application access services.

NetView/Access and SAMON provide an interface to each other, allowing NetView/Access users access to selected SAMON functions.

NetView/Access and SAMON can be installed separately. To provide maximum benefit from their complementary functions, and to take full advantage of all their functions and facilities, these two products should be installed together.

Key Functions, Facilities and Features

The SNA Application Monitor (SAMON) is a network solicitor and a network monitor running under MVS/370 or MVS/XA in an ACF/VTAM-based single- or multiple-system SNA network. SAMON provides the end user with one single window to the network.

- SAMON transmits an application status panel to every terminal in the network. This panel shows the current status (online or offline) of all VTAM applications. This facility is independent of application residence (local or cross-domain) and the operating system under which the application is running.
- It makes connecting terminals to the applications easier.
- SAMON's broadcast facility allows the network operator to send immediate messages to all SAMON terminals.
- A TP news facility for displaying general network information is included.
- An application news facility to provide additional information of each application, including those that are not active, is provided. The availability of such a panel for an application is indicated on the application status panel, and can easily be retrieved by entering the application name followed by the word INFO.
- User Exits can be used to restrict unauthorized access to the network and to control connections to applications for resource control.
- SAMON offers an ease-of-use tool for the logical re-configuration of the application network. Fallback applications can be predefined in the

SAMON startup data set, or entered from an authorized terminal, and automatically invoked by SAMON, if the original application is down.

- Multiple SAMONs in a multiple system environment can exchange the status information of those applications they monitor and thus reduce the system impact of cross-domain inquiries.
- SAMON's national language support makes it possible to translate messages and panel texts.
- Statistical information, collected by SAMON about application usage and terminal connection, provides useful planning information.
- Application information texts need only be maintained in one place.
- SAMON provides an interface to NetView/Access, giving NetView/Access users access to selected SAMON functions.

NetView/Access-SAMON Interface

Through the NetView/Access-SAMON interface the following SAMON functions are available to the NetView/Access users:

- Display application status: A pseudo application, STATUS, can be defined to the NetView/Access selection menu. When a user selects this application, control will be passed to SAMON and the SAMON application status panel will be displayed to the NetView/Access user. This panel displays the status of all active and all inactive applications in the network that the particular user is authorized to see.
- Display application information: The NetView/Access-SAMON interface allows a NetView/Access user direct access to the SAMON application information panel. If, for example, a NetView/Access user wants to get information on a specific application displayed on the NetView/Access selection menu, the appropriate command can be entered.
- Display network news: The NetView/Access-SAMON interface allows a NetView/Access user direct access to the SAMON network news panel. If, for example, a NetView/Access user wants to get general information about the entire network, the appropriate command can be entered on the NetView/Access selection menu.
- Select a user's "home" NetView/Access - The NetView/Access-SAMON interface allows selection of a user's "home" NetView/Access via a SAMON node overview panel (a variation of the SAMON application status panel). This capability is useful when the user is working at a location other than his home location.

SNA Application Monitor (SAMON)

Security

Since SAMON can be installed independently from NetView/Access it provides several levels of security itself. The customer can choose the security level that is required by the installation.

- SAMON can restrict access to the user-application network through the use of a network password. This security option as well as the password itself can be set when SAMON is initialized and changed while SAMON is operating.
- SAMON can also restrict access to specific terminals through the use of a terminal password. This may be useful for restricting access to authorized terminals.
- For installations that have a security facility, for example, the IBM licensed program RACF, SAMON provides an interface to a user-written routine. This routine gets control when a user connects to SAMON. The routine determines whether a user is authorized to access the network.
- For restricting access and passing logon data to the various applications, SAMON provides a second interface to a user-written routine. This routine gets control whenever a user connects to an application. The routine checks the name of the terminal and the passed logon data. Then it either passes the logon data to the desired application or it rejects the logon.

Primary Users

MVS-ACF/VTAM users with multiple VTAM applications

Potential Benefits

- One single "window" into an application network for the end user
- End-user information facilities for scheduled and unscheduled events

Prerequisite Products

Hardware

- Processors

SAMON supports IBM processors compatible with MVS/SP.

- Display Stations

SAMON supports all information display systems belonging to the 3270 family and having 24 rows and 80 columns, or display systems emulating the 3270 data stream with a display format of 24 rows and 80 columns. All display systems must be supported by VTAM.

In addition, SAMON supports the 5550 family (as 3270) for DBCS languages such as Kanji.

- DASD Devices

SAMON supports DASD devices compatible with MVS/SP.

Software

- Operating Systems

SAMON is available for operation under the following operating systems:

- MVS/SP-JES2 Version 1 or 2
- MVS/SP-JES3 Version 1 or 2

SAMON runs under MVS/XA in 24-bit addressing mode.

- Telecommunication Access Method

SAMON operates under ACF/VTAM.

Ordering Information

Program number: 5665-345

Reference Material

SAMON General Information Manual, GH12-5160

NetView™ File Transfer Program

Main Purpose

NetView File Transfer Program is a member of the NetView family of communications network management programs. This program provides high-performance bulk data transfer between SNA/370 systems.

NetView FTP MVS BASE is an interactive program with enhanced functions, such as application program interface, request queuing, and user exits.

Key Functions, Facilities and Features

- File-to-file transfer without spooling
 - Batch interface
 - File handler for:
 - Sequential disk, labeled and unlabeled tape (queued sequential access method (QSAM))
 - Single PDS members (QSAM)
 - Virtual storage access method (VSAM) entry sequenced data set (ESDS), VSAM keyed sequenced data set (KSDS) with different options
 - Any data type through file handler user exit facility
 - Checkpoint/restart
 - Automatic session recovery
 - Data compression
 - Dynamic allocation of new and existing data sets
 - Dynamic data security
 - Up to 32K request unit (RU) sizes, automatically adjusted to Network Control Program (NCP) capacity
- In NetView FTP MVS BASE the following enhanced functions are implemented:
- Operation modes:
 - Asynchronous file transmission request submission and queuing
 - Central control over transmission requests via NetView FTP MVS queue handler
 - Request execution by independently started NetView FTP MVS servers
 - NetView FTP MVS servers run for any number of locally or remotely initiated transmissions
 - Parallel transmissions:
 - On one NetView FTP MVS server two transmissions running in parallel (one locally and one remotely initiated)
 - Request queuing:
 - DASD resident request queue
 - Nine request classes for file transfer requests
 - Requeuing facility in case of transmission interrupts
 - Servers supporting requests from one or more classes
 - New user interfaces for file transfer requests:

- Interactive interface based on Interactive System Productivity Facility (ISPF)
- NetView FTP MVS application program interface
- Operator commands:
 - START/STOP – NetView FTP MVS queue handler
 - START/TERMINATE DELAYED/TERMINATE IMMEDIATE – NetView FTP MVS server
 - DISPLAY status of NetView FTP MVS components
 - START/STOP internal trace in NetView FTP MVS queue handler
- TSO-user notification:
 - Single message with result from transmission
 - NetView FTP MVS REPORT file with transmission statistic messages
- Reducing amount of control statement specification:
 - System-wide parameters specified as initialization control statements for the queue handler and server
 - Dynamic allocation of target file based on the source file characteristics
 - Remote NetView FTP MVS identified by node id, which represents a set of NetView FTP MVS logical unit (LU) names on the remote node
 - Reusable file transfer requests, saved in ISPF tables
- User exits:
 - Request-queue user exit
 - Preparation user exit (pretransmission activities, such as security checking)
 - Completion user exit (posttransmission activities, such as accounting)
 - File handler user exit (data types that are not directly supported)
- Security:
 - VSAM password protection
 - Creation of an RACF environment for a transmission (depending on user-specified parameters)
 - Password encryption in file transmission request
 - Request-queue user exit and preparation user exit
- Statistics/accounting:
 - NetView FTP MVS server log file (all NetView FTP MVS messages issued during a server's run time)
 - NetView FTP MVS server report file (all NetView FTP MVS messages issued during one transmission)
 - NetView FTP MVS queue handler log file (documents all queue handler commands)
- Connectivity/compatibility:
 - FTP Version 2.2 MVS/VSE/VM functions supported

NetView File Transfer Program

- The FTP Version 2.2 MVS/VSE/VM programs require a compatibility Program Temporary Fix (PTF) for connectivity to NetView FTP MVS.
- National language support for Kanji

NetView FTP MVS AFF contains all of the NetView FTP MVS BASE functions plus the following additional functions:

- PDS support:
 - Send or receive an entire PDS
 - Send or receive one member of a PDS
 - Send PDS members with new names, if specified
 - Exclude sending members from a PDS
- Dynamic creation of VSAM target cluster
- Selective use of compression/compaction:
 - No compression
 - Standard compression/compaction
 - Extended compression/compaction
 - Adaptive compression/compaction
- Parallel transmission:
 - Up to 99 NetView FTP MVS AFF servers
 - Each server capable of 32 file transmissions simultaneously
- Variable blocked spanned (VBS) records support with QSAM
- Transmission statistics written to SMF data set
- Checkpoint/restart records written by time interval
- Administrator and operator authority extended

Primary Users

Customers with large networks and high transmission rates. NetView FTP MVS AFF provides high-performance capability and high link utilization by using parallel transmissions and very efficient compression/compaction routines, thus saving link cost for the customer.

Examples of potential users:

- Banks, to exchange financial data between central site and branch offices, or between a bank institution and a clearing bank
- Manufacturing companies, to exchange production data between different plants or between a company and their suppliers
- High-technology design departments, to swap large amounts of technical data between remote locations and central sites where simulations can be run. Conversely, returning results to original data sources.
- A data processing center, to send data from the test system to the production system, or from the production system to a security data processing center (backup copies for vital data)
- A larger node with operator support that could be used to copy disk datasets from smaller nodes without operator handling

Prerequisite Products

Hardware

- Any System/370, 303X, 308X, 309X, or 43XX that can run the required software

Software

One of the following pairs of program products:

- MVS/SP-JES3 Version 1 and ACF/VTAM
- MVS/SP-JES2 Version 1 and ACF/VTAM
- MVS/SP-JES3 Version 2 and ACF/VTAM
- MVS/SP-JES2 Version 2 and ACF/VTAM

All of the following program products:

- ISPF Dialog Management Services
- ISPF PDF
- TSO/E

If NetView FTP MVS is to use functions provided by RACF, the user has also to install RACF.

Ordering Information

Program number: 5665-487

Reference Material

General Information Manual, GH12-5480

NetView™ Performance Monitor (NPM)

Main Purpose

The NetView Performance Monitor is a licensed program designed to provide extensive facilities to assist the ACF/VTAM customer using MVS VTAM or VM VTAM and NCP in managing the performance of a communications network. Using realtime monitoring of networks and color graphics displays, the NetView Performance Monitor aids in timely identification of performance problems in the network and in tuning the network for improved performance. In addition, the NetView Performance Monitor's data-collection facilities provide the customer with the information necessary for efficiently managing network resources and planning for future growth.

Key Functions, Facilities and Features

- Transit time analysis
- Online alerts based on user-specified thresholds
- Dynamically-refreshed monitor graphs
- Measurements taken in VTAM and NCP:
 - Volume data – for capacity planning
 - Performance data – for problem determination
 - Utilization data – for trend analysis
- Identification of network bottlenecks
- Color graphics for current or historical data
- User-tailored archive/restructure capability for data bases
- Automatic data collection capability
- Interactive, menu-driven monitoring and display
- Online help displays
- Online data storage for immediate or later retrieval
- SMF management function
- Response Time Monitor (RTM) data analysis
- MVS/XA virtual storage constraint relief
- NetView Performance Monitor-to-NetView Performance Monitor communication
- Three levels of security
- Definite response handling for TSO
 - Fast path between screens
 - Support for multiple screen sizes
 - New commands
 - User profile and security profile support
- Dynamic network collection
- Increased number of data files

Primary Users

NPM is designed to be used by individuals who work in network operations:

- Network operators
- Systems programmers

- Network and host capacity planners
- Network managers

Potential Benefits

NPM can benefit the operation of a network through:

- A graphic operator alert to performance problems
- The availability of accurate response time and volume data, which enables long-term network planning and helps minimize crisis situations
- The provision of separate response times for the host (application) and network components, which permits the source of a performance problem to be pinpointed more accurately
- Collection of data for a variety of resources and workload conditions, which allows the user to analyze patterns of performance in order to describe and isolate a performance problem
- The ability to collect and view current volume and response time data, which improves the accuracy and speed at which problem resolution can occur
- The capability for color graphics presentation of the data for online and printed report use with the optional NPM Graphics Subsystem
- Direct dollar savings due to reduced costs and increased efficiency of the network – specifically:
 - Improved performance of the network and personnel productivity
 - Reduced manpower requirements
 - More cost-effective use of network components because accurate volume and response-time data may often provide the option to change network configuration rather than purchase additional hardware
- Integration of the main functions of the following IBM Extended Support Field Developed Programs:
 - Network Performance Analyzer (NPA)
 - VTAM Performance Analysis Reporting System (VTAMPARS II)

Prerequisite Products

Common Programming Requirements for MVS and VM

- NPM is written in System/370 Assembler language.
- The Network Data Collection and Analysis portion of the NetView Performance Monitor is supported for any 3705, 3720, or 3725 communications controller that contains either one of the following:
 - A supported version of the Network Performance Analyzer (NPA)
 - Controller field-developed program and ACF/NCP Version 1, Release 2.1 or Release 3, or

NetView Performance Monitor (NPM)

- ACF/NCP Version 2 or later (these versions include integrated NPA data collection functions)
- Optional software products, which enable use of all NetView Performance Monitor functions, are:
 - Graphical Data Display Manager (GDDM) and Presentation Graphics Feature (PGF). These products enable the NetView Performance Monitor operator to use the graphics facility.
 - NPA – Controller or ACF/NCP Version 2, 3, or 4. One of these products must be installed in order to collect network data.
 - Sort/Merge Utility to enable rebuilding files

MVS Programming Requirements

- The NetView Performance Monitor – MVS is supported in MVS/370 and MVS/XA operating system environments. The following programs are used during installation, execution and maintenance of the NetView Performance Monitor – MVS:
 - MVS/370 (MVS/SP Version 1) for System/370 and MVS/XA (MVS/SP Version 2) for System/370 Extended Architecture
 - VSAM
 - ACF/VTAM Version 2 Release 1 or later releases
 - RACF
 - System Modification Program (SMP) or System Modification Program/Extended (SMP/E)

VM Programming Requirements

- The NetView Performance Monitor – VM is activated as a started task in a group control system (GCS) machine. The following programs are used during installation, execution, and maintenance of the NetView Performance Monitor – VM:
 - VM/SP with or without VM/SP HPO
 - VSAM
 - ACF/VTAM Version 3 or later releases
 - Installation Feature program product (INSTFPP Exec)

Ordering Information

NetView Performance Monitor (for MVS)

Program number: MVS 5665-333

NetView Performance Monitor (for VM)

Program number: VM 5684-001

Reference Material

General Information Manual, GH20-6359

NetView™ Distribution Manager (NetView DM)

Main Purpose

NetView Distribution Manager (NetView DM) provides services for centrally-controlled data distribution and the implementation of software changes in SNA networks composed of a variety of distributed/departmental systems.

NetView DM operates under MVS/XA, MVS/370, or VM/SP (with or without VM/SP HPO). Similar functions are provided for VSE by DSX (see product description elsewhere in Section 43).

NetView DM is part of IBM's strategy for providing central-site services for managing SNA communication networks. In addition to data object distribution services, it provides the ability to control operations through the initiation of required network and software change management JOBS/CLISTS/EXECs, and allows customer control of its distributed data processing operations.

NetView DM complements NetView and IBM products by providing installation management services and is a tool for customers to centrally schedule and control selected data processing operations throughout their networks.

Key Functions, Facilities and Features

Central Control

NetView DM assists the user in centrally controlling data object distribution and in implementing software changes in SNA networks composed of a variety of distributed/departmental systems. To perform this task, NetView DM provides the following functions:

- **Central Repository.** With this function, the customer may:
 - Store and track data objects
 - Define and track software objects
 - Identify and authorize central-site users of NetView DM
 - Store transmission plans.
- **User Interfaces.** These interactive and batch interfaces allow:
 - Definition and execution of transmission plans for sending or retrieving objects from nodes and for implementing at nodes
 - Tracking of plan operation
 - Maintenance and security authorization

Usability facilities for ease of use in operation, transmission plan preparation, maintenance procedures, and security procedures are also provided.

Components

NetView DM is structured into the following three major components:

- **Generalized Interactive Executive (GIX).** GIX provides an online interface for defining, validating, and submitting transmission plans for execution. It allows tracking of execution progress and results, performs NetView DM file maintenance and authorization profiles, and prints reports. Some of these functions are performed by NetView DM batch utilities, which are automatically invoked by GIX.
- **Transmission Control Program (TCP).** The TCP performs all plan-requested transmission functions and recovery operations (if required) and updates the central repositories with plan execution and node resource status.

An optional Interactive Operator Facility (IOF), which allows the operator to control transmission operations and respond to abnormal transmission situations, is available. In MVS/370 and MVS/XA environments, an operator in session with NetView may access IOF through the Terminal Access Facility (TAF).

- **Batch Utilities.** NetView DM provides batch utilities that prepare user data for sending or receipt and define, validate, and submit transmission plans for execution. They also perform NetView DM file maintenance, print reports, and prepare statistical information.

These components must all run on the same system, even in a shared DASD environment. Under MVS/370 or MVS/XA, they can run concurrently.

Improvements

NetView DM provides functional improvements over DSX Version 3 Release 2 in the following areas:

- **Transmission scheduling for:**
 - Phase cut-off date and time parameters
 - Initiate CLIST function restart
 - Definition of recursive plans for a group of nodes
- **Improved switched-line support**
- **Operation control**
 - Allows more than one control operator by running multiple concurrent TCPs on the same MVS/370 or MVS/XA system
 - Optionally routes TCP messages via MVS System console and MVS/OCCF to NetView which performs automated error-recovery actions

NetView Distribution Manager (NetView DM)

- Authorizes delete phase command
- Quiesces transmission for nodes or node groups
- Displays reason for phase hold
- Tracking
 - Displays transmission function names with a return code not equal to 0 independently of their plan
 - Provides additional resource type and name selections when browsing resource tracking information
- Resource management
 - Displays resource disposition
 - Deletes resource with "delete" disposition when current transmission function ends
- Batch utilities
 - Logically deletes a plan
 - Lists unsuccessful plans
 - Deletes resource definition
- System/36 nodes
 - Supports compression/decompression
 - Resynchronizes when sending and retrieving System/36 data
 - Releases phase remotely to allow node-controlled initiation of resource transmission to or from the host
- IOF and GIX usability

Supported Distributed/Departmental Processors

NetView DM communicates with the following nodes through SNA LU0 protocols:

- IBM processors using VM with VM/DSNX
- System/36 intermediate node
- System/36 connected through a System/36 intermediate node
- System/36 directly connected to the host
- Personal Computers using PC/DOS connected to the host via a System/36 intermediate node
- Personal Systems/2 using PC/DOS connected to the host via a System/36 intermediate node
- 4680 Store System Processors running under 4680 OS Version 1 Release 3
- IBM processors running under control of the VSE operating system with VSE/DSNX
- Series/1
- 9370 running DPPX/370
- Personal Computers attached to the Series/1 via Series/1-PC Connect

Primary Users

SNA network users. This includes those who have a host system running under MVS/XA, MVS/370, or VM/SP (with or without VM/SP HPO) and any of the supported node types, either directly connected to the host (System/370, 4300, 9370, System/36, Series/1, Series/1-PC Connect, 4680, 8100), or connected through a System/36 intermediate node (System/36, PC, Personal System/2).

Potential Benefits

With NetView DM, more effective management of the network may reduce operational costs and improve network availability. Depending upon network node types, NetView DM may eliminate the need for a highly-skilled data processing staff at remote sites. This NetView capability will be specifically attractive for those networks with System/36 intermediate and end nodes, Personal Computer and Personal System/2 end nodes (via System/36 intermediate nodes), or 9370 end nodes running under VM.

- Provides centralized support and control for resource distribution between the host and selected SNA distributed nodes
- Allows scheduled distribution of node software
- Distributes data between nodes and host
- Initiates processing at nodes and host
- Allows plans to be defined and submitted while transmissions are in progress
- Provides automatic transmission retry that enhances the retry capability on interrupted transmissions

Prerequisite Products

Host System

NetView DM is designed to operate on all IBM 30XX, System/370, 4300, and 9370 Processor models and on DASD supported by MVS/XA, MVS/370, and VM/SP (with or without VM/SP HPO).

The Generalized Interactive Executive (GIX) requires a full-screen display device for each operator who logs on to GIX.

The Interactive Operator Facility (IOF) requires a display station capable of displaying at least 24 80-character rows. To take advantage of the IOF copy function, a printer must be available.

Software

- MVS Host. The following are required to install and run NetView DM under MVS:
 - MVS/SP JES2 Version 1 with MVS/370 DFP
 - MVS/SP JES3 Version 1 with MVS/370 DFP
 - MVS/SP JES2 Version 2 with MVS/XA DFP
 - MVS/SP JES3 Version 2 with MVS/XA DFP
 - VTAM or TCAM
 - Multisystem Networking Feature (MSNF) of ACF/TCAM Version 2 if the network contains VSE nodes or other nodes belonging to other domains
 - ISPF

The following are optional prerequisite programs:

- ISPF/PDF if access to the ISPF/PDF primary option menu from the GIX master menu is desired

- JES/328X Print Facility if printing of GIX reports on a local printer is desired

The interactive operator facility may be accessed by an operator in session with the following:

- NCCF
- NetView

Selected messages originated by the Transmission Control Program may be routed to NetView

- VM Hosts
 - VM/SP, VM/SP HPO, or VM/IS including the following, is required to install and run NetView DM under VM:
 - VSE/VSAM
 - ACF/VTAM
 - ISPF
- Distributed/Departmental Programs
 - Series/1: One of the following, in accordance with its operating system:
 - RPS Operating System with the uniprocessor function
 - EDX Operating System with Remote Manager
 - CPS Operating System and the SNA PRPQ
 - IBM processors running under VSE: VSE/DSNX with the following:
 - VSE/SP
 - VSE/AF
 - VSE/POWER
 - VSE/VSAM
 - ACF/VTAM
 - SSX/VSE
 - System/36
 - SSP with SSP Communications feature and Communications and System Management feature

To communicate with NetView DM as an intermediate node, the following are also required on the System/36:

 - Distributed Systems Node Executive – Network Distribution
 - PC-Support/36 (required for the Personal Computer end node support)

To communicate with NetView DM as an end node connected through another System/36 intermediate node, the following is also required on the System/36:

 - Distributed Systems Node Executive – Network Distribution
 - 4680 Store System Processors: 4680 Operating System
 - IBM Personal Computer attached to Series/1 via the Series/1-PC Connect licensed program: PC-Connect Card for the Personal Computer and the following must be installed on the Series/1:
 - EDX Operating System with Remote Manager

In addition, the following licensed programs must be installed on the Personal Computer:

 - IBM Personal Computer DOS
 - Series/1-PC Connect
 - S/36 intermediate communicating with IBM Personal Computer and IBM Personal System/2:
 - IBM Personal Computer DOS

- PC/DSNX
- IBM Processors running under control of VM/SP with or without VM/SP HPO: The following must also be installed at the end nodes:
 - VM/DSNX
 - ACF/VTAM
 - RSCS
 - IPF

Ordering Information

NetView DM for MVS/370 and MVS/IXA

Program number: 5685-016

NetView DM for VM

Program number: 5684-017

Reference Material

- General Information Manual, GH19-6587

Distributed Systems Executive (DSX)

Main Purpose

DSX is a network management licensed program that, in conjunction with DSNX, assists the user in the management and controlled distribution of software and data in distributed data processing environments. DSX provides a range of change management, data distribution management, and problem management facilities for an expanding group of distributed systems in an SNA environment.

VSE systems are supported by DSX. MVS/XA and MVS/370 are supported by NetView™ Distribution Manager (see product description in Section 43).

Key Functions, Facilities and Features

- Generalized interactive executive (GIX) – an online interactive interface is provided and supports:
 - Online planning definition, verification, and submission for execution
 - Online tracking of plan execution
 - Online network administrative functions
 - Online access to DSX resource directories
 - Online selective report generation
- Concurrent operation between transmission operations and planning/file maintenance operations
- Functional capabilities in the transmission area:
 - Data compression for DPPX nodes and VSE nodes
 - Selectable resynchronization for a single transmission function
 - Conditional execution transmission control
 - Automatic transmission retry based upon an installation-defined time interval
 - Ability to override installation parameters when starting the transmission control program
- User application control statement interface, including the ability to:
 - Define plans to be executed by DSX
 - Submit plans for execution by DSX
- Automatic submission of a host batch job at the end of transmissions
- Interactive Operator Function (IOF) message selectivity
- Support for 8100/DPCX
- Security capabilities
- Serviceability features

Primary Users

Systems programmers, terminal operators

Potential Benefits

- Provides centralized support and control for resource distribution between the host and selected SNA distributed nodes
- Allows scheduled distribution of node software
- Distributes data between nodes and host
- Initiates processing at nodes and host
- Allows plans to be defined and submitted while transmissions are in progress
- Provides automatic transmission retry that enhances the retry capability on interrupted transmissions
- Provides wider security coverage

Prerequisite Products

Hardware

- DSX will operate on the following IBM machines: all 30XX, System/370, 4300, 9370 models and DASD supported by VSE/SP Version 2.1 licensed program or VSE/SP Version 3.1 with the required licensed programs.
- A full-screen display device must be available for each operator who logs on to the Generalized Interactive Executive.
- The Interactive Operator Facility (IOF) requires a display station capable of displaying at least 24 80-character rows.
- In order to take advantage of the copy function provided by the Interactive Operator Facility, a printer must be available.

Software

The following programs are required to install and run DSX Version 3 Release 2 under VSE/SP 2.1:

- VSE/SP or individual VSE components as follows:
 - VSE/AF
 - VSE/POWER
 - VSE/VSAM
 - CICS/DOS/VS
 - VSE/ICCF
 - ACF/VTAM
 - ISPF

The ISPF/PDF is required if the user wants to access the ISPF/PDF primary option menu from the Generalized Interactive Executive master menu.

Products Supported

- 8100 Information System
- Series/1
- System/36
- IBM processors using VSE/SP with the required licensed programs
- 4680 Store System Processors
- IBM Personal Computers attached to the Series/1 via the Series/1-PC Connect program

An SDLC communication line to the host must be available for any of the above.

Ordering Information

Program number: 5668-915

Reference Material

- DSX General Information Manual, GH19-6394

VSE/Distributed Systems Node Executive (VSE/DSNX)

Main Purpose

VSE Distributed Systems Node Executive (VSE/DSNX) is a licensed program that communicates with a companion product, Distributed Systems Executive (DSX), on the host processor and offers automated management functions in distributed data processing environments. This includes exchange of data and programs, initiation of jobs at a node, and node processing control.

VSE/DSNX Version 1 Release 2 is an adaptation to the VSE/SP environment supporting the VSE library concept and the services it provides. VSE/DSNX communicates with the host program DSX which may run under Multiple Virtual Storage/System Product (MVS/SP) Version 1 (MVS/370), MVS/SP Version 2 (MVS/XA), or VSE/SP.

Key Functions, Facilities and Features

- Distributed library maintenance
- System software maintenance
- Overall data distribution
- Central application distribution and maintenance

Primary Users

System/370 locations that have a need to automate node management functions for VSE/SP environments.

Potential Benefits

- Allows automated data transmission to multiple locations
- Allows automated transfer or retrieval of data from a node to a host
- Allows automated management functions for software installation, maintenance, and operations for VSE/SP node systems
 - Add/replace a data object
 - Delete a data object
 - Send a data object to the host
- Simplifies VSE/SP node operations, thus removing the need for a highly-skilled data-processing staff at the remote site
 - Allows execution of a VSE/POWER job from the host
 - Allows host-generated messages to be displayed at the node console

Prerequisite Products

Hardware

- VSE/DSNX 1.2 has no specific hardware requirements. It runs on any processor and DASD on which VSE/SP Version 2 or Version 3 can run.

Software

- The following software releases or versions are required. Back-level releases/versions will not operate correctly.
 - VSE/SP Version 2 or Version 3
 - VSE/Advanced Functions Version 2
 - VSE/POWER Version 2
 - VSE/VSAM Version 1 Release 3
 - ACF/VTAM Version 2 or Version 3
- Distributed Systems Executive Version 3 Release 2 or NetView™ Distribution Manager is required for MVS/370 or MVS/XA on the host.
- Distributed Systems Executive Version 3 Release 2 is required on the VSE/SP host.

Products Supported

VSE/DSNX 1.2 runs on any processor and DASD supported by VSE/SP Version 2 or Version 3 or by the corresponding "roll-your-own" components.

Ordering Information

Program number: 5666-284

Reference Material

- VSE/DSNX Licensed Program Specifications, GC33-6154
- VSE/DSNX Planning, Installation, and Operation, SC33-6210

VM/Distributed Systems Node Executive (VM/DSNX)

Main Purpose

VM/Distributed Systems Node Executive (VM/DSNX) is a licensed program that provides support for distribution of software, software changes, and user data objects from a central site to a network of distributed VM/SP or VM/SP HPO systems, with little or no intervention required at the remote sites.

Key Functions, Features and Facilities

VM/DSNX Release 1 includes:

- Support for central site control of change distribution for VM/SP systems
- Support for a wide range of VM objects
 - CMS files
 - Execs
 - Panels
 - Programs
 - Messages
- Unattended execution of change distribution functions at the VM end node

VM/DSNX Release 2 (available fourth quarter 1988) will add:

- Synchronous communications with NetView Distribution Manager (5684-017 (VM) or 5685-016 (MVS)) with either an MVS or VM host at the central site
- Retrieval of user data objects by NetView Distribution Manager (DM) to or from VM/DSNX Release 2

Primary Users

VM/DSNX Release 1 should be considered by customers requiring software change distribution functions for VM systems prior to the availability of NetView DM. Release 1 provides limited function and will not be enhanced to support non-VM systems. VM/DSNX Release 1 must reside in both the VM host and the VM remote node.

VM/DSNX Release 2 should be considered by any customer with distributed VM systems who has a requirement for central site management of these systems. Release 2 must be installed on each distributed system in a network. NetView DM will be used to send and receive changes at these remote sites.

Potential Benefits

VM/DSNX provides the functions and management tools to handle software changes from a central site. This central control will significantly reduce the need for skilled personnel at each remote site and will help

coordinate all changes so that each remote site remains up-to-date.

Prerequisite Products

Hardware

VM/DSNX runs on all IBM processors supported by VM/SP Release 5 or later. VM/DSNX will also operate on VM/SP HPO Release 5.

Software

VM/DSNX Release 1 requires:

- VM/SP Release 5 or
- VM/SP HPO Release 5
- VM/IS 5.1
- RSCS 2.2
- VM/IPF 2.2

VM/DSNX Release 2 requires:

- VM/SP Release 5 or
- VM/SP HPO Release 5 or
- VM/IS 5.1
- ACF/VTAM 3.1.2 or later
- RSCS 2.2
- VM/IPF 2.2
- NetView Distribution Manager for MVS (5685-016) or
- NetView Distribution Manager for VM (5684-017)

Ordering Information

Program number: 5684-009

Reference Material

General Information Manual, GC24-5380

ACF/Virtual Telecommunications Access Method (ACF/VTAM)

Products Included

- ACF/VTAM MVS/XA
- ACF/VTAM MVS/370
- ACF/VTAM VSE
- ACF/VTAM VM/SP

In the following description, VTAM is used as a generic term for ACF/VTAM MVS/XA, ACF/VTAM MVS/370, ACF/VTAM VSE, and ACF/VTAM VM/SP. Similarly, NCP refers to ACF/NCP. If a particular function is provided by the ACF products only, a distinction is made.

Main Purpose

- VTAM is the base for the major IBM communication subsystems. VTAM (together with NCP, when applicable) provides an "operating system" for the network. Its functions are analogous to the functions of a host operating system in terms of resource sharing and logical handling of user requests. Certain functions of a 37XX and NCP can be performed by ACF/VTAM or ACF/VTAME and the Communications Adapter for 4321, 4331, 4361, and 9370 Processors.
- ACF/VTAM VSE and ACF/VTAM VM/SP with the 4331, 4361, or 9370 Communications Adapter, and ACF/VTAM with multisystem networking capabilities extend those functions to an environment in which several hosts participate in a common network. The ACF/VTAM hosts may utilize different virtual storage operating systems.
- NetView is a supplementary product that provides in a single package the functions of NCCF (Network Communication Control Facility), NPDA (Network Problem Determination Application), and NLDM (Networking Logical Data Manager), in addition to functions not found in those products.
- DSX, also a supplementary product to ACF/VTAM, supports a network of intelligent nodes with facilities for data distribution, software change management, and central problem handling. See the DSX product description in Section 43 for more information.

Key Functions, Facilities and Features

- Supports concurrent execution of multiple telecommunications applications and controls the sharing of telecommunications resources among the programs in one or multiple hosts (multisystem networking).
- Provides the facility to establish sessions dynamically between application programs and terminals with an appropriate authorization mechanism.

- Supports a logically direct transmission of data between application programs and terminals in session.
- Also allows sessions and supports data transfer between two application programs, which can reside in the same host or different hosts.
- Supports SNA terminals and certain pre-SNA terminals attached via communication links to communication controllers with NCP or to the 4331, 4361, or 9370 Communications Adapter, as well as to locally attached 3270 and SNA devices.
- Provides the network management functions under the control of an operator with optional assistance by a programmed operator interface. NCCF can be used with VTAM for this purpose.
- Provides facilities for statistics gathering for tuning and accounting purposes, as well as trace and test facilities for improved RAS.
- Provides dynamic buffer allocation and enhanced tuning and testing facilities.
- Supports channel-to-channel adapters for multi-system communication. Hosts can function as intermediate routing nodes in the network.
- Provides the ability to easily modify, replace, or suppress ACF/VTAM messages to suit installation needs or preferences.
- Provides integrated multisystem networking capabilities.
- VTAM MVS/370 and VTAM MVS/XA provide, with ACF/NCP, the capability for multiple, independent SNA networks to communicate. With SNA network interconnection, a terminal in one SNA network can access applications in other connected SNA networks. The fact that a session is "cross-network" is transparent to the terminal users.
- VTAM VM/SP provides integrated VM SNA console support.
- VTAM MVS/XA can provide relief from virtual storage constraint through its implementation of 31-bit addressing.
- VTAM MVS/370 and VTAM VSE provide extended network addressing capabilities that expand the size of the SNA network.
- VTAM MVS/370 and VTAM MVS/XA provide integrated encrypt/decrypt capabilities.

Primary Users

All users of telecommunications

Potential Benefits

- Dynamic sharing of all network resources leads to a more manageable network structure and reduced costs.

- Transparency of the network to the application programs and to the communication subsystems, combined with the apparent device independence, makes it easier to develop and install new applications in a changing environment.
- The system can be used more efficiently by taking advantage of intelligence external to the host processor.
- Investment in existing VTAM-based application programs and communication subsystems is protected from undue impact caused by changes to the network and other applications.
- VTAM has an upward-compatible application program interface for VSE, VM/SP, MVS/370, and MVS/XA for growth and migration.
- In an environment in which multiple hosts are in one location, several hosts can share the network on a static basis without the use of the multisystem networking capabilities. This can help reduce network costs and improve backup capabilities.
- The encrypt/decrypt feature provides for improved communications security in the form of end-to-end encryption of messages. This support is transparent to application subsystems.

ACF/VTAM with Multisystem Networking Capabilities

- Additional benefits are available to users of the multisystem networking capabilities that are included with ACF/VTAM Versions 2 and 3.
- A terminal user may access any application and any data base available throughout a corporate-wide network.
- Redistribution of functions can be done so that each service may be provided at the most appropriate location with regard to the organizational needs and the availability of skills and other resources.
- Extensive fallback capabilities provide for the implementation of an orderly takeover in stages in order to have a minimal impact on those parts of the network that were not immediately affected by the failure.
- Critical applications can be backed up in another local or a remote host.
- Support of multiple routes between NCPs and hosts in a multisystem network may provide increased availability. Each application session can be assigned one of three transmission priorities and may be separated on different routes to partially meet availability and performance objectives.
- Network flow control for multisystem networking is managed globally to help prevent any host or NCP from becoming a bottleneck in the network. This feature potentially enhances the availability of the total network for all users.
- ACF/VTAM supports channel-to-channel (CTC) communication.

ACF/VTAM with SNA Network Interconnection Capabilities

- The ability to interconnect independent SNA networks can provide important benefits to SNA users.
- Terminals and applications in one network can access resources in other interconnected networks.
- A cross-network session is transparent to the terminal end user.
- Corporate-wide communication is now possible where, for merger or divisional considerations, a company has multiple independent SNA networks.
- Intercompany data sharing can be accomplished among organizations that have established SNA networks.
- Subdivision of large networks can alleviate addressing constraints and/or provide better operational control and management.

Prerequisite Products

Software

- MVS/370, MVS/XA, VSE, or VM/SP
- ACF/NCP in a 3725, 3720, or 3705 Communication Controller
- Use of the ACF/VTAM integrated encryption facility requires the Programmed Cryptographic Facility ((5740-XX5) or the Cryptographic Unit Support licensed program (5740-XX6).

Products Supported

Terminal Support – Record Mode

SDLC: All SNA terminals (except 3271/3275 Models 11 and 12 with ACF/VTAME)

Local: 3270

BSC: 3270

SS: 3101, 316X, WTTY, TWX, 2740, 2741 via NTO and ACF/NCP. (TSO, CICS, and user programs provide terminal support for selected start/stop devices using NTO or NPSI.)

Software

- ACF/VTAM is used in VSE by CICS/VS, VSE/POWER RJE, Instructional Systems, VSE/ICCF (through CICS), JEP, and FTP.
- ACF/VTAM is used in VM/SP by VSCS and RSCS Version 2.
- ACF/VTAM is used by VM/VCNA when running in an OS/VS1 or VSE guest.
- ACF/VTAM is used in OS/VS1 by IMS/VS, CICS/OS/VS, and RES.
- ACF/VTAM is used in MVS/370 and MVS/XA by IMS/VS, CICS/OS/VS, JES2 RJE and NJE, JES3 RJE, TSO, Instructional Systems, and DSX.

Ordering Information

ACF/VTAM MVS/XA Version 3

Program number: 5665-289

ACF/VTAM MVS/370 Version 3

Program number: 5665-313

ACF/VTAM VSE

Program number: 5666-280

ACF/VTAM VM/SP Version 3

Program number: 5664-280

Reference Material

- Network Program Products General Information, GC30-3350

ACF/Network Control Program (ACF/NCP)

Products Included

In the following description, "372X" refers to the 3725 and 3720 Communication Controllers.

Main Purpose

ACF/NCP resides in the 372X Communication Controller and provides the physical management of the communication network. The main function of ACF/NCP is to control attached lines and terminals, perform error recovery, and route data through the network. ACF/NCP communicates with the host through ACF/VTAM (except ACF/VTAME), ACP, TCAM, or additionally, in the case of a remote 372X, through another ACF/NCP.

ACF/NCP operates in single host environments or in environments in which it can serve multiple local hosts through multiple-channel attachments (multi-tail) and/or multiple remote hosts via communication links to adjacent 372X's.

ACF/NCP is a prerequisite for the operation of the multisystem networking facility of ACF/VTAM or ACF/TCAM in the host, in which data flow within established sessions is independent of nonparticipating hosts. ACF/VTAME supports multisystem networking via the communications adapter.

Key Functions, Facilities and Features

The basic functions of ACF/NCP include:

- Controlling lines and scheduling their operations.
- Controlling dynamic buffering
- Deleting and inserting line control characters
- Translating character codes
- Handling recoverable errors and detecting permanent errors
- Activating and deactivating lines
- Closing down the network
- Gathering line statistics and error statistics for the host
- Test and trace facilities
- High-speed links for full duplex operation
- Parallel links between adjacent 372X's
- Multiple routes between nodes and multiple priority levels on a route

ACF/NCP Version 3

- Support for the 3725 and 3705 Communication Controllers
- Support for the SNA Network Interconnection (SNI) capability, in conjunction with ACF/VTAM. This allows connection of multiple independent SNA networks through a gateway NCP node.

- Forced deactivation of SNA resources and non-SNA lines to improve availability
- Support for enhanced 386X modem problem determination functions
- Support for the 3725 of two megabytes of storage and transmission of up to 127 blocks of data before response (for more efficient use of satellite links)
- Support of X.25 public packet-switched network interface with X.25 NPSI (5668-981) for VM/SP, MVS, and DOS/VSE

ACFINCP Version 4

- Support for the 3725 and 3720 Communication Controllers
- Support for all functions of ACF/NCP Version 3
- Support for extended network addressing, to allow addressing of more than eight million elements in a single network
- Attachment support to IBM Token-Ring Network
- Extended problem determination support for 586X modems
- Support for the 3725 of up to 3MB of storage
- Enhanced availability and serviceability

ACFINCP Version 4 Subset

- A low-cost network control program for entry-level 3720 users
- Includes the functions of ACF/NCP Version 4 with the exception of SNA Network Interconnection
- Supports up to 28 lines and two channel adapters

Primary Users

Telecommunications users with remote terminal networks.

Potential Benefits

ACF/NCP provides for logical separation of functions from the host processor. This leads to better manageability of the system with cleaner interfaces up to the application program level. More host processor resources become available to application processing and, consequently, more advanced services can be provided to the communication subsystems.

ACF/NCP can increase the availability of the network in a multiprocessor environment by supporting instantaneous switchover with Channel Adapter Type 3 (CA-3).

ACF/NCP, together with the multisystem networking facility of the host access method, allows for a multi-system networking environment, in which the opera-

ACF/Network Control Program (ACF/NCP)

tion of the network is less dependent on the operation of any particular node in the network, thus minimizing the impact of host failures.

ACF/NCP Version 3, with ACF/VTAM, provides gateway functions to interconnect multiple SNA networks, thus providing terminal users the benefit of accessing applications in other, independent SNA networks. NetView provides operational problem determination and performance measurement support for this environment.

ACF/NCP Version 4, in conjunction with ACF/VTAM, enhances the capability of adding lines, cluster controllers, and terminals to a network by providing extended network addressing of more than 8 million elements in a single network.

The benefits of ACF/NCP are tightly coupled to those of the host telecommunications access method. See the appropriate telecommunications access method.

Prerequisite Products

- DOS/VSE, OS/VS1, VM/SP, MVS/370, or MVS/XA and ACF/VTAM, or ACF/TCAM are the appropriate host operating systems and telecommunications access methods.
- ACF/NCP requires ACF/SSP (appropriate release) under the host operating system to provide generation and utility functions.

Products Supported

- ACF/NCP supports local and remote 3725, 3720, and 3705 communication controllers.
- The Partitioned Emulation Program extension to NCP provides for coexistence of 270X-mode (EP) and NCP-mode operation in one communications controller.

Ordering Information

ACF/NCP Version 3

Program number: 5667-124

ACF/NCP Version 4

Program number: 5668-854

ACF/NCP Version 4 Subset

Program number: 5668-754

Reference Material

- Network Program Products General Information Manual, GC30-3350
- Network Program Products Planning Guide, SC30-3351

Network Design and Analysis (NETDA)

Main Purpose

NETDA is an interactive program product developed to assist customers in the definition, performance analysis and optimization of SNA telecommunications networks. NETDA can be used for planning the design of a new SNA backbone network or for modifying the design of an existing network. NETDA analyzes line utilization, response times, and end-to-end availability of various network designs.

NETDA is written in APL for use with Graphical Data Display Manager (GDDM) running in a VM environment.

Key Functions, Facilities and Features

NETDA provides four primary functions: network definition, availability analysis, performance analysis, and optimal route selection for SNA networks. NETDA generates a set of valid SNA routes from the node and transmission group definitions provided by a user. NETDA selects optimal primary routes based on component capacities and user-specified traffic loads. Backup routes may also be selected based on user criteria relating to capacity, path length, and availability. Availability analysis determines the probability that a session can be initiated using either the primary route or one of the backup routes. Failure analysis, which is part of performance analysis, determines the probability of various classes of failure as well as the impact of those failures on network performance. NETDA:

- Assists in determining optimal primary routes for an SNA network and constructing class-of-service tables based on customer criteria
- Analyzes performance for any set of routes
- Analyzes effect of network design change on performance of the network, including failure analysis
- Calculates end-to-end availability and selects backup routes where possible
- Creates standard Routing Table Generator (RTG) licensed program input statements

Prerequisite Products

NETDA runs in a VM environment with the Graphics Data Display Manager (GDDM).

Ordering Information

Program number: 5664-202

Reference Material

- General Information and Planning Guide for the VM Environment, GC34-4105

Non-SNA Interconnection

Main Purpose

Non-SNA Interconnection is a licensed program that extends some of the networking functions of ACF/NCP in the 3705-II, 3705-80, 3725, and 3720 Communication Controllers and the 3710 Network Controller to selected RJE devices and NJE subsystems. It allows these facilities to transport BSC data through the SNA network, sharing the use of the SDLC network links.

Key Functions, Facilities and Features

Non-SNA Interconnection offers:

- Improved network connectivity for BSC RJE terminals
- Improved network connectivity for BSC host-to-host subsystem communications
- Attachment of BSC RJE terminals to remote 3705-II, 3705-80, 3725, or 3720 Communication Controllers or to a remote 3710 Network Controller (that is, remote concentration)
- Sharing of the SDLC network links among 3705-II, 3705-80, 3720, and 3725 Communication Controllers for SNA and SNA-enveloped BSC data
- Improved network management for BSC RJE terminals and subsystems
- Line cost reduction due to BSC/SNA network link sharing
- Load sharing and backup for BSC RJE terminals and subsystems
- Session initiation by either the network operator or the BSC RJE terminal operator.

Release 2, 3, and 4 of Non-SNA Interconnection extend the facility provided by Release 1 for the 3725 by:

- Support of switched lines for supported BSC RJE/MLI terminals
- Support of VM/Pass-Through to VM/Pass-Through connections
- Support of Displaywriter in 2780 mode
- Support of System/36 MRJE (BSC)
- Dial support
- Full virtual route support and full 2780 support (Release 4 only)
- Support of ACF/NCP Version 4 Subset for VSE (Release 4 only)
- Support of X.25 for communication between two 3725 or 3720 Communication Controllers, or between a 3725 or 3720 and a 3710 Network Controller (Release 4 only).

Primary Users

- SNA customers with multiple host locations that use BSC RJE terminals and have a need to connect these RJE terminals to any appropriate subsystem (JES2) in the network through shared SDLC network links. In addition to the BSC RJE terminals, Non-SNA Interconnection also supports terminals using the BSC multi-leaving protocol.
- SNA customers with multiple host locations that currently use BSC lines to transport the data between two subsystems (for instance, JES2 to JES3) and want to eliminate the need to store and forward the data in an intermediate host facility and have the added advantage of being able to share the SDLC network links for both SNA and BSC data.
- SNA customers, regardless of the number of host locations, who have a need to concentrate data from BSC RJE terminals and SNA devices over a shared SDLC line from a remote 3705-II, 3705-80, 3720, or 3725 Communication Controller or a 3710 Network Controller, in order to reduce communication line costs.

Potential Benefits

- Reduced line/network costs
- Improved performance
- Load sharing and backup in case of overloaded or failed primary subsystem.

Prerequisite Products

Hardware

Non-SNA Interconnection Release 4 operates in the 3720 or 3725 Communication Controller only.

Software

Non-SNA Interconnection Release 4 requires:

- ACF/NCP Version 4 or ACF/NCP Version 4 Subset for VSE
- ACF/SSP Version 3
- The access method and operating systems (MVS/XA, MVS/370, or VSE/AF) to generate and operate ACF/NCP Version 4 as well as Non-SNA Interconnection.

Products Supported

Non-SNA Interconnection supports certain BSC facilities using point-to-point leased line operation and EBCDIC or ASCII code, depending on subsystem support. It supports the following BSC RJE terminals:

- 3780 Data Communications Terminal
- 3776 Model 1 Communication Terminal
- 3776 Model 2 Communication Terminal
- 3777 Model 1 Communication Terminal
- Displaywriter in 2780 mode (Releases 2 and 3)
 - With and without transparency (only reader-input)
 - With and without multiple-record feature (reader-input and printer-output)
- IBM terminals supporting the IBM BSC multi-leaving protocol, for example:
 - 3777 Model 2
 - System/360 Model 20, Submodel 5
 - System/38 RJE (BSC)
 - System/36 MSRJE (BSC) (Releases 2 and 3)
 - System/34 MRJE
 - System/370, 30XX, or 4300 processors with a Workstation Package

It supports the following BSC NJE subsystems:

- MVS/SP-JES2 Version 1 Release 3
- MVS/SP-JES2 Version 2
- MVS/SP-JES3 Version 1 Release 3
- MVS/SP-JES3 Version 2
- VM/RSCS Networking Releases 2 and 3, Version 2 Release 1
- VSE/POWER Version 2 Networking Support
- VM Pass-Through Facility Release 2

Ordering Information

Program number: 5668-951

Reference Material

General Information Manual, GC33-2023

Network Terminal Option (NTO)

Main Purpose

The Network Terminal Option (NTO) extends the capabilities of ACF/NCP to allow access to certain non-SNA terminals through the record mode application program interface in ACF/VTAM and ACF/TCAM.

Key Functions, Facilities and Features

Provides an SNA interface for a select group of start-stop and BSC devices that appear like the SDLC 3767 Communication Terminal to ACF/VTAM and ACF/TCAM. NTO preserves the non-SNA data stream, which minimizes changes to existing application programs. NTO provides single- and multiple-system networking.

The following terminals are supported:

- 2740 Model 1 nonswitched and switched
- 2741 nonswitched and switched
- TWX model 33/35 switched and nonswitched
- WTTY nonswitched only
- 3780 nonswitched subset in transparency

Prerequisite Products

- NTO operates with ACF/NCP and ACF/TCAM or ACF/VTAM. Compatible NTO releases are available for ACF/NCP Versions 1, 2, 3, and 4.
- NTO is independent of the host operating system.

Products Supported

- TSO may be accessed through NTO from 2741, TWX Model 33/35, or WTTY terminals.
- CICS may be accessed through NTO from TWX Model 33/35 terminals.
- Both VM/VTAM and VM/VCNA may be accessed through NTO 2741 and TWX Model 33/35 terminals.
- IMS may be accessed from 2740, 2741, and TWX Model 33/35 terminals.

Ordering Information

Program number: 5735-XX7

Reference Material

General Information Manual, GC38-0297

X.25 NCP Packet Switching Interface (X.25 NPSI)

Main Purpose

X.25 NPSI is a licensed program that allows ACF/NCP users to communicate over packet-switched data networks that have interfaces complying with CCITT Recommendation X.25 (Geneva, 1980 and 1984). It allows SNA host processors to communicate with SNA equipment or with non-SNA equipment over such networks.

Key Functions, Facilities and Features

X.25 NPSI causes the packet-switched data network (PSDN) to appear to the NCP and its associated host as a series of one or more switched or non-switched SDLC links. It enables communication between an SNA host node and the following types of data terminal equipment (DTE):

- SNA peripheral node
- SNA host node (Releases 3 and 4)
- Non-SNA X.25 DTE
- X.28 start-stop DTE
- Other non-SNA DTE's

Other functions include:

- X.25 standard services
- Support of optional user facilities
- Compatibility with other IBM licensed programs

Prerequisite Products

Hardware

- X.25 NPSI Releases 2 and 3 run on the 3705-II or 3705-80 Communication Controller.
- Releases 4.1 and 4.2 run on a 3725 Communication Controller.
- Release 4.3 runs on a 3720 or 3725 3MB Communication Controller.

Software

- X.25 NPSI Release 3.2 requires ACF/NCP Version 3 with ACF/SSP Version 3 for the 3705.
- Release 4.1 requires ACF/NCP Version 3 with ACF/SSP Version 3 for the 3725.
- Release 4.2 requires ACF/NCP Version 3 with ACF/SSP Version 3 for the 3725.
- Release 4.3 requires ACF/NCP Version 4 Release 2 with ACF/SSP Version 3 Release 2 for the 3720 and the 3MB 3725.
- X.25 NPSI runs under the control of ACF/NCP.

Products Supported

- ACF/VTAM and ACF/TCAM
- NCCF
- Releases 3.2 and 4 support MVS/370 and MVS/XA.
- Releases 3.2 and 4.2 support VSE.
- Releases 3.2, 4.1, and 4.3 support VM/SP Release 4.
- Release 4.3 supports CCITT 1984 X.25 Recommendation.

Ordering Information

Program number: 5668-981

Reference Material

- General Information Manual, GC30-3189
- The X.25 Interface for Attaching SNA Nodes to Packet Switched Data Networks, General Information Manual, GA27-3345
- An X.25 Primer, GG22-9103

Routing Table Generator (RTG)

Main Purpose

The Routing Table Generator (RTG) licensed program is a comprehensive tool to simplify the network definition and generation process for IBM networking customers. RTG aids medium and large network users in generating network routes and ACF-required PATH macros. It selects routes, generates PATH macros, and assists adherence to the routing characteristics of a particular ACF release. It provides these functions based on the topology of a given network as defined by user input statements. The user may specify all or some of the routes available in the network. RTG will select any remaining routes and validate the ones selected. In addition, RTG will generate PATH macros for ACF/TCAM, ACF/VTAM, and ACF/NCP.

Key Functions, Facilities and Features

- Execution in both MVS and VM environments
- Online access to RTG functions from a TSO ISPF dialog facility in an MVS environment
- Improved use of memory and processing execution time over the replaced RTG field developed program (5798-DFL)
- Algorithmic selection of a reliable collection of explicit routes
- Generation of PATH macros for NCP and host network nodes
- Algorithmic resolution of explicit and virtual route numbering
- Inclusion of virtual route pacing window specifications on VTAM and NCP PATH statements and transmission group threshold specifications on NCP PATH statements
- Capability to select alternate routes that are most unlike the physical path of the primary route
- Optional assignment of the same forward and backward explicit route numbers to a route
- Validation of user-selected routes

Primary Users

ACF/VTAM, ACF/TCAM and ACF/NCP users should consider RTG.

Potential Benefits

RTG reduces network generation time and reduces the potential for errors that may occur with manually-created PATH macros. The user describes the network with input statements and supplies these statements to RTG. RTG then automatically:

- Selects appropriate routes, including specified routes
- Generates PATH macros

- Follows the rules and routing characteristics for various releases of ACF products
- Validates user-selected routes

As a part of this process, RTG considers:

- The most direct route
- The number of subareas and nodes a route must go through
- The quality and speed of the transmission

RTG also includes the following enhancements:

- Improved memory use and processor execution time
- Optional interactive definition capabilities using ISPF
- Support for VM environments

The optional online interactive RTG Dialog Manager enables the use of menus and data entry screens with RTG. Help is available through HELP screens and a tutorial.

Prerequisite Products

RTG is written in PL/I and can be used in two environments.

In the MVS environment, RTG requires:

- MVS/370 or MVS/XA
- PL/I Resident and Transient Libraries, Release 4 or later
- TSO, ISPF Version 2.1, and ISPF/PDF Version 2.1 for the RTG dialog facility (Note: The dialog facility is not required to operate RTG.)
- SMP or SMP/E

In the VM environment, RTG requires:

- VM/SP Release 3 and, optionally, VM/SP HPO Release 3.2
- VM Linkage Editor
- VM PL/I Resident and Transient Libraries, Release 4

Ordering Information

Program number: 5668-815

Reference Material

Introduction to the Routing Table Generator, GH20-6787

Cryptographic Subsystem

Products Included

- 3848 Cryptographic Unit
- Cryptographic Unit Support program product
- Programmed Cryptographic Facility program product
- Encrypt/decrypt feature of ACF/VTAM
- Encrypt/decrypt capability of ACF/TCAM
- Encrypt/decrypt feature of:
 - 3274 Models 1C and 51C
 - 3276 Models 11, 12, 13, and 14
 - 3776 Models 3 and 4
 - 3777 Model 3
- Access method services cryptographic option of the Data Facility Product (DFP)

Main Purpose

The cryptographic products contribute to better data security by providing an integrated encryption capability for data sent across a communication line or data written to magnetic media.

Key Functions, Facilities and Features

- The 3848 Cryptographic Unit and the Cryptographic Unit Support program product, or the Programmed Cryptographic Facility program product, provides:
 - Encryption and decryption of data
 - Generation of cryptographic keys
 - Management of cryptographic keys
- The encrypt/decrypt feature of ACF/VTAM and capability of ACF/TCAM Version 2 provide:
 - Interface between the application and the Cryptographic program product, so that the cryptographic functions are transparent to communications application programs, unless explicit control is required
 - Selective use of encryption on a session basis
 - Generation and management of cryptographic key variables for each session
- Encrypt/decrypt feature of the 3274, 3276, 3776, and 3777 provides hardware encryption at the terminal end of a line communicating with a host on which either the Cryptographic Unit Support program or the Programmed Cryptographic Facility program is running. Terminals with the cryptographic feature can be multidropped with terminals that do not have the feature. Use of cryptography is transparent in an SNA network.
- The access method services cryptographic option of DFP extends the REPRO function to support encrypting/decrypting of VSAM (non-catalog) and SAM data sets.

- The Cryptographic Subsystem supports:
 - End-to-end encryption so that data is not available in the clear at intermediate NCP or host nodes
 - Terminals on the same line or cluster control unit using different keys
 - Session-level encryption, which allows each installation to select encryption for appropriate applications only
 - Frequent changes of the cryptographic key variables. The life of a session key is determined by the length of the session. This reduces the likelihood of the key being discovered and used, thus increasing the protection offered by the system.

Primary Users

Users who transmit sensitive information; both commercial firms and government agencies.

Potential Benefits

The Cryptographic Subsystem helps to provide protection of data outside the domain of installation management control — data that is passing over a communications line or written on magnetic media for offline storage or shipment. Online files can also be encrypted.

Many users are concerned about the security of information processed by their systems. They need to protect assets as well as the privacy of personal information. A comprehensive program for system resource and data protection combines many measures. Physical protection, administrative measures, hardware, and software functions must be included. Data encryption can be an important part of such a program.

Prerequisite Products

- Cryptographic Subsystem operates only under VS1, MVS/370, or MVS/XA.
- Either the 3848 Cryptographic Unit and the Cryptographic Support Unit program product, or the Programmed Cryptographic Facility program product, is required for both file encryption and communication encryption.
- Additionally, for communication encryption the ACF/VTAM encrypt/decrypt feature or ACF/TCAM V2 is needed.
- The Cryptographic Unit Support and Programmed Cryptographic Facility program products require the generation of a VSAM cryptographic key data set.

Cryptographic Subsystem

Products Supported

Hardware

ACF/TCAM Version 2 and ACF/VTAM encrypt/decrypt feature operate with:

- 3274 Control Unit Models 1C and 51C
- 3276 Control Display Station Unit Models 11, 12, 13, and 14
- 3776 Communication Terminal Models 3 and 4
- 3777 Communication Terminal Model 3 or with another application program in a multisystem networking environment

Software

File encryption is supported by the access method services cryptographic option of DFP, or may be done under user application program control.

Ordering Information

Hardware

- 3848 Cryptographic Unit Model 1
- 3274 Control Unit Models 1C and 51C
- 3276 Control Unit Display Station Models 11, 12, 13, and 14
- 3776 Communication Terminal Models 3 and 4
- 3777 Communication Terminal Model 3
- Encrypt/decrypt feature #3680
- Personalization/Key Entry Unit:
IBM part number: 4407908
Feature number: 9501

Cryptographic Unit Support - OS/VS2 MVS

Program number: 5740-XY6

Programmed Cryptographic Facility

Program number: 5740-XY5

Encrypt/Decrypt Feature of ACF/VTAM (5665-280)

In addition, appropriate ACF/VTAM or ACF/TCAM program products are required.

Reference Material

- Data Security through Cryptography, GC22-9062
- Cryptographic Subsystem:
Concepts and Facilities, GC22-9063
- OS/VS1 and MVS Cryptographic Unit Support:
General Information Manual, GC28-1015
- 3848 Cryptographic Unit Product Description and Operating Procedures, GA22-7073
- OS/VS1 and OS/VS2 (MVS) Programmed Cryptographic Facility General Information Manual, GC28-0942

- ACF/TCAM Version 2 General Information Manual: Introduction, GC30-3057
- ACF/VTAM General Information Manual, GC38-0254

ACF/Telecommunications Access Method (ACF/TCAM)

Products Included

- ACF/TCAM Version 2 Release 4
- ACF/TCAM Multisystem Networking Facility (MSNF)
- ACF/TCAM Version 3

Main Purpose

ACF/TCAM is a high-level access method providing high performance and comprehensive function. It supports a large selection of terminals (BSC, S/S, local attachment, and SDLC) and offers support for most MVS/370, MVS/XA, and VS1 applications.

ACF/TCAM Version 3 is a migration tool for those ACF/VTAM users who are migrating to the ACF/VTAM environment. It provides the interface between ACF/TCAM applications and ACF/VTAM.

Key Functions, Facilities and Features

The key to ACF/TCAM is its design, which shields the application programmer from being concerned with terminal types and their control. The application programs can be coded in Assembler, COBOL, or PL/I languages. ACF/TCAM protects the application coder through the use of message handlers that reside in the ACF/TCAM message control program (MCP). The message handlers are designed and coded by the systems programmer and are a combination of Assembler code and high-level ACF/TCAM macros that allow the coder to:

- Strip or add line control
- Insert time and/or date stamp
- Edit the message
- Test for errors
- Generate new messages
- Route messages to their appropriate destination

With the use of message handlers, ACF/TCAM can provide complete message switching capabilities without the use of any application programs.

The application programs get messages from ACF/TCAM through the use of READ/WRITE or GET/PUT macros in the same manner that a record is retrieved from a tape or disk using BSAM or QSAM. ACF/TCAM, with its use of message queues, can allow messages to be retrieved in this manner. All messages are placed in queues, which are either on disk, in real storage, or a combination of both (user's choice). Queues not only allow ease of programming, but they are independent of the application programs.

Since messages are queued, there is no ACF/TCAM requirement that the application program be active whenever ACF/TCAM is active. Messages could be placed in the queues during the day (data collection)

and processed via application programs at night. The application program in turn will store messages for the terminals in the terminal queues that will be held for the next morning or sent out to a terminal printer for the terminal operator to review. This technique offloads the processor during its prime time of operations.

Message queuing offers additional important facilities:

- Retrieving already sent messages in the case of errors or lost messages
- Having messages not sent saved on disk (in the case of a system failure ACF/TCAM can be restarted without losing the messages in the queue)

The fail soft capability is one of the key elements of ACF/TCAM's success for many of its users.

ACF/TCAM is extremely flexible in its capability to handle all types and sizes of messages in the manner desired by the user. As discussed above, it can handle a data collection type of application with no response requirement. However, at the same time, it can be extremely responsive for an inquiry type application by prioritizing messages, or holding the line until a response is sent. This is accomplished through the use of appropriate message handler macros.

Another ACF/TCAM facility is operator control. An ACF/TCAM network can be controlled by almost any terminal in the network by an application program or by the system console. The control is predefined at network definition time with one primary and any number of secondary operator control terminals and/or application programs. The primary operator control responsibility can be changed dynamically through the use of a primary operator command.

Through the use of primary operator commands, the operator or program can control the network with its capability of varying lines and terminals online and offline, starting and stopping traces for problem determination, changing line speeds, and even halting ACF/TCAM. Through the use of secondary commands, the various operators or programs can display terminal status, terminal and application queues, and determine which queues are being held. The secondary commands can be used by all terminals and programs defined as secondary.

ACF/TCAM interfaces directly with the network control program (ACF/NCP) as well as through the emulation program (EP). By using NCP, ACF/TCAM can let NCP manage the terminals (BSC, S/S, and SDLC) connected to it. ACF/TCAM, however, controls the network via special instructions to the NCP. This allows ACF/TCAM to offload some of its work to the NCP, resulting in host offload. Another benefit of

ACF/Telecommunications Access Method (ACF/TCAM)

ACF/TCAM is the capability of controlling leased-line SNA terminals as well as the existing terminals in the customer's network.

ACF/TCAM's unique design allows SNA sessions to be established at the ACF/TCAM level, instead of at the application level, which allows ACF/TCAM to keep its transaction routing capability in the SNA environment. Transaction routing is the capability of switching a message to any application or terminal without establishing new sessions each time.

ACF/TCAM with its networking feature supports a multiple-host network configuration, referred to as a multiple-domain network, in addition to supporting single-domain networks. The ACF/TCAM base product supports only a single-domain network. With the Multisystem Networking Facility (MSNF), which interfaces with the ACF/TCAM base, ACF/TCAM supports both single- and multiple-domain networks.

ACF/TCAM has additional functions:

- Supports switched SNA terminals
- Supports remote 37X5s operating in NCP mode controlling SDLC, S/S, and BSC terminals
- Permits a choice of either fixed or pageable storage for certain tables and control blocks
- Allows the collection of statistics about peak and current use of resource pools (also, monitors traffic and counts for stations attached to an NCP – statistics that can also be displayed and reset via operator commands)
- Supports use of the multiple-channel attachment capability of ACF/NCP
- Supports locally attached SNA 3270 and 3790 devices
- Supports the Programmed Cryptographic Facility program product
- Incorporates all TCS-ACF functions into ACF/TCAM to improve ACF/TCAM's installability and usability
- Supports IMS/VS, CICS/VS-MS, and JES2 (MVS/370 or MVS/XA only)
- Supports the use of NTO by CICS and user-written application programs using ACF/TCAM's queued interface
- Provides the capability to run multiple copies of ACF/TCAM in the same processor

MSNF Feature

ACF/TCAM allows its terminals to access any ACF/TCAM application program. With the MSNF feature, ACF/TCAM allows any terminal to access any application across multiple hosts within the network. Each host must have either ACF/TCAM or ACF/VTAM, or both, in its system. ACF/TCAM supports MSNF enhancements, which include NCP connectivity, routing, flow control, enhanced recovery, and network management.

Prerequisite Products

Hardware

ACF/TCAM requires a 270X or 37XX with EP and/or NCP/VS or ACF/NCP. With the MSNF feature, ACF/TCAM requires at least ACF/NCP Version 4.

Software

ACF/TCAM requires MVS/XA, MVS/370, or OS/VS1. MVS/SP Release 1.3.1 is required to utilize multiple TCAMs.

Products Supported

Hardware (only SDLC-supported terminals shown)

- ACF/TCAM via NCP/VS support includes:
 - SDLC terminals (leased and switched lines) – 3270, 3600, 3614, 3767, 3770, 3790, and 8100
 - S/S: 3767
 - BSC: 3770
- The terminals supported by TSO are a subset of the terminals supported by ACF/TCAM and include 3767 and 3270 in SDLC mode.
- IMS, JES2, and CICS/VS support SNA and 3270 BSC devices via the ACF/TCAM subsystem interface.

Software

- CICS/VS, IMS/VS, JES2 for MVS/370 or MVS/XA, TSO

Ordering Information

ACF/TCAM Version 2 Release 4

Program number: 5735-RC3

MSNF Feature

ACF/TCAM Version 3

Program number: 5665-314

Reference Material

- Introduction, GC30-3057
- Functional Description, GC30-3131
- Introduction to ACF, GC30-3033

Remote Spooling Communications Subsystem (RSCS) Networking

Main Purpose

The RSCS Networking program product provides:

- Accepting files spooled to it and transmitting those files to the destination specified by the sender
- Accepting files transmitted to it and either spooling them to appropriate local VM/SP users or transmitting them to the destination specified by the sender

Key Functions, Facilities and Features

RSCS Networking can perform different roles:

- Host system for programmable terminals
- Host system for nonprogrammable terminals
- Peer system for NJI/NJE systems

Major features include:

- Compatible network protocol
- Job networking multistreaming
- Store and forward facilities
- Routing by means of destination tables
- Automatic rerouting of messages and files
- Operator commands to control network
- Authorized operator support
- Improved usability
- User control over files already routed through the system
- Work station forms control support
- Color printer support
- SNA support for NJE and 3270 printing
- Advanced function printer support – 3800-3, 3800-8, and 3820
- Automatic link management

RSCS Version 2 Release 3

- Provides the ability to transmit data to ASCII printers and plotters
- Supports national languages for messages and panels – French, German, Spanish, or Japanese
- Transmits VM printer-like separator pages on RSCS 3270 and workstation printer links
- Can access online help for RSCS commands and messages

RSCS Network Environments

Two RSCS network environments are provided: remote system nodes and remote station nodes.

Remote System Nodes

As a remote system node:

- RSCS is a peer to a job networking system – any system capable of running RSCS Networking program product, JES2/NJE program product, JES3 Networking, or VSE/POWER Version 2 Networking.

Remote Station Nodes

As a remote station node:

- RSCS is a host to programmable systems – any system programmed to provide the multileaving line protocol:
 - System/360 Model 20 and above
 - System/370 Model 115 and above
 - 1130
 - System/3 Model 6 and above
 - 2922
 - 3277 as a System/360 Model 20
 - System/32
 - 8100
- RSCS is a host to nonprogrammable systems:
 - 2770 Data Communication System with the 2772 Multipurpose Control Unit
 - 2780 Data Transmission Terminal Models 1 and 2
 - 3770 Data Communication System in 2770 BSC mode
 - 3780 Data Communications Terminal

Primary Users

Users of VM/SP systems who want to transmit files or messages to or from another system.

Potential Benefits

RSCS Networking offers the ability to:

- Invoke application programs resident in another system
- Transport data sets between systems or transport programs to systems that have the required data
- Transport jobs to a system with a required special configuration
- Transport jobs to systems with special devices, such as the 3800 Model 3 Printing Subsystem
- Transport jobs to, and execute them on, systems with the shortest work queue

Prerequisite Products

Hardware

RSCS Networking Version 2 runs in any processor supported by VM/SP.

Software

- RSCS Networking is designed to operate with VM/SP Release 5 or later and the Group Control System (GCS)

Products Supported

- 3270 Information Display System printers:
 - 3284 Printer Model 1 or 2
 - 3286 Printer Model 1 or 2
 - 3287 Printer Model 1 or 2, 1C or 2C (base color only)
 - 3288 Line Printer Model 2
 - 3289 Line Printer Models 1 and 2
 - 3262 Line Printer Models 3 and 13 (are compatible with the 3289)
- The printers listed are supported when attached to the following control units:
 - 3174
 - 3271 Control Unit Model 1 or 2
 - 3272 Control Unit Model 1 or 2
 - 3274 Control Unit Model 1B, 1C, 1D, or 51C (base color only)
 - 3276 Control Unit Display Station Model 1, 2, 3, or 4 (printer features supported include Data Analysis – APL, APL/Text, and vertical forms control).
- Advanced function printers:
 - 3800-3
 - 3800-8
 - 3820

RSCS Version 2 running with VM/VTAM provides:

- SNA job networking support to JES2/NJE, RSCS Version 2, and VSE/POWER Version 2
- SNA printer support for LU1, LU3, and LU0
- SNA printing sharing

RSCS Version 2.3 with ACF/VTAM provides:

- ASCII printer/plotter device support
- National language support for German, French, Spanish, and Japanese RSCS messages, productivity panels, and HELP screens
- Double byte character set support
- Print file separator page support
- Operational/usability enhancements in the areas of list processing, suppression of RSCS file confirmation messages, and default routing.

Ordering Information

Program number: 5664-188

Reference Material

- General Information Manual, GH24-5055

VM/Pass-Through Facility (PVM)

Main Purpose

The VM/Pass-Through Facility allows VM/370 users connected via local or remote 3270 display terminals to interactively access applications in another system via 3270 binary synchronous (BSC) protocol. (Also see the VM/SP product description.)

When PVM Release 4 is available, in the VM/SP Release 6 environment, PVM will have the ability to use Advanced Program-to-Program Communications/Virtual Machine (APPC/VM) to communicate with another PVM. This will provide PVM access to SNA networks.

Key Functions, Facilities and Features

- Access to VM/Pass-Through services from a CMS virtual machine or via direct attachment of a local or remote 3270 display to the Pass-Through virtual machine
- Connection to any designated host supporting remote 3270 display stations
- Selection screen
- Temporary disconnect available to CMS users
- NOTEPAD feature allowing CMS users to obtain a file copy of screen images
- Message facility

Products Supported

Releases 3 and 4

Terminal Support:

- Terminal support is handled by the VM/SP operating system, which supports 3270 display terminals having a screen size of at least 24 × 80 characters.

Communication Facilities:

- Multiple host connections are supported.
- BSC point-to-point and multipoint lines and channel-to-channel adapters may be used to interconnect VM/Pass-Through virtual machines.
- The VM/Pass-Through Facility, which runs in a virtual machine, provides the VM user with interactive remote access to another host processor. It supports connection to host systems such as MVS, VSE, and other VM/SP systems. A user connected through it interacts with the host application, and the screen contents presented to the user duplicate exactly what the host system would display to a directly attached terminal.

Participation in SNA Networks:

- In the VM/SP Release 6 environment, a PVM virtual machine can use APPC/VM and ACF/VTAM to communicate with another PVM virtual machine. This support will allow the PVM virtual machine to communicate using ACF/VTAM communication support, thereby eliminating the need for independent links connection PVM machines.

Release 3

- Supports 3270 extended data streams including extended color, programmed symbol sets, and extended highlighting
- Supports 3270 displays and printers connected to the supported VM/SP and VM/XA systems by remote BSC lines. The lines are direct to the PVM virtual machine.
- Has three improvements that enhance the PVM selection screen
- Provides additional network management exits and CMS user exits

Release 4

- Provides usage of Advanced Program-to-Program Communication/Virtual Machine (APPC/VM)
- Provides national language support (NLS) for PVM messages, screens, and help panels in French, German, Spanish, and Japanese, as well as mixed case U.S. English and uppercase U.S. English
- Supplies 3088 Multisystem Channel Communications Unit Line Driver Support for PVM-to-PVM communication
- Has trace facilities
- Provides improved usability.

Ordering Information

Program number: 5748-RC1

Reference Material

- General Information Manual, GC24-5206

Section 51. Processors

9370 Information System

Products Included:

- 9373 Model 20
- 9375 Model 40 and 60
- 9377 Model 90

Main Purpose

The 9370 Information System is an expandable family of supermini computers designed to meet a broad range of processing requirements — a family of systems small enough and quiet enough to operate in an office environment. The 9370 features compact, economical, technically advanced processors and system storage units mounted in industry-standard racks. Integrated I/O controllers are packaged as cards contained in slots within the processors. The controllers as well as memory utilize advanced system packaging technology, which makes adding memory or controllers a simple task.

The 9370 provides a broad range of performance capabilities in both commercial and compute-intensive environments. It provides a distributed data processing solution for large System/370 host-based installations, and can be an excellent solution for engineering/scientific and commercial departmental environments. The connectivity capability makes it easy to coexist with non-IBM systems and to act as a middle-layer node in both IBM and non-IBM networks. The rack-mountable 9370 processor is uniquely designed for an environment having low floor space and power requirements, and provides an attractive, modular system package.

Key Functions, Facilities and Features

- Office environment compatibility
- New system packaging technology
- System/370 compatibility
- Integrated I/O controller structure
- Multimember family
- Wide performance range
- Reliability, availability and serviceability
- Task-oriented system library

9373

- Entry-level member of the 9370 family
- Compact physical size
- 120- or 220-volt operation
- Seven slots for I/O controller features
- 4MB, 8MB, and 16MB memory options
- Processor packaged in an 8-EIA-unit rack-mountable module
- Processor, tape, and DASD mountable in 1.0-meter 9309 Model 1 rack enclosure

9375 – Models 40 and 60

- Intermediate members of the 9370 family
- Two performance models with field upgradability
- Model 40 upgradable in the field to Model 60
- Both models field-convertible to 9377
- High-performance arithmetic unit
- 17 to 57 slots for I/O controller features
- 8MB and 16MB memory options
- Model 40 compute-intensive performance 1.4 times the 9373
- Model 60 performance 2.4 times the Model 40 in the commercial environment
- Model 60 performance 2.0 to 2.7 times the Model 40 in the engineering/scientific environment
- Packaged in a 16-EIA-unit rack-mountable module

9377

- Most powerful system in the 9370 processor family
- Air-cooled thermal conduction module (TCM) technology processor
- Floating-point accelerator hardware
- High-accuracy arithmetic facility (ACRITH)
- Field conversion from 9375 processors
- 10 to 114 slots for I/O controller features
- 8MB to 16MB memory options
- System throughput estimated to be 2.1 times the 9375 Model 60 in the commercial environment
- In compute-intensive environments, 1.9 times the Model 60 for short-precision floating point and 2.0 times for long-precision floating point
- Processor packaged in 16-EIA-unit rack-mountable module

Potential Benefits

The 9370 has been carefully designed to satisfy the computing requirements of IBM customers who value System/370 affinity in standalone or remotely-attached departments.

Customers can leverage existing System/370 programming skills, exploit the openness and product range of System/370 architecture, preserve their long-term application investment, and take advantage of the high-performance computational capability of the 9370 processors, whose range is greater than five times from the lowest to the highest model of the family.

The 9370 Information System utilizes the most advanced technology, extending the power of System/370 to the office environment. Its chip technology provides the ability to use 1-million-bit memory and uses dense, low cost/performance logic chips. To provide customers with configuration flexibility, the 9370 processors incorporate a new I/O structure. This allows for attachment of a wide array of products via the integrated controllers, including rack-mounted DASD and tape devices, a 3270 workstation subsystem, an ASCII subsystem, and a communication subsystem.

Ordering Information

9370 processors are eligible for volume procurement discounts and education allowance. The Volume Procurement Amendment (VPA) allows customers to aggregate System/36 (5360, 5362), System/38 (5381, 5382), 9370, and 4300 processors to qualify for discounts on System/3Xs and 9370s, on selected I/O and on the 5364. Discounts for 4300 processors are based only on the quantities of 4361s and 4381s purchased.

Reference Material

- 9370 Overview (brochure), G580-0746
- 9370 Product Specifications (brochure), G580-0747
- 9370 Departmental and Distributed Processing (brochure), G580-0748
- Virtual Machine/Integrated System (brochure), G580-0750
- Planning for Your System, GA24-4032
- 9370 Information System: System Software by Design, G580-0889
- 9370 Information System, The Distributed Solution, G361-0005
- 9370 Information System, Performance by Design, G360-2714
- 9370 Education Planner, GR20-503X
- Managing Distributed Systems in an SNA Environment, GG22-9113
- 9370 Information System and SNA Networking Overview, GG22-9100
- 9370 Information System Token-Ring Subsystem Description, SA09-1739

4381 Processor Model Group 11

Products Included

- 4381 Model Group 11

Main Purpose

The 4381 Processor Model Group 11 is a logical growth step for users of System/360, System/370, 4331, and smaller 4341 or 4361 processors whose needs do not require the greater commercial and scientific performance of the 4381 Model Groups 21, 22, or 23. The 4381 Model Group 11 may be upgraded in the field to the Model Group 21 or 22.

Key Functions, Facilities and Features

- Four, eight, or sixteen megabytes of processor storage.
- 68-nanosecond internal processor cycle time.
- For the Model Group 11 in System/370 mode, internal throughput rate from 0.9 to 1.2 times the 4341 Model Group 2 for commercial workloads and up to 1.4 times the 4341 Model Group 2 for scientific workloads with equivalent processor storage and I/O configuration
- For the Model Group 11 in XA mode, internal throughput rate 0.6 of the 4381 Model Group 22
- 4KB high-speed buffer
- Upright design for minimum floor space requirement
- Six channels standard, with six available as an option
- Four of the six standard channels supporting up to 3MB/sec data rate each in data streaming mode
- Maximum aggregate data transfer rate of 22MB/sec with twelve channels in data streaming mode
- Support by MVS/370, VM/SP, VM/SP High Performance Option, DOS/VSE with VSE/Advanced Functions, TPF, and OS/VS1 in System/370 mode and by MVS/XA and VM/XA Systems Facility in XA mode
- Extended Control Program Support (ECPS) for MVS/370 and VM/370
- Remote Support Facility (RSF), including the Remote Operator Console Facility (ROCF)
- Problem Analysis facility, including support for six languages other than English
- Engineering/Scientific Assist
- Enhancements to ECPS: MVS for MVS/System Product (including cross memory services, the page fault assist function, and the ADDFRR instruction)
- Preferred Machine Assist to improve performance of MVS/370 running as a guest under VM/SP High Performance Option

- Start Interpretive Execution (SIE) Assist
- DFSORT Assist

Primary Users

The 4381 Model Group 11 Processor is well suited to either departmental or central site applications.

The 4381 Processors are excellent solutions to engineering/scientific (compute-intensive) and commercial computing requirements. The 4381 Processors are also attractive for specialized applications such as CADAM®, and for office systems and the professional end user. Finally, the 4381 Model Group 11 is an excellent growth vehicle for the 4331, 4341, 4361, and other System/370 processors where the 9370 may not provide a growth path.

Potential Benefits

Support for both System/370 and System/370 extended architecture (XA) operating systems allows the 4381 Model Group 11 to meet the growth and operating system requirements of the smallest System/360, System/370, and 4300 users, while being compatible with the most powerful processors offered by IBM.

The 4381 utilizes a unique impingement air-cooling approach, and the upright design minimizes floor-space requirements.

The compact packaging and high internal performance of 4381 Processors are made possible through the use of a multiple-chip module packaging technique that replaces logic card packaging in the instruction processing unit.

Impingement cooling, a new concept in processor cooling, assures adequate cooling of the high-density modules using only room-temperature air as the cooling medium.

Eight-byte parallel data flow occurs within the instruction processor as well as between the instruction processor, high-speed buffer storage, and channels. Sixteen byte parallel data flow occurs between the high-speed buffer and processor storage.

The 4381 Processor offers several improvements to Problem Analysis over its implementation in 4341 Processors. One of the enhancements is language support for French, German, Italian, Japanese Katakana, Portuguese, and Spanish. Another is use of the Remote Support Facility (RSF), which allows direct telecommunication with the IBM RETAIN network to assist in problem isolation and resolution.

Products Supported

All devices attaching to a 4341 Processor and available from IBM at the time of 4381 general availability will attach to a 4381 Processor. Each operating system has its own device support.

Programming Support

Any program written for System/370 will operate in 4381 Processors in System/370 or System/370-XA mode, provided it (1) is not time-dependent, (2) does not depend on system facilities (such as storage size, I/O equipment, or optional features) being present when the facilities are not included in the configuration, (3) does not depend on system facilities (such as operation codes) being absent when the facilities are included in the 4381 Processor, and (4) does not depend on results or functions that are defined in the Principles of Operation manual to be unpredictable or model-dependent.

Any program written for System/360 will operate in the 4381 Processor in System/370 mode, provided it follows the above rules and does not depend on functions that differ between System/360 and System/370.

Ordering Information

4381 Processors are eligible for volume procurement discounts and education allowance. The 4381 can be aggregated with selected System/36s, System/38s, and 9370s to qualify for discounts.

Reference Material

- Brochure, G580-0951
- Facts folder, G520-6120
- Functional Characteristics, GA24-3947
- Channel Characteristics, GA24-3948
- Summary and Input/Output Data Communications Configurator, GA24-3950
- A Guide to the IBM 4381 Processor, GC20-2021
- Problem Analysis Guide, GA24-3955
- IBM System/370-XA Principles of Operation, SA22-7085

4381 Processor Model Groups 21, 22, 23, and 24

Main Purpose

Three uniprocessors, Models 21, 22, and 23, and one dual processor, Model Group 24, provide extended performance capability in the 4381 family. Performance improvements of up to 30% may be realized in these processors in comparison to selected Model Groups 11 through 14.

Key Function, Facilities and Features

Field Upgrade Paths

From	To
MG11	MG21, MG22
MG12	MG23
MG13	MG23, MG24
MG14	MG24
MG21	MG22
MG22	MG23
MG23	MG24

Operating Modes, System Control Program, and Microcode Support

XA Mode

System control	MVS/XA	VM/XA SF with VSE, VS1, MVS, VM guest
Microcode assists	MVS/XA Assist DFSORT Assist	SIE Assist

System/370 Mode

System control	MVS/SP1	VM/SP or VM/SP + HPO only (3)	VM/SP + HPO with VSE or MVS guest	VSE, VS1, TPF (5)
		or with VSE, VS1, VM guest		
		VM/SP with MVS guest		
Microcode assists	MVS Assist (1)	VM Assist; ECPS:VM (2,4)	VM Assist; ECPS:VM(2); PMA	

Notes:

- 1) Includes EXPS: MVS functions
- 2) Includes VM/HPO assist for HPO functions except MG11
- 3) HPO required for greater-than-16MB storage sizes

- 4) Includes assists for IX/370 for VM/SP
- 5) Supported natively on uniprocessors

Configuration

	MG11	MG21	MG22	MG23	MG24
Processor storage (MB)	4,8,16	8,16	16,32	16,32,48,64	16,32,48,64
High-speed buffer (KB)	4	8	32	64	2x64
Channels (total)	6,12	6,12	6,12	6,12	12,24
Max. number of 3MB/sec channels	4	6	6	10	20
Max. aggregate data rate (MB/sec)	22	24	24	32	60 (30 each procr)
Processor cycle time (ns)	68	68	68	52	52
Relative internal performance (commercial)*	1.0	1.5	2.2	3.5	6.1

* Approximate relative internal performance, not external throughput. Actual performance varies according to hardware configuration, system control program, and workload. Figures for Model Groups 21 through 24 are estimates.

Reference Material

- A Guide to the 4381, GC20-2021
- 4381 Uniprocessor Functional Characteristics, GA24-3947
- 4381 Dual Processor Functional Characteristics, GA24-4021
- Facts Folder, G520-6120
- Brochure, G580-0951

4381 Processor Model Groups 91E and 92E

Main Purpose

The 4381 Processor Model Groups 91E and 92E introduce the Enterprise Systems Architecture/370™ (ESA/370™) and expanded storage capability at the top end of IBM's mid-range processor line. While they offer performance capacity in System/370 and System/370 Extended Architecture environments equivalent to the 4381 Model Groups 23 and 24, the ESA/370 and expanded storage provide a vehicle for added richness in function and a degree of relief from certain resource constraints.

Key Function, Facilities and Features

Field Upgrade Paths

From	To
MG23	MG91E
MG24	MG92E
MG91E	MG92E

Operating Modes, System Control Program, and Microcode Support

XA Mode

System control	MVS/XA	VM/XA SF with VSE, VS1, MVS, VM guest
Microcode assists	MVS/XA Assist DFSORT Assist	SIE Assist

System/370 Mode

System control	MVS/SP1	VM/SP or VM/SP + HPO only (3)	VM/SP + HPO with VSE or MVS guest	VSE, VS1, TPF (5)
		or with VSE, VS1, VM guest		
		VM/SP with MVS guest		
Microcode assists	MVS Assist (1)	VM Assist; ECPS:VM (2,4)	VM Assist; ECPS:VM(2); PMA	

ESA/370 Mode

System control	MVS/SP3 (MVS/ESA)
Microcode	DFSORT Assist

Notes:

- 1) Includes EXPS: MVS functions
- 2) Includes VM/HPO assist for HPO functions except MG11
- 3) HPO required for greater-than-16MB storage sizes
- 4) Includes assists for IX/370 for VM/SP
- 5) Supported natively on uniprocessors

Expanded Storage Capability

An expanded storage capability is available for the Model Groups 91E and 92E processors where operating in ESA/370 mode. This capability allows main storage to be divided as shown in the table below. The option is chosen at IML time. This capability allows programming flexibility in the use of programs that can take advantage of expanded storage.

Processor Memory Size	Memory Options	
	Main	Expanded
64MB	64	0
	48	16
	32	32
48MB	48	0
	32	16

Configurations

	MG21	MG22	MG23	MG24
Processor storage (MB)	8, 16	16, 32	16, 32, 48, 64	16, 32, 48, 64
High-speed buffer (KB)	8	32	64	2x64
Channels (total)	6, 12	6, 12	6, 12	12, 24
Max. number of 3MB/sec channels	6	6	10	20
Max. aggregate data rate (MB/sec)	24	24	32	60 (30 each processor)
Processor cycle time (ns)	68	68	52	52
Relative internal performance (commercial)*	1.5	2.2	3.5	6.1

	MG91E	MG92E
Processor storage (MB)	16, 32, 48, 64	16, 32, 48, 64
High-speed buffer (KB)	64	2x64
Channels (total)	6, 12	12, 24
Max. number of 3MB/sec channels	10	20
Max. aggregate data rate (MB/sec)	30	60 (30 each processor)
Processor cycle time (ns)	52	52
Relative internal performance (commercial)*	3.5	6.1

* Approximate relative internal performance, not external throughput. Actual performance varies according to hardware configuration, system control program, and workload.

Reference Material

- A Guide to the 4381, GC20-2021
- 4381 Uniprocessor Functional Characteristics, GA24-3947
- 4381 Dual Processor Functional Characteristics, GA24-4021
- Facts Folder, G520-6120
- Brochure, G580-0951

3090™ E Processor Family

Products Included

- 3090 Model 120E
- 3090 Model 150E
- 3090 Model 180E
- 3090 Model 280E
- 3090 Model 200E
- 3090 Model 300E
- 3090 Model 400E
- 3090 Model 500E
- 3090 Model 600E
- Vector Facility
- 3090 E Processor Resource/Systems Management (PR/SM™) Feature

Main Purpose

The 3090 E Processors are the base for growth into the '90s. They offer improved levels of price/performance in commercial and scientific environments, increased storage and channel capacity, and enhanced serviceability, compared to predecessor 3090 models. The 3090 Models 150E and 180E replace and offer improved price/performance over the 3090 Models 150 and 180 respectively. They also provide a growth path for users of the 3083 and 4381 systems. The 3090 Models 200E and 400E replace and offer improved performance over the 3090 Models 200 and 400, respectively. Through model upgrades from a 3090 Model 120E to a 600E, an increase in processor performance of up to tenfold is available.

Key Functions, Facilities and Features

Models 120E, 150E, 180E, 280E, 200E, 300E, 400E, 500E, and 600E

- Support for ESA/370™, 370-XA, and System/370 architectures.
- 64KB high speed buffer in each central processor
- A processor storage hierarchy that includes optional expanded storage
 - Additional high-speed storage within the 3090 E Processor Complex
 - Data movement to/from central storage under control of the system control program
 - Detection and correction of all single- and double-bit errors and detection of all triple-bit errors for improved availability
 - Support by MVS/ESA, MVS/XA, VM/SP HPO, TPF, VM/XA SP, and VM/XA SF
- A processor controller with duplexed functions (except Model 120E):
 - Backup by dual processors and dual DASD of critical processor controller functions
 - Switchover to backup processor controller hardware facilities in the event of certain failures
 - Ability to automatically initiate service requests with customer authorization
 - Initialization of the 3090 E Processor Complex
- Improved VM/XA SP and VM/XA SF guest performance
 - Start interpretive execution (SIE) assist for dedicated devices
 - Virtual machine assist under SIE for VM/SP and VM/SP HPO guests
 - Multiple high-performance guest support for VM/XA SP multiple preferred guests
- Improved compute-intensive operations
 - High-speed multiply
 - Fast floating-point add/subtract
 - Fast loop control execution
 - 64-bit wide data paths throughout
 - Optional Vector Facility
- Reliability, availability, and serviceability improvements
 - Additional online error detection/fault isolation techniques
 - Deferred maintenance capability
 - Enhanced Remote Support Facilities
- Thermal conduction modules (TCMs) with emitter coupled logic (ECL) technology, cooled by circulating chilled water
- 18.5- to 17.2-nanosecond cycle time

Model 120E

- Expected to be 1.8 to 2.2 times the instruction execution rate (IER) of the 4381 Model 13 operating under MVS/XA
- Expected to be 0.7 to 0.8 times the instruction execution rate (IER) of the 3090 Model 150E operating under MVS/XA, MVS/370, and VM/SP HPO in a typical commercial environment
- Uniprocessor configuration with
 - 32MB of central storage
 - Up to 128MB of expanded storage
 - Up to 24 integrated channels
 - One optional Vector Facility
- Field-upgradable to 3090 Model 150E
- Supported by the 3092 Processor Controller Model 3:
 - Contains one processor
 - Requires one 3370 Model A02 DASD (or equivalent)
 - Is field-upgradable to the 3092 Model 1

Models 150E and 180E

- Model 150E: expected to be 1.2 to 1.4 times the instruction execution rate (IER) of the Model 120E in commercial environments

- Model 180E: internal execution rate of 1.6 times that of a Model 150E
- Uniprocessor configurations with
 - 32MB of central storage standard, additional 32MB available
 - Up to 128MB of expanded storage in 64MB increments on 3090 Model 150E
 - Up to 256MB of expanded storage in 64MB increments on 3090 Model 180E
 - Up to 24 integrated channels on Model 150E and 32 on Model 180E

Model 280E

- Internal instruction execution rate (IER) 1.9 to 2.0 greater than the 180E
- Upgradable from 3090 Models 180 and 180E and to a Model 400E
- Single-image configuration performance expected to be 1.7 to 1.9 times the IER of a 3090 Model 180E
- Physically partitioned configuration performance expected to equal a 3090 Model 180E on each side
- Two integrated central processors, each having access to a shared central storage, optional expanded storage, and channels in a single-image configuration
- Supported by MVS/ESA and MVS/XA in single-image and partitioned configuration
- 64MB or 128MB of central storage
- 32, 48, or 64 channels
- Up to 512MB of expanded storage optional

Model 200E

- Internal instruction execution rate of 12% to 18% greater than the Model 200
- Internal instruction execution rate 1.9 times that of a Model 180E
- Two central processors in a dyadic configuration, each having access to a common central storage, channels, and optional expanded storage
- 64MB or 128MB shared central storage
- 32, 40, 48, or 64 integrated channels
- Up to 1024MB of expanded storage optional

Model 300E

- Upgradable to the Model 400E
- Internal instruction execution rate of 1.4 times that of a Model 200E
- Three central processors in a triadic configuration, each having access to a common central storage, channels, and optional expanded storage
- 64MB or 128MB shared central storage
- 32, 40, 48, or 64 integrated channels
- Up to 1024MB of expanded storage optional

Model 400E

- Internal instruction execution rate of 1.7 to 1.8 times that of a Model 200E
- Four integrated central processors, each having access to a shared central storage, optional expanded storage, and channels in a single-image configuration
- Capability of partitioning into two dyadic systems, each with the approximate performance of a 3090 Model 200E Processor Unit
- Supported by MVS/ESA and MVS/XA in single-image and partitioned configurations
- Support by VM/XA System Product in single-image and partitioned configurations
- Support in a partitioned configuration by MVS/SP Version 1, VM/SP High Performance Option
- Single licensed-program license, whether operated in single image or partitioned configuration
- 128MB or 256MB of shared central storage
- Up to 2048MB of expanded storage optional
- 64 to 128 integrated channels

Model 500E

- Internal instruction execution rate (IER) 1.2 greater than the 400E
- Upgradable from 3090 Models 400E and 300E
- Single-image configuration performance expected to be 1.5 times the IER of a 3090 Model 300E
- Physically partitioned configuration performance expected to equal a 3090 Model 300E on the A side and a 3090 Model 200E on the B side
- Five integrated control processors, each having access to a shared central storage, optional expanded storage, and channels in a single-image configuration
- Supported by MVS/ESA, MVS/XA, and VM/XA System Product in single-image and partitioned configurations
- Support for up to 256MB of central storage, 2GB of expanded storage, and 128 channels

Model 600E

- Internal execution rate in the range of 1.3 to 1.4 times that of a Model 400E
- Internal execution rate in the range of 1.7 to 1.8 times that of a Model 300E
- Six integrated central processors, each having access to a shared central storage, optional expanded storage, and channels in a single-image configuration
- Capability of partitioning into two triadic systems, each with the approximate performance of a 3090 Model 300E
- Supported by MVS/ESA and MVS/XA and VM/XA System Product in single-image and partitioned configurations
- Single licensed-program license, whether operated in single-image or partitioned configuration.

