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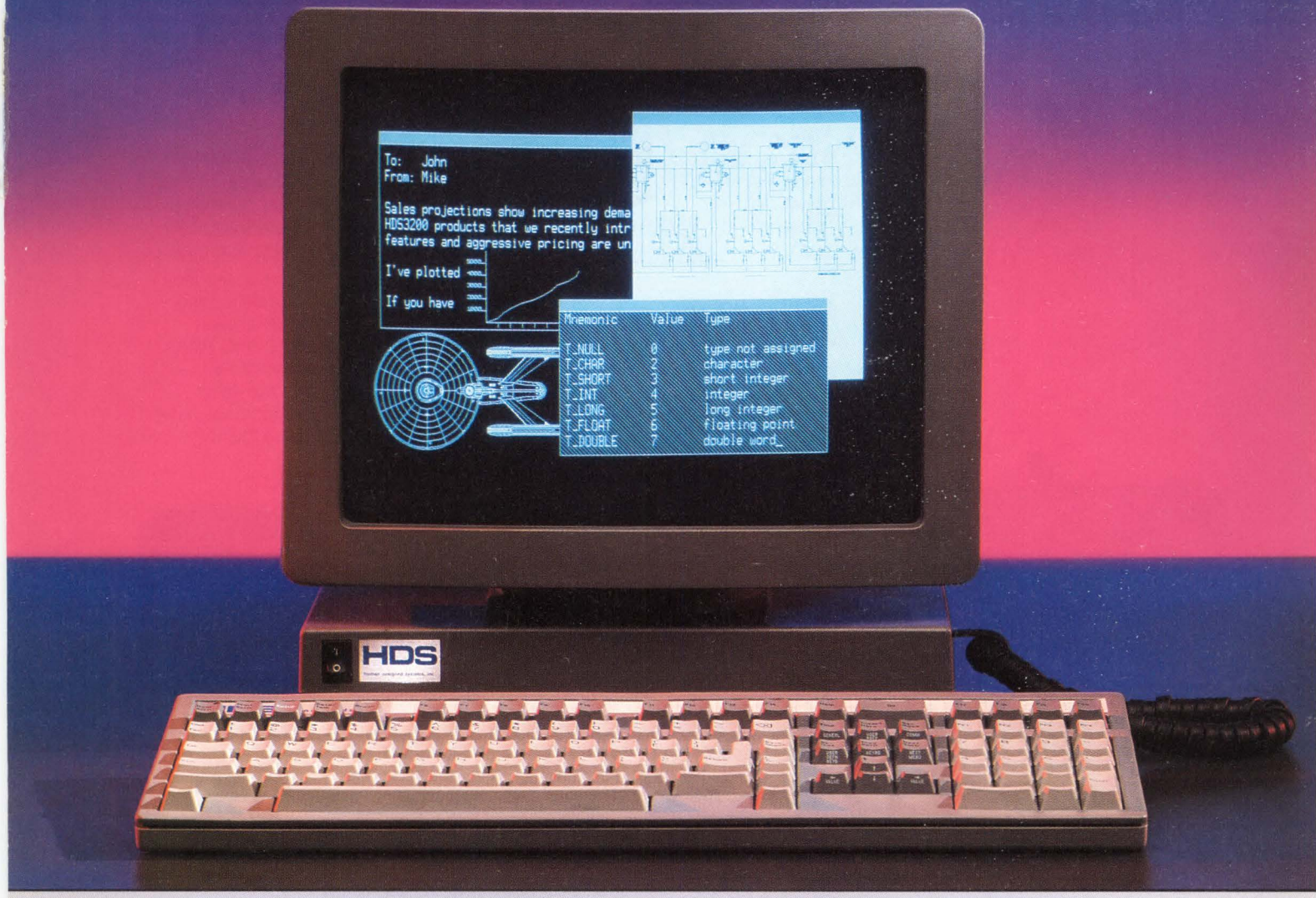

Introducing the HDS3200 Image Leader Terminals

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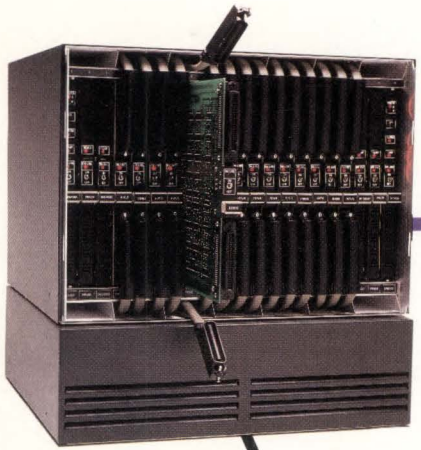

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ARTICLES

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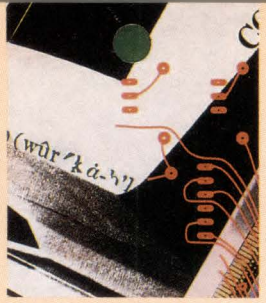
LABORATORY DECPRO TESTING CENTER

The lab seal indicates that the product reviewed has been tested by one of our experts in our Laboratory and Testing Center.

ON THE COVER:

This month's cover image was designed by Boston-based artist Karen Watson.

Portions of this college, Watson's speciality, have illustrated our features throughout 1987. They come together here to complete her view of 20th-century computer technology.



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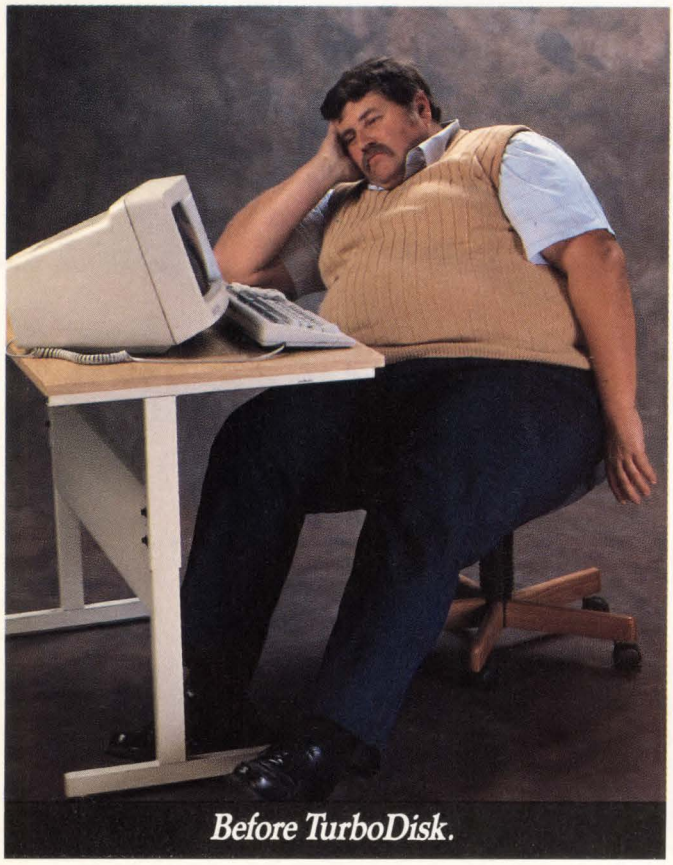

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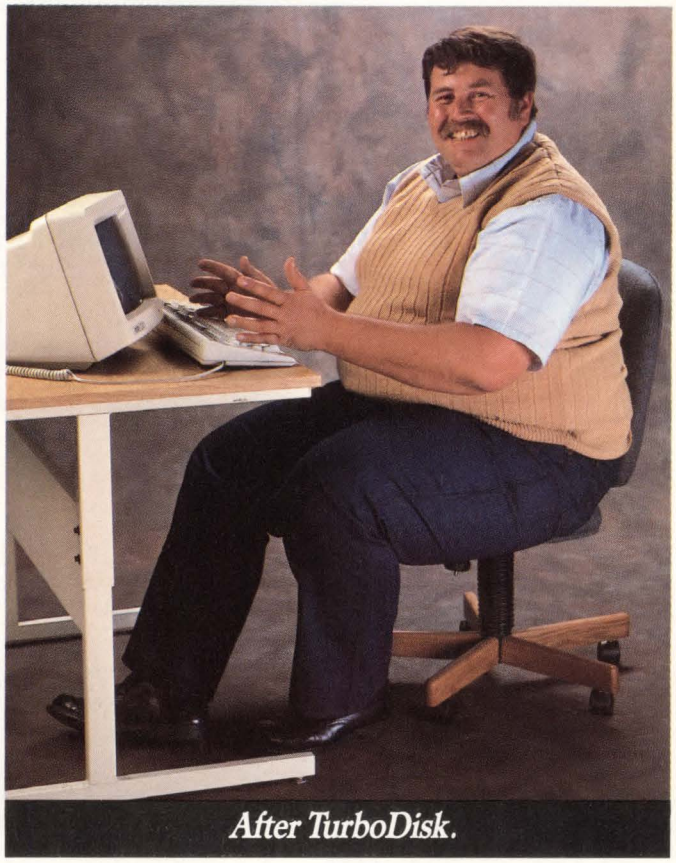

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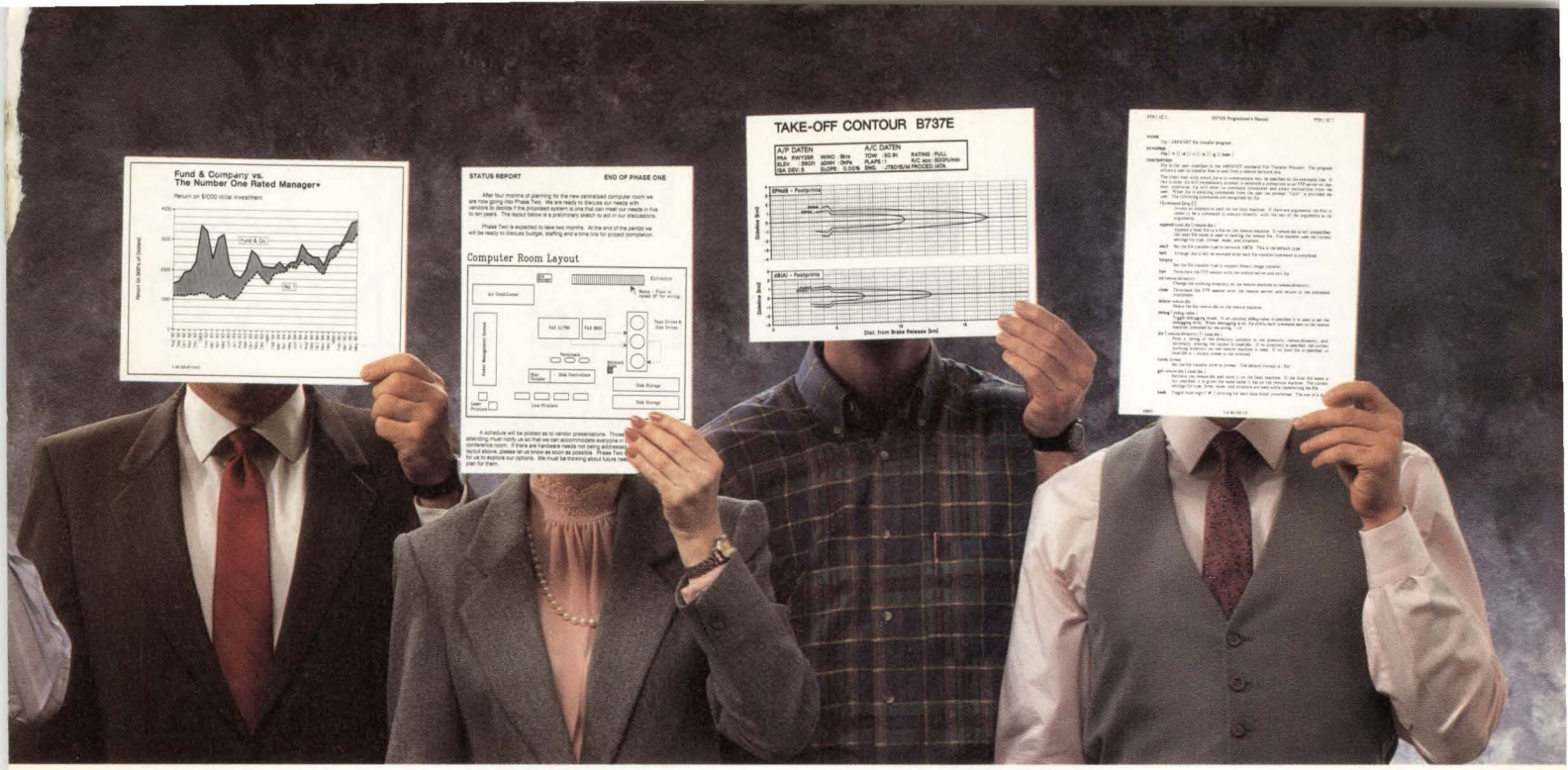

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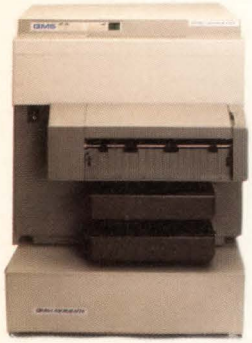

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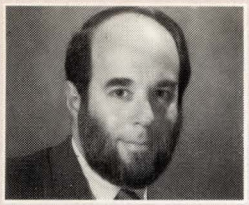

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Carl B. Marbach

Digital Has It Now, But Who Will Have It Next?

The great Satchel Paige said to never look back because someone might be gaining on you. Most of us can't help looking over our shoulders occasionally, even if we feel as if we're running so fast that no one can catch us.

Digital is running fast. Pick up any financial newspaper or ask anyone who knows computers and you'll hear about DEC. But is DEC running so fast that no one can catch it? In the first one-mile race that was run in less than four minutes, a man who broke the four-minute barrier *lost* the race. He lost to another competitor who also broke four minutes but did it faster. Running fast or getting it right doesn't automatically mean you win.

Basically the state of the computer market is: Digital has it now, Hewlett-Packard will have it soon and IBM is still thinking about what "it" is.

Hewlett-Packard is rapidly moving in on Digital's territory with a family of 32-bit RISC machines that will span the desktop to room size, share a common architecture and communicate well with themselves, PCs and other mini/mainframes. When HP finally puts it all together in the next year, DEC will have a competitor on its own turf and the battle will begin.

Until now DEC's success has been based on a superior product, VAX. From small to large, these computers are powerful and well engineered. The unified architecture allows seamless communications between other VAX processors, and layered products allow similar communication to PCs and the world of IBM. When criticized about any aspect of the company, DEC always points to a growing bottom line and increases in revenues. "We're growing at 20 percent, so we must be doing something right," is the phrase most often heard.

DEC has spent the last year looking ahead at IBM, selling the world of Fortune 100 computing, taking over the corporate data center and larger installations. They have done this at the expense of their installed base, the third-party market and their OEMs. Without feeling it, this has eroded the base upon which DEC has been built. Digital has grown, but the support base of suppliers, dealers and customers hasn't kept pace.

Now comes Hewlett-Packard with a loyal installed base, a new lineup of hardware, a sales force ready to go, a dealer network in place and a growing third-party market. HP even exhibits at the User Group trade show *alongside* the third-party suppliers. Public Relations runs seminars to acquaint people with products and services. HP works hard to support and communicate with its installed base.

While DEC is looking ahead, running full speed toward IBM, a competitor is running even faster. HP is on the move. IBM is talking 9370, Silverlake and SAA. But for now its just talk.

As we approach the 1990s, it's IBM, DEC and HP. In the 90s the big three will be the same — who'll be numbers one, two and three remains to be seen. DEC should not only look forward, but it should look back because someone is gaining.

A decision support system should handle whatever you throw at it.

If you ask some VAX-based decision support systems to work with a foreign database, they'll drop the ball. You'll have a huge job of transferring or re-keying data.

FOCUS, on the other hand, reads directly from any database on your VAX. Within minutes of installing FOCUS, you'll have your first report.

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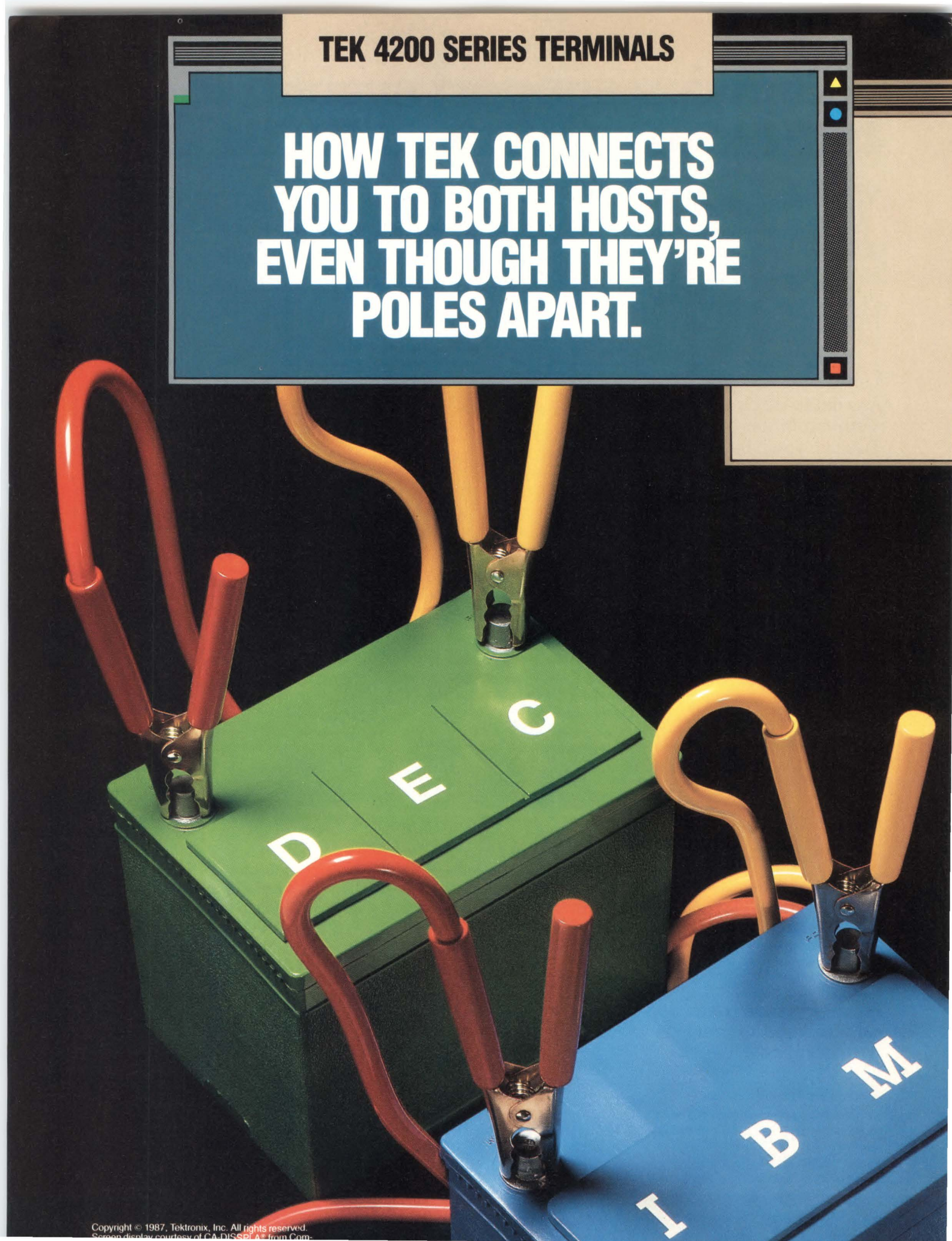

Typically, one host serves your business applications while another serves your engineering and database needs. Now Tek's 4200 Series gives you one window to them all.

Tek 4200 Series terminals let you switch between IBM and DEC hosts at will, and work with up to six databases at once.

You can work independently of the host, too: Among Tek's superb graphics capabilities is extensive local intelligence that lets you go off-line to better utilize host resources. Local zoom and pan, for example, lets you view data well beyond display addressability.

Compatibility with over 175 leading software packages puts the 4200 Series in the mainstream of CAD/CAM, CAE, technical data analysis and business graphics. Bring your report, presentation and documentation hard copy to life with the 4200-compatible 4690 Family of color printers.

Available in 13-inch or 19-inch versions, as well as a super-tough industrial version, Tek 4200 terminals add the ideal graphic and alphanumeric solution to every station.

To learn more about the 4200 Series, contact your local Tek representative.
Or call 1-800-225-5434.
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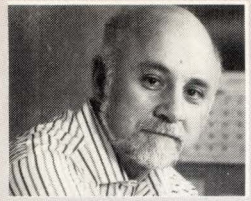

EDITORIAL

Dave Mallery

Divorce Mediation

I recently was called in to mediate an argument between a software vendor and a client. Both worked for the same parent firm, but there was a distinct vendor-customer relationship.

The client was furious. He was running in parallel and there were still a few bugs. He knew, because he had to check every transaction manually, and was at the end of his rope because he'd been running in parallel, paying double payroll and staying late each night for many weeks. He couldn't see the beauty of the system written for him, nor the elegance with which it addressed every nuance of his rather unique little world. All he felt was pain and bug bites and everything seemed too slow.

The vendor also was stuck. I found out that he kept making little changes requested by the client, instead of finishing the parallel. He forgot that when you have an elephant with a thorn in its foot, you first remove the thorn, then reason with the elephant!

Saddest of all, the "solutions" being proposed were absurd. One party actually suggested scrapping the system because it was written in a 4GL and going back to "write it in BASIC."

This was a good example of an elegant programming tool being subverted by failed communications. The thought of abandoning a 4GL environment for a traditional "do it in BASIC" really upset me. We converted our entire programming environment to a 4GL approximately a year ago. I've never experienced such control and confidence in my 20 years. I'd no sooner go back to BASIC than I'd give up VMS and go back to RSTS.

I feel that 1988 will be the year of CASE. CASE really is the application of CAD/CAE technology to software engineering. The initial CASE products seem to be oriented more toward real-time applications, but with the proliferation of workstations in the DEC arena, there'll be unlimited opportunities to use CASE in the more ordinary commercial and scientific systems that the majority of us write.

CASE offers the ability to merge design and code into a single system that really can maintain the binding between the two. A good touchstone test for a mature CASE system would be if a change in the design produces a change in the code and a subsequent change in the code produces a change in the design. As we transitioned to a 4GL, I noted a substantial increase in programmer productivity. The change from 4GL to CASE should produce an even more dramatic improvement.

Meanwhile, as we await CASE, we'll be putting MICROVAX 2000 workstations on our programmers' desks, LAVCing that terrible burden of constant compilation off the main VAX, and allowing the programmers to be constantly engaged in the multiple windows at their command. In fact, as this is written, we're also writing the purchase orders for the various software componants of our LAVC. We'll share everything we learn with you about program development and about good domestic relations.

BUYING A DEC-COMPATIBLE SUBSYSTEM FROM ARROW IS AS EASY AS ONE, TWO, THREE.

At Arrow, we've just made buying a DEC™-compatible subsystem three times easier.

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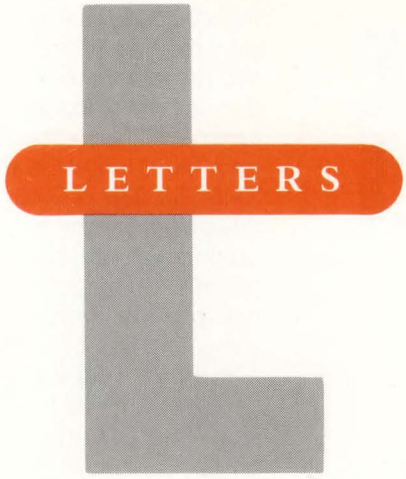


A CLARIFICATION

I was quite pleased to see the reference to our training center and its capability in your recent issue focusing on training. As a point of clarification, however, the TRW Technical Training Center (formerly International Computer Equipment [ICE]) was acquired in 1985 by TRW and is not an outgrowth of its internal training. Currently functioning as a separate business operation of TRW's Customer Service Division, we are and have been a leading source of DEC-related hardware and software training for end user and third-party maintainers since 1982.

Roger E. Giese
National Sales Manager
TRW Information Systems Group
Fredericksburg, Virginia

VALUABLE READER

I have been reading *DEC PROFESSIONAL* for some time and find it to be invaluable. I especially enjoy "Let's C Now" by Rex Jaeschke and "DCL Dialogue" by Kevin G. Barkes.

I love "Back End" by John C. Dvorak — no matter how bizarre it gets.

Bruce A. Grembowski
American S & L Association
San Jose, California

Address letters to the editor to *DEC PROFESSIONAL* magazine, P.O. Box 503, Spring House, PA 19477-0503. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

SHOW HIM THE WAY

I wonder if anyone can show me the way to retrieve a file that has been deleted on the MICROVAX II?

Mohd Jabara
Doha—Qatar

Unfortunately, there is no way to do this. Once you delete something, the space is almost always immediately used by the VAX. Had you shut down your machine and not created any new fields, you may have been able to recover your files, although the process is lengthy and complex. With the announcement of version 5.X, however, there will be a recover command.

HELPFUL INFORMATION

I'm writing in reference to the Letter titled "FAILS TO EXECUTE" from William Vaughan of Richmond, Virginia (July 1987). I had the same problem. I tried your solution but it didn't work. In my case, the system login was executing in the system account, but not in any of the user accounts.

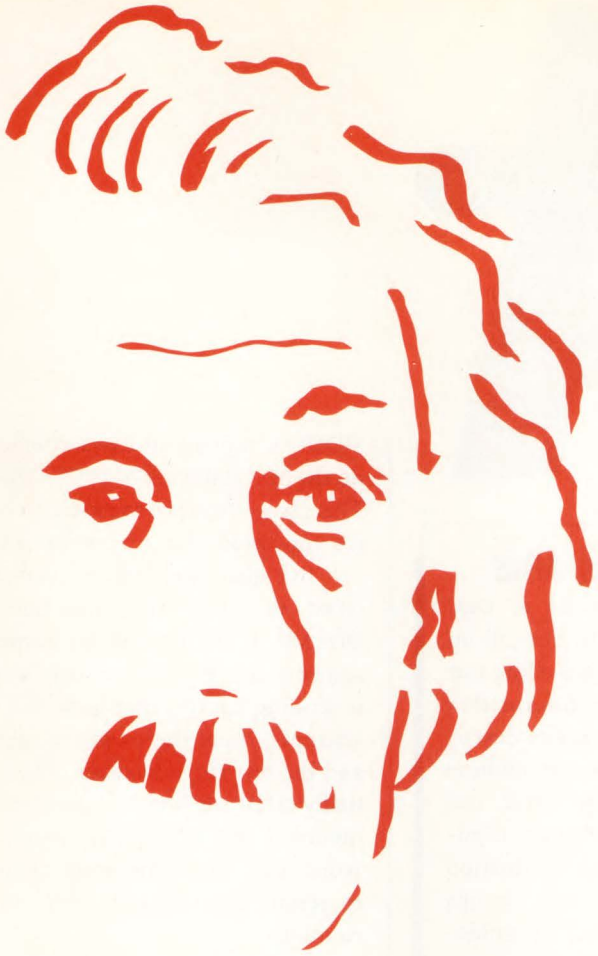
The only change I made was to use a different logical variable. Instead of using SYS$LOGIN, which is only good for that particular account, I used the logical variable SYS$LOGIN in its place. After changing that and checking that the protection was as mentioned in the letter, the system-wide login executed in all user accounts.

Melissa M. Walker
Gull Incorporated
Smithtown, New York

JUST IN TIME

The July issue of *DEC PROFESSIONAL* arrived the same week as our Ethernet hardware. We found the article "Notes From An EtherVet" by Bill Hancock very timely! Several of Mr. Hancock's suggestions were adopted for our installation. Thanks for another informative article.

Joy Veronneau
Coordinator of Academic Computing
Saint Michael's College
Winooski, Vermont ■



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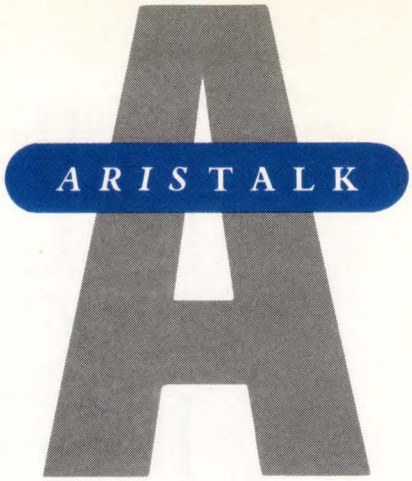


MOVEMENT ON STATIC LINES

QUERY:

Jim Hobbs (SIG 11/MESS 66): I'm trying to define a static async dialup DECNET line. I've successfully implemented static asynch (point-to-point) lines, and the dynamic asynch lines. The stat asynch dialup line has a problem though. The terminal must be set to /MODEM on a previous command before the SET-TERM/PROTO=DDCMP command.

While "booting," the system itself will not enable the DTR signal to modems until it finishes (end of SYSTARTUP).

But by that time, NETACP controls the port and the system can't raise DTR. If I log onto the system, stop and clear the line, CIR-set the terminal to PROTO=NONE, then PROTO=DDCMP, and restart the line and CIR, then all is well. Anyone solved this problem?

REPLIES:

Jamie Hanrahan (SIG 11/MESS 67): Change the line in your SYSTARTUP.COM that reads:

```
$ @SYS$MANAGER:STARTNET
```

to:

```
$ SUBMIT/NOPRINT SYS$MANAGER:
    STARTNET
$ PURGE SYS$MANAGER:
    STARTNET.LOG/KEEP=2
```

This way, DECNET won't get around to seizing the terminal until after system startup is finished.

How To Use ARIS

If you're a subscriber to *DEC PROFESSIONAL*, you can call up our VAX and log into ARIS, our **A**utomated **R**eader **I**nformation **S**ervice. In ARIS, you can download programs from our publications, communicate with our editors, request a change of address, find additional information about advertisers, order books and back issues, check the guidelines for submitting articles, access our cumulative index, take a peek at our editorial calendar for the year, and communicate with other DEC users.

To log in, you'll need your subscriber number (it's on your mailing label). Then, just set your terminal to seven data bits, one stop bit and space parity, or eight data bits, one stop bit and no parity, and dial (215) 542-9458. Baud rates: 300, 1200 or 2400.

Thanks for posting this! We were having a similar problem with line speeds on our async DECNET lines. Your message helped us figure out what was going on.

Lawrence Bleau (SIG 11/MESS 176): Jim, I have a VAX 11/750 connected to a MICROVAX II via static async DECNET lines. Both are running VMS V4.4 or higher. I understand your problem, because I also had the same problem. The fix was to SET TERM/PERM/MODEM, wait about five seconds, then do the SET TERM/PERM/PROT=DDCMP. This gives VMS time to raise DTR before it's converted into a network device.

I've also modified my LOADNET.COM to check that the line isn't DDCMP. If it isn't and it's owned by someone (i.e., the other system is up and is sending packets that look like login attempts), then the owner is STOPped and the test is made again. This eventually clears the line, because it can't be owned if SET TERM/PERM is going to work at all. The change also allows me to restart the network while VMS is running.

THE POWER OF PASCAL

QUERY:

***Bill Hall** (SIG 45/MESS 49):* Anyone out there using MicroPower PASCAL? I'd like to find someone who's experienced in it and can answer questions, exchange hints, etc.

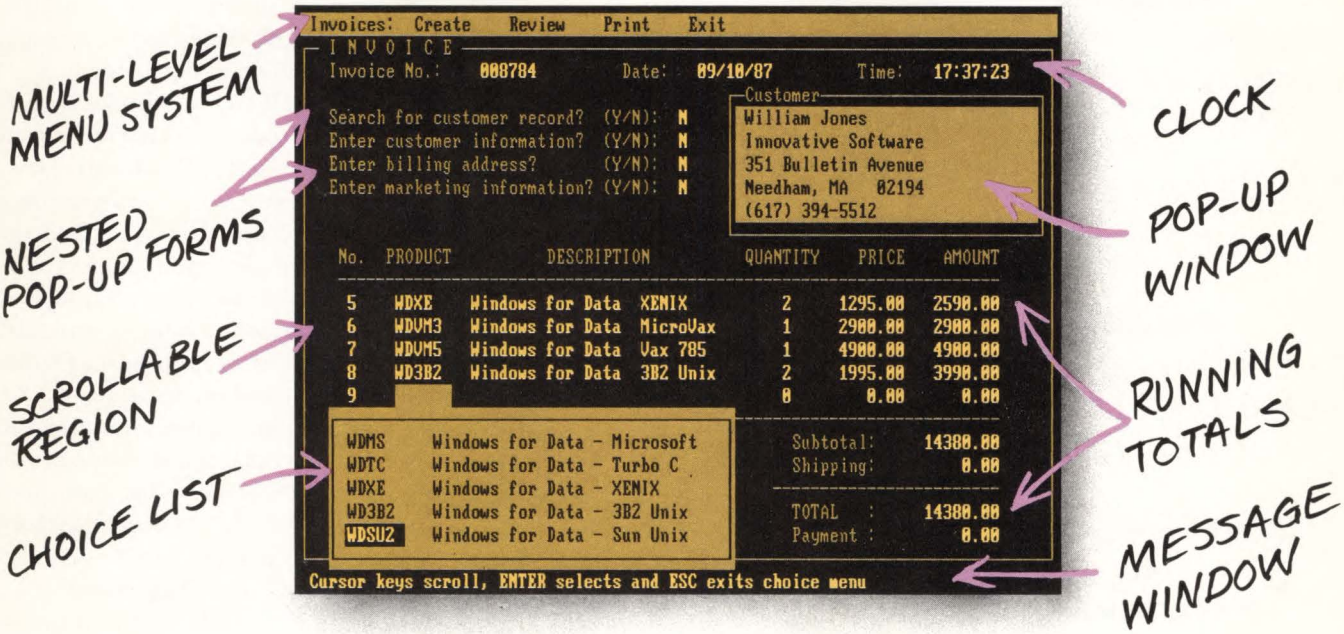
REPLIES:

***Dean W. Anneser** (SIG 45/MESS 50):* Bill, I've recently started using MicroPower for front-end processor applications (KXT11-CA, and soon to have KXJ11-CA). I'd love to open up a dialogue with anyone out there to exchange war stories, hints, kinks, etc.

***John T. Davies III** (SIG 45/MESS 77):* How about some MicroPower users submitting their hints and kinks to the DAARC SIG Newsletter? Dean, how

WINDOWS FOR DATA®

Uncommon Screens



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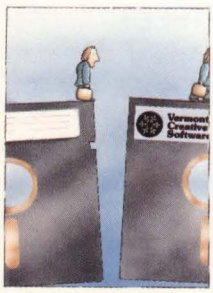

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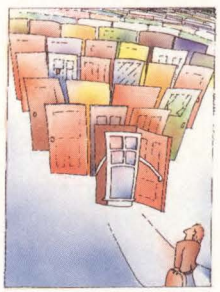

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about writing up how you use KEX as a system job while compiling? I've used this since you told me about it at DECUS San Fransisco and couldn't live without it. I've ordered more memory so that I can run two copies of KEX concurrently for complex editing.

Dean W. Anneser *(SIG 45/MESS 78):* John, good to hear from you. Running KEX as a system job has saved much time for me also. I, too, sometimes have two sessions running.

Sadly, MicroPower on the KXT11-CA for real-time applications hasn't met our needs. The host system is running a real-time control and data acquisition task. Using the KXT11-CA/MicroPower for a front-end processor (for serial data at 9600 baud) on two channels won't work. Basically, I wrote processes to handle one channel and made two invocations of these processes for each channel (SLU2A and SLU2B). The context switching kills it; one channel works fine. The solution will be to try the same application on a KXJ11-CA or rewrite it in pure MACRO-11.

The second application I had in mind for the KXT was a frequency interface. I had to measure an interpulse interval using its internal clock to provide the 2MHz time base. However, the hardware on this beast is oriented toward counting a number of pulses over a fixed interval rather than counting the interval over a fixed number of pulses (two). Accomplishing the latter requires processor interaction to move the time value out of the counter/timer registers at each interval.

Running a MicroPower application to perform this task was a joke (using the timer read functions); 30 Hz was the max before it locked up. I'm going to write this application in MACRO-11. I feel confident that the working loop can be reduced to a workable number of instructions, so that even a 7MHz processor can keep up with it.

In conclusion, using KXT11-CAs with MicroPower to improve the performance of a real-time system should be limited to running the non-real-time components of the host system. That is, reduce the amount of level-four code to process interrupts for, say, screen displays, etc., load these tasks on the KXT and let them run as fast as they can. You could use the KXT for some of the real-time components, but to achieve the same performance gains, it would have to be done in pure code.

Using MicroPower is nice because it's quick to code, but it's not the greatest for execution speed. The design philosophy I'm going to use is to parcel out the non-real-time components to the KXT, where the application can be coded quick-and-dirty in MicroPower, and let it run as fast as it can. Basically, I'll use the KXT as a coprocessor rather than a front-end processor.

I hope this experience is useful to someone. I came across a number of bugs in MicroPower that have been passed on to DEC. Perhaps they'll be corrected in a future version. Cheers!

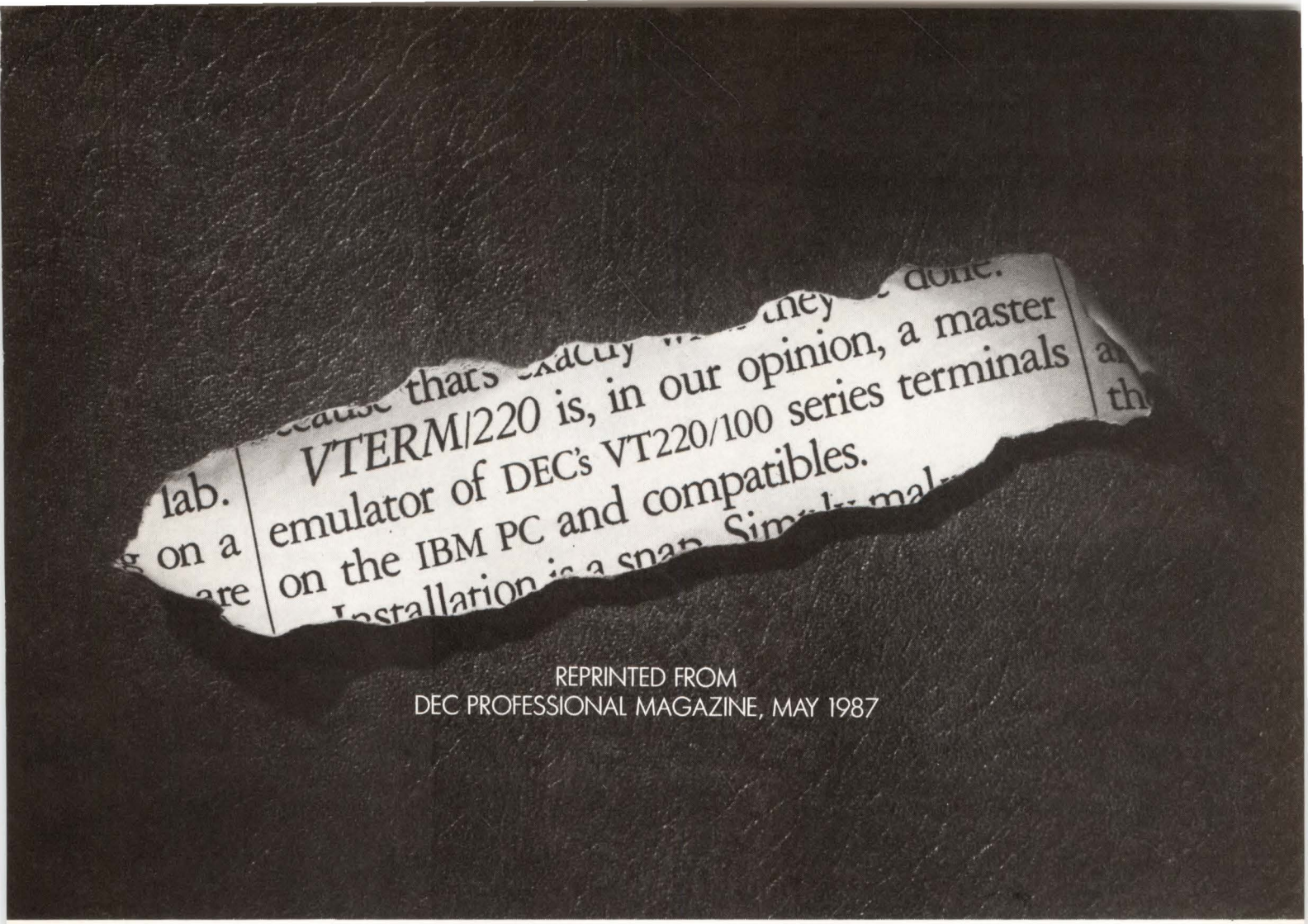
Mike Felerski and Doug Newell *(SIG 45/MESS 164):* Bill, we at Adaptive Micro-Ware have been heavy into MPP in the last two years in the area of automation. We've spent a lot of time on the phone with DEC, etc. It's good to see that there are others out there who use MPP and would like to talk! Our biggest problem is instruction space and the lack of it. We're looking for ways to crunch code. Any tips you could drop us would be great!

THE EARTH MOVES UNDER MY FEET

Southern California, Oct 1, 1987

Steve Thomas *(SIG 12/MESS 144):* Does anybody know whether DEC equipment is earthquake resistant? Has DEC ever done any tests? What about that tall, heavy SA-482? Would that end up on its face?

Just mildly curious. I thought of this in bed this morning (about 7:44 a.m.). ■



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PRODUCT WATCH

MICROVAX II Image Processing Software Simplifies Analysis, Filtering And Plotting

DT/IDL *Is A Command-Driven Software Package With 250 Functions*

DT/IDL, a MICROVAX II image processing software package, from Data Translation, provides easy access to 250 frame grabbing, image analysis, filtering and plotting functions for image processing applications in science, medical diagnosis and engineering.

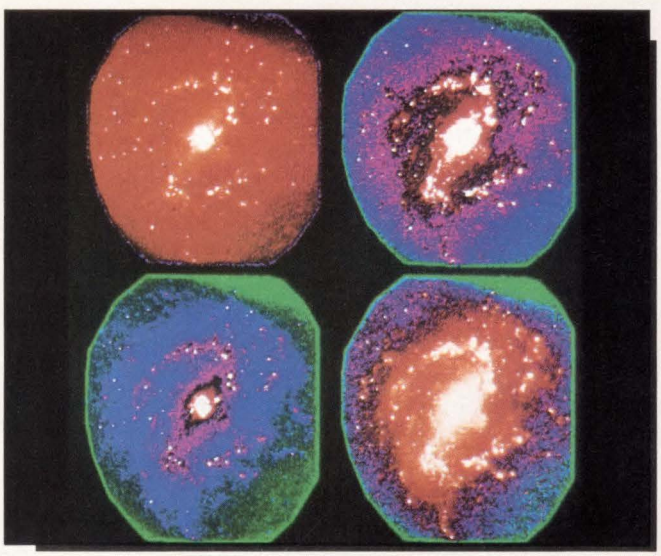
To reduce the complexity often associated with image processing, *DT/IDL* features an interactive data language. The English-language commands and syntax are easy to learn, flexible and eliminate the need for a knowledge of advanced mathematics, algorithm development and programming.

DT/IDL contains an interactive compiler that executes commands as they are typed in response to the IDL> prompt. Immediate response to typed commands allows users to review resulting data at each step of analysis.

Constants and variables are the building blocks used by *DT/IDL* to produce results. During the execution of an interactive session or of a program, numbers, strings or arrays can be stored as variables and used in future computations. *DT/IDL* supports variables containing a scalar, vector or multi-dimensional array of any size. Variables can be used to store images, spectra, single quantities and names.

DT/IDL commands allow users to acquire images into a MICROVAX II with video sources such as video cameras or VCRs, or with Computerized-Axial-Tomography (CAT) scanners and Scanning Electron Microscopes (SEMs). Once captured, images can be processed using combinations of *DT/IDL* commands. The following is a partial list available:

1. Convolution — for constructing filters that enhance edges or remove noise from an image.



Gray scale transformation. Clockwise from top left: original image of galaxy; histogram equalized; elements less than 50 percent of transformed image's maximum; logarithmically transformed image.

2. FFT—fast Fourier transform for performing frequency domain analysis and processing.

3. Histogram — for analyzing and adjusting gray scale values in an image.

4. Median Filter — for smoothing images and eliminating salt and pepper noise.

5. Warp, Rotate, Translate or Register — for changing an image's orientation or for correcting geometric distortion.

6. Thin — for reducing an image to skeletal lines reflecting its shape.

7. Zoom — for magnifying areas in an image.

8. Plot — for generating graphs, contours and 3-D perspectives.

The software package is versatile. Its facility for grouping commands into short, powerful programs allows programmers to tailor procedures for acquiring, processing and displaying images.

The graphics output procedures produce quality plots from a simple command. The commands provide for general plotting, contouring and perspective plotting. They are flexible

and can be modified by users to create titles, label axes, set colors, display a cursor or report minimum and maximum values. Other features include axis annotation, multiple graphs per second, logarithmic scaling, automatic and manual scaling and interactive cursor control.

Using *DT/IDL*'s interactive data language, users can build on the power of existing *DT/IDL* commands by grouping them together into small programs. Users can create new commands using the interactive data language or write new function routines in any language supported by the VAX Calling Standard for addition to *DT/IDL*.

The *DT/IDL* list price is $3,750. For more information, contact Data Translation Inc., 100 Locke Dr., Marlboro, MA 01752; (617) 481-3700.

Enter 471 on reader card

—Suzanne Garr

Megatek Employs Custom VLSI Technology In Powerful Graphics Terminals

Graphics Display Systems Burst With A Palette Of More Than 16.7 Million Colors

The 9100 and 9300 graphic display systems from United Telecom's Megatek Corporation use custom VLSI circuitry to increase processing speeds and add capabilities while reducing size and cost. The 9000 series provides a cost-effective solution for those users who don't require complete workstations but want local graphics capability while maintaining a centralized, host computer-to-terminal environment.

The 80386-based terminals permit VAX host downloading of geometric information for local graphics processing. The graphics display system provides local control of peripherals and local programming, thus freeing the VAX host for other processing needs.

The 9100 terminal provides 3-D graphics display with a processing speed of 200,000 fully transformed vectors per second. Users can select up to 256 colors from a palette of 16.7 million. Objects or areas can be enhanced with polygon fill and line patterns, and blinking highlights can be used to identify and differentiate entities. Additional features include depth cueing, X,Y and Z axis clipping, orthographic and true perspective transforms and backface testing for hidden surface removal.

The 9100 is aimed at Command, Control, Communication and Intelligence (C3I), simulation, military training, mapping, technical data analysis, MCAE/MCAD, process control, and general engineering and scientific applications.

The 9300 is an advanced 3-D surface rendering graphics display system that provides 20,000 fully transformed, smooth-shaded polygons per second. The terminal is capable of real-time object manipulation (i.e., can rotate a shaded object) and supports a 100,000 vector per second operation. Surface patterns, textures and meshes all are programmable. Object viewing in 3-D is further enhanced by the choice of flat, Gouraud or Phong shading and a movable light source.

The 9100 and 9300 systems employ 60 Hz non-interlaced 1280 by 1024 raster scan displays.

Up to 4,096 colors can be chosen from a palette more than 16.7 million. Users of the 9300 can enter control points or dots and have the terminal draw the resulting lines and surfaces. The 9300 is suitable for military training, simulation, molecular modeling, MCAE/MCAD and general scientific applications due to its real-time computing speed.

Both of the 9000 terminals support full VT100 emulation for VAX usage, and compatibility with a variety of joysticks, valuators, tablets, printers and large-screen projectors. Both are capable of 32-bit floating point data precision and real-time interactive manipulation of complex objects. Dual buffering of both the graphics and overlay planes allows dynamic updating without visible redraw.

The 9100 and 9300 systems employ 60Hz non-interlaced 1280 by 1024 raster scan displays and have a 1-MB hierarchical display list, expandable to 8 MB. Local terminal capabilities include display list editing, task programming and processing and various setup and configuration functions. The 9100 graphics display system has an entry price of $24,500; the 9300 from $35,000.

For more information, contact Megatek Corp., 9645 Scranton Rd., San Diego, CA 92121; (619) 455-5590.