3090E Processor Family

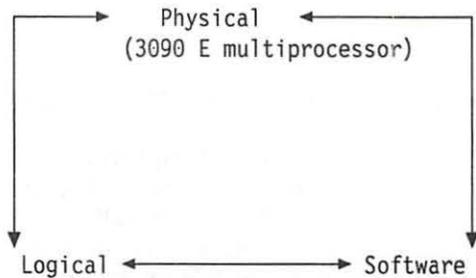
- 128MB or 256MB of shared central storage
- Up to 2048MB expanded storage optional
- 64 to 128 integrated channels.

Channel Subsystem

The channel processor on the 3090 system is a powerful Reduced Instruction Set Computer (RISC). With RISC a higher level of performance, flexibility, and growth are attained. The 3090 Channel Subsystem features include:

- Support for up to 128 channels
- Channel speed of 4.5 million characters/second to help balance overall system performance
- Individual microprocessors for each channel
- Support for the 3044 Channel Extender allowing channel lengths of 62 Km (6600 feet) at speeds up to 1.25MB/second using fiber optic serial channels

3090 E Multi-Image Management Options



- Logical partitioning through 3090 E Processor Resource/Systems Manager (PR/SM™) feature
 - Complements physical and software partitioning
 - Provides up to four logical partitions, up to eight on multiprocessor models operating in physically partitioned mode
 - Has comprehensive system control program (SCP) support
 - Uses existing skills
 - Provides high performance through event-driven scheduling
 - Permits flexible systems resource utilization
 - Processors/Vector Facilities can be dynamically shared or dedicated, with granularity as small as a portion of a single processor.
 - Processor storage is dedicated and can be partitioned in 1MB increments at activation.
 - Channels can be dynamically dedicated or reconfigured, with a granularity of one channel.
- Software partitioning through VM/XA SP
 - Enhanced through PR/SM feature (which supersedes and includes all the function of the multiple high performance guests support (MHPGS) feature)
 - Up to four preferred guests
- Physical partitioning with 3090 E Models 280E/400E/500E/600E

- Availability for diverse production workloads, consolidation, migration, test, development, maintenance, and backup/recovery
- Cost reduction, resource balancing, workload isolation, physical backup, lower-cost entry multiprocessing

Vector Facility

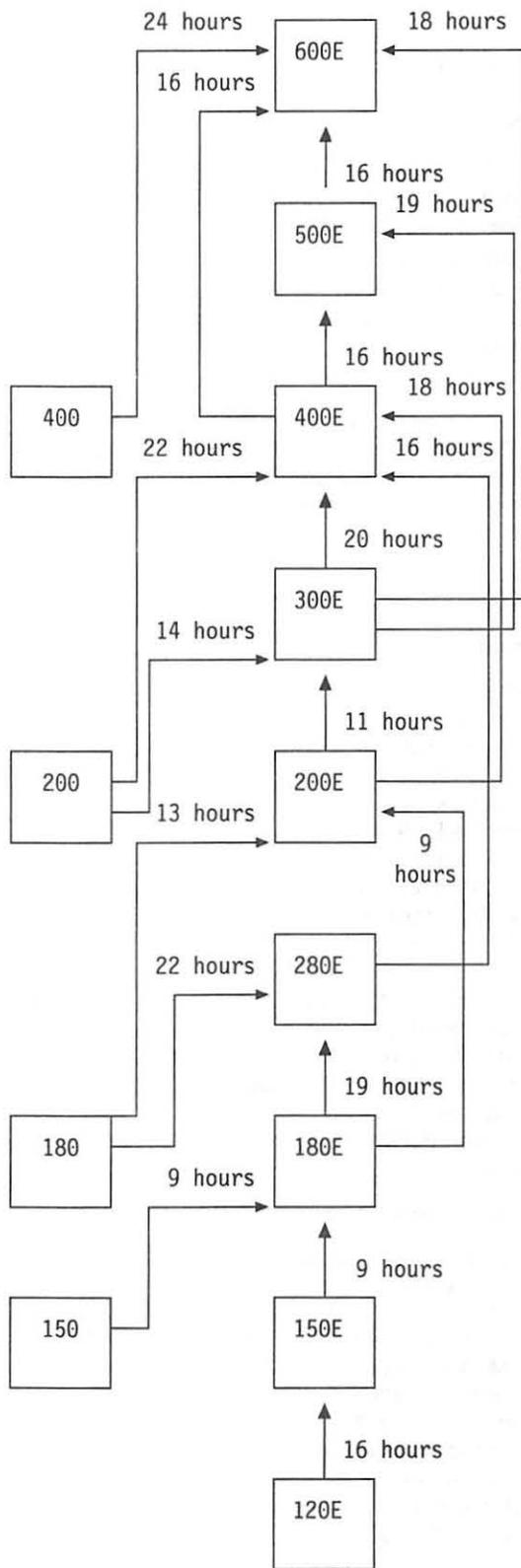
- Significantly increased levels of performance for compute-intensive engineering and scientific applications
- 1.5 to 3 times the internal throughput rate of a base 3090 central processor for many compute-intensive engineering/scientific jobs
- An integral component of System/370 and System/370 Extended Architectures:
 - 171 vector instructions
 - 16 vector registers each containing 128 elements
 - Binary, 32-bit, and 64-bit floating-point operands
 - Contiguous, non-contiguous, and random addressing
- Optionally available for each 3090 central processor
- Pipelined multiplier and arithmetic/logical units able to produce a 32-bit or 64-bit sum, difference, or product each cycle
- Compound operations able to produce both a product and sum each cycle
- Supported by:
 - MVS/XA, VM/XA, and VM/SP HPO (partitioned mode for Model 400) including automatic support for asymmetric vector configurations
 - VS FORTRAN Version 2 with auto-vectorizing capabilities
 - VS FORTRAN program multitasking facility (MTF) under MVS/XA for assignment of multiple processors to a job
 - Engineering and Scientific Subroutine Library (ESSL), a set of high-performance mathematical routines tuned to the Vector Facility
 - Vector Processing Subsystem/Vector Facility (VPSS/VF) for simulation of the 3838 Array Processor (MVS/XA environment)
- Facilities to measure vector facility usage for job analysis and tuning
- Field installable
- APL2 vector support
- MPSX/370 vector support

Potential Benefits

- The enhanced 3090 family is the base for growth into the '90s.
- Compatible growth is provided across System/370 and System/370-XA architecture processors. Highly integrated logic technology is packaged in a thermal conduction module (TCM), resulting in increased computing capacity while reducing floor space, cooling, and power requirements.

- Performance and price/performance are improved over prior 3090 models.
- The tightly-coupled multiprocessor concept is extended, with more central storage, channels, and instruction processors under the control of a single operating system.
- High performance for compute-intensive engineering and scientific applications is available with Vector Facility.

Upgradability



Note: Hours are estimated upgrade time. Actual time may vary.

Products Supported

Hardware

Generally, IBM devices attaching to the 308X are supported for attachment to the 3090 with the following exceptions:

- 3330 DASD attached to 3830 Model 3
- 3830 Storage Control Models 1 and 2
- 2835 Control Unit Model 2
- 2305 Drum Model 2
- 3340/44 DASD
- 2840/2250 Display Unit
- 3284 Printer
- 3288 Printer

In addition, the Speed Matching Buffer features for 3375 and 3380 on the 3880 DASD Control Unit are not supported. RPQs must be submitted for re-evaluation for devices that are currently supported on 308X processors by RPQ only.

Software

ESA/370 mode

- MVS/SP Version 3
 - Support for Enterprise Systems Architecture/370™ (ESA/370™)
 - Data spaces
 - Hiperspaces
 - Use of the ESA/370 instruction set
 - Improved data integrity by allowing separation of programs and data
- Data Facility Storage Management Subsystem (DFSMS™) support
 - Consists of functions provided by MVS/DFP™ Version 3 and other products of the Data Facility family as well as RACF
 - Facilitates easier migration to new DASD
 - Allows automatic management of data within the storage hierarchy
 - Improves information systems professional productivity

Transaction Processing Facility (TPF)

- TPF Version 2 (TPF2) operates in 370-XA mode
 - TPF High Performance Option (HPO) provides support for up to eight copies of TPF configured in loosely-coupled mode. HPO supports the 3090 Models 180E, 280E, 200E, and 400E.
 - TPF tightly-coupled function supports the use of one of the 3090's central processors (CPs) as the main processor for TPF and one or more CPs as application processors. The TPF tightly-coupled function is supported on the 3090 Models 200E, 300E, 400E, and 600E.

370-XA Mode:

- MVS/SP Version 2 Release 1.7
 - Up to six-way single-image

- MVS/SP JES2 Version 2
- MVS/SP JES3 Version 2
- Vector Facility compile/execute
- VM/XA System Product
- TPF Version 2 Release 4
 - TPF/HPO Version 2 Release 4

System/370 Mode:

- MVS/SP Version 1
 - MVS/SP-JES2 Version 1
 - MVS/SP-JES3 Version 1
 - (Expanded storage is not supported by Version 1. The maximum number of channels per channel set is sixteen.)
- VM/SP High Performance Option Release 3.6
- VM/SP High Performance Option Release 4.2 (includes Vector Facility support)
- TPF Version 2.3
 - TPF/HPO Version 2 Release 3

Reference Material

- MVS Migration System, G320-9714
- System/370 System Summary: Processors, GA22-7001
- System/370 Principles of Operations, GA22-7000
- System/370 Input/Output Configurator, GA22-7002
- Input/Output Device Summary, GA32-0039
- 3090 Engineering/Scientific Performance, GG66-0245

Processor Comparison Table – System/370, 30XX, 4300, and 9370

Processor	Processor Cycle Time (ns)	Storage Size	Channels Maximum Total	Byte Multiplexer*	Block Multiplexer	Maximum Channel Data Rate (MB/sec)	Control Program Support
4321	900-1300 4 byte path	1MB	0	0	–	–	VM/370 SSX/VSE VSE
4331 MG11	200 4 byte path	1-4MB	2	1 standard	1 standard	1.25	VSE VM/370 SSX/VSE
4331 MG2	200 4 byte path	1-4MB	4	1 optional	2 optional + 1 HS optional	1.86 HS Blk Mpx	VSE VM/370 SSX/VSE
4361 MG4	100 4 bytes	2-12MB	6	1 optional	1 standard Blk Mpx 2 optional HS Blk Mpx	1.25 on 1 Blk Mpx 3.0 on 2 HS Blk Mpx	SSX/VSE VSE VM/370
4361 MG5	100 4 bytes	2-12MB	6	1 standard	2 standard Blk Mpx 3 optional HS Blk Mpx	1.25 on 2 Blk Mpx 3.0 on 3 HS Blk Mpx	SSX/VSE VSE VM/370 MVS/370
9373 Model 20	90	4-16MB	1	–	1 optional	1.5	VM/SP VM/IS VSE/SP IX/370 AIX/370 DPPX/370
9375 Model 40	90	8-16MB	2	–	2 optional	3.0	VM/SP VM/IS VSE/SP IX/370 AIX/370 DPPX/370
9375 Model 60	90	8-16MB	2	–	2 optional	3.0	VM/SP VM/IS VSE/SP IX/370 MVS/SP AIX/370 DPPX/370
9377 Model 90	50	8-16MB	12	–	12 optional	3.0	VM/SP VM/IS VSE/SP IX/370 MVS/SP AIX/370 DPPX/370
4341 MG9	150-300 8 byte ALU and path	1-4MB	6	1 standard	2 standard 3 optional	3.0 on 2 2.0 on 2 1.0 on 1	SSX/VSE VSE VM/370 MVS/370
4341 MG10	150-300 8 byte ALU and path	2-4MB	6	1 standard	2 standard 3 optional	3.0 on 2 2.0 on 2 1.0 on 1	SSX/VSE VSE VM/370 MVS/370

Processor Comparison Table – System/370, 30XX, 4300, and 9370

Processor	Processor Cycle Time (ns)	Storage Size	Channels Maximum Total	Byte Multiplexer*	Block Multiplexer	Maximum Channel Data Rate (MB/sec)	Control Program Support
4341 MG1	150-300 8 byte ALU and path	2-4MB	6	1 standard	2 standard 3 optional	3.0 on 2 2.0 on 2 1.0 on 1	SSX/VSE VSE VM/370 MVS/370
4341 MG11	120-240 8 byte ALU and path	2-8MB	6	1 standard	5 standard	3.0 on 2 2.0 on 3	SSX/VSE VSE VM/370 MVS/370
4341 MG2	120-240 8 byte ALU and path	2-16MB	6	1 standard	5 standard	3.0 on 2 2.0 on 3	SSX/VSE VSE VM/370 MVS/370
4341 MG12	115-230 8 byte ALU and path	2-16MB	6	1 standard	5 standard	3.0 on 3 2.0 on 2	SSX/VSE VSE VM/370 MVS/370
4381 MG11	68	4-16MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 4 2.0 on 3 1.0 on 4	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF
4381 MG12	68	8-32MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 6 2.0 on 1 1.0 on 4	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF
4381 MG13	56	8-32MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 9 2.0 on 1 1.0 on 1	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF
4381 MG14	56	16-32MB	18	2 standard 2 optional	10 standard 6 optional	3.0 on 16	VM MVS/370 MVS/XA VM/HPO VM/XA SF
4381 MG21	68	8-16MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 6 2.0 on 1 1.0 on 4	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF
4381 MG22	68	16-32MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 6 2.0 on 1 1.0 on 4	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF
4381 MG23	52	16-64MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 10 2.0 on 1	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF

Processor Comparison Table – System/370, 30XX, 4300, and 9370

Processor	Processor Cycle Time (ns)	Storage Size	Channels Maximum Total	Byte Multiplexer*	Block Multiplexer	Maximum Channel Data Rate (MB/sec)	Control Program Support
4381 MG24	52	16-64MB	24	2 standard 2 optional	10 standard 12 optional	3.0 on 20 2.0 on 2	VM MVS/370 MVS/XA VM/HPO VM/XA SF
4381 MG91E	52	16-64MB	12	1 standard 1 optional	5 standard 6 optional	3.0 on 10 2.0 on 1	VSE VM MVS/370 MVS/XA VM/HPO VM/XA SF TPF MVS/ESA
4381 MG92E	52	16-64MB	24	2 standard 2 optional	10 standard 12 optional	3.0 on 20 2.0 on 2	VM MVS/370 MVS/XA VM/HPO VM/XA SF MVS/ESA
3090 Model 120E	18.5	32MB 0, 64, or 128MB expanded storage	24	4 optional	8 optional	3/4.5	MVS/ESA MVS/XA MVS/370** VM/SP VM/XA SP TPF
3090 Model 150E	17.75	32,64MB	24	4 optional	16 standard 8 optional	3/4.5	MVS/ESA MVS/XA MVS/370** VM/SP VM/XA SP TPF
3090 Model 180E	17.2	32, 64MB 0, 64, 128 192, 256MB expanded storage	32	4 optional	16 standard 16 optional		
Model 280E	17.2	64,128MB Up to 512MB expanded storage	64	8 optional	32 standard 32 optional	3/4.5	MVS/ESA MVS/XA MVS/370** VM/SP VM/XA SP TPF
3090 Model 200E and 300E	17.2	64, 128MB 0, 64, 128, 192, 256, 512 or 1024MB expanded storage	64	4 optional	32 standard 32 optional	3/4.5	MVS/ESA MVS/XA MVS/370** VM/SP VM/XA SP TPF
3090 Model 400E, 500E and 600E	17.2	128,256MB 0, 128, 256, 384, 512, 1024 or 2048MB expanded storage	128	8 optional	64 standard 64 optional	3/4.5	MVS/ESA MVS/XA MVS/370** VM/SP VM/XA SP TPF

* Byte multiplexer optional channels included in block channel totals
 ** MVS/370 (MVS/SP Version 1) does not support the 3090 Vector Facility, 3090 Expanded Storage, the 3090 Model 300E, or the Models 400E, 500E, and 600E in single-image mode.

Section 52. Telecommunications

3720 Communication Controller

Products Included

- 3720 Communication Controller
- 3721 Expansion Unit

Main Purpose

The 3720/3721 Communication Controller is an entry offering in the IBM communication controller family. It is a modular, small-sized communication controller characterized by a lower price, a lower capacity, and many functional enhancements. A link-attached model has been specifically designed for remote operation.

Key Functions, Facilities, and Features

- Entry member of the IBM communication controller family
- Specific model designed for remote operation mode
- Attachment of up to 28 lines to the 3720 Models 1 and 2. Addition of the 3721 expansion unit to the 3720 Models 1 and 2 can expand the line attachment capability up to 60 lines.
- Attachment of up to two IBM Token-Ring Networks and up to 16 lines to the 3720 Models 11 and 12. Addition of the 3721 Expansion Unit to the 3720 Models 11 and 12 can expand the attachment capability to up to 48 lines plus up to two IBM Token-Ring Networks.
- Main storage up to 2MB
- One or two channel adapters and up to two TPSS (two-processor switches) in the 3720 Models 1 and 11, providing a maximum of four host attachments
- Interfaces for local and remote switched operator console
- New 10MB hard disk
- Use of the MOSS (maintenance and operator subsystem) hard disk to store an ACF/NCP load module and an ACF/NCP dump. This feature enables the 3720 to automatically reload itself after a failure while preserving critical problem-determination data.
- Performance generally one-third of the 3725 performance
- Improved high-speed line support: up to four duplex 56K or 64K bps lines per scanner
- Remote support facility
- Simplified machine structure
- Customer setup for all units except 3720 Models 1 and 11

- Configuration upgrade by LICs (Line Interface Couplers) and TICs (Token-Ring Interface Cards) installed by the customer
- Improved MOSS (maintenance and operator subsystem) facilities:
 - Automatic scanner re-IML in case of failure
 - Problem determination procedures, which include the automatic analysis of the box event records
- All internal clocks set by software (NCP or MOSS commands)
- Support of ACF/NCP Version 4 subset
- Support of IBM centralized network management direction implemented through NetView
- Support of 586X modem Link Problem Determination Aid (LPDA-2) enhancements
- Support of IBM and non-IBM DTE's (data terminal equipment) with X.25 interface, when the X.25 SNA Interconnection PRPQ is used
- Support of country national networks

Prerequisite Products

In the MVS, VM, or VSE host:

- A telecommunications access method:
 - A version of ACF/VTAM compatible with the NCPs listed below, or
 - ACF/TCAM Version 2 Release 4 or
 - BTAM/SP, BTAM/ES, or RTAM
- ACF/SSP Version 3 Release 2 to provide NCP generation and utility functions

In the 3720:

- ACF/NCP Version 4 Release 1 (MVS, VSE) or Version 4 Release 2 (MVS, VM) or ACF/NCP Version 4 subset, and/or
- Emulation Program Release 3 (MVS, VSE) or Release 4 (MVS, VM). The Emulation Program will run in the 3720 Model 1 (local) only.

Reference Material

- 3720/3721 Communication Controller Introduction, GA33-0060
- 3720/3721 Communication Controllers Configuration Guide, GA33-0063
- 3720/3721 Communication Controllers Planning Site and Preparation Guide, GA33-0061
- A Family of Communication Controllers for SNA, pocket folder with inserts, G520-6129

3725 Communication Controller

Products Included

- 3725 Communication Controller Model 1
- 3725 Communication Controller Model 2
- 3727 Operator Console
- 7427 Console Switching Unit

Main Purpose

The 3725 Communication Controller is a high-performance, high-function communication controller designed to control the data flow between terminals and host processors in data communications networks. It communicates with one or more host processors over a channel or link via another communication controller. A wide range of data terminal equipment using different line speeds, protocols, and interfaces can be connected and operated simultaneously. Communications software and microcode facilitate problem determination and simplify network expansion and modification.

Key Functions, Facilities and Features

- A central control unit operates under control of the Advanced Communications Function/Network Control Program (ACF/NCP), Emulator Program (EP), or Partitioned Emulator Program (PEP).
- Main storage ranges from 512KB to 3MB, in increments of 256MB.
- Up to six channel adapters provide the physical connections to byte multiplexer, selector, or block multiplexer channels. The 3725 Model 2 can have up to four channel adapters in a single frame and Model 1 can have six channel adapters.
- Optional two-processor switches each provide a second path for a channel adapter on the first four channel adapters. This feature can be used with tightly coupled processors for symmetric I/O, and in other environments offers alternate path capability. There is a maximum of eight host connections with no more than six active at any one time.
- Up to 14 microprocessor-based communication scanners control up to 32 lines each. Capacity for attachment of as many as 256 duplex lines is provided by the 3725/3726 combination; up to 96 duplex lines can be attached to a 3725 Model 1 base frame, and up to 80 lines on a Model 2.
- Five different types of Line Interface Couplers (LICs) support a wide range of modem and direct attachments. An LIC can connect from one to four lines, depending on the LIC type.
- Internal clock features are provided for modems that do not provide clocking and for direct attachments.
- Support for very high speed adapter (VHSA) permits attachment of communication facilities up to 1.544MB/sec.
- Support for up to eight token-ring attachments at any one time is provided.
- The Maintenance and Operator Subsystem (MOSS) includes a microprocessor, its control program, a diskette drive, and an attachment for the 3727 Operator Console. The MOSS allows host-independent maintenance.
- Direct attachment can be made to the IBM Token-Ring Network using the IBM Cabling System.
- Access to MOSS over a switched line can be provided by the R-MOSS program of IBM Information Network.

Potential Benefits

- Good price/performance and reliability through the use of large scale integration (LSI) technology
- Automatic notification of malfunctions to the network operator through a combination of microcode and software
- Comprehensive, easy-to-use test and problem determination procedures
- Reduced cost and requirements for space and power
- Improved availability and serviceability resulting from built-in system management procedures
- Architecture that provides a base for easy, non-disruptive network expansion
- Simple machine design with only a single channel adapter type, single scanner type, five line interface types, and seven main storage sizes, providing a high degree of flexibility for configuration changes and extensions, while significantly reducing complexity
- Ability to switch the 3727 Operator Console to any of four 3725s by using the 7427 Console Switching Unit, thus reducing the number of consoles required in a large network and increasing configuration flexibility
- Ability to attach an alternate console and switch it to any of as many as six communication controllers, thus making possible a broad range of network management opportunities — for example, use in a network control center to execute programmed test procedures, examine machine error records, or access stored configuration data
- Improved availability through port swapping. Port swapping is the logical reassignment of a line from a failing port (LIC or communication scanner) to a spare port.

Prerequisite Products

- ACF/NCP Version 2 or the Emulation Program for the 3725
- ACF/NCP Version 4 and ACF/SSP Version 3 beyond 2MB of main storage

Reference Material

- Introduction to the 3725 Model 1 Communication Controller, GA33-0010
- Introduction to the 3725 Model 2 Communication Controller, GA33-0021

3745 Communication Controller

Products Included

- 3745 Communication Controller Model 210
- 3745 Communication Controller Model 410
- 3746 Expansion Unit Model A11
- 3746 Expansion Unit Model A12
- 3746 Expansion Unit Model L13
- 3746 Expansion Unit Model L14
- 3727 Operator Console
- 7427 Console Switching Unit

Main Purpose

The 3745 Communication Controller is a high-performance, high-function communication controller designed to control the data flow between terminals and host processors in data communications networks. It communicates with one or more host processors over a channel or link via another communication controller. A wide range of data terminal equipment using different line speeds, protocols, and interfaces can be connected and operated simultaneously. Communications software and microcode facilitate problem determination and simplify network expansion and modification.

Key Functions, Facilities and Features

- One (Model 210) or two (Model 410) central control units operate under control of the Advanced Communications Function/Network Control Program (ACF/NCP), or Partitioned Emulator Program (PEP).
- Main storage ranges from 4MB to 8MB in increments of 4MB per central control unit.
- The operator console is the 3727 or the 3151 or 3161 ASCII Display Station or an IBM PC running 3101 emulation.
- Up to 16 channel adapters provide the physical connections to byte-multiplexer, selector, or block-multiplexer channels.
- Optional two-processor switches can provide a second path for a channel adapter. This feature can be used with a tightly-coupled processor for symmetric I/O and in other environments offers alternate path capability. This is a maximum of 16 host connections with no more than 8 active at any one time.
- Up to 32 microprocessor-based communication scanners control up to 32 lines each. Capacity for attachment of as many as 512 duplex lines is provided by the 3745/3746 combination; up to 128 duplex lines can be attached to a 3745 Model 210 or 410 base frame. 256 duplex lines can be attached on the 3746 Model L13 or 128 duplex lines can be attached on the 3746 Model L14.
- Four different types of line interface couplers (LICs) support a wide range of modem and direct

- attachments. An LIC can connect from one to four lines, depending on the LIC type.
- Internal clock features are provided for modems that do not provide clocking and for direct attachments.
- Support for up to sixteen T1 connections with eight active permits attachment of communication facilities up to 1.544MB/sec.
- Support for up to eight token-ring attachments at any one time is provided.
- Direct attachment can be made to the IBM Token-Ring Network using the IBM Cabling System.
- The Maintenance and Operator Subsystem (MOSS) includes a microprocessor, its control program, a diskette drive, and an attachment for the MOSS Operator Console. The MOSS allows host-independent maintenance.
- MOSS is accessed over a switched line for remote operator support.

Potential Benefits

- Model 210 with two times the processing power of the 3725 and Model 410 with two times the processing power of Model 210
- Improved price/performance and reliability through the use of improved technology
- Automatic notification of malfunctions to the network operator through a combination of micro-code and software
- Comprehensive, easy-to-use test and problem determination procedures
- Reduced cost and requirements for space and power
- Improved availability and serviceability resulting from built-in system management procedures
- Architecture that provides a base for easy, nondisruptive network expansion with LIC hot pluggability and concurrent maintenance
- Simple machine design with only a single channel adapter type, single scanner type, four line interface types, and two main storage sizes, providing a high degree of flexibility for configuration changes and extensions, while significantly reducing complexity
- Ability to switch the operator console to any of four 3745s by using the 7427 Console Switching Unit, thus reducing the number of consoles required in a large network and increasing configuration flexibility
- Ability to attach an alternate console and switch it to any of as many as six communication controllers, thus making possible a broad range of network management opportunities — for example, use in a network control center to execute programmed test procedures, examine machine error records, or access stored configuration data

- Improved availability through port swapping. Port swapping is the logical reassignment of a line from a failing port (LIC or communication scanner) to a spare port
- Fast recovery from a CCU or memory failure on Model 410 via bus switching of channel adapters and communication scanners to the backup CCU

Prerequisite Products

- ACF/NCP
- Partitioned Emulation Program
- Compatible version of ACF/SSP to provide NCP/PEP generation and utility functions

Reference Material

- Introduction, GA27-3608
- Planning and Installation, GA27-3766
- Description, GA27-3768
- Problem Determination, GA27-3767
- End-User Reference, GA27-3765
- Setup, GA27-3611

3728 Communication Control Matrix Switch

Main Purpose

The 3728 Communication Control Matrix Switch offers a solution to the high-availability requirement of online customers, particularly in large network environments.

The 3728 with its associated control terminal is a data communications switching system that is connected between the communications controllers and the modems, and between the modems and the telecommunications lines. It provides facilities for configuring, reconfiguring, and monitoring the data network from a central location via an operator control terminal.

The 3728 is the basic machine in the system. Port interface options and control options are added to the base 3728 as required by the specific customer configuration. The minimum system uses a single base unit. Larger systems use one base unit and up to 15 extension units. The system size is determined by the number of feature options ordered.

Key Functions, Facilities and Features

Highlights

- 3728 Communication Matrix Switch
 - Up to 16 frames co-located
 - CCITT V.24/V.35/X.21 line protocols
 - Network management via menu driven system
 - Analog and digital interface support
- Availability, expandability, network management
 - Scanner/port/modem sparing
 - Reconfigurations of the network
 - Individual or group port switching
 - Central operator console
 - Extensive interface signal monitoring
- Electronic matrix switch technology
 - Microprocessor-based
 - Component redundancy
 - Online maintenance

Features

- Single unit system
 - 120 interfaces of CCITT V.24/EIA RS-232-C at speeds up to 19.2K bps, or
 - 30 interfaces of CCITT V.35 at speeds up to 153.6K bps, or
 - 240 4-wire analog interfaces, or
 - A combination of interfaces depending upon card positions utilized
- Multiple unit system (single location)
 - One base unit (single unit system)
 - 15 extension units

- System capacity up to:
 - 1920 CCITT V.24/EIA RS-232-C at 19.2K bps, or
 - 480 CCITT V.35 at speeds up to 153.6K bps, or
 - 3840 4-wire analog, or
 - A combination of the above interfaces depending upon port card types and the number of card positions utilized
- Multiple location system (network)
 - Up to 61 nodes. A node is defined as a 3728 system or the support processor – IBM PC XT control terminal. The 3161 Display Station is not classified as a node.
 - Each 3728 system must have at least one control terminal – either a system NetView or NCCF console, a 3728 support processor (PC XT), or a system control console (3161). The 3728 Matrix Switch Host Facility (MSHF) is a licensed program (5665-428) that allows centralized management support for the 3728. MSHF allows 3728 control to be incorporated into network operations performed via the NetView or NCCF console.

With MSHF or the Support Processor (PC XT), the 3728 can be programmed to change network configurations automatically based on specific timing or events.

- Maximum eight Port Card Features to switch CCITT X.21 interface signals at speeds up to 128K bps

Potential Benefits

- Maximize equipment performance: Can improve the reliability/availability of the network to bypass failed components and lines and to balance data traffic loads via central control.
- Manage and plan for network growth: Modular design can provide the ability to grow as the network grows. In addition the ability to attach test equipment to the 3728 facilitates testing prior to production of network facilities.
- Testing monitoring data: Digital and analog interface signals may be monitored for a wide variety of conditions.

Prerequisite Products

When the PC XT is used as control terminal, the 3728 Support Processor licensed program (5668-787) is a prerequisite. For remote MOSS control, a PC XT is required as control terminal at the central and remote sites.

When multiple control terminals are attached to the same 3728, the primary control terminal must be located within 6 meters of the 3728.

For centralized management support of the 3728, the 3728 Matrix Switch Host Facility licensed program (5665-428) used in conjunction with NetView and NCCF is a prerequisite. It allows 3728 control to be incorporated in the network operations via the NetView or NCCF console.

Reference Material

- Introduction Manual, GA27-3640
- Installation Planning and Configuration Guide, GA27-3641

3737 Remote Channel-to-Channel Unit

Main Purpose

The 3737 Model 2 is a telecommunication control unit that addresses the needs of customers who have the requirement to transfer large amounts of data between remote System/370 hosts at speeds up to 2.048 megabits per second (Mbps) in batch or interactive environments.

For batch file transfer requirements, the 3737 provides a cost-effective method for implementing data center back-up, disaster recovery, data base distribution, and remote printing applications.

For interactive communications, the 3737 permits, through a local host, the connectivity of large numbers of remote workstation users to host applications with "near-local" response times.

Key Functions, Facilities and Features

- Support for communications from 192 Kbps to 2.048 Mbps
- One or two parallel communication links
- Up to four 3737 units can share T1 link or links
- Efficient T1 utilization
- Full duplex operation
- Unlimited-distance operation over public or private T1 facilities
- Pass-through function
- Two-channel switch — one active, one alternate
- Remote IPL and power on/off via the local host system
- NetView/PC network management and control available
- Automatic recovery from short-duration outages of the T1 facility

Primary Users

Enterprises or establishments that require T1 speeds between System/370 hosts or a host and a large number of remote interactive workstations and high-speed printers at another host location

Potential Benefits

- Improved response time and throughput
- Ease of installation and operation
- No modification to host software required
- Improved backup and disaster recovery procedures
- More efficient use of communication facilities
- Lower cost of transmission facilities

Products Supported

IBM Processors

- 4361, 4381
- 3081, 3083, 3084
- 3090
- 9373, 9375, 9377

Programming Requirements

- MVS, channel-to-channel (CTC) system definition; VTAM Version 2 Release 1 and above; VTAM definition, CTCA
- VM, CTCA system definition; VTAM Version 3 Release 1 and above; VTAM definition, CTCA
- VSE, CTCA system definition; VTAM Version 3 Release 1 and above; VTAM definition, CTCA
- No NCP required
- The 3737s are always installed in pairs.
- Output from the 3737 must pass through a DSU/CSU or a multiplexer that provides clocking at 192 Kbps to 2.048 Mbps.
- RS449/RS423 interface is standard. V.35 or X.21 interfaces are available with the line share feature.
- The 3737 is transparent to host communications. Each host communicates as if it were channel-connected.
- All VTAM to VTAM flows will work over the 3737. Therefore, software such as CICS, IMS, RES, JES and others that use VTAM CTC support will work with the 3737 without modification.
- The 3737 is treated as a CTC unit by the host system.
- A PC/XT, AT, or PS/2 with the 3737 operator console program, 5601-175, must be available as an operator's console at each 3737 site

Ordering Information

RCTC Unit, Type 3737, Model 002

Reference Material

- Remote Channel-to-Channel Unit, G221-2606
- Description and Installation Planning Guide, GA18-2716
- 3737 Overview and Applications, G520-1244

3834 and 3864 Modems

Main Purpose

The 3834 and 3864 provide communications products with a means of transmitting and receiving data over voice-grade telecommunications channels (normally telephone lines). The 3834 and 3864 operate at 4800 bps over non-switched unconditioned lines. Both will operate with either SDLC or BSC protocols.

Key Functions, Facilities and Features

- The advanced microprocessor-based 386X Modems significantly enhance communication network management and network problem determination.
- The link problem determination aid (LPDA) modem diagnostic tests, operating with Network Problem Determination Application (NPDA) and ACF/NCP, provide:
 - Probable cause of network errors
 - Alert messages on error thresholds and other user-designated alerts
 - Reformatted modem test results
- Standard features:
 - A microprocessor for signal processing
 - Auto-answer, which provides the automatic answering of switched network calls (3864 Model 2 and 3864 models equipped with the optional four-wire Switched Network Backup feature)
 - Automatic remote speed selection. Transmission speed of remote modem follows that of local modem.
 - Antistreaming. A multipoint tributary modem can automatically cut off transmission if a terminal holds up "request to send" longer than 40 seconds – an abnormal condition in IBM communications protocol; this is a customer switch option.
 - Automatic and adaptive equalization. Equalization is automatically performed by the modem and continues to adapt in data mode.
 - Line conditioning not required
 - Operation in point-to-point and multipoint networks at all speeds
 - Protective circuits required for direct attachment to the public switched network and for compliance with FCC registration requirements built into the modems
 - Operator panel with operational status and data quality (good, poor) indicators
 - Manual tests (tests that can be executed from the modem operator panel)
- Optional features:
 - Four-wire Switched Network Backup (SNBU). This feature is available for the 3864 Model 1 to provide backup for the normal nonswitched communication facility.

- Fan Out. This feature is available on non-switched modems, allowing the attachment of up to three telecommunications machines to one modem (available on the 3864).
- Tail Circuit Attachment. This feature allows 3864 (4800-bps) Model 1 to attach to a 3865 (9600-bps) Model 1 with the data multiplexing feature.

Potential Benefits

- NPDA/LPDA capabilities allow the network operator to isolate problems to the line, local modem, remote modem, or elsewhere in the network. In addition, it provides the network operator with the most probable cause of network problems.
- Customer setup design makes the modem easier to position and relocate.
- Link outage time is reduced.
- Trend Analysis provides early warning of network problems.
- Need for a highly skilled communications specialist is decreased.
- Higher speed (9600-bps) multidrop capability increases throughput.
- Communications cost reduction is possible because of unconditioned lines, higher-speed multidrop modems, and multiplexing.

Products Supported

- IBM communications products capable of data transmission at speeds of 2400, 4800, or 9600 bps
- Support provided by:
 - Network Communication Control Facility (NCCF) Version 2 (5668-947)
 - Network Problem Determination Application (NPDA) Version 3 (5668-920 for OS/VS and 5666-295 for DOS)
 - ACF/NCP Version 3 (5667-124)
 - DPCX Release 3 (5761-DS1)
 - DPPX
 - System/36 System Support Program (5727-SS1)

Ordering Information

A volume purchase discount is available.

Reference Material

- Brochures, G520-3456, G580-0253
- Introduction and Site Preparation Guide, GA27-3200 and GA33-0030

5811 and 5812 Limited-Distance Modems

Products Included

- 5812 CNM Limited-Distance Modem Model 10
- 5812 CNM Rack-Mounted Limited-Distance Modem Model 18
- 5811 Non-CNM Limited-Distance Modem Model 20
- 5811 Non-CNM Rack-Mounted Limited-Distance Modem Model 28
- 5810 Modem Enclosure

Main Purpose

The 5811 and 5812 Limited-Distance Modems are extensions of the IBM modem family. They are general-purpose, high-performance, limited-distance base-band modems.

The 5812 Models 10 (standalone) and 18 (rackmount) are communications network management (CNM) (LPDA-1) modems to support synchronous data transmission at speeds of 2400, 4800, 7200, 9600, 14400, or 19200 bits/second. They can also serve as non-CNM limited-distance modems to support asynchronous transmission at specific speeds from 45.5 bps to 19.2K bps. On four-wire circuits they can operate in point-to-point or multipoint configurations using half-duplex or full-duplex transmission. On two-wire circuits, they can operate in point-to-point configurations using half-duplex transmission. Operation is across a DCE-to-DTE interface defined by RS-232C (CCITT, V.24, V.28, and ISO 2110) on circuits having metallic continuity.

The 5811 Modems Models 20 (standalone) and 28 (rackmount) are non-CNM versions of the 5812. They offer the same functional capabilities except CNM.

Key Functions, Facilities and Features

5812 CNM Limited-Distance Modem Model 10 and 5812 CNM Rack-Mounted Limited-Distance Modem Model 18

- Communications Network Management via LPDA-1 commands for network problem determination/isolation
- Synchronous (CNM or non-CNM) or asynchronous (non-CNM) operation
- Single circuit card
- Small size
- Standalone model convertible by the customer to rackmount model
- Microprocessor-based
- CMOS digital technology, BIFET operational amplifier analog technology
- Low power consumption
- Fully automatic line equalization

- Customer setup and easy problem determination by using a *Setup, Problem Analysis and Resolution* manual
- Comprehensive built-in manual diagnostics: local self-test, local loop-back test, loop transmit and receive test, and remote loop-back tests
- Compatible with the IBM Cabling System
- Compatible with Local Area Data Channels
- Usable as a tailed modem for conventional long-haul modems in non-CNM mode
- Set of DTE interface and status indicators
- Model 10 has a direct plug-in power transformer to supply low-voltage AC to the modem.
- Model 18 uses power from dual transformers mounted in the 5810 Modem Enclosure.
- Indicator lights also serve to display error codes during test mode to diagnose/locate problems between modem, DTE interface, and communication link.
- Four/two-wire selectable by user via jumpers on the modem card
- Configuration selectable by user option switches:
 - Control/tributary
 - Point-to-point/multipoint
 - Internal/external clock
 - Receive/transmit impedances
 - Data rate
 - Receive clock wrap
 - Synchronous/asynchronous
 - CNM/non-CNM
 - Antistreaming/no antistreaming
 - RTS/RFS short/long delay

5811 Non-CNM Limited-Distance Modem Model 20 and 5811 Non-CNM Rack-Mounted Limited-Distance Modem Model 28

- These models of the 5811 are identical to and have all of the features of the new 5812 described above except CNM.

5810 Modem Enclosure

- Provides housing and power for up to fifteen 5811 Model 28 and 5812 Model 18 Limited-Distance Modem packs. It has dual power transformers, each powering up to 8 modem packs. No cooling fan is required as long as the air in the cabinet is within specified limits.

Potential Benefits

- Substantial cost savings where distances are short and there is no need for the sophisticated signal processing capabilities of long-haul modems
- Customer setup design that makes the modem easier to position and relocate

- Typical range of 7.5 miles for 9.6KB/sec transmission over No. 22 AWG wire on a point-to-point link

Ordering Information

A volume purchase discount is available.

Reference Material

- 5810 Enclosure, 5811/12 Modem Description and Planning Guide, GA33-0081
- Users Guide, GA27-3649

5821 and 5822 Data Service Unit/Channel Service Unit (DSU/CSU)

Products Included

- 5822 CNM Data Service Unit/Channel Service Unit Model 10
- 5821 Non-CNM Data Service Unit/Channel Service Unit Model 10

Main Purpose

The 5821 and 5822 DSU/CSUs are extensions of the IBM modem family. They are general-purpose, high-performance DSU/CSUs.

The 5822 Model 10 (5822-010) extends the IBM end-to-end network management offering to customers using digital data transmission facilities. It offers consistent communications network management (CNM) services to customers who use the 5865, 5866, and 5868 modems and NetView and who also use digital data transmission facilities or plan to migrate to DDS (Digital Data Service). The 5822-010 is a combined data service unit/channel service unit for use on the DDS network, and it can also operate as a limited-distance modem.

The 5821 Modem Model 10 is a non-CNM version of the 5822. It offers the same functional capabilities except CNM.

Key Functions, Facilities and Features

5822 CNM DSU/CSU Model 10

- Combined data service unit/channel service unit
- Data transmissions and end-to-end diagnostics on DDS without secondary channel
- Automatic equalization
- Transmission speeds up to 56KB/second
- Limited-distance modem mode of operation
- Various tailing configurations in combination with analog modems in CNM and non-CNM environments
- NetView support (alerts, statistics, solicited commands, online help)
- NetView operator interface consistent with 586X modem screens
- Configurations

The 5822-010 can operate over point-to-point and multipoint carrier lines. It operates over point-to-point lines in LDM mode.

The 5822-010 can also be used with itself and the 5865 and 5866 modems in various tailed link configurations.

- Bit rates

The 5822-010 supports 2.4, 4.8, 9.6, and 56KB/second full-duplex synchronous transmissions. In

addition, it supports 19.2KB/second when used as an LDM.

- Interfaces

EIA RS-232-D and CCITT V.35 connectors are built in.

The telecommunications line interface is an eight-pin socket that follows the RJ-48S FCC designation.

- Configuration setting

A set of switches, buttons, and light emitting diodes (LED) on the front panel allows the setting of the operational parameters at setup time.

- Manual tests

These switches and LED can also be used to execute a comprehensive set of manual diagnostics. Some of them allow testing a remote 5822 and the line from the central site.

- Network-initiated diagnostics

The 5822-010 responds to loop-back commands received from the network. Such commands can be triggered by the carrier's service personnel upon a request from the customer.

- Self test

The 5822-010 monitors its own hardware. Automatic self tests and recoveries are triggered when problems are detected.

- Line monitoring

The product continuously monitors the quality of the line signal and keeps track of abnormal line behaviors. These data are made available to the customer via NetView.

- Remote DSU/CSU problem detection

Upon power-off or when a hardware failure occurs, the remote DSU/CSU sends a signal that is received and logged by the local DSU/CSU. The detection of this signal is reported by the local DSU/CSU on request.

This function is available when the bit rate is 9,600 bps or higher.

- Remote DTE interface monitoring

Remote DSU/CSUs keep track of the status and the recent activity of the attached DTE interface leads. These data are made available to the central site on request through the local DSU/CSU.

- Antistreaming

Under a configuration option, a tributary DSU/CSU on a multipoint link can prevent the attached DTE

from transmitting data for more than a 10- to 40-second duration, depending on the speed in use.

5821 DSU/CSU

- The 5821 is identical to and has all of the features of the 5822 described above except CNM.

Potential Benefits

- Cost-effective device enabling data communication across DDS-1 (Digital Data Service – 1) circuits
- Customer setup design that makes DSU/CSU easier to install and relocate
- CNM capabilities that allow network operator to isolate problems to digital circuit, local or remote DSU/CSU, or data terminal equipment
- All DDS-1 speeds supported on same model

Ordering Information

A volume purchase discount is available.

5841 Modem

Main Purpose

The 5841 is a microprocessor-based standalone modem that transmits data in duplex mode over the public switched telephone network at speeds up to 1200 bps. The modem transmits data using asynchronous or synchronous protocol.

Key Functions, Facilities and Features

- The high performance 5841 modem is designed for point-to-point communication, for IBM Personal Computers or other data terminal equipment (DTE), in a non-communication network management environment.
- Standard features:
 - Internal power pack
 - Controls via front panel for initiating built-in diagnostics and for selecting speed and data/talk mode
 - Controls via rear panel for power on/off and modem configuration
 - Automatic or manual answer capability
 - Automatic speed detection. The modem detects a DTE transmission speed of 75, 100, 110, 134.5, 150, 200, 300, 600, or 1200 bps and adjusts for compatibility.
 - Support for IBM and "AT" command sets
 - Automatic and adaptive equalization. Equalization is performed automatically by u.22 and 212A configurations of the modem and continues to adapt while in data mode.

Potential Benefits

- Cost effective device enabling point-to-point communications by IBM PC or other DTE devices
- Customer-setup design that makes the modem easier to position and relocate

Ordering Information

A volume purchase discount is available.

5853 Modem

Main Purpose

The 5853 Modem is a stand-alone unit transmitting data on the public switched telephone network (PSTN) in full-duplex mode, at the data rate of 0 to 300 bps in asynchronous mode and 1200 and 2400 bps in synchronous and asynchronous modes. Automatic dialing can be controlled from the data terminal equipment (DTE) via either the IBM, the AT, or the V.25 bis command sets. Compatibility with an 801-type autocal unit is also provided. This modem provides error-checking and retransmission capability, using Microcom Network Protocol (MNP) up to Class 3. Remote Support Facility (RSF) connection is supported using V.25 bis autocal command set.

Key Functions, Facilities and Features

- Compatible with CCITT recommendation V.22 bis (2400 and 1200 bps synchronous and asynchronous) Bell 103 standard modems (0 to 300 bps asynchronous); Bell 212A standard modems (1200 and 300 bps asynchronous); and CCITT recommendation V.25 bis for autodial in synchronous mode
- Support for IBM and AT autodial command sets
- Error checking asynchronous operation using up to Class 3 of Microcom Networking Protocol
- Speed buffering to allow the attached DTE speed to remain constant regardless of the modem-to-modem connection speed
- Automatic selection of 212A/103 or V.22 bis operation to match the remote modem in call-originate mode
- Automatic speed and character format detection in asynchronous mode. DTE speeds of 75, 100, 110, 134.5, 150, 200, 300, 1200, or 2400 bps are automatically detected.
- Automatic adaptive equalization when operating in 212A or V.22 bis mode
- Automatic or manual answer and dialing capability

Potential Benefits

- Cost-effective device enabling point-to-point communications by IBM PC or other DTE devices
- Customer-setup design that makes the modem easier to position and relocate

Ordering Information

A volume purchase discount is available.

5865, 5866, and 5868 Modems

Main Purpose

The 5865, 5866 and 5868 modems provide communications products with a means of transmitting and receiving data over voice-grade telecommunications channels (normally telephone lines). The 5865 and 5866 operate at up to 9,600 and 14,400 bps, respectively, over nonswitched lines. The 5868 Rack-Mounted Modems Model 51 operates at speeds of up to 9600 bps and the Model 61 operates at speeds of up to 14,400 bps.

Key Functions, Facilities and Features

- The advanced microprocessor-based 5865, 5866, and 5868 are synchronous, high-performance modems, designed for the IBM Communications Network Management (CNM) environment as well as non-CNM environments managed by a network specialist.
- The IBM 5866 and the 5868 Model 61 use IBM-designed trellis coding at 14,400 bps to enhance throughput.
- Standard features:
 - A microprocessor for signal processing
 - Integrated keypad/display panel used to configure modem, display modem statistics, and execute diagnostic tests
 - Detailed measurement and reporting of extensive line parameters
 - Receive level
 - Minimum receive level
 - Signal/noise ratio
 - Harmonic distortion
 - Data quality
 - Phase jitter
 - Frequency shift
 - Impulse hits
 - Line breaks
 - Round trip delay
 - Automatic remote speed selection. Transmission speed of remote modem follows that of local modem.
 - Antistreaming. A multipoint tributary modem can automatically cut off transmission if a terminal holds up "request to send" longer than 40 seconds – an abnormal condition in IBM communications protocol.
 - Automatic and adaptive equalization. Equalization is automatically performed by the modem and continues to adapt in data mode.
 - Line conditioning usually not required
 - Operation in point-to-point and multipoint networks
- The link problem determination aid (LPDA) modem diagnostic tests (a component of various IBM operating systems), operating with Network Problem Determination Application (NPDA) and ACF/NCP, provide:
 - Probable cause of network errors
 - Alert messages on error thresholds and other user-designated alerts
 - Reformatted modem test results
- The 5868 Rack Mounted Modems utilize the 5869 hand-held Portable Keypad/Display (PKD), which is used to configure the 5868's operating characteristics, display line parameter statistics, and request execution of modem tests. Results may be read directly from a new high-resolution display built into the 5869.
- The 3866 Multimodem Enclosure provides housing for up to six 5868 Rack-Mounted Modems, a 5210 Power Unit, and a 3950 Fan Unit.
- The 5868s and 3868s can reside in the same 5866 enclosure
 - Model 1 Multimodem Enclosures for installation in standard 19" cabinets. Up to six enclosures per cabinet and up to 72 modems are supported.
 - Model 2 Multimodem Enclosure for installation in a freestanding IBM minicabinet.
 - The 5868s are realtime hot-pluggable units.

Potential Benefits

- NPDA/LPDA capabilities allow the network operator to isolate problems to the line, local modem, remote modem, or elsewhere in the network. In addition, it provides the network operator with the most probable cause of network problems.
- Customer setup design makes the modem easier to position and relocate.
- Link outage time is reduced.
- Trend Analysis provides early warning of network problems.
- Enhanced diagnostic capability for local and remote modems is provided.
- Total communications costs can be reduced using high-speed 586X's.
- Non-CNM customers can use keypad/display to control their networks.

Products Supported

- IBM communications products capable of data transmission at speeds of 9,600 and 14,400 bps
- Support provided by:
 - Network Communication Control Facility (NCCF) Version 2 Release 2
 - Network Problem Determination Application (NPDA) Version 3 Release 2 (5668-920 for OS/VS and 5666-295 for DOS)

- ACF/NCP Version 3 (5667-124)
- DPCX Release 3 (5761-DS1)
- DPPX
- System/36 Support Program (5727-SS1)

Ordering Information

A volume purchase discount is available.

Reference Material

- Modem Description, GA33-0036
- Introduction and Site Preparation Guide, GA33-0037

Integrated Digital Network Exchange (IDNX)

Products Included

- 9738 IDNX Model 70
- 9737 IDNX Model 40
- 9736 IDNX Model 20

Main Purpose

The IDNX product family provides bandwidth management for integrated voice, data, image, and video telecommunications using a variety of communication services including T1 trunks at 1.544 Mbps. The IDNX is recommended for wide-area backbone communication networks.

Key Functions, Facilities and Features

- Support for a variety of transmission facilities for integrated voice/data transmission including T1 carrier service, T3 service via M13 multiplexer, and subrate trunk service
- Automatic network topology management
- Comprehensive range of input data port speeds and standard interfaces
- Support for D4 channelized format for DS1 input (1.544 Mbps) to interface to digital PBXs, D4 channel banks and the Public Switched Network (PSN)
- Voice compression capabilities of up to 4 to 1
- Dynamic bandwidth allocation (assignable on demand) and prioritized alternate routing
- Optional preempt priority assignable to high-priority connections
- Adaptive network clocking and synchronization – choice of internal or up to eight external clocking sources with a fallback priority scheme
- Redundant key components with automatic backup for increased availability
- 2.048-Mbps CEPT (Council of European Post Telecommunications) trunk module for international gateways
- Digital Multidrop Data feature to attach several terminals over a single data channel
- Link Cost Routing, which allows paths with lowest assigned “cost” to be selected
- Comprehensive centralized or distributed network management – user-friendly, menu-driven operator interface provides control, monitoring, and diagnostic capabilities
- Enhanced and advanced network management options available including alerts sent to an SNA host-based NetView application via NetView/PC
- Provision for networks of up to 250 IDNX nodes

Primary Users

- Enterprises requiring wide-area backbone communications networks

Potential Benefits

- Dynamic alternative routing for improved network availability
- Increased bandwidth utilization, which allows for lower cost of transmission facilities
- Flexible network topologies
- High degree of system reliability through fault-tolerant internal code and multitasking design
- Easy addition of nodes to the network – no routing tables required
- Ability to manage entire network from one focal point

Products Supported

- Compatible with a variety of communications equipment from major vendors such as PBXs, ACDs, modems, front-end processors, encryption devices, and M13 multiplexers
- Compatible with all major T1 common carriers and public network services with transparent access between networks
- Supports cable, microwave, satellite and fiber optic media

IDNX Model 70

- Expandability: One to eight shelves of 16 modules each
- T1 trunks: Up to 96 internodal trunks
- Voice support: Up to 768 active voice calls
- Data support: Up to 464 active data calls
- Active calls per node: 1024 maximum (originating, terminating, or pass-through)

IDNX Model 40

- Capacity: Single (dual-row) card shelf of 24 modules
- T1 trunks: Up to 15 internodal trunks
- Voice support: Up to 336 active voice calls
- Data support: Up to 76 active data calls
- Active calls per node: 1024 maximum (originating, terminating, or pass-through)

IDNX Model 20

Single Shelf

- Capacity: Single card shelf that supports up to 12 modules
- T1 trunks: Up to ten internodal trunks
- Voice support: Up to 192 active voice calls
- Data support: Up to 36 active data calls with one supporting trunk
- Active calls per node: 1024 maximum (originating, terminating, or pass-through)

Double Shelf

- Capacity: Double card shelf that supports up to 24 modules
- T1 trunks: Up to fifteen internodal trunks
- Voice support: Up to 336 active voice calls
- Data support: Up to 84 active data calls with one supporting trunk
- Active calls per node: 1024 maximum (originating, terminating, or pass-through)

The single shelf Model 20 can be upgraded to the double shelf model.

In configuring a network, the Model 20 is limited to two common logic modules, which contain the CPUs. If an application requires more CPUs because of the load units required for voice (DS-1, PRC) or trunk modules, a larger model would be the appropriate solution.

Reference Material

- IDNX Product Summary, GA34-0854
- IDNX Digest, GA34-0816

IBM 9751 CBX and ROLM CBX

Main Purpose

The IBM and ROLM CBX family consists of computer-controlled time division multiplexing switching systems and software that provide both voice- and data-switching capability. This completely integrated, PBX-based telecommunications system handles all voice transmissions plus mainframe access, management information reporting, and local and wide-area networking. The CBX is a modular, computer-driven, digital communications controller that supports a wide variety of configurations, ranging from 16 to 20,000 extensions.

Key Functions, Facilities and Features

- Support for voice, data, text and video applications
- Support for a full family of ROLM digital desktop devices that provide 3270 and ASCII terminal emulation
- ROLMlink, a digital communications path that provides voice/data integration through a single telephone wire
- ROLMbridge 5250, which allows asynchronous devices to access System/3X systems through the CBX
- Advanced voice station features
- ROLM PhoneMail voice messaging system
- Shared outgoing and incoming modem pools
- Integrated voice, asynchronous, and synchronous data communications from the desk to computers, office automation systems, and wide area networks
- High call processing throughput and system bandwidth
- Control Packet Network II (CPN II) and Virtual Node Configuration (VNC), which provide improved system performance, reliability, integrity and diagnostics
- Distributed architecture
- Self-testing diagnostic tools

Primary Users

All industries

Potential Benefits

- User productivity because of CBX features
- Voice/data integration, data switching, voice messaging, networking and telemarketing functions for increased productivity
- Integration with ROLM PhoneMail voice messaging system
- Nodal architecture designed for cost-effective modular expansion and system failure protection
- End-to-end digital system

Products Supported

- ROLMphones
- ROLM desktop products (Cypress, Juniper II)
- ROLM PhoneMail
- Synchronous and asynchronous terminals

Reference Material

- IBM/ROLM Switched Data Products Overview, GA27-3709
- IBM/ROLM Connectivity Reference, GA27-3752

Other reference materials are available from an IBM/ROLM systems branch office.

ROLM Desktop Products

Products Included

- Cypress
- Juniper II
- ROLMphone 244PC
- ROLMphone family with Data Communications Module II (DCM II)

Main Purpose

To answer a variety of office needs, ROLM provides a wide range of desktop, integrated voice/communication products. The Cypress, Juniper II, ROLMphone 244PC, and ROLMphone family with DCM II integrate voice and data at the desk and provide end-to-end digital communications over single twisted-pair wire through a CBX.

Key Functions, Facilities and Features

The Cypress and Juniper II desktop devices both include the following basic features:

- Used in conjunction with the IBM protocol converters (7171, 3708): emulation of ASCII 3270-type terminals
- Also, emulation of popular ASCII asynchronous terminals for connection to non-IBM hosts
- With Personal Communications Software (PCS): rapid access to data files, convenient one-touch telephone feature access, and a number of personal time management tools, such as built-in calculator, reminder list, and internal clock
- 25-line screen display, 80 characters per line
- Data transmission in character mode
- Transmission rate from 110 to 19,200 bits per second
- Connection to IBM and ROLM CBXs by a single twisted pair of telephone wire – no coaxial cable
- Simultaneous voice and data communications. The user can talk on the phone and use the terminal at the same time.
- Terminal profiles. The user records a terminal profile for each host computer, which defines the baud rate and parity to match the host.
- Auto-dial to the recorded terminal profiles by pressing one key

Cypress is a personal communication terminal that combines a digital telephone, productivity and communications services, and a high quality computer terminal in one compact unit.

- ASCII terminal with asynchronous communication to local and remote host computers via the ROLM CBX

- Emulation of IBM 3270, DEC VT100, DEC VT200, Data General Dasher D210, ADDS Viewpoint Plus, LEXIS and NEXIS terminals
- Compact, quiet design

Juniper II is a hardware and software package that consists of a digital Juniper phone, a Juniper II card that is installed in an IBM Personal Computer, and the ROLM Personal Communications Software (PCS) package.

- Terminal emulation: 3270 via 7171 or 3708, or popular asynchronous terminals
- Direct dialing from a personal phone list
- Easy transfer back and forth from phone features to IBM PC applications
- The ability to transfer ASCII/asynchronous files among itself, PCs and other computers
- IBM PC, XT, and AT compatibility
- Coexistence with the IBM Token-Ring Network and use of IBM PC Local Area Network Program software (Version 1.13 or later)
- Easy access to corporate data bases and public information services

ROLMphone 244PC is a voice and data communications telephone that links personal computers to IBM and ROLM CBXs. It combines a digital ROLMphone telephone with a data communications interface that supports the AT command set used by many modems. The ROLMphone 244PC attaches to an array of personal computers via a standard asynchronous serial PC port.

- Operates with IBM personal computer including Personal System/2 family
- Supports the AT command set and provides compatibility with existing communications software written to this interface
- Operates independently of the PC hardware, allowing the choice of PC monitor, communication cards, or other PC adapters
- Architected, documented ROLMphone 244PC interface permits a user to write or customize applications to take full advantage of the powerful CBX functions beyond the AT feature set
- Provides digital voice transmission and simultaneous data transmission capability using ROLMlink
- Configuration software allows for individual customizing of repertory-dialing (repdial) keys for most frequently-used features.
- Built-in two-way speakerphone allows use of the ROLMphone 244PC for "hands-free" operation.
- Has ROLMphone 240 telephone features

ROLM Desktop Products

The Data Communications Module II is a synchronous and asynchronous digital interface integrated into the ROLMphone 120, 240, and 400 digital telephones.

- Low-cost connection is provided for terminal users.
- Synchronous data calls are established using the ROLMphone keypad.

Primary Users

- All industries
- Organizations with heavy voice communication needs
- Organizations with multiple computer resources requiring switched access

Potential Benefits

- User productivity by use of telephony and data software products
- Desktop integration of voice and data

Reference Material

- ROLMphone 244PC, 303005*
- ROLM Desktop Products, G520-5086
- ROLM Cypress, 303003*
- ROLM Juniper II, 303004*
- IBM/ROLM Switched Data Products Overview, GA27-3709
- IBM/ROLM Connectivity Reference, GA27-3752

* ROLM ordering numbers

ROLM PhoneMail

Main Purpose

PhoneMail is a computer-controlled voice messaging system consisting of hardware and software that stores and forwards voice messages, eliminating costly "telephone tag" and reducing time-consuming memo writing. PhoneMail voice messages can be sent directly to an individual or simultaneously to a number of people.

Key Functions, Facilities and Features

- Compresses and stores digitalized voice messages on hard disk
- Answers the user's telephone automatically (if desired), plays a user-recorded personal greeting, and takes a message
- Records and sends messages to an individual, several individuals, or predetermined distributions
- Automatically notifies the user when messages are waiting
- Listens to messages received, answers, forwards with comments, or saves for later action from any touch tone telephone
- Provides return receipts to message senders indicating whether or not messages were received
- Delivers verbal prompts over the telephone for easy operation
- Provides enhanced integration with IBM and ROLM CBXs or Centrex #1AESS systems; can be connected to any non-IBM PBX
- Provides automatic telephone answering with personal greetings and notification of waiting messages to Centrex users.
- Provides name/extension identification and multiple personal greetings
- Provides call processing which can be used for attendant assistance, to automatically answer and route incoming calls, and for information mailboxes, to provide callers with a menu of pre-recorded information and announcements, with the option of transferring to a live attendant
- PhoneMail Network allows subscribers to send, receive, answer or forward a message to one or more subscribers at other PhoneMail locations in the same manner as local PhoneMail messages.
- PhoneMail/VM Host Link provides Professional Office System (PROFS) and Voice Text Messaging System (VTMS) users with automatic notification of waiting PhoneMail messages. PhoneMail subscribers can also receive notification through the PhoneMail system of new VTMS messages waiting on connected IBM office systems.

Primary Users

- All industries
- Organizations requiring a common messaging system at the enterprise or establishment level

Potential Benefits

- Improved productivity because of PhoneMail features, reducing telephone tag and message-taking resources
- Little or no training required to use effectively
- Recording or retrieval of messages in or away from the office
- One standard voice messaging system at the enterprise or establishment level
- Modular design for expansion
- PhoneMail Network provides a company-wide voice messaging network, independent of PBX type and PhoneMail configuration.
- PhoneMail subscribers are informed of waiting VTMS text messages
- PROFS and VTMS users receive automatic, visual notification of new PhoneMail messages at their workstations

Products Supported

- Integration with IBM and ROLM CBXs, Northern Telecom SL-1, or Centrex #1AESS
- Connection to non-IBM PBX, Northern Telecom SL-1, and other Centrex telephone systems via tie lines or single lines using the ROLM PhoneMail Telephony Interface (PTI). Full-feature set is not available when connected to non-IBM PBX and Centrex telephone systems. (Integration with Northern Telecom SL-1 and Centrex #1AESS provides most features.)

Reference Material

ROLM PhoneMail System, 303013*
 PhoneMail non-ROLM PBX and Centrex, G520-6193
 PhoneMail/VM Host Link, G520-6303

* ROLM ordering number.

ROLM Redwood System

Main Purpose

Redwood is a fully digital, distributed control telephone system that operates the ROLMphone family of digital telephones as multiline stations. The Redwood system supports 16 to 144 ROLMphone stations and from 6 to 47 outside lines in modular cabinets. There are two Model IIs – an MF key system and a configurable key PBX, or a combined operation system. Redwood utilizes ROLMlink ROLM/IBM's system-to-station digital voice/data communications link.

Redwood is a basis for IBM/ROLM switched connectivity in the small business and branch office environment. The Redwood architecture is consistent with IBM/ROLM voice/data network connectivity.

Key Functions, Facilities, and Features

- There are two Model IIs – an MF key system and a configurable key PBX, or a combined operation system; Model I is an MF (multi-function) certified key system.
- Redwood has full digital technology and distributed microprocessor control with software-driven functionality.
- Flexible call coverage is provided for both internal and external calls. Call coverage features include direct inward dialing (DID) and direct inward system access.
- Outgoing call management features include basic/custom/network toll restriction and route optimization (both assignable by station), account codes from all phones, and CDR (call detail record) list.
- Digit-translation capability is provided for intelligent end-point operation in an enterprise network or simple controller operation in a small business network.
- Station features include call forwarding, call conferencing, call transfer, call pickup, speed dialing, broadcast/zone paging, and direct outside lines.
- ROLMlink, ROLM/IBM's system-to-station digital voice/data communications link, is utilized.
- The ROLMphone family of digital telephones is utilized.
- 16 to 144 ROLMphones and from 6 to 47 outside lines are supported.
- Configurable diagnostics for ROLMphones, controllers, trunks, RS-232 port, and library/clock card are provided.
- Remote system management and diagnostics are made through RS-232 port connection.

- Distributed control provides system reliability and ease of expansion.
- Design is compact, modular.
- Standard business operating environment is used.

Primary Users

Small businesses and branch offices under 144 stations

Potential Benefits

- Easy to install
- Key system only or configurable key, a PBX, or combination operation
- ROLM/IBM's digital voice/data communications link
- Utilizes ROLMphone family of digital telephones
- Offers modular growth at linear pricing
- Customized cost control
- Flexible call coverage which can adapt to customer's business operations
- Simple-to-use telephone features

Products Supported

- ROLMphone 120, 240 Handsfree, 240 Basic, and 400 Display
- Redwood configuration processor software for the IBM PC

Reference Material

- Contact IBM/ROLM systems branch office

ROLMbridge 5250 Link Protocol Converter

Main Purpose

The ROLMbridge 5250 Link Protocol Converter integrates with IBM and ROLM CBXs to provide a powerful communications pathway between asynchronous workstations and System/36 and System/38 host computers. ROLMbridge 5250 is a CBX-resident card set consisting of one or two protocol converter cards and a CBX system board with integral twinax connectors that attach to the twinax cables coming from a System/36 or System/38 workstation controller.

ROLMbridge 5250 permits access to a System/36 or System/38 computer using ROLM Cypress, Juniper, ROLMphone 244PC or ROLMphones with DCM II. In addition, the ROLMbridge 5250 supports 3101 or 316X family of terminals as well as other asynchronous terminals, printers, and personal computers.

Key Functions, Facilities and Features

- ROLMbridge 5250 supports 10 different types of asynchronous workstations and printers.
- Connection permits selected asynchronous devices to communicate with the host system as locally attached 5291 displays or 5256 printers.
- Each protocol converter card supports seven CBX ports for seven simultaneous connections across the twinax cable.
- Asynchronous devices connect to the CBX via the ROLMlink communications protocol using standard twisted-pair telephone wires.
- Data speeds from 110 bps to 19.2K bps
- Expandable by multiples of seven channels, depending on host system limitations and the IBM or ROLM CBX configuration
- Host computer connection initiated by dialing the ROLMbridge 5250 "extension" or data group and selecting the device type
- Security and reliability with power-on self-test, interface diagnostics and password protection features
- Auto-baud and auto-parity detect up to 19.2K bps

Primary Users

IBM and ROLM CBX establishments with a need to access System/36 or System/38 hosts or multiple types of hosts with ASCII asynchronous or ROLM desktop products

Potential Benefits

- Eliminates the need for external protocol converters for System/36 and System/38
- Gives users more access to System/36 and System/38 through call queuing and resource sharing
- Links IBM and ROLM CBXs to System/36 and System/38 to provide a single-vendor solution for asynchronous connection
- Periodic users can access host computers without the need for expensive cabling and special terminal equipment
- Cost-effective connection requires no change to the host computer; supports multiple asynchronous terminals
- Cost-effective seven-port expandable configuration

Products Supported

- System/36 SSP Release 5 and System/38 CPF Releases 7 and 8
- ROLM desktop products
- A variety of asynchronous terminals, printers and personal computers
- IBM 9751 CBX and ROLM CBX systems with software releases 8003, 8004, or 9004 and later

Reference Material

ROLMbridge 5250 Link Protocol Converter, 303010

Section 53. Storage and I/O

Direct Access Storage Devices (DASD) and Storage Control

Products Included

- 3990 Storage Control
- 3880 Storage Control
- 3370 DASD
- 3375 DASD
- 3380 DASD

Main Purpose

- The 3990 Models 1, 2, and 3 provide high performance for large-capacity direct access storage devices. They incorporate the latest technology and design and offer improved attachment flexibility, price, performance, capacity, function, and reliability.
- The 3880 contains two storage directors for independent control of attached DASDs. They have different attachment and feature capabilities. Models 21 and 23 have up to 64MB of high-speed electronic cache storage. The Model 21 manages virtual storage page space and the Model 23 transfers frequently used application and systems data to the processor at electronic speeds.
- The 3370 and 3375 are nonremovable medium, direct access storage units for intermediate systems. The 3370 uses fixed block architecture data recording; the 3375, count-key-data format. Both devices employ two independently operating actuators on one spindle per unit.
- The 3380 is a large-capacity, nonremovable medium, high-performance DASD device with superior reliability, availability, and serviceability. It uses count-key-data format. Its price/capacity and price/performance characteristics provide economical growth opportunities for large system users.

Key Functions, Facilities and Features

3990 Storage Control Models 1, 2, and 3

- 4-path access for performance, availability, and the capability for non-disruptive DASD installation of enhanced-subsystem DASD (Models 2 and 3 only)
- Support for most commonly available 3380 DASD types for configuration flexibility
- Upgradability from the 2-path 3990 Model 1 to the 4-path Model 2 to the cached Model 3

- Improved reliability, availability, and serviceability through power and maintenance boundaries and remote maintenance capability, backed by a 12-month warranty
- Improved environmental factors: less power, less heat, less floor space than the 3880s with equivalent paths
- Improved cache functions of the Model 3 offering:
 - Larger cache sizes from 32MB to 256MB of one-megabit dynamic random access memory (DRAM) for high-performance data access
 - Cache-host transfers at speeds up to 4.5MB/sec when connected to 3090 processors with 4.5MB/sec channels, improving performance and lowering channel overhead
 - With DASD Fast Write, performance for written data comparable to that of read data
 - With Dual Copy, duplication of key system or application volumes to enhance data availability

3880 Storage Control Models 1 and 3

- Storage control facility has two directors, each controlling up to 32 actuators.
- Model 1 directors support the 3330/3333/3350, 3340/3344, 3370, and 3375. In the Model 3, both directors support 3380 only.
- Rotational position sensing (RPS) permits disconnection of disk drives from the control unit and block multiplexer channel during seek and search time.
- Multiple requesting in conjunction with RPS permits up to 32 channel command sequences (one per actuator) to be active concurrently.
- Two-, four-, and eight-channel switching are optional.
- The optional Speed Matching Buffer for 3380 feature allows attachment of the 3380 to the 1.5 and 2MB/sec channels of the 4341, and to the 1.5MB/sec channels in 303X Processors and System/370 Models 158 and 168. It cannot be installed on a 3880 Model 3 that has the Extended Capability Feature installed.
- The optional Speed Matching Buffer for 3375 feature allows attachment of the 3375 to block multiplexer channels with data rates as low as 1.5MB/sec on the System/370 Model 145 and up and 303X processors.
- Models 1 and 3 may be upgraded to Models 21 and 23, respectively.

Direct Access Storage Devices (DASD) and Storage Control

3880 Storage Control Model 4

- Provides a single storage director
- Controls 3370 or 3375 Direct Access Storage
- Can attach up to four strings of 3370 or four strings of 3375
- Provides a low-cost, entry-level control unit for 4341 and 4331 Model Group 2 Processors
- Supports only one switching option: the Two-Channel Switch feature

3880 Storage Control Model 21 for Paging

The 3880 Model 21 significantly enhances MVS/XA, MVS/370, and VM/SP HPO paging performance. It attaches to 3090, 308X, 303X, 4341, and 4381 systems. The 3880 Model 11 or Model 1 can be converted to a Model 21.

The 3880 Model 21 offers memory sizes to 64MB. This increases the probability that page data requested by the host will be found in cache memory for transfer to the host.

- 16MB, 32MB, 48MB, or 64MB high-speed cache storage
- Automatic paging algorithms incorporated in the microcode
- Up to four simultaneous data transfers, two on each paging storage director: cache to DASD and channel to cache on each
- Improved performance and availability with two paging storage directors
- IBM-developed one-megabit dynamic random access memory (DRAM) technology
- Supported by MVS/XA, MVS/370 and VM/SP HPO
- Cache and one or two strings of 3350 drives shared by two paging storage directors
- Two strings of 3350s supported, and the String Switch required for each 3350 Model A2
- Attachment to block multiplexer channels supported
- 1.5-, 3-, or 4.5MB/sec channel transfer rates for cached data
- Two- and four-channel switch features available, but not eight-channel switch
- Volume procurement discounts available with VPA or Special Bid

3880 Storage Control Model 23 for System and Application Data

The 3880 Model 23 cache controller is used in combination with standard or extended capability 3380 DASD to form a caching subsystem. This subsystem can significantly enhance MVS/XA, MVS/370, VM/SP HPO, and VM/XA SF (System Facility) performance on 30XX, 4341, and 4381 systems by reducing the time required to access frequently used data that is stored on 3380 DASD. 3880 Models 3, 11, 13, or 21 can be converted to a Model 23.

- Significant subsystem performance improvements contribute to improved user response times, ability to accommodate increased transaction loads, and effective use of system resources
- 8MB, 16MB, 32MB, 48MB, or 64MB high-speed cache storage
- Support for 3380 DASD Models AD4/BD4, Models AE4/BE4, and/or Models AA4/B04
- Multiple caching algorithms selected via software for optimum use of cache memory
- One megabyte dynamic RAM technology
- 3- or 4.5MB/sec channel transfer rates for cached data
- Enhanced availability with no-charge Dual Frame Configuration
- Supported by MVS/XA, MVS/370, VM/SP HPO, and VM/XA SF
- Error correction:
 - Detect all triple-bit errors
 - Correct all double-bit errors
 - Correct most triple-bit errors
- Continued caching if one director unavailable
- Cache and one or two strings of 3380 drives shared by two storage directors
- Two-channel switch required; four- and eight-channel switches optional, but with a maximum of four being active without the Dual Frame Configuration
- Volume procurement discounts available with VPA or special bid

3370 DASD

- A 3370 unit has two actuators.
- A string can contain up to four units (eight actuators).
- A fixed medium is used.
- Rotational position sensing is standard.
- The data recording format is fixed block architecture.
- An optional String Switch feature permits switching a string between two controller functions.
- The 3370 is supported by a portable maintenance device, which allows faster problem isolation and repair.

3375 DASD

- A 3375 unit has two actuators.
- A string can contain up to four units (eight actuators).
- A fixed medium is used.
- Data recording format is count-key-data.
- Rotational position sensing is standard.
- The 3375 is supported by a portable maintenance device, which allows faster problem isolation and repair.

- The 3375 Model D1 provides a second, or dual, controller function and data path for a full 3375 string. The Model D1 offers configuration flexibility and may provide improvements in availability, data sharing, and performance for certain configurations.
- An optional String Switch feature installed on the 3375 Model A1 or D1 can be used to allow sharing of a 3375 string between two storage directors in the same or different 3880 Storage Control units.

3380 DASD

- The models of the 3880 are:
 - Enhanced subsystem: AJ4 AK4 BJ4 BK4
 - Extended capability: AD4 AE4 BD4 BE4
 - Direct channel attach: CJ2
- The 3880 employs a fixed-medium head and disk assembly (HDA) that contains the heads, disks, and access mechanisms (actuators) within a sealed enclosure. Each 3380 unit (except Model CJ2) contains two HDAs. There are two independent, movable actuators within each HDA. Each actuator has its own address.
- A string can contain up to four units (16 actuators) when attached to a 3880 Storage Control and up to eight units (32 actuators) when attached to a 3990 Storage Control Model 2 or 3.
- The 3880 direct channel attach Model CJ2 incorporates both a direct access storage device (one HDA) and storage control functions in one unit. Up to three Model BJ4 or BK4 units can be attached to Model CJ2.
- Data recording format is count-key-data.
- Capacity range is from 1.26 billion bytes in the Model CJ2 to 7.56 billion bytes in the Models AK4 and BK4.
- Both enhanced-subsystem and extended-capability models have dynamic path selection (DPS) and device level selection (DLS) as standard facilities. Enhanced-subsystem models, when configured in a 4-path string with a 3990 Model 2 or 3, have device level selection enhanced (DLSE). When combined with dynamic path reconnect (DPR) under MVS/XA, these functions provide higher availability and performance.

Direct Access Storage Devices (DASD) and Storage Control

DASD Characteristics

Type	Capacity per Unit (MB)	Average Seek Time (ms)	Latency (ms)	Data Rate (KB/sec)	Actuators per Unit	Attaches To	Supported By
3370 Model 2	729.8	19	10.1	1859	2	4321 4331 4341 4361 4381 30XX*	SSX/VSE DOS/VSE VM/SP VM/HPO
3375	819.7	19	10.1	1859	2	4331-2 4341 4361 4381 30XX	DOS/VSE VM/SP MVS/370 MVS/XA VS1 VM/HPO VM/XA SF
3380 Model AJ4, BJ4	2520	12	8.3	3000	4	4341 4361 4381 30XX 9370	MVS/XA MVS/370 VM/SP VM/SP HPO VSE/SP TPF VM/XA SF
AK4, BK4	7560	16					
CJ2	1260	12					
AD4, BD4	2520	15			4		
AE4, BE4	5040	17					

* Requires RPQ MN3341

Potential Benefits

3990 Models 1, 2 and 3

- Provide high performance for large-capacity direct access storage devices
- Offer improved attachment flexibility, price/performance, capacity, function, and reliability
- Reduce environmental costs
- Improve error reporting through service information messages (SIM)

Performance:

The following performance information has been derived from analytic models. This technique has been tested with success in predicting performance of prior products both cached and non-cached. The model used in this section predicts subsystem performance in terms of response time in milliseconds versus throughput in start I/Os per second. Hit ratios for cache runs are generated by extrapolating hit

ratios seen on current cache devices to the larger cache sizes of the 3990 Model 3.

The following statements summarize the performance gains of the 3990 versus the 3880 in an MVS/XA environment. The 3880s have 3880-E DASD in 2-path connect mode on 3MB/second channels. The 3990 Models 2 and 3 are connected to 4-path 3380-K DASD. The 3990 Model 3 is operating on a 4.5MB/second channel. The total arms are equal (32 Model E actuators vs. 32 Model K actuators). The data on the 3380-E actuators has been placed directly on the 3380-K actuators. In this comparison, two 3880s are compared with one 3990 and the number of directors or paths (four) is equal.

- The 3990 Model 2 can provide up to 30% greater throughput than two 3880 Model 3s at 22 milliseconds response time.
- The 3990 Model 3 can provide up to two-and-a-half times the throughput of a 3990 Model 2 at 22 milliseconds response time.

- The 3990 Model 3 using DASD Fast Write can provide up to three times the throughput of a 3990 Model 2 at 22 milliseconds response time.
- The 3990 Model 3 can provide up to two times throughput of a 3990 Model 2 with a 45% reduction in response time.
- The 3990 Model 3 using DASD Fast Write can provide up to two-and-a-half times the throughput of a 3990 Model 2 with a 45% reduction in response time.
- The 3990 Model 3 at 150 accesses per second can reduce response time up to 60% as compared to a 3990 Model 2.
- The 3990 Model 1 can provide increased throughput of up to 10% above that of the 3880 Model 3. (Assumption: one control unit with 16 actuators of 3380-J and 16 actuators of 3380-D, respectively.)

Note. These estimates of performance are based on modeled data, not representative of all environments. Results for other installations, workloads, and environments will vary and must be assessed on an individual basis. Accordingly, these estimates do not constitute a performance guarantee or warranty.

3880 Models 1 and 3

- Reduced cost per DASD path, facilitating more paths where needed
- Improved DASD availability potential with I/O error alert on alternate storage director
- Improved subsystem availability with enhanced error detection and correction
- Improved maintainability with the portable maintenance device

3880 Model 4

- A low-cost, entry-level control unit for the 4341 and 4331 Model Group 2

3880 Model 21/3350 Paging Subsystem

- Consistent achievement of subsecond response time goals
- System-managed hierarchy for paging
- Page fault resolution at channel speed
- 3880 Model 21 measured as having approximate parity in systems performance to three 3880 Model 11s or nine 2305s in a laboratory environment using the local display terminal simulator (LDTs) with TSO and batch scripts*
- Can be used to balance peak paging workloads across multiple processors

- Convertible to Model 23 when paging requirements change

3880 Model 23/3380 Application Data Subsystem

Data that may experience immediate benefit from the use of cache include:

- MVS libraries, control blocks and indices
- IMS libraries, indices, and selected data bases
- CICS program libraries
- All TSO data sets
- Sequential batch
- RACF or similar security systems
- Data shared among processors
- VM/370:
 - Many minidisk applications, especially S and Y disks
 - Edit macros
 - PROFS “399” disks
 - Tools disks shared by multiple users
 - High-activity user minidisks

System effects include:

- Increased transaction processing capability for MVS/XA, VM/SP HPO and MVS/370
- Reduced or eliminated shared DASD bottlenecks
- Higher processor utilization capability
- Reduced tuning requirements
- Equivalent or better I/O rates and response times with longer DASD strings than non-cached 3380
- Significantly increased I/O operations per actuator

The Dual Frame Configuration option, standard on all 3880 Model 23s, allows two controllers to be cross-configured for increased availability. There is no charge for this capability.

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- Lower cost per megabyte
- Increased performance potential
- Improved reliability and data availability
- Improved maintenance with portable maintenance device

3375

- Improved performance with faster data rate and access times than previous IBM DASD
- Two concurrent data transfer operations from a string containing a 3375 Model D1
- Improved reliability

* The system configurations and workloads measured may not be representative of other system configurations and workloads. Other environments, configurations, and processors will experience different levels of performance.

Direct Access Storage Devices (DASD) and Storage Control

- Improved availability through dual controller model
- Maintenance device support
- More capacity and significantly lower price per megabyte than previous IBM DASD
- Reduced facility costs: floor space, electric power, and cooling
- Complement to a system management plan with increased flexibility in DASD configuration choices

3380

- Triple capacity, providing the lowest price per MB of any count-key-data IBM DASD
- Direct channel attach model, the lowest-cost DASD subsystem
- Improved performance with faster data rate and access times than other IBM DASD
- Performance enhanced when 3380 utilized with MVS/XA
- Four concurrent data transfer operations from a string containing enhanced subsystem model 3380s running in device level selection enhanced mode on a 3990 due to dynamic path selection
- Improved reliability
- Improved availability through dynamic path selection and device level selection
- Improved performance and channel utilization of 3380s under MVS/XA
- Maintenance device support
- Reduced facility costs: floor space, electric power, and cooling
- Complement to a system management plan with increased flexibility in DASD configuration choices
- Device level selection in the extended capability models, which provides two paths to each actuator
- Device level selection enhanced in the enhanced subsystem models, which provides four paths to each actuator

Prerequisite Products

3990 Models 1, 2, and 3

- Hardware: Attaches to 3090, 3084, 3083, 3081, 9370, and 4381 processors via 3MB/sec or 4.5MB/sec (3090 only) block multiplexer data streaming channel
- Software: Designed for ease of installation and migration. All major operating systems including MVS/XA, MVS/370, VM/SP, VM/SP HPO, VM/XA SF, VM/XA SP, TPF, and VSE support the 3990 family. Operating system support varies by 3990 model and function.

3880 Models 1, 3, and 4

- Hardware: Attaches to a block multiplexer channel:

- Model 1: System/370 Models 135 and up, 4331 Model Group 2, 4361, 4341, 4381, and 30XX Processors
- Model 3: System/370 Models 158 and 168 and 4361, 4341, 4381, and 30XX Processors
- Model 4: 4361, 4331 Model Group 2, 4341, and 4381 Processors

The Data Streaming feature must be installed on a 303X block multiplexer channel for 3880 data streaming mode of operation. The Speed Matching Buffer for 3380 feature or Speed Matching Buffer for 3375 feature may be required on the 3880 for 3380 or 3375 attachment, respectively, depending on the speed of the attached channel(s).

- Software: Programming support dependent on attached DASD

3880 Model 21

- Hardware: 30XX, 4341, 4381 for attachment of up to four 3350s for backing storage
- Software: MVS/SP 1.3.3 or MVS/SP 2.1.2 and Data Facility Product; VM/SP HPO 3.4

3880 Model 23

- Hardware: Attaches to 3MB/sec data streaming channels on 4341, 4381 and 308X processors and 4.5MB/sec block multiplexer channel on 3090 processors and supports 3380 standard, extended capability, and enhanced subsystem models.
- Software: MVS/SP 1.3.3 or MVS/XA 2.1.2 and Data Facility Product; VM/SP HPO 3.4; VM/XA SF (System Facility)

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- Hardware: The 3370 attaches to 4321, 4331 and 4361 Processors via the DASD Adapter. The 3370 attaches to a block multiplexer channel of the 4341 or 4381 Processor or the High-Speed Block Multiplexer Channel in a 4331 Model Group 2 Processor via 3880 Storage Control Model 1 or 4.
- Software: Programming support is provided by SSX/VSE, DOS/VSE, and VM/370 using SAM and VSE/VSAM access methods.

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- Hardware: A 3880 Storage Control Model 1 or 2 is required to attach a 3375 Model A1 to 30XX, 4341, 4361, 4381 (all model groups), or 4331 Model Group 2 Processors. Attachment to a 4381, 4341, 4361, or 4331 Model Group 2 via a 3880 Model 4 is also provided. A block multiplexer channel with a data rate of at least 1.86MB is required to attach the 3375 to 4381, 4341, 4361, or 4331 Model Group 2 Processors. Attachment to 303X Processors requires the Data Streaming feature in the channel group unless the Speed Matching Buffer for 3375 feature is installed on the 3880 storage director.

- Software: Programming support is provided by:
 - DOS/VSE with VSE/Advanced Functions
 - OS/VS1 Release 7 with:
 - Basic Programming Extensions
 - Data Facility Device Support
 - MVS/SP Release 1.3 with Data Facility Device Support or MVS/370 Data Facility Product
 - MVS/SP Release 2 with MVS/XA Data Facility Product
 - VM/370 Release 6 with VM/System Product
 - TPF

3380

- Hardware: The 3380 Models AJ4, AK4, AD4, and AE4 are supported for attachment to all models of the 3990 Storage Control family and to 3880 Storage Control Models 3 and 23 with required attachment features.

The 3380 Models BJ4 and BK4 are supported for attachment to either 3380 AJ4 or AK4 units or to the 3380 Model CJ2 direct channel attach unit.

The 3380 Models BD4 and BE4 are supported for attachment to either 3380 AD4 or AE4 units.

The 3380 Model CJ2 attaches to a 3MB/sec block multiplex channel of a 4381, 9375, 9377, 308X, or 3090 processor. Up to three 3380 Models BJ4 and/or BK4, intermixed in any combination, can be attached to the 3380 Model CJ2.

- Software: Operating system support will vary by 3380 model.

Products Supported

Software: Programming support is provided in the following environments: MVS/XA, MVS/SP, VM/SP, VM/HPO, VM/XA SF, VSE/SP, and TPF. Specific version and release numbers and availability dates will vary depending on respective 3380 DASD and 3880 Storage Control model numbers.

Ordering Information

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- Model A1 is a two-actuator, one-spindle disk storage and string control unit. It must be the first unit in a string.
- Model B1 is a two-actuator, one-spindle disk storage unit.

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- Model A1 contains two actuators, one spindle, and the string controller. It must be the first unit in a string.
- Up to three Model B1 units (two actuators, one spindle) can be attached to the Model A1 to complete the string.

- A dual controller string of 3375 devices consists of one Model A1, two Model B1s, and one Model D1.

3380

- Nine models of the 3380 are available:
 - Models AD4/BD4 have single capacity with dynamic path selection and device level selection as standard features.
 - Models AJ4/BJ4 have single capacity with dynamic path selection, device level selection, and device level selection enhanced (*) as standard features.
 - Models AE4/BE4 have double capacity with dynamic path selection and device level selection as standard features.
 - Models AK4/BK4 have triple capacity with dynamic path selection and device level selection enhanced (*) as standard features.
 - The Model CJ2 offers one-half the capacity of the J model with dynamic path selection and device level selection.
 - Models BD4/BE4 can be intermixed on the same string.
 - Up to three BD4/BE4 models may be attached to an AD4 or AE4.
 - Models BJ4/BK4 may be intermixed on the same string.
 - Up to three BJ4/BK4 models may be attached to an AJ4/AK4 when configured to run in DLS mode. In DLSE mode, two AJ4/AK4s that are physically connected together may each attach up to three BJ4/BK4s for a total string length of eight units.
 - Model CJ2 may attach up to three BJ4/BK4 units in any combination.
- Volume purchase agreement (VPA) price reductions are available for all models.

*Device level selection enhanced only available with 3990 Models 2 and 3 when configured in 4-path mode.

Reference Material

- Total Storage Management Product Matrix Reference Summary, GX20-2364
- 3370 Introduction Manual, GA26-1657
- 3375 Introduction Manual, GA26-1666
- 3380 Direct Access Storage Introduction, GC26-4491
- 3380 Direct Access Storage Direct Channel Attach Model CJ2 Introduction and Reference, GC26-4497
- Using the 3380 Direct Access Storage in an MVS Environment, GC26-4492
- Using the 3380 Direct Access Storage in a VM Environment, GC26-4493
- Using the 3380 Direct Access Storage in a VSE Environment, GC26-4494
- Maintaining IBM Disk Storage Media, GC26-4495
- 3380 Direct Access Storage Reference Summary, GX26-1678

Direct Access Storage Devices (DASD) and Storage Control

All of the 3380 publications above may be ordered using one bill of forms (BOF) number, GBOF-1762.

- 3880 Storage Control Model 21 Description, GA32-0081
- 3880 Storage Control Model 23 Description, GA32-0083
- 3880 Storage Control Model 21 Introduction, GA32-0080
- 3880 Storage Control Model 23 Introduction, GA32-0082
- 3880 Model 23 Installation and Administration Guide, GA32-0085
- 3880 Model 23 Performance Measurement, GG66-0223
- VM/SP HPO 3880-23 Performance Results, GG66-0297
- Cache RMF Reporter, Availability Notice, G320-0362
- VM/SP HPO CMS Support, Availability Notice, G320-9225
- VM/SP HPO CMS Support, Program Description/ Operations Manual, SH20-6537
- MVS/XA Storage Management Library, GBOF-1755
- 3990 Storage Control Introduction, GA32-0098
- Cache Device Administration, GC35-0101
- Virtual Machine 3990 Storage Control Models 1 and 2 and 3380 Direct Access Storage Direct Channel Attach Model CJ2, GC24-5372

The following manual will be available in fourth quarter 1987:

- 3990 Storage Control: Planning, Installation, and Storage Administration Guide, GA32-0100

The following manual may be ordered at general availability:

- 3990 Storage Control Reference, GA32-0099

3480 Magnetic Tape Subsystem

Products Included

- 3480 Control Unit Models A11, A22
- 3480 Tape Unit Models B11, B22
- 3480 Automatic Cartridge Loader

Main Purpose

The 3480 Magnetic Tape Subsystem represents a major advancement in magnetic tape technology. It offers significant improvements in performance, reliability, and operational productivity over previous magnetic tape subsystems. Its innovative design requires much less floor space, power, and cooling capacity. The cartridge design reduces space requirements in the library and provides extra protection from external contaminants. The 3480 establishes a tape subsystem base for the entire spectrum of tape operations — one that provides balanced system performance for today's high-speed channels and direct access storage devices, while providing the base for future magnetic tape development.

Key Functions, Facilities and Features

- 3MB/sec bytes per second instantaneous data rate (1.5MB/sec for Model B11)
- 18-track thin film read/write head
- Data density of approximately 38,000 bytes per inch
- Half-inch chromium dioxide tape enclosed in a protective cartridge (IBM Cartridge System Tape)
- Reliability improvements over current tape drives, achieved through advanced mechanical and electronic component technology, a new error correction code, and separate microprocessors in each drive and each control unit
- One-megabyte buffer in the A22 and 512KB in the A11 providing channel speed data response to the host processor and masking tape motion to host
- Ability to orient a message display on each drive visually for operational effectiveness (the display accepts commands from the control unit and from host software)
- Operator productivity improved through easy cartridge loading, tape cleaning cartridges, and message displays
- Space, power, and air conditioning requirements up to 60 percent lower than for the 3420 Magnetic Tape Unit Model 8
- Two coupled control units, providing access to up to 16 drives attached to up to eight channels (optional on A11)
- Functions provided under MVS:
 - Assign/unassign, allowing program switching of tape units among systems

- High speed search, allowing a program to position a tape to a specific block at high speed while the tape drive is disconnected from the control unit
- Host-initiated message display
- Tape-write-immediate, allowing a program to receive a device-end interrupt only when data is physically on tape
- Subsystem characteristics:
 - Drive:
 - Nominal data rate — 3.0MB/sec for B22, 1.5MB/sec for A22
 - Data density (approximate) — 38,000 bytes/inch
 - Parallel recording tracks — 18
 - Load/unload time — 7 seconds
 - Cartridge rewind time (approximate) — 48 seconds for B22, 96 seconds for B11
 - Sense bytes — 32
 - Control unit data buffer — 1MB in A22, 512KB in A11
 - Cartridge capacity with 24K blocks (approximate) — 200MB
- The optional 3480 Automatic Cartridge Loader feature provides automatic mounting and demounting of cartridges for the 3480 Model B22. Operator productivity may be improved by allowing the operator to premount up to five cartridges per drive in addition to a cartridge already mounted in the drive. Up to six cartridges per drive may be automatically demounted without requiring operator intervention. For jobs using cartridges that can be automatically mounted, system productivity may be improved by reducing the time those jobs wait for cartridges to be mounted.
- Subsystem model selection:
 - Consider 3480 A11/B11 for attachment on 4361 to 3081 processors running under MVS/370, VSE, or VM SCPs with up to 16 3420-type tape drives.
 - Consider 3480 A22/B22 for the majority of 3081 and larger processors running under MVS/XA with two strings or more of 3420-type tape drives.
- Field upgradability

Potential Benefits

- Improved reliability:
 - Reduced tape-related reruns
 - Less time spent on error research
 - Higher availability of subsystem
 - Better error correction capability
- Higher performance:
 - Tape data rate better balanced with DASD and channels
 - Relief provided for tight dump/restore window
 - Better throughput on tape-bound jobs

3480 Magnetic Tape Subsystem

- Increased operator productivity:
 - Faster, easier-to-load cartridge
 - Much faster, easier-to-clean tape drive
 - Message displays for assistance in reducing mismounts
 - Less time spent on error research
 - Less time spent on reruns
- Significant environmental savings:
 - Approximately 60% less floor space, power, and cooling required than for a 3420 Model 8
 - New library racks that may store twice as many cartridges per square foot as 10-1/2 inch tape reels

Configuration

- The 3480 Control Unit Model A11 or A22 can be attached to processors as shown below:

System	1.5MB/sec Block Multiplexer	2MB/sec Block Multiplexer	3MB/sec Block Multiplexer
4341/4361/4381	X	X	X
303X	X		X*
308X	X		X
3090	X		X

* Data Streaming feature required for operation in data streaming mode.

- The 3480 Control Unit Model A11 or A22 attaches up to four 3480 Model B11 or B22 Tape Units. Each 3480 Model B11 or B22 houses two tape drives, for a maximum of eight tape drives per control unit.
- The maximum subsystem configuration is two coupled 3480 Model A11s or A22s attached to eight channels and controlling eight 3480 Model B11s or B22s (16 drives). A host processor may attach multiple 3480 Magnetic Tape Subsystems.
- Two 3480 Model A11s or A22s, one equipped with a Dual Control Unit Communications Coupler feature, provide two data paths to up to eight 3480 Model B22 units (16 drives) attached to up to eight channels.
- Attachment to one channel is standard on each control unit. Up to three Channel Attach, Additional features can be installed on each control unit.
- The A11 and B11 are field-upgradable to A22 and B22.

Programming Support

- MVS/SP programming support is available to utilize the new standard 3480 features, or to utilize only the magnetic tape functions currently available for the 3420 Magnetic Tape Unit.

- VM/SP Release 4 supports the 3480 in both CP and CMS components of VM/SP. This support includes the 3420 compatibility subset of functions, tape write immediate mode, message display usage by VM guests, CP issuance of ASSIGN/UNASSIGN commands for itself, and high-speed search by guests.
- VSE/SP, Version 2, Release 1 provides read/write support at 3MB/sec instantaneous data rate. VSE/SP does not support: high speed search, software initiated message display, the ASSIGN/UNASSIGN function, and dynamic pathing. Buffered and tape write immediate modes are supported.
- Environmental Reporting and Editing Program (EREP) (5752-VS2 feature 5344 or 5345) supports the 3480.
- DFSORT Release 7 supports the 3480 for input/output and as an intermediate storage device.
- Data Facility Data Set Services (DFDSS) Release 2.1 supports the 3480.
- Data Facility Hierarchical Storage Manager (DFHSM) Version 2 supports the space management functions of automatic data set migration and recall. The 3480's instantaneous data rate of 3MB/sec, improved data reliability, and tape operator productivity features facilitate the movement of data between DASD and magnetic tape. These enhancements and the expansion of DFHSM's storage management hierarchy to include the 3480 provide:
 - Enhanced reliability and operator productivity for 3480 tape processing of inactive data sets
 - Performance and accessibility benefits gained by encouraging the placement of active data on DASD rather than on tape

Ordering Information

The 3480 Model B11 or B22 Tape Unit contains two tape transports. The 3480 Model A11 Control Unit supports up to four B11 Tape Units. The 3480 Model A22 Control Unit supports up to four B22 Tape Units. The Dual Control Unit Communications Coupler (#3211) is required for one of the two Model A22s or A11s with Dual Control Unit if they are to be used in a dual configuration.

The 3480 is eligible for a volume discount. The Dual Control Unit Communications Coupler does not qualify for a volume discount.

The Cartridge System Tape, Cleaning Cartridges, Media Storage Units and accessories are available from the National Distribution Division.

Reference Material

- 3480 Magnetic Tape Subsystem Introduction, GA32-0041
- 3480 Magnetic Tape Subsystem Planning and Migration Guide, GC35-0098

3422 Magnetic Tape Subsystem

Main Purpose

The 3422 is a 10-1/2 inch reel intermediate-performance magnetic tape subsystem.

The 3422 is an enhancement of current 10-1/2 inch reel technology. It provides improved price performance that complements other elements of the IBM storage products family, such as the 3480 Magnetic Tape Subsystem and the 3380 Direct Access Storage Device.

The 3422 does not represent a departure from IBM's statement of direction in the announcement of the 3480 Tape Subsystem dated March 22, 1984. The cartridge and subsystem advancements contained in the 3480 are intended to form the basis for IBM's future direction in magnetic tape development. IBM intends to continue to expand the applicability of the 3480 to a broader range of customers.

Key Functions, Facilities and Features

- The 3422 consists of a Model A01 with a tape control and one tape drive housed in the same frame and a Model B01 with one tape drive only. A maximum of seven Model B01s can be attached to a Model A01 for a total of eight drives per string.
- Standard features:
 - Dual density: 6250/1600 bpi
 - Tape speed of 125 ips
 - Nominal data rate of 780KB/sec at 6250 bpi
 - Auto thread/auto load of 10-1/2 inch reel contained in wraparound cartridge
 - Up to eight tape units per string on System/370-architecture systems
 - Up to four tape units per string on System/38
- Optional features for attachment to System/370-architecture systems:
 - Two- and 3MB data streaming channel mode via a 64KB speed matching buffer
 - Two-channel switch and a communicator that allows the 3422 control unit to attach to a second 3422 control unit and be able to address up to 16 tape units (2x16)

Primary Users

The primary use of the 3422 will be as a save/restore and processing device on intermediate systems, and as a 10-1/2 inch reel companion drive for 3480 tape subsystems. In addition, the 3422 should be the product to fulfill users' current tape drive requirements until they are positioned to take full advantage of 3480 tape cartridge and technology.

Potential Benefits

The 3422 utilizes new electromechanical design and high-density packaging to provide a compact subsystem design, resulting in improved price performance as well as in less power and space requirements than a 3420 Tape Subsystem.

Tape units are attached in radial fashion to allow limited offline service without interrupting other tape units in the subsystem.

Products Supported

- The 3422 will attach to 4300, 30XX systems, and System/38 Models 6, 18, 20, and 40
- Programming support is provided by VM/SP, VM/SP HPO, VSE/SP (VSE Advanced Functions), MVS/SP, and VM/XA System Facility

Reference Material

- Introducing the 3422 Magnetic Tape Subsystem, GA32-0088

3430 Magnetic Tape Subsystem

Products Included

- 3430 Model A1
- 3430 Model B1

Main Purpose

The 3430 provides save/restore and tape processing capability to users of intermediate systems. The 3430 represents a logical growth step for users of 8809, 3410, and 3420 Model 3 tape units.

The Model A1 includes a tape and integrated control unit. The Model B1 is a tape unit only and attaches to the Model A1.

Key Functions, Facilities and Features

- High reliability via 6250-bpi density group coded recording
- Dual density capability 6250/1600 bpi
- 312.5 or 80KB/sec data rate based on density setting
- Compact design-controller integrated with tape drive in one-meter-high unit
- Improved reliability resulting from extensive use of integrated circuitry and enhanced microdiagnostics

Potential Benefits

- Significantly enhanced save/restore performance for users of intermediate systems
- Reduction of operator overhead resulting from increased media capacity
- Fewer permanent errors, fewer reruns, and reduced operator overhead resulting from high reliability of 6250-bpi density group coded recording
- Less downtime because of extensive use of advanced integrated circuitry and an enhanced microdiagnostic package

Prerequisite Products

- 303X and 4300 processors require a control unit position on a selector or block multiplexer channel.
- System/38 requires a 3430 attachment feature on the 5381 System Unit.
- 3430 Model A1 requires the Multiple Drive Attachment feature to attach a second or third 3430 Model B1 (string lengths greater than two).

- One of the following operating systems is required:
 - VM/SP Release 3
 - CPF Release 5
 - VSE/AF Release 2*
 - SSX/VSE Release 2*

Reference Material

- 3430 Magnetic Tape Subsystem Introduction, GA32-0069
- 3430 Magnetic Tape Subsystem Description, GA32-0076

* The 3430 can be used with SSX/VSE or VSE Release 2 if defined as a 3410. Full 6250-bpi capability is available in this mode.

3420 Models 4, 6, and 8, 3422, 3430, 8809, and 3480 Tape Comparison Table

Magnetic Tape Characteristics

Tape Drive	Data Rate (KB)		Control Unit	Attaches To	Supported By
	1600 bpi	6250 bpi			
3420/4	120	470	3803/2	30XX	MVS/370
3420/6	200	780		4321* 4331**	MVS/XA VS1
3420/8	320	1250		4361 4341 4381 S/370	SSX/VSE VSE/SP VM/370
3422	200	780	3422/A01	4321/31/41 4361/81 3081/3/4 3090 S/38	MVS/370 MVS/XA VS1 SSX/VSE VSE/58 VM/370
3430	80	312.5		S/370 4300 303X System/38	VM/SP VSE SSX/VSE CPF
8809	Start/Stop 20 Streaming 160			8130 8140 8101 4361 4331 4321 System/36	DPPX DPCX SSX/VSE VSE/SP VM/BSE SSP
3480/B22	—	38,000 bpi ===== 3,000	3480/A22	4341 4381 30XX	VSE/SP MVS/370 MVS/XA VM/SP VM/SP HPO
3480/B11	—	1,500	3480/A11		

* Only the 3420 Model 4 attaches

** Only the 3420 Model 4 attaches to Model Group 1

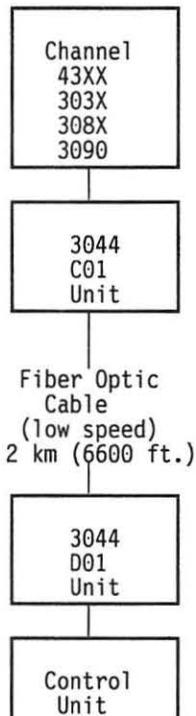
Section 54. Interconnect Systems Products

3044 Fiber Optic Channel Extender Link

Main Purpose

The 3044 Fiber Optic Channel Extender Link introduces fiber optic technology as a transmission medium for attaching low- to medium-speed (up to 1.25MB/sec) I/O control units, switching units, and channel-to-channel interfaces to byte and block multiplexer channels on all 4300, 303X, 308X and 3090 systems at distances up to two kilometers. It also provides limited support on the 9370.

The 3044 Fiber Optic Channel Extender Link consists of two units that are interconnected by up to 2 km of fiber optic cables. The 3044 Model C01 attaches the processor channel to one end of the fiber cable. The 3044 Model D01 attaches the other end of the fiber optic cable to the "remote" I/O control units (see the figure below). A pair of units is necessary for each 3044 Link: one "C01 Unit" (channel end) and one "D01 Unit" ("downstream" end).



Key Functions, Facilities and Features

- Consists of two units interconnected by up to 2 km of fiber optic cable
- Provides "near local" response time to "remote" users who can now operate channel-attached I/O devices within the 2 km fiber optic cable range
- Can handle data streaming rates up to 1.25 million bytes/second at any distance up to 2 km. The fastest attachable data streaming device approaching this speed is the 3088 Multisystem Channel Communication Unit (MCCU), which operates at 1.125 million bytes/second. The 3800 Model 3 printer also uses data streaming.
- Can achieve non-data-streaming rates up to 43 thousand bytes/second at 2 km and up to 76 thousand bytes/second at 1 km
- Operates with selected models of a broad range of I/O units such as printers (3800, 3203), card reader/punches (3505, 3525), 3174 or 3274 Control Units with displays (3178, 3179, 3180, 3277, 3278, 3279, 3290, 5150), magnetic/optical character readers (3890), switches (2914, 3814) and other devices (3705, 3725, 3088, Series/1)
- Extends distance for channel-to-channel processor communication to 4 km through use of the 3088 MCCU
- Significantly reduces the bulk and expense associated with standard channel bus and tag cables
- Is an attractive alternative to the RPQ 2944 Data Channel Repeater
- Requires no modification of existing operating systems or user programs
- 3088 MCCU communications using the 3044 can operate in data streaming or non-data-streaming mode. The 3800 Model 3 printer also uses data streaming.

Potential Benefits

The following examples illustrate some of the ways added flexibility and benefits from data processing equipment can be achieved through the use of the 3044 Fiber Optic Channel Extension Link:

- Provide "near local" response time to end-user terminal controllers and devices that, due to fiber optic technology, can be attached "locally" to channels within 2 km rather than remotely via communication equipment

3044 Fiber Optic Channel Extender Link

- Reduce floor cable volume and system installation costs by using a pair of optical fibers in lieu of the bulkier, more expensive "bus and tag" copper channel cables
- Assist with relocation and dispersion of low and medium speed I/O equipment to within the 2 km fiber optic range. Data center managers can utilize space at remote sites for additional I/O units without expanding their computer room or can place terminals and printers closer to end-user departments without employing communication equipment.
- Connect I/O equipment, previously attached to a smaller processor, to a larger one without relocating the I/O equipment. A similar capability can be obtained for non-IBM devices by using the 7171 ASCII Device Attachment Control Unit or the 7170 Device Attachment Control Unit to interface between the 3044 and the non-IBM device.
- Communicate between widely separated systems using channel-to-channel (CTC) adapters in a multisystem environment. Use of processor-integrated CTC adapters and the 3044 will allow communications between processors separated by up to 2 km. The separation can be increased to 4 km with the use of a 3088 Multisystem Channel Communication Unit instead of integrated CTC adapters.
- Provide greater data security from "electronic tapping" between the host and remotely-connected I/O devices.
- Provide an alternative through the use of fiber optic cable that protects customers from the effects of the electromagnetic interference.

Extensive experience with the installation and use of the 3044 Fiber Optic Channel Extender Link at major IBM locations has validated the performance and versatility of this technology.

A 43XX/3088/3044 combination can also be used as a remote terminal concentrator. The 43XX concentrator is connected to a multisystem environment by means of the 3088 MCCU. Terminals attached to the 43XX can establish sessions over extended distances at near local performance with any host that is connected to the 3088 MCCU. Appropriate releases of operating systems and VTAM are required for this application.

Products Supported

Processor Attachment

The 3044 Model C01 takes one control unit position on a processor channel but is not addressable. Multiple 3044 Model C01s are permitted on a channel. Up to eight control units may be attached to the 3044 Model D01 through normal bus and tag cabling. See

System/360 and System/370 I/O Interface Channel to Control Unit Original Equipment Manufacturers' Information Manual, GA22-6974, for channel configuration limitations.

Control Unit Attachment

Most IBM printers, readers/punches, display controllers, data transmission multiplexers, switches, and the 3088 Multisystem Channel Communication Unit can be attached. For a complete list of attachable devices, control units, and limitations, see the *3044 Fiber Optic Channel Extender Link Product Description Manual, GA22-7097*.

Use of the 7171 ASCII Device Attachment Control Unit or the 7170 Device Attachment Control Unit in conjunction with the 3044 link provides the potential to connect large system processors to a variety of non-IBM I/O devices and terminals at extended distances.

Ordering Information

- The 3044 is eligible for volume purchase discount.
- The 3044 is eligible for educational allowance.
- The customer is responsible for the procurement, installation, and documentation of all jumper cables, trunk cables and related components, and additional bus and tag cables. Any power cords not provided by IBM are the customer's responsibility.

Reference Material

- Product Description, GA22-7097
- Fiber Optic Cable Planning and Installation Guide, GC22-7073

3088 Multisystem Channel Communication Unit

Main Purpose

The 3088 Multisystem Channel Communication Unit is a standalone I/O controller containing its own logic and power supplies. The 3088 Model A1 provides the capability of interconnecting up to two processors. The 3088 Model 1 provides the capability of interconnecting up to four processor channels. The Model 2 provides the capability of interconnecting up to eight processor channels.

Through its multiple-address architecture, the microprocessor-based 3088 can provide up to 63 logical Channel-to-Channel Adapter (CTCA) links in the Model A1, up to 126 logical CTCA links in the Model 1, and up to 252 logical CTCA links in the Model 2. In addition to maintaining compatibility with existing System/370 Channel-to-Channel Adapter features, the 3088 embodies new facilities to improve configuration flexibility and to provide the potential for improved system performance.

Key Functions, Facilities and Features

- Data streaming capability providing 4.5MB/sec transfer rate
- Interprocessor cable distances of up to 800 feet (244 meters)
- Up to two simultaneous data transfers
- Early channel disconnect allowing enhanced channel utilization
- Compatibility with existing System/370 channel-to-channel adapter (CTCA) facilities
- Up to 126 logical CTCA links connecting a maximum of four processor channels via the Model 1
- Up to 252 logical CTCA links connecting a maximum of eight processor channels via the Model 2
- Field upgradability from the Model 1 to the Model 2
- Extensive diagnostic capability
- Model A1:
 - Provides two-processor connectivity at an entry-level price
 - Provides up to 63 logical channel-to-channel (CTCA) links
 - Provides full 3088 functional capability
 - Can be field upgraded to Model 1 or 2

- 3088 testing concurrent with host processor operation
- Improved channel utilization

Products Supported

The IBM 3088 Multisystem Channel Communication Unit provides enhanced channel-to-channel communication facilities for 303X, 3042 Model 2, 3081, 3083, 3084, 3090, 4341, and 4381 processors. The 3088 provides intersystem communication for these processors in loosely coupled multiprocessing configurations supported by subsystems such as JES3, GRS, IMS-MS, JES Networking, and ACF/VTAM. MVS/SP, MVS/XA, MVS/ESA™, VM/SP Release 2, and VM/XA Migration Aid are also supported.

Ordering Information

Cables: Four sets of interface cables, a maximum of 75 feet (23 meters) each, are provided as a standard feature for initial installation of a 3088 Model 1. Eight sets of interface cables, a maximum of 100 feet (31 meters) each, are provided as a standard feature for initial installation of a 3088 Model 2. Other cable lengths over that provided as standard will be priced on a per-foot basis. See *IBM Input/Output Equipment Installation Manual – Physical Planning*, GC22-7064, for specifications.

Potential Benefits

- Reduced configuration complexity
- Increased intersystem communication
- Improved system performance
- Enhanced error detection; microcode assist to identify failing field-replaceable units

3814 Switching Management System

Main Purpose

The 3814 provides automated switching of control unit interfaces and processor channels, enabling and disabling of control unit two-channel switches, and power sequencing of I/O control units.

Key Functions, Facilities and Features

- This modular system consists of three model groups of 3814 switching units, one or more consoles for operator control, and optional hard-copy printers.
- A 3814 system can contain up to four 3814 switching units. Models can be combined to create up to a 128-node switching matrix (8x16 or 16x8) and can control up to 128 control unit two-channel switches.
- Cable lengths can be maximized by using combinations of the models in up to four separate locations.
- A single control point for I/O switching and control unit two-channel switches is provided.
- Secondary consoles can be located up to 1000 feet (305 meters) away.
- Configurations can be stored for control unit switching (up to 464) and control unit two-channel switches (up to 327).
- Synchronous connect/disconnect process minimizes the impact of an operator error by switching at electronic speed when there is a lull in channel activity.
- Power sequencing for attached control units (up to 16 per 3814 model) is allowed.
- Security protection is controlled by three or four levels of passwords.
- Models are field-expandable.
- Support is provided for the Data Streaming feature on channels.
- The 3814 Switching Management System has been designed to maximize serviceability:
 - A diagnostic checkout procedure is started following power-on.
 - A continuously operating background microprogram monitors operating elements to detect malfunctioning hardware within the 3814.
- An audible alarm and visual indicator alert the operator to most problems.
- Modular architecture and power isolation allow major elements to be powered down and repaired and then returned to operational use.
- Up to four 3178 Model C20 or 3278 Model 2 Display Stations can be attached as operator consoles.
- Up to six 3287 Printers Models 1 and 2 can be attached for hard-copy output.
- A time-stamped audit trail can be recorded.

- A second Model A controller can be attached in place of a Model B for 100% backup of controller functions.
- The System Attachment Feature (#1440) allows 3814s to be attached to a host by means of the 3274 Control Unit. The feature operates in conjunction with software support such as the Multi-System Configuration Manager licensed program (5665-342), which provides central control for multiple 3814s by means of a host-attached terminal.

Potential Benefits

- Faster reconfiguration with fewer errors, which can improve availability
- Reduced complexity for DP operations with greater security of configurations
- Potentially fewer I/O devices needed for peak demand and critical device backup
- Ability to quickly determine the status and availability of I/O devices in an installation
- Reduced impact from device failures

Products Supported

Attaches to byte and block multiplexer channels in System/370 Models 135 and up and 303X, 308X, 3090, 4331, 4341, 4361 and 4381 Processors.

Ordering Information

- The 3814 Controller Model A contains a microcode-driven processor that manages I/O switches and control unit two-channel switches.
- The 3814 Remote Unit Model B is separately powered and can be located up to 1000 feet (305 meters) from the Model A.
- The 3814 Expansion Unit Model C directly attaches to and shares some power with a Model A or B.
- The 3178 Model C20 or 3278 Model 2 Display Station provides the maximum capability as an operator console for the 3814. It can be located up to 100 feet (30 meters) from the Model A, and a second display station can be added and located up to 1000 feet (305 meters) away. To provide compatibility, the 3178 Model C20 or 3278 Model 2 can also emulate the 3604 Model 6.
- Each 3814 model controls from 16 nodes to 32 nodes. In addition, each model can remotely control up to 32 control unit two-channel switches.

Reference Material

- Product Description Manual, GA22-7075
- Multi-System Configuration Manager for the 3814 Switching Management System, GC23-0172

Section 61. System/88

System/88

Main Purpose

System/88 is a mid-range high-availability system designed to meet the needs of customers who require highly reliable online transaction processing. System/88 combines a duplexed hardware architecture with sophisticated operating system software to provide a fault-tolerant system. The System/88 supports a wide range of peripherals, fault-tolerant communications controllers, I/O processors, and DASD subsystems.

Key Functions, Facilities and Features

Hardware Implementation of Fault-Tolerant Processing

The System/88 approaches continuous system availability through a fault-tolerant hardware approach. Since fault tolerance is built into the System/88 hardware, it does not require additional programming by the application developer. Fault tolerance is accomplished with no software overhead or performance degradation.

Duplexed Configurations

Every major component (except tape) is duplexed, or duplicated, in a System/88 configuration. Duplexed processor boards, memory boards, and communications controller boards execute in synchronization, continually comparing results with their partners to maintain data integrity and to provide a backup in cases of component failure. Duplexed disk drives and controllers operate in synchronization under control of the operating system providing backup to each other in case of a failure. Duplicate link controllers and cabling components provide double the capacity of one link during normal operation and a backup link in the event of a failure. Duplicate power supplies with battery backup for memory retention during a power failure of short duration are also provided.

Single-System Image

System/88 and its software products offer ease of expansion, the sharing of resources among users, and solutions to complex requirements while maintaining a single-system image to the end user.

Horizontal Growth

System/88 processing capacity can be expanded:

- While the system is processing
- Without software changes
- While maintaining a single system image to the end user

Horizontal growth is accomplished by combining multiple System/88 modules into System/88 systems using the System/88 link and combining multiple System/88 systems into a network using the System/88 Network.

Vertical Growth

System/88 architecture and design of Models 081 through 086 allow processor boards to be added to a Model 081 through 085 to enable vertical processor growth when needed. The System/88 can grow from Model 050 to Model 081 through 086.

Data Integrity

The duplexed System/88 components and the System/88 software help maintain data integrity. The System/88 detects a failure or transient error at the point of failure and does not proliferate it throughout the application or data. Data is protected from corruption and system integrity is maintained.

Hot Pluggability

Hot pluggability allows many replacements to be done without interrupting system operation. The System/88 takes a failing component out of service, continuing service with its duplexed twin, and lights an indicator on the failing component — all without operator intervention. The customer or service personnel can remove and replace a failed duplexed board while processing continues. The benefits to a customer include timely repair and reduced maintenance costs.

Continuous Hardware Component Checking

Each component contains its own error detection logic and diagnostics. The error detection logic compares the results of parallel operations at every machine cycle.

If the system detects a component malfunction, that component is automatically removed from service. Processing continues on the duplexed partner while the failed component is checked by internal diagnostics. No recovery time is required.

System/88

Remote/Automatic Service

Remote/automatic service is available for every System/88. Off-site IBM personnel can help determine the cause of failure, provide software fixes, and identify hardware corrective actions.

The error detection functions will automatically remove a failing component from service and run diagnostics on it while processing continues on its duplexed partner. If the diagnostics determine that the component needs to be replaced, the System/88 can automatically call the System/88 Support Center to report the problem. The customer benefits from quick repairs and low maintenance costs.

Full-Capability 32-Bit Processor Design (Models 08X)

The System/88 offers 32-bit processor design. A 32-bit wide data and instruction path provides high-performance processing power that can support high volumes of transactions.

Customer-Replaceable Components (CRUs)

All CEC components (processor, memory, and controller boards) are customer-replaceable. That means that when a hard failure occurs and a replacement component is received at the system site, there is no requirement for service personnel. A CRU can be replaced in minutes without special tools and without system interruption.

Parallel Processing

Multiple microprocessors in the Models 40, 50, 60, 82, 83, 84, 85, and 86 operate in parallel-processing mode and share the workload in a nonhierarchical fashion.

Distributed Processing

Multiple System/88 processor modules can be interconnected via the System/88 Link. This ability to interconnect multiple System/88 modules while constantly maintaining a single system image of the available resources provides a distributed processing environment transparent to the end user.

For more information about System/88 hardware and software, see the following pages.

System/88 Hardware

Products Included

- 4578 Processor Models 408 and 416
- 4579 Processor Models 408, 416, 508, and 516
- 4575 Processor Model 20B
- 4576 Processor Models 81 through 86
- 4576 Processor Model 50
- 4576 Processor Model 40
- 4576 Processor Model 60
- 4577 Expansion Cabinet
- 4580 Direct Access Storage
- 4581 Direct Access Storage
- 4583 Direct Access Storage
- 4584 Direct Access Storage
- 4585 Autoload Streaming Magnetic Tape Unit
- 4968 Autoload Streaming Magnetic Tape Unit
- 1/4-Inch Cartridge Streaming Tape Feature (#1425)
- 3151 ASCII Display Station, Models 310/410
- 3161 ASCII Display Station
- 3162 ASCII Display Station
- 3163 ASCII Display Station
- 3164 ASCII Display Station
- 3270 Bisynchronous Terminals
- IBM Personal Computer
- IBM Personal System/2
- 3812 Pageprinter
- 5262 Line Printer
- 4224 Matrix Printer
- 4245 Line Printer
- 6262 Line Printer
- 4591 Link Extender

Key Functions, Facilities and Features

System/88 4578 Processor Models 408 and 416

- System/88 entry-range processor – 16-bit processor design – 36-inch-high cabinet
- I/O processor subsystem for attaching communication and I/O devices, providing entry-range systems configuration flexibility
- 10 central electronic complex (CEC) slots for memory, main processor, I/O processor, and optional (Model 408) Link controller boards
- Four logical main processors that can simultaneously process up to four instruction streams
- Rack space for up to four 4583 disk drives, one 1/4-inch cartridge tape unit, one IOA chassis (which houses up to fourteen intelligent IOA cards), and Link connectors
- Support for 8 (Model 408) and 16 (Model 416) megabytes of duplexed memory; a maximum of

- 1.56 gigabytes of duplexed, direct access storage; and a maximum of 40 communication ports
- CEC boards, IOA cards, and disk drives (4583 Models 001 and 002) are customer-replaceable units, providing lower-cost maintenance
- Self-contained power supplies with battery backup for memory retention during short power failures

System/88 4579 Processor Models 408, 416, 508, and 516

- System/88 entry-range processor – 16-bit processor design – standard-size cabinet
- I/O processor subsystem for attaching communication and I/O devices, providing configuration flexibility
- 10 central electronic complex (CEC) slots for memory, main processor, I/O processor, and optional (except Model 416) Link and magnetic tape controller boards
- Four logical main processors that can simultaneously process up to four instruction streams
- Rack space for up to six 4583 disk drives and one IOA chassis (which houses up to fourteen I/O adapter cards); or up to four 4583 disk drives, one 4968 tape unit or 1/4-inch tape unit, and one IOA chassis; and Link connectors
- Support for a second IOA chassis (except Model 416) that can be mounted in an attached 4577 Expansion Cabinet Model 21
- Support for 8 and 16 megabytes of duplexed memory; a maximum of 2.34 gigabytes of duplexed, direct access storage; and a maximum of 96 communication ports
- CEC boards, IOA cards, and disk drives (4583 Models 001 and 002) that are customer-replaceable units, providing lower-cost maintenance
- Self-contained power supplies with battery backup for memory retention during short power failures

System/88 4575 Processor Model 20B*

(The 4576 RPQ file on HONE should be reviewed for current configuration options)

- Available with 4 to 12 megabytes of duplexed memory
- Contains 20 central electronic complex (CEC) slots for the attachment of processor, memory, and controller boards
- Includes additional rack space for two 4580 Disk Drives, one 4968 Autoload Streaming Magnetic Tape Unit, Communications Adapter Chassis and Link Connector

* Available in the USA and Canada only

System/88 Hardware

- Supports a maximum of 7.16 gigabytes of duplexed, direct access storage and a maximum of 128 communications ports (depending upon the mix of features selected)
- Has self-contained power supplies with battery backup for memory retention during power failures of short duration

Model 20B is offered in one standard predetermined configuration, which includes the following group of standard features: four megabytes of duplexed memory; duplexed controllers for memory, communications and DASD; one tape controller; one communication chassis; one remote support line/clock adapter; one 4968 Streaming Tape controller (1600/3200 bpi); and a duplexed pair of power supplies with battery backup.

System/88 4576 Processor Models 81 through 86

- Full-capability 32-bit design, high-performance processors that support high volume of transactions
- Up to six sets of high-speed processors that simultaneously process up to six independent instruction streams
- 16K by 32 bits of high-speed cache memory and 64 by 32 bits of instruction cache integrated into each processor board
- Floating-point coprocessor on each processor board that provides high-performance arithmetic capabilities
- Data transfer of 32 or 64 bits per cycle
- 32 central electronic complex (CEC) slots for memory, main processor, I/O processor, and controller boards
- Rack space for up to four communication adapter chassis (each housing up to eight line adapter cards) or up to two IOA chassis (each housing up to fourteen I/O adapter cards), and Link connectors
- Support for 8 to 96 megabytes of duplexed memory; a maximum of 23.4 gigabytes of duplexed, direct access storage; and a maximum of 256 communication ports
- Expanded-function control panel
- Self-contained power supplies with battery backup for memory retention during short power failures
- 4577 Expansion Cabinet required
- Existing System/88 I/O structure able to co-reside with System/88's I/O processor subsystem

The six models differ in processing speed, based on the number of processors installed.

Model	Sets of processors	Performance relative to Model 81
81	1	1.0
82	2	up to 1.9
83	3	up to 2.75
84	4	up to 3.5
85	5	up to 4.2
86	6	up to 5.0

Models 81 through 83 can be upgraded to Model 84; Models 83, 84, and 85 can be upgraded up to Model 86.

Upgrading up to a Model 84 from Models 81 through 83 and to a Model 86 from a Model 85 can be done by the customer and while the system is running.

System/88 4576 Processor Model 50

- System/88 intermediate-range processor
- 32-bit processor and 16-bit data/address bus
- 36 central electronic complex (CEC) slots for memory, main processor, I/O processor, and controller boards
- Rack space for up to four communications adapter chassis (each housing up to eight line adapter cards) or up to two IOA chassis (each housing up to fourteen I/O adapter cards), and Link connectors
- Support for 8 to 64 megabytes of duplexed memory; a maximum of 23.4 gigabytes of duplexed, direct access storage; and a maximum of 256 communication ports
- Four sets of main processors that share the workload in a nonhierarchical fashion
- Expanded-function control panel
- Self-contained power supplies with battery backup for memory retention during short power failures
- 4577 Expansion Cabinet required
- Upgradable to an 8X model

System/88 4576 Processor Model 40

- 16-bit processor and data/address bus
- 36 central electronic complex (CEC) slots for memory, main processor, I/O processor, and controller boards
- Rack space for up to four communications adapter chassis (each housing up to eight line adapter cards) and Link connectors. Additional rack space is available in the attached 4577.
- Support for up to two IOA chassis (each housing up to fourteen I/O adapter cards) mounted in 4577 Model 2Xs
- Support for 4 to 64 megabytes of duplexed memory; a maximum of 23.4 gigabytes of duplexed, direct access storage; and a maximum of 256 communication ports
- Four sets of main processors that share the workload in a nonhierarchical fashion
- Expanded-function control panel
- Self-contained power supplies with battery backup for memory retention during short power failures
- 4577 Expansion Cabinet required

System/88 4576 Processor Model 60

- System/88 intermediate-range processor
- 40 central electronic complex (CEC) slots for memory, main processor, I/O processor, and controller boards
- Rack space for up to four communications adapter chassis (each housing up to eight line adapter cards) and Link connectors. Additional rack space is available in the attached 4577.
- Support for up to two IOA chassis (each housing up to fourteen I/O adapter cards) mounted in 4577 Model 2Xs
- Support for 8 to 64 megabytes of duplexed memory; a maximum of 23.4 gigabytes of duplexed, direct access storage; and a maximum of 256 communication ports
- Six sets of main processors that share the workload in a nonhierarchical fashion
- 48K bytes of high-speed cache memory integrated into the processor unit
- Arithmetic assist for both floating-point and packed-decimal arithmetic functions
- Expanded-function control panel
- Self-contained power supplies with battery backup for memory retention during short power failures
- 4577 Expansion Cabinet required

System/88 4577 Expansion Cabinets**Model 001**

- For the 4576 Processor, the 4577 Model 001 provides additional power distribution and rack space for disks, magnetic tape units, and other features, such as communications adapter chassis.
- One 4585 or 4968 Tape Unit per 4577 can be mounted in the first and second 4577s from the processor on either side. For usability, they are located at the top of the rack.
- Up to four 4581 or eight 4584 Disk Drives can be mounted in a single 4577. (The 4584 Disk Drive is supported by the 4576 Processor only.)
- Up to twelve communications adapter chassis are available (in the 4577s adjacent to the processor). Link connectors can be mounted in place of communications adapter chassis.
- Combinations of disk drives, magnetic tape units, communications adapter chassis, and Link connectors can be installed in a 4577. Maximums for each unit are based on the combination of units installed.
- Multiple 4577 Expansion Cabinets Model 001 (up to a maximum of 8) can be attached to a 4576 processor.

The 4577 attaches through an air plenum to the 4576 processor or to another 4577 Expansion Cabinet.

Models 21 and 22

- For the 4576 and 4579 Processors, the 4577 Model 2Xs provide rack-mount space for IOA (I/O adapter) chassis and their supporting power modules. (The IOA chassis are features of the 4577s.)
- One power module is installed for each IOA chassis, and one back-up power module is installed in each cabinet to provide power backup should a power module fail. One power control module is installed to distribute the duplexed power to each IOA chassis.
- For the 4576 Processor:
 - The 4577 Models 21 and 22 provide rack-mount space for up to one and two (respectively) IOA chassis and their supporting power modules.
 - The Model 21 can also hold up to four 4584 Disk Drives; or two 4584s and one 4585 or 4968 tape unit; and link connectors.
 - The Model 22 can also hold up to two 4584s, one 1/4-inch tape unit, and link connectors.
- For the 4579 Processor (except Model 416):
 - The 4577 Model 21 provides rack-mount space for the system's second IOA chassis and its supporting power modules.
 - The Model 21 can also hold one 4585 or 4968 tape unit plus link connectors.

The 4577 attaches through an air plenum to the 4576 or 4579 processor or for a 4576, to another 4577 Expansion Cabinet.

System/88 Link

Multiple System/88 processor modules can be interconnected by the System/88 Link while maintaining a single-system image to the end user.

- The continuous aggregate bandwidth approaches 2.8 megabytes per second for a pair of Link controllers.
- System/88 processor modules can be located up to 230 meters (750 feet) apart using Link cable. The distance between two modules can be extended up to 457.5 meters (1500 feet) through the use of 4591 Link Extenders.

Multiple modules can be linked up to approximately 3 miles maximum between modules and up to approximately 10 miles maximum for a system, using 4591 Link Extenders.

- The linking is transparent, giving the end user and application developer a single-system view.

Communication Hardware

System/88 input/output subsystem designs are the I/O controller subsystem and the newer I/O processor subsystem. These subsystems can co-reside on the 4576 Processors. The 4578 and 4579 Processors use the I/O processor subsystem only.

System/88 Hardware

The System/88 provides fault-tolerant hardware for communication. Duplexed intelligent communication controllers support communications adapter chassis and line adapter cards through an I/O controller subsystem. Duplexed I/O processors and intelligent I/O adapter cards support communication lines in the I/O processor subsystem.

Communication hardware for the I/O controller subsystem:

- All terminals and communication lines remain operational even if one communication controller fails; no physical switching is required.
- Multiple microprocessors distribute communication functions to the line adapters and the communication controller, freeing the System/88 to work on application functions.
- The communication controller handles all data transfers directly from its own memory to main storage.
- Duplexed communication controllers can support up to 16 line adapter cards. Adapters are available to support asynchronous, binary-synchronous, SDLC, and X.25 lines.
- Multiple communication controllers may be attached to a System/88 processor.
- Asynchronous line adapters each support two asynchronous lines of up to 19.2K bits per second.
- Synchronous line adapters each support a single binary-synchronous, SDLC, or X.25 line of up to 56K bits per second.
- The printers, display stations, and PCs connect directly to the System/88 through communication ports. By attaching a 3270 controller to a communication port and using System/88 3270 Terminal Support, 3270 devices can be attached to the System/88. This allows many 3270 devices to be attached through a single communication port, greatly increasing the number of terminals that can be attached to the System/88.
- RS422 devices can be attached using the high-performance synchronous line adapter.

Communication hardware for the I/O processor subsystem

- All terminals and communication lines remain operational even if one I/O processor fails; no physical switching is required.
- The I/O processor handles the processing and transferring of data.
- A dual bus structure between the I/O processor and all attached I/O adapters provides an increased level of fault tolerance.
- A duplexed I/O processor supports a mix of up to 14 I/O adapter cards. Communication adapters are available to support asynchronous, binary-synchronous, SDLC, and X.25 lines.
- Multiple I/O processors may be attached to a System/88 processor.
- A four-port, full-modern adapter supports four RS232C synchronous or asynchronous lines. The

maximum transmit rate is 9.6K bits per second for synchronous lines and 19.2K bits per second for asynchronous lines.

- A four-port, direct-connect adapter supports four RS232C asynchronous lines of up to 19.2K bits per second.
- A two-port, programmable adapter provides support for unique or standard protocol requirements. This adapter is available in three types.
- A two-port adapter attaches the system console and the remote support network. This adapter also provides a system clock and calendar facility.
- Printers, 4583 disks, and the 1/4-inch cartridge tape unit connect through their respective intelligent I/O adapter cards.

Direct Access Storage Devices (DASD)

The System/88 DASD controllers, DASD directors, and the 4580, 4581, 4583, and 4584 Disk Drives provide an integrated, intelligent, fault-tolerant DASD subsystem.

- Fault-tolerant operation is achieved through duplexed DASD.
- DASD controllers are microprocessor-based.
- The 4580 DASD Controller supports up to four 4580 Disk Drives.
- The 4580 Disk Drive has a capacity of 142 megabytes with an instantaneous data transfer rate of 1.04 megabytes per second and average access time of 49.7 milliseconds. A maximum of 16 duplexed (32) 4580 Disk Drives can be attached to the 4575 Processor Model 20B and a maximum of 23 duplexed (46) 4580 Disk Drives can be attached to the 4576 Processors.
- The 4581 DASD Controller supports up to eight 4581 Disk Drives.
- The 4581 Disk Drive has a capacity of 448 megabytes with an instantaneous data transfer rate of 1.8 megabytes per second and average access time of 25.5 milliseconds. A maximum of 15 duplexed (30) 4581 Disk Drives can be attached to the 4575 Processor Model 20B and to the 4576 Processors.
- Two 4583 Disk Drives are supported by the 4578 Processor and three 4583 Disk Drives are supported by the 4579 Processor. Each 4583 requires a DASD adapter card and attaches through an IOA (I/O adapter) chassis.
- The 4583 Disk Drive has capacities of 151 megabytes (Model 001), 320 megabytes (Model 002), and 781 megabytes (Model 003). Data transfer rates range between 1.2 megabytes per second and 2.5 megabytes per second, and average access time ranges between 28.3 milliseconds and 24.3 milliseconds. A maximum of two duplexed (four) 4583 Disk Drives can be attached to the 4578 Processor, and three duplexed (six) 4583 Disk Drives can be attached to the 4579 Processor.
- The 4578 Model 001 and Model 002 are customer-replaceable units.

- The 4581/4584 DASD Controller supports up to eight 4584 Disk Drives.
- The 4584 Disk Drive has capacities of 151 megabytes (Model 001), 320 megabytes (Model 002), and 781 megabytes (Model 003). Data transfer rates range between 1.2 megabytes per second and 2.5 megabytes per second, and average access time ranges between 28.3 milliseconds and 24.3 milliseconds. A maximum of 30 duplexed (60) 4584 Disk Drives can be attached to each 4576 Processor.
- The 4584 Model 001 and Model 002 are customer-replaceable units.

4585 Autoload Streaming Magnetic Tape Unit

- 1600, 3200, and 6250 bits-per-inch recording densities
- Both streaming and start/stop modes
- 256K bytes of cache memory for faster response and transparent tape buffering
- ANSI-compatibility at 1600 and 6250 bits per inch

4968 Autoload Streaming Magnetic Tape Unit

- 1600 and 3200 bits-per-inch recording densities
- Streaming mode (100 inches per second) and start/stop mode (25 inches per second) supported
- Self-checking controller board
- Compatible with the 3420 Tape Drive at 1600 bytes per inch

1/4-Inch Cartridge Streaming Tape Unit Feature (#1425)

- Economical save/restore tape unit for 4576, 4578, and 4579 Processors
- 8000 bits-per-inch recording density
- Formatted capacity of 60 megabytes
- Tape speeds of 90 inches per second
- Data transfer rate of 90 kilobytes per second
- 64-kilobyte buffer

Printers

- 3812 (up to 12 pages per minute) tabletop printer
- 4224 (up to 400 characters per second) matrix printer
- 4245 (up to 2000 lines per minute) line impact printer
- 5262 (up to 650 lines per minute) system printer
- 6262 (up to 1400 lines per minute) line printer

Terminals

- IBM Personal Computer
- IBM Personal System/2, Models 25 (with Enhanced PC Keyboard and monochrome or color display), 30, 50, and 60
- 3270 BSC Terminals

- ASCII Terminals (3151 Models 310/410, 3161, 3162, 3163, and 3164)

Primary Users

The System/88 and related software products comprise a mid-range fault-tolerant system offering that is applicable in many online application environments, such as finance, distribution, and manufacturing industries, where customers require high availability or continuous operation capability for their critical online transaction-processing applications. Application software is currently available from non-IBM sources (G520-6519) for several applications, including automatic teller machines/point of sale switching, cash management, bank teller, and warehouse inventory tracking.

Potential Benefits

- Hardware implementation of fault tolerance
- Duplexed configurations
- Horizontal growth
- Vertical growth
- Data integrity
- Hot pluggability
- Continuous hardware component checking
- Duplexed data files
- Parallel processing
- Fault-tolerant processing with no performance impact
- Remote, automatic service

Reference Material

- System/88 Digest, G520-6518
- System/88 Software Solutions, G520-6519
- Configuration Information, ZZ05-0445
- Application Design Guide, GG66-0275
- IBM System Journal Reprint, G321-5299

System/88 Software

Products Included

Products described below are at the Release 4 level.

- System/88 Operating System
- System/88 Distributed System Services
- System/88 ORACLE™
- Symbolic Debugging Aid
- Transaction Processing Services
- Forms Management System
- Text Editor
- Programming Editor
- IBM PC Terminal Support
- COBOL
- BASIC
- PL/I
- FORTRAN
- Pascal
- C Compiler and Subroutine Library
- System/88 Network
- X.25 Networking Facility
- X.29 Networking Facility
- SDLC Protocol Support
- Remote Job Entry
- 3270 Terminal Support
- 3270 Emulation Support
- SNA 3270 Terminal Emulation
- SNA Cluster Controller Support
- System/88 Primary SNA
- System/88 Secondary SNA
- System/88 Advanced Program-to-Program Communications
- System/88 Communications and System Management
- System/88 SNA Network Interface Support

System/88 Operating System

The System/88 Operating System is a virtual storage operating system designed for multiprogramming, multiple processors, and high availability in a fault-tolerant environment. System/88 Operating System:

- Allocates system resources dynamically to each user as needed
- Supports concurrent system usage, including transaction processing, interactive processing, networking, batch processing, and online program development
- Maintains file integrity through duplexed disk drives
- Supports automatic sharing of code among users

- Provides a hierarchical file system with sequential, relative, or fixed file organizations
- Supports multikey indexed file access
- Supports user programming in five high-level languages
- Provides output spooling
- Includes security controls for system access and authority
- Provides a powerful, easy-to-use command language
- Provides a diagnostic subsystem for problem analysis
- Supports maintenance software for logging and reporting problems
- Provides Host Command Facility (HCF) support
- Supports Data Encryption Algorithms
- Supports permanent virtual circuits and bisynchronous 3270 emulation transparency
- Provides software installation procedures and has an online HELP facility

The System/88 Operating System supports six high-level languages: COBOL, PL/I, FORTRAN, BASIC, C, and Pascal. Where ANSI standards have been established, these languages conform to the standards, and have been enhanced with extensions. Programs written in any of these languages and executed on a System/88 have the automatic advantage of fault-tolerant operation. The compilers generate fast, compact code using a common optimizer and code generator.

Ordering Information

Program number: 5732-001
Feature #7080, Data Encryption Algorithms

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC340665
- System Administrator's Guide, SC34-0667
- The Analyze System Facility Guide, SC34-0694
- Licensed Program Specifications, GC34-0700

System/88 Distributed System Services

The System/88 Distributed System Services program allows the System/88 to communicate with the Distributed Systems Executive (DSX) program executing in a host System/370, 30XX, or 43XX. (The DSX program provides central libraries, record keeping, session scheduling, and controlled transmission.

DSX can report on data and software assignments, schedules, and transmission.)

The Distributed System Services program allows users at a central host computer with the DSX program to manage System/88 program and data libraries and to schedule and track their distribution to downstream System/88s. Distributed System Services also allows data at a System/88 to be retrieved and transmitted to the host.

Highlights of the System/88 Distributed System Services licensed program, in conjunction with DSX in the host, include the following:

- The program can be activated by an operator command or when the system is powered on.
- An operator at the host may:
 - Send programs, files, panels, and command macros to the System/88
 - Retrieve System/88 programs, files, panels, storage dumps, and command macros
 - Delete programs, files, panels, storage dumps, and command macros in a System/88
 - Process a command macro in the System/88
- An operator, using DSX, may specify a time and sequence for each operation or use the default.
- System/88 supports logical session passthru, enabling host DSX to establish sessions with logical units in downstream processors (including System/88s) and controllers.

Ordering Information

Program number: 5732-030

Reference Material

- System/88 Distributed System Services User's Guide, SL23-0182

System/88 ORACLE™

System/88 ORACLE is a relational data base management system with an integrated set of tools for end users and application developers. System/88 ORACLE functions include the following:

- ORACLE SQL (structure query language) provides an easy-to-use interface for query, data manipulation, data definition and data control. SQL can be used interactively from a terminal or through statements embedded in an application program.
- ORACLE data dictionary contains all descriptions of the tables, indexes, views, applications and reports that are defined.
- ORACLE interactive application facility provides a non-procedural, forms-oriented application gener-

ator and processor used to create ORACLE applications.

- ORACLE utility programs provide the functions to load the data base, back up and restore the data base, log data base changes and monitor System/88 ORACLE operations.

Ordering Information

Program number: 5732-024

Reference Material

- COBOL Call Interface Reference, SC34-0735
- Database Administrator's Guide, SC34-0734
- PL/I Call Interface Reference, SC34-0745
- Report Generator, SC34-0742
- Report Text Formatter, SC34-0743
- User-Friendly Interface Reference, SC34-0737
- User-Friendly Interface Terminal User's Guide, SC34-0733

System/88 Symbolic Debugging Aid

The System/88 Symbolic Debugging Aid provides a debugging facility for programs written in any of the System/88 programming languages. Using System/88 Symbolic Debugging Aid, one or more breakpoints can be set in an executing program. When a breakpoint is reached during execution, program variables can be examined and/or modified and execution can continue. Portions of source code of the executing program can be displayed at any time during a debugging session. Use of the System/88 Symbolic Debugging Aid with the System/88 programming languages requires no knowledge of the System/88 object code or the System/88 Operating System itself.

System/88 Symbolic Debugging Aid functions include:

- Interactive usage
- Source-language-level debugging for all System/88 programming languages
- Display of fragments of source programs by referencing program line numbers
- Search facility for a string of text in a source program
- Full debugging functionality for programs compiled in debug mode with a symbol table
- Partial debugging available for programs compiled without a symbol table
- Conditional breaks for specific occurrences
- Evaluation and display of complex language expressions
- One or more breakpoints that can be set by label or line number
- Breakpoints that can be displayed and/or removed

System/88 Software

- Displaying or setting variables by name
- Online HELP facility
- Stepping one source statement at a time or tracing the source flow
- Listing information about a variable

Ordering Information

Program number: 5732-017

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- System/88 Symbolic Debugging Aid Licensed Program Specifications, GC34-0716

System/88 Transaction Processing Services

System/88 Transaction Processing Services provides tools and structures that assist in developing online transaction processing applications.

System/88 Transaction Processing Services functions include:

- Control for multiple terminals from a single user program
- Support of multiple terminal types
- Access to multiple applications from the same terminal
- Distribution of workload across multiple System/88 processors
- Distributed processing in a network of System/88 processors
- Facilities that ensure file integrity in the event that a transaction fails to complete
- Priority control of transactions
- Facilities to support split-screen processing
- Flexibility of application design due to large virtual storage program space.

Ordering Information

Program number: 5732-006

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- PL/I Transaction Processing Services Guide and Reference, SC34-0670
- BASIC Transaction Processing Services Guide and Reference, SC34-0683

- COBOL Transaction Processing Services Guide and Reference, SC34-0674
- FORTRAN Transaction Processing Services Guide and Reference, SC34-0687
- Pascal Transaction Processing Services Guide and Reference, SC34-0691
- System/88 Transaction Processing Services Licensed Program Specifications, GC34-0705

System/88 Forms Management System

The System/88 Forms Management System is a set of tools and programs that streamline the design and management of screen forms for online applications. It simplifies application implementation by providing a standardized approach to designing, building, testing, and handling terminal input and output. Forms are designed interactively by positioning the cursor and using a menu to describe the attributes of each field. As forms are created, they can be tested independently of the application program.

System/88 Forms Management System:

- Interactively creates and maintains video display formats
- Assists users with little or no programming experience in designing video display formats
- Generates source code for System/88 COBOL, PL/I, Pascal, and BASIC languages
- Separates forms definition from application code for ease of maintenance

Ordering Information

Program number: 5732-007

Reference Material

- PL/I Forms Management System Guide and Reference, SC34-0671
- BASIC Forms Management System Guide and Reference, SC34-0684
- COBOL Forms Management System Guide and Reference, SC34-0675
- FORTRAN Forms Management System Guide and Reference, SC34-0688
- Pascal Forms Management System Guide and Reference, SC34-0692
- System/88 Forms Management System Licensed Program Specification, GC34-0706

System/88 Text Editor

System/88 Text Editor is an interactive full-screen editor for display devices. It is menu-driven and includes basic edit functions such as tab settings; character, line, and block moving; copying and deleting; pattern matching; and global search and replacement.

System/88 Text Editor functions include:

- Multiple work buffers (interbuffer cut and paste)
- Multiple screen windows
 - User-defined in size and number
 - Character, line, or block copies and moves between windows
- Searches
 - Forward
 - Backward
 - Case-sensitive or -insensitive
- Definition of shorthands to perform a series of key-strokes on request at any point in the text
- Online HELP at the press of a key

Ordering Information

Program number: 5732-016

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- Text Editor User's Guide, SC34-0693
- System/88 Text Editor Licensed Program Specification, GC34-0715
- System/88 Text Editor Reference, SC34-0697

System/88 Programming Editor

The Programming Editor is a full-screen, interactive text-editing facility for document and file creation. This EMACS-like editor is command-driven and includes edit functions such as tab settings, text moving, copying and deleting, pattern matching, and global search and replacement. The editor supports the single byte coded graphic character set 8859 Part 1: Latin Alphabet No. 1.

System/88 Programming Editor provides:

- Multiple work buffers (interbuffer cut and paste)
- Multiple-screen windows
 - User definitions for size and number
 - Character, line, or block copies and moves between windows
- Forward and backward searches and case-sensitive searches
- Backup and recovery file capability

- Online HELP at press of key
- National language support

Ordering Information

Program number: 5732-033

Reference Material

- System/88 Programming Editor Licensed Program Specifications, GC34-0968
- System/88 Programming Editor User's Guide, SC34-0969

IBM Personal Computer Terminal Support

The System/88 IBM Personal Computer Terminal support allows System/88 users to connect an IBM Personal Computer to a System/88 as an ASCII terminal.

The models of the IBM Personal Computer supported include the IBM Personal Computer, IBM Personal Computer XT and AT, and IBM Personal System/2 Models 25 (with Enhanced PC Keyboard and monochrome or color display), 30, 50, and 60.

The System/88 IBM Personal Computer Terminal Support requires the use of the IBM Personal Computer Disk Operating System (either DOS 2.1 or DOS 3.1) and operates as a DOS application program.

IBM Personal Computer Terminal Support functions include:

- Direct cable attachment or modem connection to an IBM System/88
- Selectable line speeds with direct cable attachment or modem connection
- Connection to an IBM System/88 using an RS-232 interface
- Use of the IBM Personal Computer as a logon device to the System/88
- Assignment of logical functions to specific IBM Personal Computer keystroke combinations.

Ordering Information

Program number: 5732-019

Reference Material

- System/88 IBM Personal Computer Terminal Support, SX34-0173
- System/88 IBM Personal Computer Terminal Support Licensed Program Specifications, GC34-0732

System/88 COBOL

System/88 COBOL conforms to ANSI (X3.23-1974:COBOL 74), with the exception of the Report Writer feature, which has not been implemented. Extensions have been developed that capitalize on the benefits of the System/88 and enhance programmer productivity. System/88 COBOL functions include:

- Support for the System/88 ORACLE (5732-024) data base, and the fixed, relative, and sequential file structures
- Support for the System/88 Transaction Processing Services and System/88 Forms Management System
- Interactive support by the System/88 Symbolic Debugging Aid
- Direct access to System/88 Operating System procedures via CALL
- Ability to CALL programs written in the other System/88 languages
- Enhancements to COBOL 74, ANSI X3.23-74

Ordering Information

Program number: 5732-011

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- COBOL Language Reference, SC34-0672
- COBOL Subroutines Reference, SC34-0673
- COBOL Transaction Processing Services Guide and Reference, SC34-0674
- COBOL Forms Management System Guide and Reference, SC34-0675
- System/88 COBOL Licensed Program Specifications, GC34-0710

System/88 BASIC

System/88 BASIC is an extended BASIC language that exceeds the BASIC Level 1 defined in ANSI X3.60-1978. It is a compiled BASIC that generates object code bound after compilation into an executable program. This typically results in faster program execution than with interpretive BASICs. Object modules generated by the System/88 BASIC compiler are shareable and re-entrant. System/88 BASIC functions include:

- Support for the System/88 ORACLE (5732-024) data base and sequential, fixed and relative file organizations
- Support by the System/88 Transaction Processing Services and the System/88 Forms Management System

- Support for System/88 Symbolic Debugging Aid
- Enhancements to BASIC (ANSI X3.60-1978)

Ordering Information

Program number: 5732-012

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- BASIC Language Reference, SC34-0681
- BASIC Subroutines Reference, SC34-0682
- BASIC Transaction Processing Services Guide and Reference, SC34-0683
- BASIC Forms Management System Guide and Reference, SC34-0684
- System/88 BASIC Licensed Program Specifications, GC34-0711

System/88 PL/I

System/88 PL/I conforms to the ANSI PL/I (X3.74-1981) subset, and includes all the features defined in the subset. In addition to these features, the System/88 PL/I compiler and language have extensions designed to enhance writing programs for a tasking environment. System/88 PL/I functions include:

- Interfaces to System/88 Transaction Processing Services (5732-006) and System/88 Forms Management System (5732-007)
- Support by System/88 Symbolic Debugging Aid (5732-017)
- Support for stream input/output and the System/88 ORACLE (5732-024) data base
- Extensions to PL/I (ANSI X3.74-1981)

Ordering Information

Program number: 5732-013

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- PL/I Subroutines Reference, SC34-0669
- PL/I Language Reference, SC34-0668
- PL/I Transaction Processing Services Guide and Reference, SC34-0670
- PL/I Forms Management System Guide and Reference, SC34-0671
- System/88 PL/I Licensed Program Specifications, GC34-0712

System/88 FORTRAN

System/88 FORTRAN is an implementation that meets the ANSI FORTRAN (X3.9-1978) specification. In addition to supporting the complete ANSI standard, System/88 FORTRAN includes extensions to enhance its operation on the System/88 and to ease conversion from FORTRAN implementations of other IBM processors. System/88 FORTRAN functions include:

- Conformity to the full language specification of FORTRAN (X3.9-1978)
- Interfaces to the System/88 Transaction Processing Services and System/88 Forms Management System
- Full access to all System/88 Operating System service subroutines and cross-language compatibility
- Support by the System/88 Symbolic Debugging Aid
- Support for indexed files and the System/88 ORACLE data base

Ordering Information

Program number: 5732-014

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- FORTRAN Language Reference, SC34-0685
- FORTRAN Subroutines Reference, SC34-0686
- FORTRAN Transaction Processing Services Guide and Reference, SC34-0687
- FORTRAN Forms Management System Guide and Reference, SC34-0688
- System/88 FORTRAN Licensed Program Specifications, GC34-0713

System/88 Pascal

System/88 Pascal is a high-level programming language suitable for structured programming techniques. The Pascal language supports error checking during compilation and execution and results in more reliable programs. User productivity is further enhanced through fast compilation and the ability to utilize the system/88 Symbolic Debugging Aid (5732-017). System/88 Pascal is a complete implementation of standard Pascal and conforms fully with the standard defined by the joint ANSI/IEEE Pascal Committee. System/88 Pascal functions include:

- Support of System/88 Transaction Processing Services and System/88 Forms Management System
- Support by the System/88 Symbolic Debugging Aid

- Re-entrant optimizing compiler that keeps efficient object code for fast program execution
- Separate compilation of procedures
- Cross-language compatibility
- Enhancements to Pascal
- Support for the System/88 ORACLE data base and sequential, fixed, and relative file organizations

Ordering Information

Program number: 5732-015

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- Pascal Language Reference, SC34-0689
- Pascal Language Reference, SC34-0689
- Pascal Subroutines Reference, SC34-0690
- Pascal Transaction Processing Services Guide and Reference, SC34-0691
- Pascal Forms Management System Guide and Reference, SC34-0692
- System/88 Pascal Licensed Program Specifications, GC34-0714

System/88 C Compiler and Subroutine Library

System/88 C is a high-function general purpose programming language. The System/88 C Compiler accepts C source statements and generates object code for execution in the IBM System/88 family of fault-tolerant computers. Output from the C Compiler preprocessor is input to the compiler, which generates optimized shareable and re-entrant object code along with optional source listings and cross-reference tables. The System/88 C Compiler functions with its Subroutine Library, as a standalone licensed program for program development in a non-UNIX® environment. System/88 C functions include:

- Support for C programming language
- Support of System/88 Transaction Processing Services and System/88 Forms Management System
- Support by the System/88 Symbolic Debugging Aid
- A functionally rich set of operators
- A versatile, extensive subroutine library
- Cross-language compatibility
- Support for the System/88 ORACLE data base and sequential fixed and relative file organizations

Ordering Information

Program number: 5732-023

System/88 Software

Reference Material

- Introduction to the Operating System, SC34-0664
- Operating System Reference, SC34-0665
- C Language Reference, SC34-0746
- C Transaction Processing Services Guide and Reference, SC34-0747
- C Forms Management System Guide and Reference, SC34-0748

Communications Software

System/88s communications software products offer a range of function including networking, device emulation, and terminal connectivity. The System/88 supports ASCII terminals, the IBM Personal Computer, IBM Personal Computer XT and AT, IBM Personal System/2, binary synchronous 3270s, X.25, X.29, and the communications protocols required to attach many industry terminals. Attachment of the System/88 to other IBM systems through RJE, 3270 emulation, X.25 networking, and Systems Network Architecture (SNA) is also supported.

System/88 Network

System/88 Network is the System/88 networking software that can be used to interconnect multiple System/88 systems and to give the user a single-system view of the entire network. System/88 Network uses an X.25 communications interface to public networks and private lines. Security functions are integrated in the System/88 Network to ensure that local and remote users are authorized to log on to the requested system. Security features of the local system, provided by the System/88 Operating System, also apply. (System/88 X.25 Networking Facility, 5732-008, is a prerequisite for the System/88 Network)

System/88 Network functions include:

- Multiple systems connection
- X.25 communication protocol
- X.25 permanent virtual circuit (PVC)
- User access to local or remote systems
- Network security

Ordering Information

Program number: 5732-002

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software Introduction, SC34-0677
- System/88 Network Licensed Program Specifications, SC34-0701

System/88 Remote Job Entry

System/88 Remote Job Entry provides binary synchronous data transfer facilities between the System/88 and a variety of host processors.

System/88 Remote Job Entry functions include:

- Multiple protocol support
- Multiple host software systems support
- Switched or leased lines
- Output files queued or routed to disk
- ASCII or EBCDIC transmission
- Concurrent operation with other System/88 applications
- Auto-dial support

Ordering Information

Program number: 5732-003

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677
- System/88 Communications Software: Binary Synchronous Communication Guide, SC34-0679
- System/88 Communications Software: Using the Remote Job Entry Facility Guide, SC34-0680
- System/88 Remote Job Entry Licensed Program Specifications, GC34-0702

System/88 3270 Terminal Support

System/88 3270 Terminal Support allows the System/88 to support binary synchronous 3270 devices. This support enables System/88 application programs to read and write to 3270 devices as if they were ASCII devices. 3270 devices are supported as standard application devices or as logon devices.

System/88 3270 Terminal Support functions include:

- Features consistent with all System/88 software
- Programming language interface
- 3270 terminal as a logon device
- 3271, 3274, or 3276 control unit support
- Dynamic network reconfiguration
- ASCII/EBCDIC code conversion
- System/88 Forms Management System support

Ordering Information

Program number: 5732-004

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677
- System/88 Communications Software: 3270 Support and 3270 Emulation Guide, SC34-0678
- System/88 Communications Software: Binary Synchronous Communication Guide, SC34-0679
- System/88 3270 Terminal Support Licensed Program Specifications, SC34-0703

System/88 3270 Emulator Support

System/88 3270 Emulator Support enables System/88 application programs to communicate with other IBM systems and to appear to these systems as 3270-type devices. This emulation is supported by a binary synchronous protocol.

System/88 3270 Emulator Support functions include:

- Emulation of 3271, 3274, and 3276 control units
- Access to other IBM hosts
- Shared multipoint lines
- ASCII/EBCDIC conversion
- 3270 BSC emulation transparency

Ordering Information

Program number: 5732-005

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677

- System/88 Communications Software: 3270 Support and 3270 Emulation Guide, SC34-0678
- System/88 Communications Software: Binary Synchronous Communication Guide, SC34-0679
- System/88 3270 Emulator Support Licensed Program Specifications, GC34-0704

System/88 X.25 Networking Facility

System/88 X.25 Networking Facility provides full-duplex, interprogram communication across System/88 systems, independent of hardware link, line speed, and physical network configuration. System/88 X.25 Networking Facility also provides access to public packet-switching networks and conforms to the CCITT X.25 level III standard for computer-to-computer communication.

System/88 X.25 Networking Facility functions include:

- Compliance with CCITT X.25 standard
- Access to public packet switching networks
- SNA host connection with NPSI supported

Ordering Information

Program number: 5732-008

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677
- System/88 X.25 Networking Facility Licensed Program Specifications, GC34-0707

System/88 X.29 Networking Facility

System/88 X.29 Networking Facility provides communications facilities between remote terminals and the System/88. The terminals can connect to a packet-switched network through a dial-up line, and the traffic is routed to the appropriate System/88 system. Terminal can be concentrated in a packet assembler/disassembler through private lines or public data networks.

System/88 X.29 Networking Facility functions include:

- Access to public packet-switched networks
- Support for system administrator

System/88 Software

Ordering Information

Program number: 5732-009

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677
- System/88 X.29 Networking Facility Licensed Program Specifications, GC34-0708

System/88 Synchronous Data Link Control Protocol Support

System/88 Synchronous Data Link Control (SDLC) Protocol Support provides synchronous communications software corresponding to the SNA link layer, and can be used to transmit and receive over SNA networks.

Ordering Information

Program number: 5732-010

Reference Material

- Introduction to the System/88 Operating System, SC34-0664
- System/88 Operating System Reference, SC34-0665
- System/88 Communications Software: Introduction, SC34-0677
- System/88 SDLC Protocol Licensed Program Specifications, GC34-0709

System/88 SNA 3270 Terminal Emulation

System/88 SNA 3270 Terminal Emulation allows System/88 asynchronous display terminals and printers to appear as 3270 devices. When used in conjunction with the System/88 SNA Cluster Controller, the System/88 can appear as a SNA 3270 cluster control unit and attach to an SNA network using synchronous data link control (SDLC) protocol.

System/88 SNA 3270 Terminal Emulation:

- Permits System/88 ASCII terminals to emulate SNA 3278 displays and 3289 printers

- Converts ASCII data to/from EBCDIC data
- Allows control of printer functions

Ordering Information

Program number: 5732-020

System/88 SNA Cluster Controller

System/88 SNA Cluster Controller provides support for the System/88 to attach to a SNA network using synchronous data link control (SDLC) protocols. The support allows System/88 terminals, using System/88 SNA 3270 Terminal Emulation or System/88 user-written applications, to communicate in a SNA network over SDLC lines.

System/88 SNA Cluster Controller functions include:

- Support for SNA communications using SDLC protocol
- Support that makes the System/88 appear to SNA hosts as 3274/76 cluster controllers with attached 3278 Model 2 Displays and 3287 or 3289 Printers with data stream compatibility
- An application programming interface that supports all System/88 programming languages
- Access to host application software in a SNA network
- Gathering of physical unit (PU) and logical unit (LU) status information through SNA commands or user-written application software.

Ordering Information

Program number: 5732-021

System/88 Primary SNA

System/88 Primary SNA provides support to allow System/88 applications to exchange data with a variety of control units and communications controllers.

System/88 Primary SNA functions include:

- Allows the System/88 to function as an SNA host (physical unit type 5) node in a network with SNA cluster controller (physical unit type 2) nodes.
- Provides an application programming interface for logical unit types 0, 1, 2, and 3.
- Allows System/88 applications to communicate with the logical units residing in the following SNA

control units, SNA communications controllers, SNA devices, and SNA applications:

- 3274 Display Control Unit
 - 3624 Consumer Transaction Facility
 - 3651 Store Controller
 - 3684 Model 2 Point-of-Sale Controller/Register
 - 4680 Store System Controller
 - 4701 and 4702 Finance Communications Controller
 - 4730 Personal Banking Machine
 - System/88 Secondary SNA applications in other System/88s
- Allows session pass-through on a logical unit basis between downstream SNA secondary logical units (for example, displays connected to a 3274 attached to a System/88) and upstream SNA primary logical units (for example, CICS running on a host System/370). System/88 Secondary SNA is required.

Ordering Information

Program number: 5732-028

Reference Material

- System/88 Primary and Secondary SNA Planning and Operations Guide, SC34-0757
- System/88 Primary and Secondary SNA Programming Guide and Reference, SC34-0758

System/88 Secondary SNA

System/88 Secondary SNA allows the System/88 to connect to SNA networks as a physical unit type 2 cluster controller. Support is provided to allow selected System/88 peripherals to appear to upstream hosts as SNA terminals and printers.

System/88 Secondary SNA functions include:

- Allows the System/88 connected to an SNA host (physical unit type 5) node to operate as an SNA cluster controller (physical unit type 2) node.
- Provides an application programming interface for logical unit types 0, 1, 2, and 3 to communicate with CICS, IMS, and System/88 Primary SNA applications.
- Allows IBM Personal Computers and IBM 316X terminals connected to the System/88 to appear to SNA host nodes as SNA 3278 displays.
- Allows print jobs created for SNA logical unit type 1 and logical unit type 3 printers to print on System/88 printers.
- Allows session pass-through on a logical unit basis between downstream SNA secondary logical units (for example, displays connected to a 3274 attached to a System/88) and upstream SNA

primary logical units (for example, CICS running on a host System/370). System/88 Primary SNA is required.

- Provides support for System/370 Host Command Facility (HCF)

Ordering Information

Program number: 5732-029

Reference Material

- System/88 Primary and Secondary SNA Planning and Operating Guide, SC34-0757
- System/88 Primary and Secondary SNA Programming Guide and Reference, SC34-0758

System/88 Advanced Program-to-Program Communications

System/88 Advanced Program-to-Program Communications supports the SNA application programming interface (logical unit type 6.2, physical unit type 2.1) and allows program-to-program communication over SDLC communication links. This interface includes a set of conversation verbs that allows application programs to communicate at a conversation level with no session awareness. It also includes a set of operator verbs that allows application programs to perform operator functions.

Ordering Information

Program number: 5732-025

Reference Material

- System/88 Advanced Program-to-Program Communications Planning and Operations Guide, SC34-0759
- System/88 Advanced Program-to-Program Communications Programming Guide and Reference, SC34-0760

System/88 Communications and System Management

System/88 Communications and System Management forwards alerts to a host Network Problem Determination Application (NPDA) to permit central problem tracking. Alerts can originate from downstream SNA controllers supported by the System/88 Primary SNA licensed program or user application programs exe-

System/88 Software

cuting on the System/88. The System/88 Communications and System Management program also generates alerts for the System/88.

System/88 Communications and System Management SNA functions include:

- Allows alert pass-through for downstream SNA physical units attached to the System/88 and controlled by the System/88 Primary SNA licensed program.
- Allows user-requested alerts to be sent to the host from an application program.
- Provides alert support for System/88 hardware. Fault tolerance is a part of the System/88 hardware design. A duplexed component that fails is automatically taken out of service without affecting system performance or operations.
- Provides a control logging facility for the SNA network controlled by the System/88.

Ordering Information

Program number: 5732-026

Reference Material

- Introducing the System/88 Communications and System Management, GC23-0155
- System/88 Communications and System Management User's Guide, SC23-0156

System/88 SNA Network Interface Support

System/88 SNA Network Interface Support provides the supporting architecture that enables processors and terminal products to be interconnected in a traditional SNA subarea network, as well as in a peer type of SNA network. The System/88 SNA Network Interface Support provides the following:

- Interface for System/88 Primary and Secondary SNA, Advanced Program-to-Program Communications, and Communications and System Management licensed programs
- Dynamic addition, change, or deletion of related resources
- Activating or deactivating local resources
- Error log and display facility for all SNA errors
- Message log and display facility for operator messages
- Session-level segmentation and segmentation assembly
- Programming interface for all operator functions
- Support for point-to-point, multipoint, and switched SDLC links

Ordering Information

Program number: 5732-027

Reference Material

- System/88 Primary and Secondary SNA Planning and Operations Guide, SC34-0757
- System/88 Primary and Secondary SNA Programming Guide and Reference, SC34-0758
- System/88 Advanced Program-to-Program Communications Planning and Operations Guide, SC34-0759
- System/88 Advanced Program-to-Program Communications Programming Guide and Reference, SC34-0760
- Introducing the System/88 Communications and System Management, GC23-0155
- System/88 Communications and System Management User's Guide, SC23-0156

Section 62. Series/1

Series/1

Products Included

- 3151 ASCII Display Station*
- 3161, 3162, 3163, and 3164 ASCII Display Stations*
- 4201/4202 Printers
- 4224 Printer
- 4234 Printer
- 4956 Processor
- 4959 I/O Expansion Unit
- 4963 Disk Subsystem
- 4964 Diskette Unit
- 4965 Storage and I/O Expansion Unit
- 4967 High Performance Disk Subsystem
- 4968 Autoload Streaming Magnetic Tape Unit
- 4987 Programmable Communications Subsystem
- 4993 Channel Termination Enclosure
- 4997 Rack Enclosure
- 5262 Printer
- Communications Attachment features

Main Purpose

The Series/1 is a family of highly modular, general purpose processors that can be applied to a wide range of data processing applications, including:

- Distributed processing:
 - Interactive
 - Batch
- Communications:
 - Line switching
 - Concentration
 - Protocol conversion
- Industrial automation
- Specialized applications:
 - Videotex
 - Energy management
- Traditional data processing applications (particularly for multiple users):
 - Distributed
 - Standalone
- Emerging data processing applications where horizontal growth or improved availability is required

Key Functions, Facilities and Features

The Series/1 is characterized as a low-cost, flexible, and versatile computer. Series/1 is highly modular and users need purchase only the system units and features that they need and in the quantities that they need them – with significant savings in multiple system environments. In addition, portions of a Series/1 system can be selectively upgraded without total system replacement, thus protecting an investment in multiple Series/1 systems. Furthermore, the Series/1 family provides for nondisruptive, horizontal system growth and improved availability.

Series/1 hardware and software support a very wide range of IBM terminals, protocols, and other special devices. This has made Series/1 the first choice for interfacing to environments that are not supported by other IBM systems.

The Series/1 hardware and software architecture is geared to the implementation of response-oriented, multiuser applications.

Functions supported include:

- Local multiuser interactive processing
- Local multiuser program development
- Local batch processing
- 3270 data stream emulation to host systems
- Primary SNA-to-downstream controllers
- Host interactive processing to IMS/VS and CICS/VS
- ARJE to host systems using SDLC or BSC
- Communications network concentration
- Peer-to-peer communications to local or remote systems
- Duplexed volumes
- Multiple Series/1 processors with a single-system image
- Advanced Program-to-Program Communications (APPC)
- Distributed function
- Connection to non-IBM or non-data processing equipment
- Series/1 attachment to the 8100 under DPPX or DPCX and access to the capabilities of the 8100 or, via DPPX/DSC or DPCX/DSC, the capabilities of the host system (System/370, 30XX, or 4300)
- IBM Personal Computer intelligent workstation support

* See Section 68

Series/1

Hardware

Series/1 hardware consists of individual units that are combined to form a working system. Each unit, such as a processor, can be combined with all of the other units, such as files, printers, and communications attachments. The processors are compatible and the software is designed to support this flexible environment.

The following are the hardware units:

- Processors ranging in processing speed and main storage size from the 4956 Models B, D, and G (1024KB) to the 4956 Models E, H, J, and K (up to 2048KB) and using the powerful Series/1 instruction set, address translation scheme, and channel with microprocessor-based attachments
- The 4956 J00 and K00 memory can also be extended up to 14MB by adding 2MB and 4MB storage cards. This allows the user to have from 2MB to 12MB of additional storage to be used as unmapped or secondary storage.
- Integrated DASD at 40MB, 60MB, and 72MB each
- Diskette units ranging from .5 megabytes (4964) to 1.2 megabytes (4965 or 5-1/4 inch integrated diskette)
- Desktop processor/diskette combinations, which include the 4956 Processor combined with the 4965 Diskette Unit or 5-1/4 inch integrated disk and diskette units
- Fixed disk storage ranging from the 5-1/4 inch integrated disk with 40 or 72 megabytes to multiple 4967 Model 3C disk subsystems with 358 megabytes each
- Autoload Streaming Magnetic Tape Unit 1600/3200 bpi (4968)
- Matrix and line printers ranging from 200 characters per second (4201/4224) to 650 lines per minute (5262)
- Data processing, correspondence, and bar code printing using the 4224 matrix printer
- Native attachments for 3161, 3162, 3163, 3164, and 3151
- Native attachments for the 7456 Plant Floor Terminal
- Sixteen unique communications attachments that support the following protocols:
 - SDLC and asynchronous to 19,200 bits per second
 - BSC to 56,000 bits per second
 - SDLC and HDLC to 56,000 bits per second
 - X.21/X.25 to 56,000 bits per second
- A programmable communications subsystem that supports asynchronous and BSC protocols on up to 32 lines per subsystem and provides outboard control of functions such as multiplexing and polling

- A Series/1-to-System/370, 30XX, 4300 channel attachment that operates at up to 300,000 bytes per second (4993)
- Extensive sensor I/O including a fully programmable cycle steal DI/DO attachment card
- Three different Series/1 local peer-to-peer attachments, including a 2-megabit local communications controller that interconnects up to 16 Series/1 systems
- I/O expansion units (4959 and 4965) to provide for additional I/O attachment slots above those provided in the base processors
- Standard 19-inch rack enclosures for housing Series/1 units (4997)

Primary Users

- End-users in stores, agencies, warehouses, hospitals, schools, dealerships, pharmacies, plants, research labs, and other locations that may or may not have the requirement to communicate with a centralized data processing facility
- Original equipment manufacturers who include Series/1 equipment as part of their products
- Central site support of communications where improved end-user availability is key to application success

Potential Benefits

- Increased customer service resulting from local, highly responsive computing
- Decreased errors in data preparation and collection, since responsibility can be delegated to local management
- Reduction in line costs and host processing load as a result of local processing
- Reduced development cost associated with the ability to migrate host 3270 interactive applications and high-level language applications to a distributed system environment
- Reduced cost associated with the ability to fit into the existing data processing environment in an organization, including those with noncompatible line disciplines and host/terminal equipment
- Reduced operational expense utilizing applications, such as energy management and plant floor control
- Ability to implement applications no other IBM systems can implement
- Ability to expand a system beyond the limits of a single processor while still maintaining a single system image
- Feasibility of investment in redundant processors and devices to improve end-user availability

Products Supported

The following are products that are not in the Series/1 family but are supported by Series/1 hardware and software:

- Communications:
 - ASR 33/35 Teletype (Trademark of the Teletype Corp.)
 - 3161, 3162, and 3163 Display Station and 3164 Color Display Station
 - 3151 Display Station
 - 3271, 3274, and 3276 in BSC mode with displays and terminals, including the 3279 Color Display Station
 - IBM hosts under MVS and DOS/VSE in both BSC and SNA environments
 - Connectability to practically all other IBM equipment operating in BSC or asynchronous modes
 - IBM Personal Computers
- Local attachment:
 - 3161, 3162 and 3163 Display Stations and 3164 Color Display Station
 - 3151 Display Station
 - 7456 Plant Floor Terminal

Reference Material

- Series/1 Digest, G360-0061
- Series/1 Pocket Digest, GX34-0104
- Series/1 Selection Guide, GA34-0143
- Brochures:
 - Equipment Programs and Services, G520-0103
 - Bringing Your Network Together, G520-0102

See the next page for a description of Series/1 software.

Series/1 Software

Products Included

- RPS (Realtime Programming System):
 - Communications Manager*
 - Remote Manager*
 - Indexed Access Method*
 - Sort/Merge*
 - Multiprocessing Feature
 - Advanced Remote Job Entry
 - X.25 High-Level Data Link Control Communications Support
 - System/370 Channel Attach
 - Intelligent Workstation Support
 - Transaction Processing System
 - COBOL (Host and Native)
 - PL/I (Host and Native)
 - FORTRAN IV
 - Pascal (Host and Native)

* Included as part of RPS operating system

- EDX (Event-Driven Executive):
 - Communications Facility
 - Remote Manager
 - SNA RJE
 - Primary SNA
 - Advanced Program-to-Program Communications (APPC)
 - Indexed Access Method
 - Sort/Merge
 - System/370 Channel Attach
 - Advanced Remote Job Entry
 - X.25 High-Level Data Link Control Communications Support
 - Intelligent Workstation Support
 - Transaction Processing System
 - COBOL (Host and Native)
 - PL/I (Host and Native)
 - FORTRAN IV
 - Pascal (Host and Native)
 - System/program analysis utility
 - Series/1 Videotex System

Key Functions, Facilities and Features

- Two operating systems that provide complete environments for both application development and application execution:
 - Realtime Programming System – multiprocessing disk transient system
 - Event-Driven Executive – ease-of-use oriented, storage resident system
- Indexed file access method (IAM)
- COBOL, FORTRAN, PL/I, Pascal, Assembler, and Event-Driven Language
- Transaction Processing System for interactive screen design and multiterminal application execution

- Full binary synchronous communication (BSC) and synchronous data link control (SDLC) 3270 emulation supporting 4978 and 316X terminals
- 3270 data stream pass-through for 3271, 3274, or 3276 connected to the Series/1 in BSC mode
- GET/PUT level SDLC programmable interface
- A comprehensive communications message handling and transaction manager (Communications Facility under EDX)
- A complete communications networking package for Series/1 networks (Communications Manager under RPS)
- System/370 Host Based COBOL and PL/I compilers
- A standalone system that presents virtual COBOL to the user as an application language and provides 3270 emulation and an interface to Host Command Facility (HCF) in an execution environment (virtual COBOL control programming support)
- Series/1 Videotex System that can provide the ability to implement private videotex systems
- Multiprocessing feature (RPS only) that provides up to 4 processors with a single-system image
- Redundancy available to provide improved availability to end-users
- Transaction Processing System offers support for developing and managing transaction-oriented user application programs.

Realtime Programming System (RPS)

Realtime Programming System (RPS) provides the greatest amount of function of the operating systems available. It is designed for full device support and functional breadth and can be used to implement both real time and batch distributed processing. RPS provides these major capabilities:

- Task management
- Storage management
- Task set management
- Event management
- Queue management
- Timer management
- Serially reusable resource management
- Interrupt management
- Error management
- Data management
- Standalone utilities
- System utilities
- Service aids
- Duplex volumes
- Program segmentation services
- Command language facility
- Uniprocessor support
- Multiprocessing support

- Virtual terminal interface support
- X.21 circuit switched support

Communications Manager*

The RPS Communications Manager provides a wide range of functions and significant flexibility in addressing communication solutions ranging from simple front-end processing to supporting distributed applications and full networking facility.

The Communications Manager allows various types of networks to be implemented as a peer-to-peer Series/1 network. It can communicate with hosts (OEM/IBM), devices, terminals (OEM/IBM), and applications, and can make the data being sent or received by them transparent to network connections. Maximum flexibility and control is emphasized.

The Communications Manager allows the user to dynamically add terminals, devices, or nodes without stopping the network or affecting normal traffic. Message integrity is provided by allowing messages to be disk-queued as they traverse the network. An alternate routing facility allows a message to be delivered even when the primary path to the destination is broken.

Remote Manager*

The RPS Remote Manager executing on each Series/1 in the network is designed to interface with the following host communications and systems management programs to provide the Series/1 with centralized management function:

- Network Communications Control Facility
- Network Problem Determination Application
- Host Command Facility
- Distributed System Executive

The Remote Manager exchanges data and information with the host communications and systems management programs via SNA sessions.

Indexed Access Method*

RPS Indexed Access Method (IAM) provides data management facilities that support indexed file operations. A single copy of IAM supports multiple programs and tasks sharing the same data files.

Sort/Merge*

The RPS Sort/Merge program sorts and merges records from up to eight input data sets into one output data set in either ascending or descending order. It can be initiated as a batch job or from a user routine in an application program.

Multiprocessing Feature

This feature of the Realtime Programming System provides for nondisruptive, horizontal system growth as well as data integrity and a single-system image for two to 4 commonly attached Series/1 processors.

Nondisruptive horizontal growth allows incremental addition of devices, features, and other system options in a manner that does not require stopping the entire system. Even processors and their attached devices may be added without stopping or quiescing the entire system.

Data integrity is provided through duplex volume support. When at least two disks are available on one to 4 processors, the Realtime Programming System and Multiprocessing Feature automatically, and transparently, keep duplex copies of the volumes synchronized. In the event of a failure of one of the volumes, the system commences using the other copy of the volume.

From two to 4 Series/1 processors are supported with a single-system image. Through the use of distributed function, most resources of each processor are available to the entire system. The entire system can be controlled from a single-system operator console, thus reducing complexity of systems management and operation.

Transaction Processing System

The Transaction Processing System offers support for developing and managing transaction-oriented user application programs. It provides high programming productivity and the use of system functions without the complexity of an operating system interface. Programs written to the Transaction Processing System application interface for one operating system (RPS or EDX) may only need a recompilation to run on the other operating system. Many applications may be developed using the application program tools available with little or no additional programming necessary.

Advanced Remote Job Entry

RPS Advanced Remote Job Entry provides remote job entry workstation support for the Series/1. The program provides the Series/1 user with RJE support in an SNA network or BSC environment.

X.25 High-Level Data Link Control Communications Support

RPS X.25/HDLC Communications Support provides read/write level X.25/HDLC support for the DLC

* Included as part of RPS operating system

Series/1 Software

adapter, the SDLC single line control, and the synchronous communications single.

System/370 Channel Attach Program

The System/370 Channel Attach Program and the Series/1 Channel Attach Device (4993) enable a Series/1 application program to communicate with a BTAM or BTAM-ES application program in a host processor. The Series/1 responds to the host as a locally attached 3272 Control Unit.

Intelligent Workstation Support

The EDX/RPS Intelligent Workstation Support PRPQ extends the use of IBM Personal Computers as an interconnected workstation, both to the Series/1 and through the Series/1 to host systems.

Event-Driven Executive (EDX)

Event-Driven Executive (EDX) is an interactive, interpretive, response-oriented system appropriate for distributed processing and standalone environments in both business and industrial applications. Language capabilities include COBOL, PL/I, Pascal, Assembler, FORTRAN IV, and Event-Driven Language.

Major Functions

EDX provides these major capabilities:

- Multiprogramming, multitasking supervisor
- Storage resident operating system
- Unmapped storage management
- Cross-partition supervisor
- Disk- or diskette-based operating system
- Printer spooling
- Session manager for easy-to-use menu of functions
- Additional high-level language (Event-Driven Language)
- Multiple terminal support
- Processor-to-processor communications support
- Binary synchronous communications support
- Sensor input/output support
- Timer support
- I/O level support (EXIO) for nonstandard devices
- Diagnostic aids
- SNA and X.25 support

EDX provides a separate set of self-prompting utilities. The areas supported include:

- Text editing
- Program preparation
- Data management
- Terminal
- Graphics
- Communications

- Diagnostics
- Job stream processor

Communications Facility

The EDX Communications Facility licensed program provides a set of functions that allows interactive message handling capability between the Series/1 and a variety of terminals, printers, and processors. Highlights of the product include:

- Appearance of Series/1 displays and printers as 3270 Information Display stations to System/370, 30XX, and 4300 host systems and host application programs
- Series/1 support for downline 3271 and BSC 3274 Control Units
- Enhanced Series/1-to-Series/1 communications over a BSC line or over a local communications controller link
- Interfaces to other IBM systems or devices over a point-to-point BSC line
- Remote maintenance facilities
- Message routing with facilities to prioritize and queue messages
- Transaction processing facilities that include a scheduler and a high-speed loader
- Application development tools including a 3270 panel design aid
- Remote disk access

Remote Manager

The EDX Remote Manager executing on each Series/1 in the network is designed to interface with the following host communications and systems management programs to provide the Series/1 with centralized management function:

- Network Communications Control Facility
- Network Problem Determination Application
- Host Command Facility
- Distributed Systems Executive

The Remote Manager exchanges data and information with the host communications and systems management programs via SNA sessions.

Systems Network Architecture Remote Job Entry

The EDX Systems Network Architecture program provides a subset of the total SNA architecture to communicate with VTAM, TCAM, and System/370, 30XX, 4300 data base/data communications subsystems (IMS/VS or CICS/VS) application programs. The SNA Remote Job Entry program allows the Series/1 to operate as an SNA remote job entry workstation.

Advanced Program-to-Program Communications (APPC)**

EDX with APPC fully supports the IBM APPC standard for LU 6.2 mapped and basic conversations as described in the *SNA Transactions Programmer's Reference Manual for LU Type 6.2 (GC30-3084)*. Application programs (written in any of the EDX-supported languages that have an EDL interface) may use EDX APPC services to communicate with programs that also use their system's APPC services.

Indexed Access Method

The EDX Indexed Access Method (IAM) program is a data management facility that supports indexed file operations. A single copy of IAM supports multiple programs and tasks sharing the same data files.

Transaction Processing System

The Transaction Processing System offers support for developing and managing transaction-oriented user application programs. It provides high programming productivity and the use of system functions without the complexity of an operating system interface. Programs written to the Transaction Processing System application interface for one operating system (RPS or EDX) may only need recompilation to run on the other operating system. Many applications may be built using the application program tools available with little or no additional programming necessary.

Sort/Merge

The EDX Sort/Merge program sorts and merges records from up to eight input data sets into one output data set in either ascending or descending order. It can be initiated as a batch job or from a user routine in an application program.

System/370 Channel Attach Program

The System/370 Channel Attach Program and the Series/1 channel attach device (4993) enable a Series/1 application program to communicate with a BTAM or BTAM-ES application program in a host processor. The Series/1 responds to the host as a locally attached 3272 Control Unit.

Advanced Remote Job Entry

The EDX Advanced Remote Job Entry provides remote job entry workstation support for the Series/1. The program provides the Series/1 user with RJE support in an SNA network or BSC environment.

Intelligent Workstation Support

The EDX/RPS Intelligent Workstation Support PRPQ extends the use of the IBM Personal Computer as an interconnected workstation, both to the Series/1 and through the Series/1 to host systems. It supports asynchronous communications between the Personal Computer and the Series/1 in direct-attach and switch-line configurations at speeds of up to 9600 baud.

X.25/HDLC Communications Support

The X.25/HDLC Communications Support programs enable an application program to communicate with remote applications either through an X.25 packet switching network or through an HDLC communications link.

Program Offerings by Industry**Series/1 Videotex System (SVS/1)**

The Series/1 Videotex System PRPQ is an interactive information retrieval system designed to satisfy the requirements of customers who wish to establish private, in-house information services or small-scale public videotex offerings.

The package supports up to 32 concurrent dial-up, asynchronous, full-duplex terminals that contain decoders capable of interpreting either the PRESTEL or ANSI videotex presentation protocols. For example, IBM Personal Computers using either PC/Colorview or PC/Videotex can be used as terminals.

Support is provided for messaging, data collection, multi-terminal conferencing, and for the extension of native system function with user-written application programs.

Application programs can access data from mainframe systems using supplied subroutines that interface with Communications Facility.

Retail Environment

- Audio Support for Touch-Tone Telephone (5798-NXX)
- Automobile Dealer and Heavy Equipment Accounting, Inventory, and Management System (5796-RFG)
- Chain Pharmacy System (5798-RGD)
- Store Item Receiving (5719-DSD)
- IBM Data Collection System for the Series/1 (5799-TLK)
- Store Item Management (5798-RTE)
- Store Application Environment (5719-YT7)

** Included as part of the EDX operating system

Series/1 Software

Data Entry and Text Processing

- Data Entry System - RPS (S1DES) - (5796-ZDE)
- Data Entry System - EDX (S1DES) - (5796-ZDF)
- Integrated Publishing System - Series/1 (5796-BDP)
- Programming Services for Multimedia Industrial Terminals (5798-RRD)

Communications Enhancements

- Communicating Job Stream Processing (CJSP) - (5798-RFC)
- Communications Facility Airlines Extensions (5798-ZZE)
- Yale ASCII Terminal Communications System II (5796-RKJ)

Laboratory Applications and X-Ray Analysis Automation Products

- Automated Instrument Control II (5798-RLL)
- X-Ray Polycrystalline Diffraction II (5798-RLP)
- X-Ray Search/Match II (5798-RLQ)
- X-Ray Fluorescence Analysis II (5798-RLN)

Industrial Automation

- Advanced Control System (5799-BEJ and 5799-BEW)
- EDX Support for Programmable Cycle Stealing Digital Input/Digital Output Attachment RPQ D02288 (5798-RHH)
- General Purpose Automation Executive (GPAX) - (5798-RCZ)
- Programming Services for Multimedia Industrial Terminals (5798-RRD)
- Programmable Controller Support (5719-THA, B, C, and D)
- Plant Automation Control System (5798-DRX)
- Manufacturing Automation Protocol Application Server (5719-XT1)
- Manufacturing Automation Protocol Communications Server (5719-XT2)

Energy Management and Facilities Management

- Energy Conservation System II (5798-RLD)
- Energy Management for Supermarkets (5796-RJT)
- General Purpose Automation Executive (GPAX) - (5798-RCZ)

Ordering Information

Realtime Programming System Version 7, Uniprocessor

Program number: 5719-PC7

Realtime Programming System Version 7, Base Operating System

Program number: 5719-PC7

Realtime Programming System Version 7 with Multiprocessing Feature

Program number: 5719-PC7

RPS SNA Remote Management Utility

Program number: 5799-TEF

RPS Transaction Processing System

Program number: 5719-TR6

RPS Advanced Remote Job Entry

Program number: 5719-RJ6

RPS X.25/HDLC Communications Support

Program number: 5719-HD1

RPS System/370 Channel Attach Program

Program number: 5719-CA1

EDX and RPS Intelligent Workstation Support (PRPQ) Version 2

Program number: 5799-TNG

EDX Basic Supervisor and Emulator Version 6

Program number: 5719-XS6

EDX Communication Facility

Program number: 5719-CF2

EDX Remote Manager

Program number: 5719-RM1

EDX Systems Network Architecture RJE

Program number: 5719-SX2

EDX Indexed Access Method Version 2

Program number: 5719-AM4

EDX Sort/Merge

Program number: 5719-SM2

System/370 Channel Attach Program

Program number: 5719-CX1

EDX Advanced Remote Job Entry

Program number: 5719-RJ1

EDX X.25/HDLCL Communications Support

Program number: 5719-HD2

Series/1 Videotex System

Program number: 5799-TFN

EDX Transaction Processing System

Program number: 5719-TR1

RPS Pascal

Program number: 5799-TEQ

RPS COBOL

Program number: 5719-CB7

Program number: 5719-CB8

RPS PL/I

Program number: 5719-PL2

Program number: 5719-PL4

RPS and EDX FORTRAN IV

Program number: 5719-FO2

Program number: 5719-FO4

EDX Pascal

Program number: 5799-TER

EDX COBOL

Program number: 5719-CB5

Program number: 5719-CB6

EDX PL/I

Program number: 5719-PL5

Program number: 5719-PL6

RPS FORTRAN IV Realtime Subroutine Library

Program number: 5719-FO4

EDX Mathematical and Functional Subroutine Library

Program number: 5719-LM3

RPS Mathematical and Functional Subroutine Library

Program number: 5719-LM2

Host Compilers**Pascal**

Program number: 5799-THT

COBOL for EDX

Program number: 5799-TEL

COBOL for RPS

Program number: 5799-TEP

PL/I for EDX

Program number: 5798-NZK

PL/I for RPS

Program number: 5798-NZJ

Section 63. System/36

System/36

Products Included

- 5360, 5362, and 5363 System Units
- 5364 System Unit (System/36 PC)
- 3196 Display Station
- 3197 Color Display Station C Models **
- 3197 Display Station D Models **
- 3262 Line Printer
- 6262 Impact Line Printer ***
- 3812 Pageprinter *
- 4210 Printer *
- 4214 Printer *
- 4224 Printer *
- 4234 Dot Band Printer Model 2 *
- 4245 Engraved Band Printer
- 5150 Personal Computer
- 5160 Personal Computer XT
- 5170 Personal Computer AT
- 5208 5250-ASCII Link Protocol Converter
- 5209 5250-3270 Link Protocol Converter
- 5294 Remote Control Unit
- 5394 Remote Control Unit
- 5299 Telephone Twisted-Pair Adapter
- 9332 Direct Access Storage Device
- 6157 Streaming Tape Drive
- 8809 Tape Drive
- XY749 and XY750 Plotters
- Personal Computer

Main Purpose

System/36 is a powerful, general purpose, low-cost, multiprocessing system with integrated support for data processing, text management, office management, business graphics, and communications.

It is designed for the new user and also provides high-level function for the more experienced user. It is a good choice for departments within an enterprise or in remote locations where users require ease of use, application packages, text and office management, and business graphics. The system may be used either standalone or in communication with host applications and data.