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—Ron Levine

System Design Automation Begins With *STATEMATE*

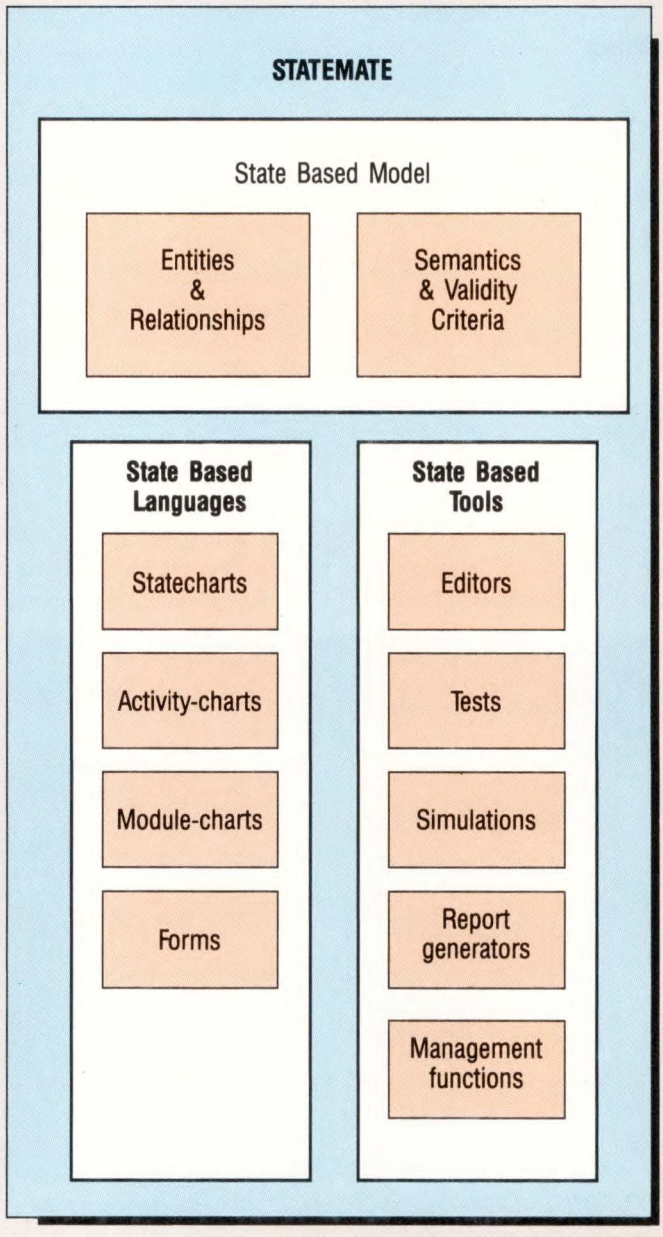
Integrated Tool Set Helps Project Teams Specify, Design And Implement Reactive Real-Time Systems

STATEMATE is, a workstation-based, graphics environment for the analyst, designer and engineer of complex, reactive systems including real-time, embedded systems. It is intended to support the entire life cycle of such systems, from the intitial requirements phase to usage and maintenance.

The *STATEMATE* from i-Logix Inc. supercedes computer-aided-software-engineering (CASE) tools by producing a computer-executable specification that you can exercise and observe in simulated operation on the terminal display. Specification errors, one of the most troublesome and costly aspects of system development, are eliminated early in the development process with *STATEMATE*.

According to Peter A. Chiasson, president of i-Logix, "The benefits of *STATEMATE* go directly to the issues of software quality and reliability." The *STATEMATE* system is an integrated toolset that helps project teams to specify, design and implement reactive, real-time systems as well as to document and maintain them.

The principle underlying *STATEMATE* is the need to view a reactive system from three different but related views. The behavioral view identifies all of the system's states of behavior and the conditions and events causing transitions between them. The functional view identifies the system's activities and processes, the data stores, and the information and control items flowing among them and between them and the environment. The structural view identifies the system's actual modules used in implementation, environmental subsystems and the information and control channel between components.



The structure of **STATEMATE.**

The system is packaged in two modules, *STATEMATE* Kernel and *STATEMATE* Analyzer. The module Kernel includes the following graphics languages and editors:

1. Statecharts Language for specifying the behavior of the system to be designed.
2. Activity-chart Language for describing and decomposing system functions and data-flows.
3. Module-charts Language for defining the architectural components of a system.

The Kernel also provides utilities for consistency and completeness testing, database manipulation, report generation and project administration.

The Analyzer module is the advanced test and analysis package. With it the user can run the system model in a user-defined environment and observe the behavior of the system. The package includes the Simulation Control Language for creating scenarios in which to exercise the specification. Also, it provides a Dynamic Reachability Test to determine the possibility of specific behaviors occurring.

The *STATEMATE* Kernel lists for $10,000 per standalone workstation. The *STATEMATE* Analyzer lists for $25,000 per standalone workstation. For more information, contact i-Logix Inc., 22 Third Ave., Burlington, MA 01803; (617) 272-8090.

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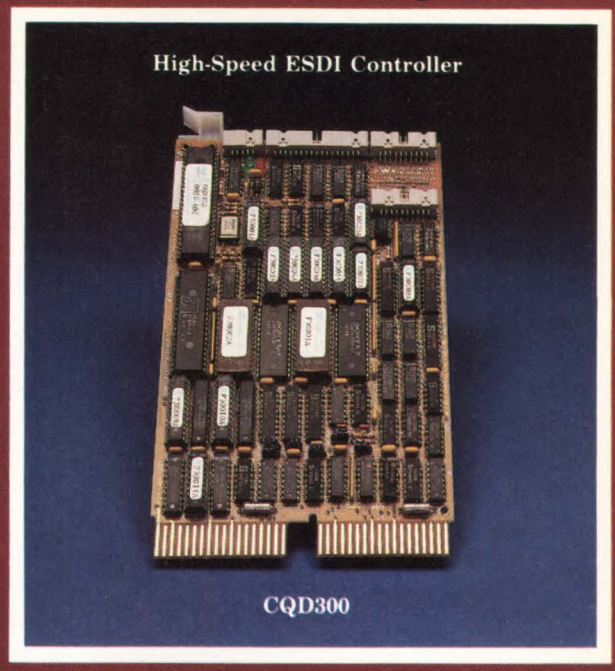

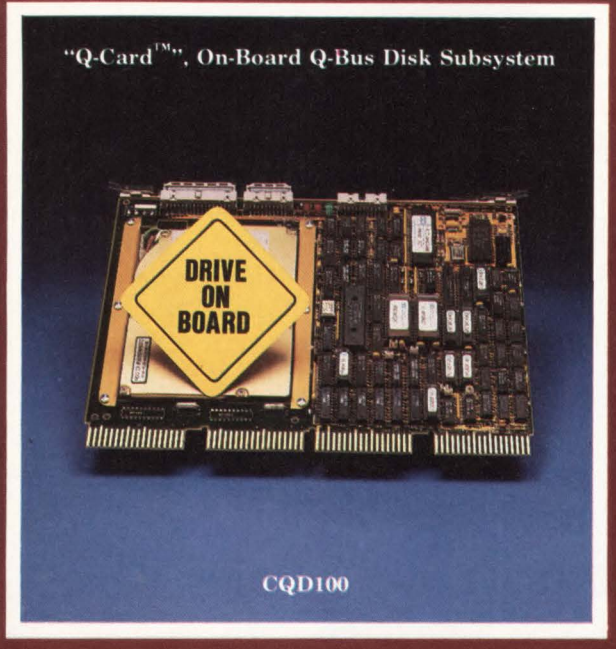

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EDS III Provides The User With The Graphics Editing Flexibility Of *GDS II*

The Integration Of Designer Control And Flexibility With Automation Is The Foundation For EDS III

GE Calma Company is offering an IC design system to extend power flexibility and automation of the *GDS II* environment. A fully compatible extension of *GDS II*, *EDS III* combines a user-friendly graphics editor with automatic routing and spacing on industry standard hardware platforms. The system also provides design management tools, and communications software to link existing *GDS II* data to the new environment.

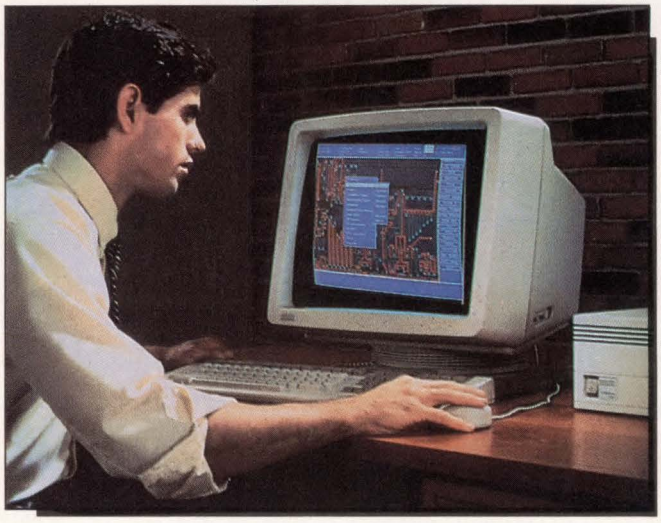
According to Bruce Gregory, senior vice president, "*EDS III* gives IC logic and mask designers a new freedom of choice by running on Sun, DEC and Apollo workstations. Furthermore, it provides the graphics editing and design flexibility of *GDS II* with advanced automation capabilities and an easy-to-learn, customized user interface.

"*EDS III* is linked directly to the *GDS II* database so that semiconductor manufacturers can preserve their investment. At the same time they gain powerful design management tools, cell- and block-based design capabilities and a modern graphics editor, all on industry standard platforms," continues Gregory.

According to David Hightower, GE Calma's manager of Advanced IC Systems Development, "First, IC development occurs in a distributed, heterogeneous computer environment and second, the IC engineer or logic designer plays an increasing role in chip layout." The foundation of *EDS III* is a design management system providing any user access to *EDS III* or *GDS II* data from any point on the network.

Communications software determines where data is located, freeing the user to consider IC design, rather than the details of operating systems and file transfer routines. For instance, a structure resident in the Data General-based *GDS II* environment can be accessed by a logic designer working on a Sun-based *EDS III* workstation. In addition, *EDS III* design management capabilities also provide database routines to track design changes, control database security and develop management reports. As a result, any change made on a particular design will be reflected throughout the system, keeping all members of the team abreast of project status.

Written in C, *EDS III* is available for most industry standard platforms, and its portability ensures easy integration onto next generation hardware. The *EDS III* environment is de-coupled from hardware. As a result, users easily can integrate new modules from GE Calma, other EDA software vendors or user-developed programs into *EDS III*. The user also can take advantage of database access routines and modify the *EDS III* database to accommodate specific requirements.



Developed with direction from current *GDS II* users, the *EDS III* Editor is written in C with the graphics portion isolated to achieve portability without sacrificing speed. The screen is organized into four regions. *EDS III* windowing capability allows the user to perform several tasks simultaneously. During a structure editing session, a word processing window may be opened for documentation, or another editing session may be started.

Also, when a structure is edited, the user is prompted for a comment and the user's name, date and comment are stored with the structure to provide a history of what was done to the structures for a project.

The *EDS III* Block Manager permits the user to route any rectilinear block automatically, whether it's a standard or macro cell, compiled module or a structure from a previous design. However, the user has complete flexibility in routing critical signals, such as power and ground, prior to automatic routing. This ensures control over circuit performance and appearance. A range of routing options is available, including feed through and stub routing. Block Manager also features automatic standard cell placement using a knowledge-based rules system that places cells in much the same way a skilled IC designer would.

The *EDS III* Editor lists for $20,000. The Block Manager lists for $50,000. For more information, contact GE Calma Co., 501 Sycamore Dr., Milpitas, CA 95035; (408) 434-4000.

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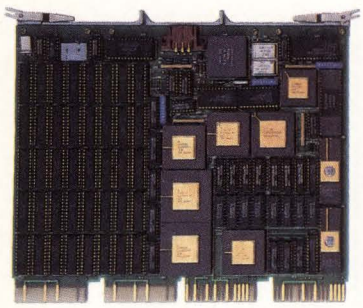

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Connecting The Channels Of Communication From Micro-To-Mainframe

PC-Style Communications Package For Minicomputers

The distinction between minicomputers and personal computers is disappearing with the upward movement of 386 micros and the downward movement of minis such as the MICROVAX 2000, encouraging PC resellers to target users of larger systems.

With *BLAST II*, from Communications Research Group, VAX users can enjoy easy-to-use, low-cost utility software similar to PC products, with PC-like features such as simple menus and scripts for automated unattended routines or repetitive tasks.

VAX *BLAST II* lets users on VT terminals use the VAX as if it were a personal computer. It allows a VAX to become an asynchronous communications server for terminal users. Modems and dedicated lines attached to the VAX to call up other computer systems may be shared among users.

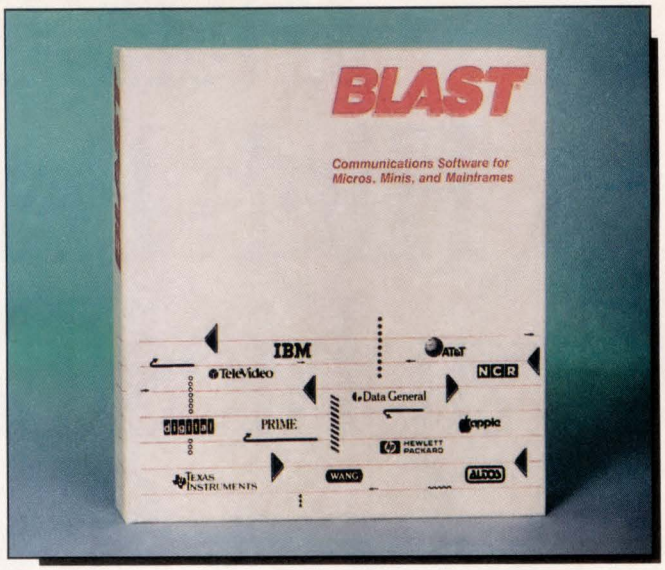
When using the VAX server as a terminal, the user can log onto the other computer, send and receive text files by uploading and downloading to a text editor. VAX *BLAST II* communicates with other *BLAST* versions for 29 different operating systems and more than 100 computer architectures including PCs and Macintosh systems.

For more sophisticated applications, VAX *BLAST II* uses dial-up networking as either a lower cost alternative to DECNET, or a complementary part of an existing network to automate linking systems and transferring information.

The following is a sample of VAX *BLAST II* uses:

1. Remote data access and management functions.
2. Scheduling functions, accessing remote systems in any sequence to perform unattended tasks.
3. Gathering transactions from branch locations using PC, XENIX or mini systems.
4. Order entry and billing.
5. Updating field price lists and parts inventories.
6. Electronic document exchange between different types of systems or from branch offices to headquarters.
7. Supporting remote systems with new software versions and updates.
8. Automating process control, manufacturing process or other tasks.

VAX *BLAST II* includes the BLASTScript programming language which is oriented to communication functions and increases programmer productivity in designing system-to-system information exchange. This



software product lets VAXs talk to PCs or other computers and control the session by dialing out, logging on, accessing and manipulating files, executing commands and transferring data error-free. Users quickly can create foolproof, easy-to-follow menus for novices using BLASTScript programming language for PCs or VAXs to perform:

1. Conditional checking.
2. Pass status information between processes.
3. Create menus and control other screen management functions.
4. Perform local file management.
5. Read and write to data files.
6. Perform string functions.
7. Search for and send specific commands to the other computer.
9. Do all this and more entirely unattended.

Users familiar with the basics of programming can create custom scripts for the VAX. The sample script below demonstrates how simple and English-like BLASTScript is:

```
.START
Connect
IF NOT OK GOTO .START
Filetransfer
Get
Prices.txt
to
Esc
Disconnect
Quit
```

BLAST works on any VAX or PC and uses standard RS-232 connections, regular dial-up phone lines, and any asynchronous modems, including new high-speed modems. VAX *BLAST II* runs on any VAX with VMS release 4.4 or greater.

BLAST II prices for different VAX models are as follows: MICROVAX 2000, $495; MICROVAX, $695; VAX 11xxx series, $995; VAX 8xxx series, $1,295. For more information, contact Communications Research Group, 5615 Corporate Blvd., Baton Rouge, LA 70808; (504) 923-0888.

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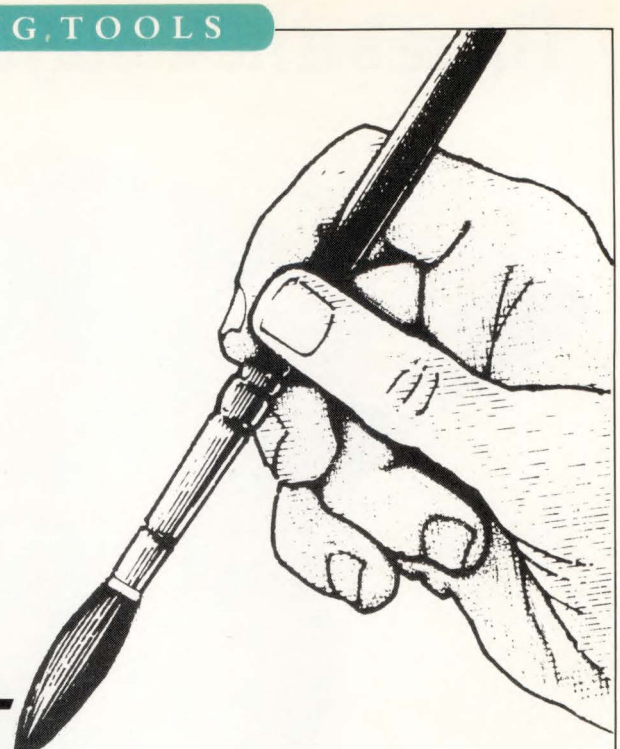

The Art Of Programming

HINTS for doing it better. BY CHARLES CONNELL

PROGRAMMING TOOLS include language-sensitive editors, planning and scheduling systems, source code control packages, symbolic debuggers and performance analyzers. Although these tools certainly are valuable, perhaps even indispensable, the actual content of a program — its lines of code — remains the most significant factor in determining software quality.

Programs that are easy to read are easy to debug. Programs that are akin to a can of Franco-American are difficult to debug, even when subjected to the greatest source code system and best debugger. Subroutines with well-planned interfaces will be useful for years. Subroutines with illogical interfaces always will be difficult to use and in constant need of revision.

High-quality software builds quickly as its subroutines are created and linked together. It's relatively bug-free at each stage of development and is easy to modify as changes are required. It also is easy to extend when users request new features and is relatively error-free as it runs and meets user's needs for many years.

But how do you create such software? Saying that software should have such-and-such qualities is of little use without a road map to get there. Most

programming tools help you write code more rapidly (and compile and test it), but they don't help you write *better* code. No one yet has found a way to automate that process.

Similarly, we don't propose a magic method for laying down good code. However, there is a set of general programming principles that helps create high-quality software. These principles are useful for all kinds of software from accounting applications to device drivers, and they work for programmers at all levels from the first semester college student to the senior operating system engineer.

Find A Simple Algorithm — Simplicity is the most important element in software design. Simple programs are finished quickly because the programmer's job is easy; they have relatively few bugs because there are few things to go wrong. Simple programs are easy to maintain because other people can read them, and they probably run quickly because they contain a small number of instructions.

What, though, is simplicity? How do you know it when you see it? Simple means *simple*. Software should be easily readable by anyone familiar with the programming language. It should be easy for another programmer to pick up your software and debug it or add a new feature. A good test for software simplicity is whether the program is understandable by a programmer junior to yourself. If not, it's probably not very simple.

Simple code is hard to write. Given a moderate amount of programming experience, most people can write a complex program to solve a complex problem; it's much harder to write a simple program for a complex problem. As we think about a piece of software, the solutions that come to mind usually are complicated. It takes a lot of work and constant revision of ideas to arrive at a simple and elegant solution.

A GOOD test for software simplicity is whether the program is understandable by a programmer junior to yourself. If not, it's probably not very simple.

One objection raised against simplicity is that some problems, usually including the one being worked on by the person raising the objection, are complex by nature. The code that deals with these problems is complicated because, it's asserted, the problems themselves are complicated. It's true that there are many complex problems, but a guiding principle of good software is that every problem has a simple, elegant solution.

Sometimes, schedule deadlines and our own limitations don't allow us to find a simple solution for every problem. But the simple solutions probably are there, and the more often we find them, the better our software will be.

Make The Program Fast Before You Write It — Efficiency of execution is an important goal of software development. If a program runs too slowly, users become frustrated and stop using it. If a slow program is running on a timesharing operating system, as many do, inefficient code can drag down response time for all the users (not a way to win friends).

I once was part of a software development effort that taught me a valuable lesson about creating efficient software. We were designing a relational database query system.

The front end of the program asked the user to pose a database query, and the main section of our code accessed the data and displayed it on the terminal. We knew speed would be an important factor in this program. The users would be asking many queries of a large database and wanted the answers within a few seconds.

As we wrote our program, we spent hours making our code as compact as possible. We studied the system manuals to find the fastest method for I/O. We optimized the disk organization. We wrote important routines in assembly language. We reviewed each other's programs, looking for ways to save steps. When we finally were finished and tested our creation, it performed horribly. Why?

Our code was efficient, but our overall design was awful. For each query the user posed, we generated a custom subprogram to search the database. We then compiled, linked and executed that subprogram. There was no way we could do this quickly; compilation, linking and image activation just take too long. We had a lousy design and none of our fast code could rectify that.

The lesson learned — make the program fast before you write it. Think through the design, then think it through again. Favor CPU use over I/O. Favor a large block I/O over many small ones. Favor index searches over record scanning. Watch out for loops within loops within loops; the inner code may get executed a phenomenal number of times. Avoid operations the computer does poorly.

Don't be afraid to challenge a design. Our design example may seem to have been patently stupid (and it was), but it's amazing how many programming projects use equally foolish methods.

A corollary lesson: Unless you're very sure the routine you're writing is extremely critical to the program's operation, don't waste time shaving microseconds off the instructions. You'll spend more time rewriting three instructions into two than the program

ever will save as it runs. Rather than spending a week tweaking the code, spend that week thinking through the efficiency of the design before you start coding.

The Comments Are More Important Than The Code — On the face of it, this is a false statement. Comment lines are never executed, so they do no useful work. There also are many working programs that have no comments at all, so how can comments be crucial?

There's another way to look at it, however. Comments state what a program is *supposed* to do. Well thought out comments are more likely to be correct than source code. Comments capture the goal of a program or subroutine and the intention of each section of code within a module. Source language instructions, however, are an attempt to implement the comments. Instructions have errors when they fail to encode the ideas stated in the comments.

The goal of programming, under this view, is to successfully write code that matches the comments. This may sound backwards, but it's a valuable approach to programming. The next time you write a program or subroutine, write all the comments first. Write a paragraph at the top explaining what the module will do, then write another short paragraph stating what the first five or six lines of the program will do. If there are files to open and data to initialize, explain this and state why you're doing it (see Figure 1).

Add more paragraphs, each one describing an operation that the program must perform to accomplish its task. This is harder than it sounds. It forces a programmer to really think through what he wants to do. As the comment sections are developed, you can spot logic bugs and correct them (see Figure 2).

After all the comments have been written, fill in code under each paragraph, code that does what the comments say it will. Although implementing the comments still may be difficult at times, you can have faith in your overall approach. Then you can concentrate on accomplishing what the comment says. Bugs at this stage probably will be coding bugs rather than logic bugs and are easy to fix (see Figure 3).

This approach breaks a programming job into two phases: getting the logic right and then using the source language to encode the logic. Try it, you might like it.

Figure 1.

```
$ !
$ ! Command procedure to count the number of words in a file.
$ ! A word is defined as any contiquous sequence of characters
$ ! that does not contain a space or tab.
$ !
$ ! Get the name of the file that the user wants to count.
$ !
$ ! Open the file for read access.
$ !
```

Start by writing the program or subroutine header and the comments for the first few operations.

Figure 2.

```
$ !
$ ! Command procedure to count the number of words in a file.
$ ! A word is defined as any contiquous sequence of characters
$ ! that does not contain a space or tab.
$ !
$ ! Get the name of the file that the user wants to count.
$ !
$ ! Open the file for read access.
$ !
$ ! Initialize the counter for the number of words.
$ !
$ ! Get a line from the file.  If we are at the end of the
$ ! file, go to the final part of this procedure.
$ !
$ ! Remove all multiple spaces and tabs from the line.
$ !
$ ! Check to see if the line is empty.  If it is, get the
$ ! next line.
$ !
$ ! If we get here, the line is not empty.
$ ! Remove each word from the line and count them.
$ !
$ ! Go back and get another line from the file.
$ !
$ ! We get here when we have read every line in the file.
$ ! Tell the user how many words are in the file.
$ !
$ ! Close the file and exit.
$ !
```

Write all the comments, each one describing what a few lines of code will do.

Code Defensively — One of the guidelines for safe driving is to drive defensively, to anticipate possible wrong moves by the other guy. A guideline for writing software is to code defensively.

While writing a program, it's easy to become caught up in the excitement of all the things the software will do right. You think about how fast it will run, how it will complete a key part of the total system and how much your fellow programmers will like it. Just as with safe driving, however, it's important to pay attention to what can go wrong. By anticipating problems, you can reduce them.

Ways to apply defensive coding include:

1. Assume your code will receive the

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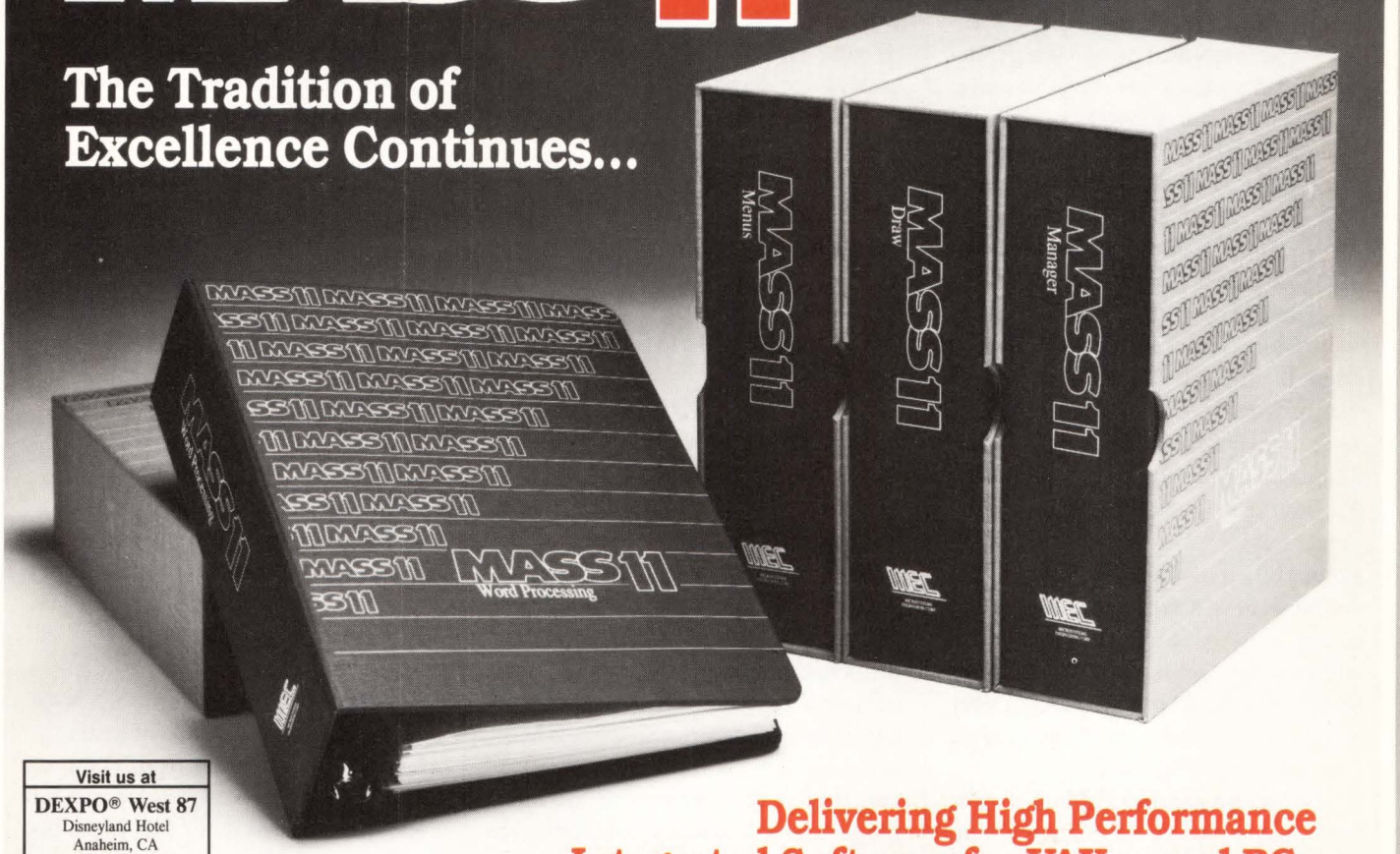

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worst possible input. Check both user input to programs and data passed into subroutines for validity. A common bug occurs when you assume that a subroutine will receive positive integer input, and then discover six months later that the subroutine passed a negative value. Similarly, it's a mistake to assume that the user will enter a digit in a screen field even when he is prompted to do so; your program may bomb when someone enters a letter.

Check every input and exit gracefully with a meaningful error message when the input isn't correct. It takes a few machine cycles to do this, but it saves the embarrassment of a stack dump during a sales call a year later.

2. Assume that each change you make introduces a bug. When you add a feature to a new program, assume that you must have done something wrong. Create tests for that feature, run them and look for problems. There may not be any bugs in your code, but it's safer to assume there are errors than to hope you did everything right.

When you're maintaining a program and trying to fix a known bug, assume that your first attempt isn't good enough. Test your fix rigorously before moving on. If a large section of code works perfectly the first time and passes all your tests, be suspicious and keep looking for bugs.

As a corollary, assume you're incapable of making two changes at once. Do one thing at a time, then try hard to find what's wrong with it.

3. Test boundary conditions. Almost any input can be used to test a program or subroutine, and any given input may turn up a problem. But what kinds of tests are most likely to reveal bugs? Most programs fail when attempting to process data at the extremes of the input range. These boundary conditions are the place to start testing.

Some examples:

A program reads an ASCII file and translates it to a typesetting language. Everything works fine until the program is given an empty file. With this kind of input, the program writes a typesetting file that prints gibberish.

A spreadsheet program allows the user to go into calculator mode and perform any short calculations he wishes. When the user types "5 + -0" the spreadsheet freezes.

A statistical analysis package reads all the records in a file and computes the average value of a certain field. This process takes approximately one second for every 1,000 records in the file. When the input file has 1,000,000 records, however, the program works all night (instead of the expected 17 minutes) and never returns an answer.

When designing software tests, imagine the extremes of every input parameter and write tests for them. Test the program with the biggest numbers, largest files and at the fastest input rate. Then test it with the smallest numbers, empty files and slowest input. When you're testing a subroutine, the same idea can be used. Give the subroutine the most unusual input you can think of. Also, try giving it extra input parameters or too few.

Most software works well with average input; if it didn't, the programmer would have seen it right away. Testing boundary conditions, on the other hand, can disclose bugs that may not have surfaced for months.

> IF A large section of code works perfectly the first time and passes all your tests, be suspicious and keep looking for bugs.

Figure 3.

```
$ !
$ ! Get the name of the file that the user wants to count.
$ !
$ file_name = p1
$ IF file_name .EQS. "" THEN INQUIRE file_name "Please enter file name"
$ !
$ ! Open the file for read access.
$ !
$ ON CONTROL_Y THEN GOTO user_interrupt
$ OPEN/READ/SHARE/ERROR=cannot_open  file_var  'file_name
$ !
$ ! Initialize the counter for the number of words.
$ !
$ words = 0
$ !
$ ! Get a line from the file.  If we are at the end of the
$ ! file, go to the final part of this procedure.
$ !
get_a_line:
$ READ/END_OF_FILE=end_of_file/ERROR=cannot_read file_var line
$ !
$ ! Remove all multiple spaces and tabs from the line.
$ !
$ line := 'line
$ !
$ ! Check to see if the line is empty.  If it is, get the
$ ! next line.
$ !
$ IF F$LENGTH(line) .EQS. 0 THEN GOTO get_a_line
$ !
```

Fill in code under each comment. Each section of code should be just a few lines.

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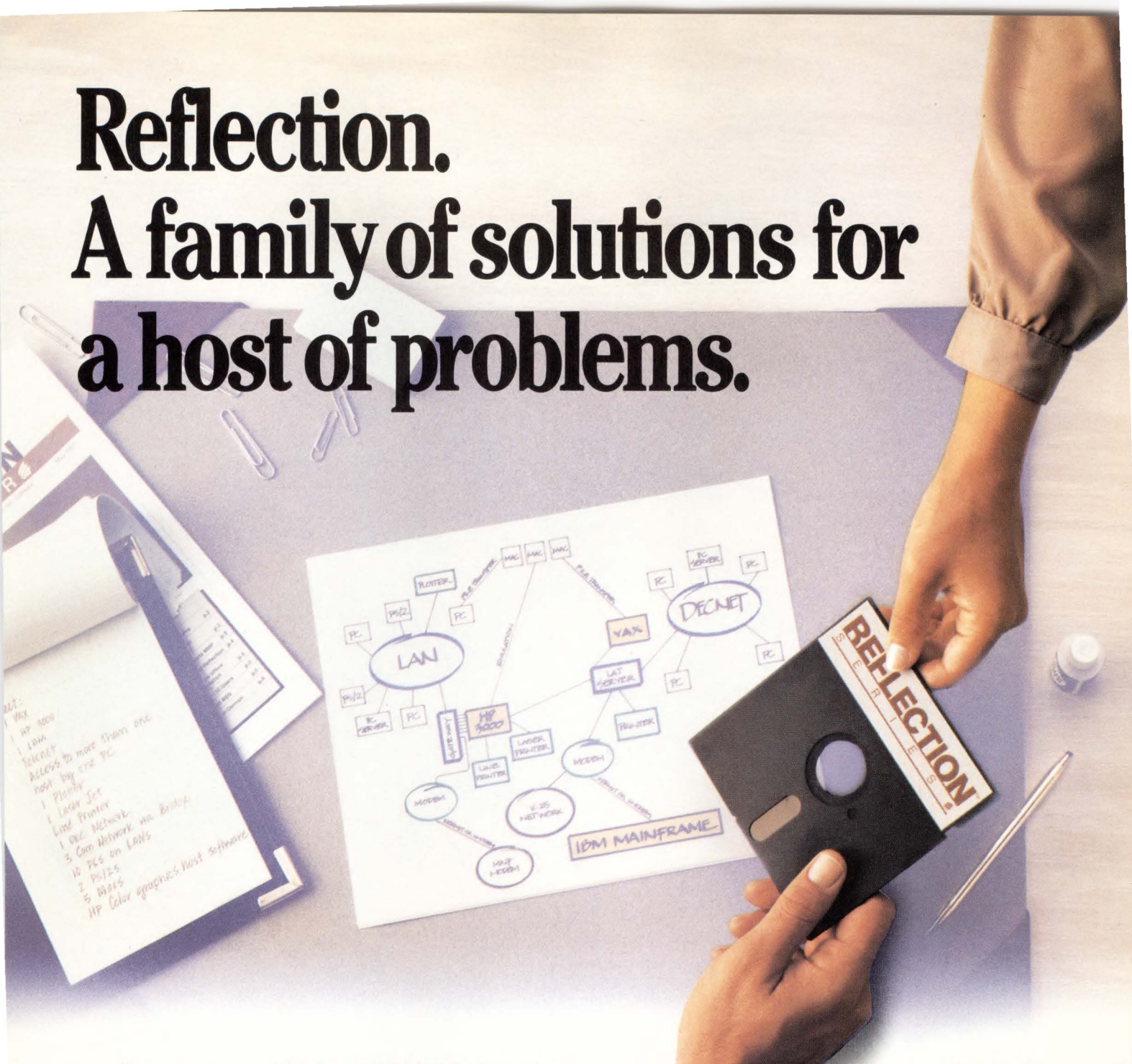

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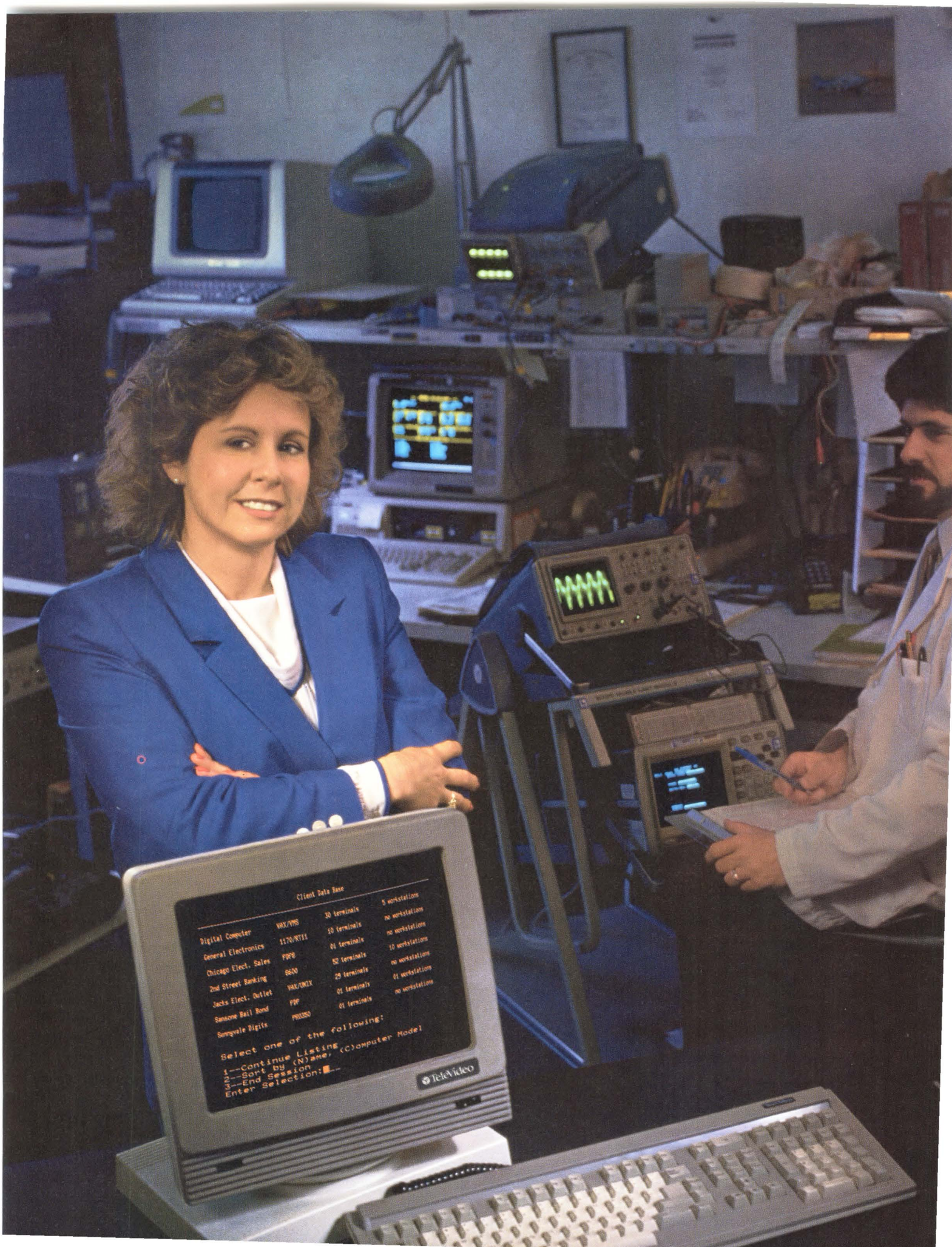
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Digital Computer VAX/VMS 30 terminals 5 workstations
General Electronics 1170/RT11 10 terminals no workstations
Chicago Elect. Sales PDP8 01 terminals no workstations
2nd Street Banking 8650 52 terminals 10 workstations
Jacks Elect. Outlet VAX/UNIX 29 terminals no workstations
Sansone Bail Bond PDP 01 terminals 01 workstations
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3--End Session
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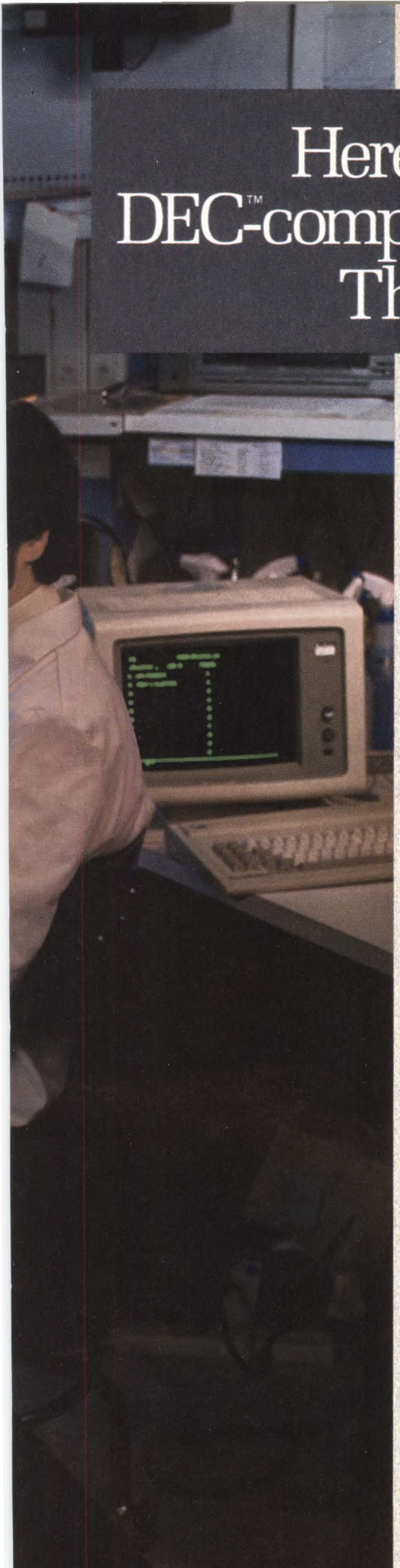

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Tools And Tips For Software Development

How 3M solved development problems in a large environment.

BY JOHN BREDESEN AND RANDALL NEWCOMB

PROBLEMS ENCOUNTERED when managing software development in a very large, distributed environment aren't different from those encountered in a shop with only one processor. However, in a large environment, the problems are accelerated, duplicated and amplified. Instead of having maybe 10 angry users, you have hundreds, and instead of having one system that won't boot, you have 40.

This article discusses some problems the Engineering Division of 3M Company of St. Paul, Minnesota, addressed when developing software in a VAX/VMS distributed data processing (DDP) environment. Our solution, the Software Development System (SDS), will be explained and evaluated.

Engineering Information Systems (EIS), an MIS organization supporting Engineering, currently provides computing resources for both business and technical computing environments. This article only will be concerned with development that occurs in the business applications area, though a similar approach is used in technical computing. Although some software is purchased, most is produced within EIS. Contractors and outside consultants are used extensively. There are two groups within EIS that are responsible for maintaining these resources: Development is responsible for all in-house code, and Technical Services is responsible for the hardware and software environment.

The hardware environment in Engineering (see Figure 1) consists of several VAXCLUSTERS connected to an Ethernet. Most departments have their own MICROVAXs also tied to the Ethernet. Digital terminal servers and Micom communication gear are used to access the VAXs.

All VAXs run VMS and DECNET. Full *Rdb* is running on all VAXCLUSTERS and Remote *Rdb* runs on the departmental VAXs. All databases reside on the central VAXCLUSTERS. An internally written product, BALLGAME, provides simple task-to-task communication between processes on the same or different nodes. Most applications are written using a server/client concept with BALLGAME as the communications path.

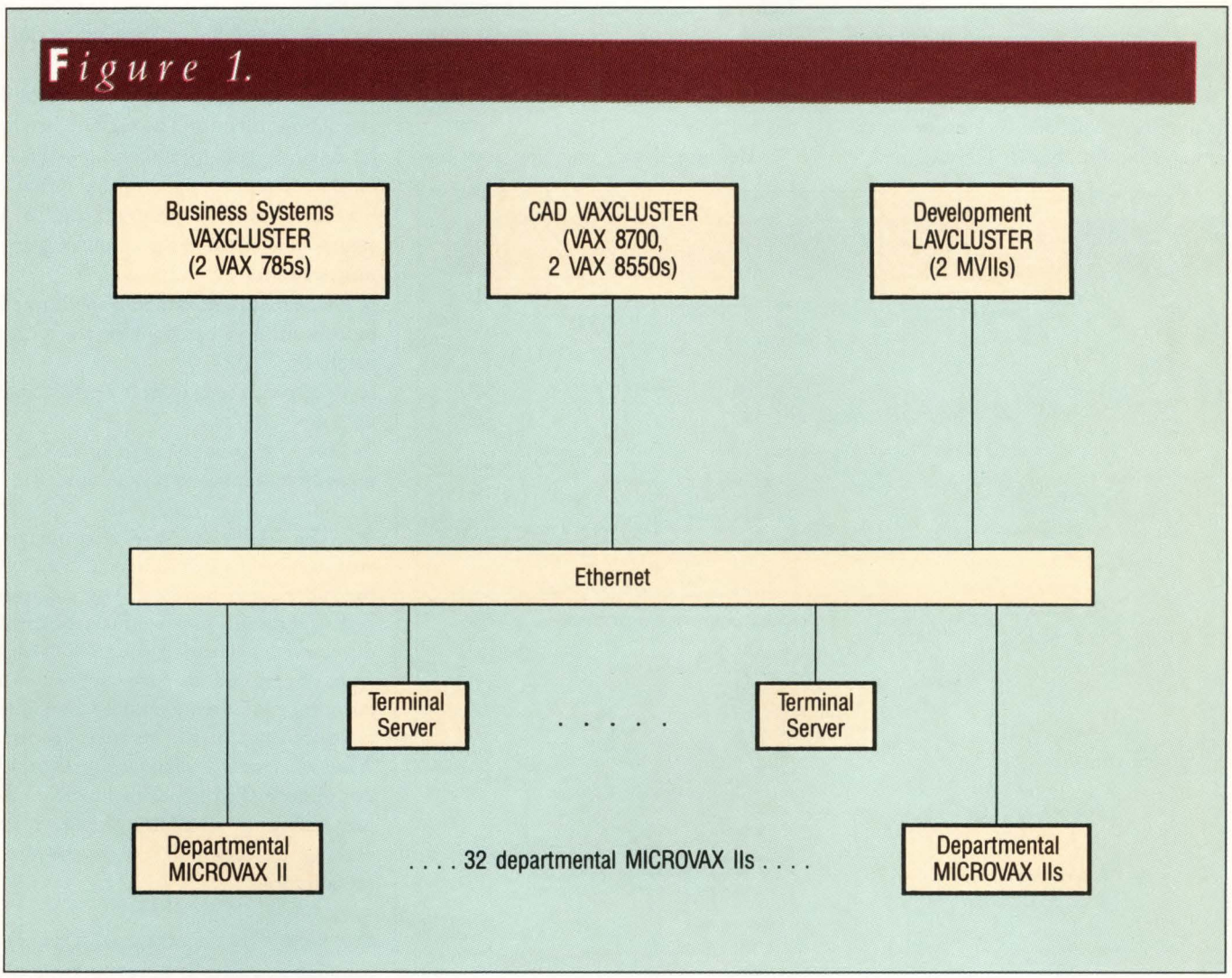
TWO YEARS AGO, we used the production VAXs for development. For production we had two standalone VAX 11/785s each with two disks, 13 VAX 11/725s each with three disks, and 100 PRO-350s. The specification writers used a DEC System 20 for documentation. The user accounts were divided between the two 11/785s. Many people also had accounts on an 11/725. In addition, there was a plethora of generic accounts with well known passwords. Most user accounts were in the same group. The developer's user identification code (UIC) group assignments were made on the basis of employer. Consultants from Digital were in one group, contractors from a different employer in another group, 3M employees in another, etc.

Because users tended to hurt themselves when they had access to DCL (e.g., STOP/ID = 0, DELETE *.*;*, "I didn't know what the file was used for so I deleted it," etc.), all applications were executed within command procedures that ran under *ALL-IN-1*. There was no database system available. Common files between all systems were referenced through hard-coded names with the DECNET node as part of the name. Other files were cloned between all systems. When a file moved, source code had to be changed.

The 11/725s were configured with one disk as the system disk; the other two disks were for the users. All application software was placed on the system disk. As the system disk became full, Technical Services would delete VMS' unused files.

The machine that the user logged

Figure 1.