Key Functions, Facilities and Features

5360 System Unit

- The 5360 has an advanced multiple processor architecture. From three to eight processors are included in the 5360 and all operate in parallel to provide responsive function.
- The main storage processor (MSP) has up to 7MB of storage in increments of 128KB, 256KB, 512KB, 1MB or 2MB.
- The control storage processor (CSP) performs work normally associated with operating systems.
- The workstation controllers (with Second Workstation Controller Expansion feature) support up to 72 local displays, printers, and personal computers attached via twinax cable. These workstations may be up to 5000 feet away from the 5360.
- The data storage controller is included with the attachment feature for the 8809 tape drive and the 6157 Streaming Tape Drive.
- The Eight Line Communications Adapter (ELCA) supports up to eight communications ports. The ELCA supports an aggregate data transfer rate of 170KB/sec. Up to 64 remote workstations can be supported.
- The 1255 attachment support and its accompanying expansion feature provide an interface and support the 1255 Magnetic Character Reader.
- The 3262 printer attachment provides a processor that buffers, unblocks spool data, and manages the attached 3262.
- High-speed, nonremovable disk storage contained within the system unit
 - Error correction code (ECC) utilized with data transfer
 - Capacity of 200MB, 400MB, 600MB, 716MB, 758MB, 800MB, 1074MB, 1116MB, or 1432MB for the 5360 Systems Unit.
- Diskette storage is contained within the system unit
 - Provides data interchange
 - Available in 300KB or 1.2MB
- Total System Package (S/36 TSP) Model D2Y – an easy and economical way to order hardware and licensed programs for a completely configured system available for 5360 Model D24 system unit.

* See Section 68, "Printers for Workstations and Mid-Range Systems."

** See Section 66, "System/38 Hardware," under heading "Local Workstations and I/O Devices."

*** See Section 68, "4248, 4245, and 6262 Printers."

System/36

5362 System Unit

- A small, low-cost system that is compatible with the 5360 system unit
- Main storage capabilities of 256KB, 384KB, 512KB, 768KB, 1.0MB, or 2MB.
- Internal disk storage capacities of 30MB, 60MB, 90MB, or 120MB
- Optional attachment of 200MB, 400MB, and 600MB of external direct access storage devices
- Diskette storage that supports Diskette 1 (300KB) or Diskette 2 (1.2MB)
- Support for up to 28 local workstations, 64 remote workstations
- Quarter-inch streaming tape drive

5363 System Unit

- Object-code-compatible with 5360, 5362, 5364
- 1MB or 2MB of main storage
- 65MB to 420MB of disk storage
- Up to 28 locally-attached devices
- BSC, SDLC, X.25, and asynch communications
- Integrated 5-1/4 inch 1.2MB System/36-format-compatible diskette
- Optional Integrated 1/4-Inch Streaming Cartridge Tape Drive
- Optional Integrated Token-Ring Adapter

5364 System Unit (System/36 PC)

System/36 PC is a combination of 5364 System Unit and a directly-attached IBM PC:

- Object code compatibility with 5360 and 5362
- 256KB or 1.0MB of main storage
- 1.2MB System/36-format-compatible 5-1/4" diskette drive
- 65MB or 130MB of disk capacity
- Up to 16 local display/printer workstations
- Directly-attached PC, PC XT, or PC AT (256KB to 640KB)
- IBM Token-Ring LAN supported on 5162 XT Model 286 when used as the directly-attached PC
- System Support Program (SSP) and 5364 attachment code running with IBM PC DOS 3.1 or DOS 3.2 in directly-attached PC
- BSC, SDLC, asynch, and X.25 communications
- Quarter-inch streaming tape drive
- Attachment of the 6157 Streaming Tape Drive to the 5364 through the directly-attached PC

Workstations

The 5360 and 5362 support the following locally attached devices:

- 3196 Display Station
- 3197 Color Display Station C Models
- 3197 Display Station D and W Models
- 5150 Personal Computer

- 5160 Personal Computer XT
- 5170 Personal Computer AT
- 5209 5250-3270 Link Protocol Converter
- 3812 Pageprinter (table top)
- 4210 Printer (table-top)
- 4214 Printer (table-top)
- 4224 Printer (table top)
- 4234 Dot Band Printer (floor-standing)
- 5219 Printer (letter-quality)
- 5224 Printer (table-top)
- 5225 Printer (floor-standing)
- 5256 Printer (table-top)
- 5262 Printer (floor-standing)
- 5208 ASCII-5250 Link Protocol Converter
- 5299 Model 3 Telephone Twisted Pair Adapter
- XY749 Plotter
- XY750 Plotter

Tape Drives

- The 6157 Streaming Tape Drive provides high-speed, convenient, save/restore and data-interchange capabilities to all System/36 System Units except 5362 Model A01s.
 - File-by-file backup
 - 3MB-per-minute average data rate (dedicated)
 - Customer setup
 - 1/4-inch tape cartridge
 - Formatted capacity of 450-foot tape – 40MB
 - Tape speed – 90 inches/second
 - Recording density – 8000 bits per inch
 - Data transfer rate – 86.7KB per second
 - Tape drive attachment features and minimum memory (256KB on 5360 and 5362, 320KB on the directly-attached PC for 5364) required
- The 8809 Models 1C and 2C provide a high-speed save/restore and convenient data exchange facility. The Model 1C attaches to a 5360 via the 8809 Tape Adapter. The Model 2C attaches to the Model 1C for a maximum two-drive configuration. Both units are customer setup.
 - 5360 attachment
 - Dual speed mode:
 - 20KB/sec start/stop mode for interchange
 - 160KB/sec streaming mode for save/restore
 - Industry compatible 1/2-inch tape
 - Customer setup
 - Growth to two drives

System Printer

- Any printer attached to the system may be designated as system printer.
- Specific IBM PC printers are supported as the system printer.
- The 4245 Models T12 and T20 are engraved band printers supported on the 5360, 5362, and 5364. They have rated speeds of 1200 and 2000 lines per minute respectively.

System Console

- Any display station locally attached to the system may be designated as the primary console or alternate console.
- IBM PC is supported as the system console.

5294 Remote Control Unit

- For communications between the System/36 and all System/36 workstations
- Up to four workstations attachable; with optional features, up to eight.
- The 5294 Text Assist Feature allows System/36 workstations to operate with DisplayWrite/36.
- Remotely-attached 4224 Printers supported
- Switched or leased circuits
- EIA, DDSA, or X.21 interface
- 2400, 4800, 9600 and up to 50,000 bps
- X.25 support
- Transmission of fewer characters through use of System/36 data compression logic
- Small lightweight package

5394 Remote Control Unit

- Support for up to eight 5250-type workstations
- Customer setup
- Customization via a display station
- 3.5-inch diskette for CSU, problem determination, and normal operations
- Connection to the System/36 in 5294 emulation mode
- 5294 optional features standard in all models

3270 Device Attachment

The System/36 supports the attachment of 3270 devices locally or remotely. On a local basis, 3270 devices can be attached to the System/36 via the 5209 Link Protocol Converter. This allows for the attachment of up to seven 3270 terminals and printers. The 5209 Link Protocol Converter has a coaxial cable attach to allow for the attachment to a 3X74 control unit. This gives the 5209 user the ability to "hot-key" between System/36 applications and System/370 applications.

On a remote basis, 3270 devices can be attached to the System/36 via a communications line and a remote 3X74 control unit.

IBM Token-Ring Network Attachment

The Local Area Network (LAN) Attachment feature is required to attach the System/36 to the IBM Token-Ring Network. The 5363 System Unit attaches to a token-ring network via an optional integrated Token-Ring Gateway card. All other System/36s attach to a token-ring network by way of a 5170 PC AT or a PC XT Model 286. Programming supplied by the System/36 LAN Communications licensed program is

downloaded from the System/36 through this PC attachment.

- Provides logical link control and media access control functions
- PC attached by this feature performs solely as System/36 LAN attachment

ASCII Device Attachment

The 5208 Link Protocol Converter allows for the attachment of up to 7 local or remote ASCII devices to the System/36. The 5208 Link Protocol Converter is attached to the System/36 by twinaxial cable. The 5208 Link Protocol Converter:

- Allows for the attachment of many IBM and non-IBM ASCII terminals
- Allows for the attachment of IBM Personal Computers without the 5250 Emulation Kit

ROLMbridge Support

The ROLM CBX products can now be attached to the System/36 via twin axial cable. This permits access to most System/36 applications from ASCII workstations such as:

- 3101, 3161/3163 terminals, and an IBM PC emulating a 3101 terminal
- ROLM Cypress and Juniper
- Certain other OEM terminals

Communications

- Bimodal communications adapters with line protocol selection performed automatically at program execution time
- Single-Line Communications Adapter:
 - Half-duplex operation
 - 600 to 9600 bps
 - SNA, BSC, or asynch
 - Asynchronous Communication (5362)
 - Integrated 1200-bps modem
 - EIA/CCITT interfaces
 - Second EIA attachable as second communications line (asynch only). MLCA feature required if second line is SDLC or BSC.
 - Digital Data Service Adapter (DDSA)
 - Nonswitched X.21 interface
 - Leased/switched
 - Auto-answer
 - Point to point
 - Multipoint primary or secondary
- Eight Line Communications Adapter (ELCA):
 - Half-duplex operation
 - 170KB/sec aggregate data rate on 5360
 - One to eight lines
 - SNA, BSC, or asynchronous communication
 - Integrated 1200-bps modem
 - EIA/CCITT interfaces
 - DDSA adapter
 - Switch and nonswitched X.21 interface

System/36

- Leased/switched
- Auto-answer and auto-call
- Point to point
- Multipoint primary or secondary
- X.25 (up to 3 lines) packet switching network support
- Full configuration support for 3833, 3834, 5841, 5865, and 5866 modems.

Potential Benefits

System/36 provides data processing, word processing, and office management support easily used by non-data processing professionals. For the fixed function or intelligent (PC) terminal user, the system provides the following:

- Wide range of industry specific and cross-industry applications from IBM and others
- Office management, text management, and business graphics support
- End-user tools for query and report writing
- Access to host
 - 3270 interactive applications
 - Batch job services
 - Data bases or subsets
 - Program or data distribution services
- Online tutorials, HELP text, and computer-assisted instruction

A personal computer attached to the System/36 provides, in addition to the above:

- Virtual disk:
 - Program and data sharing among multiple attached personal computers
 - Data and program security protection
- I/O device sharing:
 - High-speed and quality printers
 - Save/restore through System/36 tape or diskette
 - High-speed (56KB/sec) communications to host
- Remote PC support via SDLC PC card and remote 5250 emulation software

The central site support staff can benefit from the following:

- Less dependence by the System/36 user on operational assistance
- Self-configuring and tuning to isolate the host from changes to the System/36
- Comprehensive development tools, languages, and utilities
- Distribution services via DSX
- Central site control via Host Command Facility (HCF and NCCF/NPDA)

Reference Material

System/36 publications present information in a task-oriented manner. A user who needs to perform a task can use the index and go directly to the activities required to perform that task.

- Presenting System/36, GC21-9016
- What to Do Before Your Computer Arrives, SBOF-4773
- Guide to Publications, GC21-9015
- Learning about Your Computer, SC21-9018

See the following pages for a description of System/36 software.

System/36 Software

Products Included

- System Support Program (SSP):
 - Interactive Communications Feature (SSP-ICF)
 - Communications Feature
 - 3270 Device Emulation (DE) Feature
 - Distributed Disk File Facility (DDFF) Feature
 - Multiple Session Remote Job Entry Feature
 - Communications and Systems Management Feature
 - Data Encryption Standard (DES) Subroutine for Banking Feature
 - Distributed Data Management (DDM)
 - Display Station Pass-Through (DSPT)
 - Advanced Peer-to-Peer Networking (APPN)
- BASIC
- COBOL Compiler and Library
- FORTRAN IV
- RPG II
- Utilities
- Query/36
- DisplayWrite/36 (DW/36)
- Personal Services/36 (PS/36)
- PC Support/36
- Business Graphics Utilities/36 (BGU)
- 5224/5225 Advanced Printer Function (APF/36)
- System/34 to System/36 Migration Aid
- System/36 Programmer and Operator Productivity Aid PRPQ
- Industry Application Packages

System Support Program (SSP)

SSP, a licensed program, is a disk-resident operating system designed to provide multiprogramming support that is easily usable by new and departmental users. SSP provides these major capabilities:

- Concurrent multiple interactive and batch job execution
- Virtual storage management techniques (swapping) to allow overcommitment of main storage
- Disk data management that provides file sharing and protection for input, update, and add operations
- Execution time binding of resources to applications
- A single Operation Control Language for interactive and batch execution
- Operation Control Language features:
 - Extensive testing capabilities
 - Branching and substitution
 - Operator prompting
 - OCL to program communications
- Auto-response facilities to enhance unattended operation
- Security including:
 - Password signon with maximum signon attempts
 - Password date checking
 - Procedure execution at signon
 - Multilevel data file
 - Multilevel library access
 - Operator menu control
- System utilities for data file and library:
 - Create/delete
 - Rename
 - Copy
 - Save/restore
- Development Support Utility (DSU), a full-screen editor for creating and maintaining OCL statements, procedures, messages, display formats, and program source code
- Interactive Data Definition Utility (IDDU), to provide data dictionary support for the office licensed programs. Allows for the definition and storage of descriptions for data and communications files.
- System configuration utility to interactively define the configurations:
 - Input/output devices
 - Local and remote workstations
 - Security
 - Performance options
 - Other IBM-supplied support
- System history to provide a record of all jobs executed, operator prompts, and operator responses. The amount of history maintained online is user selectable.
- Interrupt/resume support to allow any workstation operator the option of suspending a current operation, performing another operation, and then resuming the current operation
- Spooling support optionally available for all printers attached to the system, including those attached via communication facilities. Two levels of console support are provided:
 - The system console may be used, for example, to display the status of any spool job or to change the position on the queue, the number of copies, or the form number. The system console may also be used to cancel print jobs or reroute them.
 - Subconsole(s) have the same facilities as the system console with the restriction of only viewing and controlling the printer(s) under their control.
- Input queue (JOBQUE) that supports submission of batch jobs from any workstation operator or jobstream. The system console may view and control all JOBQUE jobs and all subconsole operators may view and control their own jobs.
- System program library and multiple user libraries

System/36 Software

- HELP facilities (over 2000 screens) to provide the occasional user assistance in using system-provided services
- Local and remote display and printer support. System and application functions on local workstation devices are available on remote devices without requiring any changes to programs, job control, or system tables.
- Sort/merge facility
- Online programming support
- Dynamic workload management
- Remote operation support facility (ROSF)
- Support for batch binary synchronous communications (BSC)
- Support for asynchronous communications
- Additional SSP support
 - Diskette I interchange support
 - Multinational character set
 - 1255 magnetic character set
- Tape Support Feature
 - Tape save/restore support for 8809 Magnetic Tape Unit (5360 only)
 - Tape save/restore on 6157 Streaming Tape unit

Interactive Communications Feature (SSP-ICF)

This feature consists of a set of subsystems matching the link and logical protocols of various host subsystems, terminals, and other systems. A common user interface is provided that isolates the user from the link and logical protocols.

System/36 SSP-ICF consists of a common user interface for application programs and several subsystems:

- Internal protocol:
 - INTRA, which allows application program-to-program communications within the same System/36
- BSC subsystems:
 - CCP for System/3 Model 15D CCP
 - CICS for CICS/OS/VS and CICS/DOS/VS
 - IMS for IMS/VS IRSS (BTAM)
 - BSCCEL for System/3 Batch BSC, 3740 BSC, Office Systems BSC, System/34, System/36 BSC, and System/38 as a System/3
- SNA subsystems:
 - SNA upline facility (SNUF) for CICS and IMS/VS
 - SNA peer (peer) for System/34, System/36, and System/38
 - SNA finance subsystems for 4701, 3601, and 3694
- Advanced program-to-program communications (APPC) supports mapped SNA LU6.2 communications with a high-level user interface.
- SSP-ICF file transfer subroutines allow a user-written ICF application program to send or retrieve entire data files between System/36s using COBOL, RPG II, or Assembler programs. Application programs may be written to communicate

through the APPC, async (not 5364), BSCCEL, or peer ICF subsystems.

- Asynchronous communication support:
 - Switched or non-switched point-to-point communication between a System/36 and an asynchronous device
- Interactive terminal facility:
 - System/36 connection to services of public data networks such as the TELEMAIL service of GTE Telenet Network. (This is *not* an endorsement of this network.)

Additional SSP Support

Feature 6000 (Extended SSP) has been repackaged into two new SSP features:

- Feature 6101, Additional SSP Support, provides support, for diskette I format, multinational character set, 1255 Magnetic Character Reader (5360 only).
- Feature 6102, Tape Support feature, provides support for tape save/restore and data interchange on the 8809 Magnetic Tape Unit attached to the 5360 System Unit and tape save/restore on the 6157 Streaming Tape Unit.

Communications Feature

- Autocall provides support for automatically establishing communication connection for MSRJE, 3270DE, ICF, and batch BSC.
- X.21 support provides software for interface to X.21 switched and nonswitched networks.
 - X.21 short-hold/single-port sharing support
- X.25 support provides native support with the following features:
 - Permanent virtual and virtual circuit call support
 - Availability of up to three lines with 16 virtual circuits per line for a total of 48 circuits
 - Integrated pad support compatible to the GTE Telenet Network (*not* an endorsement)
 - Packet sequence by Module 8 and 128
 - Packet sizes of 64, 128, 256, and 512 bytes
 - Window sizes from 2 to 15 packets
 - Other related optional features
- Base support is provided for MSRJE, 3270DE, ICF and advanced program-to-program communications (APPC)
- Asynchronous communications support:
 - Point-to-point, switched or non-switched
 - Communication between System/36 and an asynchronous device. The communication link requires a System/36 application program to communicate with or provide services to the attached devices/system. Such an application program is not part of the asynchronous communications support and has to be written by using the SSP-ICF interface.

3278 Emulation via IBM Personal Computer

3278 Emulation via IBM Personal Computer consists of two components. One component executes in the System/36. The second executes in the IBM Personal Computer. 3278 Emulation allows the users of IBM Personal Computers to emulate a 3278 display station Model 2 or a 3279 Color Display Station Model 2A or S2A when using the System/36 3270 Device Emulation Feature in an SNA network.

3270 Device Emulation Feature

The 3270 Device Emulation feature allows the System/36 attached workstations (3179 Model 2, 3180 Model 2, 5251 Model 11, 5291, 5292, and 5150 personal computers with 5250 emulation mode) to appear as 3270 control unit and devices to a host system:

- System/36 appears as a 3271 Model 2 under BSC or as a 3274 Model 1 under SNA.
- An attached workstation appears as a 3277 Model 2 display.
- Any attached printer (3262, 5219, 5224, 5225, 5256) appears as a 3288 Model 2 printer, including spooled remote printers.
- Up to 32 device addresses are supported under BSC and up to 30 device addresses per line are supported under SNA.
- One BSC line and/or up to eight 3270 SNA lines are supported.

Distributed Disk File Facility (DDFF) Feature

The System/36 Distributed Disk File Facility (DDFF) permits a System/34 application program to access System/36 files.

Distributed Data Management (DDM)

DDM allows a System/36 application program to access files stored on another System/36, a System/38, or a System/370 running CICS (target only), thus making it easier to distribute data processing among multiple systems.

Display Station Pass-Through (DSPT)

Provides support for terminals attached to a System/36 to sign on to a remote System/36 or a System/38 or vice versa. Program output (disk files, printer output) will be on the remote system on which the user is signed-on.

Advanced Peer-to-Peer Networking (APPN)

APPN allows users to communicate on a logical, point-to-point basis across a network of interconnected System/36s. System/38s can participate in an APPN network as end-nodes. APPN allows users to communicate with other systems without having to know the network paths to the remote systems. Per-

sonal Services/36 document distribution (SNADS), Display Station Pass-Through, Distributed Data Management, and Advanced Program-to-Program Communications are supported by APPN. This allows users to extend capabilities beyond an adjacent system or node without any operator intervention on the adjacent system. APPN supports switched and leased SDLC lines, X.25 circuits, and Local Area Network (LAN) connections.

Multiple Session Remote Job Entry Feature

MSRJE is a feature of the System/36 System Support Program that permits a System/36 to function as a remote job entry (RJE) workstation for submission of jobs to a central host running RES, JES2, JES3, RSCS (BSC only), or POWER/VSE (SNA only), using BSC or SNA protocols:

- Multiple sessions are supported:
 - Up to 15 readers*
 - Up to 15 printers*
 - Up to 15 punches*
- For SNA protocols the line may be shared with SSP-ICF (SNUF and APPC subsystems), Communications and Systems Management (C&SM) feature, and PS/36.
- Consistent and common user interface are provided regardless of the line protocols.

*Seven sessions when using BSC protocols, 15 for SNA

Display Station Pass-Through (DSPT)

System/36 Display Station Pass-Through (DSPT) feature provides support for 5250 or equivalent workstations to sign on to a remote System/36 and execute procedures and application programs on that remote system. Program output (disk file, printer output) will be on the remote system to which the user is signed-on. DSPT utilizes APPC sessions as the communication protocol.

3278 Emulation via IBM Personal Computer

3278 Emulation via the IBM Personal Computer allows the users of the IBM PC, Portable PC, PC XT, and PC AT to emulate a 3278 Display Station Model 2 or 3279 Color Display Station Model 2A or S2A when using System/36 3270 Device Emulation (DE) in a SNA network.

Communications and Systems Management

This SSP optional feature contains change management and distribution and "alerts," as well as a distributed host facility. The System/36 support works in conjunction with the program product Distributed Systems Executive (DSX) or Distributed Host Command Facility (DHCF). Network Problem Determination Application (NPDA), and Network Communications Control Facility (NCCF) on the host

System/36 Software

System/370 (4321 to 3084). Distributed Host Executive distributes (and retrieves) programs, screen formats, procedures, and data files to (and from) the host. Procedures can be sent to a System/36, executed, and the results returned to the DSX host while the SSP Distributed Systems Node Executive (DSNX) is in session with the host. Alerts will also be transmitted to the host via the SSP feature. Distributed Host Command Facility (DHCF) allows a System/370 network terminal user to communicate to the System/36 via the Host Command Facility (HCF) on the System/370. The System/370 terminal will appear to the System/36 as a remotely-attached 5250 workstation. The System/370 terminals will be able to access and control applications written and running on the System/36.

Data Encryption Standard (DES) Subroutine for Banking Feature

This feature provides data encryption support for banking customers:

- DES is used to generate personal identification numbers (PINs) for use with the 3624 Consumer Transaction Facility.
- DES can be used in an RPG II, COBOL, or Assembler application program.
- DES cannot be used in a BASIC program.

Ordering Information

System Support Program

Program number: 5727-SS1

System/36 PC

Program number: 5727-SS6

Extended SSP

System/36 PC: Not available

Additional SSP Support

Program number: 5727-SS1, feature 6101

System/36 PC Not available

Tape Support Feature

Program number: 5727-SS1, feature 6102

System/36 PC

Program number: 5727-SS6, feature 6144

Interactive Communications Feature

Program numbers:

ICF Upline: 5727-SS1, feature 6264

ICF Finance: 5727-SS1, feature 6265

ICF Base: 5727-SS1, feature 6266

System/36 PC

Program numbers:

ICF Upline: 5727-SS6, feature 6264

ICF Finance: 5727-SS6, feature 6265

ICF Base: 5727-SS6, feature 6266

SSP Communications Feature

Program number: 5727-SS1, feature 6001

System/36

Program number: 5727-SS6, feature 6047

3270 Device Emulation

Program number: 5727-SS1, feature 6003

System/36

Program number: 5727-SS6, feature 6049

Distributed Disk File Facility Feature

Program number: 5727-SS1, feature 6006

System/36 PC: Not available

Distributed Data Management Feature

Program number: 5727-SS1, feature 6037

System/36 PC

Program number: 5727-SS6, feature 6052

Multiple Session Remote Job Entry Feature

Program number: 5727-SS1, feature 6004

System/36 PC:

Program number: 5727-SS6, feature 6050

Display Station Pass-Through

Program number: 5727-SS1, feature 6079

System/36 PC

Program number: 5727-SS6, feature 6090

Advanced Peer-to-Peer Networking

Program number: 5727-SS1, feature 6096

System/36 PC

Program number: 5727-SS6, feature 6096

3278 Emulation via IBM Personal Computer

Program number: 5727-SS1, feature 6080

System/36 PC

Program number: 5727-SS6, feature 6091

Communications and Systems Management

Program number: 5727-SS1, feature 6029

System/36 PC

Program number: 5727-SS6, feature 6051

Data Encryption Standard Subroutine for Banking Feature

Program number: 5727-SS1, feature 6005

System/36 PC

Program number: 5727-SS6, feature 6077

Reference Material

- Guide to Publications, GC21-9015
- Operating Your Computer, SC21-9026
- System Reference, SC21-9020
- Interactive Communications Feature, SC21-7910
- Interactive Communications Feature, Guide and Examples, SC21-7911
- Multiple Session Remote Job Entry Guide, SC21-7909
- 3270 Device Emulation Guide, SC21-7912
- Distributed Disk File Facility, SC21-7869
- 3278 Emulation Via Personal Computer, Users Guide, SC09-1086
- SSP Specifications, GC21-9021
- Using System/36 Communications, SC21-9082

BASIC

System/36 BASIC, a licensed program, is a high-level, interactive language for users who have commercial data processing requirements or who need to solve business, technical, and scientific problems.

Ordering Information**System/36 BASIC**

Program number: 5727-BA1

System/36 PC

Program number: 5727-BA6

Reference Material

- Programming with BASIC, SC21-9003
- BASIC Licensed Program Specifications, GC21-9011

COBOL Compiler and Library

The System/36 COBOL Compiler and Library is a licensed program that operates under control of the System/36 System Support Program.

COBOL is a high-level language widely used in commercial data processing; it supports batch, interactive, and communications processing.

Ordering Information**System/36 COBOL Compiler and Library**

Program number: 5727-CB1

System/36 PC

Program number: 5727-CB6

Reference Material

- COBOL Compiler and Library Licensed Program Specifications, GC21-9009
- Programming with COBOL, SC21-9007
- IBM Guide to COBOL, SC21-7890

FORTRAN IV

The IBM System/36 FORTRAN IV licensed program processes programs written in the System/36 FORTRAN IV Language (X3.10-1966), producing output suitable for execution with the System/36 System Support Program.

FORTRAN is a mathematically-oriented high-level language used to solve complex numerical problems in either batch or interactive mode.

System/36 Software

Ordering Information

System/36 FORTRAN IV

Program number: 5727-FO1

System/36 PC

Program number: 5727-FO6

Reference Material

- Programming with FORTRAN IV, SC21-9005
- FORTRAN IV Licensed Program Specifications, GC21-9010

RPG II

The System/36 RPG II Compiler is a licensed program that operates under control of the System/36 System Support Program.

RPG II is a fixed-format high-level language intended to be used for commercial data processing applications; it supports batch, interactive, and communication programs.

Ordering Information

System/36 RPG II

Program number: 5727-RG1

System/36 PC

Program number: 5727-RG6

Reference Material

- Programming with RPG II, SC21-9006
- RPG II Licensed Program Specifications, GC21-9008

Utilities

The System/36 Utilities licensed program provides support for functions of general use in system preparation and maintenance. The following utilities are included in System/36 Utilities:

- Data File Utility (DFU) to create, maintain, list, and inquire into user data files
- Source Entry Utility (SEU) to create and maintain OCL statements, procedures, messages, display formats, and program source code
- Work Station Utility (WSU) to define interactive data entry programs

- Screen Design Aid (SDA) to design, create, and maintain display formats and job menus interactively

Ordering Information

System/36 Utilities

Program number: 5727-UT1

System/36 PC

Program number: 5727-UT6

Reference Material

- Utilities Licensed Program Specifications, GC21-7895

Development Support Utility (DSU)

The System/36 Development Support Utility is a full-screen editor for creating and maintaining OCL statements, procedures, messages, display formats and program source code.

- Extensive online documentation and HELP support
- Line commands supported consistent with other System/36 products

Ordering Information

Development Support Utility (DSU)

Program number: 5727-DS1

System/36 PC

Program number: 5727-DS6

Reference Material

- Development Support Utility Guide, SC09-1085
- IBM System/36 Development Support Utilities Guide, SC09-1085

Performance Monitor PRPQs

The Performance Monitors consist of two parts:

- The appropriate Host program (P84089 System/36 Response Time Measurement Facility PRPQ for 5360 and 5362, or P84092 for the 5364)
- IBM Personal Computer program (P84090 Personal Computer Performance Monitor for the System/36 PRPQ)

System performance can be monitored during the measurement period while the information is “fresh,” and the user environment can be observed in relation to the measurements being displayed.

The two PRPQ's are listed below.

Response Time Measurement Facility

See “Performance Monitor PRPQs” above.

Response Time Measurement Facility PRPQ (P84089 for 5360 and 5362 or P84092 for 5364) provides for local workstation response time logging and recording. Response time is measured between the time the keyboard is locked with the input inhibited and the time it unlocks. Response data is recorded in a system trace file.

Ordering Information

Response Time Measurement Facility PRPQ

Program number: 5799-PAZ

System/36 PC

Program number: 5727-DS6

Reference Material

- Development Support Utility Guide, SC09-1085
- IBM System/36 Development Support Utilities Guide SC09-1085

Personal Computer Performance Monitor for System/36

See “Performance Monitor PRPQs” above.

Personal Computer Performance Monitor for the System/36, PRPQ P84090, is a personal computer program that facilitates the analysis of performance data from SMF runs or in realtime. The PC program evaluates the data and issues “alerts” that flag conditions that may impair balanced system performance.

It works in conjunction with PRPQ 84089 on the 5360/5362 or PRPQ 84092 on the 5364.

Reference Material

- User's Guide, SC21-9477
- Program Specifications, GC21-9487

System/36 Office Applications

There are four integrated System/36 applications for the office (see below): Query/36, DisplayWrite/36, Personal Services/36, and PC Support/36.

Query/36

The Query/36 licensed program provides functions that can be used by principals, secretaries, and other office workers to help improve their productivity. This program supplies easy-to-use information retrieval that can result in data being displayed, printed, or saved in a disk file using a variety of selection criteria.

Highlights

- A part of the integrated System/36 office support, consisting of DisplayWrite/36, Personal Services/36, and Query/36
- Prompted interface for definitions
- Fast path for definitions
- Data entry: creating, updating, or deleting data records in disk files
- Online information
- Output options to display, printer, or disk file
- Selection of up to 5 files
- Revising a query or patterning a query after an existing query
- Copying and deleting a query
- Executing a previously-defined query
- Result field definition by calculations performed with constants and existing fields
- Field selection and ordering
- Record selection by field content, constant value, result field, range of values, or list of values
- Ascending or descending sort on up to five fields
- Totals, averages, maximum, minimum, and counts of fields
- Kanji (ideographic data types) support
- Alternate collating sequence and summary output to disk

DisplayWrite/36 (DW/36)

System/36 DisplayWrite/36 is a high-function word processing program supporting the creation, revision and printing of documents. The full-screen text editor was designed with an interface and function similar to other DisplayWrite family products. DW/36 provides capabilities for data and text merge, graphics and text merge, image and text merge, processing large documents, automatic hyphenation, spelling

System/36 Software

verification, spelling correction assistance, synonyms, repetitive letters, label printing and report writing. DW/36 supports the IBM office system architecture Document Content Architecture for both revisable format (RFTDCA) and final format (FFTDC). DW/36 includes a program that current users of System/36 Text Management (TMS) can use to convert TMS documents to a format that can be used by DW/36.

A high level of ease-of-use characteristics is provided:

- Menu-driven access to all functions
- Cursor-sensitive help at all levels
- Optional menu bypass and line commands for advanced users
- Online user's guide

Document processing options allow the user to:

- Create a new document
- Revise an existing document
- Copy, delete, view, print or rename a document
- Change document description
- Change print options
- Send a document
- Paginate a document

Basic text entry and editing capabilities include:

- Automatic word wrap
- Automatic windowing
- Continuous text entry
- Document, page, and line formats
- Indentation
- Insert/replace modes (with word wrap)
- Underline
- Move, center, bold, copy, and delete
- Interactive adjust of line endings
- Half index up and down

Advanced editing capabilities include:

- Headers and footers
- Running headings
- Automatic date, time, page numbers, document name inserted in document
- Auto hyphenation
- Global find/replace
- Get (interactive)
- Go To (page number, line number)
- Column move, copy, delete
- Column layout
- Include external data (batch)
- Graphics (PC/IDU or BGU/36)
- Image (PC Imagedit or PC/IDU)
- Keep
- Widow/orphan line control
- Stop codes
- Roll key customization
- Multicopy document merge
- Overstrike

- Change symbols
- Conditional text
- Table of contents
- Automatic indexing
- Automatic outline
- Automatic numbered lists
- Comments
- Skip lines
- Line commands
- Multiple formats (line, page, document, alternate)
- Fast paths
- Summary math

The following proofreading aids require the System/36 DisplayWrite/36 Language Dictionaries licensed program:

- Spelling verification will show misspelled words in reverse image.
- Spelling assistance will show up to five possible alternate words.
- Hyphenation assistance will assist with determining where the word can be hyphenated.
- Synonym support will show as many synonyms as will fit in the display area.
- Grade-level analysis flags words for grades 4-16 reading comprehension.

Extensive print support includes:

- Advanced printer functions for 4224 and 3812 Printer
 - Color (4224)
 - Rotate support for 0, 90, 180, and 270 degrees (3812)
 - Expand print (4224)
- View print image on the display
- Draft or letter quality output
- Optional cover page
- Printer selection
- Forms options: continuous, cut sheet with drawer select, envelope
- Continuous-form or sheet-feed labels
- Selectable fonts within a document
- Optional change symbols (revision markers)
- Lines per page
- Print using alternate character sets (large characters)
- Additional spaces to left of margin
- Print within range of page numbers
- Print number of copies
- Composite document print

Flexible data/text merge:

- Is integrated with IBM System/36 Query
- Permits graphs created with Business Graphics Utilities/36 to be inserted into DisplayWrite/36 text document using ".include"
- Allows data to be merged interactively or in batch mode
- Can embed data in a document

- Can support compound documents
- Can produce multiple copies of documents for mass mailings
- Can produce multiple copies of documents using unique data for each document
- Can store merged documents as revisable text
- Uses one or more data files as input
- Has extensive selection and sorting capabilities

Security provides for:

- Document folder security (five levels)
- Document security within a folder (four levels)
- Authorization lists

Recoverability:

- Integral part of DW/36
- Recovery option screen presented to the user if previous work was ended abnormally. User can return to last page worked on or begin again.
- Automatic user folder reorganization/expansion, if required
- Folder rebuild (if required) at IPL

Ordering Information

DisplayWrite/36

Program number: 5727-WP1

System/36 PC

Program number: 5727-WP6

Reference Material

- DisplayWrite/36 Tips and Techniques, G360-1002
- Getting Started with DisplayWrite/36, GC21-8005
- System/36 in the Office, GC21-8002
- Getting Acquainted with DisplayWrite/36, GBOF-1096

DisplayWrite/36 Language Dictionaries

The System/36 DisplayWrite/36 Language Dictionaries program makes available to the DisplayWrite/36 user seven optional language dictionary diskettes to support spelling verification, hyphenation, spelling correction aid, and synonym aid (English only). The following language dictionary packages are available:

- US English, UK English, Legal and Medical
- French
- French (Canada)
- Spanish
- Italian
- Danish
- German

Ordering Information

DisplayWrite/36 Language Dictionaries

Program number: 5727-WP2

System/36 PC

Program number: 5727-WP7

Personal Services/36 (PS/36)

The System/36 Personal Services/36 (PS/36) is a set of related office functions that provide electronic document distribution, calendar and scheduling functions, directory services, user list maintenance, and local message functions. PS/36 runs under the control of the System/36 System Support Program (SSP) and it complements DW/36, which is a prerequisite for running PS/36. It also includes aids to convert from the Office Management System (5727-OS1) to PS/36. Electronic document distribution is supported by Document Interchange Architecture (DIA) and SNA Distribution Services (SNADS) using LU6.2 protocol.

The System/36 PS/36 functions are menu driven and provide a consistent interface to System/36 ease-of-use standards, list processing capability, online reference material, HELP-key functions, and access to the "Getting Started" manuals. PS/36 supports the 5250 family of display products and a wide variety of printers. It defines the following user categories: the general user who signs directly onto PS/36 on the System/36; the indirect user who can only receive printouts; and the independent workstation user who signs onto the PS/36 using the Electronic Document Distribution licensed program product.

Mail Handling Functions

The mail handling function of the PS/36 program allows the user to send and receive electronic documents to local users and users on other systems in the network.

- Attach memo slips to documents
- View, file to a folder, retrieve, print, and delete documents
- Log all electronic mail automatically and hard copy mail by request. Mail is logged as new mail, outgoing mail, action item, or completed mail. Mail status (new, unopened, deleted, file, hard copy, sent, delivered, undelivered, action items) is also available for review.
- Search by keyword or any combination of parameters: name, date, date range, subject, sender, addressee, document name, specific keywords, author, or document class.

System/36 Software

- Use special functions: confirm delivery (receipt acknowledgment), assign priority, attach memo slip, send personal documents, implement up to five security levels, and allow for the use of cryptography.
- Mail waiting indicator
- Exchange among Personal Services/Products (DISOSS, PS/36, PS/38)
 - PC data
 - Composite document

Calendar Management Functions

- Manage the calendar and schedule appointments for individuals or departments, meetings, conference rooms, facilities, and equipment.
- Control automatic message notification and issue a message reminder of up to 210 characters to the user.
- Schedule a S/36 job to be placed in the job queue for execution at a specified date/time. Data processing reports, document printing, and query programs may be scheduled in this manner.
- View the individual calendars in different formats: week at a glance for an individual calendar, one particular day for a maximum of five different calendars, a specific time period for a maximum of ten different calendars (calendar conflict checking), and a list of appointments, programs, and reminders from one calendar.
- Display a six-month calendar
- Define user calendar values such as view format, starting day, time interval, starting time format, and time format
- Schedule/cancel appointments for multiple calendars
- Schedule groups

Directory Support Functions

- Create a single list or file of system users containing USERID, name and address, telephone, and location.
- Maintain the directory file (add/delete/print/change/select)
- View the directory file in USERID or name sequence
- Build, maintain and identify groups
- Distribute by USERID, distribution lists, or tailored user directories

Group Support Functions

- Define a group (maximum 150 entries, including other groups; a maximum of 500 persons may be in a group, less the number of nested groups.)
- Reference multiple users by using a group name
- Define distribution lists for document or message distribution
- Identify a set of calendars to view and schedule

- Simplify the use of other office components by making the group functions accessible to other system functions

Local Message Functions

- Support users of a single (local) System/36
- Improve interface to the existing System/36 SSP message facility
- Use the group function as a distribution list
- Transmit maximum 75-character messages to specific users, specific display stations, or all display stations on the System/36

Administrative Functions

If security is active, the PS/36 administrator must be the security officer. Otherwise, the following administrative functions may be executed at the system console:

- Install PS/36 (create folders, define file sizes and default values, administer security, and define applicable communication environments)
- Maintain PS/36 (change, backup and reorganize folders and files; modify file sizes and default values; and control applicable communication queues)

Connectivity

Documents may be distributed within a single System/36, between System/36s, or in a mixed system environment. Local and remote document distribution is via Document Interchange Architecture (DIA); remote distribution is via SNA Distribution Services (SNADS). SNA LU6.2 protocols support communication between PS/36 and the System/38, DISOSS/370 for OS/VS2 and VSE, the 5520 APP for the 5520, EDD for the Displaywriter and the Personal Computer using 5250 emulation. Recipients may be local and/or remote users, nonusers, and/or groups. In the DisplayWrite environment, the System/36 shared folder and organizer functions are used with the PC Support/36 program to transfer documents between the PC and System/36. Such documents are stored in DW/36 folders and may be revised by DW/36. They are then distributed by PS/36. Document Library Services allows a user to file, retrieve, search for, and delete documents on either a host System/370 with DISOSS or a System/38. Modification of a document profile and host printing of a document are supported.

Ordering Information

Personal Services/36

Program number: 5727-WP3

System/36 PC

Program number: 5727-WP8

Reference Material

- System/36 in the Office, GC21-8002
- Migrating from Office Management System to Personal Services/36, GC09-1063
- Getting Started with Personal Services/36, SC09-1061
- Personal Services/36 PROFS Bridge, GG24-3188
- Personal Services/36 DISOSS, G360-1011
- Personal Services/36 in a SNA Distribution Services Network, G320-0593

PC Support/36

PC Support/36 is a licensed program product which provides information exchange and resource sharing between the IBM Personal Computer and the System/36. The PC Support/36 organizer is a new PC Support/36 application designed to provide a single user interface for the IBM System/36 and the IBM PC. Through this function, the user can access IBM-supplied menus or IBM PC applications from any System/36 menu without the previous requirement to "hot-key" between the DOS and the System/36 display station sessions. Multiple System/36 sessions are available, one of which may be a printer session.

PC Support/36 allows the user to:

- Transfer data from the System/36 to the IBM Personal Computer
- Transfer data files from the IBM Personal Computer to the System/36
- Select data from up to five files, externally defined by IDDU, and download the data to the PC in one operation, using the file join function or "Get Query" function in DisplayWrite 4.
- Transfer library source and procedure members between the System/36 and IBM Personal Computer files
- Translate character, packed decimal, zoned decimal and binary numeric data from System/36 data files to the IBM Personal Computer data format
- Translate IBM Personal Computer data formats except floating point to the appropriate System/36 data format based on the data definition in the interactive data definition utility (IDDU) dictionary
- Interactively create, save and execute data transfer definitions
- Direct IBM Personal Computer print output to a System/36 printer via the virtual print function
- Store IBM PC programs and data by defining virtual disks on the System/36 that vary in size from 5K to 32MB, in increments of 5K bytes. Each user can have up to eight virtual disks accessible at one time.

- Store all types of IBM PC files and documents transparent to the PC applications, using the folder management system. This extends the virtual disk concept and simplifies the use of it. Shared folders allow concurrent write access to the same folder (but not to the same file within a folder) by multiple IBM PC, DW/36, and PS/36 users. Shared folders also allow for automatic extensions when a folder is full.
- Allow concurrent use of the virtual print, shared folders and data transfer support across the link between the IBM Personal Computer and System/36

Ordering Information

PC Support/36

Program number: 5727-WS1

System/36 PC

Program number: 5727-WS6

Reference Material

- PC Support/36 Licensed Program Specification, GC21-9102
- System/36 to PC Connectivity Guide, G360-1001

Business Graphics Utilities/36

The graphics support utility allows the user to convert the keyed-in data into meaningful charts. The System/36 can generate various types of charts:

- Pie charts
- Bar graphs
- Line graphs
- Surface graphs

The display used is the IBM Personal Computer; the graph definition can also be done on the IBM 3180 Model 2. Printouts can be directed to the 5224/5225 and 4214/4224 Printers. In addition, the 6180 and 7372 color plotters can be attached to IBM Personal Computers to plot results. The user interface for accessing the System/36 business graphics support consists of a set of menus, HELP screens, and prompts.

Ordering Information

Program number: 5727-BG1

System/36 PC

Program number: 5727-BG6

Reference Material

- System/36 Business Graphics, G580-0571

5224/5225 Advanced Printer Function (APF/36)

The System/36 5224/5225 Advanced Printer Function licensed program allows the System/36 to use special functions of the 5224 (Models 1 and 2) and the 5225 (Models 1 through 4) printers. APF/36 consists of a forms generation utility and an alternate character set capability.

Advanced Printer Function/36 allows the user to:

- Define alternate character sets and symbols
- Define large characters (up to nine times normal size)
- Cause Universal Product Code (Version A), Code 39 (A-Z, 0-9, *), or European Article Number (EAN) type bar codes to be generated
- Build logos and emblems
- Allow bar graphs to be generated
- Produce a customized form that can be merged with spooled application report data

Ordering Information

Advanced Printer Function (APF/36)

Program number: 5727-AP1

System/36 PC

Program number: 5727-AP6

Reference Material

- Text/Office Brochure, G580-0454
- Advanced Printer Function Licensed Program Specifications, GC21-7981

System/34 to System/36 Migration Aid

The System/34 to System/36 Migration Aid is a set of System/34 and System/36 programs and procedures that assist the user in moving System/34 applications to a System/36. This migration aid does not address conversion of MRJE and SRJE communications applications.

The migration aid allows a user to do the major part of the migration (the library analysis work) on the installed System/34 prior to the arrival of the

System/36. Source program compilations are run on the System/36.

The migration aid runs on a 48KB minimum System/34 and on all models of the System/36. Use of the migration aid can help to relieve the user of many time-consuming tasks, provide for greater migration accuracy, and improve user productivity during the migration. The migration aid:

- Is easy to use (menu- and prompt-driven)
- Identifies source and OCL differences in reports
- Makes limited modifications to OCL statements and command procedures
- Generates OCL to save/restore the System/34 user files
- Generates OCL to move user library members from the System/34 to the System/36
- Generates procedures to compile System/34 source on the System/36
- Runs generated recompilation procedures with minimal user intervention

Ordering Information

System/34 to System/36 Migration Aid

Program number: 5727-MA1

System/36 PC: Not available

Reference Material

- System/34 to System/36 Migration Aid, SC21-9040
- Licensed Program Specifications, GC21-9058

System/36 Programmer and Operator Productivity Aid PRPQ (P84061)

The System/36 Programmer and Operator Productivity Aid is an integrated set of four utilities (File, Diskette, Library, and Edit) having the following characteristics:

- High-level
- Easy to use
- Menu driven
- Interactive

The functions it provides are commonly performed by application programmers and lead operators. These functions involve using:

- Fixed disk files
- Diskette files
- Libraries
- Library members

The File, Library, and Diskette Utilities allow the user to:

- Display the names (up to 64 at one time) of
 - All files or libraries on the system
 - Members within a selected library
 - All files in a diskette magazine
 - All files on a diskette volume
 - All members within a library file on diskette
- Perform operations (such as copy, print, delete, etc.) on individual files, libraries, or library members by using command keys and simple operation codes
- Display the data (a full screen at one time) within a data file or library member resident on disk or diskette
- Scan through the records within a data file or library member by using simple commands and the command function keys
- Perform character string searches on records within data files or library members
- Generate test data files
- Request assistance for utility functions through the online HELP and tutorial facility

The Edit Utility allows the user to:

- Create a new, or update an existing, source or procedure member in full-screen mode (22 display lines) or under format control in single-line mode (similar to the System/36 Source Entry Utility – SEU)
- Select the desired source or procedure member to be edited by the one of the following modes:
 - Specifying the appropriate library and member name
 - Specifying the library only. The names of the source and procedure members in that library are displayed for selection. The number of records within a source or procedure member can be displayed.
- Delete, insert, duplicate, and rearrange lines of data.
- Perform operations on either a single line of data or a group of data lines
- Perform character string searches, including optional replacement with another character string
- Copy lines of data from a member in the same or a different library into the member being edited
- Print a source or procedure member, including formatted printing for a text member
- Request online HELP for the edit commands, command and function control keys, and format selection options (single line model) via the HELP key

Ordering Information

S/36 Programmer and Operator Productivity Aid

Program number: 5799-BRJ

System/36 PC

Program number: 5799-BXT

Reference Material

- System/36 Programmer and Operator Productivity Aid Description/Operations Guide, SC21-9072
- System/36 Programmer and Operator Productivity Aid Licensed Program Specifications, GC21-9074

Industry Application Packages

A large number of application packages are available for System/36. Some of these programs are:

- Distributors Management Accounting System (DMAS). The System/36 DMAS program product offers distribution industry installations one complete application set to help them manage their accounting, financial, inventory management, and purchasing functions. Using System/36 DMAS, distributors can monitor important aspects of their operations and draw upon timely, accurate data to make critical business decisions. DMAS is also licensed for the System/36 5363 and 5364 System Units. DMAS program products also ease the migration for current System/34 DMAS II, DFAS II, and INVEN/34 users to System/36. The following applications are included:

Billing	5727-D41
Accounts Receivable	5727-D42
Inventory Control	5727-D43
Sales Analysis	5727-D44
Purchasing	5727-D45
Inventory Management	5727-D46
General Ledger	5727-D47
Accounts Payable	5727-D48
Payroll	5727-D49
Cross-Application System Support	5727-D4A
- Manufacturing Accounting and Production Information Control System – Version 2 (System/36 MAPICS II).

System/36 MAPICS II provides full-function, workstation-oriented applications for manufacturers. Based on System/34 MAPICS II, it also includes new features for ease of use during installation and problem determination, while maintaining full functional compatibility with System/34 MAPICS II. A full range of manufacturing processing requirements is addressed in the

System/36 Software

following integrated applications, licensed also for the System/36 5363 and 5364 System Units:

Product Control and Costing	5727-M71
Payroll	5727-M72
Accounts Payable	5727-M73
Accounts Receivable	5727-M74
Inventory Management	5727-M75
Product Data Management	5727-M76
General Ledger	5727-M77
Sales Analysis	5727-M78
Order Entry and Invoicing	5727-M79
Data Collection System Support	5727-M7A
Material Requirements Planning	5727-M7B
Capacity Requirements Planning	5727-M7G
Financial Analysis	5727-M7H
Master Production Schedule Planning	5727-M7J
Purchasing	5727-M7K
Forecasting	5727-M7L
Inventory Management for Process	5727-M7N
Location/Lot Management	5727-M7P
Cross-Application System Support	5727-M7X

- **Construction Management and Accounting System (CMAS).** The System/36 Construction Management and Accounting System and Cross-Application System Support provide an integrated and comprehensive workstation-oriented accounting and financial control system for the small-to-medium-size construction firm and related project-oriented business. The Payroll and Labor Costing, Accounts Payable, Job Costing, Revenue Accounting, and General Ledger applications are designed to meet the needs of the construction industry. They are also available for the 5363 and 5364 System Units.

Job Costing	5727-M66
General Ledger	5727-M67
Accounts Payable	5727-M68
Payroll and Labor Costing	5727-M69
Revenue Accounting	5727-M6A
Cross Applications Systems Support	5727-M6X

- **Business Management Accounting System.** The System/36 Business Management Accounting System provides fully integrated, full-function accounting programs applicable to a wide range of industry classifications. Written in enhanced System/36 BASIC, the Business Management Accounting System provides the ease-of-use characteristics required for the first-time computer user. The System/36 Business Management Accounting System is identical in function to the System/34 Business Management Accounting System.

The following applications are included:

General Ledger	5727-XB2
Accounts Payable	5727-XB3
Accounts Receivable	5727-XB4
Payroll	5727-XB5
Inventory Accounting	5727-XB6
Billing	5727-XB7

System/36 Business Management Accounting System Program Product for System/36 PC provides ease-of-use characteristics required for the first-time computer user:

General Ledger	6201868
Accounts Payable	6201869
Accounts Receivable	6201867
Payroll	6201871
Inventory Accounting	6201870
Billing	6201866

Section 64. AS/400™ System

AS/400™ System

Main Purpose

The IBM AS/400 System is a family of products designed to offer solutions for commercial data processing, office, and communications environments as well as to provide simple, consistent programmer and end-user interfaces for businesses of all sizes.

The system consists of a broad range of compatible processors utilizing the same operating system in all models. This consistency across the entire product family enables customers to have an easy, nondisruptive growth path that meets the needs and requirements of diverse environments that range from very small systems with two to six users to systems with over 200 users.

The system is specifically designed to enhance application support and development, enabling the use of many already-established applications on the AS/400 System. The AS/400 System is designed to enhance customer investment in application solutions and training while providing answers for the function and growth requirements of the currently installed IBM System/34, System/36, and System/38 systems.

Abstract

The AS/400 is supported by a single flexible, high-function operating system, a wide offering of communication capabilities, extensive connectivity, a rich office offering, strong integrated PC support, and many unique programmer productivity tools. It is designed for ease of operation with extensive menus, prompts, and comprehensive help text available. Discover/Education is included with each system, providing built-in education. Also included is innovative electronic customer support which provides automatic online problem determination and capability for direct connection to IBM and user support data bases.

System Models

The AS/400 System consists of six models that use a common operating system:

Model	Typical Users	Memory (MB)	DASD (GB)
9404 System Unit Model B10	4-8	4-8	up to .945
9404 System Unit Model B20	8-20	4-16	up to .945

9406 System Unit Model B30	12-50	4-36	up to 6.8
9406 System Unit Model B40	24-75	8-40	up to 6.8
9406 System Unit Model B50	36-115	16-48	up to 13.6
9406 System Unit Model B60	64-200	32-96	up to 27.3

Key Functions, Facilities and Features

- Product range and growth
- Advanced operating system
- Integrated relational data base support
- Office systems
- Application solutions
- Connectivity support
- Systems application architecture
- Electronic support
- Online education
- System/3X coexistence support

Product Range and Growth

The AS/400 System provides easy-to-order, easy-to-install Total System Packages consisting of various combinations of processors, hardware (tape, direct access storage devices (DASD), diskettes), preloaded software, supplies, and publications at a distinct price advantage. The packages provide for a wide range of users having different needs. Displays and printers are offered as optional pieces of the total package.

In addition to Total System Packages, AS/400 is also available as a customized system. It provides a wide variety of hardware options to configure a system that meets the unique needs of a customer. Up to 32 communications lines and one or two IBM Token-Ring LAN adapters may be attached. There are three choices for tape, including 1/2-inch native reel-to-reel and 1/4-inch cartridge compatible with the 9404 System Unit. DASD is available using the 9332 and 9335, including units that might be attached to a current system.

Advanced Operating System

The IBM Operating System/400™ is a preloaded, integrated operating system for all models of the AS/400 System. The system has many features that assist in its installation and maintenance. Most system functions are menu driven for the new user,

AS/400 System

with a "fast path" capability for the more experienced user. Comprehensive help text is readily available, as are service support options and support for a fully integrated relational data base, education, security, connectivity, and office system.

The Operating System/400 has integrated many of IBM's strategic architectures for communications and office that are the foundation for connecting IBM systems together and for sharing documents throughout the network. Although the full range of functions provided may not be needed immediately, all are available for future growth.

Integrated Relational Data Base

The Operating System/400 enables the user to organize, associate, recover, and present data through an integrated relational data base manager. The data base management also provides the traditional file management associated with IBM's mid-range System/36. The relational structure consists of both physical files and logical files. Data base definition and manipulation can be accomplished using Structured Query Language (SQL), high-level languages such as COBOL and RPG, the data definition specifications (DDS) used on System/38, and the interactive data definition utility (IDDU) similar to IDDU on the System/36. An integrated data base dictionary and recovery aids are provided. This approach provides flexible, end-user-oriented access to information through various easy-to-use query products.

Office Systems

A wide variety of integrated office services are provided with the Operating System/400, and office products are supported by IBM's office systems architectures. The Operating System/400 provides interchange capability with users of other IBM word-processing programs as well as access to various printers.

As an option with the AS/400 System, AS/400 Office is a licensed program product for a full-function word processor and proofreading system, language dictionaries, calendar services, personal directories, mail, and administration.

Application Solutions

An extensive array of applications for manufacturing, distribution, construction, education, legal, and hotel management is available for the AS/400 System. In addition to the solutions available from IBM, many applications will be available from non-IBM sources providing a resource for industry-specific solutions.

Built into the Operating System/400 is support for both graphics and image. Through easy-to-use menus, graphics users can create, modify, store, display, print, and plot information generated from keyboard input or directly from a data base file. The

AS/400 System can be a file server, print server, or archive for image data generated by a personal computer. The images can then be inserted into a document and printed or exchanged with other AS/400 Systems.

AS/400 PC Support provides for attachment and integration of PC/DOS-based personal computers with the AS/400 System. Server functions are provided to allow data access, data transfer, sharing of storage and printers, and message handling. The Work Station Function provides display station emulation, printer emulation, and graphics support.

A wide range of utilities and languages is available to enhance programmer productivity during the development and implementation of AS/400 System applications. High-level languages (HLL) supported are RPG, COBOL '85, BASIC, PL/I and Pascal.

A set of high-function, integrated utilities oriented to the programmer is available. These tools include a List Oriented Object Manager, Data File Utility, Source Entry Utility, and Screen Design Aid.

Connectivity Support

The AS/400 System offers extensive connectivity and networking facilities for both private and public networks. It communicates with other systems as a host, as part of a peer-to-peer network, or as a node in a System/370-controlled network. The IBM Token Ring Network is supported through an integrated adapter. The AS/400 System provides full-function services for both batch operations and interactive communications.

As a participant with a System/370 in a network, the AS/400 System has many capabilities. The AS/400 System can look like a 3274 to the System/370 to do interactive applications. As an RJE work station, the AS/400 System can submit jobs to the System/370 and also provide remote print capabilities. In the office environment, the AS/400 System can interact with DISOSS™ or VM/PROFS™, sending notes and documents throughout the network. The AS/400 System functions as a node in the network for object distribution from the System/370. Using Distributed Data Management (DDM), the systems can share data at the record level through user-written applications.

Systems Application Architecture™ (SAA)

AS/400 and its operating system (OS/400™) are full participants, along with the Personal System/2® and System/370, in IBM's Systems Application Architecture.

SAA is a set of selected software interfaces, conventions, and protocols that will provide a consistent framework across the System/370, Personal System/2™ with OS/2™ operating system, and the AS/400 System. These interfaces, conventions, and protocols are designed to provide an enhanced level

of consistency for user access, programming interfaces, communications support, and applications.

The AS/400 System provides a large number of SAA capabilities. The communications capabilities built around LU6.2, SDLC, X.25, SNA/Distribution Services, Document Interchange Architecture (DIA), Advanced Peer-to-Peer Networking (APPN), and many others provide a strong SAA base for communications. There are also SAA capabilities within Structured Query Language (SQL) and COBOL.

Electronic Support

Electronic support, a function available on all AS/400 Systems, offers the user a set of support solutions designed to help maintain high levels of satisfaction in resolving problems, answer AS/400 System questions, help tailor education to meet individual needs, and maximize system availability by providing timely response to support needs. Selected functions are available locally:

- Online question and answer facility
- Configuration management
- Copy screen image
- Structure problem determination
- Automated call processing for service help

Customers may also create question and answer data bases for their own unique applications. The user accesses this customer-generated application question and answer information in the same way as the one supplied by IBM.

In addition, other facilities provided remotely through the electronic support service network are:

- Hardware fast path, where a hardware problem is passed to the service system and routed to the appropriate support center
- Automated software support where a software problem is passed to the service system and routed to the appropriate support center
- Access to a national question and answer data base

Online Education

Online education provides an innovative, flexible approach for customers to obtain AS/400 System education. The Tutorial System Support (TSS) brings the AS/400 System to the customer's work place. TSS courseware is modular and permits progress through the material at an individual pace without significant interruption to normal work responsibilities. A set of modules covering basic AS/400 System terminology, concepts, facilities, and operations will be shipped and integrated into the AS/400 System operating systems software. Online education is part of the total education curriculum for the AS/400 System. Classroom and Guided Learning Center (GLC) courses are also available.

System/3X Coexistence

System coexistence: The communications and networking features of the AS/400 System allow integration into an existing System/3X telecommunications or IBM Token-Ring Local Area Network.

Application coexistence: Most System/36 source code is recompiled after minimal changes and will continue to run as it does on a System/36, with the application logic unchanged. Most System/38 application object code may be loaded onto the AS/400 System and run as System/38 application. Application end-user operations are identical to their current System/36 and System/38 operations.

For more information about AS/400 System hardware and software, see the following pages.

AS/400 9404 System Unit

Products Included

- 9404 System Unit Model B10
- 9404 System Unit Model B20

Main Purpose

The 9404 System Unit is the low-priced entry into the AS/400 family. The 9404 is a compact, floor-standing package that extends full AS/400 function to a broader range of customers. Disk storage capacity up to 945MB and main storage up to 16MB is supported.

The small size and quiet operation of the system unit allows it to be installed in a quiet office environment such as a private office or library.

Software is fully compatible among all models of the AS/400. All applications can utilize AS/400 function across the entire family.

Key Functions, Facilities and Features

- Integrated twinaxial and ASCII workstation controllers for attachment of a wide variety of displays and printers
- Attachment to the IBM Token-Ring Network via an optional integrated adapter
- Electronic customer support, accessible for remote support, service, and information, for improved customer productivity
- Battery-powered system clock to maintain the time and date when the system unit is powered off
- Automatic power on at a specific time
- Remote power on
- Optional Battery Power Unit feature to improve the availability of the system by providing power to the system unit for a minimum of 5 minutes during a power failure

Standard Features for Models B10 and B20

- Processor

The system processor uses very large scale integration (VLSI) logic and has a 32-bit data path and 48-bit addressing that has the capability to provide direct access to 281 trillion bytes of virtual storage. It is implemented with a software and hardware architecture that can accommodate up to 64-bit addressing. This architecture accommodates the needs of advanced applications such as voice, image, and artificial intelligence.

- Automatic operations
 - Programmed power off
 - Power on by time-of-day clock
 - Auto IPL after power on

- Auto power on and IPL after power interrupt
- Power on by remote signal

- Disk units

The 9404 contains two or, optionally, three high-speed, direct-access disk units, providing a capacity of 630MB or 945MB. The disk units offer quality, reliability, and performance in a 5-1/4 inch design. Programs and data are stored on the disk for processing. Data can be stored offline for security or backup purposes by copying the data to tape or diskettes.

- Cartridge tape unit

A 1/4-inch cartridge tape unit is standard on the 9404 to provide fast, convenient save/restore and data interchange with other 9404s, 9406s, and System/36 5363 System Units.

- Multiple function input/output processor

This processor with attached EIA 232/V.24 Adapter and cable provides support for disk storage, diskette, tape, and two communication lines. The first line is standard on the 9404 System Unit and is provided for use with the IBM electronic customer support facility.

An EIA 232/V.24 or X.21 Adapter are optional features that may be added to expand the capability to two lines. The multiple function I/O processor supports async, bisync, SDLC, and X.25 lines with a maximum aggregate line speed of 21,600 bps.

- Security keylock

The 9404 has a security keylock to prevent unauthorized use of the system and unauthorized accessibility to data within the system.

- Uninterruptible power supply (UPS) interface

An interface is provided to attach a vendor-supplied UPS which provides the ability to tolerate a large range of power quality problems. Significant reduction in power requirements on the 9404 makes a UPS more cost effective.

- Reliability, availability and serviceability (RAS)

Problem determination is accomplished through devices and features that, wherever possible, detect, isolate, and report their own errors.

Workstation Controllers

One of the following workstation controllers must be specified as part of the base 9404:

- Twinaxial Workstation Controller

The Twinaxial Workstation Controller is a combined workstation controller and workstation

adapter for attaching 5250-type displays and printers to the 9404. Two 4-port work station attachments are provided with this card. Up to 40 5250-type displays or printers may be supported with a maximum of seven devices per port.

- ASCII Workstation Controller

The ASCII Workstation Controller is a combined workstation controller and workstation adapter for supporting up to 18 selected ASCII displays and printer.

The following IBM modems are supported in asynchronous mode:

- 5811 Model 20
- 5812 Model 10
- 5841
- 5842
- 5843
- PC Convertible Internal and Enhanced Internal Modem

The following non-IBM modems have been tested and found to work with the ASCII Workstation Controller:

- Hayes® Smartmodem 1200™ and Smartmodem 2400™
- Concord 224®
- Racal-Vadic 2400PA

Optional Features for Models B10 and B20

Four card slots are available for attaching optional features. In the descriptions below, no card slots are required except where noted.

- Battery Power Unit

This feature provides a minimum of 5 minutes of backup power. After power is lost, the entire system unit (processor, disk, tape, diskette) will continue to operate. When the battery current is low, the system will begin an orderly shut down.

- 4MB Main Storage

The 4MB Main Storage card is the first card required when adding main storage and is available for both the Model B10 and B20. Card slots used: One.

- 4MB Main Storage Expansion

Up to two 4MB Main Storage Expansion cards can plug into the 4MB Main Storage card, which is a prerequisite to this feature. Available on the Model B20 only. Maximum: Two.

- Feature Power Supply

When a third disk unit is added to the system unit, the Feature Power Supply is required.

- Disk Unit (315MB)

Two Disk Units are included with the base system. A third Disk Unit may be added with this feature for a maximum disk storage capacity of 945MB.

- Diskette Unit (5-1/4 inch)

A Diskette Unit (5-1/4 inch) is available for use in transferring data or programs between the 9404 and other systems including the 9406, System/36 5363 System Unit, System/36 PC 5364 System Unit, and other compatible systems.

- Diskette Unit (8-inch)

A Diskette Unit (8-inch) is available for use in transferring data or programs between the 9404 and other systems including the 9406, System/36 System Units 5360 and 5362, System/38, and other compatible systems.

- Twinaxial Workstation Controller (see above)

Maximum: One. Card slots used: One.

- ASCII Workstation Controller (see above)

Maximum: Two. Card slots used: One.

- ASCII 12-Port Workstation Attachment

The ASCII 12-Port Workstation Attachment plugs into the ASCII Workstation Controller providing an additional 12 ports to the six provided with the ASCII Workstation Controller feature.

Maximum: Two (one per ASCII Workstation Controller).

Communications Functions

- The 9404 offers a wide variety of communications and connectivity functions.
- Multiple networks are available: SNA, X.25, X.21, and IBM Token-Ring Network.
- Multiple environments are available: AS/400 as a host to PCs and other AS/400s, System/36s, and System/38s; AS/400 as a peer system to other AS/400s, System/36s, and System/38s; and AS/400 as a remote system in a System/370-controlled network.
- Connectivity to IBM and non-IBM systems is provided by various protocols: async, bisync, SDLC, and X.25. The 9404 can support as many as 8 communications lines (two lines on the multiple function I/O processor and six lines on two optional Three-Line Communication Controllers) with individual line speeds as high as 64,000 bps and one IBM Token-Ring Network operating 4 million bps. A maximum of two high-speed (48000 bps or greater) lines is supported.
- The 9404 will communicate via the EIA 232/V24 and V.35 adapters through an IBM 9751 CBX using a Data Comm Module (DCM) and through the ROLM CBX 8000 and CBX 9000 using either a ROLM DCM or a Data Terminal Interface (DTI).

AS/400 9404 System Unit

- The following IBM systems and modems may be attached to the 9404:
 - IBM systems
 - 3090, 308X, 43XX, 9370
 - System/36, System/38, Series/1, System/88
 - PC, PC XT™, PC XT Model 286, Personal Computer AT®, Personal System/2™, RT PC™
 - IBM modems
 - 3833, 3834, 3863, 3864, 3865, 3868
 - 5811, 5812, 5821, 5822, 5841, 5842, 5853
 - 5865, 5866, 5868

Optional Communications Features

- Three-Line Communication Controller

This controller is an input/output processor that provides the basic control and common circuits for one, two, or three communication lines. The concurrent operation of async, bisync, SDLC, and X.25 protocols is supported. The maximum aggregate data rate for the TLCC is 192,000 bps. Maximum: Two. Card slots used: One.

- X.21 Adapter

This feature consists of an adapter and cable that is used to attach one communication line to an X.21 or X.25 network. Line speeds up to 64,000 bps are supported using SDLC or X.25 protocol. This adapter attaches to either the Three-Line Communication Controller or the multiple function input/output processor. Maximum: Three on the TLCC; one on the multiple function I/O processor.

- EIA 232/V.24 Adapter

This feature consists of an adapter and cable that is used to support one communication line using either async, bisync, SDLC, or X.25 protocol. Line speeds up to 19,200 are supported. This adapter attaches to the Three-Line Communication Controller or the multiple function input/output processor. Maximum: Eight per system. One adapter comes standard on each Model B10 and B20 for use with electronic customer support.

- V.35 Adapter

This feature consists of an adapter and cable that is used to support one communication line. Line speeds up to 64,000 bps using bisync, SDLC, and X.25 protocols are supported. This adapter attaches only to the Three-Line Communication Controller. Maximum: Three on each TLCC (for optimal performance using high-speed lines, one V.35 adapter per TLCC is recommended).

- IBM Token-Ring Network Adapter

The IBM Token-Ring Network Adapter is a card that allows the 9404 System Unit to attach to a 4-megabit IBM Token-Ring Network. Logical link control and media access control functions that comply with IEEE 802.2 and 802.5 standard are

supported. Maximum: One. Card slots used: One.

Device Support

Remote Workstation Controllers

- 5394

The 5394 Remote Workstation Controller attaches up to sixteen 5250-type displays, printers, IBM Personal Computers, and Personal System/2s to a 9404 via a communications link. The function provided will be equivalent to that provided to the local workstations.

- 5294

The 5294 Remote Workstation Controller attaches up to eight 5250-type displays, printers, IBM Personal Computers and Personal System/2s to a 9404 via a communications link. The function provided will be equivalent to that available on the System/36 and System/38 with the exception that PC support access by attached Personal Computers and Personal System/2s will not be supported.

- 5251 Model 12

The 5251 Model 12 may be used to attach remote workstations. It is a workstation controller and communications unit for remote attachment of multiple display stations and printers. PC support access by Personal Computers or Personal System/2 attached to the 5251 Model 12 will not be supported.

Multiconnectors

- 5299 Multiconnector and TTPA Adapter

The 5299 Multiconnector and Twinax to Telephone Twisted Pair Adapter (TTPA) may be used with appropriate telephone wiring. Initial and ongoing site cabling costs may be reduced with this wiring option.

Workstation Support

- Twinaxial

The following IBM displays and printers, as well as Personal Computers and Personal System/2s, are supported by the Twinaxial Workstation Controller:

- Displays
 - 3179 Model 2
 - 3180 Model 2
 - 3196
 - 3197
 - 5251 Models 011, 999
 - 5291
 - 5292

- Printers
 - 3812 Models 001, 002
 - 5219 Models D01, D02
 - 5224 Models 001, 002
 - 5225 Models 001, 002, 003, 004
 - 5256 Models 001, 002, 003
 - 5262 Model 001
 - 6262 Models T12, T14
 - 4210 Model 001
 - 4224 Models 101, 102, 1C2, 1E2
 - 4234 Model 002
 - 4245 Models T12, T20

- ASCII

The following ASCII displays as well as IBM Personal Computers and Personal System/2s are supported by the ASCII Workstation Controller. The 3151, 316X, or equivalent attached to the ASCII Workstation Controller is supported as the 9404 system console. See the *ASCII Workstation Reference Manual*, SA21-9922, for specific configuration information.

- Displays
 - 3101 Model 23
 - 3151
 - 3161
 - 3162
 - 3163
 - 3164
- IBM Personal Computer support

The 9404 System Unit supports the IBM Personal Computer Models 5150, 5160, 5162, and 5170. IBM Personal Computers and Personal System/2s must emulate a supported twinaxial or ASCII display.
- IBM Personal System/2® support

The 9404 System Unit supports the IBM Personal System/2 Models 25, 30, 50, 60, and 80. IBM Personal Computers and Personal System/2s must emulate a supported twinaxial or ASCII display.

Link Protocol Converters (LPC)

Link Protocol Converters (LPC) are small, stand-alone devices that will provide protocol conversion for 5250/3270 and for 5250/ASCII. They attach to the workstation controller ports on the 9404 System Unit, 5294, or 5394 via twinaxial cable or equivalent.

- 5208 Link Protocol Converter

The 5208 Link Protocol Converter allows ASCII displays, IBM Personal Computers emulating ASCII displays, and ASCII printers to attach to a 9404 System Unit as twinaxially-attached 5250 devices. Each twinaxially-attached 5208 may connect up to seven ASCII devices. These devices are attached locally via EIA 422-A or locally and/or remotely via EIA 232-C connection. AS/400 Support access via the 5208 is not supported.

- 5209 Link Protocol Converter

The 5209 Link Protocol Converter allows up to seven 3270-type displays and printers to be attached to a 9404 System Unit either locally or remotely (via the 5294 or 5394 Remote Control Unit) and concurrently to a System/370 through a 3174/3274 Control Unit.

- ROLMbridge 5250 Link Protocol Converter

A ROLMbridge 5250 LPC model attaches ROLM displays, ASCII displays, IBM Personal Computers, or IBM Personal System/2s emulating ASCII displays and ASCII printers as twinaxially-attached 5250 devices. AS/400 PC Support access via the ROLMbridge is not supported.

System/36 and System/38 Devices Not Supported by 9404

- 3203 Printer
- 3262 Printer
- 4245 Model 012, 020 Printers
- 5211 Printer
- 5224 Model 012 Printer
- 5225 Model 011, 012 Printers
- 3410, 3411 Tape Units
- 3422, 3430 Tape Units
- 62PC DASD
- 3370 DASD
- Diskette Magazine Drive
- 5251 Models 001, 002
- 5252 Display
- 5255 Display
- 8809 Tape Drive
- 1255 MICR
- 6157 Cartridge Tape Unit
- Digital Data Service Adapter (DDSA)

AS/400 9406 System Unit

Products Included

- 9406 System Unit Model B30
- 9406 System Unit Model B40
- 9406 System Unit Model B50
- 9406 System Unit Model B60

Main Purpose

The 9406 System Unit is offered in four models. The modular, rack-mounted packaging offers users an opportunity to select a system that satisfies current processing requirements while providing a base for extensive future growth. Each model is upgradable to any higher model. All 9406 System Unit controllers and adapters plug into the system I/O bus via card slots in the 9406 System Unit or into optional I/O card units. The number of I/O busses and card slots available varies by model.

Key Functions, Facilities and Features

- Four rack-mounted models offering configuration flexibility
- Broad range of I/O attachment
- Electronic customer support
- Timed power on/ remote power on
- Application compatibility across all models of the AS/400 family
- Total System Package models available

9406 System Unit General Information

The 9406 System Unit is available in four models and, in conjunction with a large range of IBM I/O devices, provides an extended range of price/performance for the AS/400 System beyond that provided by the 9404 System Unit. The 9406 System Unit offers performance ranging up to two times that of the 5382 Model 700, with DASD capacity to 27.2GB and main storage capacity to 96MB. The 9406 System Unit contains the system processing unit and the necessary controllers and adapters for attachment of system DASD, tape, diskette, work stations, and communications lines.

The system processor uses very large scale integration (VLSI) logic and has a 32-bit data path and 48-bit addressing that has the capability to provide direct access to 281 trillion bytes of virtual storage. It is implemented with a software and hardware architecture that can accommodate up to 64-bit addressing. This architecture accommodates the needs of advanced applications such as voice image and artificial intelligence.

The 9406 System Unit, as well as DASD, tape, and diskette devices, are mounted in the 9309 Rack Enclosures. The modular packaging approach provided by the 9309 allows the customer to select the

devices that satisfy current requirements and provides growth for their system in the future. To simplify the ordering process, a concept of predetermined device locations within the rack enclosures is utilized. This results in a system being assembled from one or more of six predefined 9309 rack configurations. All interconnecting cables and filler panels are automatically added when the system is built at the factory. This eliminates the need to order these items separately.

The 9406 System Unit has the capability to provide the following automatic operations for the system:

- Programmed power off
- Power on by time-of-day clock
- Auto IPL after power on
- Auto power on and IPL after power interrupt
- Power on by remote signal

The 9406 System Unit has a security keylock to prevent unauthorized use of the system and unauthorized access to data within the system. System availability is enhanced by an extensive package of reliability, availability, and serviceability (RAS) features including easy-to-use problem analysis procedures for the customer. An enhanced electrical interface to allow attachment of a vendor-supplied interruptible power supply (UPS) is also provided. UPS provides the capability for the system to tolerate input power quality problems.

Software is fully compatible among all models of the AS/400. All applications can utilize AS/400 function across the entire family.

9406 System Unit I/O Controllers and Adapters

The following I/O controllers and adapters are available on the 9406 System Unit:

Magnetic Storage Device Controller

This controller allows attachment of DASD, tape and diskette devices to the 9406 System Unit. One controller is standard with the 9406 System Unit and additional controllers are added as the number of devices on the system increases. The following IBM devices are supported by this controller:

- 9331 Diskette Unit
 - Model 001 – 8-inch diskette
 - Model 002 – 5-1/4 inch diskette
- 9332 Direct Access Storage Device
 - Model 200 – 200MB capacity (supported only for migration)
 - Model 400 – 400MB capacity
- 9335 Direct Access Storage Subsystem
 - Model A01 – Device Function Controller
 - Model B01 – 855.8MB Direct Access Storage Device
- 9347 Tape Unit

Twinaxial Workstation Controller

This controller is available as a feature and provides attachment for the 5250-type displays, printers, and link protocol converters. At least one of these controllers is required on a system to allow attachment of a display as the system console.

Communication Subsystems

Communication attachment capability is provided through 2-, 4-, or 8-line communication subsystems. Each subsystem comprises a communications controller card and one or more communication online adapter cards.

A 2-line subsystem is provided as standard with the 9406 System Unit. This base communications subsystem provides two lines with 232/V.24 enhanced cables. One of the lines can be used to gain access to the electronic customer support facility. Optional features are available for this standard subsystem to allow the subsystem to be upgraded to a 4- or 8-line subsystem. These optional features are only available at the time of manufacture of the 9406 System Unit.

In addition to the base communications subsystem, the following subsystems are also available:

- 2-, 4- and 8-line 232/V.24 Communication Subsystems
- 2-, 4- and 8-line X.21 Subsystems
- 4- and 8-line 232/V.24 and X.21 Subsystems
- 2-line V.35 Subsystem
- IBM Token-Ring Network Subsystem

A remote power-on (RPO) function is available that allows the system to be powered-on via a telephone call. The RPO function utilizes a "ring indicate" signal from a switched line, on either the base communications subsystem or an optional 2-line Communication Subsystem with remote power on to initiate the power on.

The 9406 System Unit features, 9309 Rack Enclosure configurations, and attaching devices are described in the remainder of this product description.

Optional Features

9346 Tape Controller

This controller provides for attachment of the 9346 Tape Unit. This unit is a 1/4-inch streaming tape drive and is compatible with the tape on the 9404 System Unit.

Main Storage

The main storage features are plugged into main storage feature slots within the 9406 System Unit. The number of slots available in each model is as follows:

- Model B30: 2
- Model B40: 2

- Model B50: 2
- Model B60: 4

4MB Main Storage

The 4MB Main Storage card is available for Models B30, B40, and B50. It may be used in any combination with 8MB Main Storage and 16MB Main Storage (below) provided maximum main storage or available number of main storage card slots is not exceeded. Main storage card slots used: One.

8MB Main Storage

The 8 MB Main Storage card is available on Models B30, B40, and B50. It may be used in any combination with 4MB Main Storage and 16MB Main Storage provided maximum main storage or available number of main storage card slots is not exceeded. Main storage card slots used: One.

16MB Main Storage

The 16MB Main Storage card is available on Models B30, B40, B50, and B60. It may be used in any combination with 4MB Main Storage and 8MB Main Storage provided maximum main storage or available number of main storage card slots is not exceeded. Main storage card slots used: One.

I/O Card Unit

The I/O Card Unit feature provides I/O card slot expansion capability for the 9406 System Unit. The unit is rack-mountable and expands a single system I/O bus by providing ten additional I/O card slots.

An I/O Card Unit is required when the feature card count in the following chart is exceeded:

Card Count Per B30	Card Count Per B40	Card Count Per B50	Card Count Per B60	Required Number of I/O Card Units
5	5	10	13	1
N/A	14	19	22	2
N/A	N/A	29	31	3
N/A	N/A	N/A	41	4
N/A	N/A	N/A	51	5
N/A	N/A	N/A	61	6

Twinaxial Workstation Controller

This feature is a combined workstation controller and a workstation adapter for attaching 5250-type displays and printers as well as link protocol converters to the system.

The controller attaches to the I/O bus. A 20-foot cable is used to connect the controller to an external box that provides eight ports for attaching twinax devices. Both the 20-foot cable and the external box are included as part of this feature. The external box may be floor-, wall-, or table-mounted. Up to forty 5250-type displays or printers are supported, with a maximum of seven devices attached per port. It will support both SNA character string (SCS) and intelli-

AS/400 9406 System Unit

gent printer data stream (IPDS) printer data streams.
I/O card slots used in 9406 System Unit: One.

Maximums:

B30: 3
B40: 5
B50: 8
B60: 12

Magnetic Storage Device Controller

This feature card provides the disk, diskette, and tape controller/adaptor function. It attaches to the I/O bus and provides attachment of various devices. The interface is IBM's implementation of the ANSI IPI-3 industry standard. One Magnetic Storage Device Controller is included as standard in each model of the 9406 System Unit.*

The controller will provide attachment for the following IBM devices:

9332 Model 200	Disk Unit (only supported when migrated from System/36 or System/38)
9332 Model 400	Disk Unit
9335 Model A01	Device Function Controller
9335 Model B01	Direct Access Storage Device
9347 Model 001	Tape Unit
9331 Model 001	8-inch Diskette Unit
9331 Model 002	5-1/4 Inch Diskette Unit

I/O card slots used: One. Card cannot be installed in the I/O Card Unit.

*Maximum additional controllers:

B30: 2
B40: 2
B50: 5
B60: 8

Communications Subsystems, General Function

The 9406 System Unit offers a wide variety of communications and connectivity functions. Multiple networks are available – SNA, X.25, X.21 and Token-Ring – with connectivity provided by multiple protocols: async, bisync, SDLC, and X.25. Multiple environments are also available: AS/400 as a host to personal computers and other AS/400s, System/36s, and System/38s; and AS/400 as a remote system in a System/370-controlled network.

The 9406 System Unit will communicate via the EIA 232/V.24 and V.35 interfaces through an IBM 9751 CBX using a Data Comm Module (DCM) and through the ROLM CBX 8000 and CBX 9000 using either a ROLM DCM or Data Terminal Interface (DTI).

The following is a list of current IBM systems and modems that may be attached to the 9406 System Unit.

- Systems
 - 3090™, 308X, 43XX, 9370
 - System/36, System/38, Series/1, System/88

- Personal Computers XT™, XT-286, Personal Computer AT®, Personal System/2™, and RT PC™
- Modems
 - 3833, 3834, 3863, 3864, 3865, 3868
 - 5811, 5812, 5821, 5822, 5841, 5842, 5853
 - 5865, 5866, 5868

Communications Subsystems for Models B30 to B60

Communications for the 9406 System Unit are provided by one standard and a number of optional hardware communications subsystems. Each subsystem comprises a communications controller card and one or more communication line adapter cards. The cards in the subsystems plug into the I/O card slots in the 9406 System Unit or into the slots in the I/O Card Unit feature.

The number of communications subsystems that can be installed is dependent on the number of I/O card slots available and the following line limitation:

Model	Lines per Model	High-Speed
		48,000 bps and Greater Lines per Model
B30	16	2
B40	32	4
B50	32	6
B60	32	8

The communication subsystem that is provided as standard on the 9406 System Unit is the base communications subsystem. This feature provides two communications lines with the first line intended for use with electronic customer support.

The base communications subsystem can be expanded, at initial machine order, to a four- or eight-line subsystem by ordering optional line expansion features.

The ten optional communication subsystems, offering two, four, and eight lines, and the two-line standard base communications subsystem support a variety of protocols and line types.

Base Two-Line Expansion

This feature consists of an adapter and cables that provide an additional two communication lines when attached to the base communications subsystem bringing the total number of lines to four. This feature is available only at time of manufacture and may only be attached to the base communications subsystem. I/O card slots used: One.

When the Two-Line Expansion is added to the base communications subsystem, the combined capabilities include:

- Support for four communication lines with line one configured for electronic customer support
- Support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps

Base Six-Line Expansion

This feature consists of adapters and cables that provide an additional six communication lines when attached to the base communications subsystem, bringing the total number of lines to eight. This feature is available at time of manufacture only and may only be attached to the base communications subsystem. I/O card slots used: Three contiguous.

When the Six-Line Expansion is added to the base communications subsystem, the combined capabilities include:

- Support for eight communication lines with line one configured for electronic customer support
- Support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps

Base Two-Line X.21 Expansion

This feature consists of an adapter and cables that provide an additional two communication lines when attached to the base communications subsystem, bringing the total number of lines to four. The X.21 lines use SDLC or X.25 protocol. This feature is available only at time of manufacture and may only be attached to the base communications subsystem. I/O card slots used: One.

When the Two-Line X.21 Expansion is added to the base communications subsystem, the combined capabilities include:

- Support for four communication lines: One for electronic customer support, one with an EIA 232/V.24 interface, and two with an X.21 interface
- Support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps via 232/V.24 and 64,000 bps via X.21

Base Six-Line X.21 Expansion

This feature consists of adapters and cables that provide an additional six communication lines when attached to the base communications subsystem, bringing the total number of lines to eight. The X.21 lines use SDLC or X.25 protocol. This feature is available only at time of manufacture and may only be attached to the base communications subsystem. I/O card slots used: One.

When the Six-Line X.21 Expansion is added to the base communications subsystem, the combined capabilities include:

- Support for eight communication lines: One for electronic customer support, one with an EIA 232/V.24 interface, and six with an X.21 interface
- Support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps via 232/V.24 and 64,000 bps via X.21

Base Six-Line 232/V.24 and X.21 Expansion

This feature consists of adapters and cables that provide an additional six communication lines when attached to the base communications subsystem, bringing the total number of lines to eight. The X.21 lines use SDLC or X.25 protocol. This feature is available only at time of manufacture and may only be attached to the base communications subsystem. I/O card slots used: Three contiguous.

When this feature is added to the base communications subsystem, the combined capabilities include:

- Support for eight communication lines: One for electronic customer support, four with an EIA 232/V.24 interface, and three with an X.21 interface
- Support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps via 232/V.24 and 64,000 bps via X.21

Remote Power-On Cable for Base Communications Subsystem

This feature provides a communications cable that allows the 9406 System Unit remote power on (RPO) function to be initiated by a telephone call. The cable replaces the standard cable attached to line one of the base communications subsystem. The cable has the same characteristics as the EIA 232/V.24 enhanced cable and in addition allows the "ring indicate" signal from the modem to be sent to the 9406 System Unit RPO function. Maximum: One.

Cannot be installed with any of the base expansion features or with the Two-Line Communications Subsystem with RPO

EIA 232/V.24 Cable

This feature consists of a communications cable that can be used instead of the EIA 232/V.24 Enhanced cable that is normally supplied with the two-, four-, and eight-line communications subsystems and the two- and six-line expansion features.

Two-Line Communications Subsystem

This feature consists of a communication controller, adapter, and cables that support two lines. I/O card slots used: Two contiguous.

Capabilities include support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps.

Four-Line Communications Subsystem

This feature consists of a communication controller, adapter cards, and cables that support four lines. I/O card slots used: Three contiguous.

Capabilities include support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps.

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Eight-Line Communications Subsystem

This feature consists of a communication controller, adapters, and cables that support eight lines. I/O card slots used: Five.

Capabilities include support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps.

Two-Line X.21 Subsystem

This feature is primarily offered in World Trade countries and consists of a controller, adapter, and cables that support two lines. X.21 leased and circuit-switched lines are supported. Automatic calling is provided for switched lines. Use of this subsystem is primarily for high speed lines. I/O card slots used: Two contiguous.

Capabilities include support for SDLC or X.25 protocol with individual line speeds operating at up to 64,000 bps.

Four-Line X.21 Subsystem

This feature is primarily offered in World Trade countries and consists of a communications controller, adapters, and cables that support four lines. X.21 leased and circuit-switched lines are supported. Automatic calling is provided for on switched lines. I/O card slots used: Three contiguous.

Capabilities include support for SDLC or X.25 protocol with individual line speeds operating at up to 64,000 bps.

Eight-Line X.21 Subsystem

This feature is primarily offered in World Trade countries and consists of a communications controller, adapters, and cables that support eight lines. X.21 leased and circuit-switched lines are supported. Automatic calling is provided for on switched lines. I/O card slots used: Five contiguous.

Capabilities include support for SDLC or X.25 protocol with individual line speeds operating at up to 64,000 bps.

Two-Line V.35 Subsystem

This feature consists of a communication controller, adapter, and cables that support two lines. Use of this subsystem is primarily for high-speed lines. I/O card slots used: Two contiguous.

Capabilities include support for bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 64,000 bps.

Four-Line 232/V.24 and X.21 Subsystem

This feature is primarily offered in World Trade countries and consists of a communications controller, adapters, and cables that support four lines. X.21 leased and circuit-switched lines are supported. I/O card slots used: Three contiguous.

Capabilities include support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps via 232/V.24 and 64,000 bps via X.21.

Eight-Line 232/V.24 and X.21 Subsystem

This feature is primarily offered in World Trade countries and consists of a communications controller, adapters, and cables that support four lines. X.21 leased and circuit-switched lines are supported. I/O card slots used: Five contiguous.

Capabilities include support for async, bisync, SDLC, or X.25 protocol with individual line speeds operating at up to 19,200 bps via 232/V.24 and 64,000 bps via X.21.

Two-Line Communication Subsystem with Remote Power On

This feature provides a method of adding the remote power on (RPO) function to installed machines when the Remote Power On Cable for Base Communications Subsystem feature cannot be installed because of feature restrictions. I/O card slots used: Two contiguous.

IBM Token-Ring Network Subsystem

This feature consists of a controller, adapter, and cable that provides a single attachment to the IBM Token-Ring LAN. Adherence to the IEEE 802.2 and 802.5 standards is maintained so that attachment to other LANs with the same standards is supported. The subsystem operates at 4 million bps. Use of the IBM Token-Ring is the preferred method for locally interconnecting two System AS/400s or AS/400s with the System/36. I/O card slots use: Two contiguous. Maximum: Two per system.

Device Support

9309 Rack Enclosure

The 9406 System Units, as well as the attached I/O Card Unit, disk units, diskette units and tape units, are mounted into 9309 Model 2 Rack Enclosures.

The rack provides:

- A cabinet (1.6 meters) to house the individual rack mountable units that make up a system
- Power control of all units within the rack (under control of the system unit) and power control for the next rack in the system
- Consolidation of individual unit AC power cords to one rack power cord
- Emergency power off (EPO) switch for the system

The rack has an input voltage range of 180 to 259 VAC ("200-volt range") and a frequency range of 49.5 to 60.5 hertz, without the need for transformer tap changes or other adjustments.

Remote Workstation Controllers

5394

The 5394 Remote Workstation Controller attaches up to sixteen 5250-type displays, printers, IBM Personal Computers, and Personal System/2s to a 9406 System Unit via a communications link. The function provided is equivalent to that provided to the local workstations.

5294

The 5294 Remote Workstation Controller can be used to attach up to eight 5250-type displays, printers, IBM Personal Computers, and Personal System/2s to a 9406 System Unit via a communications link. The function provided will be equivalent to that available on the System/36 and System/38 with the exception that PC Support access by Personal Computers and Personal System/2s attached to the 5294 will not be supported.

5251 Model 12

The 5251 Model 12 may be used to attach remote workstations. It is a workstation controller and communications unit for remote attachment of multiple display stations and printers. PC Support access by Personal Computers and Personal System/2s attached to the 5251 Model 12 will not be supported.

Note: Remote workstation controllers attach to the 9406 System Unit via the communication subsystem features. The 5294 or the 5394 running in 5294 emulation mode will not give IBM Personal Computers or IBM Personal System/2s access to AS/400 PC Support.

Multiconnectors

5299 Multiconnector and TTPA Adapter

The 5299 Multiconnector and Twinax to Telephone Twisted Pair Adapter (TTPA) may be used with appropriate telephone wiring. Initial and ongoing site cabling costs may be reduced with this wiring option.

Workstation Support

The following displays, printers, IBM Personal Computers, and Personal System/2s are supported by the Twinaxial Work Station Controller:

Displays

3179

3180

3196

3197

5251 Models 011, 999

5291

5292

Printers

3812 Models 001, 002

5219 Models D01, D02

5224 Models 001, 002

5225 Models 001, 002, 003, 004

5256 Models 001, 002, 003

5262 Model 001

6262 Models T12, T14

4210 Model 001

4224 Models 101, 102, 1C2, 1E2

4234 Model 002

4245 Models T12, T20

IBM Personal Computer

The 9406 System Unit supports the IBM Personal Computer Models 5150, 5160, 5162, and 5170.

IBM Personal System/2

The 9406 System Unit supports the IBM Personal System/2 Models 25, 30, 50, 60, and 80.

Note: The IBM Personal Computer and the IBM Personal System/2, when attached to the Twinaxial Workstation Controller, are supported as a system console and specific IBM Personal Computer printers are supported as system printers.

Link Protocol Converters (LPC)

Link protocol converters (LPC) are small, stand-alone devices that provide protocol conversion for 5250/3270 and for 5250/ASCII. They attach to the workstation controller ports on the 9406 System Unit, 5294, or 5394 via twinaxial cable or equivalent.

5208 Link Protocol Converter

The 5208 Link Protocol Converter allows ASCII displays, IBM Personal Computers emulating ASCII displays, and ASCII printers to attach to a 9406 System Unit as twinaxially-attached 5250 devices. Each twinaxially-attached 5208 may connect up to seven ASCII devices. These devices are attached locally via EIA 422-A or locally and/or remotely via EIA 232-C connection. AS/400 PC Support access via the 5208 is not supported.

5209 Link Protocol Converter

The 5209 Link Protocol Converter allows up to seven 3270-type displays and printers to be attached to a 9406 System Unit either locally or remotely (via the 5294 or 5394 Remote Control Unit) and concurrently to a System/370 through a 3174/3274 Control Unit. AS/400 PC Support access via ROLMbridge is not supported.

ROLMbridge 5250 Link Protocol Converter

The ROLMbridge 5250 LPC attaches ROLM displays and IBM Personal Computers or IBM Personal System/2s emulating ASCII displays and ASCII printers as twinaxially-attached 5250 devices.

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System/36 and System/38 Devices Not Supported by 9406 System Unit

- 1255 MICR
- 3203 Printer
- 3262 Printer
- 3370 DASD
- 3410/3411 Tape Drive
- 3422, 3430 Tape Drives
- 4245 Models 012, 020*
- 5211 Printer
- 5224 Model 012 Printer
- 5225 Printer Models 011, 012
- 5251 Display Models 001, 002
- 5252 Display
- 5255 Display
- 6157 Cartridge Tape Drive
- 62PC Disk Drive
- 8809 Tape Drive
- Digital Data Service Adapter (DDSA)
- Diskette Magazine Drive

* RPQs are available to convert 4245 Models 012 and 020 to Models T12 and T20, which are supported by the 9406 System Unit.

AS/400 Total System Packages (TSP)

Products Included

Model	Specify	System Unit	Memory/Disk (MB)
P10	5300	9404	4/630
P20	5100	9404	4/630
P20	5300	9404	8/945
P30	5300	9406	4/800
P30	5500	9406	12/1200
P40	5100	9406	8/2000

Potential Benefits

- Improved productivity through order simplicity, consolidated delivery, ease of installation
- Price advantage over non-TSP systems
- Support for standard volume discount agreements
- All TSP software preloaded

Main Purpose

The AS/400™ Total System Packages (TSP) provide advantageously-priced, easy-to-install systems that ensure consolidated delivery of all components needed to make them operational.

Key Functions, Facilities and Features

The AS/400 Total System Packages offer a unique approach to ordering and installing an AS/400 for a variety of customer environments. Frequently-ordered components are consolidated into a single shipment. Customers receive the system unit, I/O, licensed programs, and supplies in one convenient package.

Six base configurations are defined. Each includes a system unit, memory and disk storage, a save/restore device, and electronic customer support modem for remote assistance, and a preloaded operating system. Memory and disk capacities are available to support a range of users.

Standard VPA/VLA (Volume Purchase Agreement/Volume License Agreement) and special bid discounts apply.

A limited selection of frequently-used features, I/O, and licensed programs, may be consolidated with a base configuration to provide a completely configured system ready for immediate installation.

Displays (up to eight) and printers (up to four) may be included in each package. This provides flexibility to tailor the system for the proper office, development, or production environment. Both twinaxial and ASCII displays are available.

Necessary binders, blank tapes, and printer paper are included in the supplies kit shipped with each TSP order.

Operating System/400™ (OS/400™)

Main Purpose

IBM Operating System/400, the operating system for the AS/400 System, enables end users, programmers, and system operators to access menus and displays that are easy to use and consistent with common user access interface guidelines defined by IBM's Systems Application Architecture (SAA). This design consistency in Operating System/400 interfaces offers programmers and system operators a significant number of functions previously available in other products, as well as many added easy-to-use functions.

The operating system's full-function capability can help customers to meet their growth and flexibility requirements.

For most customers with System/36 or System/38 products installed, the Operating System/400 functions provide migration capabilities to the AS/400 System in conjunction with separate System/36 and System/38 Migration Aids.

Key Functions, Facilities and Features

- Single integrated operating system for all models
- Ease of use, installation, maintenance
- Productive application development environment
- Significant data base functions
- Online education
- Comprehensive security to all system resources
- Application program interface to system functions
- Multiple operating environments
- Electronic customer support
- Connectivity to remote devices, systems and networks
- Office host services
- National language support, national language versions, and multilingual support

Single Integrated Operating System for All Models

All the OS/400 functions follow a consistent design philosophy, and this consistency is one of the cornerstones of AS/400 ease of use.

- Object-oriented architecture

All system and user resources are stored on the system as "objects" that have a consistent architecture. Every object includes a description containing such information as the owner, date created, object size (in bytes), date of last save and the volume identifier of the media on which the save occurred, and text describing the object.

- Single-level storage

Object placement on different disk units is controlled by the system. The auxiliary storage disk units contribute to an overall pool of storage called "single-level storage," and it is not necessary to be concerned with where individual objects are placed; the library is used to locate any object.

- Library support

A library is a directory to a group of objects (for example, programs and files), and allows a convenient form of grouping objects for either application or control purposes.

- Spool support

Input and output spooling are supported.

Input spooling allows batch jobs to be placed on job queues to wait for an opportunity to execute.

Output spooling queues printer requests until the requested printer becomes available.

- Message handling

Message handling displays messages for various system and user operations. This allows feedback for successful operations or to identify error conditions. The user may define and send messages between users (individual users or all active users), between users and applications, or between applications.

- Job accounting

The system supports multiple levels of job accounting and captures job-related information.

- Device support

Tape and diskette devices are supported for data interchange as well as the save/restore functions. A high-level language (HLL) program or the copy command can directly read or write to a specific device.

A range of workstation printers is supported for data processing or text quality output. Printer graphics are supported for bar codes and other graphic representations.

- Display data management

Display data management provides a large number of options to allow screen formatting control and validation of input.

- Data areas

The system supports a data area object that allows storage of up to 2000 bytes of information that can be accessed and updated by various programs within a single job or across jobs.

- Data queues

The system supports a call interface to send and receive information from a data queue object. This is designed to handle job-to-job communication with a high volume of requests.

- Work management

- Work management supports the concurrent execution of batch jobs and interactive and non-conversational transactions on the system.

- Remote or timed IPL

The system can be powered on manually or automatically, at a specific time of day or from a remote location.

- Multiple concurrent tasks at the same workstation

Up to 16 different functions can be active as a result of a single sign-on to a workstation. This allows a user to suspend and resume tasks. For example, a user could be several menus deep in an order entry function, suspend that function because an interruption makes it necessary for the user to perform an inquiry function, then go back to exactly where the user left off in the order entry function.

- Performance information

The system implicitly gathers performance data available for display or user-written program processing. The performance data is used as input to the AS/400 Performance Tools licensed program (5728-PT1).

- Copy facility

The copy facility copies data from one file to another. The files may be input from the data base, tape, or diskette and be output to the data base, tape, diskette, or printer. Various options are available to control reformatting and the records selected for copy.

- Backup/recovery and system availability

Various recovery functions are supported to protect the user in case of a failure to the system such as a loss of power or the loss of a direct access storage device (DASD) unit. The uninterruptible power supply feature is supported so a user program can be notified when operating on a vendor-supplied uninterruptible power supply or the Battery Power Unit feature of the 9404 System Unit.

Save/restore functions provide the capability to copy objects off and back onto the system for backup and recovery purposes.

Journal support logs all changes to records in a file as they occur. Before and after images are supported. This provides for an audit trail of

changes and the capability for file recovery (either forward or backout) using the journaled images.

The system also supports access path journaling to provide faster recovery of access paths in case of an abnormal system termination.

Commitment control ensures that a multiple data base change transaction is completed successfully or backed out.

A checksum protection facility is provided to protect against a loss of data in event of a single DASD failure.

- Run-time support for Data File Utility and query applications

Programs produced by the Query licensed program (5728-QU1) and the Data File Utility (DFU) (included in the Application Development Tools licensed program, 5728-PW1) can be executed using OS/400 functions. Some query specifications can be changed at run time.

- Operating System/400 query functions

Applications may use OS/400 functions to display a list of queries for selection to execute or delete and to display a list of files available to query.

Limited query capability is provided directly in OS/400.

- Operating System/400 DFU functions

Applications may use OS/400 functions to display a list of Data File Utility (DFU) programs for selection to execute and to display a list of files available to DFU.

Limited data entry capability is provided directly in OS/400.

Ease of Use, Installation, and Maintenance

- Menu interface to most system functions

System-supplied menus provide a task-oriented approach so that the system can be set up and operated by a user unfamiliar with Operating System/400 control language.

- Automatic configuration for local devices

The user can request that locally-attached devices be automatically configured. In addition, local displays and printers can be added, changed, or removed without affecting users signed on to displays connected to other controller ports.

- Extensive online help

The AS/400 help facility provides comprehensive help to explain display functions for both single input fields and the entire display.

Operating System/400 (OS/400)

- System operation

System operational functions can be performed on an attended, partially attended, or predominantly unattended basis.

- Operating system installation/modification

The Operating System/400 programs use a "table-driven" design. Variation in function is achieved by changing an external table of controlling variables.

- Problem determination

Several system functions provide assistance in problem determination including dedicated and system service functions, messages, help information, and problem analysis commands.

- Copy screen function

A copy screen function allows an image from one workstation to be displayed on another workstation to assist in problem determination for user- or IBM-supplied programs. This is especially useful when used in conjunction with remote service support.

- Programming temporary fixes (PTFs)

PTFs (including licensed internal code changes) can be loaded and applied using a command. Deferred PTFs can be applied only at IPL time, but an option allows this to be done unattended.

Productive Application Development Environment

Various OS/400 functions such as interactive debug, command prompting, and the cross-reference capability are included to assist in programming the system. A programmer menu, a data dictionary capability, and the Application Development Tools (5728-PW1) licensed program are integrated with the operating system to form an application development environment.

Significant Data Base Functions

The AS/400 relational data base is integrated into both the machine and operating system and provides functions that allow for a high degree of data integrity and programmer productivity.

Access paths may be defined for files to allow access in either keyed or arrival sequence order. Access paths are maintained when a change to the data occurs. This allows multiple users to be immediately aware of changes in the data base and to access the current information in their required sequence.

Definitions of files can be entered by data description specifications (DDS), by interactive data definition utility (IDDU), or by Structured Query Language/400 (a separate licensed program, 5728-ST1). The file

definition can be used by a variety of functions of the system such as the utilities or HLL programs.

DDS supports the capability to define a field reference file (form of data dictionary) used to describe, in one place, the attributes of all data fields for use by multiple applications.

Comprehensive Security

Each AS/400 installation can use one of the following levels of security to satisfy a range of requirements:

- Minimal security. No passwords are used and any user can perform any function.
- Password security. Passwords must be used. However, any user can perform any function.
- Resource security. Passwords are required and object usage can be controlled. Users can be restricted to specific functions.

Access to system resources can be controlled by giving each user a menu from which to select functions.

It is also possible to secure individual system and/or user resources using a combination of public authority (for functions available to any user who can access the resource) and private authority (for functions available only to specific individuals).

Application Program Interface to System Functions

- Control language (CL)

The control language provides a consistent interface to all system functions. Most commands can be executed both interactively and in a compiled CL program.

CL programs allow the use of variables, error handling, and access to the data base. Programming functions include:

- Reading and writing to a display (menus, for example)
- Reading a data base file
- Performing arithmetic operations
- Manipulating character data
- Executing IF/THEN/ELSE logic
- Calling other programs and being called from another program

The programmer can create tailored solutions that utilize the full range of system functions without end-user or operator awareness of what is being executed. Most commands can also be executed for within an HLL program.

- Programming interface to DIA services and office functions

OS/400 office host support provides a programming interface designed around the AS/400 control language. The commands are provided for appli-

ation programming interfaces (APIs) to the following AS/400 services:

- Directory services
- Distribution services
- Document library services
- Editor services
- Security services
- Miscellaneous services

The majority of the APIs are provided with the AS/400 licensed program; however, there are some that are shipped with two other licensed programs:

- AS/400 Office (5728-WP1)
- AS/400 PC Support (5728-PC1)

- Graphics support

Graphics functions are supported using the Graphical Data Display Manager (GDDM™), which may be accessed from an HLL program or using the AS/400 Business Graphics Utility (BGU) licensed program (5728-DS1). The following OS/400 interfaces to graphics functions are supported:

- Base support of GDDM 1.3 graphics functions plus substantial graphics management capability such as high-function drawing capability, windowing, clipping, rotating (on a plotter), and translating
- Presentation Graphics Routines (PGR) for easier construction and display of business graphs such as bar, line, pie, and surface charts, histograms, and Venn diagrams
- Graphics Data File (GDF) to allow exchanging graphics images with other compatible GDF-capable systems such as another AS/400 system, System/38, or System/370
- Full support for IBM Personal Computer and Personal System/2 graphics resolution, with addressability up to 1024 x 768 display points
- Support of eight-color images for IBM Personal Computer and Personal System/2 devices
- 6180 plotter support, providing high-quality eight-color graphics

- Universal call facility

Programs can be written in either a high-level language (HLL) or CL. A program written in one language can call and pass parameters to a program written in the same or a different language.

- Maximum program size

The maximum size of the machine instruction stream of a program is 1,048,576 bytes, although other internal machine limits may prevent creation of programs this large in some cases.

- Sort utility

The sort utility supports sorting and merging of data base files. A full-record sort and an address sort are available as well as summary sorting.

Selection and sorting using the Sort utility has definite performance advantages over the use of data base access paths for certain applications.

Multiple Operating Environments

In addition to execution of applications written specifically for the AS/400 System, OS/400 functions allow execution of many applications migrated from the System/34, System/36, and System/38 with little or no modifications required. Applications with a mixture of AS/400 and System/36 or System/38 functions are also supported including access to the same data base files from each of the three environments. This allows existing applications to be enhanced with AS/400 functions and to evolve (over time) into completely native applications.

Electronic Customer Support

AS/400 electronic customer support is an innovative approach designed to help make users self-sufficient by offering an integrated set of functions that enhance customers' ability to service and support any environment, from a single system to complex systems and networks. In addition to locally available functions, the product's applications provide access to both remote marketing support systems and IBM service support. Because of its simplicity and ease-of-use characteristics, customers with medium or small installations, where data processing knowledge or experience may be limited, are now able to configure and support their systems.

The benefits are not limited to end users. Electronic customer support enables third-party software and support organizations to support systems and networks from a central site. This partnership between these organizations, IBM Agents, and IBM results in enhanced service and support to AS/400 customers.

Electronic customer support solutions enhance self-sufficiency in resolving problems, and maximize system availability by providing timely response to customer service and support needs. Primary elements of electronic customer support include the following:

- Problem and change management
- Online and remote technical support
- Electronic hardware and software service support
- Remote marketing support
- Menu-driven, help-supported interfaces

Online Education

Online education for the AS/400 System provides an integrated, flexible, and innovative approach for customers to obtain AS/400 education. It brings education on the system directly to the customer's workplace. Because it is modular, it enables the users to progress at their own pace with minimum work interruption.

Operating System/400 (OS/400)

Online education includes:

- Tutorial system support: A set of modules covering the basic AS/400 terminology, concepts, facilities, and operations, shipped with each system.
- Discover/Education™ for AS/400: A series of courses, available for one-time charges as AS/400 licensed programs for those who need more advanced online education. The courses are presented to either an IBM Personal Computer or IBM Personal System/2 attached to the AS/400 System.

Connectivity to Remote Devices, Systems and Networks

The AS/400 System offers a wide range of communications capabilities and functions that enable communications with a variety of IBM and non-IBM systems either in batch or interactive modes. Traditional SNA hierarchical, emerging SNA peer networks, and SAA standards are supported, thereby offering the user the greatest flexibility possible in network design both now and in the future.

Supported protocols and networks:

- IBM Token-Ring Network (IEEE 802.5 and 802.2)
- Asynchronous (async)
- Binary Synchronous (BSC)
- Synchronous data link control (SDLC)
- X.21 networks
- X.25 networks

Network management facilities:

- Alerts support to NetView, System/36, System/38, AS/400
- IBM Token-Ring Network management support
- Distributed host command facility (DHCF)
- Link problem determination aid (LPDA)
- Distributed system node executive (DSNX)

Communication facilities:

- Remote workstation support
- Intersystem communications function (ICF)
- Advanced peer-to-peer networking (APPN)
- Advanced program-to-program communication (APPC)
- SNA distribution services (SNADS)
- Network configuration menu
- Object distribution facility
- Display station pass-through
- Distributed data management (DDM)
- SNA upline facility to System/370 IMS and CICS hosts
- Autodial support

Supported Protocols and Networks

- The AS/400 System will directly connect to the IBM Token-Ring Local Area Network through an integrated attachment.

- BSC, async, and SDLC support provides the user with the ability to communicate with other systems and devices that use the comparable protocol.
- The AS/400 System provides an interface for attachment to an X.21 leased or circuit-switched network using either X.25 or SDLC communications.
- The AS/400 System provides an attachment and support for X.25 packet-switched data networks via a nonswitched line through either an X.21 or X.21.bis (V.24 or V.35) interface.

Note: All networks currently supported by the System/36 and System/38 will also be supported by the AS/400 System.

Network Management Facilities

The AS/400 System provides communication and system management (C&SM) functions that allow the management and control of the AS/400 system in a System/370 host-controlled network, in an AS/400 peer network, and as an intermediate node in a System/370, AS/400, or IBM Personal Computer network. Change management, change distribution, problem management, and problem determination functions are provided.

- Alerts support to NetView, System/36, System/38, and AS/400

The alerts support allows problems detected within the network to be quickly reported to a network operator located at a central site for problem management, thereby allowing for increased uptime for the network. The system at the central site could be another AS/400 System, a System/36, System/38, or a System/370 with the NetView licensed program.

The alert notifies the AS/400 network operator of an actual or impending loss of resource and provides information about the problem including recommended actions.

- Token-Ring Network management support
This support records and reports problems related to token-ring adapters and media. The operator is notified when hard or soft errors occur.
- Distributed host command (DHCF)
The OS/400 distributed host command facility allows the users of display stations of a System/370, using the Host Command Facility (HCF) companion program under ACF/VTAM, to:
 - Interactively operate and control an AS/400 System as if attached as a remote AS/400 workstation
 - Use the operations and service facilities of any AS/400 System in this HCF/DHCF network to do remote problem analysis on any AS/400 System in the network
 - Access and control applications on each AS/400 System in the network

- Perform problem determination and error diagnostics on any AS/400 system in the network
- Link problem determination aid (LPDA)

The OS/400 LPDA function provides data about network components for problem determination.
- Distributed Systems Node Executive (DSNX)

The OS/400 Distributed Systems Node Executive (DSNX) support allows the AS/400 System, System/36, and IBM personal computer to become part of an SNA network in which distribution of data objects and installation of software changes are centrally controlled at the System/370 focal point by NetView™ Distribution Manager (NetView DM).

Communications Facilities

- Remote workstation support

Workstations from the 5250 family of displays and printers (as well as programmable workstations that emulate the 5250) are supported via 5250 remote controllers.
- Intersystem communications function (ICF)

Intersystem communications function provides support for program-to-program communications between the AS/400 System and other systems by means of a consistent application interface to the various communication types supported. The following communication types are supported by ICF:

 - Advanced program-to-program communications
 - Advanced peer-to-peer networking
 - SNA upline facility (SNUF)
 - BSC equivalence link (BSCCL)
 - Asynchronous communications
- Advanced peer-to-peer networking (APPN)

APPN provides a way to establish and maintain a network of AS/400 Systems, System/36s, and other IBM systems in a powerful, easy-to-use manner. The AS/400 user can install and keep up to date a complex network of interconnected systems without requiring highly-skilled programmers.
- Advanced program-to-program communication (APPC)

APPC allows a program on one system to communicate with a program on a remote system so that users can run applications and have access to functions not available on the local system.
- SNA distribution services (SNADS)

The OS/400 SNADS support is an integrated queued asynchronous connection to a SNADS network and remote document libraries. It provides routing, sending, and receiving operations for users to exchange distributions containing messages, data, or objects with other users in the SNADS network.

- Network configuration menu

The network configuration menu provides options to:

 - Work with SNA distribution services (SNADS)
 - Work with the system distribution directory
 - Work with the VM/370 RSCS/PROFS Bridge services.
 - Work with the remote document library services
- Object distribution facility

The object distribution facility uses SNA distribution services (SNADS) to exchange objects between peer-connected systems. Information such as data files, source code, and print files can be easily exchanged between the AS/400 System, System/36, and System/38. The object distribution facility, when coupled with DSNX, can redistribute files and programs received from a System/370 host to another system.
- Display station pass-through

Display station pass-through allows a user attached to a local AS/400 System to be connected to a remote System/36, System/38, or another AS/400 System, sign on to that system, and execute applications or perform network management functions as if connected directly to the remote system. System/36 and System/38 users can also sign on to an AS/400 System and perform the same functions.
- Distributed data management (DDM)

DDM provides both source and target support as defined in Level 1.0 of the DDM architecture. Source DDM provides the ability to process a file on another system that supports target DDM (for example, System/36, System/38, CICS/VS, or another AS/400 System). Target DDM provides the ability to process file requests received from another system that supports source DDM (for example, System/36, System/38, IBM Personal Computer or Personal System/2, or another AS/400 System). Target DDM also supports the shared folders function of PC Support.
- SNA upline facility to System/370 IMS and CICS hosts

The SNA upline facility provides the AS/400 user with communications to:

 - CICS/VS (as LU0) and IMS/VS (as LU-P)
 - CICS/DOS/VSE (as a 3790)
 - CICS/OS/VS (as a 3790)

This provides for program-to-program communication between AS/400 and System/370 programs and supports customers migrating from SNA upline facility on System/36 as well as DSNX.

Operating System/400 (OS/400)

- Serial autodial modem support

Autodial support is provided on the AS/400 System so that users can communicate with other systems by automatically dialing remote systems under control of an application program or procedure.

- 3270 device emulation

3270 device emulation allows any AS/400 5250 display or printer to emulate a 3278 Model 2 or 3279 Model S2B display or 328X printer.

- System/370 – Personal Computer File Transfer

By using the Personal Computer System/370 File Transfer PRPQ (P84132 5799-PEH), IBM Personal Computers attached to the AS/400 System running DOS with 5250 or Token-Ring Network adapters can exchange files with the System/370.

- 3X74 remote attach

3X74 remote attach allows 3270 remote control units or IBM Personal Computer executing PC 3270 Emulation, Version 3, to be attached to the AS/400 System via an SNA/SDLC communications port (3174/3274) or IBM Token-Ring Network (3174 Model 3R or Model 53R).

- 5294

The 5294 Remote Control Unit can be used to attach up to eight 5250-type displays and printers to an AS/400 System via a communications link.

- 5394

The 5394 Remote Control Unit attaches up to 16 5250-type displays and printers to an AS/400 System via a communications link. The function provided to the remotely-attached workstations will be identical to that provided to the local workstations.

- 4700/3694 finance support

The finance support provides the capability to attach to AS/400 Systems:

- 4701/4702 Finance Communication Controllers via SNA/SDLC and SNA/X.25 communications lines
- 3694 Document Processors via SNA/SDLC communication lines

An application program interface is also provided for a high-level interface to this support.

- File transfer support

The AS/400 user can access file transfer support to exchange System/36 data and/or library members as well as AS/400 data base file members with other AS/400 Systems and System/36s.

- Interactive terminal facility (ITF)

ITF allows an AS/400 user, using async support, to send and receive data through applications such as electronic message services. ITF also exchanges files and library members with other ITF users.

- Binary synchronous communications equivalence link (BSCCEL)

BSCCEL support on the AS/400 System allows a program to start a program on another system that also has BSCCEL support: AS/400, System/36, or System/34

- VM/370 RSCS/PROFS bridge and RJE support

The AS/400 System can function as a bridge to VM/370 RSCS/PROFS, using the binary synchronous (BSC) protocol. This bridge provides support to allow the movement of mail and files to and from VM/370 RSCS/PROFS.

Office Host Services

The AS/400 System provides office host services for DIA devices and IBM AS/400 Office.

Major functions include:

- Document Interchange Architecture (DIA) host support
- Systems Network Architecture distribution services (SNADS)

DIA host services allow the AS/400 System to serve as an office systems host for document distribution and document library services. The support allows users to work with their own documents and objects or to work on behalf of another user.

DIA host services are available to the 5250 family of workstations through the AS/400 Office licensed program (5728-WP1) and to IBM Personal Computers through the AS/400 PC Support licensed program (5728-PC1). DIA host services also support the 6580 Displaywriter.

- Document distribution services

DIA distribution services provides support for sending documents to and receiving documents from other office systems hosts in an SNA LU6.2 network. Document interchange uses the OS/400 SNADS support.

- Document library services

Document library services allow local and remote systems office users to store and control access for documents in the local document library on an AS/400 System and search for them by using the descriptions stored with the documents. OS/400 functions include DIA document library services for remote users of AS/400 Office, System/36 Personal Services/36, and Displaywriter (via electronic document distribution). Folder management

services and transforms are provided on the local AS/400 System.

- **Print and view services**

Print services include draft and letter-quality support with special handling options for certain printers. View services include support for viewing final-form documents and the text portions of a compound document.

- **Creation of spelling aid dictionaries**

Spelling aid dictionaries may be created for use with proofreading aids in the AS/400 Office licensed program (5728-WP1) and the text management/38 utility (included in the AS/400 System/38 Utilities licensed program, 5728-DB1).

National Language Support, National Language Versions, and Multilingual Support

National Language Support

The local workstation controller on the AS/400 supports displays/keyboards for the following countries/languages: Arabic, Belgium, Canadian French, China (Peoples Republic of China and Taiwan), Cyrillic, Denmark, Finland, Germany/Austria, France, Greece, Hebrew, Iceland, Italy, Japan, Korea, Latin America, Latin-2 languages, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, and Yugoslavia.

National Language Versions

The machine readable information, such as screens and messages, for selected software products is available in the following languages: Belgium Dutch, Belgium French, Canadian French, Danish, English, Finnish, French, German, Icelandic, Italian, Japanese, Korean, Dutch, Norwegian, Portuguese, Spanish, Swedish, and Traditional Chinese. Not all national language versions are available from all program libraries.

Multilingual Support

AS/400 provides the capability of concurrent multilingual support. This allows the system to present and receive information in one national language for one user, while presenting and receiving information in different languages for other users.

(In Europe, the national language versions installed for multilingual support should be MNCS — multi-national character set, code page 500. The devices used for multilingual systems should be configured for the international code page 500.)

AS/400 Software

Products Included

- AS/400 BASIC
- COBOL/400
- AS/400 PL/I
- RPG/400™
- AS/400 Pascal
- AS/400 System Migration
- AS/400 Performance Tools
- AS/400 Application Development Tools
 - Programming Development Manager (PDM)
 - Source Entry Utility (SEU)
 - Screen Design Aid (SDA)
 - Data File Utility (DFU)
 - Advanced Printer Function Utility (APF)
- AS/400 Communications Utilities
- AS/400 PC Support
- AS/400 Office
- AS/400 Language Dictionaries
- AS/400 Query
- AS/400 Business Graphics Utility
- Structured Query Language/400™
- Operating System/400™ — see separate description, Section 64
- Total System Packages — see separate description, Section 64

Programming Languages

The AS/400 programming language licensed programs are, in general, suited for either commercial/business or computational and analysis applications. The language of choice for application development will be based on many factors, including: language syntax, function supported by the language, language suitability to the application, and coding skills of available programmers.

All of the AS/400 programming language licensed programs enable application development and enhance programmer productivity when used in conjunction with the AS/400 Application Development Tools (ADT). The ADT is integrated with the operating system to form an application development environment.

The AS/400 programming language licensed programs — AS/400 BASIC, COBOL/400, AS/400 PL/I, and RPG/400 — all support the following functions:

- Ease-of-use characteristics for programmers and third-party and support organizations
- Increased programmer productivity through inter-language calls
- Graphics capabilities accessible through GDDM (Graphical Data Display Manager), PGR (Presentation Graphics Routines) and BGU (Business Graphics Utilities)
- Extensive data base and workstation support through externally-described data and display device definitions, data base file extensions, subfile extensions, workstation extensions, and local/remote workstation transparency
- Interactive syntax checking provided by the source entry utility (SEU) component of the AS/400 Application Development Tools. Batch syntax checking can be performed by the compiler.
- Extensive error diagnostics during compilation
- Ability to execute authorized CL commands without having to terminate the session
- Increased/improved function over System/36 and System/38 languages

AS/400 BASIC

AS/400 BASIC (Beginners' All-purpose Symbolic Instruction Code) is a high-level programming language used for solving business, technical, or scientific problems. AS/400 BASIC is designed to be easy to learn and use. It allows the programmer or casual user to concentrate on the application or program design rather than the programming task.

- Interpreter for interactively entering, debugging and running AS/400 BASIC source programs or procedures
- Compiler for creating AS/400 BASIC program objects. Compiled programs provide for greater execution speed than interpreted programs.
- Interactive debug facilities provided for compiled AS/400 BASIC programs that enhance programmer productivity in program creation and maintenance
- Support for floating-point and scientific notation
- Full-screen processing for formatting display screens
- AS/400 BASIC design that follows the specifications of the American National Standard Programming Language BASIC, ANSI Minimal BASIC X3.60-1978, and Federal Information Publication Standard (FIPS) PUB 68-1
- AS/400 System/36 Migration Aid (5727-MG1) that converts System/36 BASIC subroutine members to source before migrating to the System/36 environment on the AS/400 System
- AS/400 System/38 Migration Aid (5714-MG1) that supports the migration of System/38 BASIC programs and files to the System/38 environment on the AS/400 System
- AS/400 BASIC compiler that will accept and compile System/38 BASIC source programs. These programs will then execute on the AS/400 System.

COBOL/400

COBOL/400 (Common Business Oriented Language) is a programming language that is especially efficient in the processing of business problems. COBOL can be used to manipulate large files of data in a relatively simple way. COBOL uses English-like syntax that assists the programmer in generating self-documenting, structured-programming constructs.

COBOL/400 capabilities of the COBOL/400 licensed program include the following:

- On the AS/400 System, COBOL/400 delivers many elements of the IBM Systems Application Architecture (SAA) COBOL common programming interface (CPI).
- COBOL/400 is designed according to the specifications of the American National Standard Programming Language COBOL, ANSI COBOL X3.23-1985, Intermediate Level, Standard of the International Organization for Standardization ISO 1989-1985, and FIPS PUB 21-2.
- Supports imbedded SQL statements and inter-system communication functions
- Has interactive debug facilities for compiled COBOL/400 programs, which enhance programmer productivity in program creation and maintenance
- Has full-screen processing for formatting display screens

The AS/400 System/36-compatible COBOL and AS/400 System/38-compatible COBOL capabilities of the COBOL/400 licensed program include the following:

- Interactive debug facilities for compiled programs, which enhance programmer productivity in program creation and maintenance
- AS/400 System/36-compatible COBOL capabilities of the COBOL/400 licensed program, which accept and compile System/36 COBOL source programs. These programs then execute in the System/36 environment on the AS/400 System.
- The AS/400 System/38-compatible COBOL capabilities of the COBOL/400 licensed program, which accept and compile System/38 COBOL source programs. These programs then execute in the System/38 environment on the AS/400 System.
- System/36-compatible and System/38-compatible capabilities, which accept and compile COBOL programs written in accordance with the ANS COBOL X3.23-1974 standard

AS/400 PL/I

AS/400 PL/I (Programming Language I) is a general-purpose programming language suited for use in commercial, scientific, and system programming application areas.

- Support for imbedded SQL statements

- Procedural-based language that supports floating point, pointers, bit and string manipulation, picture editing, and error trapping
- Interactive debug facilities for compiled AS/400 PL/I programs that assist programmer productivity in program creation and maintenance
- Full-screen processing for formatting display screens
- AS/400 PL/I design that follows the specifications of the American National Standard Programming Language PL/I General Purpose Subset, X3.74-1981 with extensions, restrictions, and omissions. A complete list of the extensions, restrictions and omissions is detailed in the *AS/400 Languages: PL/I User's Guide and Reference* (SC09-1156).
- AS/400 PL/I compiler that will accept and compile System/38 PL/I source programs. These programs will then execute on the AS/400 System.

RPG/400

RPG/400 (Report Program Generator) is a popular business language. It is designed for writing application programs, ranging from basic report writing and inquiry programs to more comprehensive applications such as payroll, order entry, and production planning. The language is easy to learn, yet offers many advanced functions for experienced programmers.

- On the AS/400 System, RPG/400 delivers many elements of the IBM Systems Application Architecture (SAA) RPG common programming interface (CPI).
- It supports imbedded SQL statements and inter-system communication functions.
- Interactive debug facilities for compiled RPG/400 programs assist programmer productivity in program creation and maintenance.
- RPG has full-screen processing for formatting display screens.
- RPG/400 has functional improvements beyond the System/38 RPG III.
- The RPG/400 compiler will accept and compile System/38 RPG III source programs. These programs will then execute in the System/38 environment on the AS/400 System.
- The AS/400 System/36-compatible RPG II compiler option of the RPG/400 compiler will accept and compile System/36 RPG II source programs. These programs will then execute in the System/36 environment on the AS/400 System.
- AS/400 System/36-compatible RPG II has improved programming limits.

AS/400 Pascal

AS/400 Pascal is a general-purpose application-development language. Pascal has gone beyond its original goals as a language for teaching computer programming, and is now being increasingly used commercially for application development.

- AS/400 Pascal is based on the VS Pascal Release 1.0 (5668-767) compiler.
- AS/400 Pascal provides constructs for defining data structures in a clear manner.
- Increased programmer productivity is provided through interlanguage calls.
- Its syntax and semantics allow extensive error diagnostics during compilation. A program written in AS/400 Pascal can have extensive execution run-time checks. Its semantics allow efficient object code to be generated.
- AS/400 Pascal programs that are compiled with the debug option can be debugged at any time. The program source statement numbers and variable names are used when requesting debug functions.
- AS/400 Pascal is designed according to the specifications of the American National Standard Programming Language Pascal, ANSI Pascal X3.97-1983, and FIPS PUB 109.

AS/400 System Migration

System/34, System/36, and System/38 Software Support

AS/400 System executes many applications that users have written for the System/34, System/36, or System/38, with little or no change. The AS/400 System provides users with environments that, in many cases, eliminate the need for software modifications before executing the application on the AS/400 System. End users of these migrated applications should see little or no difference.

The applications are migrated to the AS/400 System/36 environment or the AS/400 System/38 environment. Once migrated, these applications can access new AS/400 System function.

Not all System/34, System/36, and System/38 applications will run on the AS/400 System. Some applications will require modification or will need to be rewritten before they can execute on the AS/400 System.

Migrating System/34 Applications

The System/34 to System/36 Migration Aid (5727-MA1), which runs on the System/34, may be used to support the System/34 to AS/400 System migration process. Most System/34 applications will execute in the System/36 environment on the AS/400 after compilation, modification, and testing.

System/36 Migration Aid

The System/36 Migration Aid provides the facilities on the System/36 to analyze data, libraries, files and programs prior to saving them for migration to the AS/400 System. During the planning and preparation phase of the migration, an application can be analyzed to identify functions not supported on the AS/400 System that require conversion.

The migration process is clearly defined by a menu-driven interface with the options required to migrate most items from the System/36 including files and data providing system-related information, for example, security, workstation configuration information and document folders. In this way, the System/36 Migration Aid can migrate single libraries and files or the entire system at one time.

The migration effort is completed on the AS/400 System using the migration aids contained within the Operating System/400. Once an item has been moved to the AS/400 System, any conversion required for that item is automatically invoked by those migration aids. Compilation of migrated source code can be automatic or user-controlled. All application source may be saved and restored on the AS/400 System though some languages may not be recompiled. System/36 BASIC must be modified before recompilation. System/36 FORTRAN, System/36 Assembler, and System/36 Work Station Utility (WSU) are not supported on the AS/400 System. This Migration Aid will identify for the programmer the changes required for execution on the AS/400 System. User-written applications migrated this way will execute on the AS/400 System using the System/36 environment support.

System/38 Migration Aid

System/38 Migration Aid has many similarities to the System/36 Migration Aid. It provides functions and facilities on the System/38 to select and analyze System/38 objects and to migrate them to the AS/400 System.

Automatic conversion of Personal Services/38 documents and virtual disks is provided on the AS/400 System. System/38 programs may be transported in object code format to be reencapsulated automatically on the AS/400 System. This is provided for the following languages:

- RPG III
- COBOL '74
- PL/I
- BASIC
- Command Language (CL)

Consideration must be given for the few functions that existed on System/38 that are not on the AS/400 System; for example, 96-column card and diskette magazine support.

System/38 Utilities

The System/38 Utilities licensed program provides functions that are compatible with System/38 Release 8 functions to allow applications dependent upon those functions to be migrated to the AS/400 System. These functions are also tools used by the application developer on System/38.

Data File Utility/38 (DFU/38) permits users to establish their own data entry application, optimized for their use, and unique to their requirements, similar to the System/38 Release 8 Interactive Data Base Utilities (DFU) function.

Query/38 provides the capability to access, not change, information in data base files. The user first creates the query application by responding to a series of menus and prompts. The application may then be executed to produce the report (printed or displayed) or output to a data base file. As with DFU/38, Query/38 provides compatibility with the System/38 Release 8 Interactive Data Base Utilities query function.

Text Management/38 provides word processing capabilities to migrating System/38 customers with no integrated AS/400 Office support. Text Management/38 allows users to create, store, retrieve, revise, check document spelling, provide synonyms and automatic hyphenation, and print documents.

AS/400 Performance Tools

The AS/400 Performance Tools licensed program simplifies for the user the process of evaluating AS/400 System usage.

Given normal growth within a business and the ever-increasing application demands being put on the data processing area of a business, users need to monitor changing system workloads and plan for future system requirements. The AS/400 Performance Tools provide a set of easy-to-use tools that can assist with these tasks. The capacity planning support can also be used to help the System/36 customer migrate to the appropriately-sized AS/400 System to meet performance requirements.

Features of the AS/400 Performance Tools licensed program include the following:

Menu Interface

This easy-to-use menu interface can be used to control performance-data collection, help in managing the resulting data, and access the other functions provided by the performance tools.

Performance-Data Collection

Information on overall system performance is provided. Throughput, initial response times for both local and remote terminals, main storage and auxil-

iary storage usage, and communication statistics are reported. The program makes use of the performance-data collection function that is integrated into the OS/400 operating system.

Performance Reports

The performance reports will aid in tuning the system. The system-level report can be used to detect the increasing utilization of key system resources. The performance reports go to a level of detail that provides a diagnostic capability for performance problem determination.

With these reports the user can maintain a performance history on the workload being run and its resource utilization. This history can give early warning as to growth trends that may impact the user's performance objectives.

Capacity Planning

A capacity planning function is available to help project future system requirements. The capacity planner incorporates a performance model, an evaluator and a high level configurator that will assist the user in configuring a balanced system that meets resource utilization guidelines as well as optional response time and throughput objectives.

The capacity planning function is integrated into the data collection and reporting support. Electronic input of the data needed by the capacity planner allows the user to more easily do capacity planning and also allows for increased accuracy by projecting future requirements based on actual measured data.

The capacity planner can also be used to help the System/36 customer migrate to the appropriately sized AS/400 System to meet performance requirements.

Programmer Utilities

A set of programmer utilities is provided to help with the performance analysis of applications. The level of detail provided allows the skilled programmer to easily identify potential performance problems and assists the programmer in making application changes that will eliminate the problems.

AS/400 Application Development Tools

The Application Development Tools licensed program, together with a programmer's menu and a data dictionary capability provided within the Operating System/400, are integrated to form the AS/400 application development environment. This environment supports a comprehensive, integrated approach to application development that can increase programmer productivity. The following functions are available in the Application Development Tools licensed program:

Programming Development Manager (PDM)

The programming development manager provides a focal point and an integrated environment for using the development tools. PDM works with lists of items to be developed or maintained. The benefit of the tools being integrated is that the user always returns to a list after use of a tool is complete. PDM automatically invokes the command appropriate to a desired option with correct parameters and syntax, thereby reducing keystrokes and errors.

The programming development manager provides an enhancement to the functions provided by the Programmer and Operator Productivity (POP) PRPQ on System/36 in the following areas:

- Improved user interface: for example, scrolling within lists
- Interactive access to other tools: source entry utility, screen design aid, data file utility, and compilers
- Extendability with customer-owned tools through user-defined options

Source Entry Utility (SEU)

SEU is a full-screen editor providing syntax checking of source statements and a member list facility for selecting members to work with. Commands have a strong affinity with those provided by the System/370 Program Development Facility (PDF) editor as well as the System/36 Development Support Utilities (DSU) editor and System/38 Source Edit Utility (SEU).

Languages actively supported are:

- RPG/400, COBOL/400, AS/400 BASIC, AS/400 PL/I
- RPG II for compatibility with System/36
- COBOL '74 for compatibility with System/36 and System/38

Screen Design Aid (SDA)

With SDA, a programmer or analyst can interactively design, create, and maintain customer application screens and menus.

Screen Design Aid provides support in the following environments:

- AS/400 environment for newly-developed AS/400 screens
- System/36 environment for screens being maintained for System/36 migrated or distributed applications
- System/38 environment for screens being maintained for System/38 compatibility

Data File Utility (DFU)

Data file utility can be used to define, create, and maintain data base applications that are primarily oriented to data entry, inquiry, or file maintenance. It is also especially useful in creating test data for an

application being developed. DFU can be interactively accessed from PDM lists.

All AS/400 file access methods are supported: sequential, indexed and direct. Applications created take advantage of the data file utility runtime support provided within the Operating System/400, which includes the ability to update a file without creating a program. DFU allows a user to define data entry screens in System/36 format. This allows DFU programs to be maintained for System/36 compatibility.

Advanced Printer Function Utility (APF)

The advanced printer function utility (APF) supports advanced function printing on the 5224 and 5225 printers, including forms generation, alternate character capability, optical character recognition (OCR) printing, and support for creating logos and generating bar graphs and bar codes. Migration and comparable functions are provided for System/36 APF (5727-AP1, 5727-AP6) and System/38 APF (5714-UT2) licensed programs.

AS/400 Communications Utilities

The IBM AS/400 Communications Utilities program is composed of a VM RSCS/PROFS bridge and remote job entry functions. These capabilities provide for interchange of mail and files between nodes connected to the AS/400 System.

VM RSCS/PROFS Bridge

The VM RSCS/PROFS bridge provides support to allow the movement of mail and files to and from VM PROFS and RSCS, using the binary synchronous communication (BSC) protocol. This support could also include nodes connected to the AS/400 and VM RSCS systems.

Note: The term "VM" refers to VM/SP (Virtual Machine/System Product) with or without HPO (High Performance Option).

- Mail interchange between AS/400 and VM PROFS users

An AS/400 System, with the VM RSCS/PROFS bridge capability of Communications Utilities, may act as a bridge between PROFS users and users of AS/400 Office, Personal Services/36, Personal Services/38, Displaywriter, and Distributed Office Support System (DISOSS).

- File interchange between AS/400 and VM RSCS users

The VM RSCS/PROFS bridge capability of Communications Utilities enables the AS/400 System to exchange with RSCS any files, spooled output, or messages generated by the Object Distribution Facility (ODF) on either the AS/400 System, System/36, or System/38.

The AS/400 System as an RJE Workstation to a Remote Host

The remote job entry portion of the Communications Utilities allows the AS/400 System to function as a remote job entry (RJE) workstation for submission of jobs or receipt of output from a host system 308X, 3090, 937X, or 43XX using binary synchronous communications (BSC) and/or Systems Network Architecture (SNA) over synchronous data link control (SDLC) lines, or X.25, X.21, or Token-Ring Networks. Remote job entry facility (RJEF) supports communications with such host products as MVS/SP JES2, MVS/SP JES3, and RSCS Networking (VM).

- SNA/SDLC support
 - Multiple RJE sessions can run concurrently with other SNA/SDLC activity on the same line and with other AS/400 System program and device operations. For example, RJE functions may operate concurrently with 3270 Device Emulation and Advanced Program-to-Program Communications (APPC) programs.
 - Up to 15 readers, 15 printers, and 15 punches can operate concurrently. The maximum number of readers, printers, and punches is dictated by the host system.

RJEF communicates with the host system using Systems Network Architecture (SNA) over a switched or nonswitched point-to-point, or multi-point Synchronous Data Link Control (SDLC) line or over an X.25 or X.21 or Token-Ring Network. It is also possible for the AS/400 System to run RJEF on a Token-Ring Network.

- BSC support
 - Console input/output
 - Multileaving support concurrent with other AS/400 System programs and device operations
 - Ability for RCEF to use the host job name for spooled file names for BSC print files as SNA does
 - Up to seven readers operating concurrently
 - Up to seven printers operating concurrently
 - Up to seven punches operating concurrently

The maximum number of readers, printers, or punches is dictated by the host system. The total number of printers and punches operating concurrently cannot exceed eight in any combination.

RJEF communicates with the host system over a point-to-point (switched or nonswitched) communications line via BSC.

AS/400 PC Support

Workstation Function

The workstation function enables attached personal computer users to emulate AS/400 display workstations, printers, or graphics workstations.

- Data transfer
 - The transfer function allows data to be transferred to or from the personal computer. Data transferred from an AS/400 System to a personal computer can be sent to a display, a printer, or a personal computer file. Data can also be transferred from a personal computer file to an AS/400 data base file.
 - The transfer programs provide a user interface via displays and prompts to assist personal computer users in creating, modifying, or running a transfer request. The newly created transfer requests can then be saved, recalled and used again without prompting.
- Organizer

The organizer allows both personal computer functions and AS/400 functions to be run from a single menu interface. Some of the functions that can be selected from these default menus are:

 - Calendars and mail
 - Create, revise, copy, delete, view, print, rename, describe and/or send documents contained in AS/400 folders
 - Send and receive notes and documents.
- Shared folders

Shared folders can be used transparently to store data and applications from personal computers as though they were personal computer fixed disks. Shared folders also allow personal computer users and system users concurrent access to a shared folder. Through shared folders, all documents and folders may be protected by AS/400 security.
- Virtual print

PC Support allows the personal computer to use the AS/400 system printers. Up to three virtual printers can be assigned. These printers can be any combination of personal computer printers and system printers (called virtual printers).
- Message function

Personal computer users have the capability to send and receive messages to or from other display stations, to other personal computers attached to an AS/400 System, and to users located elsewhere in the network. Messaging can be done in either personal computer mode or workstation mode via all connections supported by PC Support.
- Ease-of-use enhancements
 - An install program is provided which sets up the personal computer user's environment through a series of simple prompts.
 - A PC Support product menu is available for the selection of PC Support programs.

AS/400 Software

- The configuration file support program simplifies the configuration and customization of the personal computer work environment.
- An update function has been added that provides automatic replacement of PC Support programs to the personal computer.
- The PC Support interactive programs follow many of the common user access (CUA) specifications for independent workstations. CUA specifications provide for consistent key assignments and uniform screen formats to make personal computer programs easy to learn and productive to use.

- Support of expanded memory

Conventional memory in the personal computer has previously been limited to 640KB. Expanded memory is memory addressable through a combination of an expanded memory specification (EMS) device driver and an EMS-capable hardware adapter. PC Support shared folders is enhanced to make use of expanded memory.

- Coresidence

AS/400 PC Support and the IBM PC Local Area Network (LAN) Program Version 1.3 may be run concurrently from a single personal computer. This capability provides the personal computer user with additional flexibility and function.

- Concurrent communications with multiple AS/400 and System/36 users

Customers with a mixed environment of AS/400 and System/36 units can use the Coexistence Enhancement feature for PC Support/36 PRPQ's (P84168, P84169). These PRPQ's allow personal computer users concurrent access to data on any AS/400 or System/36 in the network.

- Compatibility

The following IBM licensed programs are compatible with the AS/400 System and PC Support and will operate as described in their program documentation.

- The 5250 Emulation Session Manager PRPQ (5799-PGN) provides windows and Personal System/2 mouse support to PC Support workstation function users.
- Distributed Data Management for the IBM Personal Computer (DDM/PC) (59X3653) allows user-written personal computer application programs to have concurrent, record-level access to data files that reside on AS/400, System/36, System/38, or System/370 CICS/OS/VS. General file management functions are also available.
- The PC System/370 File Transfer PRPQ (5799-PEH) enables personal computer users to exchange files with System/370 through AS/400 3270 device emulation (3270DE) communications.

- Personal computer users can participate in distributed processing networks where NetView Distribution Manager (DM) manages the controlled distribution of software and data by using IBM Personal Computer Distributed Systems Node Executive (PC/DSNX) (6476171). The supported network configuration is a System/370 as a focal point, any number of AS/400 or System/36 units as intermediate nodes, and any number of personal computers downstream as end points.
- The IBM PC/AT Menu-Based Natural Language Query PRPQ (5799-PGC) and the IBM PS/2 Menu-Based Natural Language Query PRPQ (5788-PGP) allow the personal computer user to build and run queries against the host data base(s) in English rather than in computer languages.

- National language support

Only one national language version of AS/400 PC Support may be installed. PC Support does not support a multilingual environment.

AS/400 Office

AS/400 Office licensed program (5728-WP1) includes a complementary set of office functions as part of the integrated AS/400 office support. It gives enrolled users access to office functions from AS/400 workstations. The communications support enables users to participate in IBM office networks for purposes of document, note, and message interchange. AS/400 Office has:

- Easy-to-use operating characteristics
- Full-function word processing for AS/400-dependent displays and IBM Personal Computers
 - Proofreading aids
 - Compound document support (text, graphs, and image merged when printed)
 - Data/text merge
- Calendar services
- Personal directories
- Mail handling
- Document/folder management
- Administration
- Access to office services in the Operating System/400 program product including:
 - Document distribution services
 - Document library services
 - Folder management services
 - Data stream transforms
 - Print and view services
 - Application programming interface (API) for document distribution services, distribution directory services, editor services, security services, document library services
 - Creating spelling aid dictionaries

Easy-To-Use Operating Characteristics

- Menu-driven, prompted interface to all functions
- System-guided operation for the novice user
- Optional menu bypass, fast path, and line commands, in word processing, for experienced users
- Cursor-sensitive help and natural-language index search assistance
- Task interruption – suspending multiple tasks and resuming in any order
- Menu tailoring of the main office menu and menu creation
- Documentation aimed at beginning and experienced users

Full-Function Word Processing

Word processing functions offer a broad level of function for simple or advanced editing capabilities on either AS/400-dependent displays or IBM Personal Computers.

- List processing
- Status line
- Document processing options
- Editing capabilities
- Flexible data/text merge
- Proofreading aids
In one pass, up to six IBM dictionaries can be used, at one time, plus a user and system supplemental dictionary.
- Word-processing support for the 5250 family of displays
- Word processing in the AS/400 PC Support environment
- Compound documents
The AS/400 editor supports the inclusion of an instruction to imbed graphics and image objects in a document.

Calendar Services

The calendar functions allow users to easily and quickly manage their day-to-day activities. These activities can range from the simple daily reminder or "to do" items to scheduling a meeting for a large group or starting a job on the system.

Personal Directories

The personal directory facility allows users to create, maintain, and print personalized lists of data (for example, phone numbers or client addresses). The directory information can be retrieved by using exact, generic, or contextual search words.

System Distribution Directory and Distribution Lists

The system distribution directory is a system-provided service used by Office as well as other system components. In Office it provides for:

- A seamless interface to the directory and distribution lists for mail handling
- Both network address and personal data

Distribution lists:

- Can be built from the system distribution directory
- Are maintained automatically when the system distribution directory is updated

Mail Handling

AS/400 Office provides the user with menu-driven access to mail handling functions. The functions described for document distribution and document library services are part of the Operating System/400 program product support.

The mail handling functions enable the user to send and receive mail to and from users on their system or other IBM office systems in the network. The users can keep hard-copy mail references on the system to aid in later retrieving those references together with electronically filed mail. All users can handle their own mail or allow someone to work on their behalf.

Document and Folder Management**Administration**

Support is provided for ongoing administration and maintenance of office objects.

Administration functions allow all users to maintain many of their office objects while providing certain additional capability to be handled only by a designated administrator. This offers customers the ability to administer the office environment according to their individual needs.

Access To Office Services

AS/400 Office users have access to the services provided in the Operating System/400 program product for sending, receiving, viewing, filing, and printing their mail and documents.

- Document distribution services

A set of related office functions that provide electronic document distribution, directory services, user list maintenance functions, and messages. Electronic document distribution is supported by the IBM office system architectures: Document Interchange Architecture (DIA), Document Content Architecture (DCA), and SNA distribution services (SNADS).

- Document library services

Document library services provide users with a single repository where they can file electronic mail or documents they have created. Users of document library services can use either dependent displays or IBM Personal Computers using PC Support.

Document library services and transforms are included in the IBM Operating System/400 office host support.

Remote document library services:

- AS/400 Office users can access a document library on DISOSS, System/38 and other AS/400 Systems.
- The AS/400 Office host document library services can provide remote document library services for PS/36, DisplayWriter, and other AS/400 users.
- Print services, to prepare, specify, and select print options
- View services, to view final-form documents on a display
- Application programming interface (API)
 - Document distribution services API allows the customer to interface with the following functions:
 - Send a distribution
 - Receive a distribution
 - Cancel a distribution
 - Query a distribution queue
 - Distribution directory services API allows the user to:
 - Manage and display the directory
 - Add, change, and delete directory entries
 - Manage and display distribution lists
 - Create and delete lists and add/remove list entries
 - Document library services API allows the user to:
 - File a document
 - Query a document library or folder
 - Retrieve a document
 - Replace a document
 - Delete a document folder
 - Editor services API allows the customer to write programs using the command language interface to:
 - Work with document functions such as creating, displaying, editing, merging, paginating, printing, and checking document spelling
 - Create/delete spelling aid dictionaries
 - Work with folders or text profiles
 - Security services API provides the customer with a way to use a command programming interface to handle functions to:
 - Add, display, or remove document access codes and grant or revoke authority to access codes
 - Grant or revoke user permission to work on behalf of another
 - Add, change, display, edit, and remove authority to objects in the document library or to change the ownership

Functions for the Experienced System/36 User

Previous users of DisplayWrite/36 will find the AS/400 word-processing functions to be very much like those found in DisplayWrite/36 Release 5 Modification Level 1 with additional enhancements. There are limited changes in some areas of the interface, which were made as a result of integrating the office function and complying to the SAA dependent display interface standards.

Previous users of Personal Services/36 will find familiar function, with new features added in the area of calendar management, mail handling with local and remote library support, and with the addition of an application programming interface (API). The APIs provide a set of commands for user-written programs for document distribution services, distribution directory services, document library services, security services, and word processing services allowing users to use certain office services and integrate office with business applications.

Functions for the Experienced System/38 User

Previous users of Personal Services/38 editor and Text Management will find the AS/400 Office word-processing functions to be based on the DisplayWrite/36 and its folder management concepts. The AS/400 Office word processing function provides all of the DisplayWrite/36 level of function plus the run instruction – known as the execute instruction on the System/38 – footnotes, alternating headers and footers, and improved linguistics performance.

Personal Services/38 users will find many of the other office functions to be enhanced but very familiar in the areas of calendar management, personal directories, and mail-handling characteristics. Added functions include scheduling the date and time for a job to be started from the calendar.

AS/400 Language Dictionaries

The AS/400 Language Dictionaries can be used with the proofreading aids described and provided in the AS/400 Office licensed program. Language Dictionaries support includes:

- Eighteen language dictionaries
- Proofreading aids:
 - Spelling verification
 - Spelling aid and correction assistance
 - Synonym aid (English only)
 - Grade level aid (English only)
 - Automatic hyphenation option

During or after document creation or revision, the user may use the document proofreading aids with one or more online dictionaries including:

- IBM-supplied language dictionaries
- User-created permanent dictionaries
- User or system supplemental dictionaries

Entries in user and system supplemental dictionaries are accumulated during the process of checking the spelling of text by the user specifying that a word be added to either dictionary.

The AS/400 word processing proofreading aids allow the user to have multiple dictionaries active at one time. These dictionaries can be a combination of IBM-supplied and user-created dictionaries.

AS/400 Query

AS/400 Query licensed program (5728-QU1) is an interactive query definition, management, and execution facility providing functions used by principals, programmers, secretaries, and other office personnel to help extract and analyze data from their databases. This program allows users to define and modify queries using a variety of record selection criteria, manage their library of queries, and run the queries, all without programming knowledge. Users can control the formatting of the extracted data for display on a workstation or printer, or can save the selected data in a database file. It also provides a variety of text-data merge functions with AS/400 Office (5728-WP1). Queries produced by this product can be run on any AS/400 System with the Operating System/400 program product (5728-SS1) installed.

AS/400 Query features include:

- Query definition options:
 - Menu-driven definition, list-processing option selection assistance
- Enhanced query definition options:
 - Online help for casual users
 - Fast-path query definition
 - Comprehensive record join capability: up to 32 database files can be joined using as many as 100 join tests
 - Support for as many as 100 user-defined result fields, either numeric or character
 - Field selection and ordering of as many as 500 output fields
 - User definition and override of editing of numeric fields
 - Comprehensive record selection testing
 - Sorted output, ascending or descending, using up to 32 fields
 - Output to display, printer, and database file
 - Extended formatting functions for report writing to enhance format defaults for printed output
 - Changing a query or patterning a new query after an existing one
 - Setting up to six report breaks using up to nine fields
- Enhanced query processing characteristics:
 - Larger field sizes
 - National language support
- Extensive execution-enabling features provided by Operating System/400:
 - Execution of queries defined by AS/400 Query
 - Application enabling command-level interfaces
- Run-time overrides to query definition
- General operating characteristics:
 - All AS/400 databases files supported on the local system
 - Option to save queries for later execution
 - Accessibility from AS/400 Office for data and text merge
 - Menus and help text translated into many languages
 - Run queries interactive or noninteractive
 - Accessibility from DW4 for data merge
- Report-writing functions for SQL users
- Enhancements for System/36 Query users
- Added ease of use for System/38 users

AS/400 Business Graphics Utility (BGU)

The Business Graphics Utility licensed program provides a flexible and powerful business graphics function via a menu-driven interface. It allows organizations to integrate business graphics with business applications and office documents. The AS/400 user can create, modify, store, display, print and plot (in black and white or in color) business graphics using data from a keyboard or data base file. A chart management facility provides convenient storage, retrieval, deletion, modification, renaming, and copying. BGU highlights include:

- Menu-driven interface to business graphics functions
- Programming not required
- Extensive user options for creating charts such as:
 - Bar charts
 - Line graphs
 - Surface charts
 - Histograms
 - Pie charts
 - Venn diagrams
 - Text charts
- Input from AS/400 database files or keyed data
- Menu-driven as well as command-level access
- Support for missing values
- Chart management facility, which offers convenient storage, retrieval, copying, renaming, deleting, and modifying
- Charts that can be displayed from Control Language (CL) application programs using the DSPCHT command
- Charts that can be saved in the form of a graphics data file (GDF)
- Option to display, print, or plot a GDF with BGU
- Charts, saved in a GDF, that may be displayed, printed, or plotted using the DSPGDF command
- Access to selected AS/400 System graphics hardware:
 - Display terminals
 - Plotters
 - Printers
- BGU enhancements for the System/36 user
- BGU enhancements for the System/38 user

Structured Query Language/400

SQL/400™ support complies with the SQL defined in the System Application Architecture (SAA).

Most SQL functions may be performed either interactively or in the following high-level language programs: RPG/400, COBOL/400 and AS/400 PL/I.

SQL may be used to define tables (physical files) and views (logical files). This is similar to a DDS definition of a file.

SQL statements may be used to perform a query on a table or view. The system will respond with the records that meet the criteria for the columns/fields requested. A user may request output to the display, a printer, or a data-base file.

SQL statements may be used to perform maintenance of table/file data by specifying selection criteria and new values.

The support of SQL allows program developers to write applications that can be easily transported to different system architectures that also support SQL.

SQL is nonprocedural. Users specify what they want to do and need not be concerned with how it's done. Syntax is straightforward and easy to learn. Simple, powerful, single statements can perform the same functions as many lines of conventional code. SQL enables complex operations and simplifies typical tasks.

SQL also provides built-in functions and arithmetic operations, so programmers can perform immediate mathematical operations on data, often without writing traditional programs.

SQL may be used to access the AS/400 System relational data base. It allows the data to be viewed in a variety of formats without affecting the underlying data structure. This allows users and applications to share and access data for specific purposes.

To execute the interactive functions of SQL, the user must have the licensed program. However, it is possible to create a high-level program that uses SQL, compile it on an AS/400 System that has the SQL licensed program, and execute the object code from the compilation on any AS/400 with the Operating System/400 program installed. This allows program developers to create application solutions that use SQL even though the system executing the program does not have the SQL/400 licensed program.

Differences between SQL/400 and the System Application Architecture SQL will be described in a revision to the publication *System Application Architecture Common Programming Interface Database Reference*.

Section 65. Local Area Networks

Local Area Networks

Main Purpose

A local area network (LAN) is a high-speed information transport system operating among a number of devices usually located on the same premises.

Local area networks provide the capability to tie workstations and computer systems together for the purpose of sharing information and resources with minimal disruption to the business. With a local area network, the user can do everything standalone PCs can do and more — send messages, exchange files, share resources.

From a single workstation, a user can access information from PCs on the local area network, departmental systems (9370, System/36), and host systems (System/370). Through the use of gateways, information outside the network can be accessed via a ROLM CBX, PBX, or public switched network. Network bridges and gateways allow access to other networks and can connect multiple networks.

Local Area Network Terminology

- Transmission technique
- Topology
- Access protocol

Transmission Technique

Transmission technique refers to how information is sent over the media or physical wire. There are two types of transmission techniques for local area networks: baseband and broadband.

Most people are familiar with broadband networks. A broadband network has multiple channels, is an analog network, and requires a frequency selection mechanism. This type of network is used for cable television. Since computers do not “talk” in analog signals, broadband networks require computers to have a radio frequency modulator called an RF modulator. An RF modulator converts the information from analog to digital as the information enters the personal computer from the LAN, and from digital to analog as the information leaves the personal computer to travel onto the LAN.

The baseband network is an all-digital network. Computers can participate in this network without an RF device. Baseband networks can be less expensive than broadband because they transmit information in the same digital form that’s used by personal computers. This eliminates the need to translate

information into another form. All users of any given baseband network transmit at the same rate of speed on one channel.

Topology

Topology refers to what the network physically looks like. Topology names originate from the way the network looks. Although there are many different topologies, we’ll look at just a few.

A star topology is a point-to-point network layout. This topology has a central controlling point device at the hub. All traffic travels through that hub. Another way of thinking about a star topology is to think about a wheel with a central hub — the axle — as the controlling device, and spokes to the ends, where the terminals are located.

The bus topology is like a public transportation bus. The bus topology has one long central “aisle” as the backbone of the network, and “seats” off the main aisle, where devices are located that are attached to the network. This type of network has beginning and ending points.

The ring topology resembles a circle. There is no beginning or ending point. Generally, a ring network transmits information unidirectionally, that is, in one direction around the ring. The devices attached to this type of network attach to the ring’s outer edges.

Access Protocol

Access protocol refers to how information gets from one place to another. We need to define three different access protocols:

- Carrier sense multiple-access/with collision detection (CSMA/CD)
- Token-bus protocol
- Token-ring protocol

We will look at each of these protocols and how they operate.

A *collision detection network* operates like a conference call. Each member “listens” to see if anyone else is talking. A member of the conference call can talk if no one else is talking. If two people try to talk at the same time, the message is garbled, and each person stops for a minute to see who will talk next.

The CSMA/CD network also operates like a conference call. If no signal is detected, a machine can broadcast some information. If two machines attempt to broadcast information at the same time, a collision will occur, and information is destroyed. Each

Local Area Networks

machine involved in the collision "waits" some pre-determined amount of time before trying to rebroadcast. Other machines on the network will not try to broadcast until the collision is resolved. The first machine that resumes broadcasting occupies the network, and others wait for a no-signal condition in the normal manner. This includes the machine that was involved in the collision that did not get to broadcast after the collision was detected.

A *token-bus protocol* functions like a carrier distributing mail on a bus. The carrier starts at the front and goes in sequence to each person on one side of the aisle and then the other side, asking if he has information to send to someone else on the bus. When the carrier reaches someone who wants to send a message, he takes the message and delivers it. While the carrier is delivering the message, he cannot accept any other messages. Once the message is delivered and acknowledged, the carrier is available to collect another message.

The *token-ring protocol* operates like a cart going around in a circle. A flag on the cart indicates if it is full or empty. If the cart is empty as it passes a member on the ring, the member has the right to request that a "load" of information be delivered on the cart from one location to another. The cart is loaded, and then it delivers information to its destination. While the cart is busy delivering, no one else can use it. After the information is delivered, the cart continues on the ring to the original sender and acknowledges delivery. The cart is then available to pick up more information from another member of the ring.

IBM's Local Area Networks

IBM's local area network offerings are the Token-Ring Network and the PC Network (Baseband and Broadband).

Potential Benefits

IBM's local area networks:

- Allow for control and growth of IBM personal computers
- Provide via the IBM PC LAN Program the ability to:
 - Share data files among users
 - Share printers among those who need print capability
 - Send electronic notes to others on the LAN
 - Provide security by limiting access to disks, directories, and printers on the LAN
- Enhance connectivity by allowing communications to other personal computers, departmental systems, host systems, and outside networks via a CBX, PBX, or public switched network

- Improve access to multiple applications on multiple machines from one workstation
- Provide for both local and centralized network management
- Are part of the SNA communications environment
- Have the NETBIOS and APPC/PC interfaces

Local Area Network Hardware

Products Included

- Token-Ring Network PC Adapter
- Token-Ring Network PC Adapter II
- Token-Ring Network Adapter/A
- Token-Ring Network Trace and Performance PC Adapter II
- Token-Ring Network Trace and Performance Adapter/A
- 8228 Multistation Access Unit
- PC Network Adapter
- PC Network Adapter II
- PC Network Adapter II/A
- PC Network Adapter II – Frequency 2
- PC Network Adapter II/A – Frequency 2
- PC Network Adapter II – Frequency 3
- PC Network Adapter II/A – Frequency 3
- PC Network Baseband Adapter
- PC Network Baseband Adapter/A
- 5178 Translator Unit
- 5173 Baseband Extender Unit
- 8228-KT3 Token-Ring Network Starter Kit/A
- IBM Cabling System
- 8218 Copper Repeater
- 8219 Optical Fiber Repeater

Key Functions, Facilities and Features

- Adapters
 - Token-Ring Network
 - 4 megabytes per second transmission speed
 - 16KB of random access memory
 - Conforms to IEEE 802.2 Logical Link Control and IEEE 802.5 Media Access Control
 - PC Network
 - Integrated modem/transceiver
 - 2 megabytes per second transmission speed
 - CSMA/CD access protocol
 - Remote IPL across network
 - Choice of IEEE 802.2/LLC or PC network protocol
 - NETBIOS and APPC/PC interface support
- 8228 Multistation Access Unit

The Token-Ring Network Adapter resides in the workstation, occupying one long slot (IBM PC, PC/XT, PC/AT, Personal System/2 all models, Portable PC, XT/286, 3270-PC, Industrial PC). This card has all the controls for the token-ring network, both for the PCs on the LAN and for the 8228 Multistation Access Units. The Token-Ring Network Adapter, Adapter II, and Trace and Performance PC Adapter II support IBM Personal Computers and the Personal System/2 Models 25 and 30. The Token-Ring Network Adapter/A and Trace and Performance Adapter/A support all Per-

sonal System/2 models except the Models 25 and 30.

The 8228 Multistation Access Unit is a wiring concentrator that allows up to eight devices to be attached to a ring. The unit can reside in a wiring closet, on a desk top, be mounted on a wall, or be installed in a standard 19-inch wiring closet rack. Multiple 8228's may be used to attach devices to the ring.

- 5178 Translator Unit

In order to operate a PC Network (broadband), it is necessary to have a PC Network Adapter for each PC and one 5178 Translator Unit for the network. For installation of smaller networks, up to 72 PCs may be connected within a 1000-foot radius using IBM's low-cost 5178 Translator Unit and pre-configured cable kits. By using all three frequency sets, each PC Network can support up to 3000 PCs within a 16,000-foot radius, using a non-IBM translator unit available from a variety of CATV component manufacturers. (OEM equipment requires customization by a qualified cable vendor.)

The 5178 Translator Unit operates at two adapter frequencies. It receives the information from a PC at the send frequency, changes the frequency to the receive frequency, amplifies the signal, and sends the signal out onto the network for receipt by the appropriate PC.

- 5173 Baseband Extender Unit

The IBM PC Network baseband option can support up to eight nodes using the attachment cable in a daisy chain structure with a maximum end-to-end distance of 200 feet. It can support a maximum of 80 nodes by interconnecting up to 10 of the daisy-chained legs using a Baseband Extender Unit. In a structured wiring environment, the baseband PC Network can support 10 to 15 nodes using the Baseband Extender Unit.

- 8228-KT3 Token-Ring Network Starter Kit/A

One access unit, four adapters, cable sets, software diskettes, and documentation are provided in this kit, allowing quick setup of a small pilot network of IBM Personal System/2 systems for testing and demonstrating several ring functions.

- IBM Cabling System

The IBM Cabling System (ICS) is a wiring system that supports both voice and data with common connectors for all devices. It accommodates today's mix of products and topologies and is a basis for future high-speed communications systems. The IBM Cabling System is a structured information transport system that utilizes the physical star topology.

Local Area Network Hardware

ICS can be implemented using a variety of wiring types to provide a range of functions. The higher-function wire types provide higher bandwidth, and larger numbers of devices can be attached.

- 8218 Copper Repeater

The 8218 is a copper repeater for the IBM Token-Ring Network that extends the data transmission path on the IBM Cabling System data grade media. The 8218 can drive the electrical data transmission signals up to 750 meters (2500 feet) between 8228s. Typically installed in wiring closets and operating in pairs, 8218s redrive electrical signals on both the main ring path and backup path.

- 8219 Optical Fiber Repeater

The 8219 is an optical fiber repeater for the IBM Token-Ring Network that extends the allowable distance between 8228 Multistation Access Units up to 2.0 kilometers (6,600 feet) with a continuous fiber cable. Greater distances can be achieved when additional pairs of 8219s are inserted along the fiber link.

Ordering Information

Discounts for volume orders are available through the IBM Volume Procurement Agreement or Educational Allowance programs.

Reference Material

- IBM Token-Ring Network, G360-2645
- IBM PC Network—Baseband, G360-2754
- IBM PC Network—Broadband, G360-2660
- IBM Token-Ring Network Introduction and Planning Guide, GA27-3677
- PC Network Broadband Planning Guide, S68X-2268
- PC Network Baseband Planning Guide, S68X-2269
- ICS Planning and Installation Guide, GA27-3361
- IBM Token-Ring Network, Optical Fiber Cable Options, GA27-3747
- IBM Token-Ring Network Telephone Twisted-Pair Media Guide, GA27-3714

Local Area Network Software

Products Included

- IBM LAN Manager
- IBM PC 3270 Emulation LAN Management Program
- Token-Ring Network Diagnostic
- Token-Ring Network Adapter Diagnostics
- IBM Token-Ring Network Trace and Performance Program
- IBM LAN Support Program
- IBM LAN Asynchronous Connection Server Program
- IBM PC Network Protocol Driver
- IBM Advanced Program-to-Program Communications for Personal Computers
- IBM 3270 Workstation Program
- IBM PC LAN Program
- IBM OS/2 LAN Server
- IBM PC Support/36
- IBM LAN PrintManager
- IBM Token-Ring Network Bridge Program
- IBM PC 3270 Emulation Program
- IBM 3270 Emulation Memory Management Enhancement
- IBM Token-Ring Network/PC Network Interconnect Program
- IBM Asynchronous Communications Server
- IBM Asynchronous Connection Server
- IBM System/36 5360/5362 LAN Communications Program
- IBM System/36 PC 5363/5364 LAN Communications Program
- IBM Remote NETBIOS Access Facility
- Customized Operational Services

Communication Network Management Software

IBM LAN Manager (83X9100)

The IBM LAN Manager is designed to execute as an application under control of NetView/PC or as a standalone program. It supports the IBM Token-Ring Network and the IBM PC Network (broadband). The LAN Manager runs on a dedicated PC under PC DOS 3.3.

In the Token-Ring Network environment, the LAN Manager incorporates all the functions of the Token-Ring Network Manager Version 1.1 which provides problem determination and error recovery assistance for single-ring networks. It also provides alert forwarding to a CNM (Communications Network Management) System/370 host through NetView/PC. The LAN Manager extends these capabilities to multi-ring networks (in conjunction with the IBM Token-Ring Network Bridge Program Version 1.1) and offers a

single point of control for bridges and rings in the network.

LAN Manager support for the PC Network (broadband) is designed to run under NetView/PC or as a standalone program. It provides a set of functions to manage a station, using the IEEE 802.2 Logical Link Control (LLC) protocol, in a single-bus network. These functions include problem determination, problem reporting, and critical device lost notification. As an application of NetView/PC, alerts also can be sent to a CNM host.

IBM PC 3270 Emulation LAN Management Program Version 1.0 (83X8373)

The IBM PC 3270 Emulation LAN Management Program provides small and remote Token-Ring Networks or PC Networks (with no LAN Manager program) the capability for centralized network management. The program, residing under an IBM PC 3270 Emulation Program gateway, monitors the LAN for error conditions and provides automatic alert forwarding to a NetView™ host. (This program does not support connection in DFT mode.)

This program:

- Accumulates soft error information for the Token-Ring Network
- Monitors the Token-Ring Network for hard errors
- Monitors the PC Network for hot carrier, no carrier
- Builds LAN-related alerts for transport to NetView

IBM Token-Ring Network Trace and Performance Program (96X5763)

The IBM Token-Ring Network Trace and Performance Program works in conjunction with the IBM Token-Ring Network Trace and Performance PC Adapter II and Adapter/A. This program provides visibility to traffic handled by the ring and also performs user data throughput measurements on the IBM Token-Ring Network.

The program has the following major functions:

- Trace provides the actual interface to data on the ring.
- Trace analysis enables viewing of the trace data collected on the disk or diskette.
- Performance facility allows the user to start/stop performance monitoring function by passing parameters to the adapter hardware and microcode.
- Performance analysis processes the data captured and recorded by the performance facility.

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Token-Ring Network Diagnostic

The Token-Ring Network Diagnostic is provided on diskette with each Token-Ring Network adapter. When run in a PC on the ring, it provides a real-time display of the ring status and the source and nature of soft/hard errors.

Documentation for the Token-Ring Network Ring Diagnostic is provided in the Token-Ring Network Problem Determination Guide.

Token-Ring Network Adapter Diagnostics

The Token-Ring Network Adapter Diagnostics are available with each adapter. The IEEE 802.5 protocol incorporates sophisticated automatic error detection and recovery procedures, such as bypassing failing adapters. The adapter diagnostics go through a series of power-on self-tests of the adapter hardware and microcode to insure that the adapter will be a "good citizen" when it joins the ring.

Other LAN Software

IBM LAN Support Program (83X7873)

The LAN Support Program provides a common interface across the IBM LAN offerings for both NETBIOS and IEEE 802.2 interfaces. Most applications using the NETBIOS or IEEE 802.2 interface can run on the Token-Ring Network or PC Network without modification. The LAN Support Program requires DOS 3.3 and supports all PCs including 3270-PC. This program replaces the adapter support interface (TOKREUI) and the NETBIOS program (NETBEUI) for the IBM Token-Ring Network and is an alternative to the PC Network Protocol Driver.

In addition, the LAN Support Program supports, via the IEEE 802.2 interface, the IBM Advanced Program-to-Program Communication for the IBM PC (APPC/PC) on the Token-Ring Network and PC Network.

IBM PC Network Protocol Driver (62800G1)

The PC Network Protocol Driver provides a NETBIOS interface and PC Network original protocol support for applications using the PC Network Adapter II and II/A. It allows these broadband adapters to communicate directly with the IBM PC Network Adapters on the same broadband network. The PC Network Protocol Driver expands name limits to 62 and session limits to 64 and requires DOS 3.2 or higher.

PCs running the Protocol Driver cannot communicate with PCs running the IEEE 802.2 interface provided by the LAN Support Program.

IBM Advanced Program-to-Program Communications for Personal Computers (6467038)

The APPC/PC allows application programs running on a PC attached to any IBM LAN with the IEEE 802.2 interface to access and exchange information with other PCs on the network running APPC/PC applications, or with an IBM host running a CICS program.

IBM 3270 Workstation Program Version 1.0 (74X9921)

The IBM 3270 Workstation Program Version 1.0 provides IBM 3270-PC functions on IBM PC XT, IBM XT 286, IBM Personal Computer AT, IBM 3270-PC, and the IBM Personal System/2 Models 30, 50, 60, 80.

The 3270 Workstation Program provides multisession, multitasking, and memory management options to memory-constrained LAN workstations. The Workstation Program also includes the server/requester programming interface to support the Enhanced Connectivity Facility products for access to System/370 resources, and when using the GDDM-PCLK program, provides host graphics terminal support for GDDM host applications.

The 3270 Workstation Program is compatible with redirector, receiver, and messenger functions of the IBM PC Local Area Network Program Version 1.2 on the IBM Token-Ring Network. This workstation program will support a PC twin-tail attachment to both the IBM Token-Ring Network and to a 3174 for communication to a System/370 host.

IBM 3270 Workstation Program Version 1.1 (75X1088)

The IBM 3270 Workstation Program Version 1.1 will provide all the functions of Version 1.0 plus support for workstations on the IBM Token-Ring Network attached to a System/370 via 3725 and 3174 gateways. The 3270 Workstation Program Version 1.1 and the IBM Local Area Network Support Program provide for a 3270 network station configuration on the IBM Token-Ring Network using the IEEE 802.2 interface. This configuration requires an appropriately configured 3X74 control unit or a 372X communications controller, serving as a gateway on the network to a System/370 host.

IBM Token-Ring Network workstations running the IBM 3270 Workstation Program Version 1.1 will be able to communicate to a host over the Token-Ring Network and will no longer require a 3270 controller.

Servers

IBM PC LAN Program Version 1.3 (84X0076)

The PC LAN Program Version 1.3 provides resource sharing for interconnecting workstations on the IBM Token-Ring and PC Networks. It includes extended services enhancements for the administration of LAN server resources and is supported by the IBM OS/2 LAN Server.

Highlights:

- Sharing data files among users
- Sharing printers among those who need printer access
- Sending electronic messages to others on the LAN
- Providing security by limiting access to directories and programs
- Support by OS/2 LAN Server, Version 1.0
- Version 1.3 extended services
 - Central resource definition and control
 - Single system image of multiple servers
 - Encrypted passwords
 - Administrator password from any workstation
 - Remote initial program load (IPL) support
 - Application selector menu support

IBM Operating System/2 LAN Server, Version 1.0 (84X0083)

The IBM OS/2 LAN Server provides local area networking capabilities to workstations on the IBM Token-Ring and PC Networks. This program is a non-dedicated server with security, print, message administration, and status services. It provides resource sharing for disks, printers, and serially-attached devices plus facilities for defining, controlling, and managing access to local area network resources.

The OS/2 LAN Server takes advantage of protect mode, multitasking, and large memory support provided by OS/2 Extended Edition. The Server is designed as multiple OS/2 processes that are scheduled independently by the operating system. The OS/2 LAN requestor function provided in OS/2 Extended Edition enables workstation access to the Server. The OS/2 LAN Server uses the NETBIOS interface provided by the Communications Manager to communicate across the LAN.

The OS/2 LAN Server supports IBM Personal Computers and Personal System/2. Memory requirements will vary according to the functions used and the configuration requirements. The recommended minimum memory is 3MB when configured to support only the LAN Server.

IBM PC Support/36 (5727-WS1)

The PC Support/36 Program consists of two sets of programs and provides information exchange and resource sharing between a PC (PC, PC/XT, Portable PC, PC/AT) and the System/36. One set of programs runs on the System/36. The other set is transferred to a PC diskette or fixed disk and runs on the PC.

PC Support/36 supports the System/36 LAN environment. All PC Support/36 functions available via a twinaxial cable attachment to the System/36 are available to the PC using the LAN attachment. The Token-Ring Network workstation feature (6248) is program number 5727-WS1/01.

IBM LAN PrintManager (6317042)

The LAN PrintManager Program allows PCs attached to the IBM PC Network or Corvus Omninet LANs (trademark of Corvus Systems, Inc.) to share a 3820 PagePrinter on the LAN. The 3820 is attached to a specified PC on the network. This PC may be used as a LAN workstation when no PrintManager files are being printed.

Bridges

IBM Token-Ring Network Bridge Program Version 1.1 (83X7860)

The IBM Token-Ring Network Bridge Program connects two rings into a single logical network. It passes ring and bridge error information, reports of configuration changes, and error reports from attached rings to the IBM LAN Manager Version 1.0. It also allows the LAN manager to set parameters, query stations, and remove adapters on attached rings.

Using multiple Bridge Programs, information can flow through seven levels of bridges and eight rings. This program replaces the IBM Token-Ring Network Bridge Program Version 1.0.

Its functions are to:

- Transfer frames between two rings
- Display ring status and fault domain
- Maintain and display performance information
- Provide a mechanism for network analysis
- Transmit bridge status and performance data on request
- Send soft error and beacon notification to the LAN manager

Gateways

IBM PC 3270 Emulation Program Version 3.0 (59X9969)

The PC 3270 Emulation Program provides a System/370 host gateway for the IBM PC Network and the IBM Token-Ring Network. The Emulation Program Version 3.0 replaces the IBM PC 3270 Emulation Program Version 2.0. The Emulation Program requires DOS 3.1 or higher to support the PC Network, DOS 3.2 or higher to support the Token-Ring Network, and DOS 3.3 to support Personal System/2 and the LAN Support Program.

This program:

- Supports direct attachment of the Token-Ring Network to the 3720 or 3725
- Supports upstream/downstream direct attachment of the Token-Ring Network to a 3174 Control Unit
- Allows the PC to emulate a 3274 Model 51C Control Unit, a 3278/79 display, and 3287 printer

Local Area Network Software

- Allows the PC to be configured as a standalone workstation, a network gateway, or a network station
- Supports BSC communications through a non-SNA DFT 3X74 using the 3278/79 Emulation Card

IBM 3270 Emulation Memory Management Enhancement (8575345)

The IBM 3270 Emulation Memory Management Enhancement allows a user of the IBM PC 3270 Emulation Program Version 2.0 (or higher) running as a network station to move the Emulation Program into and out of memory. The Memory Management Enhancement does this through Version 2.0 of the Software Carousel program from SoftLogic Solutions, Inc. or an equivalent program. It allows up to four host sessions to be active at the same time, running in four separate Carousel partitions. The user is able to hot-key between these sessions. This program supports the IBM Token-Ring Network and PC Network.

The Memory Management Enhancement does not support swapping out of the gateway station and will not work in a standalone configuration. It requires that the gateway station be connected to the host through the Token-Ring Network, an SDLC line, or an SNA-attached 3274 when running in distributed function terminal (DFT) mode. The Memory Management Enhancement supports the PC LAN Program as a redirector configuration.

IBM Token-Ring Network/PC Network Interconnect Program (6467036)

The Interconnect Program is a NETBIOS application that provides Token-Ring Network-to-PC Network and PC Network-to-PC Network interconnection. It supports program-to-program and server functions as well as migration of existing networks to new hardware or protocol options.

IBM LAN Asynchronous Connection Server Program (83X9132)

The IBM LAN Asynchronous Connection Server allows Personal Computers and Personal System/2 attached to a LAN access to ASCII host computers, including the IBM RT PC, and other asynchronous devices connected to the server's communications adapter. ASCII terminals, PCs, and PS/2s dialing into or directly connected to the server can access ASCII host computers and other asynchronous devices connected to any outgoing line on any server on the network. Information from incoming PCs or PS/2s can be directed to devices attached to a LAN. The server can be connected to an IBM Token-Ring Network, PC Network broadband, or across the LAN to another Asynchronous Connection Server.

The Server can co-exist on the same LAN and share the modem-connected traffic with the Asynchronous

Communications Server. This program extends the capability to operate up to 32 asynchronous lines in one Personal Computer or Personal System/2. The program operates in a dedicated PC or PS/2 Model 30, attached to a LAN containing 1 to 4 IBM Realtime Interface Co-Processor Multiport cards.

IBM Asynchronous Communications Server (1642003)

The Asynchronous Communications Server enables PCs on the IBM Token-Ring Network or IBM PC Network to access ASCII applications via switched communication lines. Access is provided to a CBX, PBX, or public switched network. Attached PCs can share this communications server.

IBM System/36 5360/5362 LAN Communications Program (5727-LC1)

The System/36 5360/5362 LAN Communications Program allows the 5360 and 5362 System Units to connect to the IBM Token-Ring Network. It provides support for up to two LAN attachment features. The LAN attachments appear as communication lines. This program consists of two components. The first component executes on the 5360 or 5362 System Unit. The second component (which gives controller function to the LAN attachment) is downloaded to and executes on the directly-attached PC/AT.

For LAN-attached IBM PCs used as workstations (PC, PC/XT, Portable PC, and PC/AT), support is provided by PC Support/36.

IBM System/36 PC 5363/5364 LAN Communications Program (5727-LC6)

The System/36 PC 5364 LAN Communications Program allows the 5364 System Unit to connect to the Token-Ring Network. It enables System/36 PCs to participate in the Token-Ring Network and it supports LAN attachment to PCs (PC, Portable PC, PC/XT, PC/AT) used as workstations through PC Support/36.

The program consists of two components. The first executes on the 5364 System Unit and the second is downloaded to and executes on the directly-attached PC/AT.

IBM Remote NETBIOS Access Facility (69X7771)

The Remote NETBIOS Access Facility provides remote access capability for IBM PCs to Token-Ring Network or a PC Network via switched telecommunication lines. Digital access is supported through the ROLM CBX II. Analog access is through modems via a ROLM CBX II, a PBX, or a public switched network.

This program:

- Supports access to print and file servers
- Supports remote call setup, providing the capability to dial into up to 10 LANs

- Allows connection of two dial lines to the LAN gateway PC
- Allows multiple LAN gateway PCs to exist on a single LAN in order to provide additional telecommunication connections

The Remote NETBIOS Access Facility may coexist and share dial lines with the Asynchronous Communications Server in the same LAN gateway. Installation on a gateway station requires PC DOS 3.3 and the LAN Support Program. Installation on a remote station requires PC DOS 3.2 or higher and an appropriate NETBIOS program (PC LAN program).

Services

Customized Operational Services—Site Management Services

Site Management Services under the Customized Operational Services consists of four modular offerings designed to provide physical environment solutions for customers' information processing products. These offerings are: Site Planning, Data Center, Relocation, and Cabling.

The Cabling offering provides a wide array of services of particular interest to LAN users: design, installation, and/or verification of IBM cabling configurations, including installation and verification of IBM products designated as customer set-up (CSU) plus selected non-IBM products. Cabling configurations may include both data and voice. Voice is limited to the area between the faceplate and the wiring closet. An IBM CBX may be installed via a special bid under the Installation Management service module.

The Cabling offering consists of five separately-priced service modules: Evaluation, Design, Design/Install (Contractor Services), Verification, and Installation Management.

- **Cable Evaluation:** provides a customer contemplating the installation of an IBM Cabling System or other IBM approved cabling configuration with an IBM review of the configuration and requirements and a written report documenting IBM's findings and recommendations. Any discrepancies between the planned configuration and the physical attributes of the associated IBM or selected non-IBM hardware, system software, cable media, or accessories will be addressed.
- **Cable Design:** provides the customer with a completed and documented design of an IBM cabling network for use with IBM or selected non-IBM equipment.
- **Cable Design/Install:** provides the customer with the same services included in Design and, in addition, provides the total installation and verification of the cabling network.
- **Cable Verification:** provides the customer with a verification of the condition of an installed IBM cabling network and/or attached IBM or selected

non-IBM hardware components at the time of testing, based on IBM specifications. This module applies to previously installed cabling networks but may be purchased as an additional verification of a new cabling network.

- **Installation Management:** provides project planning and management for the installation of IBM products designated as customer set-up (CSU) and selected non-IBM products. This is primarily directed at customers with multiple sites.

In addition to planning, management, and physical installation, IBM will provide the following services:

- **Hardware customizing:** to perform approved product modifications consistent with product specifications and to meet customer requirements.
- **Network tests:** to include line verification and communication to a device level utilizing appropriate hardware diagnostics.
- **Configuration services:** to include installation of agreed-to IBM and non-IBM features on IBM products.
- **Consolidation services:** to include staging of IBM products at IBM consolidation centers prior to shipping to customer locations.

IBM will install and configure appropriate system software on intelligent workstations.

IBM will perform operator-level installation tasks using customer-supplied preconfigured software, customer-defined procedures, and customer support.

IBM will provide end-user orientation for operator-level tasks related to the cable network.

IBM will provide education for operator-level tasks using customer-supplied training packages and customer support.

Reference Material

- IBM 3270 Workstation Program Version 1.1, G320-2734
- IBM 3270 Communications Family for IBM Personal System/2 and IBM Personal Computers, G360-2646

Local Area Network Positioning

In positioning IBM LANs, it is important to understand the function provided, the software available, and the environment for which they are designed.

This chart depicts the distinguishing characteristics of PC Network Broadband and Baseband and Token-Ring Network.

Function	Token-Ring Network	PC Network	
		Broadband	Baseband
Host connectivity			
Direct	PC 3725/20 3174 S/36 9370	PC	PC
Bridges			
TRN Bridge Program	Yes	No	No
Gateways			
PC 3270 Emulation	Yes	Yes	Yes
Asynch	Yes	Yes	No
Asynch1	Yes	Yes	No
TRN/PCN			
Interconnect	Yes	Yes	No
Network mgmt			
PC 3270 Emulation			
LAN Mgmt	Yes	Yes	Yes
LAN Manager	Yes	Yes	No
NetView/PC	Yes	Yes	No
TAPP	Yes	No	No
Application interface			
APPC/PC	Yes	Yes	Yes
NETBIOS	Yes	Yes	Yes
IEEE 802.2/LLC	Yes	Yes	Yes
Data rate	4 Mbps	2 Mbps	2 Mbps
Attachment	260	72	8
Up to	Unlimited	1000 (custom)	80
Transport	Baseband	Broadband	Baseband
Protocol	Token passing	CSMA/CD	CSMA/CD
Wiring	Structured	Tree	Daisy chain
Media			
Voice grade	Yes	No	Yes
Data grade	Yes	CATV	Yes
Optical fiber	Yes	No	No
Problem isolation/ dynamic recovery	Full	Limited	Limited
Attachment cost	Medium	Medium	Low
Design point	Establishment	Mult. services Video Security Data	Workgroup Small dept.
Environment	Gen'l purpose Establishment Department	Industry Higher educ. Government Manufacturing	K-12 education Small business Small remote establishment

Asynch: Asynchronous communications server
 Asynch1: Asynchronous connection server
 TRN: Token-Ring Network
 PCN: PC Network
 TAPP: Token-Ring Network Trace and Performance Program

Section 66. System/38

System/38

Main Purpose

System/38 is a general-purpose data processing system designed to provide a high level of function, ease of use, application development productivity, and nondisruptive growth. The system features advanced architecture and an integrated relational data base that support a full range of interactive workstation applications as well as traditional batch applications.

System/38 Architecture Overview

Control Program Facility (CPF)

At the heart of the unique architecture of System/38 is the Control Program Facility. CPF provides a single, consistent, high-level interface to all functions, on all system configurations, and for all types of applications.

This high-level machine interface ensures compatibility between CPF and programs implemented for every model of the machine. Also, new functions, devices, or performance improvements can be added to the machine without affecting CPF or the application programs.

Single-Level Storage Management

Another unique concept utilized by System/38 is that of single-level storage management. Simply put, System/38 treats all storage — both main storage and disk storage — as a single unit. Programmers, therefore, do not need to be concerned about specific program sizes, task areas, or the location of data files on disk storage units. This provides more effective storage management, program independence from main storage and disk capacity changes, and reduced application design and planning effort. Memory and/or disk can be increased without impacting CPF or application code. The additional storage is simply used as needed.

Integrated Relational Data Base

The System/38 data base function was designed as an integral part of the system — not added on at a level above the base operating system. This design-level implementation enables the System/38 data base to provide optimum performance, security, integrity, and ease of use.

Office Systems

The System/38 supports Document Content Architecture (DCA), Document Interchange Architecture (DIA), and Systems Network Architecture Distribution Services (SNADS).

This support includes System/38 OFFICE/38, Personal Services/38, System/38 PC Support/38, and enhancements to IBM System/38 Control Program Facility (CPF). The System/38 Control Program Facility provides office host services for Personal Services/36 and Personal Services/PC users.

For more information about System/38 hardware and software, see the following pages.

System/38 Hardware

Products Included

- 5381 System Unit
- 5382 System Unit
- 3370 Direct Access Storage
- 9332 Direct Access Storage
- 9335 Direct Access Storage
- 3410 Magnetic Tape Unit
- 3411 Magnetic Tape Unit and Control
- 3422 Magnetic Tape Subsystem
- 3430 Magnetic Tape Subsystem
- 3196 Display Station
- 3197 Color Display Station C Models
- 3197 Display Station D Models
- 3812 Pageprinter *
- 4210 Printer *
- 4224 Color Printer
- 4234 Dot Band Printer Model 2 *
- 4245 Printer
- 3262 Line Printer
- 6262 Impact Line Printer **
- 5294 Remote Control Unit
- 5394 Remote Control Unit
- Personal Computers
- 3270 devices (remote)
- 5209 5250-3270 Link Protocol Converter
- 5208 5250-ASCII Link Protocol Converter
- 5299 Telephone Twisted-Pair Adapter

Key Functions, Facilities and Features

Processor

- System/38 models
 - System/38 models 100, 200, 300, 400, 600, and 700 replace and enhance the previous model range.
 - The System/38 Model 100 is the entry-level system with significant improvement in price/performance.
 - The System/38 Model 700 doubles the main storage capacity to 32MB and offers additional growth and performance.
 - All System/38 models can be upgraded on-site to the new models (with the exception of the Model 100). The Model 100 can be upgraded on-site to any of the other new models.
- The System/38 makes use of high-performance large-scale integration (LSI) technology and MOSFET main storage.

- Nominal storage internal cycle time (per four-byte access) is 400 nanoseconds for Models 100, 200, 300 and 400, 333 nanoseconds for the Model 600, and 267 nanoseconds for the Model 700.
- Control storage in the Model 100 consists of 8K 32-bit words and has a nominal instruction cycle of 133 nanoseconds. Control storage in the Models 200, 300, and 400 consists of 12K 32-bit words with nominal instruction cycles of 133 nanoseconds. Control storage in the Models 600 and 700 consists of 12K 32-bit words with nominal instruction cycles of 67 nanoseconds.
- System/38 supports direct attachment of up to 256 local workstations via the workstation controller extended feature.
- Remote workstations are supported via communications lines attached to the communications adapters.

Direct Access Storage Devices

- The DASD capacity for System/38 is four strings of the 9332 and 9335 DASD subsystems. This more than doubles the total DASD capacity to over 14GB.
- DASD subsystems for all System/38 models 100 through 700:
 - 9332 Model 220, 420, and 400
 - Model 220 with 200MB capacity, single actuator, stand-alone device (up to eight units per string)
 - Model 420 with 400MB capacity, dual actuator, stand-alone device (up to four units per string)
 - Model 400 with 400MB capacity, dual actuator, rack-mountable device (up to four units per string)
 - 9335 Models A01 and B01
 - Model A01 control unit supporting up to four Models B01
 - Model B01 with 850MB capacity, dual actuator, rack-mountable device (up to four units per string)
 - System/38 Model 100 supporting one string of 9332/9335
 - System/38 Models 200 and 300 supporting two strings of 9332/9335, of which one can alternatively support 3370
 - System/38 Models 400 to 700 supporting four strings of 9332/9335, of which two can alternatively support 3370

* See Section 68, "Printers for Workstations and Mid-Range Systems."

** See Section 68, "4248, 4245, and 6262 Printers."

- 9309 Rack Enclosure available for the 9332 and 9335 DASD to reduce floor space requirements, to provide common power supply and start-up sequencing. Multiple racks can be linked together.
 - 1.0-meter racks for up to six 9332.
 - 1.6-meter racks for up to two 9335s Model A01 plus four 9335s Model B01.

The following tables describe the DASD supported for the System/38 and the attachability options with the various DASD types and System/38 processor models.

DASD Characteristics

DASD Type	Capacity MB/drive	Transfer Rate MB/sec	Drives/string
62PC (Internal)	64.5	1.031	4+2
3370 Model 11	571.4	1.859	4
3370 Model 12	724.8	1.859	4
9332 Model 200	200	2.500	4
9332 Model 400	400	2.500	4
9335 Model B01	856	3.000	4

Attachability

Model	100	200 300	400 600 700
Type	5381	5382	5382
Max. DASD (MB)	3,488	7,232	14,080
Max. DASD Strings	1	2*	4**
Max. Internal Drives	1	6	6
933X DASD Strings	1	2	2-4
3370 DASD Strings	0	1	2

* 3370 or 933X DASD supported. Cannot mix 3370 and 933X DASD on same string.
 ** Two strings can be 3370 or 933X DASD. Cannot mix 3370 and 933X DASD on same string. Third and fourth DASD strings can only be 933X.

Save/Restore Devices

- The 3422 Magnetic Tape Subsystem records or reads data at densities of 1600 or 6250 bpi. The 3422 has a maximum nominal data rate of 780KB per second at 6250 bpi or 200KB per second at 1600 bpi.
- The 3410/3411 Magnetic Tape Subsystem can also be attached via the appropriate adapters. This subsystem provides a maximum nominal data rate of 80KB/sec at 1600 bpi.
- The 3430 Magnetic Tape Subsystem can also be attached. This subsystem provides dual density of 6250 bpi or 1600 bpi with an instantaneous data rate of 312.5KB at 6250 bpi or 80KB at 1600 bpi.
- The diskette magazine drive, standard on all models of System/38, is used primarily for save/restore operations, diskette input/output, and system servicing.

Local Workstations and I/O Devices

- 3196 Display Station:
 - Model A10 – 122-key typewriter keyboard, green phosphor display
 - Model B10 – 122-key typewriter keyboard, amber-gold phosphor display
 - Model A20 – Enhanced 102-key keyboard, green phosphor display
 - Model B20 – Enhanced 102-key keyboard, amber-gold phosphor display
 - Attaches locally to System/38 or remotely via the 5294 Remote Control Unit (Models A10 and B10 only)
 - 1920-character screen (24 x 80)
 - Auto-dim feature
 - 1500-character record/play capability
 - Small footprint
 - Keylock
- 3197 Display Station D Models:
 - Attachment to the System/38 System Unit and the 5294 Remote Control Unit
 - Up to 3564 characters in 27 lines of 132 characters each
 - Selective display in either 24 x 80 or 27 x 132 mode
 - Compatibility with 3180 Model 2 programs
 - Record/playback of keystrokes
 - Keyboard choice – 122 or 102 keys
 - Adjustable audible alarm
 - Security keylock
 - Display tilt/swivel
 - Cursor position indicator
 - Screen dimming
 - Multinational character set
 - Message line
 - Ability to support two display sessions or one display and one printer session concurrently
- 3197 Color Display Station C Models:
 - Seven colors
 - Attachment to the System/38 System Unit and the 5294 Remote Control Unit

System/38 Hardware

- Display of up to 1920 characters in 24 lines of 80 characters each
- 5292 Model 1 function
- Record/playback of keystrokes
- Adjustable audible alarm
- Security keylock
- Display tilt/swivel
- Screen auto-dim feature
- Compatibility with 3179 Model 2 programs
- 14-inch CRT
- Choice of two keyboards (122 or 102 keys)
- Printer port to support host-directed printing (4201, 4202, 5201)
- IBM Personal Computers:
 - Attachment of the IBM PC, IBM PC XT and IBM PC AT supported with Version 2.1 of the Enhanced 5250 Emulation Kit
 - Access to all System/38 functions to which the user is authorized
 - Option with Version 2.1 of Enhanced 5250 Emulation to emulate a 5292 Model 2, which gives full GDDM graphics capabilities to PC, PC XT, or PC AT with Enhanced Graphics Adapter and Enhanced Color Display

3270 Local Device Attachment

The 5209 3270-5250 Link Protocol Converter allows 3270 devices to be attached to a System/36 or a System/38 and concurrently to a System/370 host through a 3174/3274 Control Unit.