EIS hardware configuration.

into depended on what software he needed to run. Decisions for machine, device and directory locations for new software were made on a somewhat random basis. They were based on:

1. Where the user's account was located.
2. How full a particular disk was.
3. How many top level directories already had been created.
4. What other software the new application depended upon.
5. How busy a given system had been during the previous month, week, day or hour.
6. Any other information that could facilitate or inhibit the decision making process; i.e., upcoming holidays, phase of the moon, etc.

Developers wrote and maintained source code either in personal directories or in directories under generic accounts. If developers needed to modify an existing program, they first would have to find the files. Because developers were never given privileges, they would need to have someone with privileges, such as the system manager, look for the files. After they were located, the privileged user would set WORLD READ access on the files so the developers could copy them into their personal directory. Programs that had been worked on by several people could have multiple copies of source files in various directories. Code rarely was documented.

After the developer modified the files, they were copied either back to their original location or the new distribution was made from the developer's personal directory. All distributions were made with the developer sitting beside a member of the Technical Services staff telling him what commands to enter in order to copy, install and test the software. Command procedures seldom were used for installing software.

Because device and directory assignments were arbitrary, it was possible for every release of a program to be in a different location without the previous version being deleted. When a system was rebooted, we never were sure what version of a program, if any, would be installed. Because programs depended on a particular location or protection of file, a program might work on the development machine but fail in the production environment.

AS WE IDENTIFIED our problems, we realized that we needed the following:

1. A way to reference files regardless of their machine, device or directory location.
2. Source code to be organized without being tied to a particular individual.
3. Software to be documented for use by future generations of developers during software modifications.
4. Established methods of building and rebuilding software. The method had to be flexible enough to handle projects ranging from a single source module loan amortization program up to a 100,000-line engineering resource planning system.
5. Software installation to be performed by submitting a batch job on the target machine.
6. Production code to have a predictable location.
7. Software to be tested in an environment that simulated production.

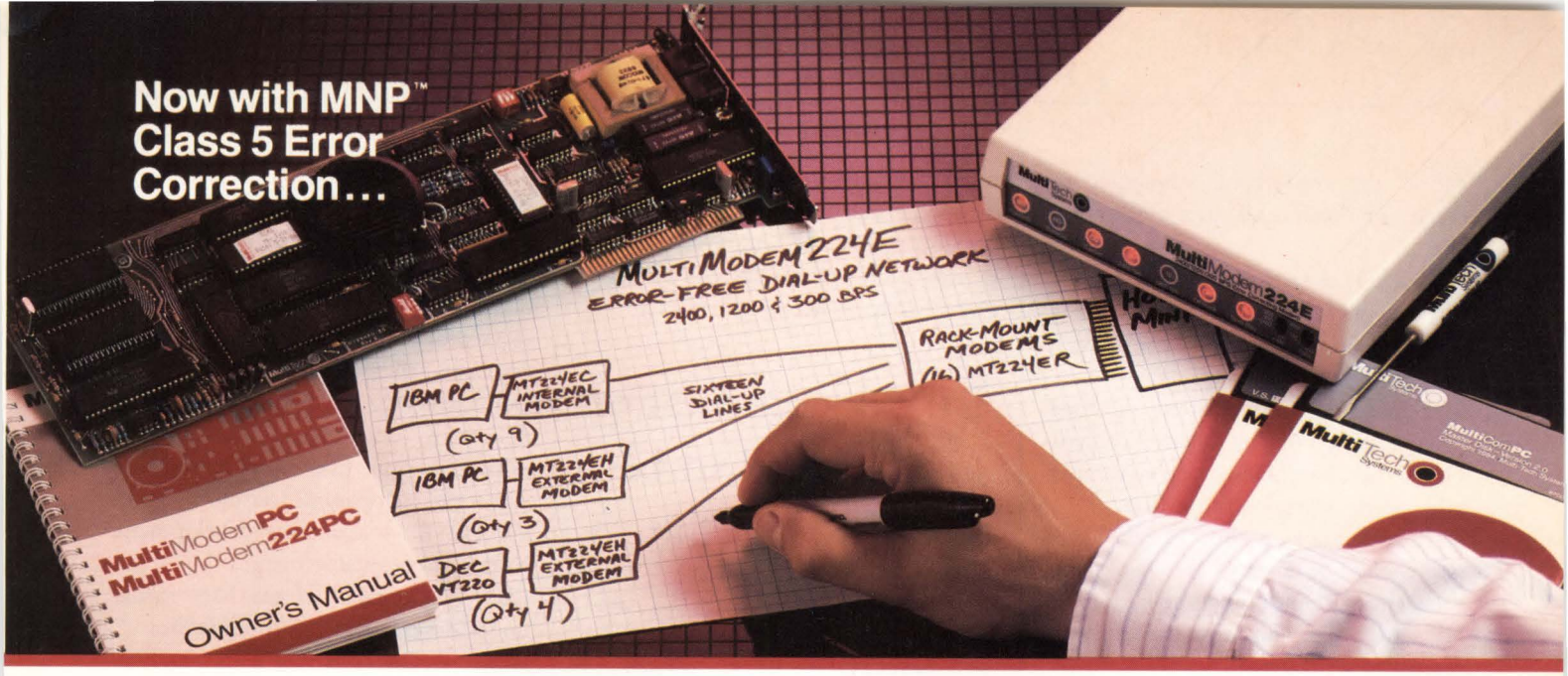
The developers had become accustomed to the freedom (read anarchy) the old system fostered. The solution had to diminish the tedious aspects of development (locating source files and trying to rebuild the software), yet still encourage standard methods to become a natural part of the creative process. Also, whatever solution we found could not impede the development cycle because slipping schedules already were making us unpopular with the user community.

THE SOLUTION TO OUR PROBLEMS was found in consistently applying the tools that VMS either makes available or

Figure 2.

```
$                                       !Work on project FOO
$CP FOO                                 !Default is now CPJ$SOURCE
$                                       !Note that CPJ$SOURCE is
$                                       !PROJECT$DISK:[PROJECTS.FOO.SOURCE]
$                                       !Turn on privs to define a
$SET PROC/PRIV=SYSNAM                   !SYSTEM EXECUTIVE mode logical name
$REMOTE SET PROC/PRIV=SYSNAM            !Do it for the remote node also
$DEFINE/SYSTEM/EXEC FOO$DATABASE NEW:[DB]FILE          !Define or redefine
$                                                      !a logical name
$REMOTE DEFINE/SYSTEM/EXEC FOO$DATABASE NEW:[DB]FILE   !Do it for the
$                                                      !remote node also
$CMS RESERVE FOO.BAS "Make changes"     !Get a source module out of CMS
$LSE FOO.BAS                            !library and make changes
$FBLD FOO.EXE                           !FBLD brings up form to prompt for
$                                       !parameters. FBLD assumes that
$                                       !FOO.EXE belongs in FOO$EXECUTE:
$CP XYZ                                 !Now work on project XYZ while
$                                       !FOO.EXE is being rebuilt
$                                       !The default is now XYZ$SOURCE
$                                       !Note that CPJ$SOURCE is
$                                       !PROJECT$DISK:[PROJECTS.XYZ.SOURCE]
$LSE CPJ$SOURCE:XYZ_PROGRAM_1.FOR       !Create source
$                                       !System notifies user that FOO.EXE
$TYPE FOO$TEMP:FOO.LOG                  !has built, type log file
$LSE CPJ$SOURCE:XYZ_PROGRAM_2.FOR       !Create more source
$                                       !Now build entire XYZ system,
$                                       !XYZ_SYSTEM is an MMS target
$                                       !that will build XYZ_PROGRAM_1.EXE
$RBLD XYZ_SYSTEM                        !and XYZ_PROGRAM_2.EXE
$RUN FOO$EXECUTE:FOO                    !Test FOO while XYZ is building
$                                       !We're satisfied with the changes
$CP FOO                                 !Go back to FOO project
$CMS REPLACE FOO.BAS "Changes made and tested"         !and replace in the
$                                                      !CMS library
$                                       !Notification of XYZ_SYSTEM build
$CP XYZ                                 !completed. Go back to XYZ project
$DTM RUN XYZ_TESTS                      !DTM runs extensive tests on all XYZ
$                                       !programs
$                                       !
$                                       !(and so on...)
$                                       !
```

An example of an interactive SDS session.



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allows the resourceful developer to create. The tools and their application are:

1. Use logical names rather than explicit file references in programs. Devise a prefix that associates logical names with the software using them.
2. Generate rights identifiers and have project files owned by those identifiers. Grant the identifier to each developer who needs access to those files.
3. Provide hooks within the editor that will encourage developers to document their code. Require documentation on how to build and distribute a new release of a program.
4. Use Digital's Code Management System (CMS) and Module Management System (MMS) to control source code revisions and rebuilding of software.
5. Have the developer write a command procedure that will handle installing the software. Require that the procedures work both with brand new installations and with updates to existing software.
6. Define a rooted directory logical:

```
DEFINE/SYS/EXE/TRAN = (CONC,TERM)
  PROD$APPLICDUA4:[PRODAPPLIC.]
```

Place production code in a subdirectory using a different directory for each application. For example, all the files for projects FOO go in PROD$APPLIC:[FOO], and all the files for project XYZ go in PROD$APPLIC:[XYZ], etc.

7. Dedicate one computer strictly for testing software and distribution procedures before the project is released into production. This would be configured (hardware and software) similar to the other production machines, but wouldn't have any users on it.

Software Development System

To realize this solution, we created SDS, made up of three parts:

1. A development environment that's consistent.

Currently we have more than 24 developers using two clustered MICROVAX IIs for software development. One MVII is used by interactive users for editing and debugging, and the other is used for compiling and linking through batch queues. The compilers (BASIC, FORTRAN and PASCAL) are licensed solely on the BATCH machine. Only batch or network processes are allowed on BATCH. This means that interactive users aren't fighting compiles and links for CPU time and vice versa.

> THE documentation is assumed to be named as the source file name, an underscore and the source file extension.

We designed SDS procedures to make it not only easy but appealing for programmers to adhere to development standards. The goal is to provide consistent ways to refer to files and build applications regardless of the application being developed.

2. A set of standards and procedures used to function in the environment.

All projects are under the [PROJECTS] top level directory on PROJECT$DISK:, now a logical list because the number and size of projects exceed the capacity of one RA81. The subdirectories under the [PROJECTS] directory use the project acronyms, e.g., [PROJECTS.FOO], [PROJECTS.XYZ]. Here's a list of the subdirectories under each project:

CMS — (CMS library) Contains all source code, command procedures and FMS forms necessary to build the project.

COMMAND — Contains all command procedures used by the project. This includes .COM, .MMS, .OPT, .RDO and .DTR files.

DATA — Contains data files and databases unique to this project.

DISTRIBUTE — Contains files used to distribute this application to production as well as the actual files to be distributed. These files may be in a saveset for a large application with many associated files.

DOCUMENT — Contains the design document, functional specification and documentation files currently under development or modification.

EXECUTE — Contains development copies of executable images.

FMS — Contains all the FMS forms under development or modification.

HELP — Contains any help text files under development or modification.

LIBRARY — Contains any object, FMS, help or other type of libraries required by the application. In practice, this seldom is used because MMS' handling of libraries is somewhat cumbersome.

OBJECT — Contains output from compilers and assemblers.

SOURCE — Contains any source code under development or modification. After modifications are complete, the source code is replaced in the CMS library.

TEMP — Contains files that may be deleted at any time (scratch area).

TEST — (DEC/Test library) Contains all tests that make up development and quality assurance testing.

3. Tools to encourage and enforce adherence to standards. We employ the following products and tools within SDS:

CDD — DEC's Common Data Dictionary. This provides a location for a project's common data structures. Database layouts also are contained in the CDD so that modules that reference a database can be kept synchronized if the database structure changes.

CMS — Digital's Code Management System. All source code necessary to build the software must reside in a CMS library. Supporting command procedures (installation, startup, shutdown, etc.) are also kept in the library.

MMS — Digital's Module Management System. It is like the UNIX MAKE util-

ity. The entire software system can be built using MMS. The MMS description file for the system is stored in the COMMAND subdirectory of the project in DESCRIP.MMS. MMS determines which parts of the software system need to be rebuilt including portions that are dependent on structures in the CDD. MMS is used by FBLD and RBLD described below.

DTM — Digital's DEC/Test Manager. This provides automated regression testing to ensure that new features or fixes don't break functions that were working. DTM even can be used to test installation and removal procedures.

Editors — Using the LSE and TPU editors, many of the standards required by SDS can be enforced easily. These editors may be used with an EDT emulation interface or a separate editor, EVE. Note: Because the compilers are licensed only on the BATCH machine, COMPILE inside LSE actually creates and submits a command procedure to a special batch queue on the BATCH machine.

In addition to numerous custom-programming features, SDS offers the following enhancements to the editors:

- Source Code Boilerplate — This provides a standard format for module description, authorship, system dependencies, revisions, etc. LSE provides this automatically and TPU has been set up to include these boilerplates as desired.
- Documentation Boilerplate — When a file is edited, the editor will check the current project's documentation subdirectory for documentation associated with the module. The documentation is assumed to be named as the source file name, an underscore and the source file extension. For example, documentation for the source code file TEMP.FOR will be stored in TEMP_FOR.TXT.
- GOLD-D — This shifts the programmer to the module documentation buffer. The developer easily can move back and forth between the source code and the documentation file.
- GOLD-M — This shifts the programmer back to the main buffer.

```
Randall Newcomb—Consultant                                    26-AUG-87

                    SUBMIT A BATCH JOB TO BUILD A TARGET

PROJECT = FOO

TARGET NAME:        FOO$EXECUTE:FOO.EXE
MMS_DESCRIPTOR:     CPJ$COMMAND:DESCRIP.MMS

MARFLAGS:           /NOLIST/OBJECT=CPJ$OBJECT:$(MMS$TARGET __NAME)
FFLAGS:             /NOLIST/OBJECT=CPJ$OBJECT:$(MMS$TARGET __NAME)
BASFLAGS:           /NOLIST/OBJECT=CPJ$OBJECT:$(MMS$TARGET __NAME)/WARN=NOINFO
RBAFLAGS:           /NOLIST
RFOFLAGS:           /NOLIST
LINKFLAGS:          /NOMAP/NOTRACE/EXE=CPJ$OBJECT:$(MMS$TARGET__NAME)
MMS FLAGS:          /SKIP
LOG FILE:           FOO$TEMP:FOO.LOG

CDD:                CDD$TOP.PROJECTS.FOO

QUE NAME:           SLOW
TIME TO RUN:


Press <RETURN> to submit job. Press <EXIT SCREEN> to abort.
Press <TAB> and <BACKSPACE> to move between fields. Press <PF2> for HELP.
```

Screen 1: Parameters are entered through an FMS form using a DCL callable interface.

- GOLD-E — This is used to access the SDS examples library. This library contains sample program algorithms and syntax. Commonly used subroutines may be copied easily into the new source.

Build procedures — There are two commands available, FBLD and RBLD, to build an application. EIS wrote these command procedures to accept various parameters and build a command procedure that's submitted to a batch queue running on the BATCH machine. The command procedures run MMS to build the target application. A log file is generated in the project's TEMP directory. The file name is the same as the target being built and an extension of .LOG. Unless directed otherwise, these routines assume that the .OBJ files go in the OBJECT directory and .EXE files belong in the EXECUTE directory, etc.

Using FBLD, defined as FBLD :== "@SDS$COMMAND:FBLD", parameters are entered through an FMS form (see Screen 1) using a DCL callable interface. It generally is used to change qualifiers on the compilers, the linker and MMS. FBLD also gives the developer control of the queue to use, the log file name and the time the job is to be started. The developer also may specify targets from different projects as well as non-default descriptor files and common data dictionary locations.

RBLD, defined as RBLD :== "@SDS$COMMAND:RBLD", is virtually identical to FBLD except that the procedure doesn't prompt for the qualifiers. Rather, RBLD uses the current value of the qualifiers. This procedure will take a target name as a parameter. RBLD particularly is useful after FBLD has been invoked once, because the developer

doesn't have to wait for the screen to paint the FMS form.

REMOTE — This provides a convenient method of working on another network node. It is based on a set of command procedures from DECUS tapes. EIS has made some significant enhancements to adapt it to the SDS environment. Interactive logins are not allowed on the BATCH machine; therefore, logical name changes either must be made by writing a command procedure and submitting it to run on the BATCH machine or by using the REMOTE command.

REMOTE assumes the developer wants to talk to the BATCH machine, but it may be redirected to talk to any node on the network through a logical name REMOTE$NODE. The session with the remote node is active until either a REMOTE LOGOFF command is issued or the interactive user logs off.

NP - The New Project command, defined as NP := = @SDS$COMMAND: CREATE_PROJECT.COM, is used to set up projects on the development system. The command procedure will ask for a one- to six-letter project acronym, a 30-character project description and the name of the person in charge of the project. The procedure will then:

1. Create a rights identifier of the form xxx_DEV to be associated with this project (for example: FOO_DEV for project FOO). This identifier is created with the RESOURCE attribute.
2. Allocate disk quota for the rights identifier. Disk usage is charged against the rights identifier's quota rather than the developer's disk quota because the identifier has the resource attribute.
3. Grant the rights identifier to the project leader's account.
4. Create a CDD entry "CDD$TOP.PROJECTS.xxx".
5. Create a subdirectory [PROJECTS.xxx].
6. Create the standard subdirectories under the [PROJECTS.xxx] directory ([PROJECTS.xxx.SOURCE], [PROJECTS.xxx.OBJECT], etc.).
7. Place PROJECT_LOGICALS.COM in the COMMAND subdirectory. Initially it contains only an assignment of CDD$DEFAULT to "CDD$TOP.PROJECTS.xxx" but it may be modified to do any setup required by the developers).
8. Place xxx.COM in the DISTRIBUTE subdirectory. It contains a boilerplate of a standard distribution command procedure.

THE command procedure will ask for a one- to six-letter project acronym, a 30-character project description and . . .

All directories and files are owned by the identifier associated with that project.

CP — The Change Project command, defined as CP := = @SDS$COMMAND: CHANGE_PROJECT.COM, is used to go to a particular project on the development system. It is invoked as $ CP FOO where FOO is the name of the project. The CP command will do the following:

1. Validate that the project exists.
2. Define logicals of the form xxx$yyyyyy where xxx is the project acronym and yyyyyy is a subdirectory in the project (e.g., FOO$SOURCE).
3. Define logicals of the form CPJ$yyyyyy where CPJ stands for "current project" and yyyyyy is a subdirectory in the project (ex. CPJ$SOURCE). This was set up for convenience because no matter what the current project is, the source files always can be seen by typing "DIR CPJ$SOURCE".
4. Set the CMS library to CPJ$CMS.
5. Execute the PROJECT_LOGICALS.COM file to perform any additional setup that the developer needs. This file usually sets up logicals pointing to databases, defines DCL symbols and also may contain a SET PROMPT command so the DCL prompt reflects which project is currently being accessed.

Figure 2 shows a sample of what a session using SDS might look like.

THE SDS ENVIRONMENT has been in place the since fourth quarter of 1986 and has worked very well for us. We were able to add DEC/Test Manager very easily when we purchased it this past summer. We have created boilerplates, or templates, for documentation and installation procedures so that they can be generated easily for each project. New developers quickly learn the system and become productive in a shorter time than under the old system. Additionally, our estimates for the time required to develop a project have become more accurate, because SDS eliminates the old gotchas of lost source files and the inability to rebuild a program.

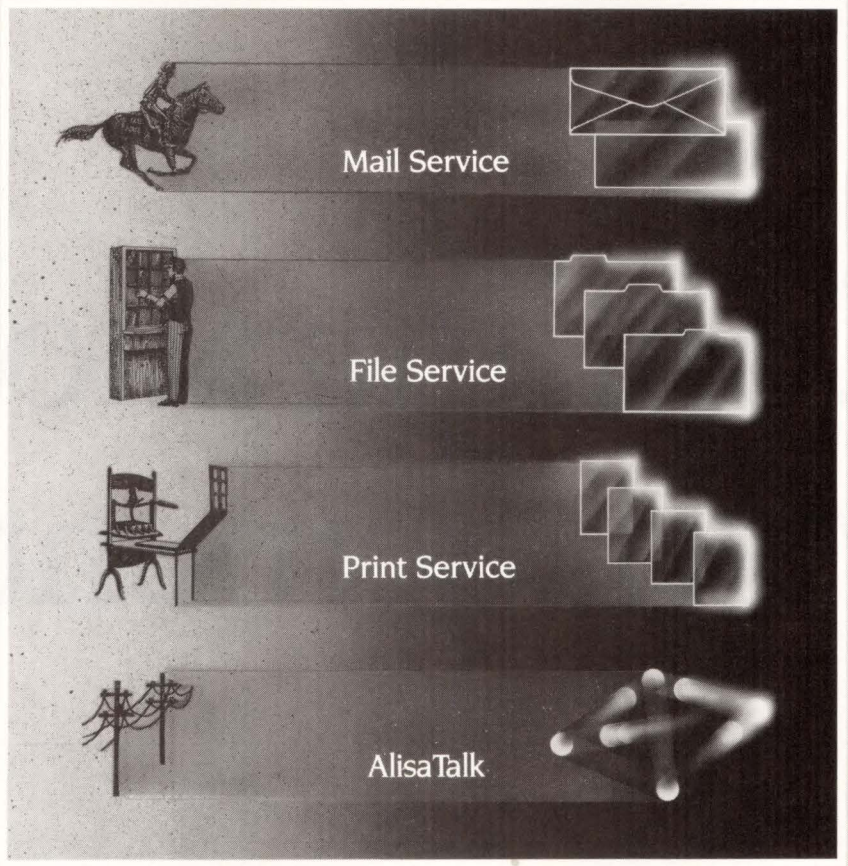
Each project that had been developed before we adopted SDS is being examined to determine if bringing it in line with the standards is worth the cost in terms of development time and possible user relearning.

One weak point of our system is that a dollar sign ($) is part of all of our logical names. Logical names containing a dollar sign are reserved by Digital. Ideally, we would have selected some other non-reservered delimiting character. Digital recommends the use of the underscore.

Overall, the throughput of software is somewhat faster than under the old system, and it is no longer such a nightmare to work on several projects simultaneously or to have several people work on the same project.

Future plans include integrating Digital's Performance Coverage Analyzer (PCA) into the environment to locate bottlenecks better in application performance.—*John Bredesen is an analyst with 3M Company, St. Paul, Minnesota, and Randall Newcomb is an independent consultant with Functional Software Inc., also in St. Paul.*

DECnet for the Mac and AppleTalk for the VAX



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Configuration Management

It makes $s and sense.

BY ARTHUR P. BEATO AND PAUL SONNENBLICK

THE RAPID EVOLUTION of today's computing hardware places an enormous demand on the software development community. The task of the software engineer is especially challenging when you consider that shorter product life cycles usually necessitate shorter development cycles. Unfortunately, this accelerating demand comes at a time when development costs are rising and a significant software development backlog already exists.

How do we meet this challenge? Even though most of us have experienced the "mythical man-month" syndrome, we still respond to increased production requirements by throwing more people into the pot. Additional people can help, but our goals must be to increase individual productivity and to minimize the inefficiencies introduced by the added interfaces. Fortunately, both of these objectives can be accomplished through effective configuration management (CM).

CM is more than a collection of utilities to handle code changes on a file-by-file basis. Utilities enabling code control are quite useful; however, they don't go far enough. They leave us with the coordination problems arising from shared data, multiple maintenance and simultaneous updating.

Because of the interfaces implicit with these conditions, developers must spend time ensuring that their pieces fit. To quote Wayne Babich from his book, *Software Configuration Management*, "Programmers lose productivity because they must spend time coordinating their work with that of the others. Even more important, they lose productivity because of the mistakes that are made by failing to coordinate."

We all have stories to tell of inconsistent flags or parameter strings, using the wrong version of a bug fix or module, using an obsolete listing or making that "one little change that won't affect anything." By themselves, these problems are frustrating enough, but consider what these mistakes mean for each member added to a project. Not only are there more mistakes occurring, but they will happen more frequently and affect more people each time they take place.

ONE WAY TO increase productivity is to minimize the problems associated with coordination. To do this efficiently, dependencies must be visible and change must be managed and communicated across the entire project. There must be a focal point that acts as a gate, that establishes a baseline from which to move forward.

The configuration manager must be able to identify all of the project's components and their dependencies; manage all change; identify, track and link problems to solutions; match requirements to deliverables; provide change impact analysis; provide support; and administer comprehensive, yet flexible, release management as each version of a product is established.

All of this must be done in a way that's responsive to a dynamic environment. Therefore, the configuration manager should have a set of integrated tools that gives him timely access to all project information and assists him in the automation of these functions.

When these capabilities are in place, the project will be able to move forward steadily as it evolves through each phase. Progress and problem areas will be more visible. Changes will be associated with baseline check points, making bug identification and recovery a manageable task. More important, individual project members will be in sync so that as they integrate and test their modules with others, surprises will be minimized.

Clearly, CM has the potential to deliver increased productivity to most projects. However, if you're like most of us, increased productivity is just too intangible. We have to associate this increase with numbers, that is, we must quantify it before we're ready to act.

The amount of increase will vary according to the characteristics of the project. However, it's safe to say that even the best run projects would be able to save at least 15 percent of their total labor costs by employing configuration management techniques, and the average project is more likely to realize a much higher savings.

LET'S LOOK AT A PROJECT from a CM perspective. For discussion purposes, the following assumptions are used to define a development project. Adjusting the assumptions to fit your environment should give you an approximation of what your savings could be.

1. The project involves 50,000 lines of code in a high-level language and will require 10 people for 15 months. This includes project management and administration.
2. Testing will occur during 60 percent of the project and there will be six project-wide versions of the product, the sixth being the initial field release.
3. Because the skill and experience will vary significantly among the project members, assume the average salary is $35,000. Use $70,000 as the total average cost per person to cover fringe benefits, overhead, etc.
4. Full regression testing takes 10 days per version and involves half of each developer's time.
5. Each bug found at the integration level averages three days to isolate, fix and test, and on the average involves 30 percent of the developers.
6. There is one problem report generated for every 100 lines of code. Therefore, 500 problems will be documented during the life of the project.

THE FOLLOWING ACTIVITIES represent the more obvious areas where a CM system using an integrated set of automated tools can provide for significant savings in time and money. In each section, equation *a* represents the time of the activity without a CM tool, whereas equation *b* is with the CM system in place. Also *V* is an abbreviation for version and *I-bugs* stands for integration bugs.

1. Preparing a Version Description Document — This document lists all the components of the project, any problems reported and the differences between versions. It's an essential baseline document as you move from version to version.

Preparing this document manually is at least a 10-person-day effort for the initial version of this size system. Subsequent versions consist of updating the initial version and should take about half the time (or five days per version). Automating the preparation of this document saves 34 person days:

a. 10 days (for V1) + 5 days (for V2-6) x 5 = 35 person days
b. 2 hours (for V1) + 1 hour (for V2-6) x 5 = 7 person hours

2. Regression Testing — If you can isolate dependencies and relate fixes to modules, you can fine tune regression testing so that only a subset needs to be tested for any given version. A full set of regression testing for this system would take at least 10 calendar days.

Both the initial version and the final version require a full set. However, with

Table 1.

ACTIVITY	PERSON DAYS W/O CM (a)	PERSON DAYS W CM (b)	SAVINGS	PERCENT OF TOTAL LABOR
1. Preparing VDD	35	.87	34	1.03
2. Regression Testing	300	133	167	5.10
3. Integration Problems	450	225	225	6.82
4. Release Management	90	18	72	2.18
5. SPR Handling	92	37	55	1.67
6. Change Impact Analysis	18	6	12	.36
	985	420	565	17.16

A summary of the total estimated savings from the use of a CM system.

the right tools to identify fixes and dependencies, testing of intermediate versions can be reduced to a subset covering the affected areas.

Because fewer modules will be involved, testing should be able to be completed in no more than five days and require less time of each person (1/3 vs.1/2 time for each person). The savings associated with testing V2-5 are 167 person days as follows:

a. 10 days x 6 (for V1-6) x 5 (10 people 1/2 time) = 300 person days
b. 10 days x 2 (for V1 and 6) + (5 days x 4 [for V2-5]) x 3.33 (10 people 1/3 time) = 133 person days

3. Duplication/Common Problems and Wrong Module Transmitted — If not all of a project's dependencies and common areas are clear, problems will arise from double maintenance, sharing data and performing simultaneous updates. Interfaces and dependencies have to be defined clearly, maintained and communicated across the project. Also, each individual's code must be administered properly so that the integration session uses all current components. A good configuration system will facilitate these activities.

It's not unreasonable to expect 20 percent of the project's problems (or 100 bugs in our example) to be discovered at integration time. It's assumed that it takes three days on average to isolate, fix and test each of these bugs. Because they are integration level bugs, assume it involves three people at about half time for the average problem. If just one-half of these problems can be avoided by using the proper tools, 225 person days will be saved:

a. 100 (I-bugs) x 3 days x 1.5 (3 people 1/2 time) = 450 person days
b. 50 (I-bugs) x 3 days x 1.5 (3 people 1/2 time) = 225 person days

4. Release Management — A full release consists of all the components of the project. Each release is done to establish a new baseline to proceed from. A release necessitates review and coordination of all the components. Having these components archived in a controlled area facilitates both the review and the assimilation process.

Code is moved about and reports generated with a few key strokes. A full release is done about every six weeks during the last 60 percent of a project. Having this process automated under the configuration manager will save 72 person days as follows:

a. (3 people per release x 5 days) x 6 (for V1-6) = 90 person days
b. (1 person per release x 3 days) x 6 (for V1-6) = 18 person days

5. SPR Handling — Assume that there's one problem reported for each 100 lines of code during the life of the project. Then consider the clerical work to assemble and disseminate, the time taken to report duplicates and the time lost in fixing duplicates. An online, template-driven, problem-reporting system will reduce the amount of time to write up a problem by at least one-half.

Dissemination is automatic and all problems reported are available to each project member as soon as they are found. Also, fixes are available as soon as they are submitted, virtually eliminating duplicate efforts. And when problem reporting is an integral part of the CM system, problem statuses are included automatically in the version differences report. We estimate a savings of 55 person days as follows:

a. 500 hours (1 hr/SPR) + 10 (dup efforts) x 3 days = 92 person days
b. 250 hours (.5 hr/SPR) + 2 (dup efforts) x 3 days = 37 person days

6. Change Impact Analysis — Each time a major modification is required, a change impact analysis should be done. To be effective, of course, it must view the entire set of dependencies. Assume that this happens at least once for each version of the system. At a minimum, you should be able to save 12 person days because differences and dependency reports can be generated with only a few key strokes:

a. 3 days x 6 (for V1-6) = 18 person days
b. 1 day x 6 (for V1-6) = 6 person days

A summary of the total estimated savings realized through the use of an automated CM system appears in the Table. Assuming an average cost of $265 per developer day, the savings realized in labor would be 565 x $265 or $149,725.

Also, assuming that 565 developer days are saved, it's not unreasonable to assume a savings of 40 project days, or approximately 12 percent of the total project time. To determine the value of a project day, you must consider the facilities, equipment, general administrative expenses and the value generated by using the new system. If the project is valued at four times the labor cost, you'd save an additional $1,060 per each project day saved, or a total of $42,400.

Administering and using the CM system is accounted for in the person days of Column b of the Table. Additionally, there's the time it takes to establish and initialize the system for the project. At worst, it should take no more than 65 person days of management and administrator time to put the CM system in place.

This time shouldn't affect the schedule because it occurs during the planning and design phases of the project. Adding the labor and project-day savings and subtracting the setup costs yields the following net savings: $149,725 + $42,400 - $17,225 = $174,900.

Those savings represent activity during the development process and don't address the value associated with a better quality product. A well coordinated project should produce a more stable and easier-to-maintain product. Thus, the owner should continue to reap savings long after the development activity is complete. *—Arthur P. Beato is a consultant and Paul Sonnenblick is president of Expertware Inc., in Santa Clara, California.*

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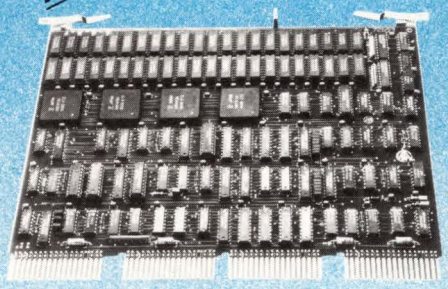

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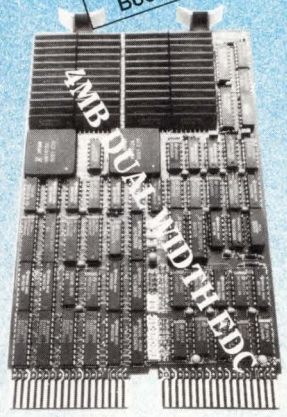

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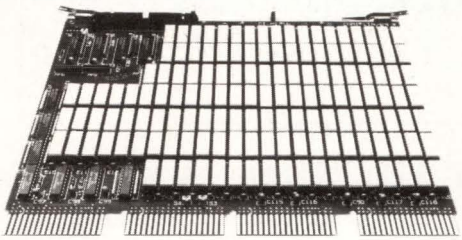

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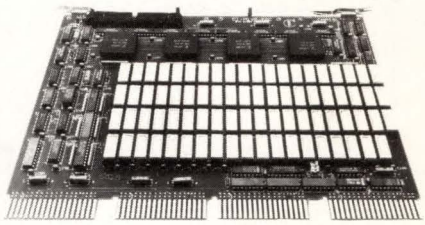

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CASE For Sale

SEEKING the right CASE for you.

BY SUE ANN HAWLEY

THE POPULARITY of CASE as a technology topic has many software development organizations feeling a little behind in the race. If software development staffs aren't investigating CASE already, they're feeling, probably quite strongly, that they should be. The rush to get acquainted with CASE isn't necessarily translating into high-revenue figures for CASE vendors. But it's selling a lot of seats at CASE conferences. So, why is there a lag in actual product sales? The answer is because users are trying to understand what CASE is and how to buy it.

The two strongest characteristics of today's CASE market are the high degree of interest and the high degree of confusion. CASE as a technology trend is simple to understand. It's the automation (computer-aided) of standardized software development processes (software engineering). Given today's software development backlogs and the strategic role of information systems, CASE is a hot topic. That explains the interest.

Now for the confusion. CASE has become an all-encompassing umbrella for a variety of software products and services. Trying to be all things to all people, vendors have failed to differentiate themselves. Much of what's being promoted as CASE are pieces of technology or methodology out chasing markets. Users seeking solutions to their software development problems can end this chase by demanding categorization, specialization and product positioning from vendors, before they buy.

CASE PRODUCTS fit one or more phases of the software development life cycle. These phases are commonly known as requirements, specifications, design, code, test and maintenance. Some products address certain phases or functions within a phase. But all products don't perform all functions. Users can evaluate CASE products better if they understand where various tools and vendors fit and where they don't. Users need to look at their organization's needs and current practices, then use that reality as a guide

for evaluating CASE offerings.

To make sense of everything that's now called CASE, keep in mind that it's an attitude or an approach, not a particular product set, not a set of product attributes. CASE as a concept means to standardize your software development process and then automate it. With those decisions made, CASE products are the tools and techniques you choose to employ.

Checklists and guides to buying CASE products often list the key elements that a user seeks within a CASE product. Although that approach suggests that there's a complete set of product attributes constituting a model or ideal CASE product, in reality, the ideal set of attributes differs from one group of users to the next, depending on their software development requirements. Different market segments require different tool capabilities, interfaces, methods and hardware platforms. Users' needs become specialized by their own development activity and environment.

Published articles and position papers that define the key elements of a CASE product suggest a product profile that both vendors and users should adopt. That product profile may or may not come close to the requirements of any one software development organization. To combine all the functions and features known to CASE tools and designate that list as the standard is a disservice to users and vendors. It makes ideal CASE product resemble an elephant: enormous, clumsy, frightening and expensive.

With the advent of any new capability from any one vendor, the list of key elements grows longer. Users seeking all these attributes within one product are seeking the perfect technology; they'll be searching long after others have employed and benefited from currently available tools.

Rather than using these checklists of key elements as a scorecard for alternative products, consider them as definitions of terms or better yet, as definitions of functions. Realistically, a single product available today is not going to:

1. Support data flow diagrams, data structure charts, program charts.
2. Validate data design, structure design.
3. Contain an encyclopedia to store, coordinate, integrate and standardize all system information.
4. Support information modeling, real-time systems.
5. Prototype the system via menu, screen and report generators.
6. Generate, test and reuse the code.
7. Develop the entire system through a programmed methodology.
8. Control the development of the entire project with automated project management tools.

Realistically, you may not need to perform all these functions but you'll have strong requirements for many of them. So use your needs as the checklist against various product offerings. Use the key elements lists that you read about in articles as a glossary of current terminology.

The ever-changing terminology and feature one-upmanship between the vendors is distracting. Yesterday's dictionary is today's encyclopedia, information repository or central knowledge base. There's life cycle methodology, life cycle management and project management.

One of the easiest concepts to understand is diagramming tools and many products fit in this category. The glitch is: Vendors are reluctant to have their products labeled as diagramming tools; they view it as a weakness instead of the popular and successful feature it has proven to be.

Consider also integrated products versus products that are interfaced. Some products are toolkits, some are workbenches, some are both, and some are neither. Don't get hung up on the terminology.

Products are being adapted to operate using:

1. Multiple hardware platforms
2. Multiple users
3. Multiple methodologies
4. Multiple design techniques
5. Multiple code generators.

Products are being enhanced to support information modeling, entity relationships, state transitions, real-time systems and embedded systems. The products can be structured and disciplined or open-architectured, and generic or customized to in-house requirements. One vendor will advance the technology today; another will advance it tomorrow. What is leading edge today will be mediocre in three years, so don't get hung up on the technology.

Don't expect to find the all encompassing, ultimate CASE product. Keep CASE at a concept level and the products at a tool level. After you've bought into the CASE concept ("standardize then automate"), choose the tools and techniques that best fit your needs. Here are some key vendor and product attributes to better define, understand and ultimately evaluate the alternatives.

Look at categories of products by function, market segment and hardware platform.

1. Is the tool built for specific functions? Such functions include requirements

DON'T expect to find the all encompassing, ultimate CASE product. Keep CASE at a concept level and the products at a tool level.

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analysis, design, documentation, graphics, analysis and validation, prototyping, code generation, testing and project management.

2. Is the tool built for specific markets such as commercial applications, scientific and engineering systems, and Department of Defense and government contract applications?

3. Is the tool built for a specific hardware platform?

Look at the categories of concepts.

1. Does the tool support a design methodology? Does it adapt to a variety or standardize on just one?

2. Does the tool interface with other tools and techniques you're using already?

3. How does the tool store, link and use data?

4. Is the tool suited for your standalone or multiuse environment?

5. Is the training available that you need?

6. Does the vendor have a plan for expanding the technology within the product set, or will you go to other vendors to link the pieces?

THE products, being the tools, techniques and training that support a CASE concept, are simply the vehicles to help get you there.

Industry experts speak at conferences promoting the technology of the future. If vendors try to compete at that level, they're selling smoke instead of deliverable products. Vendors have a responsibility to bring expectations in line with what they can deliver.

There's a tremendous amount of useful technology available today. Users can take advantage of current technology by recognizing future pitches for what they are: visions of where we'd like to be one day.

In the meantime, sorting through CASE doesn't have to be as painful as it may seem. Keep in mind that CASE is more an attitude than a particular product set. After you buy into that concept, look for products that most closely meet your current needs. With CASE, the goal (destination) is higher quality software. The strategy (path) is to automate your standardized methods. The products, being the tools, techniques and training that support a CASE concept, are simply the vehicles to help get you there. *—Sue Ann Hawley is marketing communications consultant for Hawley Communications in West Bloomfield, Michigan.*

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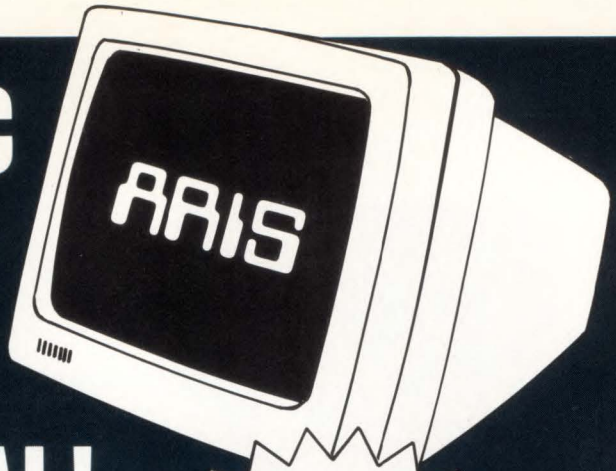

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Graphics Standards: A Firm Foundation

AN UPDATE on two prominent graphics standards — GKS and CGM.

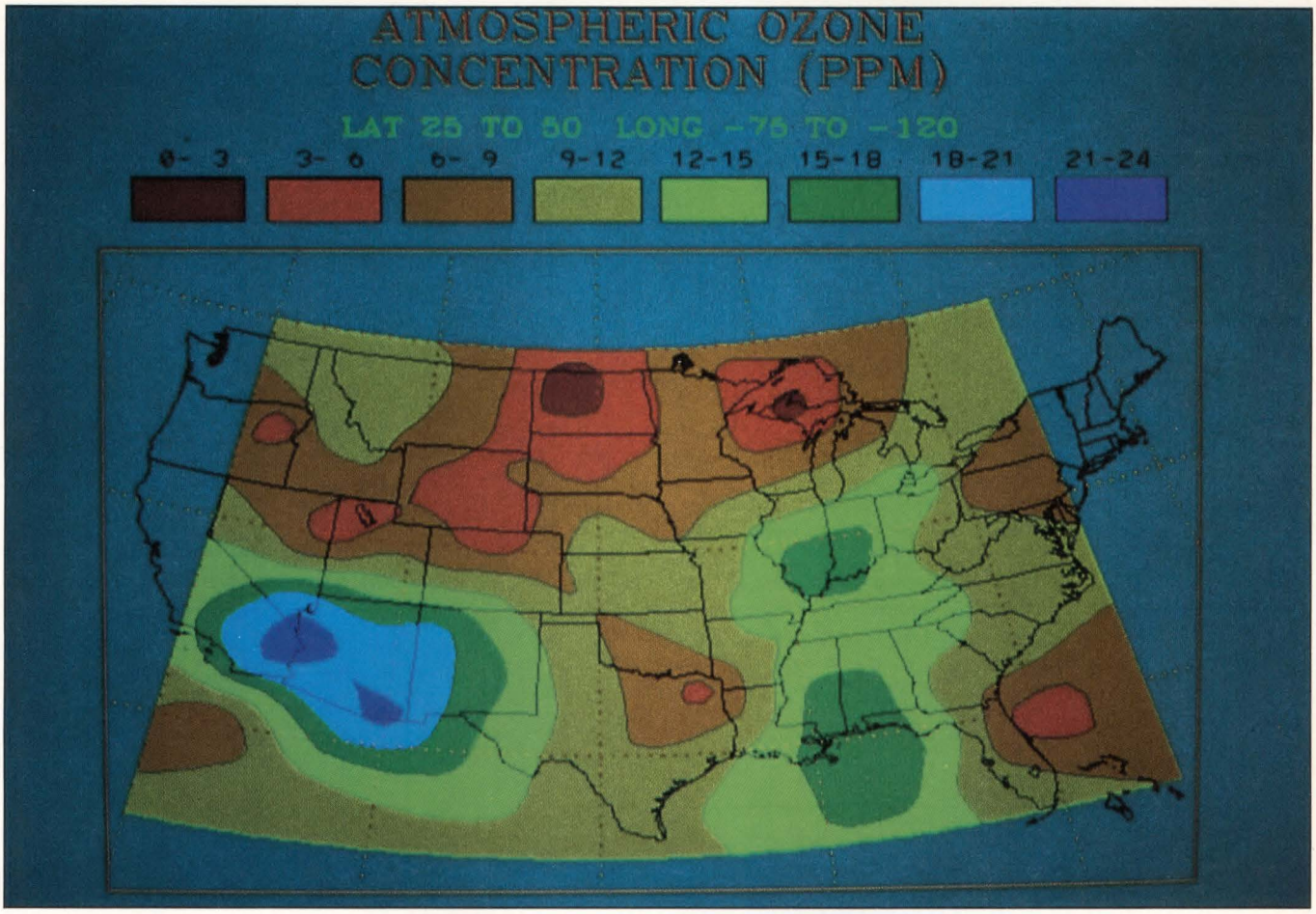
BY JOHN HOUKAL AND MARTIN PLAEHN

WITH COMPUTER GRAPHICS systems proliferating at a dizzying pace — from use on mainframes to PCs — graphics standards are becoming a necessity. Standards specify rules for exchanging information across an interface, permitting the independent development of software on both sides of it.

Using graphics standards reduces the time and cost of development while increasing usefulness and reliability. Graphics standards provide device independence and data interchangeability. Applications can be developed without regard for the particular graphics devices used, and graphics data can be stored and transferred easily between different applications and computer systems. Through the use of graphics standards, application programs can be moved to different graphics systems and computers, and programmers can more easily develop applications that are compatible with different languages and computer systems.

The two main organizations developing graphics standards are the International Standards Organization (ISO), and the American National Standards Institute (ANSI). ANSI is the official U.S. member of ISO. Each standards organization consists of various committees, subcommittees and working groups. The ISO/TC97/SC21/WG2 and ANSI/X3H3 committees are responsible for computer graphics standards.

Currently, the only two graphics standards approved by both ISO and ANSI are the Graphics Kernel System



This two-dimensional map was produced by ICEX Inc., of Louisville, Colorado, using its* GRAPHKit *utilities, which, in turn, call GKS for graphic output. The GKS package stored the picture in a CGM file which later was displayed to produce the slide.

(GKS) and Computer Graphics Metafile (CGM). These two standards deal with two important user interfaces: GKS and CGM.

GKS is a standard interface between the application program and the graphics system. It provides a uniform, device independent set of calls for graphics output (drawing) and input (cursor) functions.

CGM is a standard for archiving and transferring graphics data. It supplies a common format for storing a picture description in a file. This graphics data later can be sent to another application or computer.

GKS

GKS includes the capabilities required by the vast majority of graphics applications, from passive to interactive applications. To accomplish this, GKS supports a full set of drawing primitive commands (with variable attributes) for data input and drawing, support for multiple workstations, and device dependent picture segments. While GKS provides device dependence for standard functions, non-standard operations also are made available through the generalized drawing primitive, a well-defined mechanism for escaping from GKS. This allows a programmer to access the unique capabilities of a particular device.

The GKS standard consists of two parts. The first part is the model, an abstract specification independent of any programming language. Up to this point, we've dealt solely with the model.

The second part is language binding, which specifies how the model is implemented in a particular programming environment. Language binding specifications currently exist for *Ada,* C, COBOL, FORTRAN, PASCAL and PL/1.

Let's look closer at GKS in terms of nine basic categories addressed by the standard:

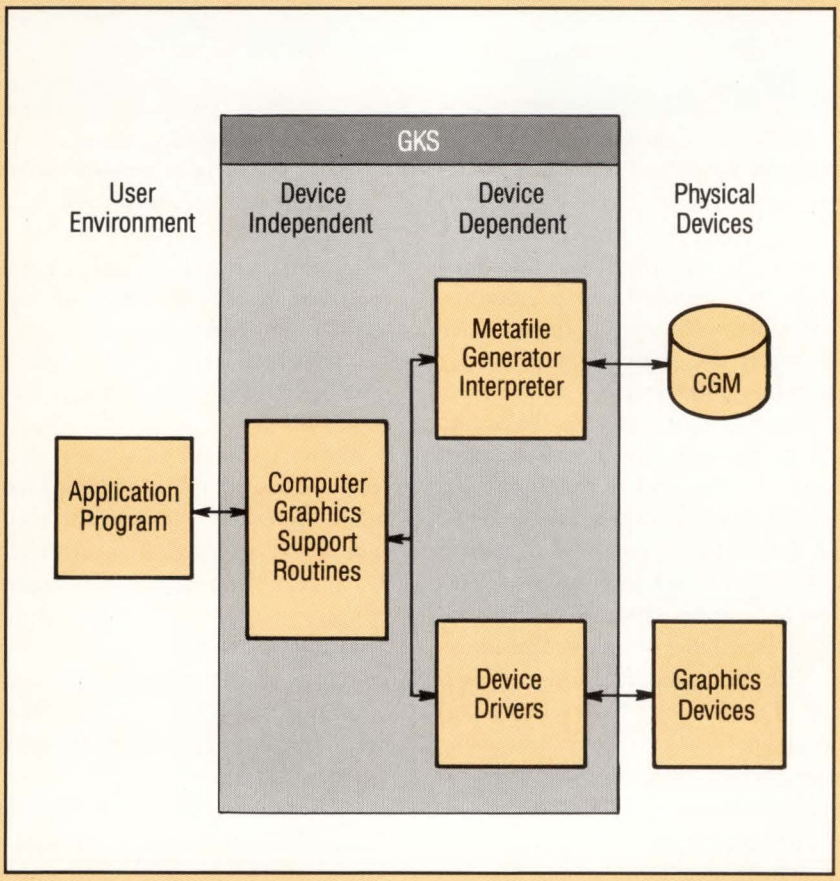
1. Graphics Output — GKS uses a small set of six basic graphics building blocks, called "primitives," to construct a picture. There are three main primitives. The polyline primitive draws a sequence of vectors (straight lines) between pairs of points (a "connect the dots" command). Pairs of points are specified in an array. A single line is merely a special case of the polyline defined by specifying two endpoints.