- “Hot key” between active System/3X display sessions and the System/370 sessions
- Interactive assignment of 3270 printers to 5250 or 3270 session
- Full access to all System/38 applications, including office and System/370 applications

ASCII Device Attachment

The 5208 Link Protocol Converter allows for the attachment of up to seven local or remote ASCII devices to the System/38. The 5208 Link Protocol Converter is attached to the System/38 by twinaxial cable. The 5208 Link Protocol Converter:

- Allows for the attachment of many IBM and non-IBM ASCII terminals
- Allows for the attachment of IBM Personal Computers without the 5250 Emulation Kit
- Supports all functions of PC Support/38, including file transfer, with IBM Personal Computers with Dial/3X software PRPQ on each PC

Remote Personal Computers

A single IBM PC, PC XT or PC AT configured with the SNA/SDLC communications card and the remote 5250 emulation software can attach to a System/38 through a communications link.

Remote Control Units

The 5294 Model 1 is a remote workstation controller that can attach up to eight workstations including the Personal Computer (with Version 2.1 of the Enhanced 5250 Emulation kit), display stations, and printers. It communicates to the System/38 in SNA/SDLC and X.25 modes and features high-speed communications capability (up to 56K bps) on nonswitched (leased) communications lines as well as speeds up to 9600 bps on switched (dial) point-to-point communications lines.

Multiple devices, including 5294s, can be dropped off of any of the System/38 communications lines or X.25 adapters. The number of remote workstations that can be supported remotely is variable depending on application mix, service level requirements, and remote device type.

The 5394 remote workstation controller can attach up to eight 5250-type workstations to the System/38, using 5294 emulation mode. The 5394 is installed by customer setup using a workstation for customization. There is a 3.5-inch diskette for CSU, problem determination, and normal operations. 5294 optional features are standard in all models.

Printers

Up to two system printers can be attached. Any combination of the following printers may be used:

Type	Print Rate
3262	650 lines/min *
3203	1200 lines/min *
4234-2	120 to 410 lines/min **
4245	2000 lines/min *
6262	1200 to 1400 lines/min

* Based on 48-character print set

** Dependent on print quality

The following printers can be attached as local workstation printers via the System/38 workstation controller or connected via a 5294 Remote Control Unit (see also General and Office Printers and Plotters, Section 68):

Type	Print Rate
4210	40 to 200 char/sec*
4214	50 to 200 char/sec
4234-2	120 to 410 lines/min*
5262	130 to 650 lines/min **
6262	1200 to 1400 lines/min
3812	Correspondence quality
4245	2000 lines/min*
4224	400 characters/second**

* Dependent on print quality

** Dependent on character set

Card I/O

- The 5424 Multi-Function Card Unit can read, punch, and/or print 96-column cards at read speeds up to 500 cards per minute and punch/print speeds up to 120 cards per minute.

Communications

- Remote communication is supported through three communication attachments, and two X.25 adapters, which can connect twelve communications lines and up to 62 X.25 virtual circuits.
- System/38 with the Digital Data Service Adapter (DDSA) feature supports remote communications at speeds of up to 56,000 bps over the AT&T non-switched Data-Phone* Digital Service Network. (*Registered trademark of the American Telephone and Telegraph Company)
- System/38 can connect locally to a 3705-II (at a nominal speed of 57.6KB/sec) or remotely to a 3705-II, a 4331 Communications Adapter, or another System/38 (at nominal speeds up to 56KB/sec) and support CCITT V.35 networks (at nominal speeds up to 56KB/sec) using BSC or SDLC protocol.
- X.25 Communications Attachment is available.
- System/38 can communicate as a terminal with System/370 CICS/VS and IMS/VS using SDLC and SNA.
- System/38 BSC using RPG III or COBOL programs can communicate with the following over point-to-point or multipoint communications facilities:

Series/1	System/370
System/32	30XX
System/34	4300
System/36	9370
System/3	5280
System/38	5110/5120

- System/38 supports the following as terminals (3741 BSC protocol):

3741	Office System 6
5110/5120	6240
5230	6580
5260	6640
5520	6670
CMC II	

- System/38 can directly attach (BSC):

System/38
System/36
System/34
Series/1

- See System/38 Software description following for more information.

Primary Users

The System/38 features advanced architecture that supports such functions as an integrated relational data base as part of the system software (Control Program Facility). The ease of use built into the System/38 allows greater application development productivity with minimal data processing skills. Available for the System/38 are utilities and end-user facilities, such as a query report writer and text and calendar management functions (Personal Services/38), that make use of the advanced function and data base capabilities of System/38.

The System/38 is primarily a commercial system that encompasses BSC, SNA/SDLC, and X.25 communications capabilities to make it very attractive for use in decentralized and distributed applications. Industry-oriented application packages, as well as productivity packages, are available for the System/38.

Potential Benefits

- Undisrupted growth through model changes
- Application development productivity through integrated architecture and data base
- End-user productivity aids
- Office applications
- Industry-oriented packages
- Reduced need for data processing skills
- BSC, SNA/SDLC, and X.25 communications capabilities for decentralized and distributed processing
- Networking capability
- Integrated data base providing merging of office and data processing functions

Ordering Information

Volume procurement discounts are available. The System/38 and the System/36 can be aggregated for volume purchase discount purposes.

Reference Material

- Introduction, GC21-7728
- Guide to Publications, GC21-7726
- Bibliography, GH30-0233
- Guide to Program Product Installation and Device Configurations, SC21-7735
- Application Programs Available from Non-IBM Sources, G360-0430

System/38 Software

Products Included

- Control Program Facility (CPF)
- RPG III
- COBOL
- BASIC
- PL/I
- Interactive Data Base Utilities (IDU)
- System/38 OFFICE/38
- Personal Services/38
- System/38 Performance Measurement Tools
- Remote Job Entry Facility (RJE)
- Display Information Facility (DIF)
- Workstation Search Facility (WSF)
- Industry application programs
- Distributed Data Management (DDM)
- PC Support/38

Control Program Facility (CPF)

The System/38 Control Program Facility is the primary interface to system functions. It provides a wide range of function and is designed to enhance the basic system architecture with support for:

- Data base applications
- Enhanced user productivity
- Communication
- Data and system security
- Simplified operation
- Graphics capability

Because the System/38 is a member of the IBM Office Systems family, the Control Program Facility has:

- SNADS document exchange with the System/36, System/38, DISOSS/370, and 5520 via SNA LU-6.2
- Document Interchange Architecture (DIA) Document Distribution and Library Services to Displaywriter via SNA LU-6.2

System/38 CPF supports the IBM Office Systems architectures:

- Systems Network Architecture Distribution Services (SNADS) provides the architected services for distribution among host systems. System/38 SNADS provides source, destination and intermediate node distribution services. SNADS provides easy-to-use interfaces for setting up and maintaining SNADS network information and for managing in-process distributions.

System/38 SNADS is a generic distribution service capable of distributing objects such as documents to/from Document Interchange Architecture.

SNADS is used outside the office environment for the distribution of System/38 objects among other System/38s.

- Document Interchange Architecture (DIA) provides the architected host services for document distribution services and document library services. DIA manages the distribution of documents for both the sender and receiver on a local node and with the SNADS support receiver on a remote node. DIA manages the host document library for functions such as filing, searching, and the retrieving of documents. DIA also provides easy-to-use interfaces to support directory, distribution list, and document access control functions.
- Document Content Architecture (DCA) defines a standard set of controls for interpreting the contents of a document and presenting the document to a user.

The DIA and SNADS components of System/38 CPF and Personal Services/38 offer function and user interfaces similar to those provided by other IBM systems that support DIA, SNADS and Personal Services. The System/38 uses IBM's strategic architectures – DCA, DIA, and SNADS – to ensure ongoing exchange capabilities with other members of the family.

For ease of use, the most common options are assumed by default. For example, the system assumes that a printed report should be produced on the system printer on standard paper unless the user specifies that the report should be printed on a workstation printer or on a special form.

IBM provides the objects needed for a workable system. These include:

- A general-purpose library
- Source files for the most common types of source data
- Work station device and system operator message queues
- Subsystem descriptions
- Job queues and output queues
- Standard user profiles that are the default security definitions for the workstation user, the programmer, the system operator, and the security officer

Control Language (CL)

The System/38 control language provides a simple, consistent syntax for invoking system-related functions. The instructions that make up this language are called commands. These commands can be:

- Entered individually from a workstation

- Used as source statements in a control language (CL) program
- Used in a batch job stream

The control language is actually a high-level programming language for system functions. Control language commands can be used to write and compile a program, and the program can be assigned a name by which it can be executed by another program.

Control language programs can call or be called by high-level language and other control language programs. Control language programs can send output to and receive input from workstations or receive input from data base files.

Data Base

The System/38 data base capabilities provide much of the advanced function of the system and are fully integrated within System/38 CPF. They include:

- **Shared files.** Multiple batch and interactive programs can simultaneously access, update, add, and delete records in the same file. To provide integrity, System/38 locks a record when a user's job retrieves it for update. While the record is locked, it still can be retrieved by other users for read operations only.
- **Externally described data.** High-level language programs written for traditionally architected machines typically have the data that the program operates upon described in the program. This is known as program-described data. The System/38 can use program-described data but also can use another method that describes data external to programs. Using externally-described data, the attributes of each field are described once in the file rather than in each program that uses the file. This allows for a high degree of flexibility and consistency when writing or changing high-level language programs, when using the various System/38 query facilities, or when maintaining the data base itself. The description of the data is consistent for applications written in any language. External data description is also used to describe display and printer attributes as well as communication protocol to high-level language programs.
- **Multiple access paths.** Many applications require access to a set of data (a data base file) by more than one key or index. For example, it may be necessary to access inventory data by item number or by vendor number. In a workstation environment, it is not practical to wait while the data is sorted into a second sequence. System/38 supports multiple indexes to the data. The indexes on System/38 are called access paths. The enhanced functions and the immediate maintainability of the System/38 access paths provide significant new alternatives to application design and programming.

Any or all of the multiple access paths that can be defined for a file can be immediately updated whenever any job makes a change to the file that affects the access path. For example, if a workstation user accesses an inventory record by item number and changes the vendor number, another workstation user accessing the same file by vendor number would immediately be able to access the record by the new vendor number.

Selection criteria can be applied when an access path is defined. For example, an access path can be created in customer number sequence within zip code, excluding all records with zero balances.

On System/38, an access path is the means by which the control program provides a logical organization to the data stored in the data base. When a data base file is created, the access path for the file is specified. When the file is used for input and output operations, records are retrieved according to the organization specified by the access paths.

Data Base Files

- **Physical Files:** A physical file is a data base file that actually contains data records. A physical file contains fixed-length records, all of which have the same format.
- **Logical Files:** A logical file is a data base file through which data from one or more physical files can be accessed in a format and organization that is different from the representation of the data in the physical files.

A logical file differs from a physical file in that a logical file has no data in it, but contains a definition of how to retrieve and format fields from one or more physical files. A logical file can be used by an application program to reorder fields in a physical file, to give selective access to fields in a physical record, and to select records from a physical file based on the contents of a field. For example, an accounts receivable application program might give a user access to some of the fields of the customer master file, sorted by customer number, with access restricted to only those records with a balance in excess of \$1,000. This would be implemented using a logical view of the customer master file from the accounts receivable application program.

An application program may need data from multiple data base files. The System/38 provides a joined logical view facility which can select elements from up to 32 physical files for presentation to an application program as a single tabular entity. Update of underlying physical files is not supported through joined logical views.

A journaling function is provided to record before and after images of changes to data base files and access paths. The journal receiver will also record the identity of the user making the changes and the date and

time of the change. This allows the use of the journal entries for recovery and audit purposes. Release 8 of System/38 Control Program Facility contains major recoverability enhancements, several of which pertain to the journaling function. See "System Services" below for more information.

A commitment control function is provided to allow definition of a group of data base changes. If a given transaction requires the alteration of a number of different data base files or records, commitment control ensures that none of the changes are applied unless all of the changes are applied. Commitment control helps to ensure data base integrity and offers a vehicle for forward and backward data base recovery.

Data Description Specifications (DDS)

With System/38, data description specifications are used to define the data fields external to the program. The description of each field (name, data type, length, decimal positions) and the location of that field within the record are defined through the data description specifications and are stored with the file in auxiliary storage.

Several benefits result from separating data descriptions and programs:

- The high-level language programs (RPG III, BASIC, PL/I, and COBOL) need less coding because the input and output specifications are not coded in the program.
- Greater control and consistency in naming and defining data may be achieved.
- Application documentation is improved because text documenting the files, records, and fields can be stored with the data and displayed in compilation listings, cross-reference listings, and file listings.
- Column heading information can also be specified and is used to prompt for field information by the System/38 utilities.
- The definition phase of Interactive Data Base Utilities is simplified because the data is already described. Also, the system shows the text descriptions of the fields to help in selecting those fields to be included in the definition.
- The file copy function is greatly enhanced because data descriptions of the from and to files are used to:
 - Rearrange fields in the record
 - Transform data types
 - Add or delete fields
 - Perform record selection — a capability that replaces the need for many user-written programs
- The owner of the file can secure specific sensitive fields while allowing access to, or the updating of, other less sensitive fields in a record.

Device Data Management

Device data management uses a device file description (stored in the system) to identify the characteristics of each type of System/38 input/output device. For each type of device, there is a device file that describes the device and the format of data for that device. These device files do not contain any data, but are used to build record formats and to control the transfer of data between the physical devices and the programs that use or generate the data

Device data management support can be classified as follows:

- Support for display devices that generally use externally described data
- Support for nondisplay devices that generally use program-described data

Object Management

Objects

An object is a named item that is made up of a set of attributes (that describe the object) and the data portion of the object. Control language commands perform functions such as create, change, delete, or display an object. Therefore, for System/38, the term *object* refers to more than just files because it can include items such as libraries, files, commands, programs, message queues, and user profiles.

Libraries

Libraries are used to organize objects into groups. Most objects can be placed in libraries. A library can group many types of objects.

Work Management

A job is the basic unit of work for System/38. There are two types of jobs: interactive and batch.

A job executes under the control of a subsystem. A subsystem provides a controlled environment for the execution of jobs. Examples of subsystems are:

- A *controlling* subsystem, which supports only the system console
- An *interactive* subsystem, which supports interactive processing through all the workstations attached to the system
- A *batch* subsystem, which supports batch job processing on the system
- A *spooling* subsystem, which supports jobs that read batch job streams into the system from input devices and jobs that write output files to output devices
- A *programmer* subsystem, which supports work done by the programmer
- A *general* subsystem, which supports a combination of the above

- A *user-defined* subsystem, which can be created by changing the CPF-provided subsystem descriptions or by creating other subsystem descriptions to support special data processing requirements

Communication Management

- The System/38 integrated communication management functions are included in CPF.
- Remote Job Entry Facility (RJE) and Distributed Data Management (DDM) are separate program offerings described in a later section.
- Advanced program-to-program communication (APPC) provides an SNA program-to-program protocol between two System/38s, between a System/38 and a System/36, and between a System/38 and CICS/VS. APPC is based on SNA LU6.2 and PU2.1 architecture and provides a peer relationship between the interconnected products. It allows System/38 to function as a departmental node with the ability to duplicate systems between departments. System/38 provides a conversational interface to allow support of user interconnect functions without the need to understand transmission/communications protocols.
- Display station pass-through support (DSPT) allows display station users at a System/38 to attach their devices to another System/38 or a System/36.
- The System/38 is supported as an end-node in an advanced-peer-to-peer network (APPN).
- A limited-distance X.25 adapter is available to link two System/38's together. This is a full-duplex link with a maximum aggregate data transfer rate of 64K bps. This provides an attractive alternative to customers who wish to link two System/38's together, but who also have a need for all twelve of the available communication lines.
- 3270 data stream pass-through allows 3270 devices attached to a System/38 and passing through to a System/370 to do so without conversion of the data stream. This gives the 3270 user full 3270 data stream support for applications such as host graphics without alteration of 3270 keyboard mapping.
- 3270 device emulation allows the System/38 locally or remotely attached 5250 Information Display System devices to appear as 3270 Information Display System devices. Most systems that support the 3270 on multipoint networks can have the System/38 with 3270 device emulation co-resident in the network. Such host system communication subsystems include 30XX, 4300 IMS/VS TSO, CICS/VS, and VM/SP CMS. Support of the 3270 includes the host access methods ACF/VTAM, ACF/TCAM, and BTAM. Support is provided for attachment via binary synchronous communications (BSC) and synchronous data link control (SDLC) communications.
- The System/38 remote attach support allows a System/38 to appear as a host system for 3270

controllers and devices. The attached device appears to CPF and application programs as a remote 5250 display station. The end user at the 3270 device views the System/38 5250 screens. Attachment is provided for SNA/SDLC connection.

- SNA-alert support notifies the SNA network operator of conditions detected by System/38. The remote System/370, 30XX, or 4300 host uses the Network Communications Control Facility (NCCF) and Network Problem Determination Application (NPDA) programs to receive the alert into the host data base for subsequent use in problem determination. Support is provided for attachment of the System/38 to the host via SNA/SDLC. Alert focal-point support allows the System/38 to monitor SNA alerts where the System/38 is the highest logical unit in a network.
- Mixed-file and high-level language multiple device support is provided. Applications written in RPG III or COBOL may have interactive communications with multiple devices and systems of the same or different types through a single file definition. A user may send and receive data records asynchronously between an application program and local/remote displays, terminals, other devices, or programs in other processors.

System Services

The System/38 Control Program Facility (CPF) includes functions that help to manage system operation. These functions include:

- Device configuration
- Security
- Save/restore
- Service (concurrent maintenance)

Security

System/38 has two major security functions:

- The integrity function reduces the possibility of inadvertent destruction or alteration of programs and data by a workstation user or someone not trained in data processing.
- The user-authorization checking function allows for information that is accessed and displayed to be restricted to specific users.

Both of these functions are especially important in the workstation environment in which physical security is difficult to maintain. Each System/38 object has a specified owner and the system knows what kind of operations can be performed on various object types. The owner of an object specifies who may use the object and how he may use it. The object owner must ensure that proper authorizations are initiated when the object is created, although authorizations can be initiated, changed, or canceled later.

System/38 security is integrated in the system. Consequently, the security facility cannot be circumvented. Everything on the System/38 is an object, and the object authorization scheme referenced

System/38 Software

above provides the only path to System/38 data constructs.

The security function is controlled by the security officer, a person operating with a special user profile called the security officer profile. Only the security officer:

- Can create user profiles
- Can alter user passwords
- Has full authorization to access any object in the system

Save/Restore & Backup/Recovery

Release 8 of System/38 Control Program Facility includes major save/restore and backup/recovery enhancements.

- **Auxiliary storage pools.** The System/38 manages the relationship between main storage and auxiliary storage. The System/38 also manages the placement of data on auxiliary storage devices. Release 8 of the System/38 Control Program Facility allows the user to designate disk drives for the storage of certain types of objects: specifically, journals, journal receivers, and savefiles. This allows a user to know which disk drive a journal is located on in the event of a drive failure. Targeting the journal to a specific drive also improves journaling performance, because the drive is dedicated to journaling and is consequently only writing journal data to disk in a serial fashion, not seeking data. Release 8 also allows users to journal changes to access paths to minimize further the length of time associated with system restoration.
- **Checksum.** Release 8 of System/38 Control Program Facility allows a user to designate three to eight disk drives of the same type to be a checksum set. In the event of a drive failure within a checksum set, the failing element is replaced. The system will then rebuild the data on the lost drive by looking at the data stored on the other drives in the checksum set.
- **Automatic microcode completion** (available on 5382 System Unit only). When the system terminates abnormally, machine instructions are interrupted. If some instructions have not completed execution, objects in use may be left in states unusable for normal processing. The machine normally reacts to such an abnormal termination by performing processing designed to place every object in a valid, usable state during the next IMPL. For objects like data base file keyed access paths, the operation needed to construct a valid object state (rebuild an entire access path) can be a long-running function.

If main storage was saved on an abnormal termination due to a 3370, 9332, or 9335 disk device failure or a power outage with a Basic Uninterruptible Power Supply installed, it may be possible for the system to invoke the automatic microcode completion function to attempt to complete exe-

cutation of each interrupted instruction during the next IMPL. If every interrupted instruction can be completed, the amount of time needed to place every object in a usable state can be significantly reduced. In the case of data base keyed access paths, it is possible to avoid rebuilding access paths if every interrupted instruction using the access path can be completed.

- The save/restore function saves objects, groups of objects and libraries by writing them to the diskette magazine drive or to a magnetic tape device. Save files can also be written to a user-designated auxiliary storage pool (ASP). Restoration can take place from media stored offline or from a user ASP.

Service

The service representative can perform concurrent maintenance on many of the input/output devices for System/38. With the concurrent maintenance support, the system operator and the service representative can share use of the system console. Information displayed at the system console can help the service representative diagnose problems faster.

The following items are available to help the service representative:

- History file (system operator messages, responses, and the status of the system at the time of failure)
- Error recording area (a defined storage area for accumulating machine and program errors)
- System level files (a defined storage area to hold current release and program change level information)
- Traces (levels included for the type of function to be traced)
- Display facilities (which allow a dump to the printer or the console)
- Modification facilities (which allow permanent or temporary changes to the IBM system support)

Programmer Services

System/38 provides aids to assist in online program development from either local or remote workstations. These aids let the programmer:

- Use the programmer menu to simplify requesting programmer functions
- Enter source data online (using the source entry utility)
- Submit a job for compilation from the workstation
- Display the output of a compilation at the workstation, or print it on the system printer or on the workstation printer

- Test and debug through CPF facilities during program execution:
 - Trace
 - Breakpoint
 - Display variables
 - Dump
- Use test libraries
- Use file reference facilities:
 - Display file description
 - Display file field description
 - Program references
 - Display data base relations
- Move data between device files or data base files

Programs can also be entered by using traditional batch methods.

System Operator Services

System/38 is designed as a workstation system that lets workstation users perform work with less need for a system operator.

The system operator receives messages:

- That were sent to the system operator explicitly by an application program
- That respond to workstation user requests
- That relate to devices of the system unit

Display commands let the user display objects, entries in libraries, and status information. For example, the spooling function lets the system operator display input and output queues, as well as the actual data in an output spooling file.

History Log

The Control Program Facility maintains a system history log that contains all messages sent to the system operator. Each message is time-stamped. The history log supplies an audit trail of the status and state of the system, subsystems, jobs, and devices.

A message is sent to the history log as every job begins, and a message is sent when every job ends. The job end message contains information about resources used by the job, and a completion code that shows whether job execution was successful or unsuccessful.

Job Log

The job log provides a record of the job requests entered and the results of those requests. The Control Program Facility creates a job log at the start of each job, and it is a user option to print it when the job completes.

Job Accounting

A job accounting journal contains information about each completed job. Examples of this information are start date/time, end date/time, CPU time used, print lines spooled, number of transactions, and total response time.

Messages

The Control Program Facility message-handling function processes both automatic responses and operator responses to messages. Operator-initiated messages can be sent from any workstation to any other workstation, including the system console.

Graphics Capability

The System/38 Control Program Facility provides Graphical Data Display Manager (GDDM), Presentation Graphics Routines (PGR), and Graphics Data File (GDF) software capabilities as well as supporting System/38 graphics hardware devices. GDDM provides multipurpose drawing capabilities for use by System/38 high-level language application programs and is the base support for PGR. PGR provides business charting capabilities within application programs.

Ordering Information – CPF

Program number: 5714-SS1

Reference Material – CPF

- CPF Concepts Manual, GC21-7729
- System/38 Guide to Publications, GC21-7726

RPG III

The RPG language is designed specifically for commercial applications. The fixed format of the specifications makes the language easy to learn, yet RPG III also offers the experienced programmer many advanced functions.

System/38 RPG III functions include:

- Externally described data
- Full procedural file specification
- Explicit input/output calculation operations
- Work station file operation codes
- Call capability (to another program)
- Data structures
- Compare and branch
- Short form of calculations
- DO loops
- IF/ELSE operations
- Compile listing functions
- Auto report standard
- Enhanced debug facilities

Ordering Information – RPG III

Program number: 5714-RG1

Reference Material – RPG III

- Programmer's Guide and Reference Manual, GC21-7725

COBOL

The System/38 COBOL compiler meets the December 1975 Federal Information Processing Standards (FIPS), low-intermediate, and the American National Standards (ANS) COBOL, X3.23-1974. It also has many features of the high-level FIPS except the communications and report writer modules.

IBM Extensions to COBOL

In addition to the standard language functions, System/38 COBOL provides the following extensions:

- Use of apostrophe in addition to quotes
- Extended data types of computational-3 (packed) and computational-4 (binary)
- SET condition-name to TRUE
- SET mnemonic-name to ON/OFF

Other Support

- System/38 COBOL permits a COBOL program to be called by, or to call, a program written in any System/38 language.
- A COBOL source file is provided by System/38 COBOL for source programs.
- A Create COBOL Program command generates object programs. This command includes various options for control of the source listing and security functions.

Extensions Supporting Data Base and Workstation Processing

- System/38 has added phrases to the READ, WRITE, REWRITE, DELETE, and START verbs to support the System/38 data base and workstations.
- System/38 COBOL supports numeric primary keys and noncontiguous composite keys for files assigned to DATABASE.
- Work stations can be programmed, whether they are locally or remotely attached.
- System/38 data base and display device definitions can be used with COBOL programs.

Ordering Information – COBOL

Program number: 5714-CB1

Reference Material – COBOL

- System/38 Concepts for the COBOL User, SC21-7855
- System/38 COBOL Reference Manual and Programmer's Guide, SC21-7718
- System/38 Reference Summary, SC21-7281

BASIC

System/38 BASIC consists of an interpreter for interactively entering, debugging, and running BASIC source programs or procedures. Each line of code is syntax-checked upon entry. In the interpreter mode, program execution can be interrupted, variables examined and changed, and execution resumed. A compiler is provided for those applications that need the performance advantages of compiled code. Source for programs and procedures may also be entered using Source Entry Utility (SEU), with each statement syntax-checked and saved in a source file for later execution or compilation.

System/38 BASIC functions include:

- Compile commands (one each in BASIC and in System/38 Control Language) to compile BASIC source
- Ability to CALL another program written in any System/38 language, from any BASIC program or procedure
- Ability to use externally described files (data base, display, and printer) in BASIC programs
- BASIC command to list variables in an externally described file
- Binary floating point with the representations of Positive Infinity, Negative Infinity, and Not-a-Number
- Integer data type support
- SYSTEM command, which allows access to authorized System/38 CL commands from within the BASIC session
- Function in Source Entry Utility (SEU) to enter and syntax check BASIC source
- Extensive HELP facility
- System/38 debug function for compiled BASIC programs
- Support for 40-character variables
- Support for matrix operations:
 - Assignment (scalar, array)
 - Addition
 - Subtraction
 - Multiplication
 - Scalar multiplication

- Setting of all elements to zero
- Ascending and descending array sort
- Setting of all elements to a constant
- Creation of an array of index elements that specifies ascending or descending sequence of the data associated with each index element
- Default BASIC source file at installation
- Support for 7-dimensional arrays
- Parameter on LISTP command for cross-reference source listings
- Support for System/38 data areas and local data areas

Ordering Information – BASIC

Program number: 5714-BA1

Reference Material – BASIC

- System/38 BASIC Reference Manual and Programmer's Guide, SC21-9046
- System/38 BASIC Reference Summary, SC21-9047

PL/I

System/38 PL/I is designed according to the specifications of the industry standard "ANS PL/I, X3.53-1976." It is a high-level programming language for use in commercial and scientific application areas. This implementation is designed to provide the ease-of-programming characteristics associated with ANS PL/I as well as System/38 functions such as externally described files and a read/write interface to workstations. All-points-addressable graphics support is included.

Extensions beyond the general purpose subset:

- System/38 specific
 - I/O extensions
 - PL/I built-in subroutines and functions
- To provide improved function
 - ON SNAP (provides for diagnostics)
 - Transmit condition
 - Arguments passed to the initial procedure
 - Skip, page
 - Process
 - Unaligned attribute for binary fixed and binary/decimal float
 - Assignment by name (only VAR = VAR)
 - Assignment aggregate promotion (only aggregate = scalar)

The extensions beyond the general purpose subset, as well as the restrictions and omissions, are discussed in detail in the reference material.

Ordering Information – PL/I

Program number: 5714-PL1

Reference Material – PL/I

- System/38 PL/I Reference Manual and Programming Guide, SC09-1051
- System/38 PL/I Reference Summary, SC09-1026

Interactive Data Base Utilities (IDU)

Interactive Data Base Utilities is a program product consisting of a comprehensive set of separate utilities:

- The Source Entry Utility (SEU) is used to enter and maintain source statements for any System/38 language or data description specifications (DDS).
- The Screen Design Aid (SDA) provides an easy-to-use, interactive way to design, redesign, and test work station screen formats and menus.
- The Data File Utility (DFU) provides functions for the interactive entry, maintenance, and display of data records and files.
- The Query Utility provides the capability to sort, summarize, tabulate, and display, print, or write to a data base file selective information contained in a data base file. A series of menus and prompts helps the user specify record selection, record sequencing, computation, and report formatting. This utility can make information available when needed, without the delays associated with the traditional design, program, test, and debug cycle.

Ordering Information – IDU

Program number: 5714-UT1

Reference Material – IDU

- Reference Manual and User's Guide, SC21-7755
- System/38 Data File Utilities Reference Manual and User's Guide, SC21-7714
- System/38 Source Entry Utility Reference Manual and User's Guide, SC21-7722
- System/38 Query Reference Manual and User's Guide, GC21-7724

System/38 OFFICE/38

System/38 OFFICE/38 consists of a series of programs designed to help improve the productivity of the professional and administrative employee in the modern office environment:

- Personal Services/38
- PC Support/38
- Administrative Management
- Text Management
- Language Dictionaries
- Bar Chart PRPQ
- Business Graphics Utility
- Worksheet/38

System/38 OFFICE/38 Personal Services/38 (PS/38)

Personal Services/38, along with CPF capabilities, allows users with System/38 workstations to participate in IBM office networks.

In addition, IBM Personal Computers with DisplayWrite can be supported by PS/38 using PC Support/38.

Personal Services/38 offers commonly used office functions in a single, integrated product for maximum ease-of-use in performing text processing, document handling and other office tasks. Personal Services/38 functions include:

- Sending and receiving mail
- Document library tasks such as file, search, and retrieve
- Copying IBM Personal Computer documents to/from virtual disks for PS/38 mail and library services
- Logging hardcopy mail
- Sending messages, on one system and across systems
- Text processing
- Calendar management
- Personal directory services
- Office administration support
- Exit to user-supplied menu

Electronic mail, through the PS/38 facilities, participates fully in final form Document Content Architecture document distribution. It provides not only the ability to exchange messages and documents but also incorporates a way to easily create and send memos. PS/38 uses an editor similar to the Text Management product to edit documents and memos.

Adding an IBM Personal Computer with a DisplayWrite product allows the user to fully participate in revisable form Document Content Architecture document distribution. The System/38 is relieved of word processing edit functions. This is consistent with the statement of direction to support intelligent workstations in the System/38 office environment.

Prompt screens/menus and online HELP text are provided for all of the office tasks supported by Personal Services/38 along with a capability to interrupt and suspend any number of tasks while other office tasks are being performed.

IBM Personal Computer Support/38

PC Support/38 provides information exchange and resource sharing between the IBM Personal Computer and the System/38.

- Transfer facility:
 - Transfers data from all types of System/38 data base files to the IBM PC
 - Transfers predefined joined logical files to an IBM PC
 - Transfers a record or selected fields from within a record to the IBM PC
 - Transfers a file member or selected records from a file to the IBM PC
 - Rearranges the order of output fields
 - Optionally translates character, packed decimal, zoned decimal, and binary numeric data from System/38 data files to the IBM PC data format
 - Transfers System/38 data base files to the IBM PC display, printer, virtual printer, diskette, fixed disk, or virtual disk
 - Transfers an IBM PC file to a new or existing member of a System/38 data base file
 - Transfers data from an IBM PC file to a new System/38 data base file
 - Optionally translates IBM PC data formats, except floating point, to the appropriate System/38 data format
 - Transfers data files from a remote System/38 or a remote System/36 with DDM
- Virtual print:
 - Directs IBM PC print output to a System/38 printer
 - With Enhanced 5250 Emulation Version 2.1, allows sharing of IBM PC printers by IBM PC users
- Virtual disk:
 - Permits access to a maximum of eight virtual disks, ranging in size from 5K to 32M bytes per IBM PC user
 - Provides System/38 CL commands to create virtual disks and copy data from the System/38 data base to the virtual disk and from the virtual disk to an System/38 data base
- General highlights:
 - Optional user exit program capability to limit function and files to which a user has access
 - Interactive and batch interfaces for data transfer, virtual disk, and virtual print functions
 - Support for PS/PC distribution and library services

System/38 OFFICE/38 – Administrative Management

The program consists of calendar management, correspondence control, and a message facility. From a single display station, users may accomplish multiple tasks that will help them improve their productivity in meeting their business, clerical, and professional responsibilities. The calendar management application may be used to schedule and maintain appointments, meetings, and conferences for individuals, and facilities such as conference rooms.

The application allows the user to:

- Add, change, delete, and display appointments and reminders
- Display calendar in 5-day weekly format
- Display a listing of appointments
- Display morning, business day, and evening calendars
- Shift calendar left or right a number of days
- Schedule tentative appointments on other calendars
- Schedule repetitive appointments
- Schedule appointments for a group
- Display multiple calendars to determine common available time
- Menu-select print options

The correspondence control application may be used to:

- Log all daily incoming correspondence for ease in tracking
- Inquire into correspondence files to assist in locating and tracking all logged correspondence
- Provide information on action items through display station and printed reports

The message facility may be used to enter and send brief, informal messages to other users and to review messages received. Administrative Management has been designed for ease of use, the applications are selected from a menu, and a comprehensive HELP text is available at the touch of a key.

System/38 OFFICE/38 – Text Management

This licensed program lets System/38 users create, store, retrieve, revise, and print documents. The user may access the System/38 data base from the text management program interactively at edit time or at print time. This provides the capability to selectively include data base information within a text document. Forms may be created and filled in on the display or stored in the system for later use. Prompts and help text are available during program execution to assist the user.

The functions available to the user are:

- Creating text:
 - Filing by user-provided document name
 - Keying new text
 - Copying in from a stored document
- Revising text
- Retrieving document by:
 - Keying document name
 - Selecting from a list of documents in a file
 - Searching document description for a character string
 - Searching for a creation date (from/to)
 - Searching for a document name (including partial name)
 - Any combination of searches
- Line commands to:
 - Move
 - Copy
 - Insert
 - Delete
 - Shift
- Text string manipulation by command key and cursor to:
 - Insert text in a paragraph
 - Move text strings
 - Copy text strings
 - Delete text strings
 - Move columns
- Copying in from a stored document
- Scanning for a character string
- Replacing a character string
- Printing documents with formatting options for:
 - Headers/footers per page
 - Number of copies
 - Length of printer form
 - Line spacing
 - Printing review copy with line numbers
 - Printing part of document (from/to page number)
 - Flagging changes
 - Utilizing the following advanced print functions of the 5219 Printer:
 - Type style support
 - Alternate cut-sheet feed
 - Lines per inch
 - Ribbon saver under program control
 - Sending documents to Displaywriter for printing
 - Sending documents to 6670 Information Distributor for printing
 - Font (type style) downloading capability on 6670 Model II with Font Storage feature installed
- Data base access
 - Form letters with data base field insertion at print time
 - Copying data base directly into document interactively
 - Simple conditional selection by field
- Creating, storing, retrieving forms
- Table of contents
- Column total for numeric data
- Online document proofreading aids for:
 - Spelling verification
 - Spelling aid
 - Synonym aid (English only)
 - Automatic hyphenation option

System/38 Software

System/38 OFFICE/38 – Language Dictionaries

The Language Dictionaries are ordered separately and are for use with the document proofreading functions of System/38 Text Management and System/38 Personal Services/38. The Language Dictionaries program contains dictionaries in each of the following languages:

- English (includes U.K., U.S. Legal, Medical)
- Spanish
- Danish
- French
- Italian
- Dutch
- Icelandic
- Norwegian
- Swedish

System/38 OFFICE/38 – Bar Chart PRPQ

This PRPQ is a licensed program that allows easy creation of business charts without user programming. With this program, the user can display, modify, and print bar charts using data obtained from a standard data base file or entered directly from a workstation. The program can be used interactively from a workstation, from a batch job, or from another application, such as the System/38 OFFICE/38 Text Management Program, to produce printed charts and chart legends. Either color or monochrome workstations can be used. Reports created on one workstation can be run unmodified on the other. On a color workstation, charts of up to seven colors can be created. On a monochrome display, two shades are used (high and low intensity), but different effects can be achieved by the selection of several attributes at chart creation time. A comprehensive online help text provides tutorial and reference information.

System/38 OFFICE/38 – Worksheet/38*

This comprehensive relational modeling system gives the user direct access to the System/38 data base to create, update, save, secure, and print models. The major component of Worksheet/38 is the Interactive Model Processor (IMP). The IMP's basic functions are to format, calculate, and tabulate data within a basic model and to link data from other models.

The functions available to the user are:

- Direct access to current data for modeling
- Linking various models into families or systems so that a change in one model is automatically reflected in linked models
- A matrix consisting of 702 columns and 999 rows
- Built-in mathematical and financial functions
- External table searching for bringing data into the model

- A search-and-replace feature to scan the entire model and display each occurrence of a specified string of information

* Worksheet/38 is a trademark of New Generation Software, Inc.

System/38 OFFICE/38 – Business Graphics Utility

This general purpose, menu-driven tool allows System/38 users to create, modify, store, display, print, and plot color business graphics. The menu-driven interface requires no programming while offering eight chart-design options that can use data from System/38 data base files or data entered by keyboard. The same data files can be used to create reports and graphs. Graphics can be stored and called later, with the same or different data, from either the terminal or an application program.

Ordering Information – System/38 OFFICE/38

Administrative Management

Program number: 5714-WP1

Text Management

Program number: 5714-WP2

Language Dictionaries

Program number: 5714-DCT

Bar Chart

Program number: 5799-BHQ

Business Graphics Utility

Program number: 5714-GP1

Worksheet/38

Program number: 5710-RRL

Personal Services/38

Program number: 5714-WP3

IBM PC Support/38

Program number: 5714-PC1

Reference Material – System/38 OFFICE/38

- Personal Services/38 Introduction, GC09-1071
- Personal Computer Support/38, GC21-8034
- System/38 OFFICE/38 Administrative Management Specifications, GC21-7990

- Getting Started with Administrative Management, GC09-1039
- System/38 – Personal Services/38, Administrative Management and Text Management, brochure, G580-0696
- System/38 – Text Management Program Specification, GC21-7964
- Getting Started with Text Management, GC09-1021
- System/38 OFFICE/38 Language Dictionary Specifications, GC21-8020
- OFFICE/38 Bar Chart PRPQ P84050 Specifications, GC21-7959
- System/38 Business Graphics Utility, GC21-8018
- System/38 OFFICE/38 – Worksheet/38, GB30-2383

Remote Job Entry Facility (RJEF)

The Remote Job Entry Facility lets System/38 function as a remote job entry workstation to the host system while the System/38 submits jobs to a central System/370, 30XX, or 4300. System/38 is attached to the central system by means of a point-to-point switched or nonswitched data link using binary synchronous communications.

System/38 RJEF communicates with the central processing subsystems OS/VS1 RES, OS/VS2 JES2, and OS/VS2 JES3, or to VM/370 Remote Spooling Communications Subsystem (RSCS) as a System/3 RJEF workstation.

Ordering Information – RJEF

Program number: 5714-RC1

Distributed Data Management (DDM)

System/38 Distributed Data Management provides source and target support as defined in Level 1.0 of the Distributed Data Management Architecture. A new type of file (called a DDM file) contains the name of a file on a remote system as well as the APPC information necessary to establish communications with that remote system. An application program at the source system is not aware that records being processed are actually stored on a different system. Programs written in RPG III, COBOL, BASIC, PL/I, and CL to process local data base files need not be modified to process the same files on remote systems that support target DDM.

System/38 DDM highlights:

- Local programs can read, add, update, and delete records on remote systems.

- Remote systems can read, add, update, and delete records on a local System/38.
- An application program is unaware that it is processing a remote file.
- A System/38 can process files from a System/36, another System/38, or a System/370 with CICS (target only) and can receive requests for file processing from a System/36 or another System/38.

Ordering Information – System/38 DDM

Program number: 5714-DD1

System/38 Performance Measurement Tools

The System/38 Performance Measurement Tools are the capacity planning aids for the System/38. They offer comprehensive tools to profile the workload of a system based on the individual application components running during a sampling period and the complexity of their accompanying transactions. The tools provide a modeling facility to determine the ramifications of various tuning measures on the system as a whole. The modeling facility also allows the user to apply hypothetical model upgrades and other hardware expansions to their current system profile to aid in determining the extent to which such hardware, if installed, would meet the user's performance expectations.

Ordering Information – System/38 Performance Measurement Tools

Program number: 5799-BJK

Display Information Facility (DIF)

DIF provides the user with a powerful tool to build online information applications consisting of a combination of alpha search, inquiry, update, list, and user programs. This facility is designed to generate programs that will give the user online access to his data files. A high degree of tailoring capability permits the user to define his unique file and display formats, and to define the interrelationship among the displays.

Ordering Information – DIF

Program number: 5714-XR1

Workstation Search Facility (WSF)

WSF allows the user to search alphabetic or numeric byte strings in a file. Blanks in the search arguments are supported. Forward and backward search are supported. The found information will be displayed.

Ordering Information – WSF

Program number: 5714-WS1

Industry Application Programs

- Distribution Management System (DMS/38)
 - Customer Service Billing (5714-D41)
 - Accounts Receivable (5714-D42)
 - Inventory Control (5714-D43)
 - Sales Analysis (5714-D44)
 - Purchasing (5714-D45)
 - Inventory Management, Product Replenishment, and Order Validity Evaluation (IMPROVE) (5714-D46)
 - General Ledger (5714-D47)
 - Accounts Payable (5714--D48)
 - Payroll (5714-D49)
- Manufacturing Accounting and Production Information Control System (MAPICS)
 - Production Control and Costing (5714-M41)
 - Payroll (5714-M42)
 - Accounts Payable (5714-M43)
 - Accounts Receivable (5714-M44)
 - Inventory Management (5714-M45)
 - Product Data Management (5714-M46)
 - General Ledger (5714-M47)
 - Sales Analysis (5714-M48)
 - Order Entry and Invoicing (5714-M49)
 - Data Collection System Support (5714-M4A)
 - Material Requirements Planning (5714-M4B)
 - Capacity Requirements Planning (5714-M4G)
- Retail Data Preparation (RMAS), a ready-to-use set of programs (5714-XA4) that will enable the user to process input from the 5260 retail system terminals

Section 67. Personal Computing

IBM Personal System/2™

Products Included

- Personal System/2 Model 25 (8525)
- Personal System/2 Model 25 LS (8525)**
- Personal System/2 Model 30 (8530)
- Personal System/2 Model 50 Z and Model 50 (8550)
- Personal System/2 Model 60 (8560)
- Personal System/2 Model 70 386 (8570)
- Personal System/2 Model 80 386 (8580)
- Personal System/2 Monochrome Display 8503
- Personal System/2 Color Display 8512
- Personal System/2 Color Display 8513
- Personal System/2 Color Display 8514
- 8604 Monochrome Display
- 3363 Optical Disk Drive
- PC Music Feature
- 4201 Proprinter™ II Model 002*
- 4207 Proprinter™ X24*
- 4208 Proprinter™ XL24*
- 5202 Quietwriter® III Printer*
- Personal System/2 Data Migration Facility
- 3.5-inch Media
- Personal System/2 5.25-inch External Diskette Drive
- Enhanced PS/2® Keyboard
- Space Saving Keyboard
- 6180/7372 Color Plotters*
- 3117/3118 Scanners*
- Operating Systems and Related Languages
- Communications Software
- Local Area Network Software
- Graphics Software
- SolutionPacs™
- Application Software

Key Functions, Facilities, and Features

Personal System/2 Model 25

The following are standard features of the Model 25:

- 8086 microprocessor
- 8-MHz clock speed, 0 wait state
- 16-bit-wide data path to processor
- 12-inch analog display (color or monochrome)
- Multi-Color Graphics Array (MCGA®)
- Serial port

- Parallel port
- Pointing device port
- Keyboard port
- Space Saving Keyboard or Enhanced PS/2 Keyboard
- Audio earphone connector
- Socket for math coprocessor
- One full-size and one 8-inch general-purpose slot
- Single-element system unit and display design
- Size: height = 15.38 inches, width = 12.63 inches, depth = 14.88 inches, weight (monochrome unit) = 33 pounds, weight (color unit) = 38 pounds

The following features expand the base function of the 8525:

- Second Personal System/2 Model 25 3.5-inch 720KB Diskette Drive (Models 001, 004, G01, G04)
- Personal System/2 Model 25 System Board 128KB Memory Expansion Kit (Models 001, 004, G01, G04)
- Personal System/2 8087 Math Coprocessor (8 MHz)

The following options are available for the Personal System/2 Model 25:

- 20MB fixed disk
- IBM Token-Ring Network PC Adapter, Adapter II, and Trace and Performance PC Adapter II
- Mouse
- 5.25-inch External Diskette Drive
- 3363 Optical Disk Drive
- IBM PC Music Feature
- Data Migration Facility
- IBM PC Network Baseband Adapter
- IBM PC Network Broadband Adapter
- Collegiate Kit

Models available:

- 8525-001 Processor with monochrome display and the Space Saving Keyboard. It comes standard with one 720KB 3.5-inch diskette drive and 512KB random access memory (RAM) on system board.
- 8525-004 Processor with color display and the Space Saving Keyboard. It comes standard with one 720KB

* See "Workstation Printers, Plotters, and Scanners," Section 68

** Available through dealers only

IBM Personal System/2

- 8525-G01 3.5-inch diskette drive and 512KB RAM on the system board. Processor with monochrome display and the Enhanced PS/2 Keyboard. It comes standard with one 720KB 3.5-inch diskette drive and 512KB RAM on the system board.
- 8525-G04 Processor with color display and the Enhanced PS/2 Keyboard. It comes standard with one 720KB 3.5-inch diskette drive and one 512KB RAM on the system board.
- 8525-C02 Processor with monochrome display and Space Saving Keyboard. It comes standard with two 720KB 3.5-inch diskette drives and 640KB RAM on the system board.
- 8525-C05 Processor with color display and the Space Saving Keyboard. It comes standard with two 720KB 3.5-inch diskette drives and 640KB RAM on the system board.
- 8525-K02 Processor with monochrome display and Enhanced PS/2 Keyboard. It comes standard with two 720KB 3.5-inch diskette drives and 640KB RAM on the system board.
- 8525-K05 Processor with color display and Enhanced PS/2 Keyboard. It comes standard with two 720KB 3.5-inch diskette drives and 640KB RAM on the system board.

The collegiate Models 8525-C02, -K02, -C05, and -K05 include the Collegiate Kit:

- IBM PC DOS Version 3.30
- Full Microsoft® Windows™ Version 1.04
- Two load-and-go diskettes
- Tutorial
- Four blank diskettes
- Mouse

Personal System/2 Model 25 LS

The following are standard features of the Model 25 LS:

- 8086 microprocessor
- 8-MHz clock speed, 0 wait state
- 16-bit-wide data path to processor
- 640KB random access memory (RAM) on system board
- One 720KB 3.5-inch diskette drive
- 12-inch analog display (color or monochrome)
- Multi-Color Graphics Array (MCGA®)
- Serial port
- Parallel port
- Pointing device port
- Keyboard port
- Enhanced PS/2 Keyboard

- Audio earphone connector
- Token-Ring Adapter Card
- Socket for math coprocessor
- One 8-inch general-purpose slot
- Single-element system unit and display design
- Size: height = 15.38 inches, width = 12.63 inches, depth = 14.88 inches, weight (monochrome unit) = 33 pounds, weight (color unit) = 38 pounds

The following features expand the base function of the 8525 LS:

- Second Personal System/2 Model 25 3.5-inch 720KB Diskette Drive
- Personal System/2 8087 Math Coprocessor (8 MHz)

The following options are available for the Personal System/2 Model 25 LS:

- 20MB fixed disk
- IBM Adapter II and Trace and Performance PC Adapter II
- Mouse
- 5.25-inch External Diskette Drive
- 3363 Optical Disk Drive
- IBM PC Music Feature
- Data Migration Facility
- IBM PC Network Baseband Adapter
- IBM PC Network Broadband Adapter

Models available:

- 8525-L01 Model 25 LS processor with monochrome display
- 8525-L04 Model 25 LS processor with color display

Personal System/2 Model 30

The following are standard features of the Model 30:

- 8086 microprocessor
- 8-MHz clock speed, 0 wait state
- 640KB random access memory (RAM) on system board
- 16-bit-wide data path to processor
- Integrated diskette adapter supporting up to two 720KB drives
- Multi-Color Graphics Array (MCGA®)
- Serial port
- Parallel port
- Pointing device port
- Keyboard port
- Enhanced PS/2 Keyboard
- Time-of-day clock with extended-life battery
- Socket for a math coprocessor
- Three general-purpose slots to accommodate IBM Personal Computer and IBM Personal Computer XT feature cards
- Universal 70-watt power supply, with internal sensing, for worldwide usage

- Size: height = 4 inches, width = 16 inches, depth = 15.6 inches, weight = 17.5 pounds

The following features expand the base function of the 8530:

- Personal System/2 8087 Math Coprocessor
- Personal System/2 Speech Adapter

The following options are available for the Personal System/2 Model 30:

- 2MB Expanded Memory Adapter
- 8503 Monochrome Display
- 8512 Color Display
- 8513 Color Display
- 8514 Color Display
- Display Adapter
- 5.25-inch External Diskette Drive
- 5.25-inch External Diskette Drive Adapter
- IBM Token-Ring Network PC Adapter, Adapter II, and Trace and Performance PC Adapter II
- IBM Token-Ring Network PC Adapter Diskette (3.5-inch)
- IBM PC Network Adapter II, Adapter II – Frequency 2, and Adapter II – Frequency 3
- IBM PC Network Baseband Adapter
- 5173 PC Network Baseband Extender
- Mouse
- IBM PC Music Feature
- General Purpose Interface Bus Cable
- InfoWindow Enhanced Graphics Adapter
- 3363 Optical Disk Drive (A01, B01)
- ROLMphone® 244PC

Models available:

- 8530-002 Processor (including keyboard), with two 720KB diskette drives
- 8530-021 Processor (including keyboard), with one 20MB fixed disk with integrated controller, and a single 720KB diskette drive

Personal System/2 Model 50 Z and Model 50

The following are standard features of the Model 50 Z and Model 50:

- 80286 microprocessor
- 10-MHz clock speed, 0 wait state (Model 50 Z)
- 10-MHz clock speed, 1 wait state (Model 50)
- 1MB or 2 MB memory on system board
- Micro Channel™ Architecture with a 16-bit microprocessor
- Support for up to 16MB of memory
- 1.44MB, 3.5-inch diskette drive
- 20MB, 30MB, or 60MB fixed-disk drive
- Disk/diskette controller
- Keyboard port
- Serial/asynchronous port
- Parallel port
- Pointing device port

- Video graphics array (VGA) port
- Three 16-bit input/output (I/O) slots
- Enhanced PS/2 Keyboard
- Time and date clock with extended-life battery
- Universal 94-watt power supply, with automatic sensing, for worldwide usage
- Size: height = 55 inches, width = 14.2 inches, depth = 16.5 inches, weight = 21 pounds

The following features provide additional capabilities. These features are supported on the 8550 and 8560.

- 80287 Math Coprocessor (10 MHz)
- 0-8MB 80286 Expanded Memory Adapter/A
- 80286 Memory Expansion Option
- 80286 Memory Expansion Kit with memory modules

The following features are supported on the 8550, 8560, and 8580:

- Dual Async Adapter/A supporting two RS232C ports
- Multi-Protocol Adapter/A supporting asynchronous, bisynchronous, HDLC, or SDLC protocols
- Mouse
- 1.44MB diskette drive, providing a second device for 3.5-inch media
- 300/1200-bps Internal Modem/A

The following options are available for the Personal System/2 Model 50 Z and Model 50:

- 8503 Monochrome Display
- 8512 Color Display
- 8513 Color Display
- 8514 Color Display
- 8604 Monochrome Display
- 8514/A Display Adapter
- 3363 Optical Disk Drive
- 5.25-inch External Diskette Drive
- 5.25-inch External Diskette Drive Adapter/A
- 6157 Tape Drive Adapter
- IBM PS/2 5.25-inch External Diskette Drive
- 60MB fixed disk (Models 8550-031 and 8550-061 only)
- IBM Token-Ring Network Adapter/A and Trace and Performance Adapter/A
- IBM PC Network Adapter II/A, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3
- IBM PC Network Baseband Adapter/A
- 5173 PC Network Baseband Extender
- System 36/38 Workstation Emulation Adapter/A and Quick Reference
- 3270 Connection
- 3117 Adapter/A
- 3117 High Speed Adapter/A
- ROLMphone 244PC
- 4250 Print Adapter/A

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Models available:

- 8550-021 Processor (including keyboard) with one 20MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- 8550-031 Processor (including keyboard) with one 30MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- 8550-061 Processor (including keyboard) with one 60MB fixed disk and a 1.44MB, 3.5-inch diskette drive

Personal System/2 Model 60

The following are standard features of the Model 60:

- 80286 microprocessor
- 10-MHz clock speed, 1 wait state
- 1MB memory on system board
- Micro Channel™ Architecture with a 16-bit microprocessor
- Support for up to 16MB memory
- 1.44MB, 3.5-inch diskette drive
- Either a 44MB or 70MB fixed disk drive
- Disk/diskette controller
- Keyboard port
- Serial/asynchronous port
- Parallel port
- Pointing device port
- Video graphics array (VGA) port
- Seven 16-bit input/output (I/O) slots
- Enhanced PS/2 Keyboard
- Time and date clock with extended-life battery
- Automatic voltage-sensing universal power supply
- Size: height = 23.5 inches, width = 6.5 inches, depth = 19 inches, weight = 47 pounds

The following features provide additional capabilities. These functions are also supported on the 8580.

- 44MB fixed-disk drive, providing a second disk drive
- 70MB fixed-disk drive, providing a second disk drive
- 115MB fixed-disk drive, providing a second disk drive

Besides these features, the 8560 also supports those features announced with the 8550.

The following options are available for the Personal System/2 Model 60:

- 80286 Memory Expansion Option
- 80286 Memory Expansion Kit
- 0-2MB 80286 Expanded Memory Adapter/A
- 80287 Math Coprocessor
- 8503 Monochrome Display
- 8512 Color Display
- 8513 Color Display
- 8514 Color Display
- 8514/A Display Adapter
- 8604 Monochrome Display

- 1.44MB Diskette Drive
- 3363 Internal Optical Disk Drive
- 3363 Optical Disk Drive (A11, B01)
- 5.25-inch External Diskette Drive
- 5.25-inch External Diskette Drive Adapter/A
- 6157 Tape Drive Adapter
- IBM PS/2 5.25-inch External Diskette Drives
- Multi-Protocol Adapter/A
- Dual Async Adapter/A
- 300/1200 Internal Modem/A
- IBM Token-Ring Network Adapter/A and Trace and Performance Adapter/A
- IBM PC Network Adapter II/A, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3
- IBM PC Network Baseband Adapter/A
- 5173 PC Network Baseband Extender
- System 36/38 Workstation Emulation Adapter/A and Quick Reference
- 3270 Connection
- Mouse
- 3117 Adapter/A
- High Speed Adapter/A
- ROLMphone 244PC
- 4250 Print Adapter/A

Models available:

- 8560-041 Processor (including keyboard) with one 44MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- 8560-071 Processor (including keyboard) with one 70MB fixed disk and a 1.44MB, 3.5-inch diskette drive

Personal System/2 Model 70 386

- 80286 microprocessor
- 16-MHz clock speed (8570-E61), 0-2 wait state
- 20-MHz clock speed (8570-121), 0-2 wait state
- 25-MHz clock speed (8570-A21)
- 82385 memory cache (64KB) (Model A21 only)
- Micro Channel Architecture with a 32-bit microprocessor
- 1MB or 2MB memory on system board (depending on model)
- Support for up to 16MB memory
- 1.44MB, 3.5-inch diskette drive
- 60MB or 120MB fixed-disk drive
- Disk controller adapter
- Integrated diskette controller
- Keyboard port
- Serial/parallel port
- Pointing device port
- Video graphics array (VGA) port
- Three expansion slots:
 - Two 32-bit expansion slots
 - One 16-bit slot with video extension
- Enhanced Personal System/2 Keyboard
- Time and date clock with long-life lithium battery
- Auto-sensing power supply

- 132-watt universal power supply
- Size: height = 5.5 inches, width = 14.2 inches, depth = 16.5 inches, weight = 21 pounds

The following options are available on the Personal System/2 Model 70 386:

- 80386 Memory Expansion Option
- 2-8MB 80386 Memory Expansion Option
- 80387 Math Coprocessor
- 8512 Monochrome Display
- 8512 Color Display
- 8513 Color Display
- 8514 Color Display
- 8604 Monochrome Display
- 8514/A Display Adapter
- 1.44MB Diskette Drive
- 3363 Internal Optical Disk Drive
- 3363 Optical Disk Drive (A11, B01)
- 5.25-inch External Diskette Drive
- 5.25-inch External Diskette Drive Adapter/A
- 6157 Tape Drive Adapter
- Multi-Protocol Adapter/A
- Dual Async Adapter/A
- 300/1200 Internal Modem/A
- IBM Token-Ring Network Adapter/A and Trace and Performance Adapter/A
- IBM Network Adapter II/A, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3
- IBM PC Network Baseband Adapter/A
- 5173 PC Network Baseband Extender
- System 36/38 Workstation Emulation Adapter/A and Quick Reference
- 3270 Connection
- Mouse
- 3117 Adapter/A
- High Speed Adapter/A
- ROLMphone 244PC
- 4250 Print Adapter/A

Models available:

- Model 70-E61 Processor (including keyboard) with one 60MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- Model 70-121 Processor (including keyboard) with one 120MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- Model 70-A21 Processor (including keyboard) with one 120MB fixed disk and a 1.44MB, 3.5-inch diskette drive

Personal System/2 Model 80 386

The following are standard features of the Model 80 386:

- 80386 microprocessor

- 16-MHz clock speed (8580-041, 8580-071), 0-2 wait state
- 20-MHz clock speed (8580-111, 311), 0-2 wait state
- Micro Channel™ Architecture with a 32-bit micro-processor
- 80-nanosecond memory, 1-megabit chips
- 1MB or 2MB memory on system board (depending on model)
- Support for up to 16MB memory*
- 1.44MB, 3.5-inch diskette drive
- Fixed disk drive
- Disk controller adapter
- Integrated diskette controller
- Keyboard port
- Serial port
- Parallel port
- Pointing device port
- Video graphics array (VGA) port
- Seven expansion slots:
 - Four 16-bit expansion slots
 - Three 32/16-bit expansion slots
- Enhanced PS/2 Keyboard
- Time and date clock with long-life lithium battery
- Auto-restart power supply
- 225-watt universal power supply
- Additional positions for a second fixed disk drive and a second 3.5-inch diskette drive
- Size: height = 23.5 inches, width = 6.5 inches, depth = 19 inches, weight = 52 pounds

The following options are available on the Personal System/2 Model 80 386:

- System Board 2MB Memory Expansion Kit (Models 8580-111 and -113 only)
- 80386 Memory Expansion Option
- 2-8MB 80386 Memory Expansion Option
- 80387 Math Coprocessor
- 8512 Monochrome Display
- 8512 Color Display
- 8513 Color Display
- 8514 Color Display
- 8604 Monochrome Display
- 8514/A Display Adapter
- 1.44MB Diskette Drive
- 44MB Fixed-Disk Drive (only Model 8580-041)
- 70MB Fixed-Disk Drive (all models except 8580-041)
- 115MB Fixed Disk Drive (all models except 8580-041)
- 314MB Fixed-Disk Drive (all models except 8580-041)
- 3363 Internal Optical Disk Drive
- 3363 Optical Disk Drive (A11, B01)
- 5.25-inch External Diskette Drive
- 5.25-inch External Diskette Drive Adapter/A

* 128K bytes are reserved for high performance BIOS (Basic Input/Output System) (Models 111 and 311 only)

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- 6157 Tape Drive Adapter
- Multi-Protocol Adapter/A
- Dual Async Adapter/A
- 300/1200 Internal Modem/A
- IBM Token-Ring Network Adapter/A and Trace and Performance Adapter/A
- IBM Network Adapter II/A, Adapter II/A – Frequency 2, and Adapter II/A – Frequency 3
- IBM PC Network Baseband Adapter/A
- 5173 PC Network Baseband Extender
- System 36/38 Workstation Emulation Adapter/A and Quick Reference
- 3270 Connection
- Mouse
- 3117 Adapter/A
- High Speed Adapter/A
- ROLMphone 244PC
- 4250 Print Adapter/A

Models available:

- 8580-041 Processor (including keyboard) with one 44MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- 8580-071 Processor (including keyboard) with one 70MB fixed disk and a 1.44MB, 3.5-inch diskette drive
- 8580-111 Processor (including keyboard) with one 115MB fixed-disk drive and a 1.44MB, 3.5-inch diskette drive
- 8580-311 Processor (including keyboard) with one 314MB fixed-disk drive and a 1.44MB, 3.5-inch diskette drive

8503 Monochrome Display

- Input signal: analog
- Display size: 12 inches (measured diagonally)
- Display type: monochrome (white on black or black on white)
- Palette: up to 64 shades of grey
- Addressability:
 - 720 x 400 text
 - 640 x 480 graphics
 - 320 x 200 graphics
- Character size:
 - 8 x 16 character box text (MCGA)
 - 9 x 16 character box text (VGA)
- Speed:
 - 31.5K-Hz horizontal scan frequency (all modes)
 - Non-interlaced with up to 70-Hz vertical refresh rate
- Attachability:
 - Personal System/2 Models 30, 50, 50 Z, 60, 70 386, 80 386
 - Personal System/2 Display Adapter (attachment to PC, PC XT, PC XT-286, PC AT)
 - Personal System/2 Display Adapter 8514/A

8512 Color Display

- Input signal: analog
- Display size: 14 inches (measured diagonally)
- Display type: color
- Palette: 256 out of more than 256K colors
- Addressability:
 - 720 x 400 text
 - 640 x 480 graphics
 - 320 x 200 graphics
- Character size:
 - 8 x 16 character box text (MCGA)
 - 9 x 16 character box text (VGA)
- Speed:
 - 31.5K-Hz horizontal scan frequency (all modes)
 - Non-interlaced with up to 70-Hz vertical refresh rate
- Attachability:
 - Personal System/2 Models 30, 50, 50 Z, 60, 70 386, 80 386
 - Personal System/2 Display Adapter (attachment to PC, PC XT, PC XT-286, PC AT)
 - Personal System/2 Display Adapter 8514/A

8513 Color Display

- Input signal: analog
- Display size: 12 inches (measured diagonally)
- Display type: color
- Palette: 256 out of more than 256K colors
- Addressability:
 - 720 x 400 text
 - 640 x 480 graphics
 - 320 x 200 graphics
- Character size:
 - 8 x 16 character box text (MCGA)
 - 9 x 16 character box text (VGA)
- Speed:
 - 31.5K-Hz horizontal scan frequency (all modes)
 - Non-interlaced with up to 70-Hz vertical refresh rate
- Attachability:
 - Personal System/2 Models 30, 50, 50 Z, 60, 70 386, 80 386
 - Personal System/2 Display Adapter (attachment to PC, PC XT, PC XT-286, PC AT)
 - Personal System/2 Display Adapter 8514/A

8514 Color Display

- Input signal: analog
- Display size: 16 inches (measured diagonally)
- Display type: color
- Palette: 256 out of more than 256K colors
- Addressability: 1024 x 768 graphics (requires use of Personal System/2 Display Adapter 8514/A)
- Character size:
 - 12 x 20 character box text (85 columns x 38 rows)
 - 7 x 15 character box text (146 columns x 51 rows)

- Speed:
 - 31.5K-Hz horizontal scan frequency (all modes)
 - Non-interlaced with up to 70-Hz vertical refresh rate
 - Interlaced at 43.5-Hz vertical refresh rate 1024 x 768 mode only)
- Attachability:
 - Personal System/2 Models 30, 50, 50 Z, 60, 70 386, 80 386
 - Personal System/2 Display Adapter (attachment to PC, PC XT, PC XT-286, PC AT)
 - Personal System/2 Display Adapter 8514/A

8604 Monochrome Display

- Input signal: analog
- Display size: 15 inches (measured diagonally)
- Display type: monochrome
- Palette: up to 64 shades of grey
- Addressability: 1024 x 768 graphics (requires use of Personal System/2 Display Adapter 8514/A)
- Character size: 146 characters per line by 51 rows (text mode)
- Attachability:
 - Personal System/2 Models 50, 50 Z, 60, 70 386, 80 386
 - Personal System/2 Display Adapter 8514/A

3363 Optical Disk Drive

The 3363 Optical Disk Drive is a high-performance optical storage product that uses a 200MB write-once removable cartridge. It provides for archiving data as well as program and data storage and distribution convenience. File driver software, archive software, and a controller card are included with all 3363 models except B01. Up to eight drives can be attached depending on Personal System/2 or PC model.

- Media
 - 5 1/4-inch optical disk
 - Removable write-once cartridge
- Capacity: 200MB
- Data rate: Burst data rate up to 2.5 megabits per second at the output of the read amplifier. Peak transfer rate is generally the same as speed of the I/O channel.
- Seek time: 45 ms to 230 ms average, depending on data location
- Attachability:
 - Model A01 (external)
(IBM PC, PC XT, PC XT-286, PC AT, 3270-PC, 3270-PC AT, Personal System/2 Models 25 and 30)
 - Model A11 (external)
(Personal System/2 Models 50, 50 Z, 60, 70 386, 80 386)
 - Model B01 (external)
(Attaches to an A01, A11, or internal)

- Feature 8700 (internal)
(Personal System/2 Models 60, 80 386)

Music Feature

- Stereo FM synthesized sound
- 336 voice/instrument combinations
- Eight voices/instruments playable simultaneously
- Headphone connection for private listening
- M.I.D.I. (Musical Instrument Digital Interface) compatibility
- Sound generation independent of system processor
- Print capability
- Amplifier, speakers or headphones, and keyboard required
- For use in the PC, PC XT, PC XT-286, PC AT, and Personal System/2 Models 25 and 30

3.5-inch Media

The primary removable storage media used in the IBM Personal System/2 family is the 3 1/2-inch diskette. It represents a significant advance in the continuing effort to develop high-quality portable memory media. The 3 1/2-inch diskette drive provides increased capacity and enhanced reliability.

- Higher capacity (720KB or 1.44MB)
- Smaller size. Makes storage easier and simpler and reduces drive size limitations.
- Risk of accidental disk damage reduced by durable casing, lack of exposure of the magnetic medium, and a cartridge liner that functions as a cleaning element
- Convenience added with built-in write-protect tab instead of removable tabs, which may be misplaced

Data Migration Facility

The IBM Personal System/2 Data Migration Facility is a low-cost, easy-to-use method for transferring data and some software (subject to copyright and licensing) from an IBM Personal Computer to a member of the IBM Personal System/2 family.

- Hardware requirements: parallel printer ports on sending and receiving ends, standard printer cable (not included) and connector plug (included)
- Software requirements: Data Migration Facility diskette (5 1/4-inch) included containing the send program to be used on the sending PC. The receive program will be on the starter diskette packaged with the IBM Personal System/2 Model 30 or the reference diskette on Models 50, 50 Z, 60, 70 386, 80 386.
- Sending: PC, PC XT, PC XT-286, PC AT
- Receiving: Personal System/2 Models 25, 30, 50, 50 Z, 60, 70 386 or 80 386

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- Transfer:
 - Unidirectional (from PC to Personal System/2 only)
 - May be diskette-to-diskette, fixed-disk-to-fixed-disk, or any combination

5.25-inch External Diskette Drive

The IBM Personal System/2 5.25-inch External Diskette Drive, 4869 Model 001, is an external 5.25-inch 360KB diskette drive unit for attachment to the IBM Personal System/2 Model 30-021 and Models 50, 50 Z, 60, 70 386 and 80 386 systems. It allows users to transfer data files and execute programs that follow DOS and BIOS procedures from 5.25-inch media. The 4869 is installed as the B drive and operates in the same fashion as a B drive.

Enhanced PS/2 Keyboard

All of the IBM Personal System/2 models feature the enhanced 101-key keyboard. This IBM keyboard was originally introduced for the upgraded models of the IBM PC XT and IBM PC AT. The enhanced keyboard features replaceable key tops, tactile home row and numeric key-pad indicators, status indicators, and a detachable keyboard cord.

Space Saving Keyboard

The IBM Space Saving Keyboard is designed for high productivity and has the same touch quality as the Enhanced PC Keyboard. It is available on the Personal System/2 Model 25 only. The Space Saving Keyboard provides a full typewriter keyboard (84 keys) plus 12 function keys, yet requires less space on the desktop. Size: width = 15.86 inches, depth = 7.5 inches, weight = 4.28 pounds.

Operating Systems and Related Software

IBM Operating System/2 – Overview

This family of operating systems provides expanded application and user support allowing for the complete utilization of IBM 80286- and 80386-based (supported in 80286 mode) systems. The ability to handle larger programs and to process those programs concurrently represents a significant advancement in personal computing. OS/2's high level of compatibility with DOS simplifies implementation and provides coexistence with DOS. OS/2 takes a step closer toward consistency with other IBM systems as the first participant in IBM Systems Application Architecture.

IBM Operating System/2 Standard Edition Versions 1.0 and 1.1

This multitasking operating system breaks the 640KB memory barrier and provides the ability to run multiple applications concurrently. A presentation

manager for graphics and windowing functions is incorporated in Version 1.1.

- Strategic operating system for IBM 80286- and 80386-based systems
 - 16MB memory addressability
 - Multitasking
 - Support for multiple 32MB disk partitions
- Participant in Systems Applications Architecture
 - User interface guidelines
 - Enablers for application portability
- Enhanced usability
 - Graphics-based window facility (Version 1.1)
 - Pop-up menus
 - Contextual help
- IBM PC DOS Version 3.30 compatibility
 - Coexistence
 - Migration aids
- High Level Language Application Program Interface (HLLAPI)
 - Compatibility with successive versions of OS/2
 - Device independence
- OS/2 Presentation Manager
 - Provides window management, graphics support, and ease-of-use features for OS/2 applications
 - Implements the Common User Access (CUA) component of SAA and complements IBM's strategic host graphics offerings
 - Provides a device-independent programming interface for application development
 - Supports multiple output devices, graphics drawing and window management facilities, typographical fonts, raster operations, and fast alphanumeric text
 - Available on Standard Edition Version 1.1 and Extended Edition Version 1.1
- Enhanced warranty and service plan
 - Three-month program warranty, including replacement, correction, and refund
 - Service plan in place for 12 months from availability date

IBM Operating System/2 Standard Edition Programmer Toolkit Versions 1.0 and 1.1

- Toolkit functions that improve programmer productivity for creating OS/2 applications
- Tools for creating dynamic link libraries and applications
- Programming aids for IBM Macro Assembler/2 and IBM C/2
- Presentation interface tools to assist in screen generation in a graphic and windowing environment (Version 1.1 only)
- Utilities to allow the development of programs that will run interchangeably in either OS/2 or DOS environments

IBM Operating System/2 Extended Edition Versions 1.0 and 1.1

This edition of OS/2 provides a communications manager component that supports a broad range of communications capabilities. It also offers a data-base manager component that supports the IBM relational data base model. In addition, it offers the operating function and, in Version 1.1, the presentation manager provided by Operating System/2 Standard Edition (Version 1.1).

- Provides combined communications capabilities
 - Wide range of concurrent sessions
 - 3270 emulation
 - LANs
 - Asynchronous
 - X.25
 - SNA LAN gateway support
 - Concurrent multiple protocol support
 - LU6.2
 - IBM 3270 data stream (LU2)
 - Asynchronous links
 - X.25*
 - Concurrent emulation of multiple terminal types
 - IBM 3270, IBM 3101, DEC VT100™
 - IBM 5250 Workstation Feature*
 - Communication and system management support
 - Programming interfaces (APPC, SRPI, ACDI, NETBIOS, IEEE 802.2, a 3270 program interface*)
- Provides built-in data-base subsystem
 - Interactive query and report writing
 - Consistency with IBM family of relational data-base products
 - IBM database (DB2)
 - Structured Query Language/Data System (SQL/DS)
 - LAN support
 - Participant in Systems Application Architecture

IBM Disk Operating System Version 3.30

Since the introduction of the IBM Personal Computer, DOS has proven to be an operating system capable of supporting a wide range of end-user environments from personal productivity to education to specialized applications. Key to the acceptance of DOS has been the open architecture and the application compatibility that IBM has maintained. DOS Version 3.30 demonstrates IBM's continuing commitment to the DOS environment by the addition of function, the capability to run on the Personal System/2 family, and the continuation of its open architecture.

- Support for the IBM PC family
- Support for the PS/2 family
- DOS 3.20 compatibility

- Enhanced system commands
- Increased number of opened files
- Increased number of communications ports (four)
- Support for multiple 32MB disk partitions
- Base for enhanced connectivity
 - 3270 communications family
 - IBM Local Area Network (LAN) products
- Base for 3270 Workstation Program enhanced function
- Support for 11 national languages
- Technical reference manual

IBM 3270 Workstation Program Version 1.1

- IBM 3270 Personal Computer Control Program Version 3 function extended to selected IBM Personal Computers and the IBM Personal System/2 family:
 - Multitasking
 - Up to four host sessions
 - Up to six PC DOS sessions
 - Up to two notepad sessions
- Expanded memory support (up to 2.25MB) with IBM 2MB Expanded Memory Adapter or IBM Personal System/2 80286 Expanded Memory Adapter/A
- Expanded memory specification support
- Virtual disk support
- Windowing
- LAN support (Token-Ring and PC Network)
- Enhanced connectivity facilities support (SRPI)
- Additional display and graphics support
- Application programming interface (API) and high-level language API (HLLAPI)
- Integrated host graphics (3270 PC)
- Host graphics (via GDDM-PCLK)
- Improved memory flexibility (over Version 1.0) in PS/2 and DOS session size and multiple expanded memory specification sessions (Lotus®/Intel/Microsoft® EMS)
- Support for the 9370 Processor and the 3720 Communication Controller as token-ring gateways for host access, using IEEE/802.2 protocols
- Keyboard definition utility support of the Enhanced Keyboard when attached to the IBM PC XT and PC AT or the PS/2 Model 30, allowing users to move from one key to another to suit individual needs
- Systems supported
 - XT/286; PC AT; 3270 PC; 3270 PC AT; PS/2 Models 30 through 80
 - National language support for Latin-American Spanish keyboard 171

* Planned enhancement

IBM Personal System/2

IBM 3270 PC High Level Language Application Program Interface (HLLAPI) Version 3.1

- HLLAPI Version 3 enhanced to include C language and national language support (previously supported by IBM 3270 Workstation Program Version 1.0)
- Support for 3270 Workstation Program Version 1.1
- Systems supported:
 - PC XT; PC AT; 3270 PC; 3270 PC AT; PS/2 Models 30 through 80 386

Advanced Interactive Executive Personal System/2 (AIX™ PS/2)

AIX PS/2 is a member of the IBM AIX family of products that will implement the AIX Family Definition, a collection of interfaces, conventions, and protocols supported across a broad range of IBM computer environments. The AIX Family Definition encompasses popular UNIX® and industry standards, includes IBM extensions, and is a framework for building portable, consistent AIX applications now and in the future for System/370, Reduced Instruction Set Computer (RISC) architecture, and Personal System/2 80 386 computing environments. Most of the functions and interfaces initially identified in the AIX Family Definition have been announced for the AIX family products — AIX/370, AIX/RT, and AIX PS/2. (See Section 43 for more information about the AIX operating systems.)

AIX PS/2 is a multiuser, multitasking virtual memory operating system for the Personal System/2 Model 80. It can operate as a single-user or multiuser system with up to 16 concurrent users.

- Base functions:
 - Support for 16 users
 - 4-gigabyte virtual memory addressability
 - Hierarchical file system
 - Graphics support library
 - National language character support
 - Mail facilities
 - IBM PC XENIX® Release 2.0 source code compatibility
- AIX PS/2 connectivity facilities:

The AIX PS/2 Operating System provides a wide range of connectivity facilities that support data and program exchange and sharing for peer-to-peer and workstation-to-host environments. AIX PS/2 supports the following:

- Transmission control protocol/Internet protocol (TCP/IP)
- Distributed services
- Network File System (NFS)™
- Transparent Computing Facility
- DOS server
- Workstation Host Interface Program
- INmail/INed/INnet/FTP
- X.25

- Asynchronous terminal emulation
- AIX PS/2 application enabling interfaces:
 - Application Development Toolkit
 - C Language
 - VS FORTRAN
 - VS Pascal
 - Text formatting system
 - Text editors (INed, vi, sed)
 - Graphics support library
- AIX PS/2 user interfaces:
 - UNIX (Bourne) shell
 - C shell
 - Usability services
 - X-windows
- AIX PS/2 DOS support:
 - DOS merge: allows multiple users to execute DOS applications
 - DOS server: virtual file and print server for DOS workstations
- AIX PS/2 data base support:
 - ORACLE™ Relational Database Management System
 - INGRES™ Relational Database Management System

Languages

IBM BASIC Compiler/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.30
- The IBM BASIC Compiler/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.
- IBM BASIC Compiler/2 provides a common language interface that allows calling routines coded with the IBM C/2, the IBM Pascal Compiler/2, or the IBM Macro Assembler/2.

IBM FORTRAN/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.30
- IBM FORTRAN/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.
- IBM FORTRAN/2 is functionally compatible with the IBM Professional FORTRAN Versions 1.0 and 1.3.
- Implements 1977 ANSI Standard
- Supports Math Co-Processor and Math Co-Processor emulation

IBM Pascal Compiler/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.30
- IBM Pascal Compiler/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.
- IBM Pascal Compiler/2 is functionally compatible with IBM Pascal Compiler Version 2.0.
- Minimal recoding may be required.
- A compiled Pascal program may load, execute and communicate with IBM C/2 language programs.
- A compiled Pascal program may call programs written in IBM Macro Assembler/2 or IBM C/2 or be called by programs written in IBM Macro Assembler/2, IBM C/2 or IBM BASIC Compiler/2.

IBM COBOL Version 2

- Operating systems:
 - DOS Versions 3.20 and 3.30
- An intermediate implementation of ANSI X3.23-1985 COBOL standard
- A high-level implementation of ANSI X3.23-1974 COBOL standard
- Source-compatible subsets of IBM VS COBOL II Release 2 and IBM OS/VS COBOL Release 2.4 included
- Source code upwardly compatible with the IBM Personal Computer COBOL Compiler Version 1.0
- Access provided to DOS and BIOS functions
- Re-entrant compiler and compiler-generated code
- Support for multiple memory models

IBM COBOL/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.30
- The IBM COBOL/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.
- Other functions are the same as those of IBM COBOL Version 2.0.
- IBM COBOL/2 participates in Systems Application Architecture.

IBM C/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.0
- IBM C/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.

- IBM C/2 has functional compatibility with IBM Personal Computer C Compiler Version 1.0.
- Many additional features beyond those of IBM Personal Computer C Compiler Version 1.0 are included.
- IBM C/2 participates in Systems Application Architecture.

IBM Macro Assembler/2

- Operating systems:
 - Operating System/2 Standard Edition Versions 1.0 and 1.1
 - DOS Version 3.30
- The IBM Macro Assembler/2 and the compiled application programs it generates can run concurrently with other applications in the OS/2 multitasking environment.
- Function and source code are compatible with IBM Personal Computer Macro Assembler Version 2.0.
- Object code files from IBM Personal Computer Macro Assembler Version 2.0 will link with object code files from IBM Macro Assembler/2.
- Includes a library manager to facilitate the creation and maintenance of libraries.
- Includes structured assembly language utilities.

Communications Software**IBM PC 3270 Emulation Program Entry Level Versions 1.1 and 1.2**

- Provides low-level 3278/3279 emulation for accessing System/370 host applications
- Requires minimal memory (approximately 21KB)
- Has dual task support
 - Simultaneous DOS program and host access
- Control unit terminal (CUT) mode attachment
- Entry emulator high level language application program interface (EEHLLAPI)
- Host graphics (via GDDM-PCLK)
- Enhanced connectivity facilities support (Version 1.2)
- Systems supported:
 - Version 1.1: IBM PC; PC XT; XT/286; PC AT; PS/2 Models 25 through 60
 - Version 1.2: PS/2 Models 70 386, 80, Enhanced Connectivity Facilities

IBM PC 3270 Emulation Program Version 3.0

- Wide variety of connectivity options
 - Single station communications support: 3278/3279/3287 emulation via SDLC, 3X74 (BSC or SDLC), or Token-Ring
 - Local/remote LAN gateway and network station support: SDLC, 3X74 (BSC or SDLC), Token-Ring
- Dual tasking and auto-key function
- Host graphics (via GDDM-PCLK)
- Enhanced connectivity facilities support

IBM Personal System/2

- Systems supported:
 - IBM PC; PC XT; XT/286; PC AT; PS/2 Models 25 through 80

IBM Personal System/2 Graphics Workstation Program

- Provides migration for applications from the IBM PC AT/G and /GX with Graphics Control Program Version 3.21 to PS/2 Models 50 through 80 under DOS 3.30
- Up to four concurrent interactive host graphics sessions and two notepad sessions
- Support for a range of graphics devices, including RS232 plotters, printers and a PS/2 Mouse
- Virtual disk support
- Graphics procedure interface supported by six language bindings (Assembler, COBOL, BASIC, FORTRAN, Pascal, C)
- 12-function HLLAPI subset support
- Enhanced connectivity facilities support (SRPI)
- LAN support (token-ring)
- Windowing
- Support for maximum available memory
- Use of 8514 Display and 8514/A Display Adapter required

IBM 5520/Personal Computer Attachment Program Version 4.0

IBM 5520 Personal System/2 Attachment Program Version 1.0

- Allow IBM personal computers to operate as online 5253 terminals connected to a 5520 system
- Provide keystroke capability to switch quickly between DOS and 5520 system applications
- Provide 3270 emulation access capabilities to a System/370 host connected via the 5520 system
- Systems supported:
 - 5520/Personal Computer Attachment Program Version 4.0
 - IBM PC; PC XT; XT/286; XT 370; PC AT; PC 3270; Portable PC; PS/2 Models 25, 30
 - 5520 Personal System/2 Attachment Program Version 1.0
 - PS/2 Models 50 through 80

IBM Enhanced 5250 Display Station Emulation Version 2.12

Remote 5250 Emulation Program Version 2.0

- Allow IBM personal computers to operate as online 5250 terminals connected to a System/36 or System/38
- Provide "hot key" capability to switch quickly between DOS and System/36 or System/38 applications
- Permit two host sessions to be run at the same time

- Allow host applications to be printed out at the personal computer workstation
- Support workstation printers through table driven printer processing
- Remote 5250 emulation provides 5250 emulation access capabilities to System/36 or System/38 by emulating the function of the 5294 Remote Control Unit at speeds of up to 19,200 bps (PS/2 Models 50 and 50 Z, 70 386, 80)
- Systems supported:
 - IBM Enhanced 5250 Display Station Emulation Version 2.12
 - PS/2 Models 25, 30; IBM PC; PC XT; XT/286; PC AT; Portable PC
 - Remote 5250 Emulation Program Version 2.0
 - PS/2 Models 25 through 80; IBM PC; PC XT; XT/286; PC AT; Portable PC

PC/HOST File Transfer and Terminal Emulation (FTTERM)

- Provides for attachment of IBM Personal Computers and Personal System/2s to IBM hosts
- Supports 3174/Asynchronous Emulation Adapter, 9370 ASCII Subsystem Controller, 7171 ASCII Terminal Control Unit, and 3708 Network Conversion Unit
- Includes 3270 full-screen emulation and file transfers
- Uses DEC VT100™ and DEC VT220™ ASCII terminal emulations and XMODEM/YMODEM file transfer protocols to support attachment to ASCII hosts
- Supports ROLM® data communications products

Local Area Network (LAN) software

LAN adapters for the Personal System/2 family

- Token-Ring Network PC Adapter
- Token-Ring Network PC Adapter II
- Token-Ring Network Adapter II/A
- Token-Ring Network Trace and Performance Adapter II
- Token-Ring Network Trace and Performance Adapter II/A
- PC Network Adapter II
- PC Network Adapter II/A
- PC Network – Baseband Adapter
- PC Network – Baseband Adapter/A
- PC Network Adapter II Frequency 2
- PC Network Adapter II Frequency 3
- PC Network Adapter II/A Frequency 2
- PC Network Adapter II/A Frequency 3

IBM Local Area Network Support Program Version 1.3

- Provides resource sharing of disks, files, and printers for interconnected workstations on the IBM Token-Ring Network and PC Network
- Supports increased NETBIOS sessions (up to 254, depending on the LAN adapter and device driver)
- Provides increased levels of security, including user log-on with optional encrypted password
- Includes enhancements to LAN resource definition and control, including an application selector panel for customizing the user's view of the system
- Supported by OS/2 LAN Server Program
- Provides remote IDL support of DOS to PS/2 models equipped with a LAN adapter

IBM Operating System/2 Local Area Network Server Version 1.0

- Takes advantage of OS/2 Extended Edition functions
- Allows resource sharing for files, printers, and serial communication devices
- Provides multiple security services to protect resources
- Offers extensive printer management capabilities with concurrent support for up to eight printers

IBM Local Area Network Manager Program Version 1.0

- Manages an IBM Token-Ring Network or a broadband IBM PC Network
- Operates as an application of Netview/PC for central network management
- Monitors the network for station or media failure and configuration changes and notifies the operator of errors that require immediate attention (alerts)
- Logs network error and stores information to disk for further analysis and reporting
- Provides easy-to-use menus and operator commands to facilitate problem determination and error recovery

IBM PC 3270 Emulation LAN Management Program Version 1.0

- Provides small and remote LAN support
- Operates as resident code with the 3270 Emulation Program
- Requires no additional dedicated resources
- Provides automatic alert forwarding to NetView host

IBM Token-Ring Network Starter Kit

- Simplified start-up for LAN pilot installations
- Upgrade for PS/2 family

Graphics Software

Graphics Development Toolkit Version 1.2

- Contains application programming interface for a device-independent graphics environment
- Eight additional virtual device interface (VDI) device drivers:
 - PS/2 integrated display adapter and PS/2 Display Adapter – 640 x 480, 16 colors
 - PS/2 integrated display adapter and PS/2 Display Adapter – 640 x 480, 2 colors
 - PS/2 integrated display adapter and PS/2 Display Adapter – 320 x 200, 256 colors
 - PS/2 Model 30 – 640 x 480, 2 colors
 - PS/2 Model 30 – 320 x 200, 256 colors
 - Quietwriter III
 - 6180 Color Plotter
 - PS/2 Mouse
- Packaged with 5.25-inch and 3.5-inch diskettes

IBM Operating System/2 Graphics Development Toolkit

- Powerful, flexible productivity tool for application developers writing graphics programs for OS/2
- Operates in and supports virtual device interface (VDI) application development for OS/2's multi-tasking and 16MB environment
- Software font support
- Additional vector drawing functions
- Improved text handling
- Device independence at source code level
- Minimal conversion effort for existing VDI applications

GDDM-PCLK Version 1.0 and 1.1

- Together with the host GDDM-PCLK feature, enables a GDDM host application to link to the IBM PC, 3270 PC, or PS/2 with the new or existing 3270 terminal emulator as a graphics terminal
- Supports most GDDM Version 2 functions, including windowing and image
- Display, print and plot to attached devices
- Simple transfer of picture interchange format (PIF) to local file
- Interactive Chart Utility (ICU) and other GDDM applications run without change
- Requires a 3270 terminal emulator (IBM PC 3270 Emulation Program Entry Level Version 1.2, 3270 Display Station Emulation Program Version 3.0, or 3270 Workstation Program Version 1.1)

SolutionPacs™

IBM SolutionPacs address specific business needs. These integrated packages provide the right mix of products — software as well as hardware in some cases — to offer an immediate solution.

SolutionPacs are available for such applications as accounting, computer-aided design and drafting, desktop publishing, and personal typing. IBM expects to produce more SolutionPacs in the future.

Personal Publishing System

- Fully-integrated IBM PC system for document production and printing
 - High-quality, professional-looking documents that include text, graphics and image
 - Flexible and rapid page layouts
 - Multiple type styles and sizes
- Components
 - PS/2 Models 30, 80
 - Monochrome or color display
 - Personal Pageprinter, Adapter and program
 - PS/2 Mouse
 - DOS Version 3.30
 - Aldus PageMaker™
 - Microsoft Windows, Windows Write and Windows Paint
- Services
 - One order number
 - 800-number telephone support
 - Preloaded hard file
 - Setup/start-up diskette
 - Optional on-site setup support available from the IBM National Service Division

Personal Publishing Options

- Allow users to appropriately configure IBM PCs and PS/2 models to achieve the advantages of the Personal Publishing System

Additional IBM SolutionPacs

- Business Adviser Financial Accounting
- CADwrite Design and Drafting System
- Doctor's Office Management
- Legal Profession Series
- Construction Industry Series

Application Software – Other

Other already-existing application software has been updated to run on the IBM Personal System/2 products. For local area networks, see Section 65.

Primary Users

- I/S professionals, managers, and administrative personnel
- End-users in a variety of departments, including engineering, planning, forecasting, research, and program development
- Students and faculty in secondary schools, colleges, and universities

Potential Benefits

- Standalone personal computing
- Wide variety of host-attached capabilities
- 32- and 16-bit microprocessors with high-quality display options
- Extensive memory and storage options
- Application support for professional, educational, and home use

Ordering Information

- Discounts for volume orders are available through the IBM Volume Procurement Agreement or Educational Allowance programs.
- The IBM Personal Computer Assistance Center provides software and setup assistance by telephone free of charge only for customers under a Volume Procurement Agreement. Procedures for using the center, including telephone numbers, are shipped with each system unit.

Reference Material

Specifications

- Model 25, G360-2777
- Model 30, G580-0801
- Model 50, G580-0793
- Model 50 Z, G580-0801
- Model 60, G580-0794
- Model 70 386, G360-2803
- Model 80 386, G580-0795
- 3.5-inch Diskettes, G360-2729
- 3.5-inch External Diskette Drive, G360-2657
- 6157 Streaming Tape Drive, G360-2659
- 3363 Optical Disk Drive, G360-2656
- 3117 Scanner, G360-2655
- 3118 Scanner, G360-2727
- Proprinter II and Proprinter XL, G360-2755
- Quietwriter III Printer, G360-2644
- Proprinter X24 and Proprinter XL24, G360-2643
- Quietwriter Printer Model 2, G360-2679
- 5404 Quickwriter Printer, G360-2801
- 4202 Proprinter II XL, G360-2755
- 4201 Proprinter III Model 003, G360-2811
- 4202 Proprinter III XL Model 003, G360-2811
- Music Feature, G580-0802
- Disk Operating System (DOS), G360-2733

- 3270 Workstation Program, G360-2734
- Operating System/2 Standard and Extended Editions, G360-2735
- Token-Ring Network, G360-2645
- 3270 Communications Family for Personal System/2 and Personal Computers, G360-2646
- Personal System/2 Technology, reference guide, G580-0799
- Enhanced 5250 Display Station Emulation, G360-2647
- 8512 Color Display, G580-0805
- 8513 Color Display, G580-0804
- 8503 Monochrome Display, G580-0807
- 8514 Color Display, G580-0806
- IBM PC Local Area Network Program Version 1.20, G360-2753
- IBM PC Network – Baseband, G360-2754
- IBM PC Network – Broadband, G360-2660
- AIX Fact Sheet, G580-0933

Pocket Guides

- IBM Personal System/2 Customer Reference Guide, G360-2669
- Storage Products, G360-2726
- 3270 Communication Family of Products, G360-2654
- IBM Service Support Customer Reference, G360-2728
- Model 25, G360-2778
- IBM Personal System/2 at a Glance, G360-2779
- Model 30, G580-0800
- Model 50, G580-0796
- Model 60, G580-0797
- Model 80, G580-0798
- A Guide to Data Interchange, G360-2667
- IBM Personal Printers Product Guide, G360-2740
- IBM Personal Printer Software Compatibility, G360-2652

DisplayWrite for Personal Computers

Products Included

- IBM DisplayWrite Assistance
- IBM DisplayWrite 4
- IBM DisplayWrite 4/2

Main Purpose

IBM DisplayWrite Assistant provides simple text processing for the business professional or occasional user.

IBM DisplayWrite 4 and IBM DisplayWrite 4/2 provide full-function text processing for the user who types several hours a day and needs comprehensive document creation, editing, and revision capabilities.

Both IBM DisplayWrite Assistant and IBM DisplayWrite 4 are used on IBM Personal Computers with PC DOS.

IBM DisplayWrite 4/2 is used on IBM Personal Computers with Operating System/2.

Key Functions, Facilities, and Features

DisplayWrite 4 and DisplayWrite 4/2

- Streamlined user interface and menu design with a choice of simple menu-selection techniques
- Menu-driven text processing with multilevel pop-down menus for function selection and separation of basic options for the more advanced functions
- Extensive contextual help facility based on cursor position and the function in use
- Voice/audio annotation support (DisplayWrite 4)
- Optional mouse-pointing device support
- Direct link to the System/36 (DisplayWrite 4)
- Revision-marking capability
- Working copy/backup copy of a document
- Multiple options for saving a document
- Notepad and paperclip functions
- Optional character display mode or APA display mode support
- Cursor draw
- Text document interchange with other IBM software
- Text document merge with data files. For example, a user may create a letter and then merge names and addresses from a LOTUS 1-2-3® to create mail/merge letters.
- Printer support for OEM printers

DisplayWrite 4/2

- Multiple column support. This allows text to flow from the bottom of one column to the top of the next.

- Synonym assist
- Color printing capability to give the user the ability to change colors as often as every character
- Date control for headers and footers
- Widow line control in footnotes
- Sorting blocks of text columns
- Skip to line number feature in the merge function
- Spell check that may be run against multiple concurrent dictionaries

Primary Users

Designed for ease of use by the occasional user and for ease of use with depth of function for the more experienced user

Prerequisite Products

Software

- DisplayWrite 4 requires IBM Personal Computer Disk Operating System (DOS), Version 2.1 or 3.2.
- DisplayWrite 4/2 requires IBM Operating System/2 (OS/2) running in the native mode.