The polymarker primitive, primarily used to identify points on curves, is similar to the polyline except that a marker symbol, rather than a vector, is

Computer Graphics Environment

The primary elements of the computer graphics environment are:

1. **The Application Program** — Written by the user and interfacing to GKS for graphics output and input. GKS provides a standard device independent environment for the application. The specific interface between the application program and GKS is defined by the GKS language binding standard.
2. **GKS Computer Graphics Support Routines** — Supply a standard device independent graphics environment for the application. GKS is divided into two sets of routines: device independent (interface to the application), and device dependent (interface to the physical graphics devices).
3. **GKS Metafile Generator/Interpreter** — Writes and reads the graphics data from a metafile. While the metafile generator/interpreter is a device-dependent routine, the actual metafile is device independent. This metafile capability has two main purposes: to archive and retrieve graphics data, and to transfer graphics data to different graphics systems.
4. **GKS Device Drivers** — Convert the device-independent graphics data to device-dependent commands associated with the specific graphics device. In general, both input and output operations are supported.
5. **CGM** — This is a standard device-independent method of encoding graphics data for file storage or transfer to other applications or computers.
6. **Physical Devices** — These are the actual graphics devices (pen plotters, laser printers, graphics terminals, etc.). The devices simply may consist of a drawing surface (output only), or may include both a drawing surface and graphics input capabilities (input and output).



drawn at each specified point. Finally, the text primitive allows text strings to be displayed at any position without any orientation.

GKS also supports filled regions with two additional primitives. The fill area primitive paints the interior of a closed polyline (polygon) with a specified color or pattern (such as a crosshatch). The cell array primitive allows a two-dimensional array of different colors, called "cells," to be defined. The cell then may be replicated over an arbitrary area simply by giving the desired boundary. This operation finds many uses in imaging applications like cartography.

Some graphics devices have incorporated more powerful capabilities, such as the ability to draw arcs, circles and spline curves. GKS allows an application program to access these capabilities through the last primitive. The generalized drawing primitive (GDP) is a special escape mechanism that passes an identification number and required parameters to the device driver to invoke unique drawing features of the device. In effect, the generalized drawing primitive provides a standard way to be non-standard.

Associated with each output primitive, including GDP, are attributes that alter the object's visual appearance. For example, the polyline primitive has linetype (solid, dashed, etc.), width and color attributes. Polymarkers have attributes of style, size and color. Text primitives have attributes of font, spacing, size, color and orientation. Color indexes may be defined by associating a desired color specification in red-green-blue (RGB) intensities with a color-index number; the color values of the primitive then are given as the appropriate index.

2. Viewing and Transformations — The GKS workspace is a plane defined by a 2-D Cartesian coordinate system. GKS allows the programmer to define a coordinate space, called "the world coordinate space," that's appropriate for each application. This world coordinate space is mapped into device coordinates through two distinct operations: nor-

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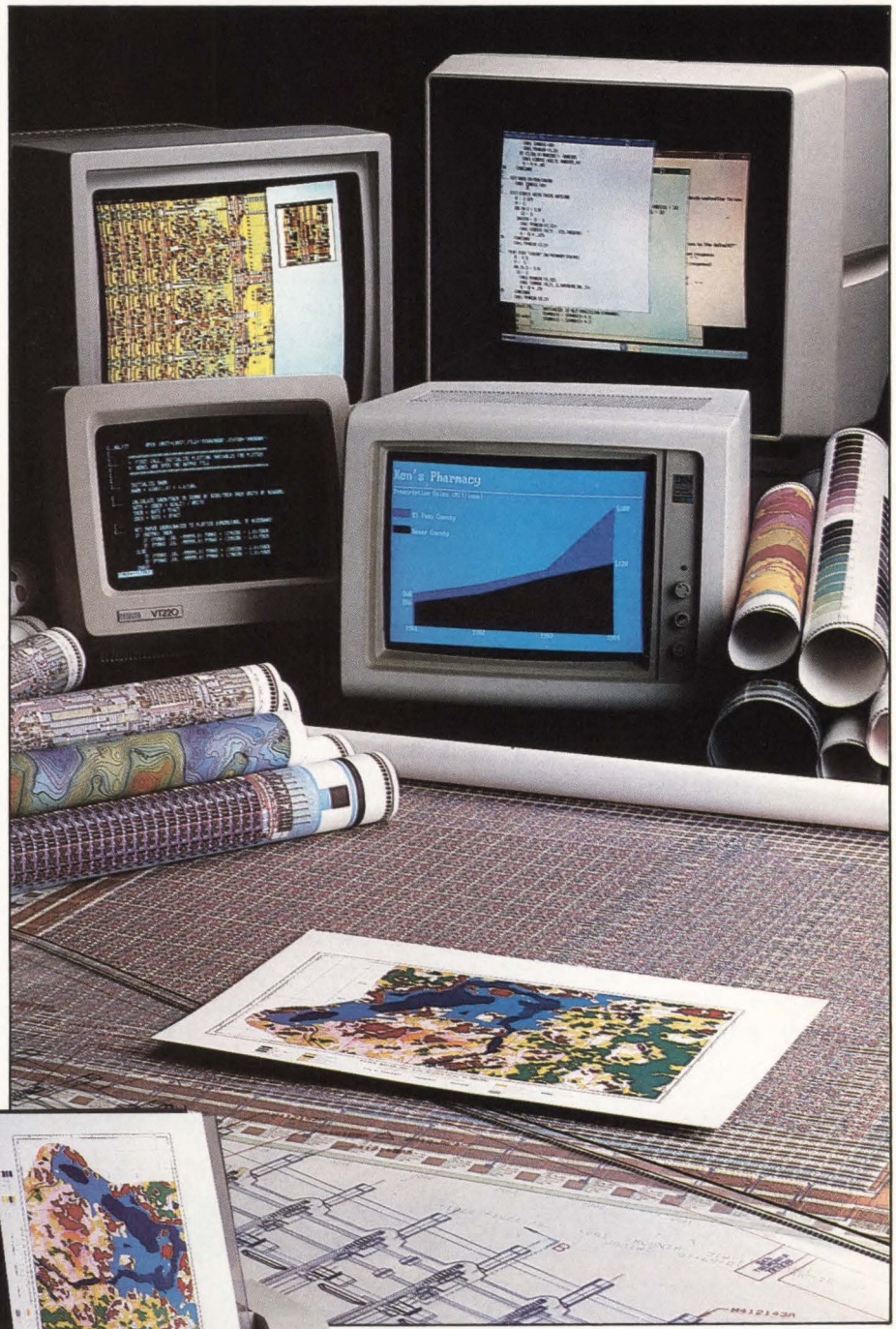

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malization transformation and workstation transformation. This combination of transformations provides a highly flexible system for performing pan and zoom operations.

3. Segmentation — GKS provides a way to group output primitives together so they can be manipulated as a whole. Such a collection of primitives is called a "segment." Each segment is identified by a unique name and can be manipulated as a unit.

4. Graphics Input — GKS provides a full set of input operations that allow an application program to receive input from a broad range of graphics input devices. Input operations are grouped into six classes (locator, stroke, pick, choice, string and valuator) and three operating modes (request, sample and event). These input capabilities provide the interactive graphics capabilities required for pointing, selecting, sketching, placing and erasing.

5. Workstations — Fundamental to the device independent graphics provided by GKS is the concept of a workstation. This concept maps a flexible virtual system to a variety of real-world devices. The workstation is an abstraction of a graphics device with a single display surface and zero or more input devices. Actual workstations vary from a pen plotter (no input devices) to a workstation with CRT screen for output and with several input devices (keyboard, mouse and lightpen).

6. Metafiles — GKS provides the capability to generate and interpret a graphics metafile. The metafile is a device and application independent method for storing and transferring graphics data. The CGM format (described below) provides a standard definition for the capture, transfer and archiving of the picture information used in GKS.

7. State Lists — At any given time, the GKS system is in a precisely defined state. This rigorous state definition and related inquire capability allow you to find information about the graphics environment.

8. Error Handling — GKS provides a uniform error system for handling abnormal conditions. By default, the standard error handling provides error messages on the selected output device. This standard error handling can be replaced by the user's own error handling routines with specific error actions and recovery techniques.

9. Levels — In order to tailor GKS to specific application classes, several levels of GKS have been identified. These levels deal mainly with interactive graphics capability. Where little interactive capability is required, a smaller, faster running level can be used. Alternatively, highly interactive applications require the larger, more complex levels. The levels are defined according to the two capabilities important in interactive applications, segmentation and graphics input. The levels are designated by a number (segmentation) followed by a letter (graphics input) as shown in Table 1.

The levels of interactive graphics capability for GKS.

Table 1.

	No Input	Request Input	Full Input
Minimal Segmentation	0A	0B	0C
Basic Segmentation	1A	1B	1C
Full Segmentation	2A	2B	2C

Computer Graphics Metafile (CGM) is a standard file format for the capture, transfer and archival of graphics information. A component of the graphics system generates the graphics data (the metafile generator), and a component reads, interprets and displays the graphics information (the metafile interpreter). In some graphics systems, like GKS, the generator and interpreter are combined. In different environments, the interpreter may be a standalone process.

GKS AND CGM will provide a firm foundation for future growth.

CGM is a static picture capture metafile. Thus, the current CGM standard, while fully capable of representing all the output primitives and their attributes, isn't capable of representing the dynamic elements of GKS like segments and workstation transformations.

CGM standardizes the semantics and syntax of a set of elements for the device independent definition of pictures. Different applications have different needs: compactness of the metafile vs. speed of generation and interpretation vs. readability, editability, and ease of transfer, etc. These conflicting needs are met by providing three distinct encodings:

1. Character Encoding — Encoded by characters from the ASCII character set. The resulting encoded data consists of printable characters. The encoding is compact and can be transmitted through standard text communications.

2. Binary Encoding — Intended for applications whose speed of generation and speed of translation are most important. It's reasonably compact as well.

3. Cleartext Encoding — Human readable, transmittable with standard text communications, but not compact or

quickly generated or interpreted.

CGM is being applied by the ISO standards committee for text and office systems as a basis for including graphics into documents. As such, CGM will be a link between graphics generated by a graphics system and text used in desktop publishing systems.

Future Enhancements

Both GKS and CGM were designed with future enhancements in mind. Work is underway at both ISO and ANSI for the following enhancements:

1. GKS-3D — The current GKS standard defines only 2-D graphics and doesn't directly support 3-D constructs. GKS-3D is a standard being developed for such applications. Included in GKS-3D are 3-D primitives, 3-D transformations, access to hidden line/hidden surface removal, and 3-D geometric attributes. GKS-3D is in final draft form; final approval is expected early next year.
2. CGM-Dynamic Extensions — The current CGM standard is strictly a static picture capture metafile and doesn't support the dynamic capabilities available in GKS. The dynamic extensions will make CGM a complete GKS metafile, including provision for segmentation and workstation transformations. This standard is an addendum to the existing GKS standard in the draft stage.
3. CGM-3D — Work on adding 3-D capabilities defined in GKS-3D to CGM also has started. Like the dynamic extensions, this standard is an addendum to the existing GKS standard in the draft stage.

Graphics standards are constantly evolving to meet changing graphics needs. In the future, the current standards will be further extended and new standards added. GKS and CGM will provide a firm foundation for this future growth. — *John Houkal is a software manager at ICEX Inc., Louisville, Colorado. Martin Plaehn is vice president of research and development at Template Graphics Software Inc., San Diego, California.*

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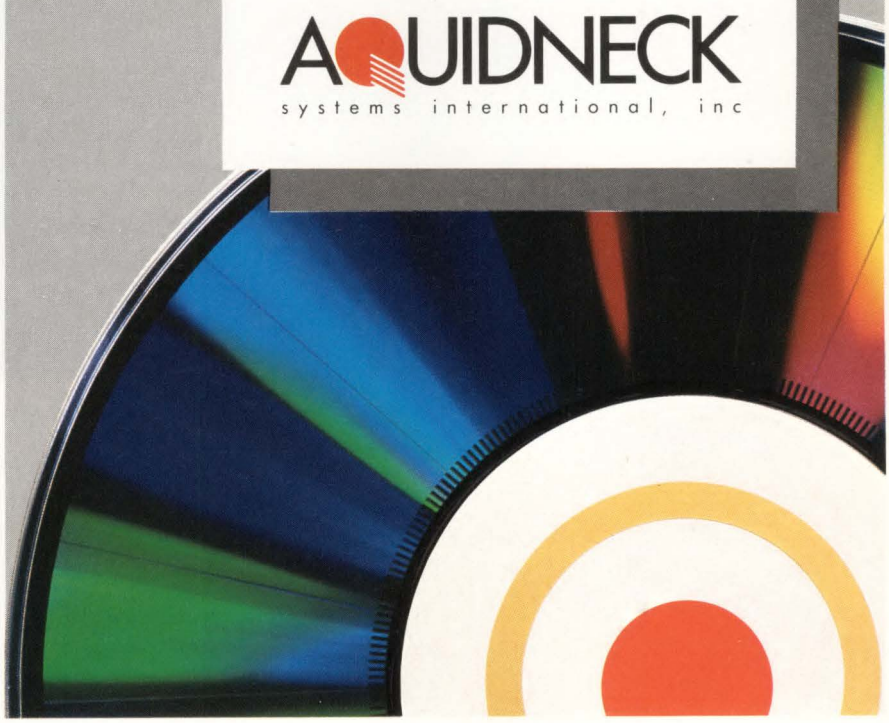

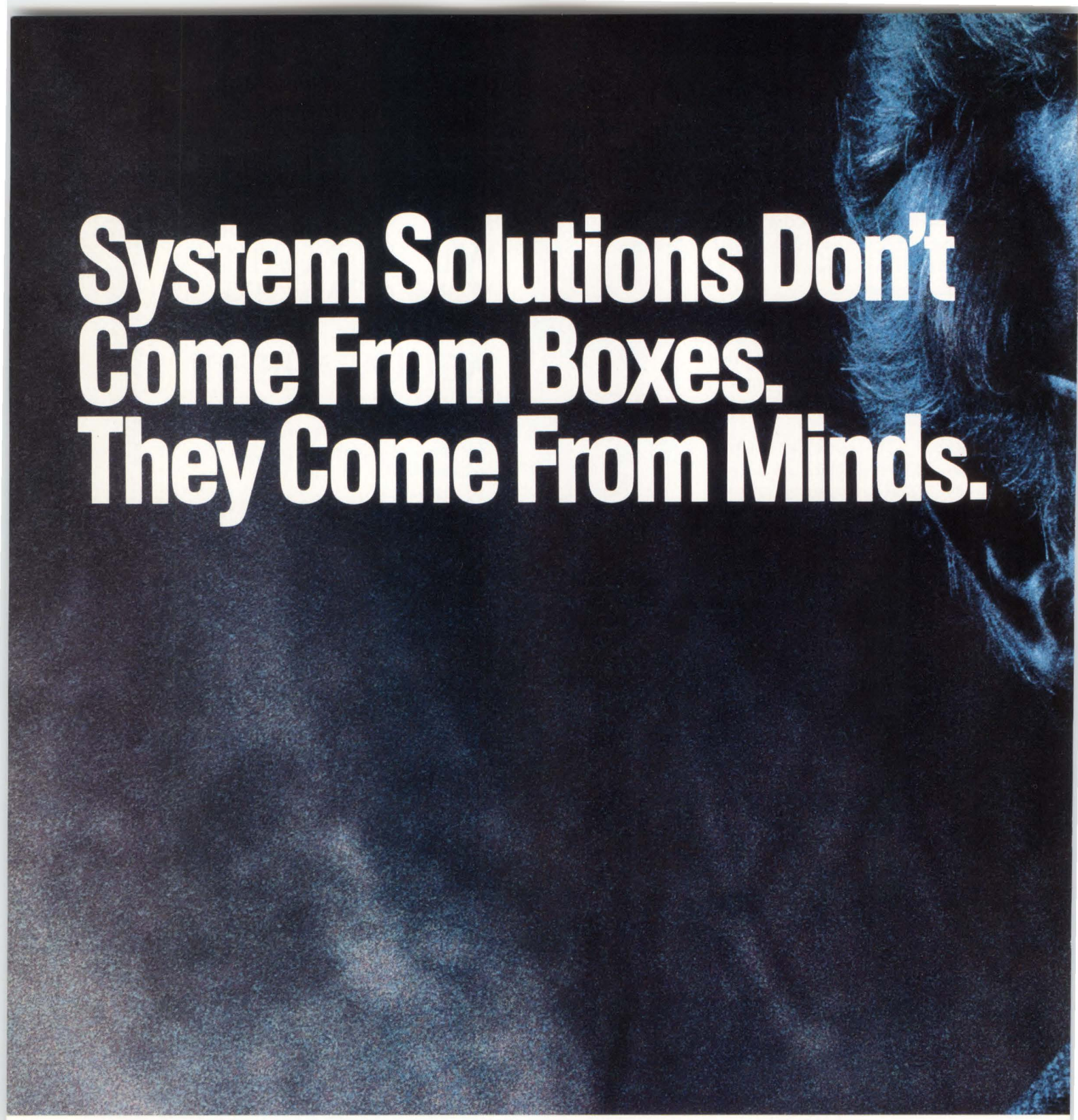

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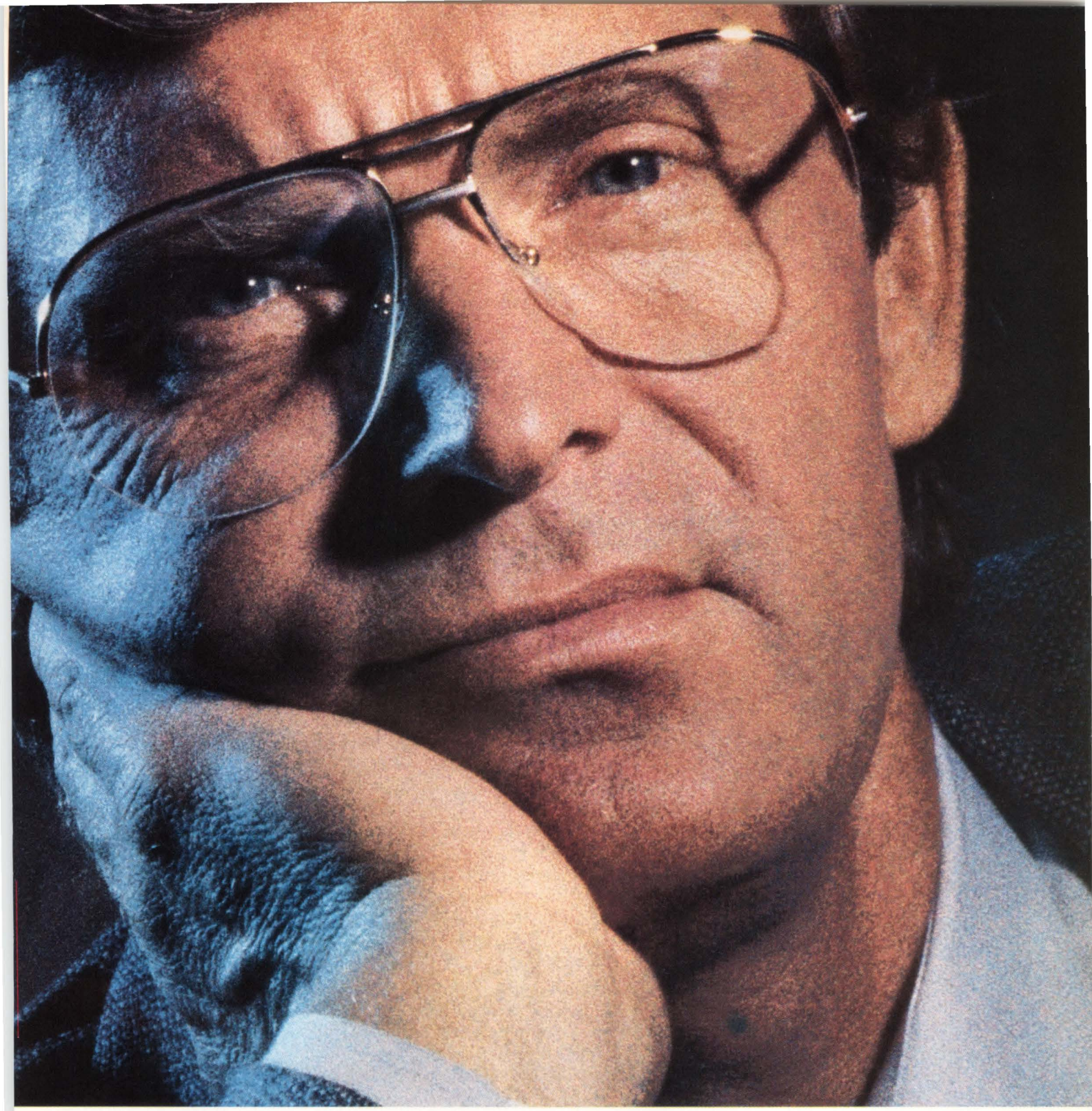

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DECUS IN DECEMBER

A Look Through The Crystal Ball.

DECWORLD and similar trade shows often are the site of DEC's announcements of new processors and network products, but the real technical fare usually is saved for DECUS Symposia; those twice-annual migrations of the DEC faithful.

This year's Fall Symposium is December 7th to 11th at the Anaheim Convention Center. We've prepared this preview of the happenings that will cram Symposium week. We'll also predict the announcements to come from DEC. We've garnered these little peeks into the future not by some skulldudgery or violation of trust, but by paying careful attention to DEC's past announcements and listening carefully at the last several DECUS Symposia.

The Symposium

The Symposium consists of more than 1,000 sessions covering virtually every topic of interest to the DEC user. The sessions are presented by DEC personnel, users and representatives from third-party vendors. Most sessions are technical or tutorial in nature, to help you learn more about how to use DEC systems for practical computer solutions.

There typically are 21 concurrent sessions for most of the five solid days of the Symposium, and the selection usually is so good that most people have trouble deciding which to miss. The sessions almost always are rated as "good" or "excellent" by attendees.

The Pre-Symposium Seminars are just that — full day seminars on technical and management topics. These classes are presented either by highly experienced experts in the field or by professional DEC educators, so you get your money's worth. DECUS is offering more than 70 different seminars this month.

The next component of the Symposium is the exhibit floor, where DEC and a limited number of third-party vendors display their wares and provide an opportunity to talk to their knowledgeable technical and sales staff. The booths often are staffed with the actual product developers, so this is an opportunity to get excellent answers to your most difficult questions. You'll also have a chance for hands-on experience with the newest hardware and software, often before it's even released or announced.

You also can catch developers in another component of a Symposium — the "campgrounds," suites, clinics, or other unstructured gatherings. These are the best places to find a wizard or expert to help you with your toughest technical problem. Most attendees find that a single answer from a wizard saves them enough time to more than pay for the entire trip!

The final part of a DECUS meeting actually isn't a part of the Symposium at all — it's the DEXPO show that follows the Symposium around the country (see related article on page 196. DEXPO is the product show for third-party vendors, and it provides an awe-inspiring look at the newest hardware and software. DEXPO isn't sponsored by DECUS,

The Anaheim Convention Center is home to the 1987 Fall DECUS Symposium.

which is a non-commercial society. Lest you think that a Symposium is all work and no play, there also are a number of social gatherings (like a trip to Disneyland) where the tech-talk will be minimal and the fun level high. It's often during these "play" times that professional relationships are converted into personal ones.

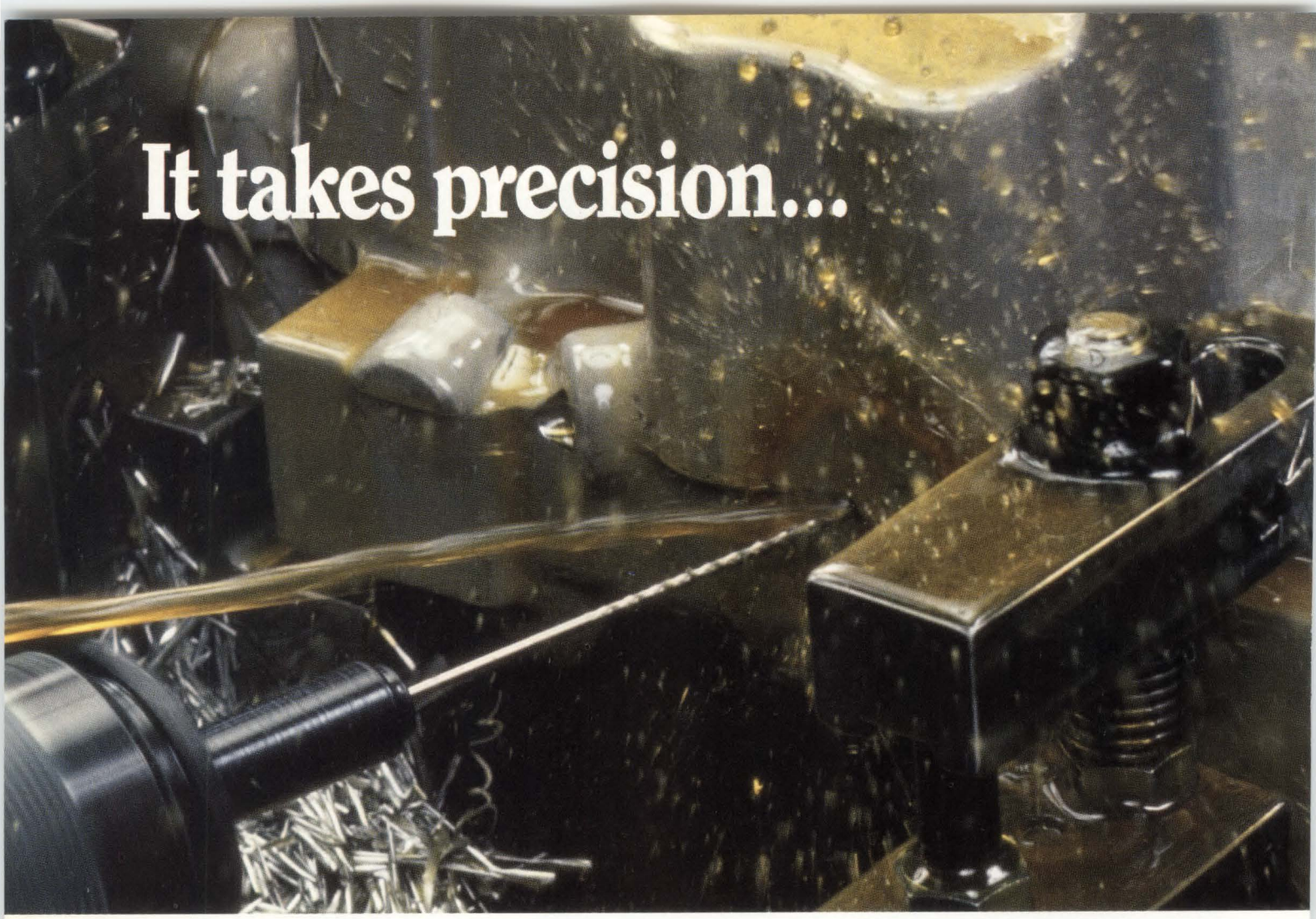
DECUS Symposia are the product of thousands of hours of time volunteered by DECUS members from around the country, working in concert with dedicated professionals from the DECUS staff. The quality of their contributions makes DECUS Symposia the best education value around.

Whispers In The Wind

For many, DECUS is where to go to learn about upcoming VMS features. By knowing DEC's VMS directions in advance, a savvy system manager or software developer often can save a great deal of time and effort by avoiding conflicts with future VMS features and by delaying developments until new features are available. Here is what we expect to learn about VMS V5.0 at the VMS sessions this month:

1. New Packaging — We heard at the last Symposium that MICROVMS won't be going away beginning with VMS V4.6, as previously planned, but that it will live until version 5.0 is announced. DEC now has said that, beginning with VMS V5.0, there will be only one VMS and that both large and small VMS systems will share a tailoring facility to control which VMS components are installed.

This means that sites with both VMS and MICROVMS systems no longer will have to purchase both distribution media. However, if you use the tailoring facility and then use VMSKITBLD to create a new VMS system (say, to port your version of the operating system to another site), it might not run if the other



system has a different processor. This is because not all versions of all files will be on the tailored system, but it's a problem only for OEMs and other folks building VMS kits for other sites.

2. Separate Form From Function — Listen for the code words, "We intend to separate form from function in many parts of the operating system," and substitute the words, "We intend to make a menu- or mouse-based interface to many parts of the operating system."

Translated this means: There are many things in the current version of VMS that can be done only via the DCL interface or with great difficulty by programming it yourself. Examples are VMS MAIL, BACKUP and even running a compiler.

Some of these, like BACKUP and MAIL, obviously are things that folks would like to be able to do from a program, and many people have been asking DEC to build a callable interface to these programs (like the one they've built for CONVERT). DEC has said it's going to provide such a callable interface for MAIL.

The problem with this approach is that DEC now would have a great many callable interfaces to support, and even then the guts of DCL (the environment creating commands such as SET) still would be outside the interface.

Another approach, and possibly the one that DEC is going to announce in Anaheim, is to provide an open interface to DCL; i.e., devise a way to allow access to all the programs that make up DCL in one swoop.

3. Parallel CPU Support — Version 5 will contain support for new processors and for new ways to use existing CPUs in a multiple processor environment. To be most useful, symmetric multiprocessing (SMP) should support multiple concurrent I/O streams. It's also likely to support more than the 16-node limit of the BI-bus; there's no reason for the VMS software architecture to be limited to the BI address space, especially because there could be multiple CPUs per BI node.

Expect a SMP machine to be running at DECUS, because the changes DEC already has "announced" for the VMS Executive in version 5 clearly are there to support symmetric multiprocessing. We also may hear about support for multiple interrupt levels on the Q-bus — something that always was possible but never interesting until the possibility of multiple parallel processors began to loom.

To make it easier to use the parallel capabilities, watch for DEC to announce a new run-time library with parallel

support routines, and for MONITOR to provide support for symmetric multiprocessors more elegantly than it currently supports asymmetric multiprocessors.

If you're hoping that SMP support in VMS will provide the kind of fault tolerance available in some of the "nonstop" architectures around, you'll be disappointed. DEC is likely to state that fault-tolerance will be a "non-goal" of its SMP architecture; besides, it would be very difficult to implement in VMS. However, SMP support is likely to incur essentially zero overhead in a single-CPU operation and probably will incur very low overhead in multiple-CPU operations.

In the process of implementing SMP support, DEC has indicated that it's going to rebuild the entire VMS Executive. SYS.EXE is going to become multiple images so that only the images needed for each processor are loaded at boot time. And processor-specific code also will be moved into a central image loaded at boot time, rather than existing in every CPU. This will make the overall system image smaller because only the needed code will be loaded, and it will make it easier for DEC to add CPU-specific support in the future.

There also will be some performance enhancements to the Executive, especially in the area of paging and swapping. Multithreaded modified-page-writing will be provided, as will multiple-page-files-per-process, and the trimming algorithms will be reworked completely.

4. Mixed-Mode Clusters and Non-HSC Failover Support — Everyone knows by now that there will be mixed-mode clusters (co-existing CI-and Ethernet-based clusters) in version 5. What we expect to find out at DECUS is how DEC did it!

It's rumored that version 5 will support failover for non-HSC disks, a feature previously limited only to HSCs. This means that if you have, say, a local area VAXCLUSTER with KDA50 controllers on two MICROVAXs, each connected to the same disks, you'll be able to continue processing uninterrupted and without manual intervention if one of the MICROVAXs goes down (with only a brief pause as the cluster reconfigures itself).

This is a significant enhancement if you've been looking for a way to get high availability without paying big bucks for HSCs and cluster hardware. Of course, HSCs and cluster hardware still have a big performance boost and offer some other integrity features, but it's a big step in the right direction.

For non-HSC failover to be truly useful in a small LAVC, DEC must add boot node failover, and it appears that it will. This feature would allow a cluster to continue processing even if the boot node crashes (the boot node is the machine that everyone else, especially the diskless nodes, boots from). Taken together, these facts mean that every VAX will be clustered before long, and that takes DEC a long way toward its avowed goal of "The system is the network."

What's interesting is that DEC is

doing this over Ethernet (an "open" architecture) but using a closed (and difficult to copy) cluster protocol that's guaranteed to change each point release and is just about impossible to implement on non-VAX machines. It appears that while everyone was dumping on DEC for closing the BI, DEC sneaked in the back door and closed Ethernet!

Beginning with version 5, you'll be able to tell the difference.

5. Licensing — DEC is changing from a hardware company to a software company, so you can expect it to begin taking action to protect its income source from unscrupulous users. Expect version 5 to include support for a new licensing facility to prevent unauthorized use of software.

The new facility will protect layered products, as well as VMS itself, and is likely to be available to third-party software developers. The new facility may be invoked by an image via a system service or an RTL call. Look for DEC to explain at DECUS how such a facility might be made hacker-proof.

It's also expected that the new licensing system somehow will tie software to customers rather than to CPUs, but it's not clear how the facility might deal with clusters and other multi-CPU environments. Not much is known about the new licensing facility, so many DECUS attendees will be anxious to hear about it.

Bits And Pieces

Here's a random collection of some of the more interesting tidbits we expect to hear about version 5.0 of VMS:

1. VMS BACKUP — This utility has been substantially reworked, especially standalone BACKUP. Version 5 BACKUP will issue its own $MOUNT request.
2. DEBUG — The DEBUG utility has a number of new features, including better shareable image support and a few bug fixes.
3. SMG — Enhancements will provide support for pull-down and strip menus, viewports, and sub-processes in windows.
4. VAXTPU and EVE — Several Symposium talks are scheduled to discuss new features of these utilities.
5. Run-Time Library — This will be enhanced with new date/time formats and routines, including a $NUMTIM style input routine.
6. AUTOGEN — A new feedback mode is scheduled for AUTOGEN. You'll tell AUTOGEN to collect and analyze a particular workload; e.g., the peak workload during the day. AUTOGEN then would analyze and tune your system to that single particular workload. It won't be an AI tool to tune VMS on the fly, but it's a start in the right direction.

The queue files finally have been rewritten as part of version 5. Performance is improved drastically; there are ACLs, separate queue lists for each queue, F$GETQUI and LIB$GETQUI interfaces, and new SET/SHOW ENTRY commands to support all this stuff and make the queue management routines more like the rest of DCL.

7. IF-THEN-ELSE — Finally, DCL will get this capability.
8. New TPU Version — No longer will TPU require section file recompilation between versions. There's a WPS-compatible keypad supplied, and the LSE-style /START qualifier will allow the support of TPU under DEBUG (instead of just LSE as is currently the case). TPU (and possibly SMG) also will get mouse support — a big win for all you VAXSTATION and VAXMATE owners!
9. System Management Tools — New tools will make it easier to set up complete turnkey VAX installations at small sites. The idea is that a VMS system should have a minimal set of system management functions that can be performed by a non-technical person via DCL menus or a mouse-based interface.
10. File Systems — There will be a new SALVAGE command to reconstruct trashed disks. Also, look for version 5 to include directory scan improvements and true highwater marking (as opposed to the pseudo highwater implementation currently in place).

Since version 4.0, we've been able to use native VMS utilities to create extra directory entries for files. That allows the same file (even a directory file) to appear in more than one directory hierarchy. But it's been confusing because you couldn't tell which file was the "real" one and which was the secondary directory entry. Beginning with version 5, you'll be able to tell the difference.

DEC PROs At DECUS

Our *DEC PROFESSIONAL* editors will be speaking at the upcoming Symposium. Be sure to check your schedule for the appropriate times and locations.

Al Cini, Senior Technical Editor:
- "Evaluating DBMS Software For Commercial Applications"

Philip A. Naecker, West Coast Editor:
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Bill Hancock, Networking Editor:
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Several years ago DEC coined the saying, "The network is the system," and it looks like it's now making good on that promise.

This will also make it possible for a directory of your entire disk to avoid listing some files twice, as now happens with the SYSCOMMON directory tree. Rumors also have it that VMS V5 will include RMS journaling as a standard feature, rather than an option as it is in VMS V4.6.

DECNET Directions

On the first day of the Symposium look for sessions giving details on DEC's new distributed services products, which provide for a network-wide name service, network-wide access to RMS files in a transparent fashion, and network-wide queuing for batch and print queues.

We also can expect to hear technical details about DEC's new electronic mail products. These services take a page from the Xerox networking environment and may be the beginning of many new services to be offered inside DEC's new networking environment. Several years ago DEC coined the saying, "The network is the system," and it looks like it's now making good on that promise.

DECNET performance is improved in several key areas, and NCP gains wildcards and command line recall. DECNET also will include support for VMS Services for MS-DOS, now packaged as a separate product.

New Products

There are two kinds of new product announcements that always attract attention at DECUS. The first involves announcements synchronized with the Symposium. These, of course, are always exciting. But most attendees are interested equally in the products announced during the last few months. Adequate technical information usually isn't yet available from the sales staff. As a result, you can expect tremendous interest in the technical sessions providing specifics about products like the MICROVAX 3000 series, the TK70 tape, the RA70 disk, and a number of new software products.

At DECUS, DEC often discusses products under development but not exactly in those terms. Look for sessions with titles like "Future Directions in Widget," "Coming Soon to a Widget Near You!" and "Widget — The Next Five Years." Don't expect to hear promises to include all features in the next version of the product, but these sessions afford a useful (if sanitized) look into the future of DEC computing. Of course, a quick scan of the titles for this Symposium shows a healthy number of "What's New in Widget" titles, too, so a dedicated user probably could keep busy full time learning about DEC futures.

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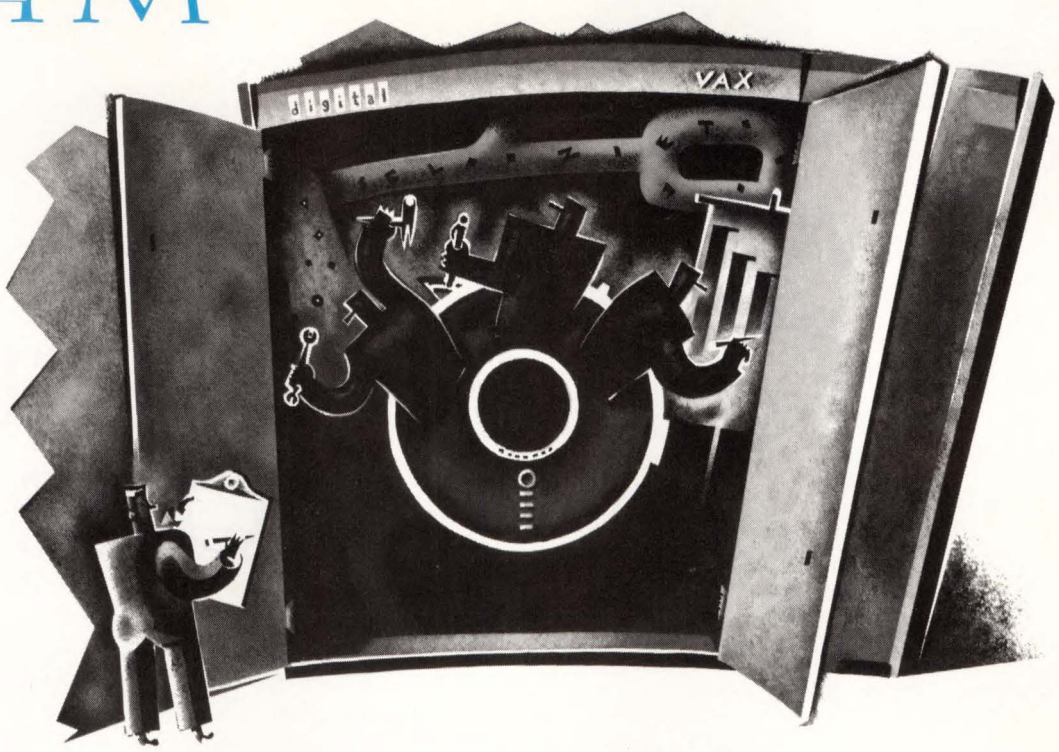
Quantum PM



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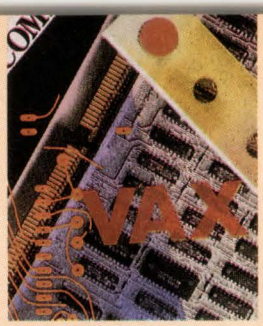

VAX

REPLY/LOG IN BATCH MODE

By Perry Bret Wischow

A Program To Close And Open An Operator File.

Have you ever wanted to do a REPLY/LOG (close the OPERATOR.LOG file and open a new one) from a batch job?

Here's a program that will run in either batch or interactive mode. The key to the program is that the call to the system service $SNDOPR must be tied to a terminal that always is enabled as a central operator terminal. Our system, like most, uses OPA0: (the operator console). Then, the program thinks that the REPLY/LOG function came from OPA0:. To run this program, you need OPER privilege. — *Perry Bret Wischow serves with the United States Oceanographic Office in Mississippi.*

PROGRAM

```
;*******************************************************************************
        .TITLE  REPLY_LOG - close the current OPERATOR.LOG file and
;                                       open a new one.
;
;*******************************************************************************
        $OPCDEF                         ; Macro definitions
        .PSECT  REPLY_LOG_DATA,noexe,rd,wrt,long
mbuf:   .byte   OPC$_RQ_LOGI            ; Request code (REPLY/LOG)
        .blkb   3                       ; Reserved for DIGITAL use only
        .long   0                       ; Request id
        .word   0                       ; Unit # of system console
        .ascii  /_OPA0:/                ; Device name of operator console
mdesc:  .long   16                      ; Length of "mbuf"
        .address mbuf                   ; Request packet

        .PSECT  REPLY_LOG,exe,rd,nowrt,long
        .entry  REPLY_LOG,^M<r6,r7,r8>
        $SNDOPR_S  msgbuf=mdesc         ; Send request
        $EXIT_S
        .end reply_log
```

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TURBO PROLOG

By David G. Goldstein

For Less Than $100, It's Hard To Beat.

Every so often another product appears with a prefix like "Super" or "Soft" that is more hype than substance. However, when the word "Turbo" appears, and the product is made by Boreland, the witch's brew is always tasty.

TURBO PROLOG is Boreland's recent entry into the artificial intelligence field. Like *TURBO PASCAL*, *TURBO BASIC* and the company's other offerings (most notably *Sidekick*), *TURBO PROLOG* is an inexpensive alternative in a field where whims can cost thousands of dollars.

TURBO PROLOG, a PC-compiled version of the PROLOG programming language, comes with sample programs and documentation, and isn't copy protected. The package, which lacks some features of standard PROLOG, offers a thorough, well-designed system that includes compiler, editor, DOS shell, windowing environment and more.

Back To School

PROLOG (often used for implementing PROduction LOGic) is a great language for certain artificial intelligence applications, particularly those dealing with if-then-type rule constructs, as in an expert system.

PROLOG differs from most familiar languages in that it strives to achieve a desired end by solving the needs of the problem, as opposed to executing a program step-by-step in some procedural fashion. Simply put, a PROLOG program strives to achieve a certain goal as a hypothesis, instead of executing a series of statements until some end marker is found.

For example, in *TURBO PROLOG*, there's always some statement that's a formal goal, such as:

```
GOAL:

ISDRUNK( COMPUTER). /* Proving an obvious conclusion, considering to err is impossible... */
```

PROLOG would attempt to prove the goal by matching the conclusion to the left-hand side of a rule, and verifying that all the facts used on the right-hand side are true, such as in:

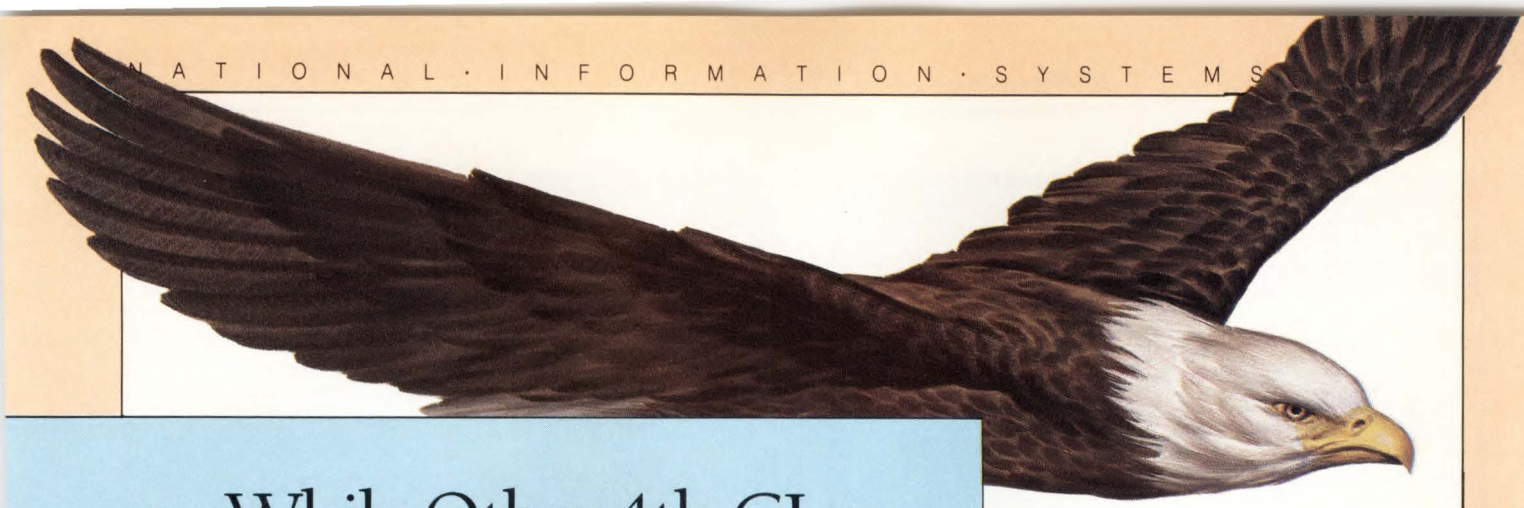
```
ISDRUNK( X) :- SMELLS_LIKE_WHISKEY_
               BOTTLE( X), HICCUPS( X).
```

This statement, in English, translates to "if X smells like a whiskey bottle and X hiccups, then X is drunk."

PROLOG continually attempts to prove the goal until either it proves it or it runs out of evidence trying.

Various artificial intelligence-oriented languages, particularly those geared to implementing expert systems or "expert system shells," follow similar, goal-driven if-then-type rules. The concept of proving a goal by proving its conditions until arriving at given assumptions is called a "backward-chaining rule-based system." Normally, of course, the rules aren't as useful as proving that your computer's been out drinking.

TURBO PROLOG is extremely fast. Although the package isn't interpretive (there-



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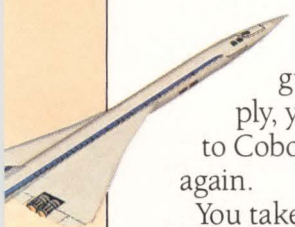

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PROGRAM 1.

```
predicates

outer(integer) inner(integer)

clauses

inner(X) :- X=10000.
inner(X) :- X1=X+1, inner(X1).

outer(X) :- X=10.
outer(X) :- X1=X+1, inner(0), outer(X1).

goal
   clearwindow(), time(_,_,X,Y), write(X," ",Y), nl, outer(0),
                  time(_,_,A,B), write(A," ",B).
```

PROGRAM 2.

```
domains
        intlist = integer*      /* signifying a list of integers */

predicates
        append(intlist, intlist,intlist)
        writelist(intlist)

clauses
        append([],List, List).. /* if empty list, just return second list */
        /* else append head of one list to result */
        append ([X| L1], List2, [X|L3]) if append(append(L1,List2,L3).
        writelist([],([]). /* if no list, return no list. */
        /* else write list */
        writelist([Head|Tail]) if write(Head),nl,writelist(Tail).
```

PROGRAM 3.

```
predicates

        again(integer)

clauses

again( X) :- Y = X+1, write(Y), nl, again( Y), nl.

goal

        again(1).
```

fore not hippo-like in its execution), as are most versions of the language, Boreland's code compiles so fast that iterative compiling is almost as feasible as an interpretive environment for developmental stages. More important, when a project is done, *TURBO PROLOG* permits the creation of standalone executable files that run faster than most interpretive versions.

Speed computations for PROLOG programs are based on an unusual standard, logical inferences per second (LIPS.) This execution standard is used because PROLOG has as its driving mechanism a "theorem prover" — the mechanism that continually attempts to prove the goal. Program 1 includes several listings. These listings, running at up to 40,000 LIPS, run between 1.5 to 20 times faster than other compiled PROLOGs (and faster when compared against interpreters).

The first program, an iterative looping structure, mimics a common programming practice in procedural languages (for-next, do-continue). This program is useful for pointing out several features of the PROLOG language. First, the language can support normal program constructs, once properly doctored. The algorithm incorporates branching concepts as well as sequential procedures.

The program also shows, as it implements an inner/outer

PROGRAM 4.

```
   /*************************************************************/
   /*                    TOWERS OF HANOI                        */
   /*                    ===============                        */
   /*                this hanoi is slowed down                  */
   /* Call the predicate hanoi with the number of slices, you want.*/
   /* Example:  Hanoi(6).                                       */
   /*************************************************************/
DOMAINS
  TIME, ROW, COL, NUMBER = INTEGER

PREDICATES
  hanoi( NUMBER )
  move(  NUMBER, NUMBER, ROW, ROW, ROW, COL, COL, COL )
  inform(  NUMBER, NUMBER, ROW, ROW, COL, COL )
  makepole( NUMBER, NUMBER, COL)
  delay()  dd(TIME)
  move_vert(COL,NUMBER,ROW,ROW)
  move_horizon(ROW,NUMBER,COL,COL)

CLAUSES
  delay :- dd(100).
  dd(0):-!.
  dd(N):-N1=N-1,dd(N1).

  hanoi(N) :-
        N<=13,!,
        VB=2+6*N,VH=3+N,CV=N, CM=3*N, CH=5*N,
        STCOL=(79-6*N)/2, STROW=(25-VH)/2,
        makewindow(1,7,7,"Hanoi",STROW,STCOL,VH,VB),
        makepole(N,N,CV),
        move(N,N,0,0,0,CV,CM,CH),
        cursor(0,0), write("Press any key"),readchar(_).

  hanoi(_):- write("maximum 13 disc's\n").

  move(H,1,HA,_,HC,CA,_,CH):-!,inform(H,1,HA,HC,CA,CH).
  move(H,N,HA,HB,HC,CA,CB,CC):-
                N1=N-1,
                HA1=HA+1,
                move(H,N1,HA1,HC,HB,CA,CC,CB),
                inform(H,N,HA,HC,CA,CC),
                HC1=HC+1,
                move(H,N1,HB,HA,HC1,CB,CA,CC).

 inform( H, N, H1, H2, C1, C2 ) :-
        C11=C1-N, C22=C2-N, NN=2*N,
        H11=H-H1, H22=H-H2,
        move_vert(C11,NN,H11,1),
        move_horizon(1,NN,C11,C22),
        move_vert(C22,NN,1,H22).


  makepole(_,0,_):-!.
  makepole(H,N,C):-HH=H-N,inform(H,N,H1,C).


  move_vert(_,_,H,H):-!.
  move_vert(COL,SIZE,H1,H2):-H1<H2,!, /* move up */
        H11=H1+1,
        field_attr(H11,COL,SIZE,112),
        field_attr(H1,COL,SIZE,7),delay,delay,
        move_vert(COL,SIZE,H11,H2).
  move_vert(COL,SIZE,H1,H2):-H1>H2,!, /* move down */
        H11=H1-1,
        field_attr(H11,COL,SIZE,112),
        field_attr(H1,COL,SIZE,7),delay,delay,
        move_vert(COL,SIZE,H11,H2).

  move_horizon(_,_,H,H):-!.
  move_horizon(ROW,SIZE,C1,C2):-C1<C2,!, /* move right */
        C11=C1+1, HH=C1+SIZE,
        field_attr(ROW,HH,1,112),
        field_attr(ROW,C1,1,7),delay,
        move_horizon(ROW,SIZE,C11,C2).
  move_horizon(ROW,SIZE,C1,C2):-C1>C2,!, /* move left */
        C11=C1-1, HH=C11+SIZE,
        field_attr(ROW,C11,1,112),
        field_attr(ROW,HH,1,7),delay,
        move_horizon(ROW,SIZE,C11,C2).

goal
  hanoi(6).
```

loop, how PROLOG passes variables; i.e., rules don't need to be passed any parameters, but if they are, then all instances of the same variable (beginning with capital letters) refer to the same variable.

Schemes like this seem clearer when considering PROLOG'S implementation. *TURBO PROLOG* begins solving a goal by finding a left-hand side matching the goals form (number of and correct types of parameters) and that sequentially satisfies the conditions on the right-hand side. If any of the right-hand side conditions can't be met, the language tries to find later instances of the same left-hand side form. As the condition is met, the program continues solving the next goal (in this case another iteration).

Generally speaking, all manipulations involving legal, computable expressions that don't involve logical comparisons

are assumed true by the environment, such as:

```
RESULT( A) :- WRITE( A), WRITE( "is true as there are no
   logical operations.").
```

Program 2, a list appending algorithm operating on a large, pre-generated list, illustrates a few more interesting ideas incorporated into PROLOG. First, like LISP, PROLOG includes a few basic functions to work with the handling of lists.

PROLOG treats lists simply: They are either empty (denoted by [ ]) or consist of a head and tail ([Head | Tail]). This representation allows for the first item of the list as the head, and all remaining items to comprise the (possibly empty) tail.

PROLOG allows new functions to be defined from preceding ones, permitting the implementation of almost any LISP (LISt Processing) function. However, here arises Boreland's first weak point: *TURBO PROLOG* doesn't allow unstructured lists.

Using a generic PROLOG interpreter, you can create lists with boundless creativity; an interpreter can adjust dynamically to user-defined nuances as they occur, at the expense of speed. However, *TURBO PROLOG* derives its speed partially by forcing you to predefine exactly how functions are used later in the program in a kind of "strong typing." This feature permits faster compilation and execution, but also greatly weakens the capabilities of the language; here, restricting the types of processes that can be performed on a list.

Program 3 was used to check *TURBO PROLOG*'s recursive capabilities without modifying the stack size (easy to do through Boreland's nice user interface). We made 984 recursive calls before the stack ran out of space.

Program 4, the Towers Of Hanoi, is one of several Boreland-supplied sample programs included in the package.

The principle weakness of *TURBO PROLOG* is that in order to create faster code, a form of "strong typing" is enforced, whereas generic PROLOG interpreter allows it to take on any form at any time during a program's execution. *TURBO PROLOG* requires each rule to be predefined with the types of values it returns and parameters it expects.

The easiest way of explaining this kind of difficulty is by example:

```
add2(Complex1,Real1,Complex2,Real2,Complex3,Real3) :-
   Complex3 = Complex1 + Complex2, Real3 = Real1 + Real2.
add2(Real1,Real2,Real3) :- Real3 = Real1 + Real2.
```

These would be legal statements in standard PROLOG, however, using Boreland only one or the other could be used because add2 previously would have been defined with a particular number of parameters and its types.

Further, and probably the largest drawback of the package, is *TURBO*'s inability to add new clauses to the program. *TURBO PROLOG* allows only database items to be added dynamically. Because facts, but not rules, can be added at run time, making true artificial intelligence projects with this software can be tricky; i.e., FATHER(TIM, JOHN) can be added, but not GRANDFATHER(A, C) :- father(A, B), father (B, C).

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Good Developments

TURBO PROLOG has a number of incredible features, primarily its interface capabilities. Boreland's product is the only true compiler I've seen so far on the market; others simply feature standalone interpreters. Therefore, along with lightning speed, *TURBO PROLOG* includes a variety (more than 90) of standard predicates to perform PC-specific functions that are all to be implemented in the standard fashion of fixed parameters.

Remaining chic, Boreland provides the advanced graphics, windowing, sound and other input/output functions you expect from the makers of *Sidekick, Reflex,* and *TURBO PASCAL*. A list of some available features is shown in Figure 1.

Also included in the package are a built-in editor, linker, filer, setup utility and help facility, as well as a few impressive demonstration programs (particularly nice is a geography tutorial).

For most PC applications *TURBO PROLOG* seems to be a winner — graphics, windows, list processing, recursion, theorem proving and a full development facility for less than $100 is hard to beat. Yet for true artificial science applications, the limitations of the language should be considered carefully. However, artificial intelligence is often a misused buzz word to describe applications mimicking human behavior and not human intelligence. Therefore, in any setting other than a university laboratory, *TURBO PROLOG* may be just the cost-effective cure-all you seek. *—David G. Goldstein is a Philadelphia-based free-lance writer.*

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FIGURE 1.

```
INPUT
readln(X$) - read a line of data
readint(I) - read an integer
readreal(R) - read a real
readchar(C) - read a character

file_str(DosFileName,StringVariable)    File <---> String


FILESYSTEM
openread(SymbolicFileName,DosFileName)  - opening files
openwrite(SymbolicFileName,DosFileName)
openappend(SymbolicFileName,DosFileName)
openmodify(SymbolicFileName,DosFileName)
readdevice(SymbolicFileName) - using devices
writedevice(SymbolicFileName)
closefile(SymbolicFileName)
filepos(SymbolicFileName,FilePosition,Mode) - position pointer into file
eof(SymbolicFileName)
flush(SymbolicFileName)
existfile(DosFileName)
deletefile(DosFileName)
renamefile(OldDosFileName,NewDosFileName)
disk(DosPath) - sets or returns drive path


SCREEN HANDLING
scr_char(Row,Column,Char) - writes a character on a screen position using
                            current screen attributes
scr_attr(Row,Column,Attribute) - set or return screen attributes for screen
                            position
field_str(Row,Column,Length,String) - similar to above, but operating upon
                            a string, instead of a character
field_attr(Row,Column,Length,Attr)
cursor(Row,Column)
cursorform(Startline,Endline)   0<Startline<15, 0<Endline<15
attribute(Attr)

WINDOW SYSTEM
makewindow(WindowNo,ScrAtt,FrameAtt,Framestr,Row,Column,Height,Width)
shiftwindow(WindowNo)
removewindow()
clearwindow()
window_str(ScreenString) - writes a string to the active window
window_attr(Attr) -        assigns attributes to the active window


STRING HANDLING
frontchar(String,FrontChar,RestString)
fronttoken(String,Token,RestString)
frontstr(Length,Inpstring,StartString,RestString)
concat(String1,String2,String3)  String3 = String1 + String2
str_len(String,Length)
isname(StringParam)


CONVERSIONS
char_int(CharParam,IntgParam)
str_int(StringParam,IntgParam)
str_char(StringParam,CharParam)
str_real(StringParam,RealParam)
upper_lower(StringInUpperCase,StringInLowerCase)
```

```
GRAPHICS
graphics(ModeParam,Palette,Background)
dot(Row,Column,Color)
line(Row1,Col1,Row2,Col2,Color)
pendown - "turtle graphics" commands
penup
pencolour(Color)
forward(Step)
back(Step)
right(Angle)
left(Angle)


MISCELLANEOUS
edit(InputString,OutputString)
editmsg(InputString,OutputString,Headstr,Headstr2,Msg,Pos,Helpfilename,
   RetStatus)
display(String)

/* Show a picture of the directory and return a filename */
dir(Path,Filespec,Filename)

random(RealVariable)
storage(StackSize,HeapSize,TrailSize)
sound(Duration,Frequency)
date(Year,Month,Day)
time(Hours,Minutes,Seconds,Hundredths)
port_byte(PortNo,Value) - memory affecting predicates
ptr_dword(8086Ptr,Segment,Offset)
memword(Segment,Offset,Word)
membyte(Segment,Offset,Byte)
bitand(X,Y,Z) : Z=X and Y
bitor(X,Y,Z) : Z=X or Y
bitexor(X,Y,Z) : Z=X exor Y
bitnot(X,Y) : Y= not X
bitleft(X,Y,Z) : Z=X shiftet Y places to the left
bitright(X,Y,Z) : Z=X shiftet Y places to the left
system(DosCommandString)        Call the dos system
bios(Interruptno,reg(AXi,BXi,CXi,DXi,SIi,DIi,DSi,ESi),
                 reg(AXo,BXo,CXo,DXo,SIo,DIo,DSo,ESo))
        Activate a system interrupt
consult(DosFileName)  Load a database from file
save(DosFileName)  Save the database on file
exit    Return to menu system
fail    is always false and provokes backtracking
nl      New line
beep    A short sound


SPECIAL  PREDICATES
write( Variable|Constant * )
writef( FormatString, Variable|Constant * )
findall( Variable, Atom, ListVariable )
not( Atom )
free( Variable )
bound( Variable )
readterm( Domain, Variable )
assertz( Term )
asserta( Term )
retract( Term )
```

A listing and explanation of some of* TURBO PROLOG's *predicates.

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MASS STORAGE

Disk I/O: Part 2

By Moses Sun

The Challenge Of The Disk Storage System Integrator.

In Part 1 we developed an understanding of how to configure a disk subsystem. We now address another essential issue: properly managing the disk subsystem. We'll review some of the tools provided with VMS to assist both the system manager and the application programmer in achieving their goals.

A common goal shared by both system managers and application programmers is minimizing disk I/O. Although the goal is the same, different perspectives result in different approaches. The application programmer reduces disk I/O by carefully designing the program and data files. The system manager, on the other hand, is concerned with overall I/O system performance. However, reasonable system response only can be achieved by combining the efforts of both.

Optimizing Disk Subsystems

The demand of a disk is defined by the I/O operation rate, which can be obtained by executing the MONITOR DISK command. Because the size of data transfer varies from one I/O operation to the other, it's difficult to determine if a disk's I/O capacity has been saturated just by examining the I/O operation rate. To determine if the capacity of a disk has been saturated, another key factor that must be examined is the disk I/O request queue length. The disk I/O request queue length is the number of I/O operations that must be serviced at a particular time.

You can obtain the disk I/O queue length information by executing MONITOR DISK/ITEM = ALL. When the average queue length of a disk is greater or equal to one, we say that the disk I/O capacity has been completely saturated. A thorough investigation of saturation causes is necessary to improve disk responsiveness.

To improve the responsiveness of a saturated disk, you must determine if the disk is heavily fragmented. Disk fragmentation is the result of continuous file deletion, creation and extension processes. On a heavily fragmented disk, the files created on it also can be very fragmented.

To identify a file on a disk, a file header is created for the file on the same disk. The file header is a fixed-size data structure that describes the ownership, protection, size, location, etc., of the file. For a fragmented file, its file segments may be scattered over many locations on the disk. The location of each file segment will be recorded in the file header as a retrieval pointer. For a very fragmented file, a single file header may not be able to accommodate these retrieval pointers. As a result, multiple file headers may be needed for a very fragmented file.

The impact of disk fragmentation is to take longer to create and extend a file and to locate the desired data block in the file. The excessive seeking operations quickly eat up the useful disk I/O bandwidth and slow down disk responsiveness. It's even worse for a heavily fragmented file, because the file needs extra

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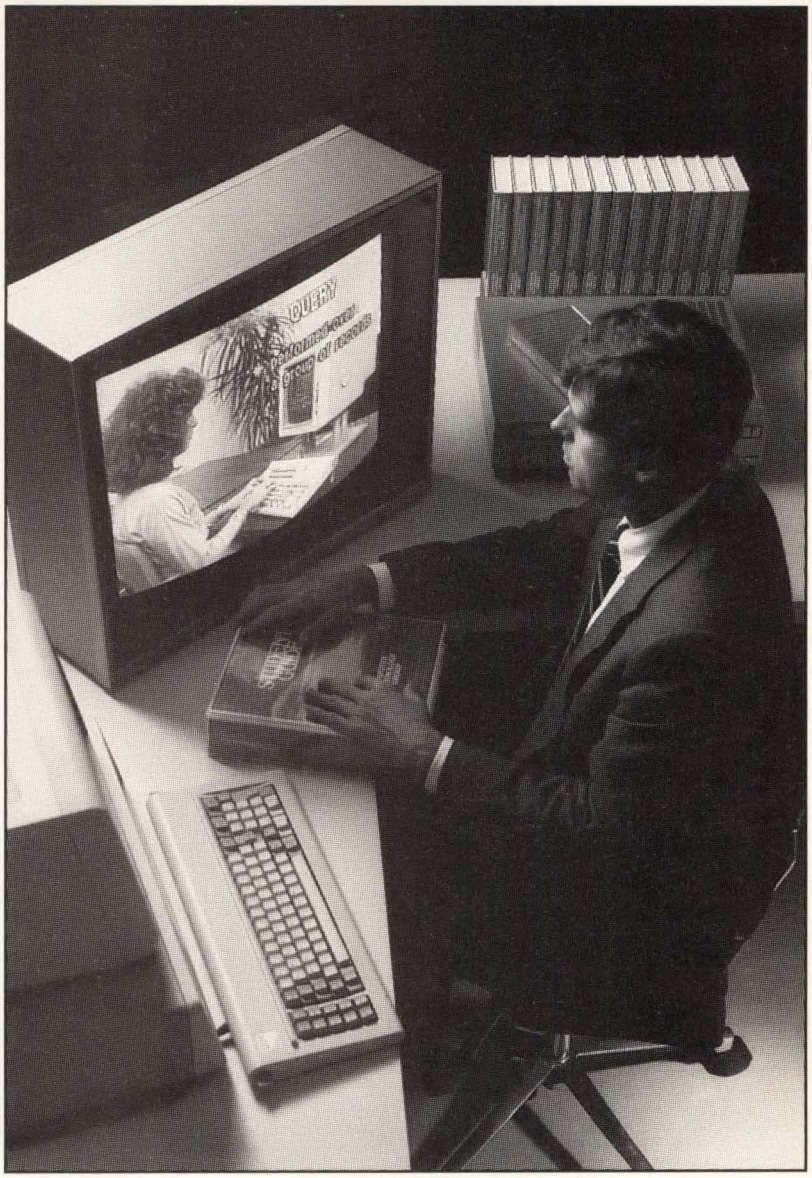

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PROGRAM 1.

```
$! This program will monitor memory management activities of each
$! user process between 8 a.m. and 5 p.m. The result will be
$! output to the printer at the end of the day. The job will
$! resubmit itself at the end of the day and will start to monitor
$! at 8 a.m. next day.
$!
$ set nover
$ time = f$time()
$ time = f$extract(12,2,time)
$ if time .gt. 8 then goto BEGIN
$ delta = 8 - time
$ wait 'delta':00:00
$ BEGIN:
$ ASSIGN SYS$MONITOR:SHOW.DAT SYS$OUTPUT
$ ASSIGN SYS$MONITOR:SHOW.LOG SYS$ERROR
$
$ loop:
$ time = f$time()
$ time = f$extract(12,2,time)
$ if time .eq. 17 then goto resubmit
$ quote   = """
$ pid     = ""
$ context = ""
$ out     := write sys$output
$
$ if p1 .nes. "" then pid = p1
$
$ out "                        Working Set Information"
$ out ""
$ out -
"                                    WS   WS     WS    WS   Pages  Page "
$ out -
" Username  Processname    State  Extnt Quota  Deflt Size  in WS Faults  Image"
$ out ""
$ count = 1
$ start:
$  if p1 .eqs. "" then pid = f$pid(context)
$  if pid .eqs. "" then goto exit
$
$ pid = quote+pid+quote
$ username = f$getjpi('pid,"USERNAME")
$ if username .eqs. "" then goto start
$
$ processname = f$getjpi('pid,"PRCNAM")
$ imagename   = f$getjpi('pid,"IMAGNAME")
$ imagename   = f$parse(imagename,,,"NAME")
$ state       = f$getjpi('pid,"STATE")
$ wsdefault   = f$getjpi('pid,"DFWSCNT")
$ wsquota     = f$getjpi('pid,"WSQUOTA")
$ wsextent    = f$getjpi('pid,"WSEXTENT")
$ wssize      = f$getjpi('pid,"WSSIZE")
$ globalpages = f$getjpi('pid,"GPGCNT")
$ processpage = f$getjpi('pid,"PPGCNT")
$ pagefaults  = f$getjpi('pid,"PAGEFLTS")
$ pages       = processpage + globalpages
$
$ text        = f$fao("!AS!15AS!5AS!5(6SL)!7SL!AS", -
  username,processname,state,wsextent,wsquota,wsdefault,wssize,pages, -
  pagefaults,"   "+imagename)
$ out text
$ if p1 .nes. "" then exit
$ count = count + 1
$ goto start
$ exit:
$ out ""
$ out "Total Processes are ",count
$
$ WRITE SYS$OUTPUT ""
$ WRITE SYS$OUTPUT ""
$
$ WAIT 00:10:00     !wait 10 minutes
$ goto loop
$
$ resubmit:
$ deassign sys$output
$ deassign sys$error
$ print/delete sys$monitor:show.dat
$ submit/after=tomorrow/que=monitor_batch  sys$monitor:csgshow
$ EXIT
```

A working set adjustment monitor program.

I/Os to map the right file header to memory before any data seeking and retrieving activities can take place.

Two approaches may be taken to detect the fragmentation of a disk. A simple approach is to run a fragmentation utility program, written by James B. Fischer and available through DECUS (DECUS Tape A, Spring 1986. To order, write DECUS, Order Processing, 219 Boston Post Road, BP02, Marlboro, MA 01752). This program produces a disk fragmentation percentage. This approach is good for the preliminary investigation of disk fragmentation. Its shortcoming is that it's unable to indicate file fragmentation if it exists.

A more thorough approach is first to execute the MONITOR PROCESS/TOPDIO command to identify the processes making a significant number of disk I/O requests. Next, by executing the SHOW DEVICE/FILE/NOSYS command, you can identify the files that currently are opened by those processes. Finally, you can determine the file fragmentation by examining the number of retrieval pointers under the map area after executing the DUMP/FILE/HEADER command.

On a lightly fragmented disk (low fragmentation percentage), you can defragment a file by using the COPY/CONTIGUOUS command. On a heavily fragmented disk, you must use the BACKUP command to rebuild the disk. There are few commercial software packages that entirely can eliminate this painful disk rebuilding process. Among them are *DISKEEPER*, *SQUEEZPAK*, *DISKIT 2000* and *RABBIT-7*. All can be run online concurrently with other user processes. The advantage of using these packages is that they eliminate the backup and restore process entirely.

If the demand on a disk stays high after defragmenting the disk and files, consider the possibility of offloading the demand on the disk. If the disk is the system disk, the first choice is to offload paging and swapping activities onto another lightly loaded disk by installing secondary paging and swapping files onto the non-system disk. This process

is particularly important for a cluster-wide common system disk because it will have an adverse effect on cluster-wide system performance when the cluster-wide system disk is overloaded.

To offload the paging and swapping activities to another disk (e.g., device DISK), first edit the SYS$SYSTEM:MODPARAMS.DAT file to change PAGEFILE and SWAPFILE parameters to a small size. Normally, both can be set to 6000. Next, create a secondary paging and swapping file by executing the following two SYSGEN commands:

```
SYSGEN> CREATE DISK:
    [SYSTEM]PAGEFILE.
    SYS/SIZE=(desired size)
SYSGEN> CREATE DISK:
    [SYSTEM]SWAPFILE.
    SYS/SIZE=(desired size)
```

These commands assume that there's a SYSTEM directory on the device DISK. The third step is to add the following commands to the SYS$MANAGER:SYSTARTUP.COM file:

```
$ RUN SYS$SYSTEM:SYSGEN
  INSTALL DISK:[SYSTEM]
    PAGEFILE.SYS/PAGEFILE
  INSTALL DISK:[SYSTEM]
  SWAPFILE.SYS/SWAPFILE
  EXIT
```

Last, use the @SYS$UPDATE:AUTOGEN GETDATA REBOOT command to reboot the system.

If the disk isn't a system disk, offload heavily accessed files (identified by using MONITOR PROCESS/TOPDIO and SHOW DEVICE/FILE) to other lightly loaded disks. The ultimate goal is to reduce the average disk I/O queue length to below one.

Disk I/O Subsystem Tuning

A few improvements still can be made to improve overall I/O system responsiveness:

1. Install shared images as header resident. When executing an image file, memory. The image header contains a set of image descriptors that describe the virtual address of the image. The memory management service (pager) uses the image descriptors to map the image into memory. If an image has been installed as a shared image, it will be mapped into the system address space. Otherwise, the image will be mapped into the user address space.

If an image file is found to be shared by several different processes (by using SHOW DEVICE/FILE), consider using the INSTALL utility to install that image as shared and header resident. By doing so, there are significant savings not only on

the I/O bandwidth, but also on the CPU and memory bandwidth as well (see the *VAX/VMS Linker Reference Manual*). Savings in I/O come from eliminating the need to read image header to memory and eliminating the paging activities of user private pages. Savings in memory come from needing only one copy of the image maintained in memory. Savings in CPU come from the image being activated only once. In summary, an installed image can be activated more quickly with less overhead.

2. Separate seek-intensive applications from data-transfer-intensive applications. Seek-intensive applications (database inquire system) can be characterized by heavy disk head movement and short transfer time for each I/O request. The data-transfer-intensive application (the computer graphics system) exhibits the opposite characteristics. Accompanying large transfer size, the data-transfer-intensive application tends to block the requests from the seek-intensive application on the same disk. It's therefore desirable to separate these two kinds of activities onto different disks. It's better if these disks are connected to different controllers. This

FIGURE 1.

Username	Processname	State	WS Extnt	WS Quota	WS Deflt	WS Size	Pages in WS	Page Faults	Image
SYSTEM	CACHE_SERVER	HIB	512	512	222	512	94	61	FILESERV
SYSTEM	CLUSTER_SERVER	HIB	512	512	222	512	299	122	CSP
SYSTEM	OPCOM	LEF	2048	512	222	512	179	465	OPCOM
SYSTEM	JOB_CONTROL	HIB	512	512	222	512	319	189	JOBCTL
SYSTEM	CONFIGURE	HIB	512	512	222	512	133	103	CONFIG
DECNET	NETACP	HIB	1500	444	222	594	359	436	NETACP
DECNET	EVL	HIB	444	444	222	444	43	166010	EVL
SYSTEM	REMACP	HIB	444	444	222	444	58	85	REMACP
SYSTEM	VAXsim_Monitor	HIB	444	444	222	444	107	222	VAXSIM
ODASI	_RTA2:	LEF	2048	1500	1024	2048	1762	1995	S1032
BILL	BILL	LEF	2048	1024	800	800	351	974	
MARKB		LEF	2048	512	300	450	260	46282	
SAMREQ	SAMREQ	LEF	2048	1024	300	2048	2048	5704	S1032
ODASI	ODASI	HIB	2048	1500	1024	2048	1859	2120	S1032
SAMUTL	SAMUTL	CUR	2048	500	300	2048	1785	9704	S1032
ODASI	ODASI_1	HIB	2048	1500	1024	1024	307	296	RTPAD
DATABASE	_LTA120:	LEF	2048	1024	300	600	418	2231	EDT
ODASI	_RTA3:	LEF	2048	1500	1024	2048	1787	2631	S1032
DATABASE	_LTA121:	LEF	2048	1024	300	1650	1213	1720	EDT
DATABASE	_LTA124:	LEF	2048	1024	300	300	250	652	
MANAGER	MANAGER	CUR	2048	512	300	450	326	3781	
CHEMDB	CHEMDB	LEF	2048	1024	300	2048	2048	7882	CHEMDB
DATABASE	DATABASE	LEF	2048	1024	300	300	260	653	
MANAGER	S1032K_DET	HIB	444	444	222	444	444	664	S1032DET

Total Processes are 25

A sample output from the working set adjustment monitor program.

FIGURE 2.

Source Program		PSECTs in the Object File	
Data Declarations	compilation	LOCAL	NOEXE,WRT
Constant Declarations	⟶	DATA	NOEXE,NOWRT
Codes		CODE	EXE, NOWRT

A program is structured into three PSECTs.

is especially true for MASSBUS and UDA50 devices. When the controller is occupied by the data-transfer operation, a seek operation initiated on other disks still has to wait for the transfer to complete.

3. Allocate appropriate working set to user processes. When a user process has been allocated an appropriate working set size, it will reduce the page fault rate and disk I/O rate. To determine the appropriate working set size for each user or application, you must continuously monitor each user process. Program 1 (a modified version of a program in *Digital's Guide to VAX/VMS Performance Management*) can be submitted as a batch job to monitor each user's working set size. Figure 1 shows a sample output.

The output from the program can be used to determine the required working set size for the images of the running processes. The sample output from Figure 1 shows that the working set sizes from all database processes (running S1032 and CHEMDB) exceed their WSQUOTA. This implies that plenty of free pages are available on the free page list. Consider increasing WSQUOTA to 2048 and set WSEXTENT to a value larger than 2048.

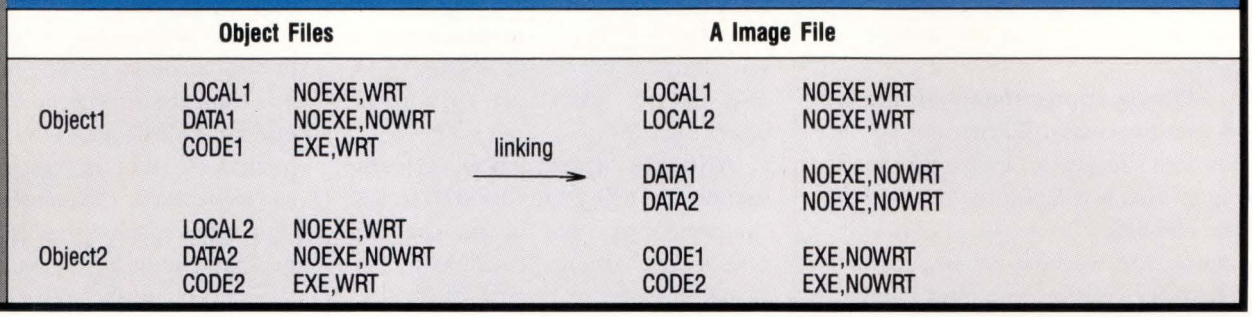
4. Allocate appropriate system caches. By using the MONITOR FILE command, you can obtain the file system cache hit rate. If it's lower than 75 percent of a particular cache (file header cache), use AUTOGEN to adjust the cache size. The higher the cache hit rate, the less disk I/O will be requested by the file system.

5. Decompress system library files. Most of the libraries (help and object) of VMS 4.X are in compressed form. Decompressing these library files, via SYS$UPDATE:LIBDECOMP.COM, could improve the system performance by reducing the demand on both I/O and CPU.

6. Offload the demand on the MSCP-served disk from the remote node. In a cluster environment, when a data request is made to a MSCP-served local disk from the remote node (CPU), the local node (CPU) issues the disk I/O request on behalf of the remote node. The data requested by the remote node, after being received from the disk, is sent to the remote node by the local node as a datagram(s). In this scenario, the local CPU could be viewed conceptually as a disk controller of the remote CPU. To use a CPU as a disk controller for the non-casual file access is certainly a waste of resources.

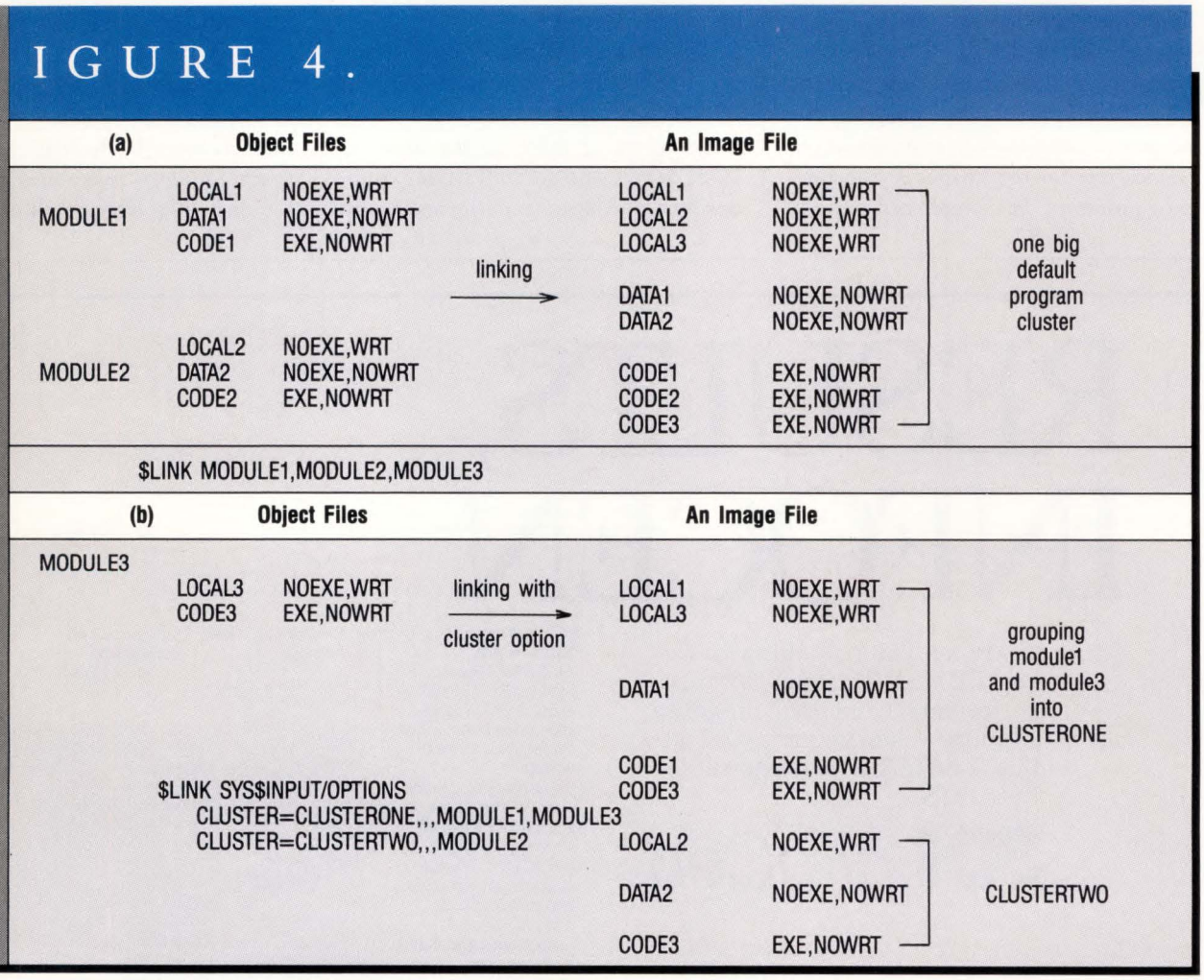
You can execute the SHOW DEVICE/FILE command on every remote node that has access to the MSCP-served disk to find out how many files are open on the disk. If a large number of files is

FIGURE 3.



Two object files are grouped into three image sections.

FIGURE 4.



A comparison between the default linking process and the linking process with the CLUSTER option.

open on the disk, consider relocating those files to an HSC-disk.

7. Reduce excessive image activation by rewriting long command procedures in high-level language programs. Frequently, activating a long command procedure may cause excessive image activation activities. Substantial page faults and disk I/Os could result. Consider rewriting the long and often used command procedure in a high-level language by using system service routines.

8. Turn off the high-water marking mechanism on the disk. The file system high-water marking mechanism is a VMS default security feature. This feature guarantees that the content in the allocated disk space is erased before giving it to the user process. Disabling the high-water marking mechanism can improve disk responsiveness when creating and extending files.

After compiling a program, the program is structured into a set of program sections (PSECTs). Each section is the grouping of codes of similar attributes, that is, writeable, readable, executable, end, etc (see Figure 2). During the program linking phase, the compiled program object files are further organized by the linker. The executable image is organized into the program clusters. By default, all the user-written codes are grouped into one big cluster called the default cluster. Each shareable image (e.g., VMS run-time library routines) will have a separate cluster. Within each cluster, PSECTs with similar attributes are further grouped into an image section (see Figure 3). PSECTs are alphabetized by name within an image section.

During the program activation phase, the image activator maps each image section to the process' virtual address space. The memory management routine (pager) then translates the program virtual address to the physical memory address when loading the program into memory. Sometimes the process working memory may not be large enough to accommodate the complete program. The other program segments may have to be brought in when they're needed. The process of bringing in missing program segments during the program execution is called "page faulting."

Because the linker has no knowledge of the relationships among the object files, the organization of the program clusters may not be optimal for the program execution. To reduce the page faults, you must improve the program locality by grouping related program sections into one cluster. To facilitate the programmer-controlled cluster mechanism, the VMS linker provides the pro-

grammer with the CLUSTER option when linking a program (see Figure 4). Refer to the *VAX/VMS Linker Manual* for details.

Figure 4 illustrates how to reduce page faults by properly clustering the program sections. This assumes that the process' working memory can accommodate only the program sections of two modules, and that the program execution sequence is MODULE1, MODULE3, and MODULE2. Based on the first assumption, the MODULE1 and MODULE2 will be first loaded into the process' working memory. When the execution of CODE1 of MODULE1 is completed, the pager has to be activated to retrieve MODULE3 from the disk to the memory currently occupied by MODULE2. When finishing with CODE3 of MODULE3, MODULE2 again will be brought into the memory by the pager. Two page faulting processes are necessary to complete the program execution. Suppose the program had been organized as in part (b) of Figure 4. Only one page fault would have been necessary to execute the program.

In summary, properly clustering the program sections can reduce the program page fault(s), enhancing program performance.

File Optimization

The file design process is crucial to the design of a successful application system. It involves choosing the proper file organization, such as sequential, relative, or index sequential, and determining the appropriate file attributes. Several important file attributes controlled by the designer are initial file allocation size, file extension size, window size and I/O buffers.

If the ultimate size of a file is known during the design phase, a contiguous disk space should be allocated to accommodate the complete file. Because only one retrieval pointer is required, enhanced I/O performance can be expected. If the ultimate file size isn't known but the growth of the file is known, for example, the number of records that will be inserted into the file per day, a proper file extension size should be specified to reduce the number of extension operations. Consequently, file fragmentation can be minimized.

To speed up data retrieval from a fragmented file, the VMS file system maintains the retrieval pointers of the file in a memory resident data structure called a "window." The default window size is seven pointers. When accessing a data segment whose pointer is not in the current window, a window turn is caused. At this time, the file header(s) must be read into memory to build a new window. One way to reduce window turn is to assign a larger window size. Although you can assign a window size large enough to map the entire file, exercise caution. Too large a window may increase other system overhead; for example, excessive paging activities because of lack of working memory. Periodically, the COPY/CONTIGUOUS command should be employed to defragment the file.

Another file design issue is the I/O buffer assignment. If the memory resource is sufficient, the allocation of a large buffer size can minimize the disk I/O activities. If a file is shared by several processes, consider allocating a global buffer to the file. A global buffer is an I/O buffer shared by many processes. The allocation of a global buffer not only can conserve the memory resource, but also can reduce I/O while several processes access the same data.

The VAX Record Management System (RMS) is a set of tools to assist the designer in designing, creating and tuning data files. It includes the File Definition Language (FDL), EDIT/FDL utility, ANALYZE/RMS utility, CREATE/FDL utility and CONVERT utility. Several DCL commands also are available for checking and setting RMS file default attributes: SHOW RMS_DEFAULT, SET RMS_DEFAULT (/BLOCK_COUNT, /BUFFER_COUNT, /EXTEND_QUANTITY), and SET FILE (/EXTENSION, /GLOBAL_BUFFERS). A complete discussion of designing, creating and tuning data files using the above utilities and commands is given in the *Guide to VAX/VMS File Applications*.

We've emphasized that to maintain a system properly, the system manager must understand the disk capacity and demand, detect and defragment the disk fragmentation, balance workloads and perform necessary system tuning. To use the current optimal system performance fully, the programmer must create an effective application by optimizing the program and file design.

The creation of a responsive computing environment requires the joint efforts of the system integrator, system manager and the application programmers. *—Moses Sun is a system manager with the Ocean Drilling Program at Texas A & M University, College Station, Texas.*

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The Sherrill-Lubinski Object-Oriented Graphical Modeling System (SL-OOGMS) is an off-the-shelf software product designed to speed up your development of interactive graphics. With it you can build anything from simple menu-driven screens to fully animated schematic or pictorial interfaces for both visualization and control of real-time applications.

Helping you with GKS or CGI

SL-OOGMS is fully compatible with standard graphics packages such as GKS, CGI, CORE and VDI among others. Normally to exploit the versatility of these standard packages a great deal of code has to be written to control the graphics functions at the low level. SL-OOGMS eliminates this step to give users unprecedented speed and directness. Without time consuming development or study of low-level graphics functions you can easily create simple screens and animate graphic visualizations.

SL-OOGMS handles the tasks of creating, modifying, saving, filing and displaying graphics. And all calls to standard display packages are made for you by SL-OOGMS.

Your screens can be driven from a great variety of data streams such as external real-time sources, direct conversational input, deeper underlying models, mathematical expressions and from SL-OOGMS scripts for quick design evaluation and simulation.

SL-OOGMS supports 2D modes of operation in an integer coordinate system. It has all standard graphics primitives, including splines and bit maps, and offers hierarchical models and groups.

This high-level graphics management approach takes all the time and work out of handling graphical data objects. As a result you write much simpler programs to bring up screens, make changes and access objects by names you choose.

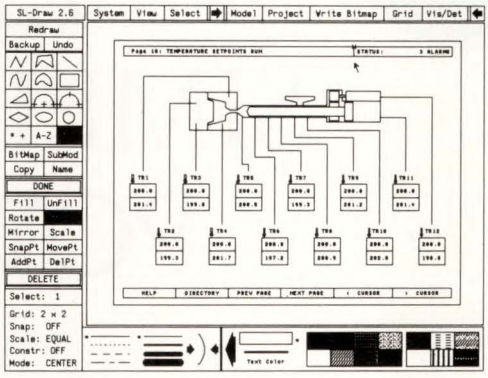
Programmer Training and Assistance

SL recognizes that the transition to new methods, new structural designs and/or the adoption of newer programming concepts by serious software engineers is best made through informal tutoring and personal attention—in addition to complete and relevant documentation.

If you desire it, SL offers individualized assistance which lets you start by applying SL graphics-technology to your own immediate application. You will be surprised at how quickly your competence becomes fluent as you work on your own product/ task requirements from the beginning. It is normal for customers to make substantial progress toward their objectives during this collaborative period.

Using SL-OOGMS

The **Graphical Model Editor (SL-DRAW)** is shown above, composing a process visualization screen. SL-DRAW allows you to edit, modify, combine



and file screen icons and objects which are supplied by SL-OOGMS— or you can easily create your own. By making appropriate menu selections or by drawing with the mouse, display screens are composed effortlessly. Attributes such as line style, width, and color may be quickly selected or changed. Objects can be moved, scaled, rotated, or mirrored. Libraries of user-defined graphics symbols may be created and referenced from many different screens.

SL-DRAW produces data files that contain information which describes the screens you have created. Graphic objects that need to be dynamic, i.e. changed by the application program, may be assigned simple names, such as "valve_1" or "voltage_meter", while you are using the editor. These object names are stored in the data files along with the graphics information. The coherent binding of icon to dynamic variable can be instantaneous and codeless.

The **Graphical Modeling Language Interpreter (SL-GML)** may be used to exercise different screen scenarios. Using the simple SL-GML command language, screen data files may be loaded and redisplayed. Sequences of attribute or position changes can be applied to objects by name. This allows you to experiment easily with the look and feel of graphics screens before binding the screens to your real-time program variables.

The **Graphical Modeling Function Library (SL-GMF)** consists of all the functions needed to change color, size, appearance, visibility and motion of an object or icon you have created with SL-DRAW. It is equally simple to invoke these functions to bind various buttons you may have created on a screen to functions and procedures which directly control your applications.

Creating graphics display screens in this way eliminates the work necessary to attach even complex graphics to your applications. This is especially true if your requirement must maintain compatibility with **any** graphics standard . . . including the new ones emerging.

SL-OOGMS Architecture

SL-OOGMS is a solid and robust environment for working with graphics screen development. This is the result of its design and its maturity.

It is a true, coherent hierarchical modeling system with all its components—SL-DRAW, for example—built up from combinations of its own graphics primitives and from functions in the SL-GMF library. These functions are organized according to classes and subclasses.

This organization has particular value to many developers because of its strict underlying object-oriented architecture, managed and controlled by the **Object-Oriented Environment (SL-OOE).** This is itself a library of powerful object-management functions, used within SL-OOGMS, and which is made accessible to interested users for application program development. SL-OOE also contains a program utility to define the user structural-framework and organize program code into strict hierarchical classifications.

SL-OOGMS uses run-time class-information to provide the functionality present in object-oriented programming systems, such as messages to objects, dynamic binding, encapsulation, class inheritance, and so on. SL-OOE does not require the use of any language extensions or special compiler.

Useful object management functions include: 1) an automatic facility for debugging and tracing function calls invoked on every object, 2) automatic archival and retrieval of arbitrary data structures, and 3) automatic "dumping" of object data.

While written in C, SL-OOGMS is uniquely hospitable to other languages and code. It is extremely adaptable and is easily embedded, in part or in whole, in a user's application program.

Complete SL-DRAW source-code is offered at a low price, so that you may customize the editor to your particular requirements. For example, you may want to change the layout of SL-DRAW menus, or offer a different set of attributes or primitives to the user. You may need to have special symbols available at all times. Users often reconfigure SL-DRAW and add functionality relevant to their own applications, data bases or simulations.

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DBMS

DATAFLEX: SIMPLE YET POWERFUL

By David W. Bynon

Your Ticket To Portable Database Applications For Your PC And VAX.

One of the most noticeable differences I've found between developing applications on the VAX and the PC is the tools. PC development tools always seem to be easier to use. I keep thinking how nice it would be to have some of my old PC favorites on the VAX; *dBASE III+* and *TURBO PASCAL* for the VAX would have suited me just fine.

Late last year I found *DataFlex*, a microcomputer database application generator from Data Access Corporation, Miami, Florida, that has migrated its way to the VAX. Since then, I have developed numerous programs with this powerful applications development tool. Although it wasn't designed to be an end-user application (*DataFlex* developed programs are the end-user applications), developing programs in *DataFlex* is easy enough that even the novice could use it.

DataFlex is supported on several operating systems, including: VAX/VMS, MICROVMS, MS-DOS, PC-DOS and UNIX System V. For users on PC networks, such as TurboDOS, Novell Netware and Fox 10 Net, *DataFlex* handles all file and record locking. Best of all, *DataFlex* programs developed on one of these operating systems can be compiled and run on any of the others. No fuss, no muss.