Hardware

For DisplayWrite 4

- IBM Personal Computer
- IBM Personal Computer XT or AT
- IBM 3270 Personal Computer
- IBM PC Convertible
- IBM Personal System/2 Models 30, 50, 60, 80

The above machines, except for the IBM PC Convertible, require two diskette drives (370KB/1.2MB) or one diskette drive (360KB/1.2MB) and a fixed-disk drive. The IBM PC Convertible requires two 720KB, 3.5-inch diskette drives.

For DisplayWrite 4.2

- An IBM Personal Computer running IBM Operating System/2

Products Supported

- IBM PC Network
- IBM Token-Ring Network
- 4865 Personal Computer 3.5-inch External Diskette Drive Models 1 and 2
- IBM Voice Communications Adapter
- PC Mouse
- Microsoft Mouse
- Visi-On Mouse

Ordering Information

	5.25-inch Diskettes	3.5-inch Diskettes
IBM Displaywrite Assistant		
Program number:	74X9903	—
IBM DisplayWrite 4		
Program number:	74X9904	74X9913
IBM DisplayWrite 4/2		
Program number:	75X1122	75X1121

Reference Material

- DisplayWrite in an Office Systems Environment, GG24-3148

Each program package (see "Ordering Information" above) contains the following publications:

- Getting Started
- Reference Guide
- Technical Reference
- Keyboard Templates

Personal Decision Series

Products Included

The IBM Personal Decision Series Version 2 (PDSV2) includes:

- Data Edition
- Reports + Edition
- Plans + Edition
- English Access Edition
- Network + Edition

Main Purpose

The IBM Personal Decision Series Version 2 is an integrated set of productivity tools designed for the business professional. Each product in the series provides specialized functions for gathering data, developing customized reports, or performing advanced statistical modeling. The IBM Personal Decision Series Version 2 data may be used with IBM DisplayWrite 4 and IBM DisplayWrite Assistant documents.

Key Functions, Facilities and Features

Data Edition

The Personal Decision Series product set is centered around the Data Edition which is a prerequisite for the other editions. The Data Edition serves as a database manager and a tool for accessing, organizing, analyzing, and reporting information. Data Edition allows the user to access information from a variety of sources, create and maintain files and procedures, and perform extensive reporting, query, and sorting of information.

The data base management functions include the following:

- *File creation and maintenance* for four file types: indexed, direct, basic sequential, and text. Among the 13 field formats are ASCII numeric data, character data, and date data types.
- *Smart copy* for reorganization, restructuring, calculations and selection
- *Smart sort* on up to 10 fields, mixed ascending/descending, and with selection. Multiple sort definitions can be kept for the same physical information.
- *Multiple indexes* of indexed files, giving up to 11 logical views of the same physical information
- *Data entry* using a built-in screen that can be used as is or tailored and can include editing with limit checking

- *File join* feature, which allows as many as five indexed files to be joined. This means that information from separate files can be used as though it came from one file. For example, a report can be created that shows fields from different files.

The Data Edition provides decision support query function to generate queries with calculations, record selection, tailoring, and subtotalling. Output can be directed to the screen printer, or to an output file. The results of the query may also be re-ordered on the fly, using a different key field. All of this can be done in an ad hoc "what if" mode to give the user results that are organized in a meaningful way.

The procedures function allows a number of tasks using PDSV2 members to be put together in a repetitive sequence that can be initiated with one command.

Data Edition allows the user to exchange data with the following kinds of files:

- DIF (trademark of Lotus Development Corporation)
- ASCII text
- BASIC sequential
- Direct
- IBM BASIC Compiler 2.00 Indexed

An import function allows input from additional file types to the Data Edition. These include:

- LOTUS 1-2-3 or Symphony (registered trademarks of LOTUS Development Corporation)
- dBASE II (trademark of Ashton-Tate)
- dBASE III or dBASE III PLUS (registered trademarks of Ashton-Tate)

A user can *export* PDS Data files to DIF (Data Interchange Format) files and *import* DIF files into PDS Data files. The PDS Data Edition files exported to DIF files can be used by programs such as LOTUS 1-2-3 or Symphony, dBASE III Plus, or Multiplan Version 2 (trademark of Micro Soft Corporation).

Reports + Edition

The Reports + Edition is an application generator and advanced report writer that produces customized reports from files managed by Data Edition. Complete applications can be built by applying the capabilities of this product.

A Query definition from PDS Data Edition can be used as the first step in developing a more sophisticated report. Reports are designed by laying out a format directly on the PC screen.

The prompted user interface steps the user through the report development process. Output printing is very flexible in terms of print styles and the use of color.

As an application generator tool, Reports+ can be used to design and build simple to complex application programs without the user being a programmer. Custom screens for input and output operations for use with multiple files can be designed interactively.

To aid the user in developing applications, several sample programs are provided to perform such functions as file inquiry and update. These programs may be easily modified to run with user files.

Plans + Edition

The Plans+ Edition is a modeling and spreadsheet application with graphics. It offers built-in advanced financial, statistical, and logical functions for specialized analysis and modeling. Each of these functional capabilities can be invoked by a single command.

- Plans+ Edition is easy-to-audit and provides self documentation. Calculations and procedures are kept in tables that make it easy to understand how the model works. Numerous sets of data can be run against the same model.
- "What if" graphics include: bar graphs, line graphs, and pie charts. These provide assistance in making decisions.
- PDS Plans+ Edition has a built-in sort command for sorting rows of data based upon a key column that the user selects. The user has ascending or descending options (numbers and/or text).
- Consolidation of models is accomplished through the "Consol" instruction in the calculation window. The user specifies which model data files are to be consolidated and provides the destination where this consolidation is placed.
- Because many models have very large numbers of columns, sideways printing is provided.

English Access Edition

The English Access Edition provides a "natural language" access to Data Edition data bases. Information from the data bases can be retrieved using English-like requests, and the results can be shown as a report or graph. It provides access to information for people who do not want to take the time to learn a special query language.

- English Access Edition allows users to query PDS Data Edition indexed and direct files with questions such as, "Show me the nickname and population of West Virginia." These queries can be used in report or graph forms. English Access provides two options, "request answer" and "enhance access." With request answer, the user makes a request and gets an answer. The answer can be viewed, tailored to the needs of the user, verified, and saved for future use. With enhance access, the user can tailor English Access to the data base thus increasing versatility and power by defining words and phrases, defining synonyms and expressions, relating words to fields, linking

files, specifying search criteria, setting display and processing options, and merging access enhancements.

- English Access provides a way to join file definitions in a data base. For example, if file definitions in a library contain common field names with matching data types, English Access automatically links the definitions on these field names. If all of the file definitions have a field for employee number such as "EMPNO" then English Access assumes that "EMPNO" in one file definition contains the same information as "EMPNO" in another file.
- English Access "learns" from the user. If English Access doesn't understand a part of a request, it will ask the user for more information. If the answer is not what the user intended, the user can then modify the request or make another one.
- English Access provides functions that can be utilized to perform complex queries against PDS Data Edition indexed and direct files.
 - English Access sorts in ascending sequence unless descending is specified. Examples of sort phrases: top n; bottom n; by; sorted by; ordered by
 - The user can specify the conditions which must be met for record selection. For example: between; in the range of; begins with; ends with; contains; and; not
 - Calculations include: plus; minus; multiply; divide; square; phrase count; total; grand total; average; percent; count
 - Summarization is provided by phrases such as: grouped by; broken down by; for each; in each; for every
 - Flexible output options are: screen; print; graph; save as PDS text file
- Users can define their own phrases as well as synonyms; define "who," "when," or "where" fields; link files; and merge access enhancements.
- All of this function is done via user-prompted menus that further customize the query capabilities of the English Access Edition.

Network + Edition

The Network+ Edition can connect up to twelve IBM Personal Computers within an IBM Local Area Network or IBM Token-Ring Network, sharing files and programs.

- Data can be entered by multiple users.
- Records are locked out during time of updating.
- By using the Network+ Edition, PDS Editions can be distributed to other IBM Personal Computers on the Network and run from either the server PC or non-server PC.

Personal Decision Series

Primary Users

- People who create and utilize data bases for decision support, spreadsheets, analysis, and reporting

Prerequisite Products

Software

- Personal Computer Disk Operating System (DOS), Version 2.1 or higher

Hardware

- IBM Personal Computer
- IBM Personal Computer XT or AT
- IBM 3270 Personal Computer
- IBM 3270 Personal Computer AT
- IBM PC Convertible
- IBM Personal System/2 Models 30, 50, 60, 80

Ordering Information

IBM Personal Decision Series Version 1 Data, Reports + Plans, and Plans + Editions are upwardly compatible with the corresponding Version 2 editions. However, asynchronous communication is no longer supported by the Data Edition Version 2. Version 1 customers of the Personal Decision Series may upgrade to Version 2 at reduced pricing with Version 1 proof of license.

	5.25-inch Diskette	3.5-inch Diskette
Data Edition		
Program number:	6476060	6476085
Reports + Edition		
Program number:	6476061	6476075
Plans + Edition		
Program number:	6476062	6476076
English Access Edition		
Program number:	6476065	6476079
Network + Edition		
Program number:	6476063	6476077

IBM Interleaf™ Publisher

Products Included

- IBM Interleaf Publisher
- IBM Interleaf Publisher Data Export

Main Purpose

IBM Interleaf Publisher is a full-function integrated professional publishing solution for the IBM PS/2® 80386-based machines running the DOS operating system. IBM Interleaf Publisher enables business and technical professionals to create documents that include text, graphics, and image.

Key Functions, Facilities and Features

IBM Interleaf Publisher provides business and technical professionals and small departments a high level of document coordination and control. Its built-in features allow companies to enforce standards and consistent formatting throughout the document even though many writers or designers may be involved in production. Key features include:

- Powerful text processing, with spell checking and style templates for easy document design
- Text entry and editing of graphics and image; business charts, line art, clip art, and free-hand drawing capabilities; and interactive page layout capabilities, all in the same environment
- Dictionary and spell checking
- Many import filters
- Support for PostScript®, the page-definition language implemented in the 4216 Personal Pageprinter
- Compatibility with IBM PC Local Area Network program
- During document creation, display of an actual representation of the final, printed output. This is called What-You-See-Is-What-You-Get (WYSIWYG).
- Sharing of resources such as printers and storage devices
- Data Export feature, which allows documents created on the professional publishing system to be processed by host system publishing applications. This program is an aid to convert ASCII documents created by the IBM Interleaf Publisher into files that can be processed by Publishing Systems BookMaster on a 9370 or System/370.

Primary Users

- Engineering and scientific workgroups
- Training and education workgroups
- Academic (DOS and UNIX®) environments
- Business professionals
- Government, defense contractors
- CIM/CAD/CAM environments

- Publishing departments

Prerequisite Products

Software

IBM Interleaf Publisher and IBM Interleaf Publisher Data Export programs require DOS 3.3 and may coexist with MicroSoft Windows 2.0®.

Hardware

IBM Interleaf Publisher and IBM Interleaf Publisher Data Export programs require:

- Personal System/2® 80386-based machine with at least 6MB of real memory, one diskette drive (1.4MB), and a fixed-disk drive of at least 40MB
- Personal System/2 Display: 8503, 8513, or 8514 driven by the Video Graphics Array or the 8514 Display driven by the 8514/A Adapter
- 4216 Personal Pageprinter, Personal Pageprinter Adapter/A, and Personal Pageprinter Adapter licensed program
- Personal System/2 Mouse

Products Supported

The IBM Interleaf Publisher accepts and will edit text and graphics from other workstation applications. The following data import filters are provided to ease the process:

- ASCII text
- DisplayWrite 3 or 4 RFT DCA
- Microsoft Word™ Version 3.0 or later
- MultiMate®
- WordPerfect™ files (IBM RFT DCA)
- WordStar™
- DEC DX™
- Xerox 860
- Wang™ WPS, PC and TTY files
- Lotus 1-2-3® (ASCII data file)
- VisiCalc (ASCII data file)
- Multiplan® (ASCII data file)
- Microsoft Excel (ASCII data file)
- MacDraw™
- MacPaint™
- 3117 and 3118 Scanner image data stream (IMDS)
- Tagged image format (TIF) files
- Encapsulated PostScript® (EPS) files
- Hewlett Packard Graphics Language (HP-GL®) files
- CalComp® 960 plot file format files

A variety of peripherals can be connected to the system. The 4216 Personal PagePrinter Model 020, Personal Pageprinter Adapter/A, and Personal

IBM Interleaf Publisher

PagePrinter Adapter licensed program are required for printing. The workstation can participate in an IBM Token-Ring local area network, when configured with the proper hardware and software.

The IBM Interleaf Publisher can coexist with the following applications and hardware:

- Microsoft Windows 2.0
- 3270 Emulation Program Entry Level 1.2
- IBM Local Area Network Program 1.2
- IBM Local Area Network Support Program
- IBM Token-Ring Network Adapter/A
- IBM Network Adapter II/A

Local Area Network Support

The IBM Interleaf Publisher will operate with appropriate network configurations of the IBM Personal System/2 Model 80 or Local Area Network programs. A Personal 4216 Pageprinter can be attached to a server station. In this configuration, the printer can be used for either PostScript or ProprinterTMXL emulation printing. IBM Interleaf publishing documents can be stored on data servers in the network to provide documents to workstations on the network. Connection is also available to other local area networks including the IBM Token-Ring Network.

Ordering Information

Order Type Number	Feature Number	Program	Media
5871-COM	9956	IBM Interleaf Publisher	3.5 inch
5871-COM	5912	IBM Interleaf Publisher	5.25 inch
5870-EAD	9966	IBM Interleaf Publisher	3.5 inch
5871-COM	9967	IBM Interleaf Publisher Data Export	Dual

Reference Material

- IBM Interleaf Publisher Specification Sheet, G520-8513
- IBM Interleaf Product Flyer, G520-8515

Each program package contains the following publications:

- User's Guide
- Installation and Administration Guide
- Getting Started Tutorial
- Quick Reference Guide

Section 68. Printers and Displays

Printers for Large Systems

Printers for Large Systems—
Comparison Table

Non-Impact Printers			
Printer Model	Rated Speed (Pages per Minute)	Attaches To	Supported By
3800 – 3 – 6 3827 Page Printer 3835 Page Printer	215 134 92 88	43XX 303X 308X 309X 9370	MVS VSE* VM**
3820 Pageprinter	20	43XX 303X 308X 309X 9370 PC LAN	MVS VSE VM
4250-II ElectroCompositor	See 4250-II product descrip- tion	43XX 30XX PS/2-30 PC XT-286	MVS VSE VM
Impact Printers			
Printer Model	Rated Speed (Lines per Minute)	Attaches To	Supported By
4248-2	2200, 3200, 4000	43XX 303X 308X 309X 9370	MVS VSE VM
4245-12 -20	1200 2000		
4245-D12 -D20	1200 2000		
3262-5	650		
6262-14	1400		

Note: See also *Guide to IBM Printers, G520-6302*.

* 3800 Models 3 and 6 support in AFP mode only.
3800 Model 1 compatibility mode is not supported
in VSE.

** VM support is a statement of intent.

3800 Page Printer

Products Included

- 3800 Model 3
- 3800 Model 6
- Print Services Facility
- Print Management Facility
- Overlay Generation Language
- Typographic Fonts for the 3800 Model 3

Main Purpose

The 3800 Model 3 is a general-purpose, high-performance, nonimpact printer subsystem that uses laser technology and an electrophotographic process to print up to 215 pages per minute.

The 3800 attaches to System/370. Data Streaming Channel Adapter (standard) is supported and reduces channel utilization when compared to running the 3800 in DC Interlock (DCI) mode. The 3800 allows either channel mode.

The 3800 Model 6 is an intermediate-speed advanced function printing (AFP) fanfold printer that uses an electrophotographic process to print up to 134 pages per minute. Both the 3800 Model 3 and Model 6 print with a density of 240 x 240 dots (pels) per square inch. There are two modes of operation for these printers: compatibility mode, which prints 3800 or impact printer applications with a minimum of change to the application program, and advanced function printing mode, which prints complex pages of image, text, graphics, and system printing applications.

Key Functions, Facilities and Features

3800 Printing Characteristics

- 3800 Model 1 compatibility mode – Model 1 characteristics, speed, and the following enhancements:
 - 240 x 240 dots per square inch or 2.2 times the Model 1 print density
 - Line spacing of 10 lines per inch
 - 59 standard character sets including converted Model 1 fonts plus many text and 6670 fonts
- 3800 All-Points- Addressable Mode – ability to:
 - Position characters at any defined point on the printable area of the page
 - Print proportionally spaced and fixed spaced fonts ranging in size up to 36 points (one point is approximately 1/72 inch)
 - Print raster images of 240 x 240 dots per square inch
 - Merge predefined boxes, lines, etc., with variable data, through an electronic overlay capability, and print on demand

Model 3 Special Features

- Character Conversion Aid (5665-299)
- Two-Channel Switch
- Accumulator
- Accumulator Expansion
- Burster/Trimmer/Stacker (BTS)

3800 Paper Characteristics

- Single part plain papers 56 to 90 gm (15 to 24 lb)
- Up to 50 common-use or 72 ISO paper sizes
- Forms Design Reference Guide (GA26-1633) for all specifications
- Photographic negative allowing printing forms overlays and data at the same time

3800 Postprinting Operations

- Deleaving eliminated (no carbons)
- Copy modification/identification facility to place customized information on every page of copy or group of copies
- Can have in sequence n copies of each page, n copies of the overall job, or a mix of both
- Job separation marks
- The bursting, trimming, and stacking feature:
 - separates and/or trims at each edge
 - offset-stacks to separate jobs/copies

Operator Intervention

- No chains, trains, or ribbons
- Extended sense-byte control of each operation
- Print alignment/print darkness electronically controlled
- No operations for bursting/trimming/stacking using BTS feature

RAS Highlights

- Continuous monitoring of printing quality
- Two-channel switch feature
- Dynamic two-channel switch feature
- Alternative areas for microprograms and character sets
- Error correction and retry at page level
- Extensive microdiagnostics
- Extended sense-byte analysis for error checking

IBM Supplies

- Toner (a specially formulated black, plastic powder) forms the ink for the printed page.
- The developer consists of small magnetic beads that carry the toner through the printer.

- Splicing tape for splicing packages of continuous paper forms is especially constituted to withstand the high temperatures in the 3800.

Typographic Fonts

- Licensed program fonts are available for 3800 and 3820, providing a total of 148 type fonts in six typeface families, ranging in size from 4 to 72 points.
- These fonts satisfy demands for aesthetics, variety of style, emphasis, and readability in document processing or publishing applications.
- Currently available are Sonoran Serif (5771-ABA), Sonoran Sans Serif (5771-ABB), Pi and Specials (5771-ABC), Data1 (5771-ADA), APL2 (5771-ADB), Sonoran Serif Headliner (5771-ADW), Sonoran Sans Serif Headliner (5771-ADX), ITC Avant Garde Gothic (5771-ADL), Century Schoolbook (5771-ADJ), ITC Souvenir (5771-ADQ), Mathematics and Science (5771-ADT).

Primary Users

- Organizations with one or more of the following:
 - High print volumes for data processing (approximately 1,000,000 feet/month for Model 3 and 500,000 for Model 6)
 - Complex and/or wide range of characters required, for example, text, OCR, large/small characters, special symbols
 - External printer (for example, lithographic), particularly where short lead times are involved
 - In-house publishing applications (text and graphics)
- Organizations in which:
 - The use of smaller size paper is advantageous
 - Custom character sets (boldface, logos, images) can be used in lieu of imprinting forms
 - The formatting character set and/or overlays can be used instead of preprinted forms
 - Printing all original copies of a report is beneficial
- Organizations that wish to:
 - Eliminate the copying of computer printouts for general distribution or reduction of size
 - Print reports such as rate tables, sales manuals, etc., that are sent to outside vendors to be photo-offset
 - Print hard-copy graphics output that will enhance end-user acceptance of reports
 - Print high-quality plots and graphs for management reports
- Organizations that want security and privacy through:
 - Elimination of carbon paper
 - Printing and bursting forms in one operation
 - Addressing copies of reports to individuals, printing only the information the recipient is authorized to know

Potential Benefits

- Printing cost saving:
 - Expensive multipart carbon or carbonless paper use reduced or avoided
 - Only needed quantity of pages printed
 - Paper stock ordered for use in large volume
 - Fewer preprinted forms used because of forms overlay feature
 - Smaller paper used with 12, 15 cpi and 8, 10, 12 lpi capability
 - Bursting, trimming, and deleafing operations reduced
- Manpower saving:
 - Operator intervention facilitated
 - Clerical work improved
 - Forms management reduced
- Floor space saving in warehouse, DP room, and post-printing room
- Productivity increased by:
 - Faster response to end-user requests
 - Easy testing, forms modification, and printing flexibility
 - Reduction of postprinting time during peak workload
 - Easier and fewer operator interventions
- Applications investment capitalized by:
 - Total printing approach
 - New applications
 - Integration of text processing (in-house publishing, demand printing, archiving)
 - Merging text, graphics, and image
- Data security and system integrity:
 - Data unavailable after printing
 - Selective distribution of identified copies
 - No carbons
- Fast and easy implementation by:
 - Compatibility with 1403/3211
 - Easily changed printing design
 - Ease of programming
 - Independence of hardware/software

Prerequisite Products

See "Advanced Function Printing Software" in Section 41 for additional information.

The 3800 Models 3 and 6 are supported by MVS/SP Version 1 and Version 2. JES2 and JES3 Release 1.3.4, and JES2 and JES3 Release 2.1.2 contain required support for advanced function printing.

The 3800 Models 3 and 6 are supported in 3800 Model 1 compatibility mode in VM/SP and VM/HPO environments. In AFP mode the 3800 Models 3 and 6 are supported in the MVS environment listed above and in VM/SP, VM/HPO, and VSE 2.1.

Text processing facilities, DCF, and DLF Release 3 offer support for in-house publishing, application development, documentation, and office publishing.

3800 Page Printer

Print Services Facility (PSF) provides device and resource management support for the 3820 Pageprinter and the 3800 Printing Subsystems. PSF, along with Print Management Facility (PMF), Overlay Generation Language (OGL), DCF, and GDDM comprise the advanced function printing (AFP) support for the 3820 and 3800. PSF performs page processing that organizes data to be printed based upon page formatting instructions and creates a stream of data and printer commands. Therefore, new page and report formats can be created independent of the application program. In addition, graphics image files, generated by GDDM, can be merged with text and data and printed on the 3800 and the 3820 through PSF.

Reference Material

- Introducing the 3800 Printing Subsystem, GC26-3829
- Forms Design Reference Guide, GA26-1633
- Introducing the IBM 3800 Model 3 Printing Subsystem, GA32-0049
- 3800 Models 3 and 6 Presentation Guide, G320-8054
- 3800 Model 3 Facts Folder, G520-4000
- 3800 Models 3 and 6 Executive Brochure, G520-6395
- 3800 Models 3 and 6 Proposal Insert, G221-2413

3827 Page Printer

Main Purpose

The 3827 Page Printer is a compact, cut-sheet, all-points-addressable, electrophotographic printer that operates at speeds of up to 92 impressions per minute and is capable of printing up to 2,000,000 impressions per month. The 3827 prints in both simplex (one-side) and duplex (two-side) modes, and is supported by the advanced function printing (AFP) software. With the appropriate software, the 3827 is capable of combining text in multiple fonts with electronic forms, graphics, and image data on each page printed.

Key Functions, Facilities and Features

- All-points-addressable printing at 240 x 240 picture elements (pels) per square inch
- Advanced function printing (AFP)
- Print speeds up to 92 pages (impressions) per minute for single-sided printing
- Duplex printing at speeds up to 46 pages per minute (92 impressions per minute). Two modes of duplexing, normal and tumble (end-to-end), are supported.
- Intermixing simplex and duplex printing in the same job with minimal impact to performance
- Printing of electronic forms generated at the host and merging text and/or data with the form
- Edge-to-edge printing of letter- (8.5" x 11") and A4-size papers
- Area shading
- Full-page graphics and image printing including signatures and logos
- Use of preprinted papers (forms and letterheads) suitable for for electrophotographic printing
- Paper-based and polymer-coated-paper-based adhesive labels suitable for the electrophotographic process. *Note:* All label applications should be tested before production quantities are ordered.
- Prepunched and preperforated papers supported
- Print orientation of 0, 90, 180, and 270 degrees. Print rotation is performed in the printer.

Paper Handling

- Two input paper sources:
 - 2500-sheet primary drawer
 - 1000-sheet secondary drawer
- Simplex printing supported from both input sources providing continuous (overlapped) input for simplex printing. Also, a different form can be placed in the secondary bin and accessed under program control.
- Duplex printing from the primary drawer only
- Automatic job offset of printed output for easy job separation

Paper Sizes

- 8" x 10"
- 8" x 10.5"
- 8.5" x 11" (letter)
- 8.3" x 11.7" (A4)
- 8.5" x 13"
- 8.5" x 14" (legal)

Paper Weights

- Simplex: 16 lb. to 32 lb.
110 lb. index
- Duplex: 20 lb. to 28 lb.

Fonts

- A basic set of fixed-pitch fonts is supplied with the Print Services Facility (PSF) software. Other fixed-pitch and proportional fonts are available as licensed programs.
- All fonts are downloaded from the host and are managed by the AFP software.
- Up to 64 fonts, depending on the size and number of characters, can be loaded into the printer and printed on the same page.
- Typographic fonts are available in sizes ranging from 4 to 72 points (approximately 1/18 inch to 1 inch). There are six typeface families available, providing a total of 148 type fonts. The fonts for the 3827 Page Printer are the same as the 3820 fonts.
- OCR-A, OCR-B, and bar-code printing are supported.

Control Unit Storage Configurations

- 2 megabytes page buffer storage, standard
- 2 megabytes raster pattern storage, standard
- The page buffer storage holds the data from the host to be printed as well as electronic overlays. The raster pattern storage is used to store the font patterns and any image data, such as graphics, logos, and signatures. This base configuration is sufficient to print full-page graphics.

Optional Features

- 2 megabytes of raster pattern storage, making the total configuration of raster pattern storage 4 megabytes
- Two-channel switch

3827 Page Printer

Attachment

- The 3827 is a channel-attached printer and is supported by the following processors: 4331, 4341, 4361, 4381, 3081, 3083, 3084, 3090, and 9370
- The 3827 is attached via a block multiplex channel and can be supported by the 3044 Fiber Optic Channel Extender

Supplies

- 3827 Toner: Approximately 48,000 impressions per cartridge at 4% coverage
- 3827 Developer Mix: Approximately 800,000 impressions per bottle
- 3827 Fuser Oil: Approximately 300,000 impressions per bottle

Primary Users

The primary users of the 3827 Page Printer are medium-to-large data centers who have a requirement for high-quality cut-sheet duplex printing.

Potential Benefits

The high-quality print of the 3827, combined with the advanced function printing software capabilities, offers application benefits such as dynamic production of insurance policies or creating documents with text and graphics combined. For more details on the benefits provided by the AFP software, see Section 41.

Prerequisite Products

- Print Services Facility (PSF), the key component in the advanced function printing software, is required to support the 3827 Page Printer.
- The 3827 is supported in the MVS/SP, MVS/XA, and VSE/SP environments.
- There is a statement of intent to provide PSF support for the 3827 in VM environments.

AFP Software Support

Advanced function printing software supports the 3827 as well as the 3800 Models 3 and 6, 3820, 3835, and 3812 Page Printers. This provides a common application interface across the family of IBM Page Printers. For more details, see Section 41.

Reference Material

Introduction to the 3820 and Advanced Printing Software, G544-3088

4250/II ElectroCompositor

Products Included

- 4250/II ElectroCompositor Model 002
- Composed Document Printing Facility (CDPF)
- 4250 Print Driver and Typographic Fonts for the IBM PC
- 4250 Print Adapter/A

Main Purpose

The 4250/II is a high-resolution, all-points-addressable (APA), non-impact printer that provides high quality printing capability at a relatively low price. With associated software, it can print a wide variety of text in various type styles and sizes, graphic objects, and half-tone images in an office or publications environment. Output of the 4250/II can be produced either on aluminized paper or on a polyester electroNEG material. The paper is normally used as a high-quality camera-ready master for reproduction by a printing press or copier. Alternatively, polyester electroNEG material can be used as a high-quality pre-plate negative. A printing plate can be produced directly from the electroNEG which eliminates the chemical processes, dark-room facilities, and environmental considerations that are encountered in the production of photographic negatives from camera-ready masters. This eliminates several costly steps in the production of printing plates. The 4250/II is a quiet, floor-standing unit suitable for the office environment and attaches directly or remotely to System/370 Models 138 and up, 4300, and 30XX processors. The 4250/II can also be attached to any 80386-based IBM Personal System/2 when equipped with a 4250 Print Adapter/A (#7122).

Key Functions, Facilities and Features

- Provides high-quality pre-plate negatives (electroNEG) or camera-ready master pages at an addressing resolution of 600 X 600 dots (pels) per square inch
- Provides immediately-usable dry output and requires no chemical processes, darkroom facilities, or special environmental considerations
- Provides the capability of merging and printing text, graphics, and image, thus eliminating costly and time-consuming paste-up steps
- Creates output that is immediately visible and usable
- Uses aluminum-coated paper, which is less costly than conventional photographic paper, or electroNEG, which eliminates the costly photographic process of negative creation
- Provides new take-up mechanism for convenient multipage output handling
- Provides end-user convenience — small size and silent operation, suitable for an office environment

The 4250/II uses advanced electro-erosion technology. During printing, an electric current passes through high-precision guides with electrode tips onto aluminized paper or electroNEG. These tips create a high current density that vaporizes the aluminum layer. This results in a transparent area on electroNEG or a contrasting black area on the paper. ElectroNEG can then be used directly to make a printing plate or the paper can be used as a camera-ready master.

Unlike traditional photographic technology, this process requires no special chemicals or facilities and is exceptionally clean, dry, and easy to use.

On a host system, the 4250/II, with associated software such as the Document Composition Facility Release 3 and Graphical Data Display Manager Release 3, covers a wide spectrum of application areas. In traditional document processing and publishing, customers may take advantage of the high-quality printing of the 4250 and use the printed page as camera-ready master, or electroNEG may be used to produce an offset plate for volume reproduction. This technique of reproduction is generally used in the production of manuals, procedures, price lists, forms, brochures, and the like.

The programming and application development department may use the 4250/II for documentation of application programs, including flow diagrams and user application guides. The documentation may be copied for low-volume distribution or may be reproduced by regular offset reproduction means.

The 4250/II enables use of as many as 33 typeface families in a range of styles and sizes.

Reports, presentations, business charts, and other management documents are often generated in the office environment by professionals and secretaries. The functional capability of the 4250/II, together with appropriate software, provides a versatile tool to produce quality management information.

The 4250/II also provides high-quality graphics hard-copy output. The 4250/II has the capability to print simulated half tones when used with appropriate image support software such as Image Handling Facility Version 2 (5664-363).

When attached to any 80386-based Personal System/2 via the 4250 Print Adapter/A card, the 4250 print driver software (5871-BBB, part number 6193074) provides support for the 4250 functionally equivalent to that of the Composed Document Print Facility (CDPF) on a host system. Remote printing on a PC- or PS/2-attached 4250 eliminates the need for a 327X control unit thus reducing the cost and minimizing the impact on other 3270 interactive display users. Also, rasterization and decompression of a

4250/II ElectroCompositor

page is performed at the PC or PS/2, which greatly reduces loads on the communication line.

The 4250/II has been designed for ease of use. It offers a number of operator control keys and indicator lights. Also, with the programming support, the user can initiate retransmission of a page if necessary.

Primary Users

- Printing/publishing companies
- In-house publishing organizations

Prerequisite Products

Hardware

Host:

System/370 Model 138 or above, 30XX, or 4300

PS/2:

4250 Print Adapter/A

Software

Host:

MVS/370, MVS/XA, VM/SP CMS, VSE/AF with ACF/VTAM, CDPF

See "Advanced Function Printing Software" in Section 41 for more information.

PS/2:

4250 Print Adapter and Typographic Fonts for the IBM PC

Products Supported

The 4250/II Printer is supported by the following application packages:

- Composed Document Printing Facility (CDPF) (5668-997). This is a licensed program specifically designed for the 4250/II. CDPF is a prerequisite program for 4250/II operation. It processes Document Composition Facility (DCF) Release 3 and/or Graphical Data Display Manager (GDDM) Release 3 output into an appropriate format for printing on the 4250/II. CDPF can print this data immediately on the 4250/II and/or store the data on DASD for later use.
- Document Composition Facility Release 3 (5748-XX9). DCF Release 3 provides advanced composition functions of proportional spacing, unlimited font usage, inclusion of graphics and image objects into the composition function (integration of text/graphics/image), and hyphenation and justification.
- Document Library Facility Release 3 (5748-XXE). The Document Library Facility provides functions

to store and retrieve documents and executes DCF in MVS or VSE batch.

- Graphical Data Display Manager Release 3 (5748-XXH). Release 3 of GDDM provides support for the 4250/II by enabling GDDM created graphics objects to be rastered. Subsequently, the graphics objects can be printed on the 4250/II. Interactive Chart Utility (ICU) can be used to create charts that later can be printed on the 4250/II. GDDM Release 3 also provides the capability to separate multicolored pictures created on the 3279 Color Display Station into several monochrome print masters for color printing using standard offset litho techniques.
- IBM Typographic Fonts for the 4250/II (5771-AAA and other 5771- numbers). The Typographic Fonts are a set of 33 licensed programs that provide an extensive number of fonts in various styles and sizes. These fonts are specifically designed for the 4250/II.
- Advanced Text Management System III Release 2 (5740-XYL for MVS and 5746-XXU for VSE). ATMS III Release 2 provides support for Document Composition Facility Release 3.
- 4250 Print Driver and Typographic Fonts for the IBM PC (5871-BBB, part numbers 6193074 and 6193088 through 6193124). The 4250 Print Driver provides an application program interface from an 80386-based Personal System/2 to the 4250/II ElectroCompositor and the 4250 printer. It provides function equivalent to CDPF on the host and uses a set of 37 licensed programs that provide an extensive number of fonts in various styles and sizes.

Ordering Information

Volume purchase discounts are available for the 4250/II.

Composed Document Printing Facility

Program number: 5668-997

Reference Material

- A Guide to IBM's Document Processing and Publishing Application, G320-0091
- Composed Document Printing Facility, General Information Manual, GC33-6133
- Document Composition Facility and Document Library Facility Release 3, General Information Manual, GH20-9158
- Graphical Data Display Manager, General Information Manual, GC33-0100

4248, 4245, and 6262 Printers

Products Included

- 4248 Model 2 (4000 lpm)
- 4245 Models 12, D12, and T12 (1200 lpm)
- 4245 Models 20, D20, and T20 (2000 lpm)
- 6262 Models D12 and T12 (1200 lpm)
- 6262 Models 014, D14, and T14 (1400 lpm)

Main Purpose

The 4248 Printer Model 2 uses a hammer magnet technology and an etched steel print band and prints at multiple speeds (4000, 3200, 2200 lines per minute). It achieves print quality at 4000 lines per minute that approaches the print quality of the 4248 Model 1 at 3000 lines per minute and print density on multipart forms equivalent to that of the 3211 Printer. Ergonomic enhancements facilitate operator setup and utilization, such as elimination of platen wear strips and the ability to store up to twenty job setups for instant recall. OCR capability is a standard feature at 2200 lpm. The enhanced print quality, superior performance and function, and reliability (including lower monthly maintenance than the 4248 Model 1) make this machine an excellent growth path for 3211, 4245, 3203 and 1403 customers. The 4248 Model 2 attaches via a channel to 43XX, 303X, 308X, 3090, and 9370 processors.

The 4245 family consists of six high-speed impact band printers. The 4245 Models 12, 20, D12, and D20 are System/370, 4300, and 30XX printers. Models 12 and 20 are channel-attached with rated speeds of 1200 and 2000 lpm respectively. Models D12 and D20, attached via 3X74 control units, provide the same features and speeds, 1200 and 2000 lpm, respectively, for remote environments. These printers offer exceptional price/performance, reliability, throughput, and ease of use. In addition, they offer floor space and power savings for 3203 Model 5 and 1403 Model N1 users. The Model 12 also offers a growth path for 3262 Model 5 users.

Models T12 and T20 attach via twinax or the IBM Cabling System to System/36 and System/38. They offer increased speed over the 5262, enhanced function, ease of use, field upgradability, and high reliability.

The 6262 Impact Line Printer family consists of five high-speed impact band printers. The 6262 Models D12, D14, and 014 are System/370, 4300, and 30XX printers. The Model 014 is channel-attached with a rated speed of 1400 lines per minute (lpm). Models D12 and D14, attached via 3X74 control units, provide the same features and speeds, 1200 and 1400 lpm, respectively, for remote environments. These printers offer exceptional price/performance, reliability, throughput, and ease of use. In addition, they

offer floor space and power savings for 3203 Model 5 and 1403 Model N1 users.

Models T12 and T14 attach via twinax or the IBM Cabling System to System/36, System/38, and System/88. They offer increased speed over the 5262, enhanced function, ease of use, field upgradability, and high reliability.

Key Functions, Facilities and Features

The 4248 optional 168-print position feature gives greater freedom in forms design as well as side-by-side printing when in horizontal copy mode, thus eliminating multi-part forms for some jobs. It features 6 or 8 lines per inch, intermixed vertical spacing selection, automatic print band verification, and a power stacker.

The 4245 printers provide flexibility through field-upgradability and the choice of channel attachment (Models 12 and 20), remote attachment (Models D12 and D20), or attachment to System/36 and System/38 (Models T12 and T20). These printers combine OCR capability, etched steel band technology and a variety of productivity-enhancing operator features.

The 6262 printers provide the choice of channel attachment (Model 014), remote attachment (Models D12 and D14), or attachment to System/36, System/38, and System/88 (Models T12 and T14). These printers combine OCR capability, etched steel band technology and a variety of productivity-enhancing operator features.

Potential Benefits

4248 Printer Model 2

- High performance — selectable print speeds up to 4000 lpm and skip speeds up to 100 inches per second. Print speeds should be matched to customer requirements, since 4000 lpm provides a reduced print quality compared to the print quality at 2200 or 3200 lpm.
- Quiet operation — less than 62 dB, which makes it quieter than almost any other impact line printer
- Enhanced operator convenience
- Job Setup/Recall feature
- Horizontal copy mode for side-by-side printing
 - OCR capability (numeric OCR standard, alpha available via RPQ) recommended to be run at 2200 lpm
 - Up to six-part forms recommended for 3000 lpm and 2200 lpm (up to four-part at 4000 lpm). Multipart forms over four-part, and all special forms, should be tested for acceptability at all speeds.
 - Large print jobs at 4000 lpm

4248, 4245, and 6262 Printers

- Multistrikes in a single print position for under-scoring and special character creation

4245 Printer Models 12, 20, D12, D20, T12, and T20

- Remote (Models D12 and D20) or channel attachment (Models 12 and 20)
- Twinax or IBM Cabling System attachment to System/36 and System/38 (Models T12 and T20)
- Field upgradability
 - Model 12 to 20
 - Model D12 to D20
 - Model T12 to T20
- OCR A and B capability (numeric OCR standard, alpha available via RPQ)
- Forms capability up to four parts (forms greater than four parts should be tested)
- Less floor space required than for other IBM impact printers
- Reduced power requirements over 1403 Model N1, 3211, and 4245 Model 1
- Power-assisted forms stacker
- Extensive software support
- Enhanced serviceability

6262 Impact Line Printer Models D12, D14, T12, T14, and 014

- Operator ease of use
 - Unobstructed access to print area
 - Unobstructed access to stacker area
 - First-line viewing option
 - Single knob for horizontal forms alignment/tension
- Operator-selectable flight timing
- Four forms tractors
- Six-part form capability
- Forms motion detection
- Attention light
- OCR alphanumeric — standard
- Polyester ribbon support
- 120-volt, single-phase power
- Reduced footprint
- Print-band verification (Model 014 only)
- 6-or-8 lines-per-inch intermix within a page (Model 014 only)
- Power-assisted stacker (Models X14 only)

Prerequisite Products

- System/370 Model 148 to 168 (except Models 155 II and 165 II), 30XX, 4300, 9370, System/36, or System/38 processor is required.
- 4245 Printer Models D12 and D20:
 - 3X74 and 4701 via SNA/SDLC communication link
 - 4361 via Workstation Adapter
- 4245 Printer Models T12 and T20:
 - System/36 — Local: Attaches to the workstation controller on the 5360, 5362, or 5264.

- System/38 — Local: Attaches to the workstation controller on the 5381 and 5382.
- 6262 Printer Models D12 and D14
 - 3X74 via SNA/SDLC communication link
 - 4361 via workstation adapter
 - 9370 via workstation controller
- 6262 Models T12 and T14
 - System/36, System/38, or System/88
- 6262 Model 014
 - Channel-attaches to 9370, 43XX, 308X and 3090

Reference Material

- Printer Pocket Guide, GBOF-1077
- System/Printer Combinations Flyer, G580-0331
- 4245 Printer, Models 12 and 20, Information Manual, GA33-1579
- 4245 Printer, Models D12 and D20, Information Manual, GA33-1586
- 4245 Printer, Models T12 and T20, Information Manual, GA33-1591
- 4248 Model 2 Description, GA24-3991
- 6262 Printer, Model D12, Product Description, GA24-3988
- 6262 Printer, Model T12, Product Description, GA24-4011
- 6262 Printer, Model 014, Product Description, GA24-4134

3262 Line Printer

Main Purpose

The 3262 is a low-cost system printer for use with 4300, 8100, 303X, 308X, and most System/370 processors and for the 3174 or 3274 Control Unit. The printer provides flexibility and price/performance for users with low- to mid-range print requirements.

Key Functions, Facilities and Features

- Print speeds vary in accordance with the character set print belt:

Character	Set Nominal Speed (lpm)	
	Models 1,2,3,5	Models 11,12,13
48	650	325
64	466	230
96 (94 printable)	363	180
128 (except Models 1 and 11)	252	125

- An optimized 63-character-set print belt provides increased print speeds over the standard 64-character set.
- 132 print positions are standard at 10 characters per inch.
- A single-speed carriage allows skip speeds up to 20 inches per second.
- Vertical spacing of 6 or 8 lines per inch is under system control.
- Forms width can range from 16 inches maximum to 3.5 inches minimum.
- Forms length ranges from 14 inches to a minimum of 6 inches.
- OCR feature for Models 1, 2, 3, 5, 11, 12, and 13 provides capability to print numeric OCR A and B character sets and their respective special characters for optical character recognition applications. The printed characters are for use on the 3886 and 3890 optical readers.
- Important operator considerations included in the 3262 are:
 - Easy front forms loading
 - Human factors engineered operator control panel
 - Quick operation
 - Simplified spool ribbons for easy changing
- Model 5 has a horizontal fine adjustment for positioning printed characters and for greater ease of use with preprinted forms.

Potential Benefits

- The 3262 is ideally suited for: Low print-volume applications
- New users, as an entry-level printer
- Online applications with limited print requirements
- Model 5 reduces entry printer cost for 4341 engineering/scientific systems.

Prerequisite Products

- Models 1 and 11: Position on a 4321 or 4331 Display/Printer Adapter, with up to two 3262 Printers attachable to the adapter
- Models 2 and 12: Position on an 8100 system loop
- Models 3 and 13: 3174 or 3174 Control Unit
- Model 5: Channel attachment position on System/370 with virtual storage support (except 155 II and 165 II), 30XX, 9370, and 4300 processors

Reference Material

All Models

- Forms Design Guide for Printers, GA24-3488
- Site Planning and Preparation Guide, GA24-3734

Models 1 and 11

Component Description, GA24-3733

Models 2 and 12

Component Description, GA24-3737

Models 3 and 13

Component Description, GA24-3741

Model 5

Product Description, GA24-3936

Printers for Workstations and Mid-Range Systems

Printers for Workstations and Mid-Range Systems - Comparison Table

Printer Model	Maximum Speed*	Attaches to	Technology
4210	200 cps	S/36, S/38	Wire matrix
4224 Models: 101, 102, 1E2, 1C2 201, 202, 2E2, 2C2 301, 302, 3E2, 3C2 (E Models: expanded memory) (C Models: color, expanded memory)	XX1 - 200 cps XX2 - 400 cps	S/36, S/38 3X74, 3276, 9370 S/1, S/88, 43XX	Wire matrix
4234 Model 001 Model 002	410 lpm	3X74, 3276, 9370, 43XX, 3694 S/36, S/38, 5294	Dot band
5225 Model 4	560 lpm	S/1, S/36, S/38	Wire matrix
3262	650 lpm	S/36, S/38, 43XX, 9370, 3X74	Engraved band
5262	650 lpm	S/1, S/36/38/88, Remote WS cluster	Engraved band
4248-2	4000, 3200, 3000 lpm	S/38 (RPQ), 9370, 43XX	Engraved band
4245 Models 12,T12,D12 Models 20,T20,D20	1200 lpm 2000 lpm	S/36/38—T models 3X74—D models S/88, 9370, 43XX	Engraved band
6262 Models T12, D12 Models 014,T14,D14	1200 lpm 1400 lpm	S/36, S/38, S/88, 3X74, 43XX, 9370,	Engraved band
3812 Pageprinter	12 ppm	S/36, S/38, S/88, VM host, PC LAN, Token-Ring Net- work, PC and PS/2 (up to 8), 3X74, 43XX, 9370, RT	Electro- photographic (LED)
5210	60 cps	43XX, 30XX, 3X74, 3276, 9370	Printwheel
5219	60 cps	S/36, S/38, S/1	Printwheel
* cps = characters per second lpm = lines per minute ppm = pages per minute			

Note: See also Guide to IBM Printers, G520-6302.

Products Included

- 3262 Line Printer
- 3812 Pageprinter
- 4210 Printer
- 4224 Printer
- 4234 Dot Band Printer
- 4245 Line Printer
- 5210 Printer
- 5219 Printer
- 5225 Printer
- 5262 Line Printer
- 6262 Impact Line Printer

Key Functions, Facilities, and Features

3262 Line Printer

- Print speeds vary in accordance with the character set print belt:

Character	Set Nominal Speed	
	Models 1,2,3,5	Models 11,12,13
48	650 lpm	325 lpm
64	466 lpm	230 lpm
96 (94 printable)	363 lpm	180 lpm
128 (except Models 1 and 11)	252 lpm	125 lpm

- Models 1 and 11: Position on a 4321 or 4331 Display/Printer Adapter, with up to two 3262 Printers attachable to the adapter
- Models 2 and 12: Position on an 8100 system loop
- Models 3 and 13: 3X74 Control Unit or 3276 Control Unit Display Station (Model 13 only)
- Model 5: Channel attachment position on System/370 models with virtual storage support (except 155 II and 165 II), and 303X, 308X, 4331, 4361, 4341, and 4381 processors
- Multinational character set
- Simplified forms handling
- Operations ease
- 132 print positions
- 10 characters/inch
- 6/8 lines/inch
- Fine vertical and horizontal vernier adjustment
- Maximum skip speed: 20 inches/second

3812 Pageprinter

- Attachment to System/36, System/38, System/88, VM host*, PC LAN, Token-Ring Network, PC and PS/2 (up to eight on a sharing card), RT PC, 3X74, 9370, 4321, 4331, 4341, and 4361
- Maximum speed: 12 ppm
- Electrophotographic technology (LED)
- Large input/output capacity
 - 550/250-sheet capacity paper drawers
 - Output-sequenced, job-offset, face-down
 - 550-sheet output tray
- Letter quality (240 x 240 dots/inch)
- Advanced print functions supported through Intelligent Printer Data Stream (IPDS)**
- Up to 61 unique fonts standard
 - Virtually unlimited changes/page
- Multiple pitches
- All-points-addressable (APA) graphics
- Support for vector graphics
- 0-, 90-, 180- and 270-degree print orientations standard
- Quiet
- No usage charge
- Self diagnostics

4210 Printer

- Attachment to System/36, System/38
- Three print-quality modes and resulting print speeds:

Mode	Max Speed
DP	200 cps
Emphasized	100 cps
NLQ	40 cps

- Wire-matrix technology
- Low-volume utility printer
- Vertical spacing:
 - System/36 – 3, 4, 6, 8 lines per inch
 - System/38 – 4, 6, 8, 9 lines per inch
- Horizontal spacing of 5, 10, 12, 17.1 characters per inch
- Power-assisted paper loading for continuous forms
- Document-on-demand capability: the convenience of removing a printed continuous form without wasting or disturbing the unprinted forms
- Continuous forms (from 3" to 15")

* Via the 3705 or 3725 Communication Controller or communications adapter of a 4321, 4331, or 4361 processor using RS-232C BSC line.

** IPDS, with appropriate software support, allows the 3812 Pageprinter and the 4224 Printer to print advanced functions such as electronic forms, text/graphics merge, images, signatures, logos, resident bar codes, and OCR A and B. GDDM is the software product that provides the print driver for IPDS in the 327X environment for the 3812 and 4224 printers. The System/36 operating system (SSP, Release 5 or higher) and the System/38 operating system (CPF, Release 8 or higher) provide the printer driver for IPDS in the System/3X environments for the 3812 and 4224 printers.

Printers for Workstations and Mid-Range Systems

- Cut sheets/cut forms easily loaded from the front of the printer without removing continuous forms

4224 Printer

- Three series (by attachment):
 - Models 1XX – attachment to System/36, System/38
 - Models 2XX – attachment to 3X74, 43XX, 3694, 9370
 - Models 3XX – attachment to Series/1, System/88
- Four models:
 - Model X01 – 200 cps maximum
 - Model X02 – 400 cps maximum
 - Model XE2 – 400 cps maximum – expanded storage (no model 3E2)
 - Model XC2 – 400 cps maximum – color and expanded storage
- Wire matrix technology
- Three print-quality modes and resulting print speeds:

Mode	Model X01	Models X02, XE2, XC2
DP	200 cps	400 cps
DP Text	100 cps	200 cps
NLQ	50 cps	100 cps

- Vertical spacing of 6 and 8 lines per inch
- Horizontal spacing of 10, 12, 15, and 16.7 characters per inch
- Color printing (Model XC2) in 4 or 8 color (black, red, green, blue, yellow, magenta, turquoise, brown)
- Advanced print functions supported through Intelligent Printer Data Stream (IPDS) including vector graphics, resident bar codes, OCR A and B, raster image, and electronic forms (overlays) (see footnote for "3812 Pageprinter," above)
- Word processing functions including proportional spacing, sub/superscript and various emphasis capabilities (software-dependent). Print quality is operator-selectable and may be overridden by software.
- Print line maximum of 13.2 inches; paper width from 3 inches to 15 inches (continuous forms)
- Multipart forms up to 6 parts (including original)
- Coaxial attachment to 3174 Subsystem Control Unit, 3274 Control Unit, or 4361/4312/4331 or 9370 Processors
- Twinax attachment to System/36, System/38, and 5294 Remote Control Unit communicating to System/36 or System/38
- Graphics printing at 144 X 144 dots per inch
- Three operator-changeable forms modules
- Front loading and straight paper path
- Advanced jam detection checks (continuous forms), paper skew and insertion error detection (cut forms)

- Ribbon cartridge for clean-hands removal and installation
- Operator-replaceable printhead
- Multifunction operator panel including three-position digital display
- Compact table-top design
- Accessory printer stand available via RPQ
- Accessory cover window available via RPQ

4234 Dot Band Printer

Model 001 attaches to the 3274, 3276, 3694, the 4321/4331/4361 and the 9370.

Model 002 attaches to the System/36, System/38 and the 5294 Remote Controller communicating with a System/36 or System/38.

This allows the 4243 Dot Band Printer to function as either a display subsystem printer or a small system printer. The 4234 has:

- Enhanced price/performance
- Unique new dot-band technology
 - Variable dot size (band-to-band) allows optimizing print quality to a particular print speed
 - Customer-changeable
- A black ribbon cartridge and a print band with 0.016-inch (.406-mm) dot print elements shipped with each printer. Additional ribbons and print bands may be ordered.
- Three selectable print qualities and speeds:
 - Draft (upper case only) - 410 lpm
 - Data processing - 300 lpm
 - Near letter quality - 120 lpm
- Low acoustical levels - 57 dBA, 58 dBA when printing and 44 dBA idling
- Bottom forms loading
- Power assist on forms load
- Forms eject and restore function to reduce forms waste
- Simple but functional operator panel
- Status codes defined in booklet attached to operator panel
- 13.2-inch print line
- Horizontal spacing: 10 and 15 characters per inch
- Vertical spacing: 3, 4, 6, and 8 lines per inch (lpi) on Models 001 and 002, plus 9 lpi for Models 002 graphics
- Vertical and horizontal fine adjustments
- Clean-hands, long-life ribbon cartridge
- Customer setup for early machine availability
- Sophisticated RAS capabilities, including internal diagnostics
- Bar code and OCR support for System/36 only (Automatic Identification Printing System (AIPS) – RPQ)

4245 Line Printer (Models T12 and T20)

- Attachment to System/36 and System/38
- Rated speeds
 - Model T12: 1200 lpm
 - Model T20: 2000 lpm
- Field-upgradable from T12 to T20
- OCR A and B capability
- Forms capability up to four parts (forms greater than four parts should be tested)
- Power-assisted forms stacker
- Growth path for 5262 users

4248-2 Line Printer

- Attachment to System/38 via RPQ
- OCR A and B capability
- Forms capability up to six parts, low and medium speeds, and up to four parts at high speed (forms greater than four parts should be tested)
- Full power stacker

5210 Printer

- Attaches to 8100 (E Models), 3X74, 3276, 8775 (G Models), 9370, and 4300
- Maximum speed: 60 cps
- Printwheel technology
- Letter quality
- Optional two-drawer cut-sheet feed and envelope handling
- Optional tractor feed for continuous forms, interchangeable with sheet feeder
- Drop-in ribbon cartridge and drop-in print wheel
- Output from the cut-sheet feed face down and printed in sequence
- Print positions: 132 for 10 pitch, 158 for 12 pitch, and 198 for 15 pitch
- Vertical spacing of 3, 4, 5 1/3, 6, 8, 9.6, 12, 24, and 48 lines per inch, plus half-line spacing for superscript and subscript to a single level

5219 Printer

- Attaches to Series/1, System/36, or System/38
- Hardware features same as for 5210 Printer (above)

5225 Printer Model 4

- Attaches to Series/1, System/36, or System/38
- Rated print speed: 560 lpm
- Condensed printing (15 char/inch)
 - 198 maximum print positions
- Oversize characters
- Bar codes
- Business graphics
- OCR
- Special characters
- Heavy-duty, floor-standing

5262 Line Printer

- 650 lpm
- Like 3262 except:
 - One model only
 - Attaches to System/36, System/38, Series/1, and remote workstation cluster

6262 Impact Line Printer Models T12 and T14

- Attachment to System/36, System/38, and System/88
- Rated speeds
 - Model T12: 1200 lpm
 - Model T14: 1400 lpm
- OCR A and B capability
- Forms capability up to 6 parts
- Power-assisted stacker (Model T14)
- Growth path for 5262 users

Workstation Printers, Plotters, and Scanners

Printers, Plotters, and Scanners for Personal Computers and 327X - Comparison Table

Machine No.	Speed	Key Characteristics	PS/2*	PC	3270-PC	327X
5202	80-274 cps	Executive letter quality Quiet, lightweight Folds APA graphics Up to 8 fonts online Integrated paper handler	X	X	X	
5201-002	40-60 cps	Letter quality Quiet, lightweight Folds APA graphics	X	X	X	
6180	15.7 in/sec	8-pen plotter High-quality graphics Folds	X	X	X	X
6182	31.5 in/sec	8-pen plotter High-quality graphics Auto sheet feed A- and B-size paper	X	X	X	X
6186		8-pen plotter Auto pen change High line quality Folds	X	X	X	
3852-2	30-50cps	Ink jet technology APA graphics 7-color printing	X	X	X	
4201-002	40-240 cps	Wire matrix technology APA Graphics	X	X	X	
5223	16 cps	Letter quality Low price	X	X	X	
3812	12 ppm (max.)	Table-top Multiple fonts Letter quality LED technology APA graphics	X	X	X	
4202	40-200 cps	Wire matrix Wide carriage APA graphics	X	X	X	
4207	67-240 cps	24-wire matrix Letter quality/ utility printing APA graphics Auto sheet feed option	X	X	X	
4208	67-240 cps	24-wire matrix Letter quality/ utility printing APA graphics Auto sheet feed option Wide carriage	X	X	X	

Machine No.	Speed	Key Characteristics	PS/2*	PC	3270-PC	327X	RT
4216	6 ppm	Desk-top publishing APA graphics Quiet Envelopes, trans- parencies, labels	X	X	X		X
3117	30 sec per pg	Desk-top, flat-bed scanner	X	X	X		
3118	12 sec per pg	Desk-top, sheet-fed scanner Integrated paper handler	X	X	X		
3119	28-14 sec per pg	Desk-top, flat-bed scanner for PS/2 Mod 50 or higher	X				

* IBM Personal System/2®

Note: See also *Guide to IBM Printers, G520-6302*.

Printers for Direct Display Attachment

Printer	System/370			S/3X	ASCII			
	3191 Models	3192 Models	3194 Models	3197 Models	3	3	3	3
	D E L	C D F G L	C D H	C D	1	1	1	1
					5	6	6	6
					1	1	2	3
5202		X		X X				
5201-002		X		X X				
3852-2		X						
4201-002	X X X	X X X X X	X X X	X X	X X	X X	X X	X X
4202	X X X	X X X X X	X X X	X X	X X	X X	X X	X X

X = Has printer attachment port

Products Included

- 3117/3118 Scanners
- 3119 PageScanner
- 3812 Pageprinter
- 3852 Model 2 Color Jetprinter
- 4201 Proprinter II
- 4202 Proprinter XL
- 4207 Proprinter X24
- 4208 Proprinter XL24
- 4216 Personal Pageprinter Model 20
- 5201 Quietwriter® Model 2 Printer
- 5202 Quietwriter III
- 5223 Wheelprinter E
- 6180 Color Plotter
- 6186 Color Plotter

Main Purpose

The following are descriptions of printers, plotters, and scanners that attach to IBM Personal Computers and IBM Personal System/2®.

Key Functions, Facilities and Features

3117 Scanner

- Compact desk-top flat-bed scanner allowing the scanning of a page from bound documents and of irregular paper size or weight
- Scan speed per page — approximately 30 seconds (8-1/2" x 11" page) at 240 x 240 pels per inch
- Program-selectable scanning resolutions
- Program-selectable partial page scan
- Program-selectable digital halftone emulating grey levels of pictures

Workstation Printers, Plotters, and Scanners

- Image data compression (requires 3117 Extension Unit, #4555)
- Contrast control via dynamic thresholding and edge enhancement*
- Attachment to:
 - PC family
 - 3270-PC family
 - Personal System/2 family
 - 3193 display (requires 3117 Extension Unit, #4555)

3118 Scanner

- Compact, light-weight desk-top scanner with a small footprint
- Wide variety of paper sizes
- Built-in paper stacker and paper chute with an adjustable paper guide
- Program-selectable scanning resolutions
- Scan speed per letter-size page with 240 x 240 pels per inch with compression: 12 seconds (average)
- Two-dimensional image data compression at an average of 27-to-1 compression ratio at 240 x 240 pels per inch resolution
- Program-selectable darkness control
- Program-selectable contrast control with dynamic threshold and edge enhancement technology
- Program-specifiable digital half-toning emulating grey levels of pictures
- Program-specifiable partial page scanning
- Attachment to:
 - PC family
 - 3270-PC family
 - Personal System/2 family
 - 3193 display

3119 Scanner

- Compact desktop flatbed scanner for the PS/2 Model 50 or higher
- Accommodates bound documents such as books or magazines
- 300-pel-per-inch scan in either black/white or 128 shades of gray
- Variable output resolution of 1-600 pels per inch
- Darkness and contrast adjustments
- Partial page scanning and image scaling
- Fast scanning: 28 seconds per page at 300 pels per inch

3812 Pageprinter

- LED technology
- 12 pages per minute (maximum)
- Multiple fonts and multiple pitches
- Letter quality
- APA graphics
- Sharing card

- Attachment to:
 - PC family
 - Personal System/2 family
 - 3270-PC family
 - System/36, except System/36 PC
 - System/38
 - VM host
- Two paper drawers
 - 550 sheets primary
 - 250 sheets secondary

3852 Model 2 Color Jetprinter

- 30-50 cps
- Inkjet technology
- APA graphics
- 7 colors
- Near letter quality
- Attachment to:
 - PC family
 - 3270-PC family
 - 3192 Model G Display Station

4201 Proprinter II Model 2

- Wire matrix technology
- 40-240 cps
- Near letter quality
- APA graphics
- Multiple pitches
- Attachment to:
 - PC family
 - Personal System/2 family
 - 3270-PC family
 - 3708/3710 (8-Port Communication Adapter)
 - 3191 Model D, E, and L Display Stations
 - 3192 Model C, D, F, G, and L Display Stations
 - 3194 Model C, D, and H Display Stations
 - 3197 Model C and D Display Stations
 - 3151 Display Stations
 - 3161, -2, -3, and -4 Display Stations

4202 Proprinter XL

- Wire-matrix technology
- 40 to 200 cps
- Wide carriage
- APA graphics
- Multiple pitches
- Attachment to:
 - PC family
 - 3270 PC family
 - 3708/3710 (8-port communication adapter)
 - 3191 Model D, E, and L Display Stations
 - 3192 Model C, D, F, G, and L Display Stations
 - 3194 Model C, D, and H Display Stations
 - 3197 Model C and D Display Stations
 - 3151 ASCII Display Station
 - 3161, -2, -3, and -4 ASCII Display Stations

4207 Proprinter X24

- Wire-matrix technology
- 67-240 cps
- Letter quality
- High-resolution APA graphics
- Multiple pitches and fonts
- Optional sheet feed
- Attachment to:
 - PC family
 - Personal System/2 family
 - 3708 Network Conversion Unit
 - Token-Ring LAN
 - Compatible non-IBM PC

4208 Proprinter XL24

- Wire-matrix technology
- 67-240 cps
- Letter quality
- Wide carriage
- High-resolution APA graphics
- Multiple pitches and fonts
- Optional sheet feed
- Attachment to:
 - PC family
 - Personal System/2 family
 - 3708 Network Conversion Unit
 - Token-Ring LAN
 - Compatible non-IBM PC

4216 Personal Pageprinter Model 020

- Printer for IBM publishing solutions:
 - IBM SolutionPac™ Personal Publishing System
 - IBM SolutionPac Publishing System VM Edition
 - IBM Interleaf Publisher
 - IBM Interleaf Publishing Series RT PC Edition
- Laser APA printer
- With appropriate adapter card and program, the 4216 is a PostScript® printer. PostScript is a page description language that performs functions vital to publishing.
- Up to six pages per minute
- 300 x 300 dpi resolution
- Various paper sizes and weights
- Envelopes, transparencies, and labels
- Supported by:
 - IBM SolutionPac Personal Publishing Systems on:
 - All PS/2 models
 - PC AT models
 - PC XT Model 286
 - IBM Interleaf Publisher on PS/2 80386-based machines
 - IBM Interleaf Publishing Series RT PC Edition on RT PC
 - IBM SolutionPac Publishing System VM Edition through PC hardware and software

5201 Quietwriter Printer Model 2

- 40-60 cps burst print speed
- Letter-quality printing
- Non-impact resistive ribbon (resistive ribbon thermal technology – R₂T₂)
- Multiple fonts – four pitches
- Two fonts online, expanded print capability
- Line graphics that utilize full IBM PC character set
- Optional sheet feed and tractor feed
- All points-addressable (APA) graphics
- Attachment to:
 - IBM PC
 - Personal System/2 family
 - PC XT
 - PC AT
 - 3270-PC
 - 3270-PC/G
 - 3270-PC/GX
 - PCjr
 - 3192 Model G Display Station
 - 3197 Model C and D Display Stations

5202 Quietwriter III

- Resistive ribbon thermal technology
- 80-274 cps
- Letter quality
- Wide carriage
- Multiple pitches and fonts
- High-resolution APA graphics
- Optional auto paper handling
 - Single-drawer sheet feed
 - Dual-drawer sheet feed
 - Envelope feed
 - Tractor feed
- Quiet: 45 dBA
- Transparencies
- Attachment to:
 - PC family
 - Personal System/s family
 - Compatible non-IBM PC
 - 3192 Model G Display Station
 - 3197 Model C and D Display Stations

5223 Wheelprinter E

- Bidirectional printwheel technology
- 16 cps
- Attachment to:
 - PC family
 - 3270 PC family

6180 Color Plotter

- Eight program-selectable pens
- Compact desk-top design
- Plots on standard 8-1/2 inch by 11-inch or 150 A4 (210-mm x 297-mm) media
- Automatic pen capping

Workstation Printers, Plotters, and Scanners

- Programmable pen velocity settings
- 60-byte buffer (extendable to 1K)
- Software compatibility with most commercially-available graphics packages
- High line quality
- Highly accurate registration for camera-ready charts
- Extended graphics facilities
- Plots on paper and transparency film
- Attachment to:
 - IBM RT PC
 - PC family
 - 5080 Graphics System
 - 3179 G1 and G2 attached to System/370, 30XX, 4300 or 7370 processors

6182 Color Plotter

- 8 pens, automatic capping
- High line quality
- Automatic sheet feed
 - 150 sheets
 - 100 overhead transparencies
 - A- and B-size media
- 1,024-byte buffer (reconfigurable up to 12KB)
- RS232C and IEEE488 interfaces standard
- Attachment to:
 - PC family
 - IBM RT PC
 - 3179 G1 and G2 attached to System/370, 30XX, 43XX
 - System/3X via attached PC with emulator

6186 Color Plotter

- Eight-pen automatic changing and capping
- High line quality
- Cut-feed (Model 1) or roll-feed (Model 2)
- Selectable pen sorting feature
- 26K data buffer
- Fiber-tip, roller-ball, and drafting plotter pens
- Selectable 7375 emulation mode
- CAD/CAM software support: CADAM®, CATIA®, CBDS™, CAEDS, CIEDS, GPG, GDQF, graPHIGS, and CADwrite
- Attachment to:
 - IBM RT PC
 - IBM PC family
 - System/370, 30XX, 4300, 9370 via 3179 Model G10 or G20, 3270-PC/G and /GX, 3270-PC AT/G and /GX, and 5085-3270.

3151 ASCII Display Stations

Main Purpose

IBM 3151 ASCII Display Stations offer full-function ASCII compatibility in a range of versatile, high-quality video displays designed to work with both IBM and non-IBM systems. There are three 3151 Display Stations: the entry-level Model 110 and two full-function models, the 310 and 410. Each model consists of two elements: a streamlined 14-inch monitor and a keyboard.

Key Functions, Facilities and Features

- **Screens**
The 3151 ASCII Display Stations feature a flat-screen design. The high-resolution monitors come in green or amber-gold phosphor and display 80 or 132 columns across.
- **Emulation**
Ten non-IBM ASCII emulations are resident in the base of each 3151 ASCII monitor. The Models 310/410 accept new slim-line 3151 cartridges for emulation of DEC VT220/100/52 and WYSE WY-50/50+ terminals. These emulation cartridges – each about the size of a credit card – allow the 3151 to be used with many ASCII systems.
- **Keyboards**
Designed for comfort and utility, the 84-key Model 110 or the 102-key Model 310/410 keyboards provide a tactile response to let the user know every stroke has counted. Model 310/410 keyboards can be recapped to suit specific applications and have 12 function keys that are shiftable to up to 36. The keyboards for all models of 3151 ASCII Display Stations offer an adjustable slope angle of 6° or 12°.

Major features of all three models include the following:

- Sharp, crisp screen images result from high-quality short-persistence phosphors – in green or amber-gold – that eliminate “ghosts” and “smearing.”
- Auto-dim feature reduces monitor “burn in” by clearing the screen if there has been no terminal activity within 15 minutes. This feature is selected during the menu setup.
- Smooth scrolling – one-speed on the Model 110, two-speed on Models 310/410 – makes it easier to manipulate data and eliminate text smearing.
- Versatile data highlighting – by characters, by fields, or by a combination of both – helps to emphasize important information with under-scoring, reverse video, nondisplay, blinking or dual intensity.
- Full user control of image intensity permits adjusting brightness.

Features unique to full-function Models 310/410 include the following:

- 80 or 132 columns are displayed per line.
- 102 keys provide tactile responses.
- Up to 36 definable function keys, available through shifting, suit individual application needs.
- 24 line-drawing characters are used to create continuous lines from the numeric keypad – such as grids, tables, horizontal and vertical rows, and organization hierarchy boxes.
- Easily expandable emulation feature permits optional cartridges to be snapped in to add emulations (including DEC VT220/100/52 and WYSE WY-50/50+).
- Split-screen capabilities permit a host program to divide the screen into as many as three horizontal screen areas, each capable of receiving and sending data.
- Bidirectional auxiliary port permits connection of input and output devices for attaching printers, displays or input devices on Models 310/410.

Warranty

3151 ASCII Display Stations are backed by a one- or three-year exchange service warranty. Warranty service is provided using Customer Carry-in Exchange. With an IBM Maintenance Agreement, the user can arrange for Customer Carry-In or IBM On-Site Exchange Service.

Emulations in Base

Emulations resident in the base of each 3151 monitor are:

- TeleVideo 925/925E/920/912/910/910+™
- Lear Siegler ADM 3A/5™
- ADDS Viewpoint A2™
- Hazeltine 1500™
- IBM 3101*

* Models 310 and 410 only

Options

Available options for 3151 ASCII Display Stations include:

- Cartridges for Models 310/410:
 - Cartridge to emulate Zentec ADM 11plus/ADM 12plus™ and Data General D215™ as well as TeleVideo 955™ terminals with either an RS232C or RS422A communications interface.
 - The 3151 Connectivity Cartridge to emulate DEC VT220™ and IBM 3101. The cartridge also enables display stations to act as workstations for PC systems; establishes connections with dual hosts for dual-session performance; and

3151 ASCII Display Stations

supports dual sessions from a single host. In addition, it supports auto-dial, 3708 enhanced attachment mode, and either an RS232C or RS422A interface.

- The 3151 Expansion Cartridge to support: multiple pages of memory; 24, 25 or 28 lines of displayed data; double-high, double-wide, and host-loadable characters; and the ISO 8859/1.2 character set. Also supported are a double-queue buffer for auxiliary devices; emphasized printing of visual field attributes and near-letter-quality printing on IBM Proprinters; and an RS232C or RS422A interface. An IBM 3101 mode is included with this cartridge.
- Cartridge to emulate WYSE WY-50/50+® terminals. Provides 3151 Native, WYSE WY-50/50+®, IBM 3101, TeleVideo 925/925E/920/912/910/910+™, Lear Siegler ADM 3A/5™, ADDS Viewpoint® A2, and Hazeltine 1500™.
- Cartridge to emulate IBM and DEC terminals. Includes 3151 Native, RS422A communications option, mode switch without cartridge removal, 3708 Enhanced Attachment Mode, 3101 emulation, and DEC VT220/100/52 emulation.
- Tilt-and-swivel monitor stand. Allows easy positioning at the most comfortable angle.

Primary Users

Suitable for all users requiring alphanumeric ASCII display stations

Potential Benefits

- High quality
- Low cost
- ASCII
- Excellent ergonomics
- Ability to attach to a wide range of IBM and non-IBM systems

Reference Material

- Pocket Brochure, G360-2760
- Specifications, G360-2751
- Presentation Guide, G360-2761
- Software Reference Guide, G360-2762
- Technical Reference Guide, G360-2763

3161, 3162, 3163, and 3164 ASCII Display Stations

Main Purpose

The 3161, 3162, 3163, and 3164 ASCII Display Stations bring a high level of function and ergonomic design to IBM ASCII displays. They can attach to both IBM and non-IBM systems.

The 3161 is a high-function, entry-level ASCII display. It offers such features as menu setup, definable function keys, split-screen, and character and field display attributes. It also has an auxiliary output port, a cartridge capability, and an ASCII keyboard with a numeric keypad.

The 3162 is a general-purpose, full-function ASCII display consisting of a 132-character, 14-inch green or amber-gold phosphor CRT and a logic element that accommodates optional cartridges. Two keyboards are available on the 3162 — a low-profile 102-key keyboard and an optional spacesaving 84-key keyboard. The 3162 offers smooth scroll at two speeds and a bidirectional auxiliary port.

The 3163 provides these same features plus smooth scroll, windowing, double high/double wide characters, and a redefinable keyboard. The 3161 is upward compatible with the 3163.

The display stations include a high resolution green or amber-gold phosphor monitor with tilt/swivel base, etched dark screen to reduce glare, and a low-profile adjustable keyboard with tactile feedback.

The 3164 is a high-function display that offers the advanced capabilities of the IBM 3163 ASCII Display Station in eight colors. Applications that call for multiple windows, smooth scrolling, and double size characters can now be presented in color.

As a member of a family of ASCII displays, the 3164 is upward compatible from the 3161 and 3163. In native mode the 3164 will default to four colors on programs written for the 3161/3163. The 3164 also emulates the IBM 3101 model 881 (model 230) and provides four colors for 3101 programs in block mode.

The 316X display family provides high-quality terminals for a variety of user applications at an attractive price.

When attached to a System/370 host through the 3708 Network Conversion Unit or the 3710 Network Controller, the 3161, 3162, 3163, and 3164 may be used as 3270-like devices. For attachment to non-IBM systems a number of competitive ASCII display emulations are available.

Key Functions, Facilities and Features

- Ergonomics
 - Tilt/swivel display
 - Etched/dark screen to reduce glare
 - Enhanced keyboard
 - Brightness/contrast controls
 - Reduced footprint
- Screen characteristics
 - 25 lines x 80 characters; 8 x 16 character cell (3161, 3163, 3164)
 - 12-inch amber-gold or green-phosphor cathode ray tube (CRT) (3161 and 3163)
 - 25 lines x 80 characters; 9 x 15 character cell or 29 lines x 132 characters; 9 x 13 character cell (3162)
 - 14-inch amber-gold or green phosphor cathode ray tube (CRT) (3162)
 - 14-inch cathode ray tube (CRT) with eight foreground and eight background colors (including black) (3164)
 - Reverse video, blinking, underline, dual intensity, and nondisplay attributes
- Keyboard
 - Designed for ASCII
 - Tactile feedback
 - Low profile, 102 keys
 - Space-saving 84-key keyboard (3162 only)
 - 12 function keys (shiftable to 24) and three program access (PA) keys
 - Numeric keypad
 - Coiled cable
- Enhanced functions
 - Menu setup
 - Definable function keys
 - Character, field, and line attributes
 - Line drawing characters
 - Split screen
 - CRT saver
- Communication
 - RS232 and RS-422A host attachment
 - Selectable speeds to 19.2K bps
 - 7/8 bits option
 - XON/XOFF option
 - RS232C auxiliary port
- Additional functions of 3163/3164
 - Smooth scroll
 - Viewports, paging, and partitioning
 - Double-high/double-wide characters
 - Redefinable keyboard
 - Block longitudinal redundancy checking (LRC)
 - Host-loadable character set
 - Extended attributes

3161, 3162, 3163, and 3164 ASCII Display Stations

- Emulation capability
 - 3161:
 - 3101 Model 881 (23)
 - ADDS Viewpoint®
 - Hazeltine 1500™
 - Lear Siegler ADM-3A™
 - Lear Siegler ADM-5™
 - TeleVideo 910™
 - 3161 via cartridge:
 - ADDS Viewpoint A2
 - Hazeltine 1500
 - Lear Siegler ADM-3A/5
 - TeleVideo 910 + /912/920/925/925E™
 - 3162:
 - 3101 Model 881 (23)
 - 3162 via cartridge:
 - DEC VT220/100/52™
 - TeleVideo 925/925E/912/920/910/910™
 - Lear Siegler ADM-3A/5
 - ADDS Viewpoint A2
 - Hazeltine 1500
 - WYSE 50/50+®
 - 3163:
 - 3101 Model 881 (23)
 - DEC VT52 and VT100, TeleVideo 950/955™
(via cartridges)
 - 3164: 3101 Model 881 (230)
 - DEC VT100, TeleVideo 955 (via cartridge)

Reference Material

- 3161/3163 Description Manual, GA18-2310
- 3161 Enhanced 3708 Attachment, GA18-2595
- 3161 TeleVideo 92X/91X Emulation User's Guide, GA18-2509
- 3161 Extended ASCII Emulation User's Guide, GA18-2525
- How to Use the Additional Read Command Cartridge on the 3161/3163, GA18-2487
- 3162 User's Guide, GA18-2493
- 3162 VT220 Emulation, GA18-2496
- 3162 10 ASCII Emulations, GA18-2554
- 3162 WYSE Emulations, GA18-2593
- 3162 VT220 with Hot Key/3708, GA18-2621
- Using the 3163 to Emulate the DEC VT100/52, GA18-2313
- Using the 3163 to Emulate the TeleVideo 950, GA18-2314
- 3164 Description Manual, GA18-2317

4055 InfoWindow Display

Main Purpose

The InfoWindow Display has a simple display screen capable of combining audio, video, computer graphics and text in a coordinated and interactive manner. Users may interact with the display and control the presentation sequence via a touch-sensitive screen or computer keyboard. InfoWindow Display utilizes the IBM Personal Computer (PC), an optional non-IBM videodisc player, and the InfoWindow Control Program. The system is designed for use in applications addressing education and training, merchandising of products and services, and public access to information.

Key Functions, Features, and Facilities

- 13-inch dual-frequency display attachable to the IBM Personal Computer XT (PC XT), IBM Personal Computer AT (PC AT), or IBM Personal System/2™ Model 30, 50, or 60
- Display of both red-green-blue (RGB) graphic images and National Television Standards Committee (NTSC) composite video formats
- Support for overlay of text and graphics on composite video
- Dual-resolution graphics
 - High resolution (640 x 350 pels)
 - Low resolution (640 x 200 pels)
- Touch-sensitive screen with up to 60 variable touch pads representing 64K touch points
- Choice of 16 colors presentable on a single text and graphic screen from a palette of 64 colors
- Synthetic speech for vocal messages and prompting
- Integrated stereo speakers
- Support for attachment of one or two concurrent non-IBM videodisc players
- Attachment of user-supplied optional devices (external stereo amplifier and speakers, stereo headphones, auxiliary composite video display, and projection screen)

With the optional videodisc attached, the system will be capable of the following added functions:

- Random access of audio and motion or still video images from a videodisc player
- Overlay of video images with text and graphics from the PC

Primary Users

The InfoWindow Display provides the means for customers to enhance education, training, and information dissemination in a convenient manner that is user-paced and can provide valuable feedback.

The InfoWindow Display is designed for operation by non-technical individuals. It can be installed in unattended environments such as break areas, retail stores, or transportation centers, on a customer-provided desk or table, or in a carrel or kiosk.

Prerequisite Products

Each InfoWindow Display must be attached to any PC XT (5160), PC XT 286 (5162), PC AT (5170), or Personal System/2 Model 30 with a minimum of 512K bytes of memory, a minimum of one dual-sided diskette drive, a minimum of one 10MB fixed disk drive, and the following features:

- InfoWindow Enhanced Graphics Adapter Card (with 128KB memory expansion)
- General Purpose Interface Bus (GPIB) Adapter and Cable
- Enhanced Graphics Adapter Jumper Card
- Disk Operating System (DOS)
- InfoWindow Control Program
- One 360KB 3.5-inch or 5.25-inch diskette drive

The Personal System/2 Model 50 or 60 can be attached to the InfoWindow Display by means of Attachment Kit 82X9239.

Note: Programs or applications used may require additional hardware capacities.

Products Supported

Optional videodisc players:

Laser videodisc players that may be attached to the InfoWindow Display are available from original equipment manufacturers (OEMs). Among these are the Sony LDP-2000 Models 1 through 5, which offer support for still frame audio (Models 4 and 5) and digital data read (Model 5), and the Sony LDP-1500. Others include the Pioneer LD-V6000, V6000A and V6010A, with or without the still with sound data (SWSD) system, and the Pioneer LD-V6200A, or their functional equivalents.

With the proper system configuration, up to two Sony LDP-2000 Models 3, 4, or 5, or two Pioneer LD-V6200A players, or their functional equivalents may be attached and used interchangeably for even more presentation flexibility and power.

Educational Support

- All Guided Learning Centers will have an InfoWindow Display installed for IBM and customer education.
- A videodisc and accompanying diskettes entitled *Exploring the IBM InfoWindow System*, GV30-0169, designed to be used with the InfoWindow Display,

4055 InfoWindow Display

a PC XT, PC AT, or Personal System/2 Model 30 and an appropriate videodisc player are available for customer information and demonstration. The purpose of this videodisc is to introduce the concepts and describe the benefits of interactive videodisc technology, applications, and IBM hardware/software.

- The IBM Advanced Education System (AES) Support Center in Atlanta will make available the videodisc above, an IBM Conference Guide Demonstration, product briefings, fee classes, and fee consultant services (on an availability basis). Fee and schedule information is available through AES area marketing representatives.

Reference Material

- Executive (hardware and software) brochure, G580-0689
- Hardware brochure, G580-0692
- Courseware Catalog, G580-0845

3270 Information Display System

Products Included

- 3178 Display Station
- 3179 Color Display Station Model 1
- 3179 Color Display Station Model 2
- 3180 Display Station
- 3180 Display Station Model 1
- 3180 Display Station Model 2
- 3191 Display Station
- 3192 Color Graphics Display Station G Models
- 3192 Color Display Station C, F, and L Models
- 3192 Display Station D Models
- 3193 Display Station
- 3194 Advanced Function Display C, D, and H Models
- 3196 Display Station
- 3197 Color Display Station C Models
- 3197 Display Station D Models
- 3174 Subsystem Control Unit
- 3274 Control Unit
- 3278 Display Station
- 3279 Color Display Station
- 3262 Line Printer (see separate description, Section 53)
- 4234 Dot Band Printer (see General and Office Printers and Plotters, Section 68)
- 3852 Color Printer (see General and Office Printers and Plotters, Section 68)
- 3299 Terminal Multiplexer Model 2
- 6262 Impact Line Printer (see description Section 68)

Main Purpose

The 3270 Information Display System provides a series of machines for local and remote online applications such as:

- Data entry
- Inquiry and update
- Interactive program development
- Personal computing
- Graphics applications
- Image applications

Displays, printers, and their controllers can be configured flexibly to match the particular requirements of a wide range of applications. Color displays and printers provide:

- Display of high-quality color images for alphanumeric and presentation graphic use
- Local copy or host direct printout of color information in up to four colors

Key Functions, Facilities and Features

3178 Display Station

- Models:
 - C1: 1920-character display, 75-key data entry keyboard
 - C2: 1920-character display, 87-key typewriter keyboard
 - C3: 1920-character display, 87-key typewriter keyboard with numeric keypad
 - C4: 1920-character display, 87-key typewriter keyboard with numeric keypad
- Three elements: video, logic, and keyboard
- Attachment to Type A terminal adapters on 3174 or 3274 Control Unit
- Attachment to any 3276 Control Unit operating in SDLC protocol or 3276 Model 2, 3, or 4 operating in BSC protocol
- Audible alarm, keyboard numeric lock, and security keylock
- Compatibility with 3278 Model 2
- For operator comfort:
 - Etched screen, reducing light reflections and fingerprint smudges
 - Pedestal, permitting tilt and swivel
 - Low-profile adjustable keyboard
- Optional extension cables to position logic unit up to seven feet from display and keyboard

3179 Color Display Station Model 1

- Three elements: video, logic, and keyboard
- 1920-character display
- Seven colors (red, green, blue, white, yellow, pink and turquoise)
- Attachment to Type A terminal adapter on 3174, 3274, and 3276 Control Units and to the standard display printer adapter on a 4321, 4331, or 4361 Processor
- Compatibility with 3279 Model S2A, S2B, or S2X
- In existing 3178/3278/3180 environments, ability to display four colors with existing field attribute definitions
- Low-profile 122-key typewriter-style keyboard with three angles
- Modifiable keyboard with removable keycaps that can be used to apply unique nomenclature to the keyboard
- High-resolution images and an etched screen to reduce both light reflections and smudging
- Auto-dim feature
- Tilt/swivel pedestal

3270 Information Display System

3179 Color Display Station Model 2

Note: For System 36/38

- Three elements: video, logic, and keyboard
- 1920-character display (24 lines of 80 characters)
- Seven colors (red, green, blue, white, yellow, pink, and turquoise)
- Attachment to System/36 or System/38 either directly or through 5294 Remote Control Unit
- Plug-compatible with the 5292 Model 1 Color Display Station
- Functionally equivalent to the 3180 Model 2 Display Station with the exception of the 132-character line and the dedicated message line
- Low-profile, 122-key typewriter-style or 102-key enhanced keyboard
- Storage for 1018 keystrokes
- High-resolution images and an etched screen to reduce both light reflections and smudging
- Auto-dim feature
- Tilt/swivel pedestal

3180 Display Station Model 1

- Three elements: video, logic, and keyboard
- 15-inch display screen with adjustable height, tilt, and rotation
- Four operator- or program-selectable screen formats:
 - 24 lines by 80 characters (1920)
 - 32 lines by 80 characters (2560)
 - 43 lines by 80 characters (3440)
 - 27 lines by 132 characters (3564)
- 122-key low-profile keyboard with adjustable slope
- Modifiable keyboard with removable keycaps that can be used to apply unique nomenclature to the keyboard
- Attachment to Type A terminal adapters on 3174, 3274, and 3276 Control Units and to the 4321/4331/4361 via the display printer adapter
- Compatibility with 3278 Models 2, 3, 4, and 5
- Tinted screen to improve contrast; etched glass filter to reduce glare and smudging
- Attachment to the 4700 Finance Communication System controllers. In that case, provides only the 3278 base functions and 1920- and 3564-character screen formats

3180 Display Station Model 2

Note: For System 36/38

- Three elements: video, logic, and keyboard
- 1920-character 15-inch display screen with adjustable height, tilt, and rotation
- 122-key low-profile keyboard with adjustable slope
- Attachment to System/36 or System/38, either directly or through a 5294 Remote Control Unit
- Base functions of the 5251 Model 11
- Selectable multinational character set

- Message line
- Tinted screen to improve contrast; etched glass filter to reduce glare and smudging

3191 Display Station A, B, D, E, and L Models

- Offered in green or amber-gold screen phosphor
- Attachment to 3174, 3274, or 3276 via the Type A adapter, 4701 or 4702 via the DCA adapter, 4321 or 4331 Processors via the display/printer adapter, and 4361 Processors via the display/printer or workstation adapter
- Low price with discounts for volume procurement
- Three-year or three-month warranty (model-dependent)
- Alert function for maintenance
- 3270 compatibility
- Screen characteristics:
 - 1920-character screen (80 columns by 24 rows) plus operator information area (all models)
 - 2560-character (80 column by 32 row) screen for D, E, and L models
 - Non-glare, 12-inch/14-inch monochrome CRT with steady image
 - Green or amber-gold
 - Auto-dim feature
- Keyboards:
 - 102-key enhanced keyboard (modifiable)
 - 122- or 104-key typewriter keyboard (modifiable)
 - Coiled keyboard cable
 - Home-row indicator keys
- Ergonomics:
 - Smaller, lighter-weight video unit
 - Tilt/swivel pedestal
 - Small footprint
 - Low-profile keyboard with two angles of inclination
- Light pen with L models

3192 Color Graphics Display Station G Models

- One- or three-year warranty
- Three elements: video, logic, and keyboard
- 1920- or 2560-alphanumeric-character display screen with presentation graphics and colors (red, green, blue, white, yellow, turquoise, and pink on a black background)
- All-points-addressable (APA) with 720 x 384 picture elements in viewable area
- Host-directed alphanumeric-only print support through 2KB buffer – does not interfere with other display activity
- Local screen buffer for alphanumeric and graphic print output – display activity can continue immediately after hitting PRINT key
- Screen trimming to crop screen area for local printing
- Two low-profile lightweight keyboards: 122-key typewriter keyboard and 104-key typewriter keyboard

- Modifiable keyboard with removable keycaps that can be used to apply unique nomenclature to the keyboard
- Support for APL2-type characters
- Attachment to 3274 and most models of 3174 control units — does not attach to 3174 Models 81R and 82R
- Function equivalent to 3279 Model S3G and 3179G
- Support for attachment of the 3852 Model 2 Color Jetprinter, Proprinter II, 4202 Proprinter XL, and 5201 Model 2 Quietwriter and 5202 Quietwriter Model 1 Printer in the base unit
- With 3979 Expansion Unit, extended configuration capability by allowing connection of 5277 Mouse, 7371, 7372, 6180-2, and 6184 Color Plotters plus the printers listed above

3192 Color Display Station C, F, and L Models

- One- or three-year warranty
- Three elements: video, logic, and keyboard
- 14" color monitor
- Four screen formats:
 - 24 lines by 80 columns (1920 characters) all models
 - 32 lines by 80 columns (2560 characters) all models
 - 43 lines by 80 columns (3440 characters) F models only
 - 27 lines by 132 columns (3564 characters) F models only
- Seven colors (red, green, blue, white, yellow, pink, and turquoise)
- Attachment to type A terminal adapter on 3174, 3274, and 3276 control units and to the standard display printer adapter on the 43XX and 9370 processors
- Compatibility with 3279 S2A, S2B, or S2X and the 3179 Model 1 all models. 3192 F models also compatible with 3180 Model 1.
- In existing 3178/3278/3180/3191 environments, ability to display four colors with existing field-attribute definitions
- Printer port: used to attach Proprinters to the display logic unit for local screen copy
- Screen trimming to crop screen area for printing
- Three low-profile lightweight and adjustable keyboards: 102-key enhanced keyboard, 104-key typewriter keyboard, and 122-key typewriter keyboard
- Modifiable keyboards with removable keycaps that can be used to apply unique nomenclature to the keyboard
- Excellent resolution and an etched screen to reduce light reflections and smudging
- Auto-dim feature: user-selectable screen timeout can be 0, 2, 5, 10, or 20 minutes. The screen blanks out after no keyboard activity for the selected time, is reactivated by any keystroke activity.

- Set-up feature: users can control cursor size, clicker volume, and printer details such as horizontal and vertical spacing.
- Record/pause/play: provides memory storage for 1500 characters for automatic playback with the capability to PAUSE for the insertion of variable information
- Tilt/swivel pedestal
- Light pen with L models

3192 Display Station D and W Models

- One- or three-year warranty
- Three elements: video, logic, and keyboard
- 15" green or black on white phosphor monitor
- Four screen formats:
 - 24 lines by 80 columns (1920 characters)
 - 32 lines by 80 columns (2560 characters)
 - 43 lines by 80 columns (3440 characters)
 - 27 lines by 132 columns (3564 characters)
- Attachment to type A terminal adapter on 3174, 3274, and 3276 control units and to the standard display printer adapter on the 43XX and 9370 processors
- Compatibility with 3180 Model 1
- Printer port: used to attach Proprinters to the display logic unit for local screen copy
- Screen trimming to crop screen area for printing
- Three low-profile lightweight and adjustable keyboards: 102-key enhanced keyboard, 104-key typewriter keyboard, and 122-key typewriter keyboard
- Support for APL-type characters
- Modifiable keyboards with removable keycaps that can be used to apply unique nomenclature to the keyboard
- Excellent resolution and an etched screen to reduce light reflections and smudging
- Auto-dim feature: user-selectable screen timeout can be 0, 2, 5, 10, or 20 minutes. The screen blanks out after no keyboard activity for the selected time, is reactivated by any keystroke activity.
- Set-up feature: users can control cursor size, clicker volume, and printer details such as horizontal and vertical spacing.
- Record/pause/play: provides memory storage for 1500 characters for automatic playback with the capability to PAUSE for the insertion of variable information
- Tilt/swivel pedestal

3193 Display Station

- Models:
 - 10: 122-key typewriter keyboard
 - 20: 102-key IBM enhanced keyboard
- Three elements: video, logic, and keyboard
- 15-inch, portrait-type, monochrome display station that supports alphanumeric/image applications
- Support for 3278 Model 2, 3, and 4 screen formats
- Multiple logical terminal capability (up to two)

3270 Information Display System

- Support for two full 24-line by 80-column screens
- Support for attachment of 3117 and 3118 Scanners
- All-points-addressable (APA) with 1200 × 880 picture elements in the viewable area
- Attachment to 3174 or 3274 Control Unit
- Modifiable keyboard with removable keycaps that can be used to apply unique nomenclature to the keyboard

3194 Advanced Function Display C, D, and H Models

- One- or three-year warranty with IBM on-site repair
- Three elements: video, logic, and keyboard
- Three monitors:
 - Model C 12" color
 - Model D 15" monochrome
 - Model H 14" color
- Four screen formats
 - 24 lines by 80 columns (1920 characters) all models
 - 32 lines by 80 columns (2560 characters) all models
 - 43 lines by 80 columns (3440 characters) D and H models
 - 27 lines by 80 columns (3564 characters) D and H models
- Seven colors (red, green, blue, white, yellow, pink and turquoise) on Models C and H
- Locally attached Proprinters
- Local utility session with host file transfer
- Device Function Interface and Device Function Modifier to simplify writing and executing customer-defined utility programs
- Advanced screen management including up to four host sessions, two notepads, and one utility session
- A fifth host session on an ASCII host available with the ASCII/VT100 feature
- Attachment to Type A terminal adapter on the 3274/76 and 3174 control units and to 4321/4331/4361 via the standard display printer adapter
- Three workstation elements: video, logic, and keyboard
- Record/play/pause with 30K characters
- Compatibility with 3279 Models S2A, S2B, or S2X and with 3179 Model 1 and 3180 Model 1 with equivalent function
- Usable in existing 3178/3278/3180 environments to display four colors with existing field attribute definitions on Models C and H
- High-resolution images and an etched screen, to reduce light reflections and fingerprints
- Customer setup

3196 Display Station

Note: For System 36/38

- Member of the 5250 Information Display System
- Attachment to System/36, System/38, or 5294 Remote Controller
- Offered in green or amber-gold screen phosphor
- Low price with discounts for volume procurement
- Three-year or three-month warranty
- Compatibility with 5291 Model 2
- Screen characteristics
 - 1920-character screen (80 columns by 24 rows) plus operator information area
 - Reduced glare, 12-inch monochrome CRT with steady image
 - Green or amber-gold
- Ergonomics/usability
 - Tilt/swivel pedestal
 - Small footprint
 - Low-profile keyboard with two angles of inclination
 - 1500-keystroke record/play capability
 - Setup mode
 - Keylock

3197 Color Display Station C Models

- Dual-address terminal: the user can be simultaneously logged-on to two different applications and may use a JUMP key to switch between the applications.
- One- or three-year warranty
- Three elements: video, logic, and keyboard
- 14" color monitor
- Screen format: 24 lines by 80 columns (1920 characters)
- Seven colors (red, green, blue, white, yellow, pink, and turquoise)
- Attachment to System/36 or System/38 either directly or through the 5294 Remote Control Unit
- Compatibility with the 5292 Model 1 and 3179 Model 2 Color Display Stations
- In existing 5291/3180/3196 environments, ability to display four colors with existing field-attribute definitions
- Printer port: used to attach Proprinters or Quietwriters to the display logic unit for local host copy
- Two low-profile lightweight and adjustable keyboards: 102-key enhanced keyboard and 122-key typewriter keyboard
- Excellent resolution and an etched screen to reduce light reflections and smudging
- Auto-dim feature: user-selectable screen timeout can be 0, 2, 5, 10, or 20 minutes. The screen blanks out after no keyboard activity for the selected time, is reactivated by any keystroke activity.