Power In Simplicity

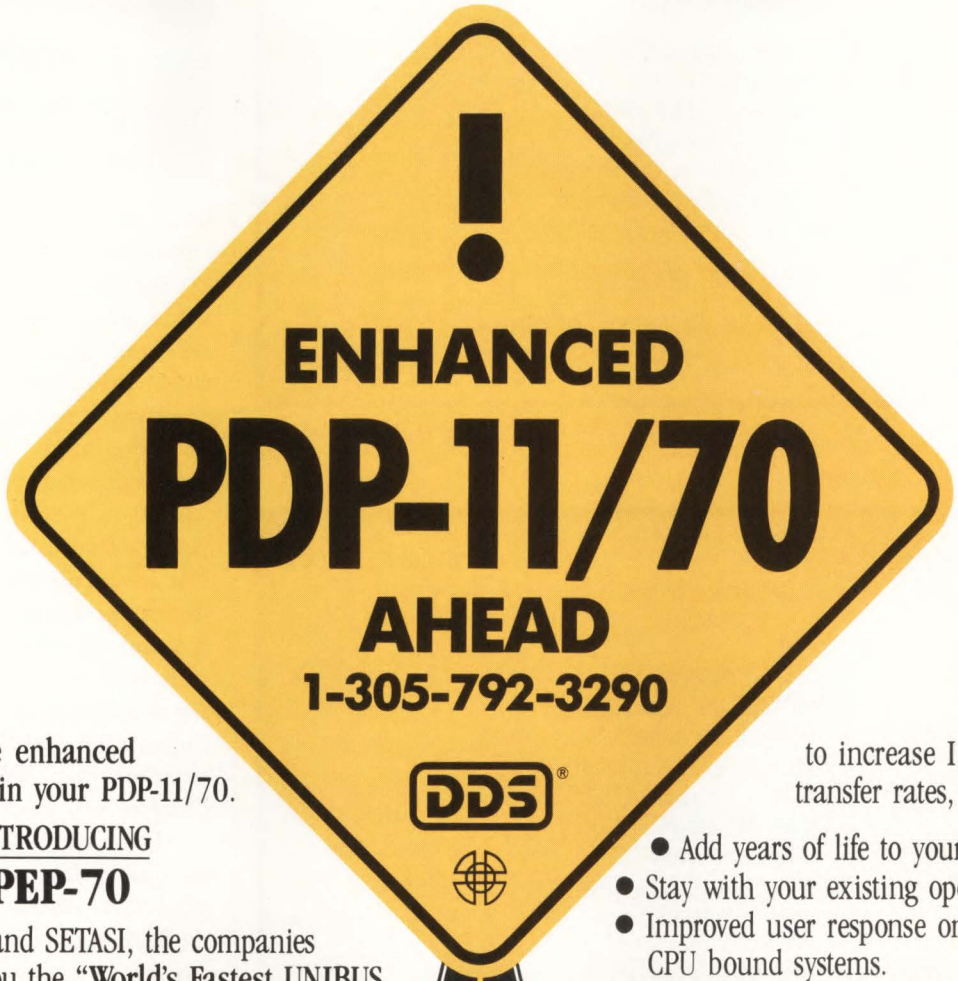
DataFlex applications primarily are based on screen images. To develop a simple application you need to know how to use the *DataFlex* editor or a text editor of your choice, and the way you want to format your screen (the screen layout defines the database). After a screen is developed, you simply instruct *DataFlex* to write the underlying program to make it operational. My first application, a mailing list manager, was developed in less than two hours. It's that simple.

DataFlex and its applications are completely menu-driven in a standard environment. In other words, the time it takes users to learn to use applications is minimal (see Screens 1, 2 and 3).

Even complex database operations, such as queries and reporting, are easy with *DataFlex*. It uses what Data Access terms a Point and Shoot method of database query selection. It works like this:

A query or selection is the process of having the *DataFlex* Query system pick out records in the database that satisfy a criterion you specify. A criterion is composed of a database field, a way to compare it and a value you enter to compare with the field. *DataFlex* Query prompts you through the steps necessary to build up to 10 criteria.

For example, suppose you wanted to select records from a database of PARTS supplied by a vendor called ACME with a cost of



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```
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                          DataFlex
                       MASTER MENU

                    1 Sample Applications Menu
                    2 Query Databases
                    3 DataFlex Utilities Menu
                    4 System Utilities Menu
                    5 Run a DataFlex Configuration
                    6 Enter a System Command
                    7 Exit To Operating System

                  PLEASE ENTER YOUR SELECTION     >1

Use UP or DOWN ARROW to select option, then <RETURN>
Press <ESCAPE> to return to previous menu
```

Screen 1: Master menu.

```
DEC PROFESSIONAL                                    Serial # : 62090

                       DataFlex Utilities
                            Menu

                    1 EDIT a Program File
                    2 AUTODEF an Application
                    3 COMPILE a Program
                    4 Run a DataFlex Program
                    5 Define a Database (FILEDEF)
                    6 Define Menus (MENUDEF)
                    7 RE-INDEX a Data File
                    8 Generate a READ Application
                    9 Query Databases

                  PLEASE ENTER YOUR SELECTION     >1

Use UP or DOWN ARROW to select option, then <RETURN>
Press <ESCAPE> to return to previous menu
```

Screen 2:* DataFlex *utilities.

```
DATA ACCESS CORPORATION                    CUSTOMER MASTER FILE

        CUSTOMER NUMBER: <_______>

           NAME: <____________________>
        ADDRESS: ____________________
           CITY: _____________ ST: _____ ZIP: _______

        DISCOUNT: ____ %
        PURCHASES/MONTH $_______ PURCHASES/YEAR $ _______
        PROFIT/YEAR $ _____________

Windows with <   > can be used to FIND customers
```

Screen 3: Sample data entry form.

. . . *DataFlex* provides a rich programming environment . . .

more than $250. First, you would choose the VENDOR field, pick EQUAL TO as the way to compare and enter a value of ACME to form the first criterion. Then, you would choose the COST field, GREATER THAN for the comparison and "250" to form the second criterion.

At this stage of the *DataFlex* query, you should POINT to a field from which you want to make a selection. Specific help instructions on how to determine the way in which database information is compared, and entering a value for the comparison to complete your criterion are available after you SHOOT your field choice. After establishing your selection criterion, press SAVE to proceed and *DataFlex* will start the query.

If the database you've chosen has too many fields to display on one screen, press NEXT RECORD to display more of the fields available. If your selected database relates to any others, you also can use its fields for selections. The whole operation is simple yet powerful.

Programming In *DataFlex*

For the advanced applications developer, *DataFlex* provides a rich programming environment comparable to *dBASE III+*, *DATATRIEVE*, *R:BASE System V* and others.

In developing many complex *DataFlex* programs, I never had a prob-

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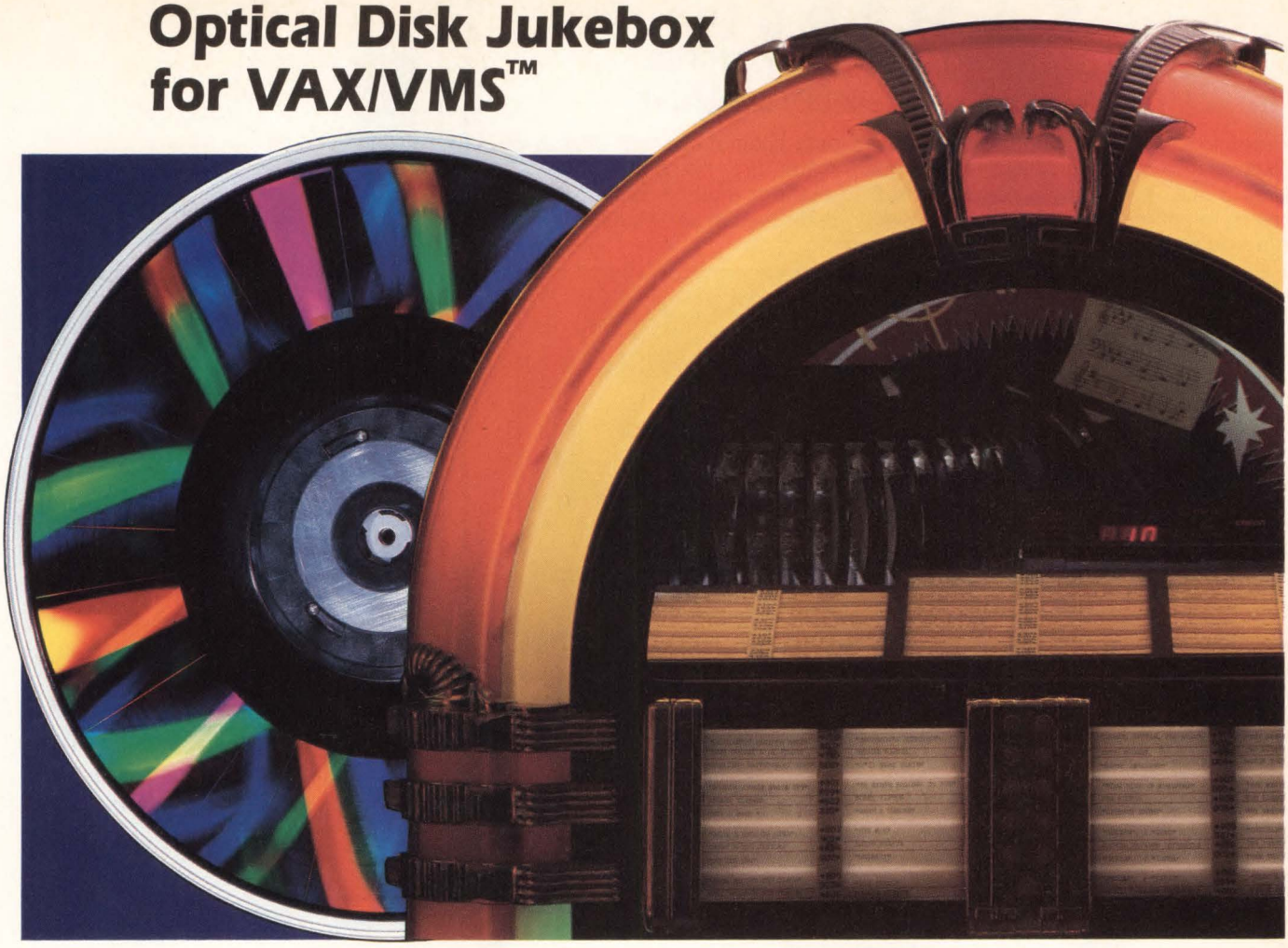

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. . . *DataFlex* is a true relational database language.

lem finding a command or function to get the job done. Furthermore, the *DataFlex* language was easy to learn and remember.

To help the developer along, *DataFlex* provides a number of macro commands used for basic functions, such as data entry and reporting. These macro commands are skeletons that provide the basic functions needed to get the job done.

Best of all, *DataFlex* is a true relational database language. You can open many files with related fields, and generate queries and updates against them.

Impressions

At first I felt uncomfortable with *DataFlex* because of the keyboard commands on the VAX terminals. However, when I used the IBM-PC version, everything fell into place. I hope Data Access will address the DEC terminal environment in a future version.

The documentation is excellent. With the *DataFlex* kit, you receive a primer, reference manual, keyboard overlays, a technical services catalog and an application for *FlexLines*, a technical magazine for *DataFlex* programmers and users. The documentation is easy to read and reference information is found quickly.

DataFlex is a solid product that works. If you need to generate portable database applications for your PC and VAX, this may be your ticket. *—David W. Bynon is a VAX systems consultant in Silver Spring, Maryland.*

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PRINTERS

SPEED AND QUALITY WITH THE P6280

By David B. Miller

Printronix's P6280 Is Big, Fast, Reliable And Loaded With Features.

Printronix of Irvine, California, has been a familiar name in the computer printing industry for many years. The company manufactures high-speed, full-featured printers that shops tend to keep around while other equipment comes and goes.

The Printronix P6000 series of printers is the company's latest effort to provide high-speed, high-quality printing with a host of sophisticated features. The unit we tested was the P6280, the higher-speed big brother of the 6240. In fact, the only difference is the print rate, according to the reference guides.

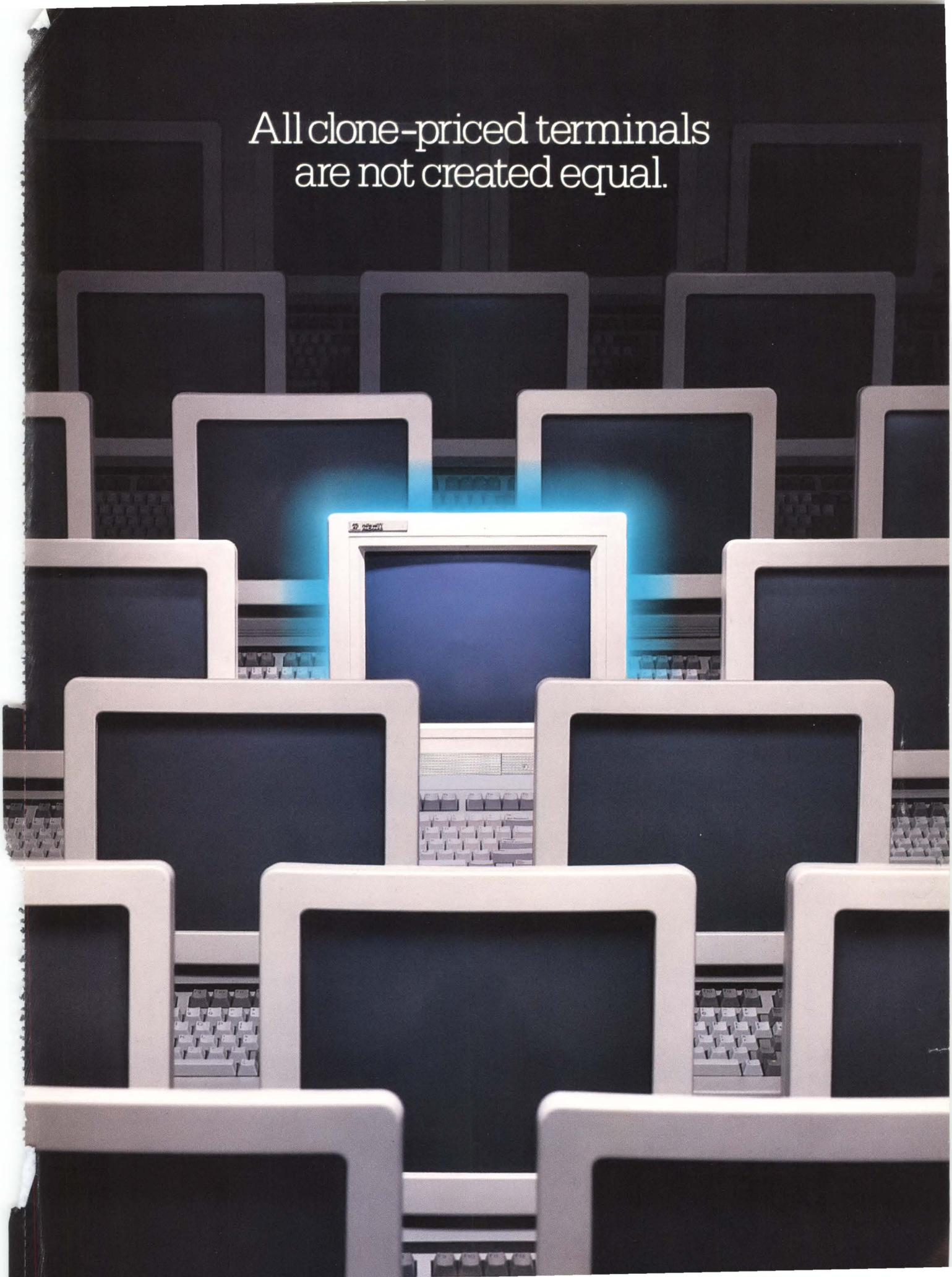
In addition to offering print speeds of up to 800 lines per minute, the P6000 series offers the following additional features:

1. Low noise level.
2. P-Series and serial matrix emulation protocols.
3. P-Series plot and bit image graphics.
4. Dynamic character generation including selectable pitch, elongated print, shadow print, expanded print, automatic underlining and super- and subscripts.
5. Selectable forms length.
6. Electronic vertical formatting through Printronix's vertical format units and direct access vertical format units.
7. Resident International character sets.
8. Built-in diagnostics and self tests.
9. Available printout of current configuration.
10. Hex code printout of the data stream.
11. Serial and parallel interfaces.
12. Optional intelligent graphics processor for forms generation, bar codes, reverse image print and logos.

Speed and quality often are the first features investigated when buying a printer of this sort. The P6000 printers use the shuttle matrix method of forming characters. The P6240 possesses 44 hammers, while the P6280 sports 66. Characters are formed when the shuttles sweep across the ribbon and paper, printing one row of dots per sweep. When the end of a dot line is reached, the paper is advanced the height of one dot and the hammers make another sweep in the reverse direction. The shuttles move horizontally — three characters for the 6240, two for the 6280.

Print rate not only is dependent on the quality of printing desired, but also on the number of lowercase letters to be generated. The more lowercase letters involved in the print job, the slower the print speed. This is because of the vertical movement involved in printing one row of dots at a time.

Text print quality is divided into three modes: correspondence (NLQ), data processing and draft. The print quality is very good to excellent in all modes and pitches (particularly in correspondence mode), with the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14-inch anti-glare screen
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Tilt and swivel
Front panel controls
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Additional Features
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The P6280 printer from Printronix.

exception of draft mode, at 13 CPI, where characters begin to run into each other and the wider dot spacing makes them look alike.

First Impressions

Even though print speed and quality are first on everyone's list of "musts" to investigate, you cannot help but notice the unit's size. This is a big printer. It weighs in excess of 380 pounds. New owners would do well to plan ahead and decide where they want it before it hits the delivery dock door. Fortunately, the bottom casters work very well and pushing it around proved no problem. Getting it in elevators and especially up and down steps, however, may be an interesting challenge. With all bay doors fully open to provide the best access, the unit measures 36 inches wide by 73 inches deep by 68 inches high. Make sure you have space for the printer and operator to be in the room at the same time.

Adequate ventilation and temperature controls also are necessary. Printronix designed the unit to be operated in a relatively dust-free environment, with plenty of air space for cooling. Temperature and humidity ranges are very forgiving with proper operation guaranteed between 41 and 104 degrees Fahrenheit and a relative humidity of 10 to 90 percent.

Loading and unloading paper and changing ribbons was simple. Even though surrounded by acoustical covers, the control for paper thickness (capable of accommodating six part paper), tractor doors, platen roller, etc., were easy to reach and operate. The power switch is tucked up and out of the way near the port connector, to prevent accidental power

FIGURE 1.

Printer Configuration

P6000 Series Firmware Version 1.01A, #148518
Copyright 1986 Printronix, Inc.

P6000 Series Font Part #108943001
Copyright 1986 Printronix, Inc.

Application Parameters

FORMS LENGTH SET	AT 11.0 INCHES
PRINT MODE:	DP 10 CPI
LINE SPACING	SET AT 6 LPI
CHARACTER SET	ASCII
AUTO LINE FEED	DISABLED
NO PAPER MOTION	ON CR
LINEFEED/NEWLINE	LF = CR + LF
BOTH UPPERCASE	AND LOWERCASE
VFU SELECT	VFU ACTIVE
PAPER MOTION	DETECTOR ENABLE
POWER-UP	OFF LINE
UNDERLINE	ENABLED
MOD PLOT	DISABLED
PERFORATION SKIP	DISABLED
PAPER FAULT	STOP IMMEDIATELY

Interface Parameters

PRINTER	SERIAL MATRIX
SPECIAL FUNCTION	CHAR DISABLED
DATA LINE 8	ENABLED
PI LINE	DISABLED
FAST BUSY	DISABLED
BUFFER SIZE	TWO LINES @ LF
PARALLEL	INTERFACE

down at an inconvenient time.

A control panel on top of the unit allows operator control and provides an alphanumeric display of the usual items, such as on/off line status, paper advancing and skipping to the top of form. In addition, the form length may be set from 1.0 to 24.0 inches in 0.5-inch increments, top of form can be adjusted and line spacing (six or eight LPI) can be set.

The ability also is provided for the operator to change the current print mode to any of the various types (data processing, NLQ, or high speed) at any of the available pitches (10, 12, 13, 15 and 17 CPI for DP; 10, 12, 13 and 15 for NLQ, and 10, 12 and 13 for draft). It's possible, though not recommended, to change print modes in the middle of a document, through the control panel switch. Print mode, form length and line spacing also can be controlled from the host computer. Codes sent from the host override any manual settings.

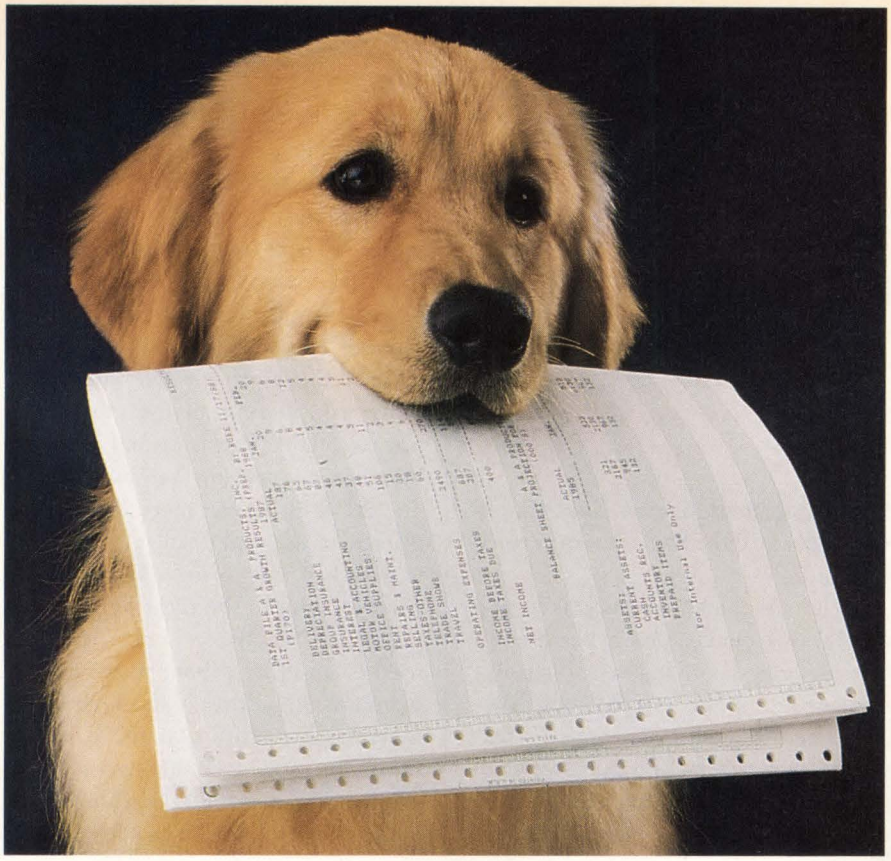
The bottom of the control panel features switches that allow for changes in the printer's semi-permanent configuration. Once into the configuration process, the following operations can be performed:

1. Select character set — ASCII, French, German, English, Danish, Swedish, Italian, Spanish and Japanese.
2. Printer compatibility — P-Series or serial matrix.
3. Buffer Size — Two lines at line feed, 512 or 1K characters.
4. Automatic line feed enabled or disabled.
5. Line feed on carriage return or not.
6. Carriage return on line feed or not.
7. Upper only/upper- and lowercases.
8. Enable/disable vertical format units.
9. Paper motion protection enable/disable.
10. Paper out enable/disable.
11. Power up status — on or off line.
12. Perforation skip enable/disable.
13. Plot enable/disable.
14. Interface parameters including type, buffer size, etc.
15. Change paper format.
16. Cause text stream to be printed in hex.
17. Run self tests.
18. Save/restore parameters.

These configuration settings can be changed temporarily, stored permanently or reset to default values as required. The Figure shows a sample printer configuration (see Figure).

More Power

If you want to get fancy, the P6280 printers afford lots of opportunities. They're powerful, fully programmable units capable of producing bit image graphics either alone or in conjunction with normal text characters, using ap-



He could probably retrieve information from a database more easily than most spreadsheet users.

Which isn't surprising considering what the average spreadsheet user has had to go through to access a database.

But what if there were a way to retrieve that information without knowing a database language, without a database administrator and without leaving the spreadsheet?

Well now there *is* a way. Introducing the 20/20 ™ Database Connection.

Designed to work with 20/20, the leading integrated spreadsheet for multi-user computers, 20/20 Database Connection makes the promise of easy access to databases a reality.

Because the 20/20 Database Connection talks directly to your DATATRIEVE,™ DBMS or RDB databases, they actually seem like a part of 20/20.

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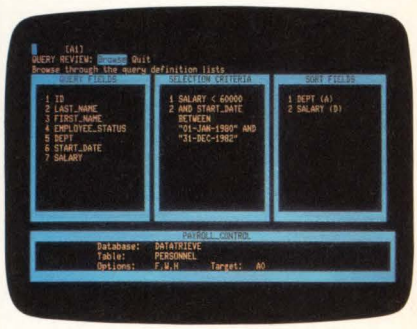
The data goes right into your spreadsheet, which automatically formats itself.

What's more, you can save your query with your model to execute later. Your spreadsheet and database can work together by having your query use results from the spreadsheet.

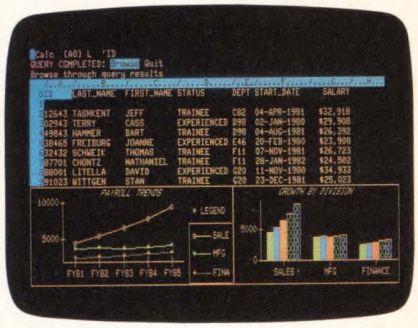
There's even built-in protection that lets systems managers control access to the database.

If you've ever been through the hassle of accessing databases, you won't believe how easy it is to use 20/20 with the new Database Connection until you actually try it. To order a special Evaluation Kit, send us the coupon, or call (617) 655-9191.

Granted, you could look for some other way to access your DEC databases this easily. But you'd be barking up the wrong tree.



Menus tell you what information is available and help construct your query.



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The P6280 is fast, powerful and flexible. After its capabilities are mastered, it should prove to be extremely valuable for long periods of service . . .

propriate Escape sequences. Normal and high density plot modes are available and can be mixed on a row-by-row basis.

Through programming, the P6280 can produce a variety of special effects, including mixed fonts on the same line, a feature that Printronix calls dynamic font selection. Other programmable features, which override manual settings, include settings for lines per inch, bold printing, underlining, elite printing, double-high/double-wide characters, condensed printing, super/subscripting, form length, tabbing, margins, bit image plot modes and more. A complete summary of correct sequences for all programmable features is included for both P-Series and serial matrix emulations.

If printing forms is your concern, have no fear. The P6280 fully supports electronic vertical format units in both Dataproducts and P-Series flavors. This feature enables the printer to advance to predetermined lines very quickly, increasing throughput by reducing time spent on vertical paper movement a line at a time. The documentation provides instruction on how to set up your own custom forms if vertical formatting is desired.

The *Operator's Guide* is adequate for the daily user but, with the *User's Reference,* the capabilities of the machine are fully realized. Both guides are extremely well written, logically organized, clear and easy to understand. In fact, the smaller *Operator's Guide* simply was a subset of the larger, more detailed reference.

Certain operations, such as setting the various configuration parameters, were described both in normal step-by-step form and also via pull-out flowcharts and diagrams. Chapters on features such as graphics programming not only tell what the particular feature does, but explain the concept behind it. This makes for interesting reading.

Installation And Operation

To accommodate the interface required by our VAX, it was necessary to change a couple of chips on the PCB board. The interface operated perfectly once the installation was complete.

Printers without all the acoustical covering of the Printronix have easier paper loading, simply because there are fewer doors to open and close. While the sound shielding on the P6280 did an excellent job, it increases the physical size of the unit quite a bit. Keep in mind that there are doors and covers that must open and people must be able to get around the unit.

There also must be room for ventilation. This is so critical that Printronix states in the reference guide that a warranty could be void if printer malfunction can be traced to lack of proper air circulation.

We found that the top of form adjustment left something to be desired. A number of staff members tried following the manual when setting top of form (the directions appeared very straightforward), but had no success getting it right. Guesswork was the order of the day when adjusting paper for this function.

The paper thickness adjustment nicely allows for infinite variability of settings. There are markings for certain paper thicknesses, but the lever doesn't have the familiar click that many expect to hear. This was disconcerting at first because the lever felt free enough to move, considering all the vibration a printer of this size is bound to make. However, no problems were encountered.

As with other more recent line printers of this type, the left tractor door was locked into place and prohibited from moving to the right by a washer placed on the tractor rail. Operators used to an older printer may find this to be annoying. Most likely, a job somewhere will require that the paper or forms be located in the center of the printer. The horizontal adjustment for the left tractor may not be sufficient for this application. There should be a way to override the locked position if necessary.

This printer can do many nice things, but prepare to spend time learning its capabilities. As expected, the learning curve increases with the printer's capability.

The P6280 is fast, powerful and flexible. After its capabilities are mastered, it should prove to be extremely valuable for long periods of service, especially in shops requiring more than just the ordinary types of printed documents. *—David B. Miller is associate director of computer services at Beaver College in Glenside, Pennsylvania.*

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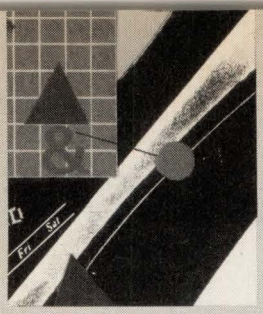

RSTS

DISPLAY DIRECTORY OVERHEAD

By Michael Mayfield

RD1TRC Is A Program That Can Show You When To Reorder Any Specific Directory.

This article provides a utility program (available in its entirety on ARIS) that displays the overhead required to create or access a file on disk using the level one directory structure (RDS1) available with Versions 8.0 through 9.4 of RSTS/E.

The directory structure on RSTS is used to catalog information about all the files on the system. This information is used to open or delete existing files, create new files, and map the blocks of a file onto the physical disk structure.

Since the directory structure is used so often, overhead when accessing the directory can have dramatic effects on system performance. When a directory is properly ordered, overhead to open a file is minimal. However, as files are created and deleted, the directory structures become less and less optimal. In the worst case, over 1600 overhead accesses are possible just to open one file.

To keep the directory structures optimized, the REORDR program should be used often. The question is, how often should this be? Since the REORDR program supplied by Digital is slow, doing reorders too often can be a hassle.

The RD1TRC program can show you when to reorder any specific directory. Running RD1TRC will display the disk accesses required to open or create a file in a given directory. If more than half a dozen accesses are required, it's time to reorder the directory.

RD1TRC can be used in two ways. You can find the overhead to open an existing file by entering its file specification in response to the "File to trace" prompt. Each disk I/O required to find the file's Name Entry while searching through the UFD will be displayed. Once the file is found, the overhead required to access each of the file's Retrieval Entries is also shown.

You also can find the overhead to create a new file by specifying the account number, but not a file name. Choosing not to specify a file name or using a wildcard file name causes the overhead to search the entire directory to be displayed. Since the entire directory must be checked for an existing file before creating a new file, not specifying a file shows the overhead to create a new one.

Screen 1 shows the use of RD1TRC to analyze the overhead to find the file RD1TRC.BAS and to create a new file in DM2:[1,4] in an account that needs reordering. Each UFD or RE seek indicates a disk read. Note that the disk reads may be fulfilled from directory cache and don't always require a physical disk access.

Cluster is the pack cluster number where

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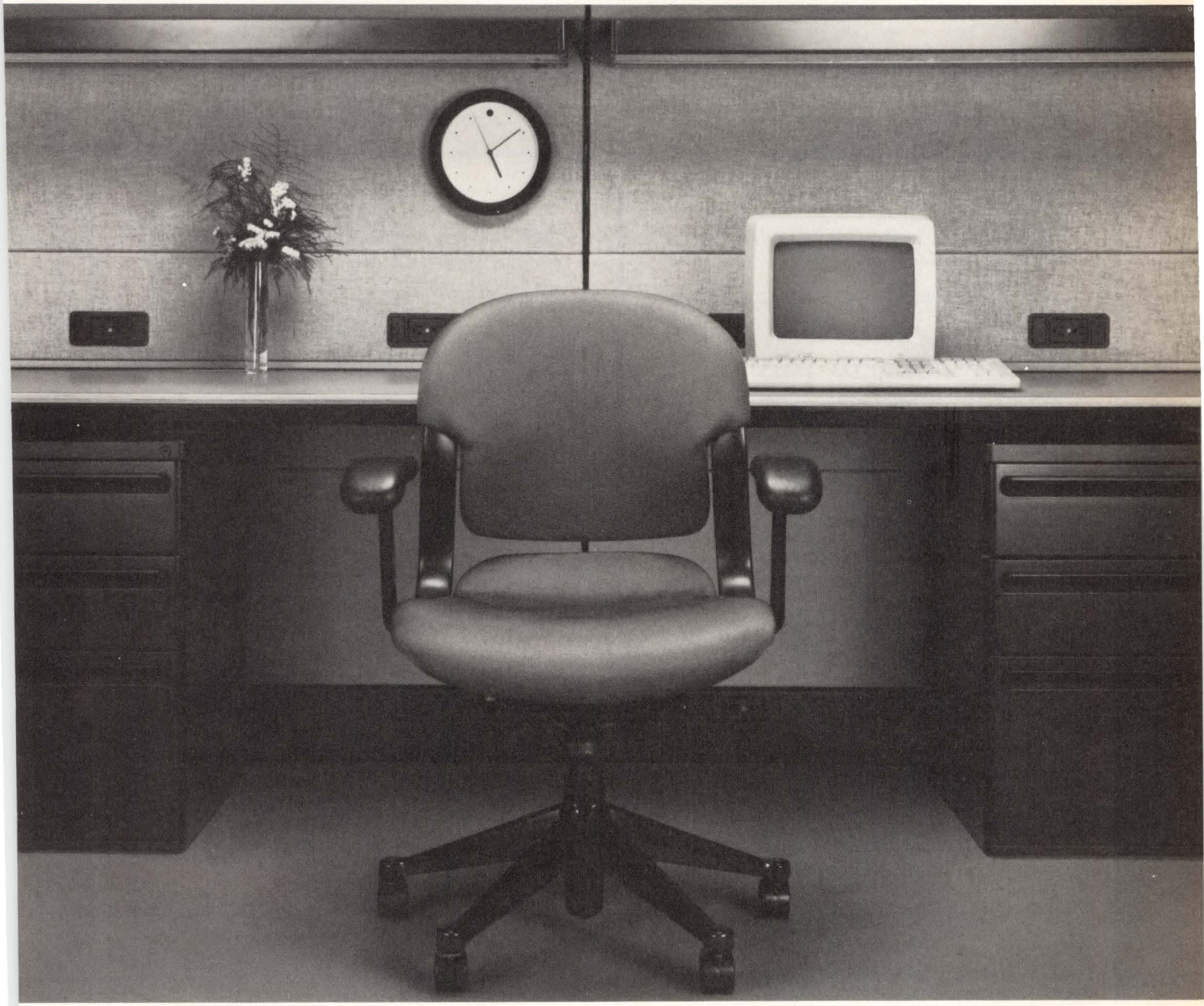

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the UFD cluster starts. Sector is the block offset within the cluster. Entry is the 32-byte UFD entry number within the block. The Retrieval Entry listing shows the entry number and the starting pack cluster number for each file cluster for each Retrieval Entry.

Screen 2 shows the effects of using REORDR to optimize directory structures, DM2:[1,4] was reordered and RD1TRC was used again to search the entire directory. The reduction in overhead from 15 seeks to three shows the benefits of reordering. — *Michael Mayfield is an authority on RSTS/E and author of* RSTS/E Monitor Internals Manual.


```
$ RUN RD1TRC

RD1TRC V1.1 == File Directory Trace Utility (RDS1.x)
Output to <KB:RD1TRC.TXT> ? <CR>

File to trace ? DM2:[1,4]RD1TRC.BAS <- To open an existing file

UFD seek to Cluster    26961 Sector    0 Entry  0
UFD seek to Cluster    26961 Sector    5 Entry 25
UFD seek to Cluster    26961 Sector    6 Entry  0
UFD seek to Cluster    26961 Sector    0 Entry  1
UFD seek to Cluster    26961 Sector    2 Entry  1
UFD seek to Cluster    26961 Sector    0 Entry 16
UFD seek to Cluster    26961 Sector    3 Entry  0
UFD seek to Cluster    26961 Sector    4 Entry 18
UFD seek to Cluster    26961 Sector    1 Entry 16
UFD seek to Cluster    26961 Sector    3 Entry  2
10 seeks to find file, accounting entry, and attributes.

Retrieval entry listing:

RE seek to Cluster 26961 Sector 4 Entry 26
26:  1515  1551  1587  1611  2175  2213  2215
27:  2317  2407  2619
11 total seeks with 2 retrieval entries.

File to trace ? DM2:[1,4]                <- To create new file

UFD seek to Cluster    26961 Sector    0 Entry  0
UFD seek to Cluster    26961 Sector    5 Entry 25
UFD seek to Cluster    26961 Sector    6 Entry  0
UFD seek to Cluster    26961 Sector    0 Entry  1
UFD seek to Cluster    26961 Sector    2 Entry  1
UFD seek to Cluster    26961 Sector    0 Entry 16
UFD seek to Cluster    26961 Sector    3 Entry  0
UFD seek to Cluster    26961 Sector    4 Entry 18
UFD seek to Cluster    26961 Sector    1 Entry 16
UFD seek to Cluster    26961 Sector    3 Entry  2
UFD seek to Cluster    26961 Sector    1 Entry  1
UFD seek to Cluster    26961 Sector    4 Entry  1
UFD seek to Cluster    26961 Sector    5 Entry  0
UFD seek to Cluster    26961 Sector    7 Entry  0
UFD seek to Cluster    26961 Sector    8 Entry  2

End of directory reached after 15 seeks.

File to trace ? ^Z
$
```

Screen 1: The use of RD1TRC to analyze overhead.

```
$ RUN RD1TRC

RD1TRC V1.1 == File Directory Trace Utility (RDS1.x)
Output to <KB:RD1TRC.TXT> ? <CR>

File to trace ? DM2:[1,4]

UFD seek to Cluster    26961 Sector    0 Entry 0
UFD seek to Cluster    26961 Sector    1 Entry 0
UFD seek to Cluster    26961 Sector    2 Entry 0

End of directory reached after three seeks.

File to trace ? ^Z
$

Listing of RD1TRC. BAS:
```

Screen 2: The reduction in overhead from 15 seeks to three shows the benefits of reordering.

RD1TRC.

```
1     EXTEND
2     ! RD1TRC == Trace RDS1.1 Directory Structure Overhead                  &
      !                                                                      &
      !  This program displays the disk accesses required to find a file     &
      !  in a directory or to get to the end of the directory.  If the       &
      !  file exists, the directory accesses required to sequentially        &
      !  read the file and the map of starting pack clusters for each        &
      !  file cluster also are displayed.  Minimizing the number of          &
      !  directory accesses to open and access files will improve overall    &
      !  system performance.                                                 &
      !                                                                      &
      !  Author:                                                             &
      !   Unknown.  Based on a program written circa 1978 to support the     &
      !   RDS level 0 directory structure.  Modified by Mike Mayfield to     &
      !   support RDS level 1.0, 1.1 and 1.2 and allow generic directory     &
      !   searching.                                                         &
      !                                                                      &
      !  Edit History:                                                       &
      !   00 xx-XXX-78 ???      Original version                             &
      !   01 10-Jan-85 MEM      Modified to support RDS1.  Removed           &
      !                         filetype to specify device, filename,        &
      !                         and filetype. Conformed to programming       &
      !                         standard.                                    &
      !   02 15-May-86 MEM      Update for V9.x and publication.             &
      !   03 01-Oct-87 MEM      Confirm before overwriting output file.      &
      !                                                                      &
      !  RSTS Version:                                                       &
      !   V8.0-V9.4                                                          &
      !                                                                      &
      !  Variable Usage:                                                     &
      !   BLKBUF$               Current block in cluster                     &
      !   BLOCK.NUM%            Block number within UFD                      &
      !   CLUST.NUM%            Cluster number within UFD                    &
```

Continued.

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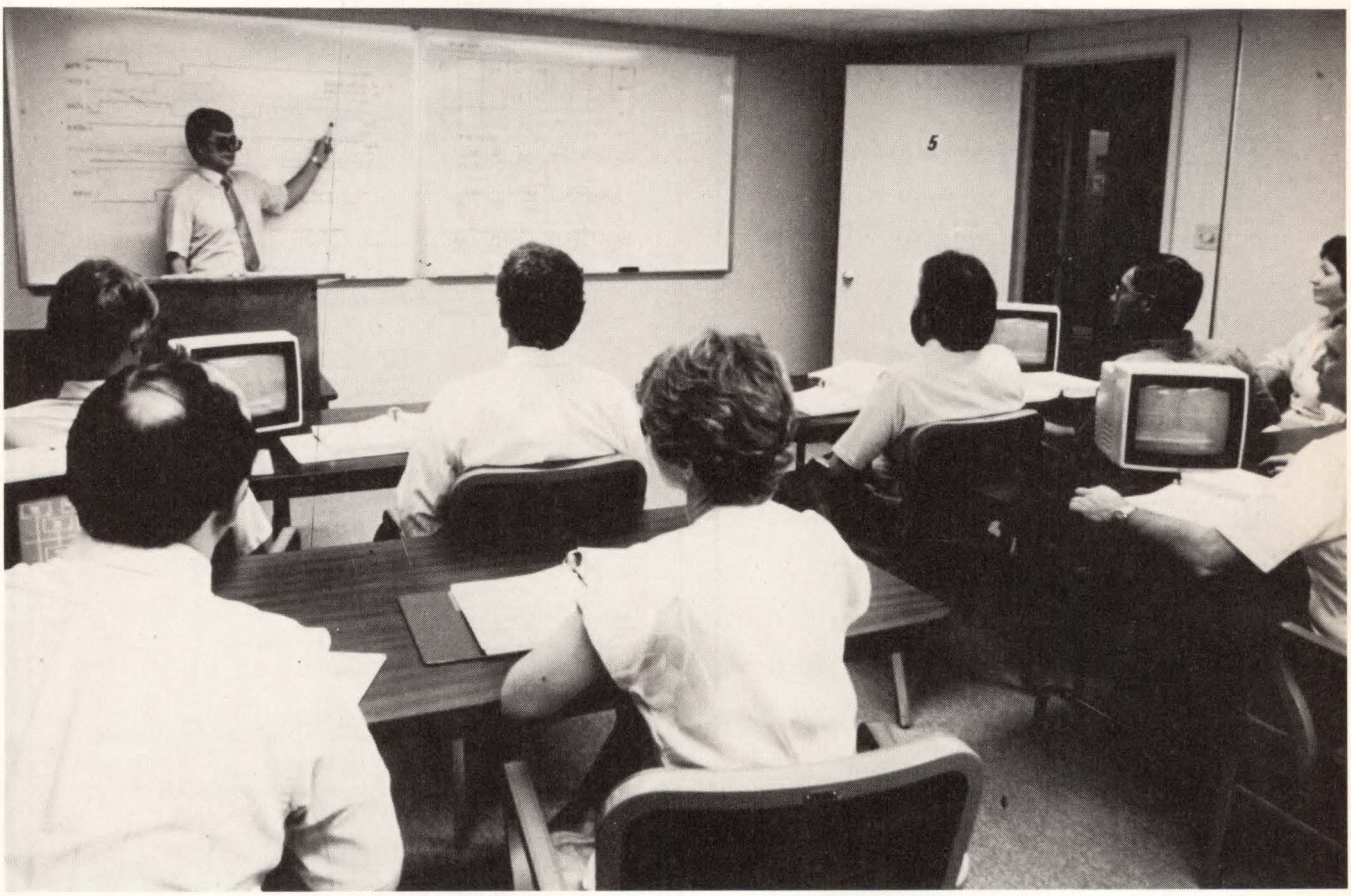

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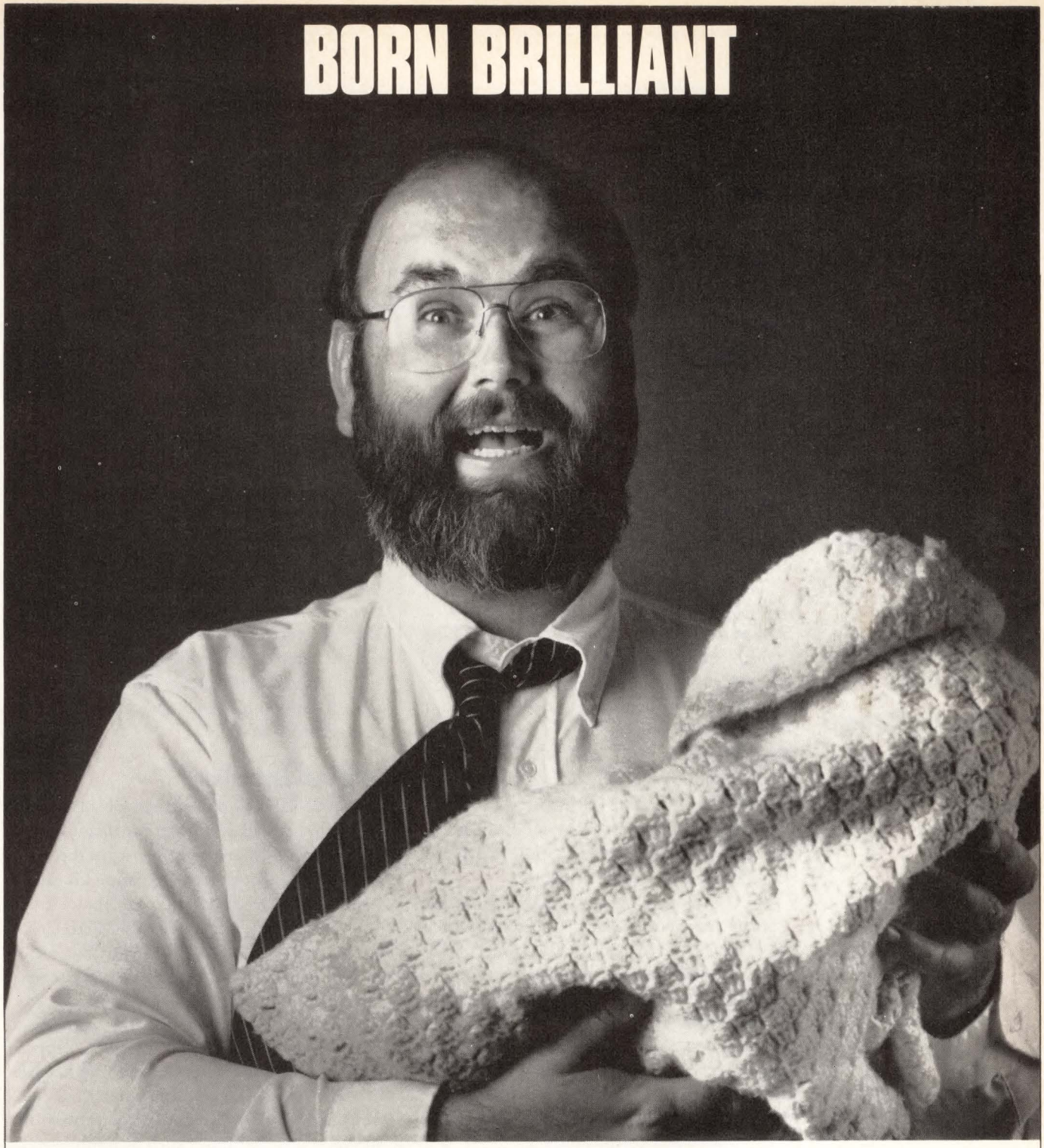
RD1TRC . . . continued

```
!  CUR.BLK%              Block number of current block                  &
!  CUR.ENT%              Entry number of current entry                  &
!  DEVNAM$               Disk name                                      &
!  ENT.NUM%              Entry number within UFD sector                 &
!  ENT.TYPE$             Current entry type                             &
!  ENTRY%(0..16)         Working values for UFD entry                   &
!  FILNAM.1%             Filename.  First 3 characters (RAD50)          &
!  FILNAM.2%             Filename.  Second 3 characters (RAD50)         &
!  FILTYP%               Filetype.  (RAD50)                             &
!  FLG.MASK%             Mask for all but bits <0:4> (flag bits)        &
!  OUT.CHN%              Channel number for report output I/O           &
!  PROG%                 Programmer number for file spec                &
!  PROJ%                 Project number for file spec                   &
!  RE.CNT%               Running total number of Retrieval Entry seeks  &
!  RE.PIC$               PRINT USING template for RE seek notification  &
!  SECT.NUM%             Sector number within UFD cluster               &
!  SEEK.CNT%             Running total number of directory seeks        &
!  SEEK.PIC$             PRINT USING template for seek notification     &
!  SYS.DAT$              Filename string scan values for file spec      &
!  UFD.CHN%              Channel number for UFD I/O                     &
!  UFD.ENTRY%()          Current directory entry                        &
!  UFD.MAP%()            MFD map of current account                     &
100   DIM UFD.MAP%(7%), UFD.ENTRY%(7%), ENTRY%(16%)                     &
\     UFD.CHN%=1%                                                       &
\     OUT.CHN%=2%                                                       &
\     FLG.MASK%=32767%+32753%                                           &
\     SEEK.PIC$="\ \ seek to Cluster ###### Sector ## Entry ##"         &
\     RE.PIC$="######  "                                                &
\     PRINT                                                             &
\     PRINT "RD1TRC V1.1 == File Directory Trace Utility (RDS1.x)"      &
\     ON ERROR GOTO 32000                                               &
      ! Define I/O channels.  FLG.MASK% is a constant of 177760(8) used to  &
      ! mask off flag bits from link words.  Define PRINT USING pictures.   &
      ! Announce ourselves and trap ^Z on keyboard.                        &