- Set-up feature: users can control cursor size, clicker volume, and printer details such as horizontal and vertical spacing.
- Record/play: provides memory storage for 1500 characters for automatic playback

3197 Display Station D and W Models

- Dual-address/split-screen terminal: the user can be simultaneously logged-on to two different applications and may view work with each
- One- or three-year warranty
- Three elements: video, logic, and keyboard
- 15" monochrome monitor with green phosphor (Model D)
- 15" monochrome monitor with black on white phosphor (Model W)
- Three screen formats:
 - 24 lines by 80 columns (1920 characters)
 - 27 lines by 80 columns (3564 characters)
 - Dual-address-mode/split-screen formats:
 - 24 lines by 80 columns (1920 characters)
 - 17 lines by 80 columns (3280 characters)
- Attachment to System/36 or System/38 either directly or through the 5294 Remote Control Unit
- Compatibility with the 3180 Model 2
- Printer port: used to attach Proprinters or Quietwriters to the display logic unit for local host copy
- Low-profile lightweight and adjustable keyboards: 102-key enhanced keyboard and 122-key typewriter keyboard; 122-key data entry for Model D only
- Excellent resolution and an etched screen to reduce light reflections and smudging
- Auto-dim feature: user-selectable screen timeout can be 0, 2, 5, 10, or 20 minutes. The screen blanks out after no keyboard activity for the selected time, is reactivated by any keystroke activity.
- Set-up feature: users can control cursor size, clicker volume, and printer details such as horizontal and vertical spacing.
- Record/play: provides memory storage for 1500 characters for automatic playback

3174 Subsystem Control Unit

- Models 01L, 01R, 02R, and 03R are large-cluster control units for attaching up to 32 3270 Information Display System terminals; Models 51R, 52R, and 53R are small-cluster control units for attaching up to 16 terminals. Models 81R and 82R are small cluster control units, attaching up to eight remote displays (non-downstream-load devices) and/or printers.
 - Models 01L — System/370-architecture channel interface for SNA and non-SNA attachment
 - Models 01R, 51R, and 81R — EIA RS-232C/CCITT B.24 and CCITT B.35 interfaces

for SNA/SDLC, BSC, or X.25 remote link attachment

- Models 02R, 52R, and 82R — CCITT X.21 interface for SNA/SDLC or X.25 remote link attachment
- Models 03R and 53R — IBM Cabling System interface for IBM Token-Ring Network attachment
- The 3174 models are functionally equivalent to the 3274 Control Unit Models 41A, 41C, 41D, and 61C, and in addition offer improved price/performance, usability, and increased functional capabilities.
- Improved performance
- Customizing time significantly reduced
- Increased microcode control storage
- 3174 base control microcode including selected 3274 microcode RPQs
- Optional second diskette drive
- Terminal attachment flexibility
- All special features and model conversions customer setup
- IBM Token-Ring Network 3270 Gateway Feature for Model 01L/01R (SNA)
- 20MB fixed-disk drive as an optional feature
- Multiple logical terminal (MLT) support
- Asynchronous Emulation Adapter (AEA) feature that provides 3270 terminal emulation, ASCII pass-through, and ASCII terminal emulation
- Improved communications capabilities
- Attachment to IBM Cabling System media without baluns
- High-speed transfer channel data transfer mode for Model 01L
- Central site customization
- Response time monitor in base hardware
- Off-line diskette utility procedures
- Serial OEM interface (SOEMI) for Model 01L (non-SNA)
- Intelligent printer data stream (IPDS) support

3274 Control Unit

- Models:
 - A: local SNA attachment
 - B: local 3272 type attachment
 - C: line attachment for BSC/SDLC line control
 - D: local non-SNA attachment for APL/text application support and MVS console support
- Up to 32 devices attachable
- Line speed up to 9600 bps via external modem interface
- Encrypt/decrypt feature available when operating in SNA environment
- CCITT V.35 interface for speeds up to 56K bps on all C models except 1C
- DDS adapter for SDLC up to 56K bps on Models 21C, 31C, 41C, 51C, and 61C
- Standard models of Models 41A, 41C, and 41D with 32 ports and 192KB control storage for easier configuring and ordering

3270 Information Display System

- Double-sided diskette standard on Models 41 and 61
- Response time monitor for attached 3178, 3179, 3180, 3278, and 3279 display stations on Models 31A, 31C, 31D, 41A, 41C, 41D, 51C, and 61C
- Alert capability for SNA Models 1A, 1C, 31A, 31C, 41A, 41C, 51C, and 61C
- Integrated adapter for attachment of 3299 Terminal Multiplexer
- Category B devices not supported by Models 41 and 61 — only Category A devices

3274 Control Unit Model 51C

- Attachment of up to eight Type A and four Type B devices
- Table-top configuration
- Support for full range of 3270 display and printer products, including color and graphics
- Standard 64KB storage, 128KB storage optional

3274 Control Unit Model 61C

- 192KB control storage and 16 ports standard
- Attachment of up to 16 Type A devices via direct ports or eight via direct ports and eight via a 3299 Terminal Multiplexer Adapter
- Table-top configuration
- Support only for Category A 3270 displays and printers, including color and graphics

3278 Display Station

- Models:
 - 1: 960-character display (12 rows of 80 characters)
 - 2: 1920-character display (24 rows of 80 characters)
 - 3: 2560-character display (32 rows of 80 characters)
 - 4: 3440-character display (43 rows of 80 characters)
 - 5: 3564-character display (27 rows of 132 characters)
- Attachment to 3174, 3176, and 3274 Control Units (exception: Model 5 not attachable to 3274 Model B or 3276)
- 75- and 87-key keyboards
- Programmed symbols — Models 2, 3, and 4
- Audible alarm and security keylock

3279 Color Display Station

- Models:
 - S2A: 1920-character display, four-color display (red, green, blue and white)
 - S2B: 1920-character display, seven-color display (red, green, blue, white, yellow, pink, and turquoise), extended function and APL

- S3G: 2560-character display, seven-color display with presentation graphics, extended function, and APL

3299 Terminal Multiplexer Model 2

- Features:
 - Connects category A terminals to 3274 Control Units (except Model 51C) and to 4361 Workstation Adapter
 - May be used with either coaxial cable or IBM Cabling System
 - Small separately-powered multiplexer
 - One coax wire in from 3274, but up to eight ports (and coax wires) out to displays/printers (Category A only)
 - Multiplexer adapter required on 3274 for each 3299
 - Requires specify-feature 9901 on 3274 Models 41X, 61C, and field-installable RPQs on 3274 Models 1X, 21X, and 31X
- Benefits:
 - Reduces the coax cable requirement for display system installation/expansion
 - Provides lower subsystem coax cabling costs
 - Improves cabling options and flexibility
 - Up to 3000 meters between the terminals and their 3274 Control Unit

Potential Benefits

- Flexibility of configuration:
 - Local/remote, BSC/SDLC
 - 1920/2560/3440/3564-character screen
 - Single stations, clusters
 - Multiple printer options:
 - Line printers (3262)
 - Color printers (3287, 3268)
 - Dot-band printer (4234)
 - 80- to 340-cps matrix printers
- Special regard for human factors:
 - Quality and constancy of display image
 - Screen and keyboard position
 - Audible and tactile feedback from keyboard
 - Antiglare screen on 3178/3179/3180/3270-PC
 - Higher-resolution character matrix on 3179/3180
- Features for operating productivity:
 - Cursor select (3276/3278/3279/3179/3180)
 - Customer setup (3268/3274 Models 51C and 61C/3287/3178/3179/3180/3270-PC)
 - Double-speed cursor typematic
 - Operator-selectable alternate cursor (3179/3180/3276/3279/3270-PC)
 - Print/identification key (3179/3180/3270-PC)
 - Enhanced printer support
 - Enhanced price/performance of 3178/3179/3180
 - Enhanced end-user options for growth
 - IBM Personal Computer compatibility with 3270 Personal Computer Attachment
- APL feature (3179 Model G2/3180/3178/3279)

- Color/extended highlighting:
 - Distinction between headings, data items, and details
 - Distinction between budget plan figures, actual historical data, and forecasts
 - Exception conditions to highlight degrees of importance
 - Operator guidance to reduce training time for casual or non-I/S users
 - Clearer indication of actions required, easier/faster information perception, less likelihood of error, easier detection of productivity improvement
- Multiple 3270 sessions in one workstation (3270-PC)
- Dual 3270 sessions on any fixed-function display attached to a 3274 (RPQ 8X0002)
- Symbols and fonts:
 - Display and printing of user-defined symbols and special characters:
 - Special alphanumeric symbols
 - User-defined characters
 - Special type fonts
- Presentation graphics:
 - Display and printing of graphic data, such as bar charts, pie charts, and line graphs
 - Business planning/analysis/tracking
 - Executive information
 - Resource scheduling
 - Monitoring of control

Reference Material

- Introduction to the 3270, GA27-2739
- Alphanumeric Color Display Guide, G320-6296
- 3270 Feature Description, GA23-0113
- 3270 Configurator, GA27-2849
- 3270 Color and Programmed Symbols Manual, GA33-3056
- The Modifiable Keyboard brochure, G520-4219
- Human Factors of Workstations with Display Terminals, G320-6102
- Health and Safety Aspects of Visual Displays, G320-9261
- 3270 Personal Computer Introduction and Pre-Installation Planning Guide, GA23-0179
- Introducing the 3270-PC/G and /GX Workstations, GA33-3141
- 3174 Subsystem Control Unit Functional Description, GA23-0218
- 3191 Display Station Description, GA18-2522
- 3192 Display Station Description, GA18-2535
- 3196 Display Station Description, GA18-2521
- 3192G/3179G Color Graphics Display Station Description, GA18-2589
- 3179 Display Description, GA18-2544

Ordering Information

- The 3178, 3179, 3180, 3191, 3192, 3193, 3194, 3268, 3274, 3278, 3279, 3287, and 3299 are eligible for volume purchase discount.
- The following standard models may be ordered using a simplified ordering process. They contain preconfigured features and limited options:
 - 3178 Models C1, C2, and C3
 - 3179 Model 1
 - 3180 Model 1
 - 3278 Model 2 (optional: three keyboards)
 - 3279 Models S2A, S2B, S3G (optional: three keyboards for each model)
 - 3274 Models 21C, 31A, 31C, and 31D (optional: 24 or 32 ports)
 - 3274 Models 41A, 41C, and 41D (192KB storage and 32 ports standard)
 - 3274 Model 51C (optional: 64KB or 128KB storage)
 - 3274 Model 61C (192KB storage and 16 ports standard)
 - 3287 Models 1, 2, and 2C
 - 3268 Models 2, and 2C
 - 3299 Model 1

8775 Display Terminal

Main Purpose

The 8775 Display Terminal is a high-function single-station cathode ray tube microprocessor-controlled terminal that provides a means of entering data to, and receiving data from, the 8100 Information System and System/370, 30XX, and 4300 processors.

Key Functions, Facilities and Features

- The 8775 is available in four models:
 - Models 1 and 11 display 960, 1920, or 2560 characters in a 9x15 matrix.
 - Models 2 and 12 display 960, 1920, or 2560 characters in a 9x16 matrix or 3440 characters in a 9x12 matrix.In all models, the number of characters in use is under operator control. The base 8775 offers equivalent function to 3276/3278 display units.
- Models 1 and 2 connect via local loop or data-link attached loop to a 4331 or 8100 processor.
- Models 11 and 12 attach to a 4331 or 4321 Processor via the Integrated Communications Adapter or to a 30XX, 4300, or System/370 processor via a 3704/3705 controller using SDLC over a nonswitched, nonswitched with switched network backup, or public switched network.
- Models 11 and 12 attach to the 8100 system via nonswitched communications lines at speeds of up to 9600 bps.
- Keyboard and/or selector light pen permit easy operation. Also offered are audible alarm, security keylock, and setup keylock.
- The following 8775 optional features are offered:
 - Enhanced Functions:
 - Extended highlighting. Three additional methods of highlighting are offered: blink, reverse-video, and underscore.
 - Multiple partitions. Up to eight rectangular areas may be defined on a single screen.
 - Field validation. A data field may be defined as mandatory enter, mandatory fill, or trigger field.
 - APL. An extended APL character set can be entered and displayed.
 - Enhanced Function with Magnetics: This feature provides the ability to read via a magnetic slot reader, a dual-entry magnetic slot reader, or a magnetic hand scanner.
 - Programmed Symbols: This feature provides access to up to six sets of user-defined symbols. Each set contains up to 190 symbols.
 - Multiple Partitions and Scrolling: This is a facility to divide the screen into as many as eight rectangular areas. The operator may scroll vertically within any defined partition without intervention by host software.

- Interactive Display Text Facility (IDTF). This feature provides text entry and editing to 8775 users and is used with DPCX and DOSF/8100.

Primary Users

- Functional management
- I/S and non-I/S professionals

Potential Benefits

- Design permits a comfortable operator posture.
- Screen coating makes it antireflective.
- Application design is flexible because of enhanced function features.
- Variable tilt mechanism is provided.
- Customer setup design and low weight (20 kilos, 45 lbs) allow for customer relocation.

Products Supported

8100 support is provided by:

- DPPX/BASE
- 3270 Data Stream Compatibility (including APL)
- Distributed Presentation Services
- DMS/DPPX and DMS/DPCX
- DPCX
- DCMS/DPPX

4300, System/370, and 30XX support is provided by:

- ACF/VTAME
- CICS/DOS/VS
- NCCF, NPDA, DOS/VSE/AF
- NCCF, NPDA, VTAM, VS1
- GDDM

Reference Material

Introduction, GA33-3040, and Configurator, GA33-3042

5080 Graphics System

Products Included

- 5081 Display (available in color and monochrome models)
- 5085 Graphics Processor
- 5088 Graphics Channel Controller
- 5083 Tablet
- 5087 Screen Printer
- 5084 Digitizer
- 5082 Projection System

Main Purpose

The 5080 is a high-resolution, high-performance graphics system. It may be used in applications requiring graphics and product design and analysis in such areas as electronics, mechanics, mapping, process control, and image manipulation. This workstation allows the user easy access to, and interaction with, the computing power of the host for local or remote teleprocessing applications.

The 5080 also attaches to the RT personal computer to supply high-resolution, high performance, interactive graphics capability in a standalone, remote, or host-offload environment.

Key Functions, Facilities and Features

5081 Display

- Clear, comfortable view of the screen enhanced by an antireflective treatment in both the color and monochrome models
- A 19-inch diagonal screen with a 1024-by-1024-pixel array
- A 16-inch diagonal screen with a 1024-by-1024-pixel array
- Sharp, precise images
- Steady, bright image
- Convenient tilt and swivel mechanism
- RS343 video attachment
- Up to 256 simultaneously displayable gray shades (5081 Model 11) or up to 256 colors (5081 Model 16 or 19) from a range of 16.7 million colors
- May attach directly to the 6150 RT PC via the Megapel Display Adapter

5085 Graphics Processor

- 3250 Graphics Display System compatibility
- Powerful graphics order set. The 5085 controls the display list storage, concurrent graphics and 3270 data mode sessions, peripheral device attachments, RS232C attachment, and display functions.
- Base system memory of 512KB (Model 1A) or 1.5MB (Model 2A)

- Up to 4.5MB system memory
- Base display list storage of 320KB available for application use
- Diskette drive using 3-1/2 inch diskettes with a formatted capacity of 720KB
- Palette supporting 16.7 million colors or gray shades
- High-performance graphics functions:
 - Vector-to-raster conversion
 - Comprehensive solid and pattern area fill
 - 2-D/3-D coordinate transformation and clipping
 - Circle and ellipse generation
 - Character and line generation (fixed and programmable)
 - Four fixed character sets
 - Four fixed and programmable line types
 - Duplicate geometry detection
 - Preselection highlighting
 - Hardware tracking cursor
 - 64-bit by 64-bit programmable tracking cursor
- Dual frame buffers
- Display of 256 colors standard (Model 2A), or 16 colors standard, up to 256 colors optional (Model 1A)
- Image capability to display bit-map images from host or RT Personal Computer
- V.35 attachment that provides telecommunications support for remote 5085s
- Three-dimensional, 64K (X) by 64K (Y) by 64K (Z), virtual world coordinate space
- 4K by 4K virtual image space mapped to the 1K by 1K real screen coordinates
- Frame buffer write and erase protect function, which facilitates animation, menu overlays, and visual detection of vector intersections
- Transformation and Clipping Feature (standard on Model 2A)
- Dials
- Lighted program function keyboard with 32 keytops
- Optional 3270/RS232C Attachment Feature (standard on Model 2A) allowing both graphics and 3270 applications to be concurrently active and alternately displayable, and the attachment of RS232C-compatible devices (see RS232C devices such as the 6184 and 6186 Color Plotters)
- Optional features for connection to the 6150 Micro Computer Model 115, 125, or B25

5088 Graphics Channel Controller

- The 5088 operates as a shared, high-speed channel-attached controller for the workstations. It may attach to a System/370 channel with a channel data rate of up to 2.5 megabytes per second in data streaming mode or up to one megabyte per second in conventional channel mode. Functional compatibility with the 3258 permits attachment of 3255s and 5085s. Since 5085s may

5080 Graphics System

also attach to the 3258, the capability to mix units from the 5080 Graphics System and the 3250 Graphics Display System protects installation investments and eases migration.

- Attachment of sixteen 5085s and/or 3255/3251 workstations and/or RS232C-attached devices on a Model 1. The Model 2 has two sets of 16 attachments for a total of 32 attachments.
- Two-megabit-per-second data rate between the 5088 and 5085 in a 5085 configuration is supported. A 3255 attached to the 5088 reduces the data rate to any 5085 or 3255 attached to the same 5088 Model 1 or to the same side of a dual 16-attachment (32 total) 5088 Model 2 to one megabit per second.
- Model 11R provides remote attachment of up to 16 displays.

5083 Tablet

- Peripheral I/O device for user interaction with an image on a display
- Model 11A (8.5 x 11 inches) and Model 12A (14.6 x 16.4 inches) accommodate small desk area
- Hand-held or lap use as well as table-top
- Snap-on tilt adjustment allowing alternate multiple surface angles
- Palm rest
- Active area of 6.1 x 6.1 inches (Model 11A) or 11.5 x 11.5 inches (Model 12A)
- Resolution of 500 lines/inch
- Four-button cursor or pen-like stylus for cursor control
- Attachable to the 5085, RT PC, PC, and PS/2

5084 Digitizer

- Separately addressed I/O device
- High resolution of up to 1279 lines/inch
- May be used concurrently with the 5083 tablet
- Three models/sizes:
 - Model 1: 24 x 36 inches active area
 - Model 2: 36 x 48 inches active area
 - Model 3: 44 x 60 inches active area
- Cursor with 16 buttons and four indicator lights included
- RS232C interface
- Attachment to the 5085 and 3270 PCAT
- Programmable command set
- Binary and ASCII output data formats
- Optional power lift and tilt

5082 Projection System

- High-resolution projection of graphic applications for the large-audience environment with the same clarity and brightness as the 5081 high-resolution display
- Attachment to the 5085 Graphics Processor or 5081 Display via the RGB interface
- 60-Hz noninterlaced refresh rate

- Three lenses and liquid-cooled CRTs
- Hand-held wired remote control with 20-foot cable for operational, diagnostic, and adjustment data
- Ceiling mount, rear-projection mount, or cart
- 100-inch diagonal high-gain curve screen available

5087 Screen Printer

- Seven colors or monochrome
- Thermal transfer process
- Buffered: four seconds to load, 65 seconds to print in color
- Compact 15" x 15" footprint
- Attachment to standard RGB video output port on 5081
- "A" size (8-1/2" x 11") or "A-4" (8.3" x 11.7") copies
- Negative image capability for white background
- Paper or transparency
- Remote print switch
- Multiplexer that attaches up to four 5081s

Telecommunications

Configuration flexibility for the 5080 Graphics System is provided by the ability to remotely attach 5080 systems. The 5088 Remote Control Unit Model 11R may coaxially connect up to sixteen 5081/5085 devices, 3251/3255 devices, or 5085/3255 RS232C-attached devices. It communicates to a channel-attached 5088 Model 1 or 2 at speeds of 9600 bps to 2 megabits per second.

3270 Mode Shared Attachment

Users may utilize the 5080 in 3270 mode via the same physical 5085-5088 connection that is used when in graphics mode. This permits the 3270 data stream and the graphics application data stream to jointly use the 5088 and its host channel connection for data transmission.

Primary Users

Engineers, designers, scientists, and draftsmen who need to visualize and analyze graphic data.

Potential Benefits

The 5080 system combined with application support provides an effective means to utilize computer graphics capabilities for design, analysis, drafting, process, and manufacturing. Use of these products may increase productivity, shorten design time, improve change control, increase accuracy, and predict fault or tolerance data.

The 5080 is used interactively with a host System/370, 4300, 30XX, or RT Personal Computer allowing creation and modification of graphical and alphanumeric data.

With RS232C attachment, users requiring other input/output devices, such as digitizers or plotters, can make use of the system.

Programming Support

Two levels of programming support are available:

- The GDDM/graPHIGS™ and Personal graPHIGS™ programs provide an advanced graphics application programming interface for host and RT Personal Computer attachment.
- Graphics Access Method/System Product (GAM/SP) provides basic host programming support.

The GDDM/graPHIGS™ program operates on a mainframe configuration under MVS/SP, MVS/XA, VM/SP, or VM/XA. It can be used in FORTRAN, PASCAL, PL/I, C, or Assembler programs. The Personal graPHIGS™ program operates on the RT Personal Computer under AIX™. It can be used in FORTRAN, PASCAL, and C programs. Both programs are designed to take full advantage of the 5080 Graphics System's local graphics intelligence, allowing for improved application performance and better utilization of the graphic system, yet providing all of the sophisticated functions and characteristics presently required for technical and engineering graphics applications.

The Graphics Access Method/System Product (GAM/SP) provides basic host programming support for the full range of functions provided in the 5080 Graphics System. It also supports the 3250 Graphics Display System in a generally compatible manner with existing programming support. This enables coexistence of 3250s with 5080 devices and assists migration for use of the advanced functions provided by the 5080. Support is provided under MVS/SP, MVS/XA, VM/SP, and VM/XA.

CAD/CAM applications are:

- Computer-Graphics Augmented Design and Manufacturing (CADAM®)
- Professional CADAM® (with RT Personal Computer)
- Computer-Graphics Aided Three Dimensional Interactive Application (CATIA*)
- RT CATIA®
- Computer-Aided Engineering Design System (CAEDS®)
- Professional CAEDS® (with RT Personal Computer)
- Circuit Board Design System (CBDS™)
- Graphical Display and Query Facility (GDQF)
- Computer-Integrated Electrical Design Series (CIEDS™)

Ordering Information

Program Number: 5668-978

Reference Material

- 5080 Graphics System, GK10-6578
- Computer-Integrated Manufacturing, G520-1093
- 5080 Principles of Operation, GA23-2012

Ordering Information

Program Number: 5668-978

Reference Material

- 5080 Graphics System, GK10-6578
- Computer-Integrated Manufacturing, G520-1093
- 5080 Principles of Operation, GA23-2012

Section 69. IBM RT Personal Computer

IBM RT Personal Computer (RT PC)

Products Included

- 6150 System Unit
- 6151 System Unit
- 5080 Attachment Adapter
- 6153 Advanced Monochrome Graphics Display
- 6154 Advanced Color Graphics Display
- 6155 Extended Monochrome Graphics Display
- 6157 Streaming Tape Drive
- 3812 Pageprinter*
- 3852 Color Jet Printer
- 4201 Proprinter*
- 4202 Proprinter XL
- 5201 Quietwriter® Printer*
- 5081 Color and Monochrome Displays
- 5083 Tablet
- 6180 Color Plotter*
- 7372 Color Plotter
- 7374 Plotter
- 7375 Plotter
- AIX™ Operating System
- Licensed programs

Main Purpose

The IBM RT Personal Computer (RT PC) is a 32-bit, high-performance, multiuser, multitasking system. With its reduced instruction set computer (RISC) microprocessor, the RT PC is a versatile microcomputer. It can be configured as a cost-effective multiuser system for business, technical, engineering/scientific professionals, and/or as a CAD/CAM workstation.

All RT models support a variety of IBM displays, input/output devices, storage capacities, and communications capabilities. Multiple IBM RTs can share many of these resources through the use of a local area network (LAN) providing a reduced cost per end user.

The RT is particularly useful where UNIX capability is a requirement and for environments requiring connectivity using industry standard protocols which are supported by both IBM and non-IBM computers.

An assortment of applications for small, medium, and large organizations in all industries is available. The operating system supports an application-development environment that includes a variety of programming languages and tools, mathematical and

statistical packages, and graphics development utilities.

In addition, a large number of program offerings developed by IBM and other vendors is available for the RT PC. They include a variety of applications such as financial analysis, project management, business and engineering graphics, desktop publishing, CAD/CAM, accounting, and data base management.

The open architecture of the RT is designed to allow extending the hardware and software capabilities of the system and the development of new applications.

Key Functions, Facilities and Features

- The RT technology features the IBM-developed 32-bit RISC microprocessors and memory management unit. The RISC architecture enables the microprocessors to execute most instructions in a single cycle.
- The microprocessors are offered in two technologies: the standard 032 microprocessor which operates at 170-nanosecond cycle time, and the advanced processor card (APC) which contains a CMOS microprocessor and operates at 100-nanosecond cycle time.

The APC also contains a 20-MHz Motorola 68881 Floating Point Unit.

- The memory management unit is standard on all RT PCs. This chip provides a 40-bit virtual address structure capable of addressing one terabyte of virtual memory.
- The RT PC offers a choice of desktop (6151 Models 10, 15, and 115) or floor-standing system units (6150 Models 20, 25, A25, 125, B25, and T25).
- Model T25 has been designed to meet a U.S. government specification for customers who need to provide protection from unauthorized acquisition of electromagnetic emission from their systems.
- Models 10, 15, 20, 25, and A25 are standard-performance models. Models 115, 125, and B25 offer the more advanced APC technology and have significantly higher performance and capacity.
- A variety of floating-point performance levels is available, with the highest level¹ approximately eight times the entry level.
- The RT PC can support up to 32 concurrent users, a maximum of 16M bytes of memory, up to 6.3G bytes of internal and external disk storage, and 1.2M-byte or 360K-byte diskette drives.

* See Section 68, "Workstation Printers, Plotters, and Scanners."

IBM RT Personal Computer (RT PC)

- The RT PC supports a wide range of IBM input and output devices including: two-button mouse, tablets, serial and parallel printers, color plotters, streaming tape, extensive communications connections, and the 5080 Graphics System. Displays are offered in character or all-points-addressable (APA) models, in monochrome or color, with resolution up to 1024 × 1024, and ranging from 12 to 19 inches in size.
- The operating system is called the AIX™/RT Operating System, for Advanced Interactive Executive/RISC Technology Operating System, and is based on the UNIX® System V® operating system with selected BSD (Berkeley Software Distribution) 4.3 features. During AIX development, enhancements were added by IBM and INTERACTIVE™ Systems Corporation under contract to IBM. These enhancements improve the AIX Operating System's functions, ease-of-use, and performance, and take advantage of the RT PC technology. The enhancements consist of functions exclusive to IBM and the RT PC, along with functions from several versions of UNIX.
- The virtual resource manager (VRM) portion of the AIX/RT Operating System provides a high-level virtual machine interface. It provides hardware-independent device interfaces that allow the hardware device configuration to be dynamically modified without affecting the operating system or application software.
- The RT PC is especially suited for use when connectivity (communications, local area networks, or direct attach) is required. The RT PC connectivity offerings include: SNA with LU 1, 2, 3, and 6.2 protocols, asynchronous communications, 3270 emulation (SNA, BSC), RJE (SNA, BSC), TCP/IP support for Token Ring or Ethernet, PC Network, Distributed Services, and Network File System (NFS).

In addition, the RT PC provides connectivity to the System/370 and IBM PC families. In a System/370 environment, this support includes:

SQL-compatible data base offerings, RT PC VS FORTRAN, RT PC VS Pascal, RT PC Personal GRAPHIGS, and several CAD/CAM applications.

- In an IBM PC environment, the RT PC support includes: an IBM Personal Computer AT Coprocessor, BASIC, RT PC Pascal, and an input/output bus that allows attaching many IBM PC devices, an IBM AIX/RT Personal Computer AT Simulator, and IBM AIX/RT PC Interface.

6150 System Unit

- Model 20 Floor-Standing System Unit
 - Standard 032 microprocessor
 - 1.0M-byte system memory, expandable to 8.0M bytes
 - 40M-byte fixed disk drive, expandable to 180M bytes

- 1.2M-byte diskette drive
- Two standard asynchronous (RS232C) ports
- Six 16-bit, two 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
- Model 25/A25 Floor-Standing System Unit
 - Standard 032 microprocessor
 - 2.0M-byte system memory, expandable to 8.0M bytes
 - 70M-byte fixed-disk drive, expandable to 210M bytes
 - 1.2M-byte diskette drive
 - Two standard asynchronous (RS232C) ports
 - Six 16-bit, two 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
 - 5080 attachment adapter standard in Model A25
- Model 125/B25 Floor-Standing System Unit
 - Advanced processor card (APC)
 - 32-bit CMOS RISC processor
 - 20-MHz Motorola 68881 floating-point unit
 - System memory expansion up to 16M bytes
 - 70M-byte extended ESDI fixed disk drive, expandable to 342M bytes
 - 1.2M-byte diskette drive (maximum two)
 - Two standard asynchronous (RS232C) ports
 - Six 16-bit, two 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
 - 5080 attachment adapter standard in Model B25
 - 4.0M-byte fast memory
- Model T25 Floor-Standing System Unit
 - Advanced processor card (APC)
 - 32-bit CMOS RISC processor
 - 20-MHz Motorola 68881 floating point unit
 - 70MB extended ESDI (enhanced small device interface) fixed-disk drive
 - AT high-capacity diskette drive
 - Extended monochrome graphics adapter
 - 4-port asynchronous RS-232C buffered adapter

6151 System Unit

- Model 10 Desktop System Unit
 - Standard 032 microprocessor
 - 1.0M-byte system memory, expandable to 8.0M bytes
 - 40M-byte fixed disk drive
 - 1.2M-byte diskette drive
 - Five 16-bit, one 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
- Model 15 Desktop System Unit
 - Standard 032 microprocessor
 - 2.0M-byte memory, expandable to 8.0M bytes
 - 70M-byte fixed disk drive
 - 1.2M-byte diskette drive
 - Five 16-bit, one 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
- Model 115 Desktop System Unit
 - Advanced processor card (APC)
 - 32-bit CMOS RISC Processor
 - 20-MHz Motorola 68881 floating-point unit
 - System memory expansion up to 16M bytes
 - 70M-byte extended ESDI fixed disk drive
 - 1.2M-byte diskette drive

- Five 16-bit, one 8-bit expansion slots (one 16-bit slot is used for the disk/diskette adapter)
- 4.0M-byte fast memory

Input/Output Devices

Displays

- The 6153 Advanced Monochrome Graphics Display is a 12-inch (30.48 cm), medium-resolution (720 × 512 pel) all-points-addressable black-on-white display, designed for use with IBM RT PC applications that require both alphameric and graphic output.
- The 6154 Advanced Color Graphics Display is a medium-resolution (720 × 512 pel) all-points-addressable, red-green-blue (APA RGB) video monitor that provides for the color display of alphameric and graphics results from RT PC programs. This 14-inch (35.56 cm) display has a screen area of 25 rows of 80 characters and supports up to 16 simultaneous colors.
- The 6155 Extended Monochrome Graphics Display is a high-resolution (1024 × 768 pel) APA black-on-white display that permits the viewing of graphic and text applications on a 15-inch (38.10 cm) display.
- The 5081 Models 19 and 16 are high-resolution color displays. The Model 19 screen measures 19 inches diagonally, and the Model 16 screen measures 16 inches diagonally. Both displays have 1024 by 1024 pels and can display up to 256 colors from a palette of 4096 colors, depending on the application usage.
- The 5081 Model 11 is a monochrome display measuring 19 inches diagonally and showing 16 levels of grey tones.
- The 5081 Model 12 is a color display measuring 19 inches diagonally, capable of displaying up to 256 colors.
- The Moniterm® Monitor Model VY-6155 is a 19-inch black-on-white display with 1024 × 768 pel resolution.
- In addition, the RT PC can use the 5151 PC Display and the 5154 PC Enhanced Color Display.

6157 Streaming Tape Drive

- Up to 55M bytes storage capacity
- Standard 1/4-inch tape cartridge
- 5M bytes/minute burst data rate
- Backup by image or file

Parallel Printers

- 5152 Graphics Printer
- 5182 Color Printer
- 4201 Proprinter
- 5201 Quietwriter Printer Models I and II
- 5202 Quietwriter III Printer
- 4202 Proprinter XL
- 3852 Color Jet Printer, Model 2

Serial Printers

- 3812 Pageprinter
- 4201 Proprinter with Serial Attach feature
- 4202 Proprinter with Asynchronous feature for RS232C attachment

Plotters

- 7371, A size: 8.5 × 11 inches (216 × 279 mm); 2 pens
- 7372, B size: 11 × 17 inches (279 × 432 mm); 6 pens
- 7374, D size: 22 × 34 inches (559 × 864 mm); 8 pens
- 7375 Models 1 and 2, E size: 34 × 44 inches (864 × 1118 mm); 8 pens
- 6180, A size: 8.5 × 11 inches (216 × 279 mm); 8 pens
- 6184, C to D size: 17 × 22 inches (432 × 559 mm); 8 pens
- 6186, A to E size: 8.5 × 11 inches to 34 × 44 inches (210 × 297 mm to 841 × 1188 mm); 8 pens

Diskette Drives

- 1.2M-byte Diskette Drive
 - Standard in all system units
 - Read/write 1.2M-byte diskettes
 - 96 tracks per inch
 - 98 milliseconds average access time
 - 300K-to-500K bits/second transfer rate
 - Read-only 360K-byte diskettes
- 360K-byte Diskette Drive
 - 48 tracks per inch
 - 250K bits/second transfer rate
 - 105 milliseconds average access time
 - Read/write 360K-byte diskettes

Internal Disk Storage

- 40M-byte Fixed Disk
 - Standard on 6151 Models 10 and 20
 - Option for 6150 upgrades
 - 40 milliseconds average access time
 - 5M bits/second transfer rate
- 70M-byte ESDI Fixed Disk
 - Standard on 6151 Model 15, 6150 Models 25 and A25
 - Option for 6150 upgrades
 - 40 milliseconds average access time
 - 4:1 interleave
 - 10M bits/second transfer rate
- 70M-byte Extended ESDI Fixed Disk
 - Standard on 6151 Model 115, 6150 Models 125 and B25
 - Option for 6150 upgrades
 - 40 milliseconds average access time
 - 1:1 interleave
 - 10M bits/second transfer rate
- 114M-byte extended ESDI Fixed Disk
 - Option for 6150 upgrades
 - 28 milliseconds average access time
 - 10M bits/second transfer rate

IBM RT Personal Computer (RT PC)

External Disk Storage

- 9332 Direct Access Storage Device
 - Standalone or rack-mounted
 - 200M bytes or 400M bytes formatted capacity
 - 20 milliseconds average access time
 - 1 to 7 drives per adapter
 - 2 adapters supported by the RT PC
 - 5.6G bytes maximum storage
- Support for disk and tape devices having an appropriate interface
- Portable Fixed Disk Adapter
 - Removable 114MB Portable Disk Drive Modules
 - Support for 6156 Portable Disk Drive, one per adapter
 - 6156-001: One 114MB Portable Disk Drive Module
 - 6156-003: One, two, or three 114MB Portable Disk Drive Modules
 - One adapter maximum per system

5080 Attachment Adapter

- Connects 5080 Graphics System to RT PC 6150 System Unit
- 5080 may also be host-connected
- Transfer rate between RT PC and 5080 is up to 2M bits/second

Optional Hardware

- Memory expansion of 1.0, 2.0, or 4.0M bytes for Models 10, 15, 20, 25, and A25
- 4.0M-byte and/or 8.0M-byte Fast Memory Expansion cards for Models 115, 125, and B25 (maximum 16M bytes)
- Two additional Internal Fixed Disk Drives of 40M or 70M bytes each (Models 20, 25, and A25)
- Two additional internal Extended ESDI Fixed-Disk drives of 70M or 114M bytes each (Models 125 and B25)
- External Fixed-Disk Storage from 200M bytes to 5.6G bytes (in 200M-byte or 400M-byte increments) for any model via the Small Computer System Interface (SCSI) Adapter
- Additional Diskette Drive of 1.2M bytes or 360K bytes (Models 20, 25, 125, A25, and B25)
- Floating-Point Accelerator (Models 10, 15, 20, 25, and A25), or Advanced Floating-Point Accelerator (all models)
- Supported display, printer, communications and DASD adapters (see "IBM-Supported Adapters" below)
- 5080 Attachment Adapter (Models 20, 25, and 125 only)
- 5080 Peripheral Adapter
- 5080 Dials, Lighted Program Function Keyboard, and Tablet
- RT PC Mouse
- 6157 Streaming Tape Drive and Adapter

- IBM Personal Computer AT Coprocessor
 - IBM PC AT Math Coprocessor
 - IBM PC AT 512KB Memory Expansion
- Portable fixed disk storage module and 114MB drives for Models 115, 125, and B25 (maximum 342MB storage)
- 6192 Expansion Unit
 - One unit per system
 - Supports combinations of the following adapters: 4-port and 8-port Asynchronous AS232C and RS422A Adapters and PC AT Serial/Parallel Adapter
 - Supports up to a maximum of six adapters, depending on type and combination

IBM-Supported Adapters

The RT PC hardware supports the following adapters:

- Adapters for RS232C, RS422A, and PC Parallel Connectivity
 - IBM Buffered 4-Port or 8-Port Asynchronous RS232C Adapter
 - IBM Personal Computer AT Serial/Parallel Adapter
 - RT PC Expansion Unit Adapter
 - Buffered 4-Port or 8-Port Asynchronous RS422A Adapter
- Specialized Communications Adapters
 - Advanced 3278/79 Emulation Adapter
 - IBM Personal Computer Network Adapter
 - The Multiprotocol Adapter, supporting the following:
 - Three programmable ports
 - Line protocols including BSC, SDLC, and X.21
 - IBM RT PC Token-Ring Network Adapter
 - IBM RT PC Baseband Adapter for use with Ethernet
 - IBM System/370 Host Interface Adapter
- Fixed Disk and Diskette Drive Adapters
 - IBM PC AT Fixed-Disk and Diskette Drive Adapter
 - ESDI Magnetic Media Adapter
 - Extended ESDI Magnetic Media Adapter
 - IBM RT PC Small Computer Systems Interface Adapter
 - RT PC Portable Disk Drive Adapter
- Display Adapters
 - Each RT PC supported display requires an appropriate adapter:
 - Megapel Display Adapter
 - Monochrome Display and Printer Adapter

Programming Features

A full range of system software is available to provide operating system functions, support for I/O device drivers, virtual resource management, program development facilities, and system application support. In addition, software is available to provide for coexistence with the PC environment.

The Advanced Interactive Executive Operating System for the RT PC

AIX™/RT is a multiuser, multitasking, virtual memory operating system for the RT PC. Based on UNIX® System V®, AIX/RT provides the level of function necessary for the high-performance RT PC. It can operate as a single- or multiuser system with up to 32 concurrent login IDs.

The virtual resource manager is a significant element of AIX/RT. It controls the real hardware and provides a high-level machine interface to the advanced hardware features and devices.

AIX/RT is sold separately and runs on any model of the RT PC that has a display and keyboard. The virtual resource manager function is included in AIX/RT. If an alternate operating system is used, the virtual resource manager function is available as a separate licensed program.

AIX/RT, in conjunction with the unique implementation of the RT PC hardware, provides a broad range of functions:

- vi, ed, INed® editors
- Multiple user interfaces
 - Bourne shell
 - C shell
 - DOS shell
 - Usability services shell
- Virtual memory, mapped files, and shared library support
- Advanced Display Graphics Support Library
- Graphics Development Toolkit
- Communications facilities
 - Mail command
 - Connect command
 - Asynchronous terminal emulation
 - Base PC network services
 - SNA services
 - Interface program for use with TCP/IP
- Menu-driven installation and configuration
- IBM PC AT Coprocessor services
- I/O management extensions
- Change-level management
- Problem determination, tracing, error logging

The programs described below are part of AIX/RT:

- SNA services provides an application programming interface to SNA LU 1, 2, 3, and 6.2 protocols.
- INed is a full-screen text editor.
- Usability services provides a menu-driven interface to many AIX operating system functions.
- Asynchronous terminal emulation can be used to connect to, and exchange data with, remote private data bases and other AIX systems.
- Multiuser services provides these functions:
 - Accounting capabilities for managing the system
 - Group conferencing and messaging capabilities

- Programming and graphics support for specified terminals
- Device support for most RT PC graphics displays, printers, and plotters
- Extended services provides these functions:
 - Translation of DOS-like commands for AIX processing
 - Text-processing/typesetting functions
 - Application development tools
 - Enhanced file system functions
 - Enhanced data manipulation functions
 - Enhanced system management functions
 - Electronic mail/file interchange
 - Games
- Base PC network services provides RT PC support for the IBM PC Network local area network.
- The interface program for use with TCP/IP allows an RT PC and another system with equivalent protocols to transfer files and relay mail.

Licensed Programs

The following licensed programs can be acquired separately:

Distributed Services

- Allows AIX/RT users to access files and programs of other network-connected AIX systems that are also running Distributed Services
- Supports LU 6.2 and TCP/IP protocols
- Supports SDLC, Ethernet™, and IBM Token-Ring
- Includes print, batch, and program servers, and facilities to simplify network administration of systems
- Can operate over the same Ethernet line with AIX/RT Network File System

AIX/RT Network File System

- Supports NFS 3.2 protocols
- Permits access of data and programs from any attached system running a compatible NFS
- Supports remote procedure call, external data representation, Yellow Pages, and remote execution
- Supports both client and server functions
- Can operate over the same Ethernet line with Distributed Services

RT PC X-Windows

- Windowing system that supports multiple bit-mapped virtual terminals
- Permits simultaneous overlapped windows
- Operates locally or over a network using TCP/IP or Distributed Services

RT PC Data Management Services

- Multiuser data management system
- Extends AIX support of files and directories
- Provides record/field management facilities
- Provides for multiple indices

IBM RT Personal Computer (RT PC)

RT PC Data Base Management System

- SQL/RT
 - A relational data base management system
 - Both programmer and end-user facilities
 - Facilities to enter, retrieve, modify, display, or print
 - A programming interface for C language
- ORACLE™
- INGRES™

RT PC BASIC Interpreter and Compiler

- Function comparable to the IBM PC BASIC Version 1.1
- Interpreter (IBM PC BASIC) plus extensions
- Support for both IBM PC mode and IBM RT PC native mode
- Support for subroutines written in C language

RT PC Pascal

- Function comparable to IBM PC Pascal Version 1.0 plus extensions
- Support for both IBM PC mode and IBM RT PC native mode
- Support for subroutines written in C and FORTRAN

RT PC VS Pascal

- Accepts most Pascal source code as defined by System/370 Pascal/VS
- Supports FORTRAN and C interfacing
- Supports floating point in compatible or direct mode

RT PC FORTRAN 77

- Implements FORTRAN 77, with enhancements
- Provides extended FORTRAN Language (EFL) and Rational FORTRAN (RATFOR)

RT PC VS FORTRAN

- Offers portability from host VS FORTRAN and migration from VAX™ FORTRAN
- Offers high-performance optimizing compiler

RT PC Common LISP

- Common LISP Development Environment
 - Permits dynamic definition and execution of LISP programs
 - Allows interactive debug
 - Contains an application programming interface for calling RT PC C Language, Pascal, and FORTRAN 77
- Common LISP Application Environment
 - Provides facilities to execute compiled LISP programs developed with the Common LISP Development Environment

IMSL Problem Solving Systems

- Provides a set of mathematical and statistical FORTRAN subprograms

RT PC Personal Computer AT Coprocessor Services and IBM AIX/RT Personal Computer AT Simulator

- Allow many PC AT programs to run on the IBM RT PC
- Run DOS 3.1
- Execute concurrently with programs running under AIX
- Share display and fixed disk with AIX
- Has shared main storage or dedicated option (AT Coprocessor only)
- Supports the optional IBM PC AT Math Coprocessor (AT Coprocessor only)

IBM AIX/RT DOS Server

- Provides capability for AIX/RT host system to act as a print and/or file server for an AIX Access for DOS client
- Allows sharing of files between AIX/RT and DOS users and applications
- Includes utilities for converting text files between DOS and AIX formats

CAD/CAM and Graphics Software

- RT PC Professional CADAM®
 - Runs native on the 5081, 6153, 6154, and 6155 displays
 - Supports download of mainframe CADAM drawings
 - Supports user interface similar to mainframe CADAM user interface
- RT PC CIEDS™
 - Runs native on the 6154 or 5081 display
 - Electrical design capture/simulation
 - Interactive or batch execution
 - Interface to IBM CAEDS®
- RT PC CAEDS®
 - Runs native on the RT PC with a 5081 Display
 - Provides solids modeling and finite element modeling
 - Interfaces with CADAM® and CATIA®
- RT PC CATIA®
 - Runs on the RT PC with a 5080 Graphics System
 - Provides 2-D and 3-D wireframe and surface geometry modeling
 - Has interface consistent with host-user interfaces, model data base fully compatible with the host version, and uses the same advanced graphics features of the 5080 Graphics Display System as the host version
- RT PC Personal graPHIGS™
 - Runs on the RT PC or 5080/RT PC
 - Provides tools for programmer to create graphics applications
 - Contains a set of over 250 subroutine calls
 - Allows device-independent coding and creation of three-dimensional interactive graphics
- UNIRAS™
 - Provides three-dimensional graphics functions for programmers and nonprogrammers

RT PC Professional Graphics Series

- RT PC Graphics Development Toolkit
 - Provides tools for programmers who develop graphic applications
 - Provides a set of graphics device drivers for printers, plotters, and displays
 - Includes a set of graphics primitives to be called by high-level languages
- RT PC Graphics Terminal Emulator
 - Allows the RT PC to emulate the Tektronix™ 4010 and 4100 protocols
 - Allows the RT PC to emulate the Lear Siegler ADM-3A™ terminal
 - Provides an icon-driven user interface
- RT PC Plotting System
 - A subroutine library to assist the user in developing programs to produce various types of charts
 - Supports area, bar, line, pie, scatter, schedule, step, and text-only chart types
 - Includes language bindings for FORTRAN, Pascal, C, and BASIC compilers
- RT PC Graphical File System
 - Supports retrieval, interpretation, and output of computer-generated graphics stored independent of devices
 - Includes an icon-driven, interactive user interface

Software for the Technical Professional

- Interleaf™ Publishing Series RT PC Edition
 - Full-function integrated professional publishing solution that enables business and technical professionals to create documents that include text, graphics, and image
 - Text processing, text entry, and editing of graphics and image; business charts, line art, clip art, and free-hand drawing capabilities; interactive page layout
 - Style templates for easy document design and WYSIWYG (What-You-See-Is-What-You-Get) environment
 - Support for PostScript®, the page-definition language implemented in the 4216 Personal Pageprinter and for the 3812 Pageprinter
 - Data Export feature, which allows documents created on the professional publishing system to be processed by host system publishing applications
- Workstation publishing software
 - Provides facilities for text composition, business graphics, line art, and importing CAD designs
- RT publishing software
 - Desk-top publishing with functions for multiple columns, spell-checking, table of contents, footnotes, and multiple fonts
- SAMNA™ PLUS II
 - A full-featured multiuser word-processing program plus an integrated spreadsheet and text-retrieval system

- APPLIX IA™
 - Multiuser integrated application that combines text, spreadsheet, data base, and business graphics into a single document
 - Support for APPLIX IA file usage in electronic mail, messaging, and file transfer
- Solomon III™
 - 12 accounting subsystems form an integrated package
 - Uses a single relational data base
 - Can run stand-alone or as multiuser

Communications Applications

- INmail™/INnet™/FTP
 - Allows the queued transfer of files and electronic messages
 - Uses asynchronous facilities to send electronic mail
- 3278/79 Emulation Programs
 - Provides 3270 emulation and file transfer capability
 - Emulates 3278 Display Station Model 2
 - Emulates 3279 Color Display Station Model 2A or S2A
- Workstation Host Interface Program
 - Provides 3278/79 emulation and file transfer via:
 - RT PC 3278/79 Emulation Adapter
 - 5088 Communications Controller
 - Connects to both VM/CMS and MVS/TSO host environments
- NETWORK 3270-PLUS™
 - SNA and BSC 3270 emulation, both displays and printers
 - Permits up to 32 concurrent sessions
 - Allows file transfer
 - RT PC can appear as a 3X74 control unit to the System/370 host.
 - 3270 is available to all work stations attached to the RT PC.
- NETWORK RJE-PLUS™
 - Emulates various RJE devices in BSC and SNA versions
 - Features data compression and decompression
 - Provides emulation of readers, punches, and printer
- Base PC Network Services
 - Provides an application programming interface for the RT PC to exchange messages and data with systems residing on the IBM PC Network

Note: Many additional programs and software offerings are described in the *RT PC Hardware/Software Catalog* (GH23-0150).

Reference Material

- Facts folder, G320-0909
- Planning Guide, GC23-0782
- General Information, GC23-0783
- RT PC Hardware/Software Catalog, GH23-0150
- RT PC Technology Guide, SA23-1057

Section 71. Typewriters

Typewriters

Products Included

- Personal Wheelwriter® Typewriter
- Quietwriter® 8 Typewriter
- Wheelwriter Series II
 - Wheelwriter 3 Series II Typewriter
 - Wheelwriter 6 Series II Typewriter
 - Wheelwriter 10 Series II Typewriter
 - Wheelwriter 30 Series II Typewriter
 - Wheelwriter 50 Series II Typewriter
 - Wheelwriter 70 Series II Typewriter

Main Purpose

IBM typewriters range in capability from the Personal Wheelwriter to the Wheelwriter Model 70 Series II, from basic typing to heavy revision and word-processing applications. All Series II models from 3 to 50 can be upgraded.

Personal Wheelwriter Typewriter

This machine is the lowest-priced model in the Wheelwriter line and is designed to provide a high-function affordable typewriter for the office, home, or classroom.

Highlights

- Express cursor keys
- Auto centering
- Decimal tabulation
- Bold print
- Caps lock
- Full line correction memory
- Flush right margin
- Spell-check option
- Printer option

Quietwriter 8 Typewriter

This typewriter combines leading-edge, non-impact printing technology with state-of-the-art electronics providing its users with a quiet, productive, and fast typewriter.

Highlights

- Limited revision capabilities
- Justified print from storage
- 31,000 characters of document storage
- Decimal tabulation

- Spell-check option
- Display and printer options

Wheelwriter 3 Series II Typewriter

The Wheelwriter 3 Series II is a general-purpose typewriter that uses a 96-character printwheel and provides many significant productivity aids.

Highlights

- Upgradable to Model 30, 50, or 70 Series II typewriters
- Semi-automatic paper insertion
- Automatic centering
- 72-character correction buffer
- Automatic underscore
- Decimal tabulation

Wheelwriter 6 Series II Typewriter

This typewriter provides typists with more productivity advantages through electronic function and limited revision capability.

Highlights

- Limited revision capability
- Justified print from storage
- 31,000 characters of document storage
- Format storage
- Directory print
- Upgradable to Model 30, 50, or 70 Series II

Wheelwriter 10 Series II Typewriter

The Wheelwriter 10 offers many innovations for a basic nonrevision machine.

Highlights

- 4,000-character correction memory
- Spell check
- Reprint
- Express cursor keys
- Bold function
- Automatic carrier return
- Printer option (Series II)
- Relocate
- Series II sound hood

Typewriters

Wheelwriter 30 Series II Typewriter

The Wheelwriter 30 is a high-performance addition to the Series II family. It combines quality, reliability, and advanced features, all designed to increase end-user productivity.

Highlights

- 80-character (one-line) LCD
- 30K document storage
- External 720KB Diskette option
- Approximately 4,000-character correction memory
- Bidirectional printing at 20 characters per second
- Spell Check II: 120,000 words plus 300 personal words
- Interactive search and replace

Wheelwriter 50 Series II Typewriter

This typewriter is a more advanced addition to the Series II family. It has all the advanced function of the Model 30 and more.

Highlights

- 25-line full-screen display (swivel base)
- Advanced revision function
 - Block, copy, move, delete
 - Global search and replace
- "Hot key" to typewriter mode
- Approximately 60,000-character document storage
- Spell Check II

Wheelwriter 70 Series II Typewriter

The Wheelwriter 70 Series II Typewriter is the most advanced member of the Series II family offering word processing plus three productivity applications on a full-screen typewriter.

Highlights

- High-function word processing
- Approximately 80,000-character document storage
- 25-line full-screen display (swivel base)
- Menu-driven word processor interface
- Spell Check II
- External 720KB Diskette option
- "Hot key"

Ordering Information

Call IBM Direct, 1-800-IBM-2468, for the nearest authorized typewriter dealer, or order directly from IBM Direct.

Reference Material

Orders for publications may be placed through IBM Direct, 1-800-IBM-2468.

Section 72. SolutionPacs

IBM SolutionPac™--VM/Software Engineering

Main Purpose

This program offering provides a simple yet powerful environment for the development, management, and control of software applications developed under VM/SP.

Key Functions, Facilities and Features

- Central repository of source code, object code and documents. All objects managed under VM/Software Engineering are stored in an access-controlled repository. No data is stored in the user's personal storage. The VM/Software Engineering catalog contains all information on the objects in the database.
- Access and authorization control of managed objects. Access to the VM/Software Engineering database is controlled by authorizing users for specific activities within a predefined work context (that is, a distinct portion of the project).
- Management of dependencies and relationships among objects. VM/Software Engineering tracks and enforces relationships between software objects. These relationships are specified by the user when the object (such as a source module) is constructed. Enforcement of these relationships ensures that all interdependent objects be available when the resulting software product is constructed from these objects.
- Version and release control. VM/Software Engineering allows for simultaneous development of multiple versions of the same software object. Additionally, VM/Software Engineering will manage multiple occurrences of objects under development, thus allowing developers to revert to a previous copy of the object.
- Consistent interface to software tools. Tools (compilers, editors, formatters, and the like) are invoked by a single command interface. This interface determines the processing to be done (that is, the tool to be called) based on the data type of the object specified.
- Centralized addition and deletion of user tools via a common interface. Tools are inserted into the system via a command procedure which provides the interface between the tool and VM/Software Engineering services. The base VM/Software Engineering system provides several predefined procedures, which are ready to use, as well as a prototype procedure intended as a template to allow a user to develop additional ones. The existing procedures may be customized to reflect customer specific requirements or system configurations.

- Database queries. VM/Software Engineering provides a collection of predefined database queries, which can be sent to the terminal, a local printer, or a disk file. Additional customized queries may be easily made through any SQL/DS database query facility (such as the Query Management Facility).

Potential Benefits

- Consistent interface to user-defined software tools
- Access-controlled central repository for all software products
- Control of the composition of software products
- Control of multiple versions and releases
- Product and project information accessible via queries

Prerequisite Products

Hardware

VM/Software Engineering is designed to operate on any of the IBM System/370, 9370, 43XX, or 30XX processors using the configuration required by the IBM offerings described below. It requires 2MB of virtual storage to operate.

Software

- VM/SP with or without VM/SP HPO
- VM Batch Facility
- CMS Sort for VM/370
- PL/I Transient Library and Resident Library
- SQL/DS
- DMS/CMS

To streamline installation, it is recommended to install the VM/Integrated System (VM/IS) BASE product (with data base query optional package), which is a package of system services, application programs, and dialogs. The specific products orderable through that package which apply specifically to VM/Software Engineering are:

- VM/IS Base
- SQL/DS (available in the database query optional package of VM/IS)

Additional IBM licensed programs required with VM/IS Base are:

- CMS Sort for VM/370
- DMS/CMS

IBM SolutionPac--VM/Software Engineering

New versions or releases of the above IBM offerings may affect the functioning of this program offering.

Ordering Information

Program number: 5713-AAK

Reference Material

- Availability Notice, G320-0832
- General Information Manual, GH21-0012
- Program Description/Operations Manual, SH21-0011
- Software Engineering Flyer, G520-6292
- IBM Application Solutions for Software Engineering, G520-6282

IBM SolutionPac™ Personal Publishing System

Products Included:

- SolutionPac Personal Publishing System
- SolutionPac Personal Publishing Option
- SolutionPac Personal Publishing Option/A

Main Purpose

This collection of hardware and software products enables users to produce near-typeset quality documents without recourse to outside typesetting, layout, or paste-up services. The Personal Publishing System increases user control while saving time and money over conventional methods. Documents well-suited to the personal publishing application include newsletters, business forms, price lists, instructional materials, proposals, flyers, brochures, reports, briefs, charts, and diagrams.

Key Functions, Facilities and Features

- Master-page formatting
- Text/graphics merge
- Electronic paste-up
- Design tools
- Interactivity
- Threaded text
- Automatic hyphenation and justification
- Built-in editor
- Kerning
- Application and system software preloaded to hard disk
- Tutorial programs
- SolutionPac Personal Publishing Option and Option/A. These are companion products to the SolutionPac Personal Publishing System. They are intended for customers who already own a qualified system unit (PC XT-286, PC AT-99, -239, -319, or -339, or Personal System/2) with high-resolution display (EGA for PC or VGA for Personal System/2). Except for system unit, display, and DOS 3.3, the Option includes all the hardware and software components provided in the System SolutionPac.

Primary Users

Personal publishing is truly a cross-industry or "horizontal" application. One survey shows that the Fortune 1000 companies spend from 6 to 10 percent of revenues on publishing.

The manufacturing, government, insurance, and communications industries all publish extensively. Many users of personal-computer-based publishing applications come from this group, and these are the users who are most likely to benefit from personal publishing.

Potential Benefits

- Saves time: The conventional publishing procedure is very involved, requiring up to eighteen steps, depending of the extent to which work is performed in-house rather than by outside vendors. By contrast, there are just four steps to preparing camera-ready copy on a personal publishing system:
 - Prepare text and graphics files. The popular text processing programs (including DisplayWrite) are compatible, along with many paint and draw programs.
 - Design, compose, and paste up the components electronically using PageMaker (registered trademark of Aldus Corporation)
 - Print camera-ready copy on the 4216 Personal Pageprinter using PostScript® at 300 dpi resolution
 - If halftone illustrations are required, leave space and have the printer "strip in" while preparing the lithograph plate
- Saves money: Personal publishing is easy to cost justify, even for 100 pages per year.
- Improves user control: Keeps work in-house, close to the author/editor, eliminating delays and transmit time and avoiding the security risk that comes with sending confidential materials outside. With deadlines to meet and schedules to keep, users prefer to set their own priorities and make their own tradeoffs.

Prerequisite Products

None.

Useful extensions include an advanced text processor (such as DisplayWrite) and a "draw" program for graphics creation. A "paint" program is included. A scanner also may increase the systems usability.

Reference Material

- Hardware Components (one-page flyer), G520-6410
- SolutionPac description (one-page flyer), G520-6404
- Sample Newsletter (four-page flyer), G520-6408
- SolutionPac Overview (one-page flyer), G520-6413
- Software Components (one-page flyer), G520-6411
- Optional Services (one-page flyer), G520-6412
- SolutionPac Folder (one each of all the "G520-" numbers above), GBOF-0404

IBM SolutionPac™ Publishing System VM (Virtual Machine) Edition

Main Purpose

IBM SolutionPac Publishing System VM (Virtual Machine) Edition is an easy-to-use, menu-based in-house publishing system. It lets VM/370 users produce high-quality documents, such as technical manuals and proposals, catalogs, training manuals and reports.

The base product for this SolutionPac enables users to create text documents and to preview and publish compound documents (text, graphics, images). It includes three software products: Publishing Systems ProcessMaster, Publishing Systems BookMaster, and Publishing Systems BrowseMaster; and a set of services including installation, software customizing, and end-user training. Coordinated defect support is available at no extra charge. Hardware and software options provide graphics, image handling, formula creation, and printing. Options include a range of services as well.

Key Functions, Facilities and Features

- Publishing Systems ProcessMaster is a series of helpful menus that improves user productivity by providing easy access to publishing functions. It also contains a library management system and facilities for system administration and customizing. ProcessMaster allows users to control the creation of documents by multiple authors, while maintaining document integrity. ProcessMaster also allows users to import PROFS documents and convert CADAM® drawings through interfaces provided to the VM System Editor (ProcessMaster provides references to a written procedure for importing CADAM files). The BookEdit facility of ProcessMaster allows viewing and editing of a BookMaster or GML document.
- Publishing Systems BookMaster is a generalized markup language that simplifies the production of technical publications by allowing users to design their documents and to develop customized document styles. It also enables users to develop multiple documents from common source information.
- Publishing Systems BrowseMaster lets users preview compound documents on their workstation display screens. In addition, it allows users to manipulate graphical data formats for inclusion in composed documents.

Software installation and customizing and on-site end-user training are all designed to enable immediate use of the system for publishing company documents.

IBM SolutionPac Publishing System VM Edition also offers several modular options: the graphics option, the formula formatting option, and the printing options. Options include installation, customizing,

and end-user training, as well as coordinated defect support.

Graphics Option

The graphics option is based on IBM's Publishing Systems DrawMaster. This product gives users considerable flexibility for creating, modifying, and displaying quality illustrations for insertion in various types of documents.

With this option, users can create and edit illustrations containing line art and text information and output these illustrations to a variety of devices. These include IBM all-points-addressable printers, as well as IBM plotters and color displays. A large library of pre-drawn "clip art" can be used as the basis for these illustrations. Graphics files can also be accepted from other programs and modified before use in a publication.

Formula Formatting Option

The formula formatting option significantly enhances users' ability to format complex mathematical formulas before including them in a document. The formulas can be specified using simple English descriptions.

Printing Options

The printing options include a master printing option and two draft/proof printers, giving users a choice of output quality.

The master printing option is the IBM 4250/II ElectroCompositor. This is a non-impact all-points-addressable device with a printing density of 600 dots per inch. The 4250/II produces camera-ready masters and/or specially formulated pre-plate negatives, eliminating several steps in the preparation of printing plates for an offset press. It may also be used as a direct plate for limited print runs.

The 4250/II ElectroCompositor can print a wide variety of text, image and graphics data in various type styles and sizes to help meet the needs of the publishing environment.

Printer output is dry, immediately visible and usable. The pre-plate negatives do not require chemical processing as do traditional photographic techniques.

The draft/proof options consist of 3812 and 3820 Pageprinters. These all-points-addressable printers can print draft or proof copy at 12 and 20 pages per minute respectively.

Both printers provide an addressability of 240 dots per inch for master printing of certain applications. In addition, the proof printing capability enables accurate representation of line endings and page breaks for document masters that will be printed on a 4250/II ElectroCompositor. Combining all of this with a range of installation, customization, education and support services, the user has an easy-to-use, high-

quality in-house publishing system that can help to improve the quality of publications while cutting costs and increasing productivity.

The Image Handling Facility (IHF) is not a part of the VM SolutionPac but may be ordered separately. IHF allows the user to prepare pictures (images) to be included in documents. It supports the interactive manipulation of images in a manner similar to the photographic process.

Primary Users

Publishing departments, authors, editors, and graphic artists use the Publishing System VM Edition to create text documents and to preview compound (text, graphics, and image) documents via an easy-to-use, tailorable menu system.

Potential Benefits

Users may improve the publishing cycle in the following areas:

- Improved quality control
- Reduced costs
- Shorter publishing lead times
- Greater user productivity
- Increased function

Prerequisite Products

The following is a partial list.

Hardware

SolutionPac Publishing System VM (Virtual Machine) Edition supports 4300-, 9370-, and 30XX-series processor configurations. The models, their specific configurations, and appropriate peripheral devices will vary depending on the Publishing System functions installed.

A variety of 3270 and host-attached PC terminals is supported, including the Personal System/2.

Software

Customers who install Publishing Systems ProcessMaster will require one of the following operating systems:

- Virtual Machine/System Product (VM/SP)
- VM/Integrated System
- VM/SP High Performance Option

Products Supported

The following is a partial list:

- ProcessMaster: 3270
- BrowseMaster: 3270
- BookMaster: 3270

- DrawMaster: 3270
- DrawMaster Workstation Support
- The printing options:
 - 4250
 - 3812
 - 3820

Ordering Information

IBM SolutionPac Publishing System VM Edition:	5759-003
BrowseMaster:	5688-009
BookMaster:	5688-015
DrawMaster:	5664-388
ProcessMaster:	5664-387

Reference Material

- General Information Manual, GC34-5040

The following publications will be available at general availability:

- Getting Started, SC34-5041
- Getting Started with Graphics, SC34-5042
- Getting Started with Image Handling, SH12-5279
- Getting Started with Formula Formatting, SC34-5044
- Introduction and Planning Guide, SC34-5045

IBM SolutionPac™ NetView™ Implementation (Networking Edition)

Main Purpose

The IBM SolutionPac NetView Implementation (Networking Edition) offers a comprehensive package of services with NetView Release 2. This SolutionPac is designed to accelerate a customer's implementation of NetView and to provide the customer with an enhanced NetView-based network management system. The IBM services include installation planning, product installation, migration, tailoring, network management productivity enhancements, and customer education. At the conclusion of the on-site activities, IBM will provide the customer with a NetView implementation summary report. IBM will also provide a single point of contact for 90 days of follow-on usage and defect support for the tailored NetView-based network management system.

This offering is intended to reduce a customer's time and resource requirements for product installation and implementation of the NetView program product. It will also help to enhance an operator's productivity through more effective use of NetView.

Key Functions, Facilities and Features

Highlights

- NetView implementation
 - Implementation planning
 - Product installation, test, and migration
 - Addition of network management productivity enhancements
 - Tailoring of the NetView program product and installed productivity enhancements
- On-site education for telecommunications systems operators
- Single point of customer contact for 90 days of usage and defect support on the tailored NetView system

Description

- NetView program product
The most currently available release of NetView is included in this SolutionPac. NetView provides a cohesive set of SNA host network management services in a single product. It enhances the usability and operability of network management function in the MVS/XA, MVS/370, VM, and VSE environments.
- Implementation planning
IBM will conduct and document a planning session with the customer's project administrator. This session will identify the customer's network

requirements for the installation of the NetView program product and appropriate productivity enhancements, as well as schedule customer personnel and resources for training.

- Installation, test, and migration
IBM will install the most currently available release of the NetView program product and appropriate program temporary fixes (PTFs), as required, on one central processing unit of one network domain.

IBM will verify that the NetView program product was properly installed on the customer's central processing unit.
- Network management productivity enhancements
IBM will install a selected group of IBM-provided network-management-oriented CLISTs, command processors, panels, and tutorials for use as operator productivity enhancements.
- Tailoring
IBM will tailor the NetView program product and IBM installed productivity enhancements to the customer's network configuration.
- Test customer's target NetView system
IBM will test the IBM-installed CLISTs, command processors, panels, and tutorials to ensure that the requirements identified during the planning session have been met.
- Customer education
IBM will conduct two three-hour on-site training sessions, within one day, for up to eight telecommunications operators per session. This instruction will provide the operators with guidance on how to use the installed and tailored NetView program product and IBM-supplied productivity enhancements.
- NetView implementation summary report
At the conclusion of IBM's on-site activities, IBM will provide the customer with an implementation summary report that summarizes the installed NetView product configuration parameters and productivity enhancements provided with this offering.
- Single point of contact for defect and usage support
IBM will provide the customer with a single point of contact for defect and usage telephone assistance. Customers may call the IBM Support Center 24 hours a day, seven days a week, toll free, to report defects or request usage information.

IBM will provide remote usage support for 90 consecutive days.

Products Supported

NetView for MVS/XA
 NetView for MVS/370
 NetView for VM
 NetView for VSE

Ordering Information

The IBM SolutionPac NetView Implementation (Networking Edition) is available through an IBM marketing representative.

If not previously ordered or installed, one of the following NetView program products must be ordered when this SolutionPac is ordered:

- NetView for MVS/XA (5665-362)
- NetView for MVS/370 (5665-361)
- NetView for VM (5664-204)
- NetView for VSE (5666-343)

This offering is not licensed. Each program must be separately licensed for contractual and billing purposes. No feature can be specified unless there is a license for the program on order or installed for the same designated machine.

Program number is 5759-011, and feature number is 9001. One of the following feature numbers is needed to identify the customer's operating environment:

Feature Number	Environment
5006	MVS/XA
5007	MVS/370
5008	VM
5009	VSE

Ordering number 5759-011 is used only for the registration of the customer as a participant in the IBM SolutionPac NetView Implementation (Networking Edition). No media or documentation will ship under 5759-011.

IBM SolutionPac™ Office Series (System/36 Edition)

Main Purpose

IBM SolutionPac Office Series (System/36 Edition) Version 2 provides a comprehensive preconfigured office solution for System/36 systems. This SolutionPac Office Series offering includes host and IBM Personal Computer software, installation assistance, two optional end-user implementation service offerings, and single point-of-contact defect support.

Along with software for electronic mail, text, notes, calendar, decision support, and query functions, SolutionPac Office Series (System/36 Edition) Version 2 includes enhancements that provide additional workstation attachment options and support for the System/36 Model 5363.

Key Functions, Facilities and Features

- Additional workstation attachment options provided to support the attachment of the IBM Personal System/2™ family Models 50, 60, and 80
- Support for System/36 Model 5363
- Available to new and installed System/36 customers
- Comprehensive package of office functions:
 - Text (DisplayWrite 4, DisplayWrite/36)
 - Personal computer support (IBM Personal Computer Support/36)
 - Notes (Personal Services/36)
 - Calendar (Personal Services/36)
 - Electronic mail (Personal Services/36)
 - Query (Optional)
 - Decision support (Personal Decision Series II) (optional)
- Single point of contact for defect support
- Installation assistance for installation and testing:
 - System/36 Support
 - IBM Personal Computer Support
- Optional implementation services
 - End-user software customizing and system administrator training
 - On-site end-user education

Prerequisite Products

Hardware

System/36:

5360 and 5362 System Units with a minimum of 1MB of memory and 260MB DASD or 5363 System Unit with 1MB of memory 210MB DASD

IBM Personal Computer:

IBM Personal Computer (XT or AT) with 640KB memory, 10MB (minimum) hard disk, 5-1/4-inch double-sided diskette drive and display, or IBM Personal System/2 Models 30, 50, 60, or 80 with hard disk, 3-1/2-inch double-sided diskette drive and display. The appropriate emulation attachment is also required.

Software

For the 5363, SSP Release 5.1 with feature number 6047 (Communications), is a prerequisite. SSP feature number 6050 is a prerequisite for the Personal Services/36-PROFS bridge on the 5363.

DisplayWrite 4 is required for each IBM Personal Computer or IBM Personal System/2 attached to SolutionPac Office Series (System/36 Edition). IBM DOS 3.30 is prerequisite for IBM Personal Computer software supported by SolutionPac Office Series (System/36 Edition). The appropriate emulation software is also required.

Ordering Information

Program number: 5759-001

Reference Material

SolutionPac Office Series (System/36 Edition) Kit, GK2T-0943

IBM SolutionPac™ Office Series (VM Edition)

Main Purpose

IBM SolutionPac Office Series (VM Edition) Version 2 provides a comprehensive preconfigured office solutions for VM systems. This SolutionPac Office Series offering includes host and IBM Personal Computer software, two levels of installation assistance, four optional end-user implementation service offerings, and single point-of-contact defect support.

Along with software for electronic mail, text, notes, calendar, decision support, relational data base, and query functions, SolutionPac Office Series (VM Edition) Version 2 includes enhancements that provide additional connectivity, additional function, attachment of the IBM Personal Typing System and updated releases of component products and VM/IS packaging.

Key Functions, Facilities and Features

- Additional functions
 - IBM Token-Ring LAN attachment of IBM Personal Computers and IBM Personal System/2™ as workstations
 - Cross-system calendar access support
 - Composite document capabilities of DisplayWrite/370 Release 2
 - Optional inclusion of NetView™ as a component product
 - Distributed support through VM Distributed System Network Executive (VM/DSNX) and VMBACKUP-MS products
- Support for IBM Personal Typing System
- Updated releases of VM/IS and product components
- Availability to new and installed VM customers
- Comprehensive package of office functions:
 - Personal services
 - Document creation
 - Decision support (optional)
 - Data base query (optional)
 - Menu and navigation between the components
- Single point of contact for defect support
- Two levels of installation assistance
 - Installation Assistance Level 1 – Provides planning assistance and productivity aids for customers who wish to install SolutionPac Office Series (VM Edition) themselves
 - Installation Assistance Level 2 – Provides a complete installation support service for customers who wish to have SolutionPac Office Series (VM Edition) installed by IIS/Systems Integration and Professional Services

- Optional implementation services
 - Systems support
 - End-user software customizing
 - On-site end-user education
 - IBM Personal Computer software training

Prerequisite Products

Hardware

Any System/370 processor supported by VM/IS Version 5.1, VM/SP Version 5, with or without HPO

For customers ordering the IBM Personal Computer component of SolutionPac Office Series (VM Edition), any of the following systems may be used:

- IBM Personal System/2 Models 30, 50, 60, and 80
- IBM 5160 Personal Computer XT
- IBM 5170 Personal Computer AT
- IBM 3270 Personal Computer (5271 System Units except Models G and GX)
- IBM 3270 Personal Computer (5273 System Units except Models G and GX)
- IBM Personal Typing System

Ordering Information

Program number: 5759-002

IBM SolutionPac™--Database Application Development

Main Purpose

The IBM SolutionPac – Database Application Development offering is designed to complement the application generator (CSP), relational data base (DB2 or SQL/DS), and query (QMF) licensed programs by providing direct IBM support in the form of on-site education, consulting services, and productivity services to the DP professional during the education and initial application design and preinstallation phases.

SolutionPac – Database Application Development is intended for first-time users of CSP, DB2 or SQL/DS, and QMF licensed programs. Design and implementation of the applications based on these relational productivity family products involve learning new concepts and techniques. The education component of the package is designed to teach the user those concepts and techniques, as well as how to use IBM's application generator, relational data base, and query licensed programs.

The consulting components enable the user to work with qualified IBM professionals during the initial phases of application development and implementation. The licensed programs provide the user with powerful and flexible tools for developing and executing an application using a high-level application language (CSP) with an underlying data base management system (DB2 or SQL/DS).

Key Functions, Facilities and Features

On-Site Education and Consulting

On-site education and consulting consists of implementation planning, education, and consulting. The education component consists of two on-site courses: Relational Data Base and Query, and Cross Systems Product (CSP). The intent of the courses is to assist the user in developing an initial application.

- *Implementation planning.* IBM will conduct and document a one-day implementation planning session with the customer's project administrator. This session will identify and schedule customer personnel and resources for training and consulting.
- *Relational data base and query education.* Depending on the customer's operating system, the customer will receive either six consecutive days of DB2 and QMF on-site education (MVS customers) or five consecutive days of SQL/DS and QMF on-site education (VM/VSE customers) for five students. The education will be conducted at a central customer site.

Among the topics included are product overviews, query and data base language usage, data base design considerations, program development, utilities, performance and recovery considerations, and other aspects of data base administration.

- *Relational data base and query consulting.* The purpose of on-site consulting services is to provide the customer with practical skills transfer. They will consist of 10 consecutive work days commencing on the next work day after the completion of the Relational Data Base and Query course.

The consulting service will be primarily directed at the same five students who received the relational data base and query training, unless the customer has determined a need to change personnel.

IBM will assist and answer questions relating to the development of the customer's initial application data base design. The objective of this skills transfer is to help the students successfully make the transition from the classroom to practical application of the information presented.

Skills transfer can be accomplished by assisting the customer in the following areas:

- Defining programming standards
- Determining library control procedures and guidelines
- Setting up table standards
- Problem resolution
- Defining views for other application groups
- *CSP education.* IBM will provide five consecutive work days of education for a maximum of five students.

Among the topics included in this course are a product overview, application design and data definition, structured programming, test procedures, data base usage, utilities, and performance considerations.

- *CSP consulting.* The objective of the on-site consulting services is to provide the customer with practical skills transfer. They will consist of 10 consecutive work days, commencing on the next work day after the completion of the CSP course.

The consulting service will be primarily directed at the same five students who receive CSP training.

IBM will assist and answer questions relating to the development of the customer's initial application design. The objective of this skills transfer is to help the application programmers successfully make the transition from the classroom to practical application of the information presented.

Skills transfer can be accomplished by assisting the customer in the following areas:

- Defining naming standards
- Determining library control procedures and guidelines
- Defining sample programs
- Recommendations for CICS customizing
- Problem resolution

The completion of CSP consulting marks the end of the on-site services.

Remote User Support

IBM will provide three consecutive months of remote user support beginning on the first workday after completion of on-site services. Remote user support will be available Monday through Friday during normal business hours from 8:30 a.m. to 5:00 p.m. except on IBM holidays.

The customer will provide a focal point contact to collect and review technical questions before calling remote user support. The Systems Integration and Professional Services branch office providing the on-site service will provide the remote user support. When called by the customer, IBM will initially record the customer's name and phone number and will return the call to begin answering questions before the end of the next business day.

The objective of remote user support is to provide answers to usage related questions for CSP, relational data base, and QMF licensed programs on topics covered in on-site classes.

Potential Benefits

- Improve application development turnaround by helping the user implement applications sooner
- Provide application growth through implementation of relational data base and application generator technology
- Develop new application development skills that currently may not exist in the user's organization

Products Supported

MVS Environment

- DB2
- QMF
- CSP/AD
- CSP/AE

VM Environment

- SQL/DS
- QMF
- CSP/AD
- CSP/AE

VSE Environment

- SQL/DS
- QMF/VSE
- CSP/AD
- CSP/AE

Ordering Information

Program number: 5759-012

IBM SolutionPac™ Expert Systems

Main Purpose

IBM SolutionPac Expert Systems offers first-time users a solid introduction to the IBM expert systems environment application programs. This SolutionPac combines the software, training, and consulting services needed to help identify potential applications, structure a development plan, and begin building successful knowledge-based applications.

Key Functions, Facilities and Features

The components of SolutionPac Expert Systems are:

Software

Expert System Environment is used to build a knowledge base and allows the user to consult with that knowledge base.

This software product is available in VM or MVS.

Education

Five enrollments in five-day workshop, either Expert System Environment Workshop (course code WS172), or Building Expert Systems (course code WS179). Enrollments may be intermixed between the courses. In the Expert System Environment workshop, attendees can learn how to use IBM expert system environment software to define rules, parameters, procedures, and customized screens. The Building Expert Systems course is designed to teach attendees how to perform knowledge-acquisition and knowledge-base implementation and to design applications. Regularly scheduled classes are held in selected major cities.

Knowledge-Based Systems Center Planning/Review Session

Knowledge-Based Systems Center Planning/Review Sessions are typically two days in length and can include joint review of customer applications, preliminary application design, or implementation planning. These sessions refer to material covered in course code WS172 and are tailored for a specific customer situation. They are individually scheduled at the Knowledge-Based Systems Centers located in Cambridge, Massachusetts or Palo Alto, California.

Consulting Services

One calendar week of on-site consulting services. These services are designed to assist users in the initial use of expert system environment products, as well as with project management, knowledge acquisition, prototype development, and other related requirements.

Ordering Information

Program number: 5759-014

Section 99. Abbreviations

Abbreviations

b	byte (= 8 bits)
bpi	bits or bytes per inch
bps	bits per second
cpi	characters per inch
cps	characters per second
cpu	central processing unit
dB	decibel
dpi	dots per inch
GB	Gigabyte
ips	inches per second
KB	Kilobyte = 1024b for processor storage (memory) size, otherwise = 1000b
KB/sec	Kilobytes/second
kg	kilograms
lpi	lines per inch
lpm	lines per minute
m	meter (= 100 cm = 39.37 in)
MB	Megabyte (= 1,024KB = 1,048,576b for processor storage (memory) size, otherwise = 1,000,000)
MB/sec	Megabytes/second
MHz	megahertz
mm	millimeter
ms	millisecond (= 0.001 s)
μs	microsecond (= 0.000,001 s)
ns	nanosecond (= 0.000,000,001 s)
ppm	pages per minute
s	second
spool	simultaneous peripheral operations online
X.25	CCITT X.25 Network Communication Protocol
303X	3031, 3032, and 3033 Processors
308X	3081, 3083, and 3084 Processors
30XX	303X, 308X, and 3090 Processors
4300	4321, 4331, 4341, 4361, and 4381 Processors

Acronyms

AAACX	Automated Administrative Activities for DPCX
ACF	advanced communications function, access control facility
ACRITH	High-Accuracy Arithmetic Package
ADF	Application Development Facility
ADRS	A Departmental Reporting System
ADS	Audio Distribution System
AF	advanced function
AFP	advanced function printing
AI	artificial intelligence
ANMP	Account Network Management Program
ANS	American National Standard
ANSI	American National Standards Institute
AP	attached processor

APA	all points addressable
APF	advanced printer function
APL	A Programming Language
APPC	advanced program-to-program communications
APPN	Advanced Peer-to-Peer Networking
ARJE	Advanced Remote Job Entry
AS	Application System
ASCII	American Standard Code for Information Interchange
ASM	Auxiliary Storage Manager
ASP	Attached Support Processor
ASR	auxiliary storage save/restore, or automatic send/receive
ATMS	Advanced Text Management System
AWG	average wire gauge
B/I	batch interactive
BASIC	Beginners All-Purpose Symbolic Instruction Code
BDAM	Basic Direct Access Method
BDE	batch data exchange
BGU	Business Graphics Utilities
BICARSA	Billing, Inventory Control, Accounts Receivable, and Sales Analysis
BIFET	bimetallic inductive field effect transistor
BMAS	Business Management Accounting System
BMP	batch message processing
BPAM	basic partitioned access method
BPE	Basic Programming Extensions
BPT	Bisynchronous Pass-Through
BRADS	Business Report Application Development System
BSC	binary synchronous communication
BTAM	Basic Telecommunications Access Method
BTAM-ES	BTAM Extended Support
BTS	Batch Terminal Simulator
C	C-Language
C&SM	Communications and System Management
CAD	computer-aided design
CADAM	Computer-Graphics Augmented Design and Manufacturing (TM, CADAM, INC.)
CAEDS	Computer Aided Engineering Design System (TM, Structural Dynamics Research Corporation)
CATIA	Computer-Graphics Aided Three-Dimensional Interactive Application (TM, Dassault Systemes)
CBDS	Circuit Board Design System
CBIPO	Custom-Built Installation Process Offering
CBPDO	Custom-Built Product Delivery Offering
CCITT	International Telegraph and Telephone Consultative Committee
CEC	Central Electronic Complex

Abbreviations

CF	Communications Facility	DFU	Data File Utility
CICS	Customer Information Control System	DHCF	Distributed Host Command Facility
CICS/ISC	CICS/Intersystems Communications	DI	data interface
CICS OLTD	CICS Online Test/Debug	DIA	Document Interchange Architecture
CICSPARS	CICS Performance Analysis Reporting System	DIF	Display Information Facility, or Document Interchange Facility
CICS SPM	CICS Source Program Maintenance Online	DISOSS	Distributed Office Support System
CIPREC	Conversational and Interactive Project Evaluation and Control	DL/I	Data Language/One
CM	Communications Manager	DLF	Document Library Facility
CMOS	complementary metal-oxide semiconductor	DLS	Device Level Selection
CMS	Conversational Monitor System	DMAS	Distributed Management Accounting System
CNM	communication network management	DMS	Development Management System or Distribution Management System
COBOL	Common Business Oriented Language	DOS	Disk Operating System
CODASYL	Conference of Data Systems Languages	DOS/VS	DOS/Virtual Storage
COPICS	Communications Oriented Production and Information Control System	DOS/VSE	DOS/Virtual Storage Extended
CP	control program	DOSF	Distributed Office Support Facility
CPF	Control Program Facility	DP	data processing
CPU	Central Processing Unit	DPCX	Distributed Processing Control Executive
CPX	Capacity Planning Extended	DPPX	Distributed Processing Program Executive
CRJE	Conversational Remote Job Entry	DPR	dynamic path reconnect
CRT	cathode ray tube	DPS	dynamic path selection
C&SM	Communications and Systems Management	DSC	data stream compatibility
CSMP III	Continuous System Modeling Program	DSL	Data Simulation Language
CSP	Cross System Product	DSLO	Distributed System License Option
CSP/AD	Cross System Product/Application Development	DSNX	Distributed System Node Executive
CSP/AE	Cross System Product/Application Execution	DSX	Distributed System Executive
CSP/Q	Cross System Product/Query	DTE	data terminal equipment
CSTU	currently signed-on terminal user	DTMS	Database and Transaction Management System
CSU	customer setup unit	DW	DisplayWrite
CTC	channel-to-channel	DXT	Data Extract
CTCA	Channel-to-Channel Adapter	E/S ³	Engineering/Scientific Support System
DACU	Device Attachment Control Unit	EAN	European article number
DAM	Direct Access Method	EBCDIC	extended binary-coded decimal interchange code
DASD	direct access storage device	EC	extended control
DB	data base	ECF	Enhanced Connectivity Facility
DB/DC	Data Base/Data Communications	ECPS	Extended Control Program Support
DBDA	Data Base Design Aid	EDD	Electronic Document Distribution
DB2	DATABASE 2	EDL	Event-Driven Language
DC	data communications	EDX	Event-Driven Executive
DCA	Document Content Architecture	EML	Elementary Math Library
DCE	data communication equipment	EP	Emulator Program
DCF	Document Composition Facility	EREP	Environmental Recording, Editing, and Printing
DCM	display control module	ESA	Enterprise Systems Architecture
DCMS	Data Capture and Management System	ESP	early support program
DDP	distributed data processing	ESSL	Engineering and Scientific Subroutine Library
DDS	data description specifications	ETSS	Entry Time Sharing System
DE	data entry, device emulation	FDP	field-developed program
DFDS	Data Facility Device Support	FET	field effect transistor
DFDSS	Data Facility Data Set Services	FFT	final form text
DFEF	Data Facility Extended Function	FFTDCA	final form text document content architecture
DFHSM	Data Facility Hierarchical Storage Manager	FIPS	Federal information processing standards
DFP	Data Facility Product	FORTTRAN	Formula Translation
DFSORT	Data Facility Sort	FP	Fast Path

FPS	Financial Planning System	INS	Information Network Services
FRU	field-replaceable unit	IOA	input/output adapter
FTP	File Transfer Program	IPA	Integrated Printer Attachment
GDBS	Geo-Facilities Data Base Support	IPCS	Interactive Problem Control System
GCR	group coded recording	IPDT	Integrated Processing of Data and Text
GDDM	Graphical Data Display Manager	IPF	Interactive Productivity Facility
GDQF	Graphical Display and Query Facility	IPL	initial program load
GLAPPR	General Ledger, Accounts Payable, and Payroll	IPO	Installation Productivity Option
GML	Generalized Markup Language	IR	information retrieval, infrared
GPAR	Generalized Performance Analysis Reporting	ISAM	indexed sequential access method
GPG	Graphics Program Generator	ISC	Integrated Storage Control, inter-system communications
GPSS	General Purpose Simulation System	ISDN	integrated services digital network
GTFPARS	Generalized Trace Facility Performance Analysis Reporting System	ISPF	Interactive System Productivity Facility
H/W	Hardware	ISPF/PDF	ISPF/Program Development Facility
HASP	Houston Automatic Spooling Program	IUP	installed user program
HCF	Host Command Facility	IX	Interactive Executive
HDA	head and disk assembly	JCL	Job Control Language
HDAM	Hierarchical Direct Access Method	JDS	Job Development System
HDDI	Host-Displaywriter Document Interchange	JEP	Job Entry Program
HDLC	High-Level Data Link Control	JES	Job Entry Subsystem
HIDAM	hierarchical indexed direct access method	JNF	Job Networking Facility
HIPO	Hierarchy plus Input, Process, and Output	KSDS	Key Sequenced Data Set (VSAM)
HISAM	hierarchical indexed sequential access method	LAN	local area network
HPO	High Performance Option	LDA	local data area
HSAM	hierarchical sequential access method	LDU	link diagnostic unit
HSM	Hierarchical Storage Manager	LED	light-emitting diode
HSS	Host Support Services	LIC	line interface coupler
I/O	input/output	LISP	LISt Processing
I/S	information services	LLC	logical link control
IA	Integrated Attachment, or Integrated Adapter	LPDA	Link Problem Determination Aid
IC/1	Information Center/1 program product	LSI	large-scale integration
ICA	Integrated Communications Attachment, or Integrated Communications Adapter	MAPICS	Manufacturing and Production Information Control System
ICCF	Interactive Computing Control Facility	MCS	multiple copy screens
ICEF	Interactive Composition and Editing Facility	MFT	multiprogramming with a fixed number of tasks
ICF	Interactive Communications Feature	MICR	magnetic ink character recognition
ICU	Interactive Chart Utility	MIS	multiple interactive screens
IDAM	indexed direct access method	MLPSC	monthly licensed program support charge
IDTF	Interactive Display Text Facility	MMLPSC	monthly multiple licensed program support charge
IDU	Interactive Data Base Utilities	MOS	metal oxide semiconductor
IFA	Integrated File Adapter	MOSFET	metal oxide semiconductor field effect transistor
IGES	Initial Graphics Exchange Specification	MP	multiprocessor
IIAS	Interactive Instructional Authoring System	MPSX	Mathematical Programming System Extended
IIPS	Interactive Instructional Presentation System	MPX	multiplex or multiplexer
IMD	Interactive Map Definition	MRJE	Multileaving Remote Job Entry
IML	initial microprogram load	MRO	multiregion operation
IMS	Information Management System	MSC	Multiple Systems Coupling
IMSADF	IMS Application Development Facility	MSG	message region
IMSPARS	IMS Performance Analysis Reporting System	MSNF	Multisystem Networking Facility
		MSRJE	Multiple Session Remote Job Entry
		MSS	Mass Storage System
		MSSE	Mass Storage System Extensions
		MVS	Multiple Virtual Storage
		MVS/ESA	Multiple Virtual Storage/Enterprise Systems Architecture
		MVS/SP	Multiple Virtual Storage/System Product

Abbreviations

MVS/XA	Multiple Virtual Storage/Extended Architecture	RES	Remote Entry Services
MVT	Multiprogramming with a Variable Number of Tasks	RESQ	Research Queueing Package
NCCF	Network Communications Control Facility	RFT	revisable form text
NCP	Network Control Program	RFTDCA	revisable form text document content architecture
NETPARS	Network Performance Analysis Reporting System	RGB	red-green-blue
NJE	Network Job Entry	RISC	reduced instruction set computer
NLDM	Network Logical Data Manager	RJE	Remote Job Entry
NMPF	Network Management Productivity Facility	RJEF	remote job entry function
NPA	Network Performance Analyzer	RM	remote management
NPDA	Network Problem Determination Application	RMAS	Retail Merchandise and Audit System
NPM	Network Performance Monitor	RMF	Resource Measurement Facility
NTO	Network Terminal Option	ROCF	Remote Operator Console Facility
OCCF	Operator Communication Control Facility	ROM	read-only memory
OCL	Operation Control Language	RPG	Report Program Generator
OCR	optical character recognition	RPQ	request for price quotation
OEM	original equipment manufacturer	RPS	Realtime Programming System
OLTD	Online Test/Debug	RSCS	Remote Spooling Communications Subsystem
OLTEP	Online Test Executive Program	RSF	Remote Support Facility
OPC	Operations Planning and Control	RT	RISC technology
OS	Operating System	RTAM	Remote Teleprocessing Access Method
OS/VS	OS/Virtual Storage	RTG	Routing Table Generator
OSI	open systems interconnection	S/S	start/stop
PARS	Performance Analysis and Reporting System	SAA	Systems Application Architecture
PC	Personal Computer	SAM	sequential access method
PDM	Programming Development Manager	SAMON	SNA Application Monitor
PE	phase-encoded	SCP	system control programming
PEP	Partitioned Emulation Program	SDA	Screen Design Aid
PERT/CPM	Project Evaluation Review Technique/Critical Path Method	SDF	Screen Definition Facility
PGF	Presentation Graphics Feature	SDLC	synchronous data link control
PL/I	Programming Language/One	SDMA	Storage Device Migration Aid
PMA	Preferred Machine Assist	SEU	Source Entry Utility
PMS	Project Management System	SLR	Service Level Reporter
POWER	Priority Output Writers, Execution Processors, and Input Readers	SMF	System Measurement Facilities
PP	program product	SMFF	SCRIPT Mathematical Formula Formatter
PROFS	Professional Office System	SMP	System Modification Program
PROJACS	Project Analysis and Control System	SMU	Space Management Utilities
PRPQ	Programming RPQ	SNA	System Network Architecture
PS	personal services, programmed symbols	SNADS	System Network Architectural Distribution Services
PS/PC	Personal Services/PC	SNI	SNA Network Interconnection
PTF	program temporary fix	SP	System Product, Program, or Package
PUT	program update tape	SPF	System Productivity Facility, or Structured Programming Facility
PVM	VM/Pass-Through Facility	SPM	Source Program Maintenance
PVS	Program Validation Service	spool	simultaneous peripheral operations online
QMF	Query Management Facility	SQL/DS	Structured Query Language/Data System
QSAM	queued sequential access method	SRM	System Resources Manager
QTAM	queued telecommunications access method	SS	start/stop
RACF	Resource Access Control Facility	SSP	System Support Program
RAM	random access memory	SSX	Small Systems Executive
RAS	reliability, availability, and serviceability	SSX/VSE	Small System Executive/Virtual Storage Extended
RCS	reloadable control storage	STAIRS	Storage and Information Retrieval System
		SU	selectable unit
		SVA	shared virtual area
		SVS	Single Virtual Storage

TCAM	telecommunications access method
TCM	thermal conduction module
TCS-ACF	Telecommunications Control System-ACF
TPF	Transaction Processing Facility
TPNS	Teleprocessing Network Simulator
TPS	Transaction Processing System
TSO	Time Sharing Option
TSO/E	TSO Extensions
TTY	Teletypewriter
UP	uniprocessor
UPC	Universal Product Code
VCNA	VTAM Communications Network Application
VF	vector facility
VM	virtual machine
VM HPO	Virtual Machine High Performance Option
VM/AS	VM/Application System
VM/BSE	Virtual Machine/Basic System Extensions
VM/IFS	Virtual Machine/Interactive File Sharing
VM/IS	Virtual Machine/Integrated System
VM/RTM	VM/Realtime Monitor
VM/SE	Virtual Machine/System Extension
VM/SP	Virtual Machine/System Product
VM/TSO	Virtual Machine/Time Sharing Option
VM/VSE	Virtual Machine/Virtual Storage Extended
VM/370	Virtual Machine/370
VMA	Virtual Machine Assist
VMMAP	Virtual Machine Monitor Analysis Program
VMPPF	VM Performance Planning Facility
VNCA	VTAM Node Control Application
VS	virtual storage
VSAM	virtual storage access method
VSE	Virtual Storage Extended
VSE/ACLR	VSE/Access Control Logging and Reporting
VSE/PT	VSE/Performance Tool
VTAM	Virtual Telecommunications Access Method
VTAME	VTAM Entry
VTAMPARS	VTAM Performance Analysis Reporting System
VTMS	Voice/Text Message System
WP	word processing
WRC	workstation resource center
WS	workstation
WSF	Workstation Facility
WSU	Workstation Utility
XEDIT	Extended Editor
XRF	Extended Recovery Facility

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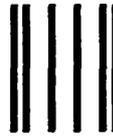
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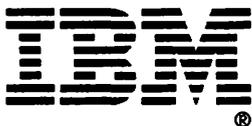


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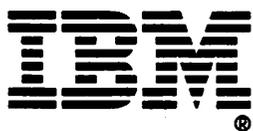


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