110   PRINT "Output to <KB:RD1TRC.TXT> ";                               &
\     INPUT LINE Z$                                                     &
\     Z$=CVT$$(Z$,39%)                                                  &
\     Z$="KB:RD1TRC.TXT"  IF Z$=""                                      &
\     GOTO 115  IF LEFT(Z$,2%)="KB"                                     &
\     OPEN Z$ FOR INPUT AS FILE OUT.CHN%                                &
\     PRINT "%File exists.  Delete it <NO>";                            &
\     INPUT Z1$                                                         &
\     Z1$=CVT$$(Z1$,-1%)                                                &
\     GOTO 110  IF Z1$<>"YES"                                           &
      ! Open our output file.  If the file already exists, confirm that it  &
      ! can be replaced.                                                  &

115   OPEN Z$ FOR OUTPUT AS FILE OUT.CHN%                               &
      ! Create the output file.                                         &

120   PRINT                                                             &
\     PRINT "File to trace ";                                           &
\     INPUT LINE Z$                                                     &
\     Z$=CVT$$(Z$,39%)                                                  &
\     Z$="SYO:"+Z$  IF INSTR(1%,Z$,":")=0%                              &
\     SYS.DAT$=SYS(CHR$(6%)+CHR$(-23%)+Z$)                              &
\     FILNAM.1%=SWAP%(CVT$%(RIGHT(SYS.DAT$,7%)))                        &
\     FILNAM.2%=SWAP%(CVT$%(RIGHT(SYS.DAT$,9%)))                        &
\     FILTYP%=SWAP%(CVT$%(RIGHT(SYS.DAT$,11%)))                         &
\     FILNAM.1%,FILNAM.2%=0%  IF FILNAM.1%=-17947%                      &
\     FILTYP%=0%  IF FILTYP%=-17947%                                    &
\     Z%=SWAP%(CVT$%(RIGHT(SYS.DAT$,5%)))                              &
\     PROJ%=SWAP%(Z%) AND 255%                                          &
\     PROG%=Z% AND 255%                                                 &
\     IF (PROJ% OR PROG%)=0% THEN                                       &
       PRINT "?You must enter an account number."                       &
\      GOTO 120                                                         &
130   IF FILNAM.1%=0% AND FILTYP%<>0% THEN                              &
       PRINT "?Invalid file specification: Missing filename."           &
\        GOTO 120                                                       &
140   IF FILNAM.1%<>0% AND FILTYP%=0% THEN                              &
        PRINT "?Invalid file specification: Missing filetype."          &
\       GOTO 120                                                        &
150   OPEN MID(SYS.DAT$,23%,2%)+CHR$(ASCII(RIGHT(SYS.DAT$,25%))+48%)+":["+  &
            NUM1$(PROJ%)+","+NUM1$(PROG%)+"]" AS FILE UFD.CHN%          &
\     FIELD #UFD.CHN%, 496% AS Z$, 16% AS Z$                            &
\     GET #UFD.CHN%, RECORD 1%                                          &
\     CHANGE Z$ TO ENTRY%                                               &
\     UFD.MAP%(Z%/2%)=ENTRY%(Z%+1%) OR SWAP%(ENTRY%(Z%+2%))            &
            FOR Z%=0% TO 15% STEP 2%                                    &
\     CUR.BLK%, CUR.ENT%=-1%                                            &
\     SEEK.CNT%, RE.CNT%=0%                                             &
      ! Get the trace file specification.  Convert logicals in filename.  &
      ! Wildcard filenames default to same as not specifying a filename.  &
      ! Check for required specification arguments.  Build RAD50 filename,  &
      ! filetype, and PPN.  Open the specified directory.  Get the first   &
      ! block of the directory and map the cluster map.  Ensure that we    &
      ! do physical I/O on next access.                                    &
200   ENT.TYPE$="UFD"                                                   &
\     PRINT #OUT.CHN%                                                   &
\     Z%=FNC.GET.ENTRY%(0%)                                             &
      ! Set our access type as "UFD".  Get the label entry.             &

210   Z%=FNC.GET.ENTRY%(UFD.ENTRY%(0%))                                 &
\     IF UFD.ENTRY%(1%)<>FILNAM.1% OR                                   &
           UFD.ENTRY%(2%)<>FILNAM.2% OR                                 &
           UFD.ENTRY%(3%)<>FILTYP% THEN                                 &
       IF (UFD.ENTRY%(0%) AND FLG.MASK%) THEN                           &
         GOTO 210                                                       &
       ELSE                                                             &
         Z$="?File not found"                                           &
\        Z$="End of directory reached"  IF FILNAM.1%=0%                 &
\        PRINT #OUT.CHN%                                                &
\        PRINT #OUT.CHN%, Z$; " after"; SEEK.CNT%; "seek";              &
\        PRINT #OUT.CHN%, "s";  IF SEEK.CNT%<>1%                        &
\        PRINT #OUT.CHN%, "."                                           &
\        CLOSE #UFD.CHN%                                                &
\        GOTO 120                                                       &
      ! Follow the link to the next entry.  If this is not the file we're  &
      ! looking for, try the next entry if there are more, else we failed  &
      ! or reached the end of the directory.                             &

300   RE.LINK%=UFD.ENTRY%(7%)                                           &
\     Z%=FNC.GET.ENTRY%(UFD.ENTRY%(6%))                                 &
\     Z%=FNC.GET.ENTRY%(UFD.ENTRY%(0%))  WHILE UFD.ENTRY%(0%) AND FLG.MASK%  &
\     UFD.ENTRY%(0%)=RE.LINK%                                           &
\     PRINT #OUT.CHN%, NUM1$(SEEK.CNT%); " seek";                       &
\     PRINT #OUT.CHN%, "s";  IF SEEK.CNT%<>1%                           &
\     PRINT #OUT.CHN%, " to find file, accounting entry, and attributes."  &
\     PRINT #OUT.CHN%                                                   &
\     PRINT #OUT.CHN%, "Retrieval entry listing:"                       &
\     ENT.TYPE$="RE"                                                    &
      ! Save the link to the first retrieval entry (RE).  Map the accounting  &
      ! entry (AE).  Get the clustersize from the AE.  Prepare to map the  &
      ! first retrieval entry.  Print our banner.                        &

310   IF (UFD.ENTRY%(0%) AND FLG.MASK%) THEN                            &
       Z%=FNC.GET.ENTRY%(UFD.ENTRY%(0%))                                &
\      RE.CNT%=RE.CNT%+1%                                               &
\      PRINT #OUT.CHN%, USING "##:  ", ENT.NUM%/16%;                    &
\      PRINT #OUT.CHN%, USING RE.PIC$, FNC.UINT(UFD.ENTRY%(I%));        &
            IF UFD.ENTRY%(I%)  FOR I%=1% TO 7%                          &
\      PRINT #OUT.CHN%                                                  &
\      GOTO 310                                                         &
320   !ELSE                                                             &
       PRINT #OUT.CHN%, NUM1$(SEEK.CNT%); " total seek";                &
\      PRINT #OUT.CHN%, "s";  IF SEEK.CNT%<>1%                          &
\      PRINT #OUT.CHN%, " with"; RE.CNT%; "retrieval entr";             &
\      IF RE.CNT%=1% THEN                                               &
         PRINT #OUT.CHN%, "y."                                          &
       ELSE                                                             &
         PRINT #OUT.CHN%, "ies."                                        &
330    CLOSE UFD.CHN%                                                   &
\      GOTO 120                                                         &
       ! Follow link to next retrieval entry.  Print entry number and all  &
       ! values in that entry.  Repeat for all retrieval entries then quit.  &

10000 ! FNC.GET.ENTRY% == Get Entry From a UFD Given a Link              &
      !                                                                 &
      ! Loads the entry information for a directory UFD entry given a   &
      ! directory link word.                                            &
      !                                                                 &
      ! Input:                                                          &
      !  LINK%                Link word to follow                       &
      !  UFD.MAP%(0..7)       UFD cluster map for this UFD              &
      !  SEEK.CNT%            Count of seeks performed                  &
      !  CUR.BLK%             Current block number in UFD.CHN% buffer   &
      !  UFD.CHN%             Channel number for UFD I/O                &
      !                                                                 &
      ! Output:                                                         &
      !  UFD.ENTRY%(0..7)     Contents of UFD pointed to by link word   &
      !  CLUST.NUM%           Current cluster number within UFD         &
      !  SECT.NUM%            Current sector number within cluster      &
      !  ENT.NUM%             Current entry number within sector        &
      !  BLOCK.NUM%           Current block within UFD                  &
      !  CUR.ENT%             Current entry number                      &
      !  CUR.BLK%             Current block number in UFD.CHN% buffer   &
      !                                                                 &
      ! Variables Modified:                                             &
      !  ENTRY%()             Working array for UFD entry               &
      &
      DEF* FNC.GET.ENTRY%(LINK%)                                        &
\     SECT.NUM%=(SWAP%(LINK%) AND 240%)/16%                             &
\     ENT.NUM%=LINK% AND 496%                                           &
\     CLUST.NUM%=(SWAP%(LINK%) AND 14%)/2%                              &
\     BLOCK.NUM%=CLUST.NUM%*UFD.MAP%(0%)+SECT.NUM%+1%                   &
\     IF BLOCK.NUM%<>CUR.BLK% THEN                                      &
        GET #UFD.CHN%, RECORD BLOCK.NUM%                                &
\       CUR.BLK%=BLOCK.NUM%                                             &
\       CUR.ENT%=-1%                                                    &
\       SEEK.CNT%=SEEK.CNT%+1%                                          &
\       PRINT #OUT.CHN%, USING SEEK.PIC$, ENT.TYPE$,                    &
            FNC.UINT(UFD.MAP%(CLUST.NUM%+1%)), SECT.NUM%, ENT.NUM%/16%
10010 IF ENT.NUM%<>CUR.ENT% THEN                                        &
       FIELD #UFD.CHN%, ENT.NUM% AS Z$, 16% AS Z$                       &
\      CHANGE Z$ TO ENTRY%                                              &
\      UFD.ENTRY%(Z%/2%)=ENTRY%(Z%+1%) OR SWAP%(ENTRY%(Z%+2%))          &
            FOR Z%=0% TO 15% STEP 2%                                    &
\      CUR.ENT%=ENT.NUM%                                                &
10020 FNEND                                                             &
      ! Mask off sector, entry, and cluster numbers.  Calculate block   &
      ! number within UFD for specified block.  If the block number changed,  &
      ! get the new block, ensure that we remap the entry and print our log  &
      ! message.  If the entry number changed, map the new entry.        &

10100 ! FNC.UINT == Convert unsigned integer to floating point          &
      !                                                                 &
      ! Converts an unsigned 16-bit integer to its equivalent positive  &
      ! floating point value.                                           &
      !                                                                 &
      ! Input:                                                          &
      !  INT.VAL%             16-bit value to convert                   &
      !                                                                 &
      ! Output:                                                         &
      !  FNC.UINT             Floating point value equivalent to INT.VAL%  &
      &
      DEF* FNC.UINT(INT.VAL%)=32768.+(INT.VAL% EQV 32767%)              &

32000 IF ERR=11% AND (ERL=110% OR ERL=120) THEN                         &
        RESUME 32767                                                    &
      ! ^Z on keyboard input.  Exit gracefully.                         &

32010 IF ERR=2% AND ERL=150% THEN                                       &
       PRINT "?Can't find account: "; Z$                                &
\       RESUME 120                                                      &
      ! Nonexistent account entered.                                   &

32020 IF ERR=5% AND ERL=110% THEN                                       &
       RESUME 115                                                       &
      ! Output file does not already exist.                            &

32099 ON ERROR GOTO 0                                                   &
      ! All other errors are fatal.                                    &

32767 END
```



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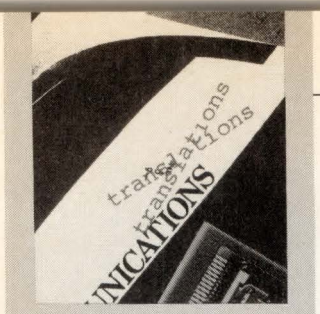

COMMUNICATIONS

CommUnity-DOS

A Rock-solid Communications Package That Requires No Changes To The Host VAX System.

By David W. Bynon

It always excites me when a young, spirited company with vision brings its labors of love to fruition. Such is the case with Technology Concepts Inc., Sudbury, Massachusetts, with its line of DECNET (Ethernet Local Area Network) compatible software products called *CommUnity.*

We had the opportunity to install and test the IBM PC version of *CommUnity-DOS* release 2.0, and an Excelan EXOS 205T host adapter, in our Lab. *CommUnity-DOS* currently supports the Excelan controller and the Ungermann-Bass Personal-NIU. Both are intelligent Ethernet controllers for IBM personal computers and true compatibles.

Technology Concepts' choice of Ethernet controllers was excellent. The Excelan EXOS 205T is hot! At the heart is an Intel 80186 microprocessor running at 8 MHz, an Intel 82586 LAN coprocessor and 256K of dual-ported RAM.

The 82586 implements the Ethernet datalink protocol, managing important functions such as CRC, address recognition and buffer chaining. The dual-ported RAM, which may be accessed concurrently by the PC and the 80186 processor, is used for protocol software execution and buffering. The benefits of this controller design are twofold: The majority of the processing load is handled by the controller, not the PC, and the controller provides an "open architecture" design.

All of this sophisticated hardware would be useless without something to make it work; *CommUnity-DOS* implements full-function Phase IV DECNET on the Excelan EXOS 205T. *CommUnity-DOS* is an Ethernet-based (non-routing) end-node implementation of the Digital network architecture. In short, *CommUnity-DOS* provides virtual terminal support, remote directory, file transfer, task-to-task communications and local network management facilities.

Terminal Emulation

In a DECNET environment, one job a PC is expected to perform is host terminal emulation. *CommUnity-DOS* provides, as part of the software package, a terminal emulation kit called *FANSI Console* (Fast ANSI Console).

FANSI Console, from Hersey Micro Consulting Inc., is an ANSI X3.64 standard console driver (replacing the PC-DOS/MS-DOS ANSI.SYS driver) with many integrated console control features. For *CommUnity-DOS*, however, *FANSI-Console* primarily makes the PC keypad and function keys emulate the auxiliary keypad on the VT100-series terminals. Most emulation functions work well, with the exception of special screen attributes such as double-high and double-wide characters. And, on a positive note, you'll see a significant increase in screen performance.

CommUnity-DOS provides the PC user with heterogeneous command terminal (CTERM) support with a utility called SETHOST. This is used to create a logical link (connection) to a DECNET-VAX node or *CommUnity-DOS* node that implements the virtual terminal server, *CommUnity-UNIX*. The

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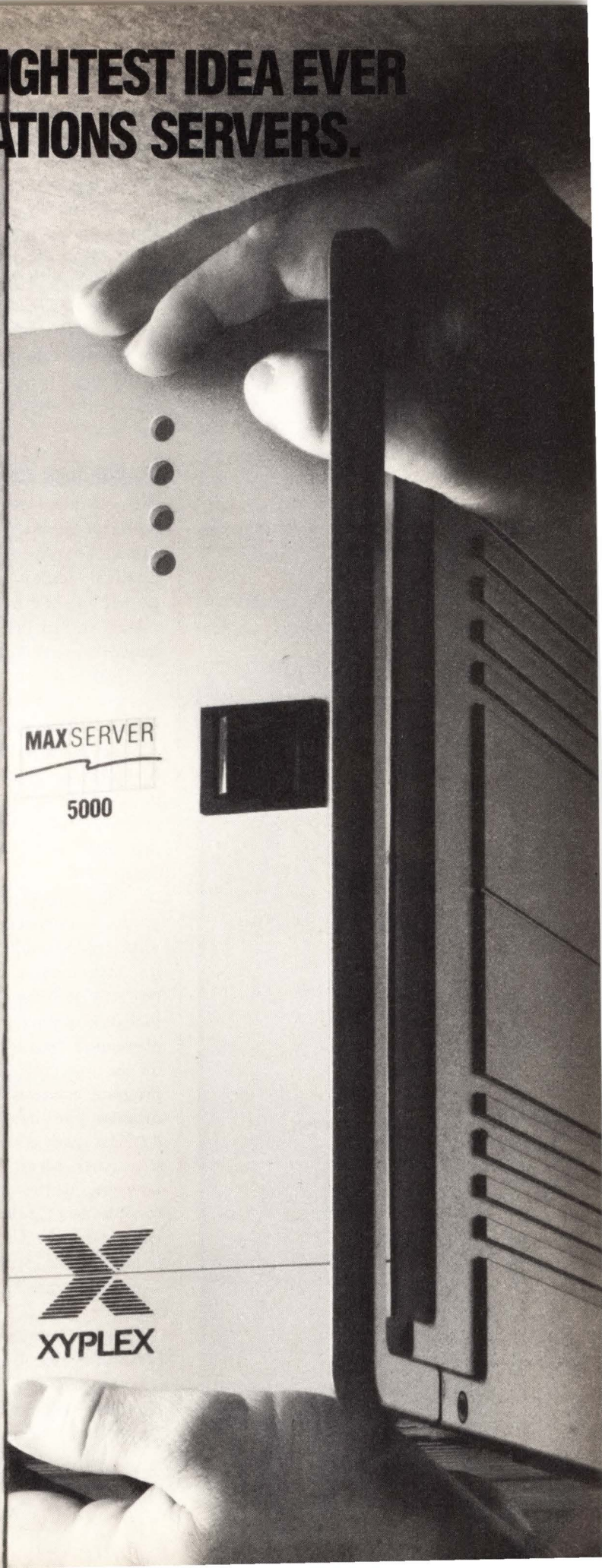

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connection is identical to that in Digital's DECNET-VAX or DECNET-DOS environment using the SET HOST commands. SETHOST allows the PC user to use a remote system as if the PC were a local terminal.

PC users running *CommUnity-DOS* have access to remote file systems through the Data Access Protocol (DAP). DAP is the DECNET protocol that permits file system access among unlike systems. Through this mechanism, the PC user may freely copy files to and from, and request directory listings of, other DECNET nodes that implement the File Access Listener (FAL). These functions are accomplished using the *CommUnity-DOS* NETCOPY and NETDIR functions.

As a true DECNET implementation, *CommUnity-DOS* implements a Network Control Program (NCP). NCP is an interactive *CommUnity-DOS* utility that allows the user to monitor the network, show the value of counters and timers, zero counters, and bring up or shut down the network on the PC. Unlike DECNET-VAX or DECNET-DOS, the *CommUnity-DOS* NCP utility isn't used to define other nodes and characteristics. This information is maintained by editing a text file called NETWORK.DAT, a function that should be built into NCP.

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Task-To-Task Communications

Task-to-task communications is a powerful *CommUnity* (DECNET) feature that allows cooperating programs on individual nodes to exchange data. *CommUnity-DOS* implements a wonderful task-to-task interface for developing network-based applications.

Network I/O is supported over multiple logical links in stream or record format. Additionally, two I/O modes are supported: blocking and non-blocking. In blocking mode the user program must wait for the I/O to complete, while in non-blocking mode the user program may poll or be interrupted for I/O completion.

Like other PC-to-VAX connectivity products, *CommUnity-DOS* provides a virtual disk capability, which is proof of its task-to-task abilities. Unlike DECNET-DOS, the *CommUnity-DOS* virtual disk doesn't rely on DAP. It implements a "server" program that runs on the host VAX system. This server program connects with a "requester" program (the virtual disk driver) on the PC. The result is superior performance for a disk server system. Be aware, however, that the virtual disk only is accessible by *CommUnity-DOS* PCs. It would be preferable to have a server like Digital's VMS Services For MS-DOS, where files are stored in the native format.

CommUnity-DOS is only one sample of the CommUnity line of network software products. After speaking with Howard Sholkin, marketing manager at Technology Concepts, I've learned that other *CommUnity* implementations are under development and will be available soon. Most notable is *CommUnity-MAC,* for the Apple Macintosh. The first release will support the same basic features as the *CommUnity-DOS* release 2.0, tested here. A UNIX version, *CommUnity-UNIX,* also is available.

CommUnity-DOS
Technology Concepts Inc.
40 Tall Pine Drive
Sudbury, MA 01776
(617) 443-7311
Price: $350 for single unit; $200 for media and documentation (only required for initial purchase).
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Future releases of *CommUnity-DOS* promise enhanced functionality and hardware support. Slated is support for the 3COM Etherlink Plus host adapter, a file access listener, VMS-like mail, remote batch and print capability, and a remote file server; i.e., VMS server for MS-DOS.

CommUnity-DOS is a rock solid product. I especially liked the fact that it required no changes to the host VAX systems to be fully functional; no VAX hardware changes, no VAX software changes. Simply configure the PC and you're up and running; just like DECNET — the way it should be.

For those who meddle in bits and bytes, the *CommUnity-DOS* documentation and programming library in C are very good. From the examples and documentation provided, I was able to develop a FAL-like server to run on the PC in a few days.

CommUnity offers 100 percent DECNET Phase IV compatibility now, super functionality on the way. This is one to watch!

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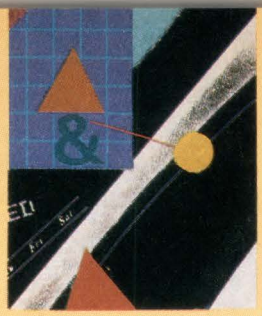


RSX

A QUICK RECOVERY

By James A. McGlinchey

The *RECOVR* Disk Recovery Utility.

Recovering a corrupted RSX disk is in the same category as writing RSX device drivers and ACPs. It's the stuff of which wizardry is made: the bashing of just the right bit in just the right place; the use of arcane tools, such as ZAP and VFY.

The RSX file system is a rugged, flexible design. What more can be said about a file system designed 14 years ago (when the largest disk that DEC sold was the RK05) that still can be used today on RA81s? The RSX file system is rugged because of its redundancy and the isolation of all directory operations in a single animal: F11ACP.

In spite of this, RSX users have ways of turning RSX file systems into quivering heaps of ones and zeros; the ways of doing this are best left unpublished. The result, however, usually is a disk with one or more of its critical parts damaged. The critical part may be the home block, the boot block or any one of the other files that sit in the master directory, UFD [0,0].

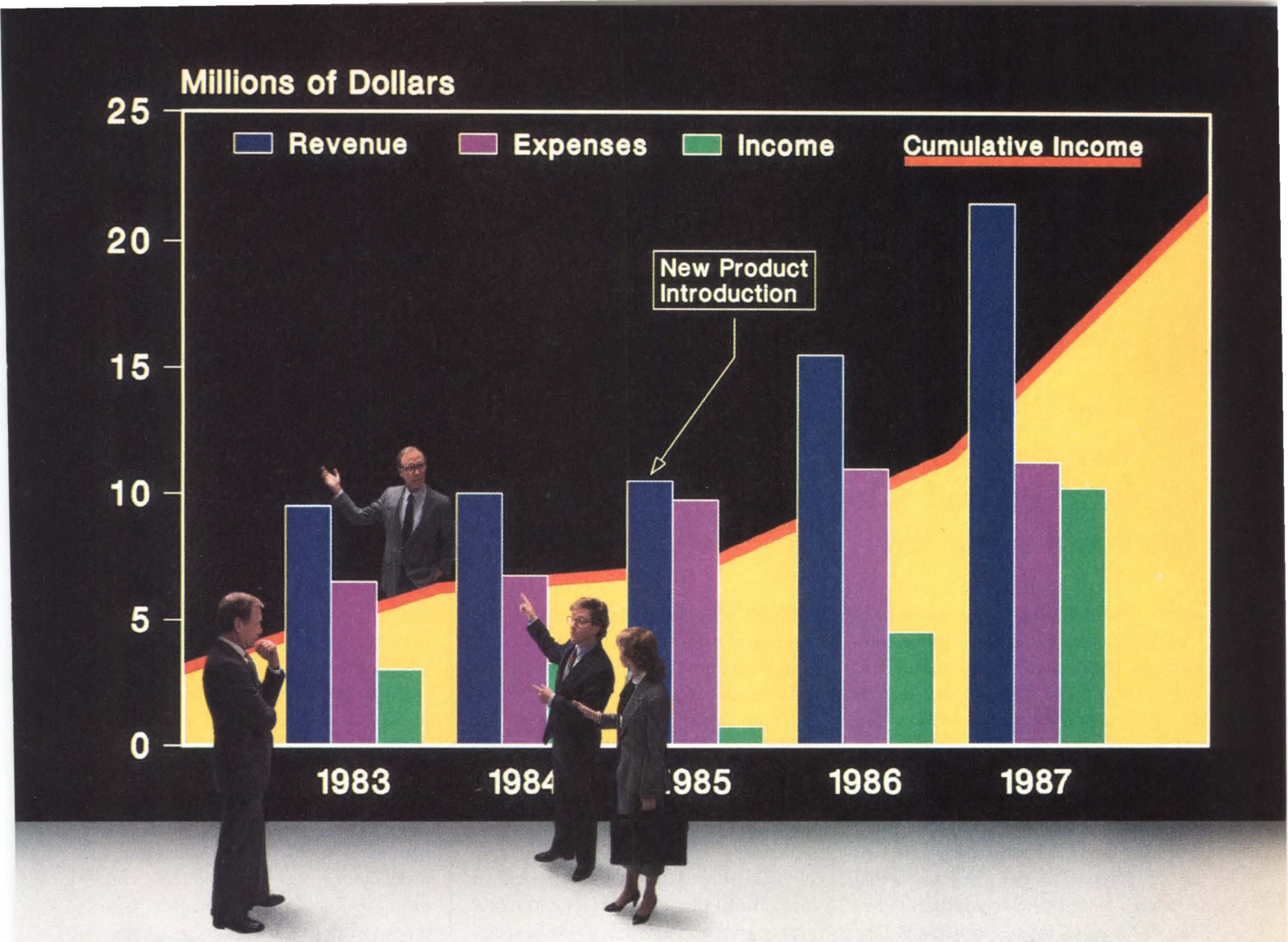
When a corruption occurs, the RSX system programmer is consulted, usually with a request indicating that data on this disk has been damaged to the extent of being unreadable and the disk unmountable. The requestor believes that the data is still there on the disk, and hopes that the system programmer can wave a magic wand, say a few prayers, and the files will reappear, usually with the requisite blinding flash of light. A backup?

Never. The system programmer disappears into his cubicle, posts a few "Do Not Disturb — Ever" signs and in a few hours or days hands a tape to the user containing the data files. Another battle is over.

In the process of waging this little battle, most system programmers either invent or use a suite of ad hoc programs that will do some bit surgery on a disk and possibly recover files. Such programs are written quickly, tucked away, rarely polished or documented. Some have taken on a legendary character: Mike Higgins' *LAZARUS* and Larry Baker's *UNDELETE* both are programs for recovering inadvertently deleted files, one of the simplest of the recoveries to perform, yet still difficult. These programs are in the public domain and are available from the DECUS Library (DECUS, Order Processing, 219 Boston Post Road, BPO2, Marlboro, MA 01572).

Bruce Mitchell, owner of Machine Intelligence and Industrial Magic (MIIM), Bryon, Minnesota, has integrated a collection of disk recovery tools and techniques into a well-designed utility. The MIIM *RECOVR* utility is a "soft" disk disaster recovery utility for the RSX family of operation systems. *RECOVR* restores lost files and corrupted disks to new output media.

Invocation of the *RECOVR* utility is done through an interactive question and answer session in which the user specifies the type of recovery to be run and the mode in which it's to be run. The interactive session runs in both



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terse and verbose mode and, in general, the verbose mode will be chosen until the user becomes familiar with the options and their import.

RECOVR can be put into a dry run mode where all normal operations except the actual file recoveries are performed. In this mode, a logging file, terminal output and scanning are done as if an actual recovery were being done. This can be useful in determining the extent to which a disk would be recovered without investing time and disk space in performing the recovery. For large disks, a dry run takes only two to 10 percent of the time an actual recovery would take. In addition to being an obvious safety feature, the Dry Run facility is an excellent means for learning how to use the *RECOVR* utility.

An extensive log file is created as *RECOVR* executes, listing all files being recovered and any attributes that *RECOVR* finds in the file header. The log file can get large; using one block for each file recovered.

RECOVR always requires two disks: the crashed disk and the disk to which the recovered files are copied. The careful design of the *RECOVR* task permits the crashed disk to be recovered while being hardware write protected. Some of the more notorious disk recovery tools have twiddled a bit on the crashed disk in an attempt to rebuild a corrupted data structure, usually making a corrupted disk worse. MIIM's *RECOVR* avoids this kind of trickery, adopting a "do no further harm" principle and doing all its recovery to a second disk.

Several optimizations are built into *RECOVR* in order to save time, effort and disk space in doing a recovery. The user has the option of recovering system and directory files because these files often can be recovered from backups or have no significance to the user. The same is true for files that have zero blocks allocated, although they may exist in directories. *RECOVR* attempts recovery of multiheader files, if so directed.

The careful design of the *RECOVR* task permits the crashed disk to be recovered while being hardware write protected.

Corrupted disks often have only a few critical files on them. The *RECOVR* utility gives the user the option of specifying a list of files to be searched for. Files can be recovered selectively by filename, UFD, or any wildcard combination. This is useful when recovering specific files or whole directories that have been deleted inadvertently.

The *RECOVR* utility has a specific option so that the user can attempt the recovery of deleted files. When a file is deleted from a FILES-11 disk, the file is not overwritten; only the system disk allocation files, file header and entry in the directory are changed. The information on disk remains until the disk blocks are reused for another file, and it's therefore possible to attempt recovery of files that have been deleted.

Virtual disk container files present a problem because their contents must be treated as if the container file were a physical disk, not just a contiguous file on a FILES-11 disk. *RECOVR* has the option of scanning, and thereby recovering, files in virtual disk container files in the correct fashion: as if they were valid physical disk files.

RECOVR is intended to be used to recover a disk from a data disaster or a corruption caused by the physical failure of the disk drive. A disk that has been damaged badly by a head crash, warping, or firearms, first must be brought back to a semblance of being physically intact, to the extent that it can be spun up in a drive. *RECOVR* then can be used to assess the extent of data damage caused by the physical disaster.

Reported cases of *RECOVR* use include the recovery of a floppy disk that had holes punched in it at random, several RD52s with parity errors on alternate blocks and an RL02 that had been overwritten by a privileged task inadvertently doing Write Logical Block QIOs to the disk instead of to its terminal. All were recovered successfully, with more than 80 percent of the files recovered intact.

RECOVR is distributed as a task image, making installation simple. The manual is nicely done, explaining in detail the use of the *RECOVR* task, common problems encountered, some theory of doing disk recoveries, example recovery sessions and words of wisdom about prevention of future disk disasters.

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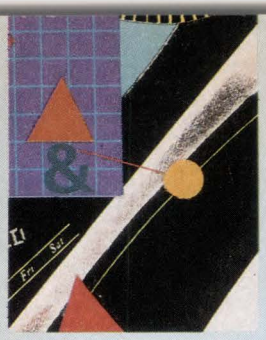

RT-11

RESTOR

By Gerardo Hugo Fisanotti and Sergio Hector Silva

A Utility To Restore Files From RT-11/BUP 'Containers.'

With RT-11 V5.0, DEC released a new backup utility called BUP. This release was long-awaited because the standard COPY was inefficient in tape space and speed performance. BUP basically has solved this problem but it lacks useful features such as restoration of individual files from the "container," listing the container directory, and the capability of storing more than one container in the same tape. The latter capability is important because the biggest RT-11-supported disks are not greater than 32 MB and even the cheapest tape drives (e.g., TK2) can store up to 60 MB per reel. There's a lot of wasted space in each reel.

BUP has two modes of working: copying a single file and copying a whole disk (BACKUP/DEVICE). The first mode isn't very efficient because no more than one container can be stored in the same reel. You need big files to justify using this mode. The second mode is used most often, but its applicability is reduced if you don't have an efficient way of recovering individual files, which is an important capability. You usually don't lose whole devices.

We haven't been able to test this in our system yet, but as far as we know with RT-11 V5.2, BUP includes the ability to restore individual files and directory listings. However, it still can't restore files that reside within logical disks stored as standard files in the container, or list logical disk directories. This is important because logical disks are a common way of organizing information in the RT-11 mono directory disk structure.

There are at least two remaining features not included in BUP: storing more than one container per reel and managing files within logical disks. The solution for the former may require modification of the BUP program, so we decided not to do anything about this. It's possible to solve the latter problem, however, with a separate utility, and that's what we've done with RESTOR.

DEC doesn't specify BUP tape format in the documentation set, but after hacking around we discovered that its format is the same as the RT-11 disks. The only particularity is that the block size is not 512 bytes but 2,048. All we had to do was use the *Software Support Manual* to get a full description of the directory structures.

We decided to implement this program in FORTRAN IV because it's not as cryptic as MACRO, and RT-11 system services lets you do this kind of relatively complex task. Implementation was straightforward. The only trouble we had was dealing with block numbers greater than 32,767, which is the highest positive integer supported in FORTRAN IV. In this case, we wrote a few small subroutines (rtoi and unsig) to convert 16-bit unsigned integers to REAL*4 back and forth.

Tape positioning and reading was done with SPFNW and READW system services respectively. Disk writing was done with IENTER for file creation and allocation and IWRITW for populating files. Basically, all tape and disk input and output is done through RT-11 system services rather than standard FORTRAN I/O statements. RESTOR is self-guided and prompts the user for every possibility. The current version doesn't implement wildcarding, but we expect to include it in a future release.—*Gerardo Hugo Fisanotti and Sergio Hector Silvia are system programmers at Galmes y Casale S.R.L., Cordoba, Argentina.*

PROGRAM.

```
c Program : RESTOR
c Function: To restore files contained in RT-11/BUP genned "containers"
c Author  : Gerardo Hugo Fisanotti/Sergio Hector Silva
c Date    : 15-jan-1986
c-------------------------------------------------------------------------

        subroutine parse (file,out)

        implicit integer (a-z)
        integer*2 out(4)
        byte file(15),dev(3),name(6),ext(3)

        call scopy('DK ',dev,3)
        call scopy('      ',name,6)
        call scopy('   ',ext,3)
        file(15)=0
        i=index(file,':')
        if (i.gt.0) call scopy(file,dev,i-1)
        j=index(file,'.')
        if (j.eq.0) goto 1000
        call scopy(file(i+1),name,j-i-1)
        call scopy(file(j+1),ext,3)
        goto 2000

1000    call scopy(file(i+1),name,6)

2000    call irad50(3,dev,out(1))
        call irad50(6,name,out(2))
        call irad50(3,ext,out(4))
        return

        end

c-------------------------------------------------------------------------

        function rtoi (r4)
        integer*2 rtoi, i2(2), sts
        real*4 r4
        integer*4 i4
        equivalence (i2(1),i4)

        sts = jafix(r4,i4)
        rtoi=i2(1)
        return
        end

c-------------------------------------------------------------------------

        subroutine readw (blknbr,bloque)

        implicit integer (a-z)
        common inchan,ouchan,infile(3),oufile(4)
        common /direct/ tabnam(3,2232),tablen(2232),tabbeg(2232),entry
        common /actual/ phyblk, physeg(2048), privez
        logical*1 privez
        integer*2 bloque(256),dblk(4)
        real*4 phyblk
        real*4 unsig, blkr, skip

c---    calculates nmbr of physical blocks to be read
        blkr=unsig(blknbr)
        skip=aint(blkr/8)-phyblk
        offset=amod(blkr,8.)
        if (skip.gt.1)
     1      i=ispfnw("376,inchan,rtoi(skip-1),dblk,iaddr(dblk))
        if (skip.ne.0 .or. privez)
     1      sts=ireadw(2048,physeg,0,inchan)
        privez=.false.
        phyblk=phyblk+skip

1000    do 1100,i=1,256
          k=offset*256+i
          bloque(i)=physeg(k)
1100    continue
        return

        end

c-------------------------------------------------------------------------

        subroutine setup

        implicit integer (a-z)
        common inchan,ouchan,infile(3),oufile(4)
        byte ascfil(15),ouasc(15),indev(15),ans(1)
        integer*2 dblk(4)

        type *,'RESTOR: BACKUP "containers" file restoration program'
        type *,'------'
        type *,' '

c---    Ask input device

        type 10
        call scopy('              ',indev,14)
        accept 40,indev
        indev(15)=0
        call parse(indev,dblk)

c---    Open input device

        inchan=igetc()
        if (inchan.lt.0) stop 'no channel for input'
        type *,'Rewinding...'
        i=lookup(inchan,dblk,0)
        if (i.lt.0) stop 'bad lookup for input'

c---    Skip first 2 blocks of tape that don't contain usable
c---    information for us

        i=ispfnw("376,inchan,2,dblk,iaddr(dblk))

c---    Get directory

        call getdir(0)

c---    Ask if he wants to display directory

1000    type 50
        accept 60,ans
        if (ans(1).ne.'y' .and. ans(1).ne.'Y') goto 2000
        call lisdir
        goto 1000

c---    Ask if wanted file resides into logical disk

2000    type 70
        accept 60,ans
        if (ans(1).ne.'y' .and. ans(1).ne.'Y') goto 3000
        type 80
        call scopy('              ',ascfil,14)
        accept 40,ascfil
        ascfil(15)=0
        call parse(ascfil,dblk)
        infile(1)=dblk(2)
        infile(2)=dblk(3)
        infile(3)=dblk(4)
        call search(infile,begin,length)
        if (begin.ne.-1) goto 2100
        type *,'Logical disk not found'
        goto 1000
2100    type *,'Searching for requested logical disk...'
        call getdir(begin)
        goto 1000

c---    Ask input file

3000    type 20
        call scopy('              ',ascfil,14)
        accept 40,ascfil
        ascfil(15)=0
        call parse(ascfil,dblk)
        infile(1)=dblk(2)
        infile(2)=dblk(3)
        infile(3)=dblk(4)

c---    Ask output file

        type 30
        call scopy('              ',ouasc,14)
        accept 40,ouasc
        ouasc(15)=0
        call parse(ouasc,oufile)

        return

10      format (' Input Device: ',$)
20      format (' Input File  : ',$)
30      format (' Output File : ',$)
40      format (15a1)
50      format (' Do you want to display directory      [Y/N]: ',$)
60      format (a1)
70      format (' Is requested file into a logical disk [Y/N]: ',$)
80      format (' Logical disk name                           : ',$)

        end

c-------------------------------------------------------------------------
c---    Searches for file name into entry table and returns start
c---    and length if found. If not found returns -1 in start.

        subroutine search (filnam,begin,length)

        implicit integer (a-z)
        common inchan,ouchan,infile(3),oufile(4)
        common /direct/ tabnam(3,2232),tablen(2232),tabbeg(2232),entry
        integer*2 filnam(3)

        do 1000,i=1,entry
          if (tabnam(1,i).ne.filnam(1)) goto 1000
          if (tabnam(2,i).ne.filnam(2)) goto 1000
          if (tabnam(3,i).ne.filnam(3)) goto 1000
          begin=tabbeg(i)
          length=tablen(i)
          goto 9000
1000    continue
        begin=-1

9000    return

        end

c-------------------------------------------------------------------------
c
c---    returns "unsigned" value of input integer

        function unsig (ent)
        real*4 unsig
        integer ent
        unsig=32768.*(1-isign(1,ent))+ent
        return
        end

c-------------------------------------------------------------------------
c
c---    Displays directory

        subroutine lisdir

        implicit integer (a-z)
        common inchan,ouchan,infile(3),oufile(4)
        common /direct/ tabnam(3,2232),tablen(2232),tabbeg(2232),entry
```

PROGRAM . . . continued

```
      real*4 unsig
      byte nam(6),ext(3)

      type 10
      type 20
      type 10
      do 1000,i=1,entry
        call r50asc(6,tabnam(1,i),nam)
        call r50asc(3,tabnam(3,i),ext)
        type 30,nam,ext,unsig(tablen(i)),unsig(tabbeg(i))
1000  continue
      return

10    format (' ---------------------------------')
20    format (' Filnam          Leng.       Start ')
30    format (' ',6a1,'.',3a1,'      ',f8.0,'      ',f8.0)
      end

c-------------------------------------------------------------------------
c
c---  Gets directory

      subroutine getdir (offset)

      implicit integer (a-z)
      common inchan,ouchan,infile(3),oufile(4)
      common /direct/ tabnam(3,2232),tablen(2232),tabbeg(2232),entry
      integer*2 seg(512)
      data tent/"400/, empty/"1000/, perm/"2000/, prot/"102000/
      data eosmrk/"4000/
      logical*1 first

      first=.true.
      snbr=0
      entry=0
      blk=offset+4

c---  Read a directory segment

2000  blk=blk+2
      snbr=snbr+1
      call readw(blk,seg(1))
      call readw(blk+1,seg(257))
      begin=seg(5)+offset
      if (first) hgst=seg(3)
      first=.false.

c---  Process directory entries

      ebase=-1
3000  ebase=ebase+7
      if ((seg(ebase+0).eq.eosmrk) .and. (snbr.eq.hgst)) goto 9000
      if ((seg(ebase+0).eq.eosmrk) .and. (snbr.ne.hgst)) goto 2000
      status=seg(ebase+0)
      length=seg(ebase+4)
      if (status.ne.prot .and. status.ne.perm) goto 4000
      entry=entry+1
      tabnam(1,entry)=seg(ebase+1)
      tabnam(2,entry)=seg(ebase+2)
      tabnam(3,entry)=seg(ebase+3)
      tablen(entry)=length
      tabbeg(entry)=begin
4000  begin=begin+length
      goto 3000

9000  return

      end

c-------------------------------------------------------------------------
c
c---  Main program

      program restor
      implicit integer (a-z)
      common inchan,ouchan,infile(3),oufile(4)
      common /direct/ tabnam(3,2232),tablen(2232),tabbeg(2232),entry
      common /actual/ phyblk, seg(2048), privez
      byte filnam(9)
      real*4 phyblk, unsig
      integer*2 inrec(256), rtoi
      logical*1 privez

      privez=.true.
      phyblk=0.
      call setup
                .          .          .
                .          .          .
                .          .          .
```

SOFTWARE

WHERE ARE YOUR SALESPEOPLE?

By Donna Barron

The *Marketing Management System* Knows!

Just last week a young woman named Linnea called to remind me that the manufacturer's warranty on my personal computer would expire shortly. Wouldn't I like to purchase an extended service contract? Actually, I hadn't thought about it, but now that she brought it to my attention . . . .

Ring up another sale for telemarketing. Linnea's call was a typical example of direct sales telephone solicitation, a marketing technique that's rapidly gaining converts among companies that once depended exclusively on the proverbial traveling salesman and local field representative to peddle its wares. But using telephone salespeople to sell its products and services directly to potential customers is only one of the ways companies are using telemarketing these days.

Some products, like the service contract I purchased, seem to be tailor made for the telephone trade, but in many cases, face-to-face contact or on-site demonstration continues to be an essential factor in closing a sale. Thus, rather than switching to telephone sales, many companies just implement telemarketing techniques to augment the sales potential of their outbound sales staff. In some cases, callers are employed simply to qualify sales leads, target specific prospects and schedule appointments for the salespeople. In others, calls also may conduct after-sale follow-up phone surveys to determine customer satisfaction.

To be truly effective, any marketing program requires a significant amount of feedback. Telemarketing programs, in particular, cry out for the kinds of answers and analysis only a computerized application program can provide. The *Marketing Management System (MMS)* from JEB Marketing Information Systems Inc. of Austin, Texas, currently available in both MS-DOS and VMS, is such an application.

MMS is a computerized sales and marketing database package that has been designed to address the particular needs of companies whose sales are generated by telephone and field representatives. Essentially, these needs fall into three major categories: lead generation, which is geared to finding and qualifying potential customers; account development, which includes sending out personalized letters and product information and setting up appointments; and account management, which focuses on maintaining an ongoing relationship with the customer, tracking sales activity and anticipating future needs.

Although *MMS* essentially is a database application with all that implies, it presents an interesting concept in database construction. Not only does *MMS* provide all the power you'd expect from a rigid database format program in terms of search, mail merge and list and report generation capability, but it also in-

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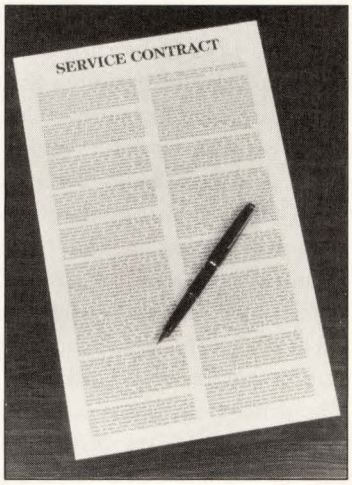

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cludes a taste of the flexibility ordinarily reserved for free-form file management systems.

The Inner Workings Of MMS

MMS accomplishes this merger of structure and fluidity by adding two optional screens to its basic database file (called a master file account), so that each file can have up to three separate parts: a primary data entry screen, an account activity screen and a sales activity screen.

Because *MMS* is a menu-operated program, it's extremely easy to learn and use. While this may be of minor importance to companies that hire dedicated keyboard operators to input data and qualify sales leads for their salespeople, companies with a number of salespeople who will be working hands-on with the computer will appreciate the program's simplicity and ease of operation.

All major operations are selected from a main menu, with secondary and tertiary selections made from subsequent submenus. In some cases, function keys are used to move from screen to screen, but such choices always are visible on-screen so that even novice computer users should have no difficulty finding their way around the program. Written documentation is provided in the form of an extensive and well-written three-ring loose-leaf manual. Unfortunately, the lack of an index limits the manual's usefulness and makes finding specific information awkward and time consuming.

One of the program's more unique features is its ability to provide several levels of user access. Using a password authorization security scheme, access to certain data files and menu options can be restricted to designated users. In addition, companies with extensive master file account databases can speed up end user operations considerably by subdividing data into smaller task or user-specific units called work files.

For example, a salesperson planning a trip to Cincinnati might make up a work file exclusively of leads and clients

Using a password authorization security scheme, access to certain data files and menu options can be restricted to designated users.

with Cincinnati ZIP codes. He then could use this work file as a prospect list for setting up appointments with potential or existing customers in the Cincinnati area. Separate work files might be set up to segregate each salesperson's accounts, a salesperson might set up a work file of customers due for a follow-up call on a particular day, or customers with similar interests who'd want to be advised of product enhancements, might be lumped together in a work file.

The primary screen of each *MMS* master file account is set up as a client or potential customer data file and includes 26 fields covering everything a salesperson possibly could want to know about a given client or prospect.

Fields range from the company name, address and SIC code, through the name and position of the contact person, the company's potential and actual purchases, its particular product interest, the anticipated date of next follow-up call and everything in between. This screen has been preconstructed and all fields are predetermined by JEB. Unlike a generic database application, it requires no special planning or structural manipulation (although it does allow you to personalize up to seven fields if you need them).

Basically, all you have to do is fill in the blanks that are relevant to your client base. In fact, all that *MMS* requires to set up a master file account is a company or contact name. It should be noted, though, that fields are limited to 24 characters, and names longer than that will have to be abbreviated if they're to be used for creating mailing labels or mail-merged letters.

In order to further facilitate data entry, many of the fields have been set up to receive codes of up to four alphanumeric characters rather than words. For example, instead of keying in "vice president" for the "contact" field, you could assign "vice president" a code of 2 or 17.

Unfortunately, while the actual text will appear whenever the information is used for correspondence, only the code appears when you review the file on screen. In case you forget what a code means, you can hit the Help key while the cursor is in a coded field to bring up a list of all the codes for that field. It would be easier, though, if keying in the code number actually made the code definition appear on the screen as well. As it is, I found using mnemonic codes like VP considerably easier than trying to memorize dozens of numeric code definitions or having to flip back and forth through the Help screens.

Another problem with codes is that they can't be set up on the fly. Defining codes is a separate menu operation from entering data in master file accounts. If, in the course of entering account data, you find you need an additional code definition, you'll need to exit the data entry mode, enter the code definition mode, define the code and then exit that mode before you can continue entering account data. There should be an easier way.

Use of the second and third *MMS* screens is optional. The account activity screen is the unstructured part of the account file. This can hold up to 999 lines of free-form notes regarding the salesperson's contact and interaction with the account.

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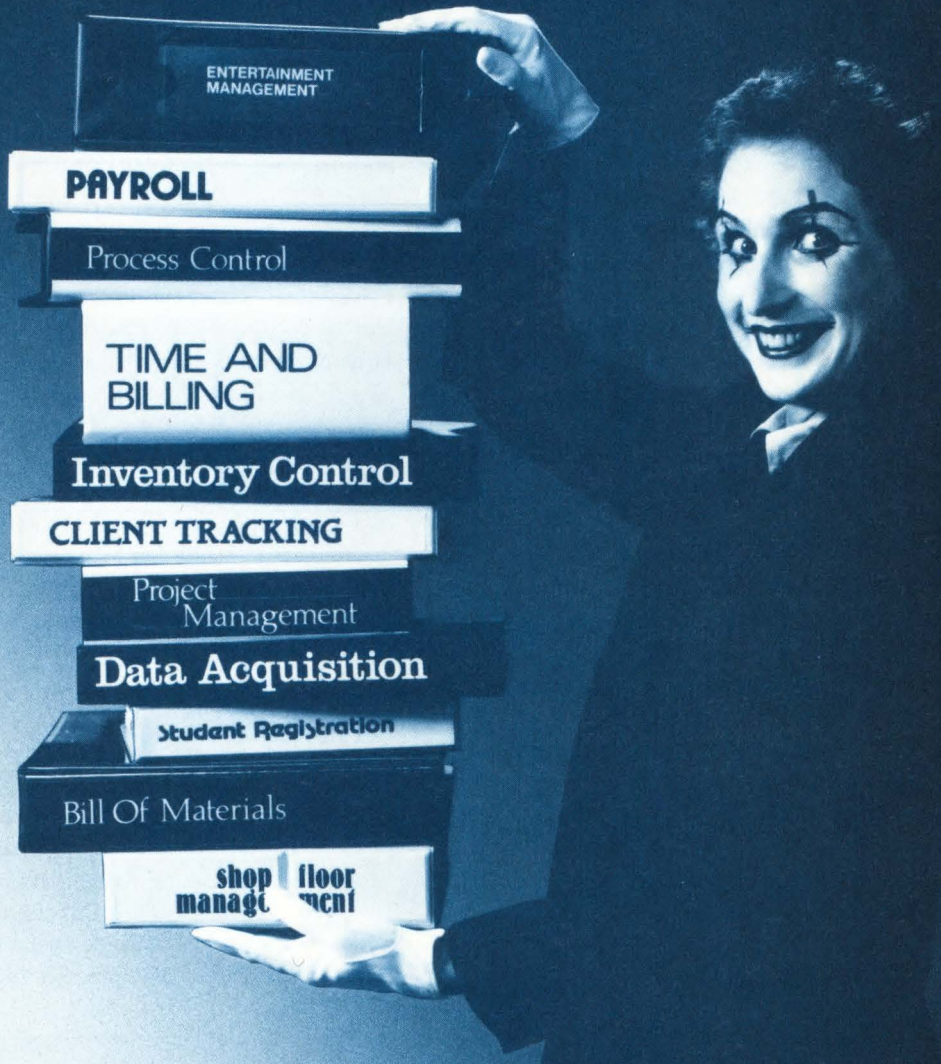

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For those with a modem, *MMS*'s autodial feature makes it possible to have the computer dial calls directly from within your account files.

The third screen is the sales activity screen. This allows the salesperson to maintain a record of all potential and actual sales activity that occurs in each account and also may contain up to 999 lines of information.

While it's only possible to view one account screen at a time, printing doesn't have this limitation. Users have the option of printing only the primary screen of each account, printing all three screens together on a single sheet, or printing an abbreviated two-line listing for each account.

Features

The program includes a simple editor for preparing one-page letters and boiler-plate documents for mail-merge activity. Although this probably is adequate for most short correspondence, it's extremely basic — lacking word-wrap and insert and delete capability — and should in no way be confused with a word processor. However, *MMS* also provides a pathway for merging data files with documents from popular word processing applications such as *WordStar, WordPerfect* and *WPS.* It also has a special menu selection for printing labels, envelopes and Rolodex and index cards directly from the data file.

The test pattern is a handy option that gives you an opportunity to check out how letters, labels, etc., will look on the page and, if necessary, to readjust them before you start a merge-print. Another interesting option is the print-to-disk selection which allows you to store your merge printed documents in a disk file for later use, rather than sending them directly to the printer.

In addition to interfacing with a variety of word processing applications, *MMS* also offers the ability to automatically extract data for use with *Lotus 1-2-3* or other spreadsheet programs and to accept database information from other sources directly into *MMS* format. This batch update function can save time when you must input large numbers of files such as prospect lists from a business information database. Another time saver is the global change and delete option which allows you to alter or purge multiple records in a single operation. For those with a modem, *MMS*'s autodial feature makes it possible to have the computer dial calls directly from within your account files.

MMS automatically assigns an account number of up to six digits to each account file. The program also allows for an additional two digits to be used as a site identification code. This code is useful in tracking the source of data files when a company shares data between two or more offices. File sharing and data updating is a simple operation with *MMS*. Disk sharing is the most common method among companies with similar hardware, although modem transfer is equally effective. Where it's necessary to transfer data between a PC and a VAX, any standard terminal emulation software will do the trick. In addition, *MMS* supports many of the major MS-DOS networking systems.

One of the most important features of any database application is its report generation capability, and *MMS* provides plenty of power in this area with six separate reports. These are designed to help you determine which advertising sources have been most active and which have been most cost effective, to analyze the lead and sales activity of particular products and their average closing time, and to review the sales performance of each salesperson and forecast upcoming sales either by salesperson or product based on existing leads.

Reports may be directed either to the printer or to disk, but can't be visualized on-screen within the program itself. However, because reports are saved to disk in ASCII format, they can be opened and reviewed with any word processor or text editor that will read ASCII text. For those who need more detailed or sophisticated reporting, JEB offers a software add-on for both single-user MS-DOS systems ($795) and multiuser MS-DOS, UNIX and Xenix systems. It's called Report Management System (RMS), and it lets users design their own customized reports.

JEB offers *MMS* with a 90-day warranty and offers an extended one- year warranty and telephone service for an additional 15 percent of the software price. The JEB support staff answered my questions promptly and was both knowledgeable and extremely pleasant to deal with. *—Donna Barron is a freelance writer from Hollywood, Florida.*

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SOFTWARE

XENTIS IS EASY TO USE

By Michael G. Gonzales

Smooth Sailing With Ease Of Learning, Speed And Flexibility.

XENTIS, from Park Software Inc., Seattle, Washington, is a comprehensive information management system for VAX/VMS. It's suited to support the data resource needs of individuals with backgrounds ranging from non-technical to advanced technical. *XENTIS* offers ease of learning and use, speed and flexibility.

Some of the features that make the package easy to use are:

1. A three-window Display Mode that shows the format of the report as it's being created.
2. The ability to step the user through report creation via interactive dialogue.
3. Context-sensitive online help that provides help on the current field without having to know the general topic. This feature alleviates some of the frustrations encountered in similar systems, especially during the learning period.

XENTIS supports almost any RMS file under VAX/VMS. Files may be created with a variety of languages including COBOL, FORTRAN, BASIC, C and DIBOL.

XENTIS/Report, the master program in the system, acts as a "nucleus" module and is necessary for the operation of all other modules. It allows up to:

1. 10 input files per report
2. 100 fields per report
3. 10 sort fields
4. 10 levels of subtotals
5. 64 calculations per report.

XENTIS/Report can run in either hardcopy mode or in a CRT-based display mode. It requires either *XENTIS/Dictionary* or VAX CDD. Either way, the user is guided through report definition via a series of questions, each with a default. Unlike some systems that ease you through report definition up to a point and then net you in a web of confusion, *XENTIS* eases even the novice user through the whole process of report definition. With *XENTIS*, report definition becomes a smooth process. Help can be requested at any time (see Screen 1).

Menu Options

XENTIS provides a number of menu options:

1. **Create a Report** — This option initiates what's referred to as the Master Dialogue. It provides access to all *XENTIS* reporting capabilities. The system asks you what files are to be used, questions about the fields, format, calculations and breaks. You then may run the report and have the option of saving the dialogue in a command file.
2. **Create a Query** — This mode provides for limited functionality report writing. *XENTIS* is shipped with a default Query dialogue that uses approximately half of the Master Dialogue prompts. This is suited for taking a look at ordered data.
3. **Utility Programs** — These programs are

used for manipulating *XENTIS* reports and command files.

XENTIS/File writes records to an existing data file instead of to a report. Also, */File* permits advanced users to reorganize or consolidate input data files by copying records from one or more old files to a new one. This new file might be structurally unlike the old ones in that it can have different fields, data types and/or additional fields. The ability to reorganize or consolidate data files is convenient, alleviating some typical problems encountered in updating records common to multiple files. The */File* mode uses the same commands as */Report*. The Initial Prompt and File Dialogue is shown in Screen 2.

The *XENTIS/Model* and *Graphics* option operates in conjunction with *XENTIS/Report* to build data files to be used by financial modeling, spreadsheet and graphics packages. Park Software provides a Modeling or Graphics Control File that prepares the output for compatibility with specific packages at each user installation.

XENTIS/Word takes data from data files and produces ASCII files that are compatible with other word processing packages, such as *CT*OS*, *IT*OS*, *WORD-11* and *DECWORD*.

XENTIS/Update is an optional module that eliminates writing new programs every time a multiple records update is done. */Update* allows you to delete or modify records in existing files, up to 10 files concurrently.

XENTIS/Dictionary permits you to create and maintain centralized data dictionaries, providing access to a variety of files. As such, */Dictionary* acts as a management tool for *XENTIS* and RMS data files. */Dictionary* is required by other *XENTIS* modules (*/Report, /Edit*), allowing them to process data in *XENTIS* and RMS files. It features a variety of dictionary and file management functions (see Screen 3).

```
Park Software, Inc.        SYS$SYSDEVICE:[XEN30.DATA]XENDEMO.DIC;

                    XENTIS Information System Menu

                    1 Create a New Report
                    2 Create a Query
                    3 Run an Existing Report
                    4 Modify an Existing Report
                    5 Directory of Report Definitions
                    6 Delete a Report Definition
                    7 Print a Report
                    8 Print a Report Definition
                    9 Copy a Report Definition
                   10 Report Definition conversion : 2.1 to 3.0
                   11 Setup file compilation
                   12 Back to main menu
                   13 Quit

        Use arrow keys to select an option, then press <RETURN>
                or enter the number of your selection __
```

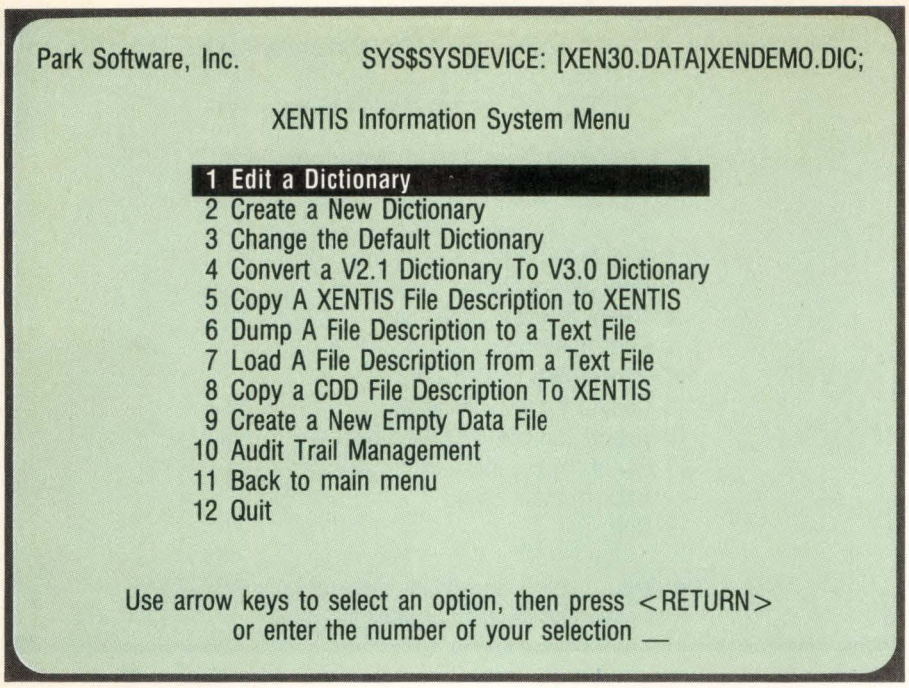
Screen 1: The /Report Menu screen.

```
....v....1....v....2....v....3....v....4....v....5....v....6....v....7....v....8

XENTIS V3.0                PARK SOFTWARE, INC.                PAGE ####
                                                              04-SEP-86

....:....1....:....2....:....3....:....4....:....5....:....6....:....7....:....8
REPORT          MODEL           REWORD
SELECT          CREPORT         REGRAPH
QUERY           REREPORT        REMODEL
FILE            RESELECT        RECREPORT
WORD            REQUERY         QUIT
GRAPH           REFILE

<PF1>=GREEN <PF2>=HELP <PF3>COMMAND <PF4>=SELECT **Function Selection**
Type Index to list your reports, or @'filename' to run a report.

Enter XENTIS function: FILE_____
```

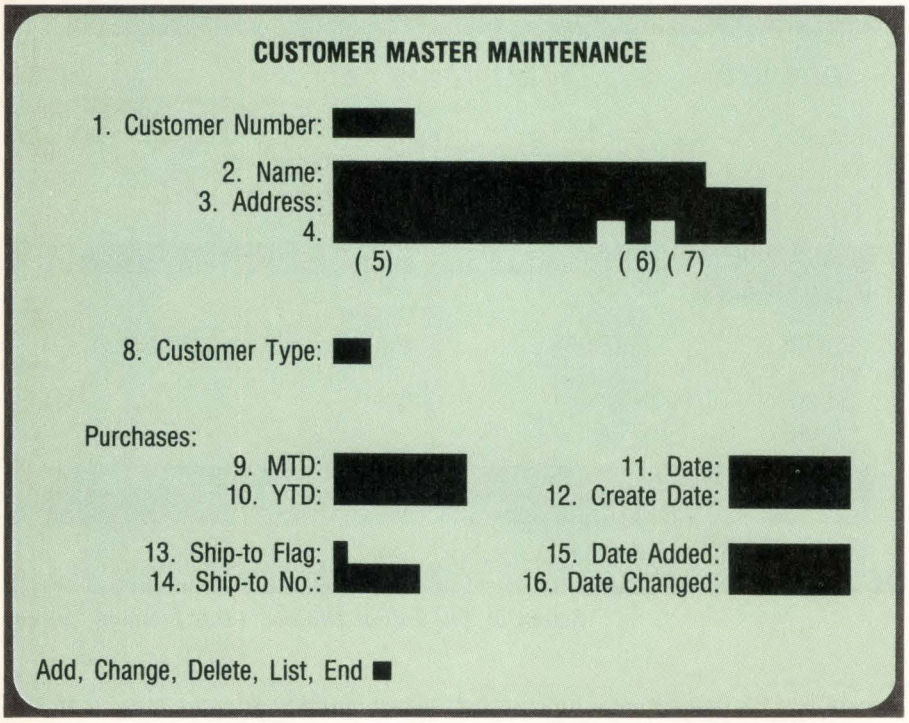
Screen 2: The Initial Prompt, FILE Dialogue screen.

XENTIS/Edit is an easy and complete data editing system. Even a novice user can master many of the features of this module and use them to an advantage in a short time. Its features include the ability to add, change and delete data in a file; guard against entry of incorrect data; support indexed, relative and sequential files; support more than 30 data types; use *XENTIS/Dictionary*; and restrict editing to authorized users. In addition, you can create new files, using */Edit* in conjunction with */Dictionary* menu options.

XENTIS/Interface is a set of 11 routines that perform file I/O according



Screen 3: The /Dictionary Menu screen.



Screen 4: The Customer File Data Entry customized screen.

to information stored in the data dictionary. The */Interface* module supports the following features:

1. Application programs to access data files defined by *XENTIS/Dictionary*.
2. Programming language conforming to the VAX/VMS calling standard.
3. Applications programs to open, close, read, write and update data files.
4. Audit trials.
5. Application programs to extract specific fields of records.

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Because of its features, especially applications programs accessibility, */Interface* allows a newly installed *XENTIS* to impact on the overall data processing system in a gentle way.

Documentation

The *XENTIS* Information System comes with two reference manuals for users with varying levels of experience. They are well written, organized and easy to follow with ample figures and screen snapshots.

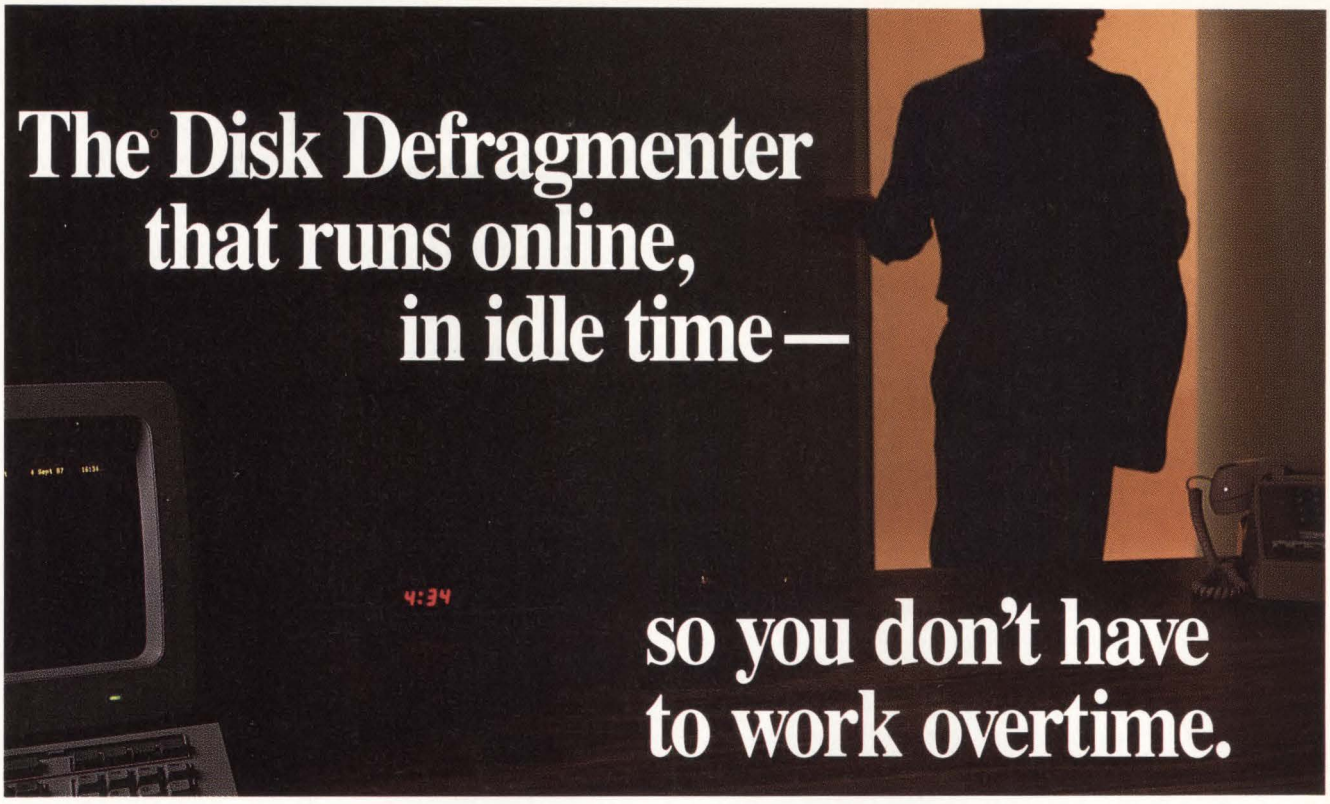
Part One of the documentation contains an "Introduction to *XENTIS*," with brief summaries on elementary computing topics, data processing, helpful terms and instructions for the *XENTIS* output management products.

Five appendices include topics such as Valid Data Types, Error Messages and SETUP FILE. Part One closes with a comprehensive index.

Operating instructions for the data management products of the *XENTIS* Information Management System are contained in Part Two. In addition to the reference manuals, the *XENTIS* main module, *XENTIS/Report*, comes with a handy reference guide that lists and summarizes the report writer commands.

Park Software has developed a high quality product. *XENTIS* grows on you — the more you work with it, the more you grow to like it. *—Michael G. Gonzales is assistant professor of Computer and Information Science at Gwynedd Mercy College, Gwynedd, Pennsylvania.*

DISKEEPER



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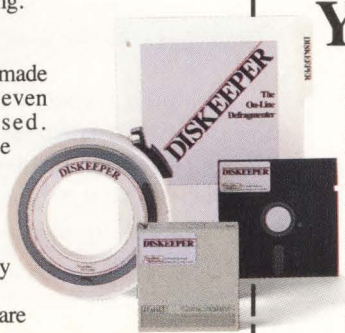

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Rex Jaeschke

From FORTRAN To C

Editor's note: Because FORTRAN is the most popular VMS language, and C is gaining its own strong following, it seems inevitable that there will be some cross pollination among their respective followers. In this issue, Mr. Jaeschke explains how to emulate some FORTRAN constructs in C.

This month's column was prompted by the following reader letter.

Dear Mr. Jaeschke,
I would like to thank you for the wonderful series of articles in DEC PROFESSIONAL. *I've read and saved every one and they've been extremely helpful to me. I have several problems that I thought you might be able to shed some light on for me.*

I've been a FORTRAN programmer for many years and, for the most part, have switched to C. I'm trying to convert my "mathematical" FORTRAN programs to C and have major problems to contend with:
1. What's the best solution to translate FORTRAN's COMMON statement? I know how to use C's global variables, but this doesn't allow me to change the name of the variables in the same way that COMMON does. I'm not familiar enough with C's structures to duplicate the common statement with it.
2. Is there a way to duplicate the EQUIVALENCE statement in C?

Mimicking COMMON Blocks

Before I answer the reader's specific questions, let's look at why we use COMMON. (The discussion and examples that follow are applicable to PDP-11 and VAX implementations.)

The most obvious and frequent use of COMMON is to share data among two or more routines. To do this, we declare a COMMON block in each of the affected routines and, as if by magic, the data objects declared within the COMMON block become available. The fact that the variables declared in the COMMON block are packed into adjacent memory locations is really of no interest to the programmer; he simply puts all related variables into the same COMMON block for consistency. Using COMMON blocks to make data available across routines is more efficient than passing arguments at run time because the mapping of COMMON blocks is a compilation and link-time activity. Argument list processing, however, takes time and resources at run time and this cost is proportional to the number of arguments passed.

A lesser use of COMMON is to use the knowledge that variables declared to be in a COMMON block are packed in the order specified. And, allowing for object alignment requirements (not necessary on the VAX), the objects occupy consecutive addresses. The advantage of this comes when we want to write out a whole screen of text at once. Rather than putting each field out individually, we can declare a COMMON block that contains character arrays with embedded display attributes, such as bold, blink, underline, etc. We then write out the whole COMMON block with one I/O, using something like a QIO system service call. We need to provide the address of the start of the block (the address of the first variable declared there), and the length of the block in bytes. We also can use this technique to write unformatted records to disk. In these cases, we never use the fact that COMMON blocks can be shared across routines.

A COMMON statement reserves one or more contiguous blocks of storage. A symbolic name is used to identify each contiguous block . . .

COMMON Block Syntax

The following is an overview of the formal definition of the COMMON statement:

A COMMON statement reserves one or more contiguous blocks of storage. A symbolic name is used to identify each contiguous block; however, you may omit this name, in which case it becomes "known" as BLANK COMMON. COMMON statements also specify the order of variables in each COMMON block.

The format of the COMMON statement is:

```
COMMON [/[block-name]/] name-list
```

Multiple COMMON blocks can be declared using the same COMMON statement, but that's an abbreviated form and won't be discussed further.

When COMMON blocks that have the same name but are located in separate modules are made part of the same ex-

ecutable program, the individual names become associated with the same storage area. For example:

```
PROGRAM TEST

COMMON /STUFF/ FIRST, LAST, INC
INTEGER*2 FIRST, LAST, INC
...
CALL SUB
...
END

SUBROUTINE SUB

COMMON /STUFF/ FIRST, LAST, INC
INTEGER*2 FIRST, LAST, INC
...
RETURN
END
```

How COMMONs Are Implemented

When COMMONs are implemented, the compiler generates a program section (PSECT) of the same name as the COMMON block, and it assigns it the overlay (OVR) attribute, among others. The linker then gathers all PSECTs with the same name from the input object modules and, because they have the OVR attribute, forces all of them to begin at the same relative location in the executable image. Because you know the PSECT's name, you can do interesting things with it using linker options.

This mechanism lets a number of things happen. First, the names of the variables in the COMMON declaration can vary from one module to the next because variable names within COMMONs are merely offsets from the start of the contiguous area occupied by the block. I strongly suggest that you not use this capability; however, you always should use the same name for a variable across all COMMON block declarations. The reason for this is one of consistency and ease of maintenance. In fact, this is forced on you when you use the file INCLUDE capability. As a matter of style, I reject the idea that using different names for the same variable (in this context) is a useful practice.

The second thing is that, in practice, the sizes of each declaration of the same COMMON block don't have to be the same; the linker allocates enough space for the largest block declaration. This can be misleading and lead to obscure programming practices. Fortunately, it's subverted when INCLUDE is used.

The third problem has to do with initialization. You can have a data statement for COMMON block variables in ANY routine in which the block is declared. Not only that, but the same variable can have more than one DATA statement, with different values, provided each is in a different routine. Apart from the potential to mislead maintenance programmers, the actual initial value of the variable is controlled by the linker. It depends on the order in which the linker finds the corresponding object modules. The last initializer seen for a particular object probably will be its actual starting value.

I've been using the term declaration instead of definition. In C parlance, a declaration gives the attributes of an object, such as name, type and class, whereas a definition actually causes storage to be allocated for the object. A definition is also a declaration, but a declaration isn't necessarily a definition. I make this distinction because on VMS (and RSX) none of these COMMON declarations cause space to be allocated at compile time or run time. Allocation actually is done by the linker.

C provides two ways in which to share data across functions: via the argument list (as does FORTRAN) and via externally declared variables.

One big plus about COMMON is that the syntax used to declare the COMMON block and its members can be identical in each routine. (As we'll discuss later, this isn't true in C). This makes it a natural candidate for an INCLUDE file.

If we're to emulate a COMMON block in C, we need a way of allocating a block of contiguous space (possibly with a name) that can be subdivided into multiple data objects, each of which can have a different type and size. Ideally, as the author suggests, we would like to be able to use different names for the same variable in different routines.

From C's point of view, all FORTRAN data objects have class **static**; i.e., every variable defined is allocated space (conceptually) at compile time.

Note, however, that the initial value of all data objects is undefined by default, whereas in C, **static** (and external) objects have a default value of zero cast to their data type. (On many systems this is not the same thing as all-bits-zero, but that's another issue.) The only flexibility then, when declaring variables in FORTRAN, is the issue of scope; and here you have two choices: global (via COMMON) or local (the default case).

Global Data In C

C provides two ways in which to share data across functions: via the argument list (as does FORTRAN) and via externally declared variables. You can access variables across functions via pointers, but to do so requires the pointer to be passed by argument or made an external variable. The only way in C to declare a contiguous block of space in which to store multiple objects is to use an array or a structure. Because an array requires each object in it to have exactly the same type,

we'll eliminate that possibility. A structure simultaneously may contain objects with any combination of data types, including arrays and other structures and pointers.

The only way to share data across functions is to use external variables and if a contiguous block is needed, these external variables must be structures.

I carefully use the word external rather than global because not all C externals are global. For example, a **static** external

> ***. . . the linker allocates the space, so in reality, a C compiler running on a PDP-11 or VAX (at least using DEC's operating systems) doesn't need to distinguish between a global definition or reference.***

is defined outside all functions, but it only can be shared (accessed) by functions defined in the same source file. If you like, it's a "global" with file scope rather than program scope. However, any variable defined outside functions without the static class has global scope, and as such can be accessed from any source code file in which it's declared.

```
/* file a.c */

static int si = 100;

struct ss {
        int i;
        long l;
};

static struct ss ss1, ss2[10];

sub1()
{
        ss1.i = si * 10;
}

sub2()
{
        ss2[4].l = (long) si;
}
```

Here, the integer **si**, the structure **ss1** and the array of 10 structures **ss2** can be accessed from functions **sub1** and **sub2**. They can't, however, be accessed from code in other source code files. The reason for this is that the variable names **si**, **ss1** and **ss2** aren't entered into the object module as global symbols, and so the linker doesn't see them and can't use them to resolve references from other object modules. This means that these same names can be used elsewhere as static externals or even as global variables. The only restriction is that you can't access global variables by the same name from within a.c. There's simply no syntactic way to differentiate between a global called **si** and the **static** external **si**. One declaration would have to hide the other.

```
/* file b.c */

int total = 25;

struct tag {
        int i;
        double d;
};

struct tag s1 = {123, 1.234};
```

```
/* file c.c */

extern int total;

struct tag {
        int i;
        double d;
};

extern struct tag s1;
```

In b.c, **total** is defined as a global **int** with an initial value of 25. Likewise, **s1** is a global structure of type **tag** with initial member values of 123 and 1.234, respectively. The syntax of the language (according to K & R and the proposed ANSI C Standard) dictates that both of these declarations are definitions and conceptually cause storage space to be allocated.

In order to access these globals in c.c, we must declare them appropriately, and we do so using the **extern** class as shown. C requires that global references have the **extern** class and that they not have initializer lists. Global definitions mustn't have the class **extern** and may or may not have an initializer list. (If the list is absent, the list defaults to a set of zero values as mentioned above.)

C's REF/DEF Problem

The problem with this approach is that we have a different syntax for the definition and the reference, and that prohibits us from using the same code for both. We could put the reference declaration in a header and **#include** that as necessary but we still would need the definition syntax in only one place.

As mentioned earlier, the linker allocates the space, so in reality, a C compiler running on a PDP-11 or VAX (at least using DEC's operating systems) doesn't need to distinguish between a global definition or reference. And this is reinforced by Whitesmiths' (and others) compilers allowing liberal combinations of definitions and references as is allowed in FORTRAN. In other words, various compilers may allow all global declarations to have the **extern** class, any or all to have initializers, or perhaps none to have the **extern** class. They simply notice a global declaration, create the corresponding PSECT (initialized as specified or by default) and let the linker resolve the total amount of storage and final "initial" value to use.

I already have stated my objections to using different

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names for the same variable in a COMMON block. There's no way to map different names to globals (or **static** externals) in C. I can't think why you would want to do this, but perhaps you could use the preprocessor to **#define** a synonym for them and use the macro name throughout the code. While this may

Perhaps the most obvious solution (at least to the C novice) is to use a union because a union's purpose is to allow you to redefine the same storage area in different ways.

make it look as if you're using a different name, you really aren't.

The bottom line is this: To simply share variables across functions, use global variables. If you need to share a contiguous area, use a global structure. In both cases, the "COMMON block name" of the shared data is the name of the variable itself; with a shared structure the whole structure has a name because it's a variable in its own right.

Writing Contiguous Blocks In C

The second use of COMMONs is to read and write contiguous blocks. To do this in C, use something like:

```
struct byte {
        char attributes[15];
        char ch;
};

struct byte bytes[2000];

main()
{
        /* ... */

        display(bytes, sizeof(bytes));

        /* ... */
}
```

Here we have an array of 2,000 structures, each containing one character on the screen along with an escape sequence representing that character's display attributes. All unused attribute bytes would contain the character ' \0 ' and as such, would be ignored by the display.

The *VAX C Manual* contains a section that discusses interfacing with VAX FORTRAN. Even if you don't wish to do this, the section is worth reading because it expands on what I just mentioned. In fact, it says, "A VAX C **extern** variable corresponds to a FORTRAN COMMON block with the same name." It also shows how to map a structure containing multiple members into a COMMON block with corresponding variables. Because you have direct control over PSECT names in both FORTRAN and C (the names used are those you specify), this mapping is not a problem. However, if you need to map into some other language's data structures you may find it necessary to say explicitly which PSECT to use and what attributes that PSECT should have. VAX C allows this via the extended keywords **globaldef**, **globalref**, **readonly** and **noshare**.

Mimicking The EQUIVALENCE Statement

This construct allows you "to partially or totally associate two or more entities in the same routine with the same storage location."

```
INTEGER*2 ARRAY1(100), ARRAY2(20)
EQUIVALENCE (ARRAY1(50), ARRAY2(1))
```

This causes space for 100 integer*2 variables to be allocated, named ARRAY1. The 20 elements of ARRAY2 overlap ARRAY1 beginning at ARRAY1(50); i.e., the same location can be accessed by ARRAY1(50) and ARRAY2(1), ARRAY2(51) and ARRAY1(2), etc. The two arrays only could overlap partly as follows:

```
INTEGER*2 ARRAY3(100), ARRAY4(20)
EQUIVALENCE (ARRAY3(91), ARRAY4(1))
```

Here, space is allocated for 110 integer*2 variables and elements ARRAY3(91) through ARRAY3(100) correspond to ARRAY4(1) through ARRAY4(10), respectively.

The Union Solution

Perhaps the most obvious solution (at least to the C novice) is to use a union because a union's purpose is to allow you to redefine the same storage area in different ways. To implement the FORTRAN examples above we could use the following code:

```
struct stag {
        short filler[49];
        short array2[20];
};

union utag {
        short array1[100];
        struct stag dummy;
};

union utag u;
```

The structure **dummy** contains two integer*2 arrays stored contiguously for a total size of 69 elements. Specifically, (assuming that structures have no holes, as with VAX C) **array2[0]** begins immediately after **filler[48]**. (Remember, C's arrays begin at subscript zero.) The union **u** is a union of the

structure **dummy** and the 100 element array **array1**. Because all members in a union begin at the same address, **dummy** and **array1** overlap starting at the same place. Therefore, **array2[0]** overlaps **array1[49]** directly.

To access the arrays we use expressions such as **u.array1[i]** and **u.dummy.array2[j]**, both of which are more cumbersome than FORTRAN's approach.

We must use the type **short** because that's two bytes, the size of an integer*2 on both a VAX and a PDP-11. We could use **int** on a PDP-11 because that's the same size as a **short** on that machine.

The second FORTRAN example could be done by using:

```
struct stag {
        short filler[90];
        short array4[20];
};

union utag {
        short array3[100];
        struct stag dummy;
};

union utag u;
```

The most obvious wart on this approach is the need to introduce a structure. We also need to use a dummy array of the appropriate size merely to force the required alignment and because C has no concept like COBOL's FILLER, we must explicitly name the unused variable.

Another significant problem is that the results of these approaches are implementation defined. C makes no guarantee about behavior when you store into a union via one of its members and fetch from it via another member. How the various members are represented internally, and the alignment requirements they need or have, are totally up to the implementation. In short, this approach is not portable, although for these specific examples it's hard to see how they wouldn't work as expected on many systems.

The Pointer Solution

Fortunately, there's a better and simpler solution involving the use of pointers, and an understanding about the relationship between arrays and pointers. Consider the following examples that provide alternate solutions to the EQUIVALENCE problems above:

```
#include <stdio.h>

main()
{
        short array1[100];
        short *array2 = &array1[49];

        array1[49] = 1234;
        array2[6] = 5678;
        printf("array1[49] = %d\n", array1[49]);
        printf("array2[0] = %d\n", array2[0]);
        printf("array1[55] = %d\n", array1[55]);
        printf("array2[6] = %d\n", array2[6]);
}


array1[49] = 1234
array2[0] = 1234
array1[55] = 5678
array2[6] = 5678
```

```
#include <stdio.h>

main()
{
        short array3[100];
        short *array4 = &array3[90];

        array3[90] = 1234;
        array4[6] = 5678;

        printf("array3[90] = %d\n", array3[90]);
        printf("array4[0] = %d\n", array4[0]);
        printf("array3[96] = %d\n", array3[96]);
        printf("array4[6] = %d\n", array4[6]);
}


array3[90] = 1234
array4[0] = 1234
array3[96] = 5678
array4[6] = 5678
```

How can we subscript a pointer? Doesn't an array have to be declared before we can use it? C defines that an array element expression of the form **a[i]** is identical to ***(a + i)** where **a** is a pointer and **i** is an integral offset. This means that these two expressions are completely interchangeable within C programs, and they often are. Because an array reference is simply an expression involving pointer arithmetic, the C language has no array bounds checking.

An important and powerful rule to remember when using C is, "Wherever you have a pointer, you also have an array and vice versa. Although any arbitrary pointer can be subscripted, whether or not the object designated by that expression exists or has meaning, depends on whether or not you have control of the space being referenced." This last caveat is necessary because **array4[1000]**, while acceptable to the C compiler, references some memory location outside our control.

If these examples are correct (and they are) then what location does **array2[-1]** reference? This is an interesting question and its answer can be useful. Try it and let me know. If you think C doesn't allow negative array subscripts, think again.

Numerous other FORTRAN-related issues of interest also were raised by the author. These will be recycled for future columns. Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia 22091.—*Rex Jaeschke is an independent consultant, author and lecturer. He is the C language editor of* DEC PROFESSIONAL, *and our representative on the ANSI C Standards Committee.* ■

System Performance And *ALL-IN-1*, Part 1

BOIS

David W. Bynon

Of all the complaints I hear about *ALL-IN-1*, system performance tops the list. If there's a reason not to install *ALL-IN-1* on an existing system, it's performance or the lack of it.

The purpose of this month's column is not to argue the worth of *ALL-IN-1* (personally I think it has great value); rather it's to explain why *ALL-IN-1* presents a system performance problem and some of the things you can do about it.

I had planned to address resource and capacity planning before performance. However, because so many *ALL-IN-1* sites have problems, it makes sense to discuss performance first. But, let me say this while it's on my mind: The only *ALL-IN-1* system worth having is one that's planned. Someone should take the time to research the capabilities, capacity and performance of the required *ALL-IN-1* system before buying or installing it on an existing system.

Resource Hog Or Resourceful?

To understand why *ALL-IN-1* presents a system performance problem, we first must understand what *ALL-IN-1* is. I can sum it up in a brief statement: *ALL-IN-1* is the most idiot-proof, handholding, interpretive, modifiable and robust office system known to man. The key words are interpretive, handholding and modifiable.

In the first BOIS column, I explained that *ALL-IN-1* is a fourth generation language and application development system. Moreover, *ALL-IN-1* is an operating environment and an interpreter, like BASIC. Its interpretive nature automatically puts it in a class of poor performance. Interpretive languages don't perform as well as their cousins, the compilers and assemblers, because they consume more CPU cycles. However, this interpretive ability makes *ALL-IN-1* modifiable and a fast application development tool.

Next, *ALL-IN-1* handholds its users. For example, when a user needs help or makes a mistake, the answer is only one or two key strokes away. If you forget the name of a folder, document or record, *ALL-IN-1* will provide you with an index. If you know only part of what you're looking for, *ALL-IN-1* will search for everything that matches. If you forget the commands, *ALL-IN-1* will take you step-by-step through the menus. These abilities put the power of the VAX into the hands of any novice, but they also increase disk I/O and CPU use.

To present a uniform interface to its users, *ALL-IN-1* uses a screen-based forms driver called the Forms Management System (FMS). FMS has the ability to associate data elements, called named data, with the form. *ALL-IN-1* uses this FMS function as interpretive input; *ALL-IN-1* instructions may be received from a form. In most cases this is a performance benefit, because the form must be loaded into memory to be displayed. These FMS forms, while useful to both *ALL-IN-1* and the user, significantly increase terminal I/O.

Finally, the *ALL-IN-1* image (A1.EXE) is massive, usually between 2,500 to 3,800 blocks. To start executing (i.e., present the first menu) the *ALL-IN-1* image causes the user's process to page fault heavily. If the user's process working set isn't allowed to grow to at least the size of the *ALL-IN-1* image, this heavy page faulting will continue while the user actively is using *ALL-IN-1*. Simply stated, *ALL-IN-1* needs lots of memory. On the other hand, it makes excellent use of shared images.

> ***System performance improvements come in many forms. Tuning, hardware upgrades, load balancing, system management and user education are a few of the issues in the battle to maintain or improve performance.***

So there you have it, four aspects that point out the good and bad points. Now all you have to do is keep the system so that all you see is the good side, and then figure out where to get started.

System performance improvements come in many forms. Tuning, hardware upgrades, load balancing, system management and user education are a few of the issues in the battle to maintain or improve performance.

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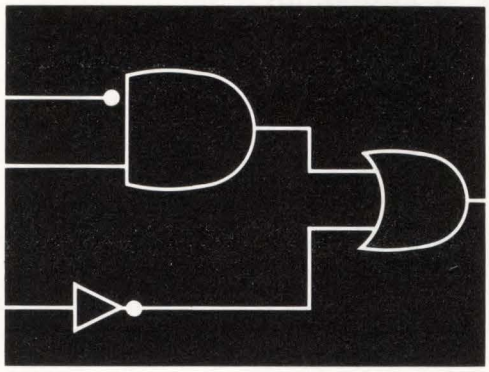

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The easiest *ALL-IN-1* performance improvements you can make are also the quickest and most effective. These improvements don't involve increasing the system's capabilities, rather they decrease the amount of work the system must perform.

A good place to start is with user training. For example, how many of your users know that *ALL-IN-1* menus can be called by name (e.g., MAIN, WP, EM), that a menu may be specified when *ALL-IN-1* is invoked and that *ALL-IN-1* commands can be stacked? The latter is especially important. By stacking commands (e.g., DIR PER SEL) the intermediate menus are skipped, saving the system CPU time and terminal I/O.

Equally important to system performance is the user's perception. Most users view *ALL-IN-1* performance as how fast screens are displayed and the time between screens. To get the most from this perception, have all terminals set up with jump scroll, as opposed to smooth scroll, and set the line speed as high as possible. Also, be aware that it takes longer to display a complex screen than a simple one. Thus, an easy way to make screens display faster is to remove some of the information or video characteristics (bold, blink, reverse, etc.).

The *ALL-IN-1* user profile is another source for decreasing the system's workload. In the user profile, you can specify a number of privileges, some of which allow consumption of major system resources. For example, the DCL privilege allows the user to have access to DCL through the use of a subprocess. This consumes more memory and CPU time. The SRC privilege permits a user to perform searches for embedded strings by pressing <GOLD-S>. This searches for all possible entries to the entry field, consuming CPU and disk I/O resources. The ERR privilege turns on error logging for a user, requiring disk I/O and disk space.

The user profile also has a number of notification flags to inform the user of mail, job completion, action items, etc. Most of these notification activities take place when *ALL-IN-1* is invoked. Naturally, if *ALL-IN-1* must search for new mail or meetings, the user will have to wait longer and the system will have to work harder.

A system performance problem is only a perception. For example, a three-second cursor response time to one group may be fast, while another group may find it unacceptable. So performance, good or bad, is how you define it.

Sustained Performance

As an *ALL-IN-1* system manager, you may have noticed that system performance started off all right, then slowly declined. This is known as the messy system syndrome.

ALL-IN-1 systems require a significant amount of care and feeding, especially in the disk, directory and file department. For some unknown reason, *ALL-IN-1* users are lazy. They rarely empty their wastebaskets or reorganize their file cabinets. The side effect is that as files are added, deleted, expanded or copied, the file cabinet index becomes fragmented and the file cabinet performance degrades. Second, the more files there are in a cabinet, the longer it takes to search for a particular file.

Fortunately, *ALL-IN-1* keeps a janitor on staff. The janitor and other *ALL-IN-1* system management functions provide a method of cleaning up after the users. File cabinets and data files are reorganized and file cabinet wastebaskets are emptied. It's important that these functions are performed on a regular basis. You also must keep after the users to do some of their own housekeeping by deleting unwanted files and memos.

Several *ALL-IN-1* system management performance issues relate to electronic mail. To facilitate shared memos, *ALL-IN-1* uses directories called shared areas or file cabinets. As these directories fill up with memo files, electronic mail slows down. The magic number seems to be approximately 500 files; when a VMS directory contains more than 500, inordinate resources are consumed searching for files. Regularly inspect the size of these shared directories ([ALLIN1.SHARE1], [ALLIN1.SHARE2], ...) and create more before they get too full. Logical names in A1V2STARTUP.COM define the high and low directory names.

Another issue concerning electronic mail is the size of the mail logs, such as MTILOG.LOG. The mail logs should be replaced frequently to decrease the amount of time it takes to write a new entry. Finally, be aware that a shared electronic mail memo isn't deleted from the system until all addressees have read and deleted it from their READ folders.

The last system management problem I'd like to discuss, disk fragmentation, comes about because *ALL-IN-1* creates and deletes so many files. Disk fragmentation is a system performance

problem inherent to VAX/VMS because of the way it allocates disk space.

To avoid the performance overhead of a fragmented *ALL-IN-1* disk, reorganize the files in one of two ways. First, perform a full backup and restore operation of the volume. When BACKUP restores a disk volume, it attempts to make the files contiguous. This method works, but it's time consuming. The second method is to use one of the several VMS disk defragmenters available. Choose one that operates online, otherwise use BACKUP.

Monitor And Collect

VMS provides the necessary tools to determine when and where you might have a system performance problem, SHOW and MONITOR. A system performance problem is only a perception. For example, a three-second cursor response time to one group may be fast, while another group may find it unacceptable. So performance, good or bad, is how you define it.

To define performance, or a standard from which to judge, you first must have statistics. If you don't have system statistics, you don't know if you have a performance problem. Use MONITOR and SHOW to collect information, at regular intervals, for historical statistics.

The information you collect is equally important to the collection itself. Don't collect more than you need or more often than you need to; it wastes CPU time and disk space. Here are some hints: MONITOR PAGE provides information on the free list size and the page read I/O rate. Use this information to decide if page faulting is excessive. Use MONITOR STATES to determine if processes are being swapped, an indication that the system has reached its memory limitation.

In part two of this series I will continue with *ALL-IN-1* system tuning, load balancing and possible performance upgrades. Until then, start collecting data and cleaning house. *—David W. Bynon is a VAX systems consultant in Silver Spring, Maryland.*

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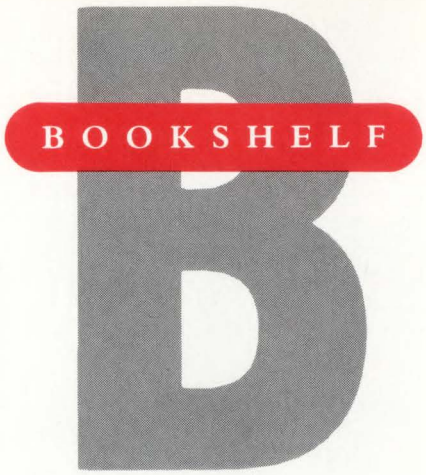

WORKING OUT WITH AUTOCAD

Designed as a companion to *Inside* AUTOCAD, *Working Out With* AUTOCAD is a detailed, self-paced workbook for intermediate and advanced users of *AUTOCAD*. The reader will acquire an understanding of *AUTOCAD* systems; system management; drawing strategies; creating, editing and customizing *AUTOCAD* and *AUTOLISP* screen and table menus; and the use of *AUTOLISP* to automate drawings.

There are more than 200 menu items and 50 annotated macros listed. Many of the customized menus and macros are available on a "Workout Diskette," through New Riders Publishing.

Ample use of MS-DOS to manage the *AUTOCAD* systems environment is available. The book will help minimize drawing time, while at the same time enhancing it.

Working Out With AUTOCAD is divided into seven exercise sets — graduated in difficulty. These sets start with DOS subdirectories and automated startup procedures for the *AUTOCAD* program, and proceed through how to:

1. Build up drawing with *AUTOCAD*'s editing commands.
2. Create drawing symbols including tablet tracing symbols.
3. Assemble a drawing combining symbols and previously completed drawings.
4. Assign and extract attributes.
5. Adapt *AUTOCAD*'s dimensioning for individual use.
6. Use advanced plotting techniques, including plotting symbol libraries, plotting with different line weights, and merging 2-D and 3-D drawings with plotting.
7. Create *AUTOCAD* script files.

Working Out With AUTOCAD
Martha Lubow
New Riders Publishing
Thousand Oaks, CA, 1987
368 pages, softbound $29.95
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The suggested environment includes *AUTOCAD* V2.5 or higher, IBM XT/AT (or compatible) with 640K, a math coprocessor, hard disk, color monitor, digitizing tablet or mouse, and a pen/plotter or printer/plotter.

The Appendix includes *AUTOCAD* standard table and screen menus, customized menu items and macros developed in the seven excerise sets, a description of DOS system configurations, and how to use the "Workout Diskette." —*Dr. Charles Moulton.*

RSX: A Guide For Users

Many people have asked me to recommend a book about RSX. My standard reply has been to read the manuals, the *Multitasker*, and *DEC PROFESSIONAL* because no books about RSX ever have been published. My reply needs to be updated. We now have a book.

RSX: A Guide for Users is meant to be read by the newcomer or by the person who just wants to get the job done using RSX: the physicist, the programmer with little or no RSX experience, or the engineer who wants to know just enough about RSX to get the job done.

The author's ability to explain a topic in just the right amount of prose is this book's strongest feature. The explanations are done in a one-on-one tutorial style, with getting the job done as the objective.

This book should be read cover to cover during, not before, a first skirmish with RSX. Little needs to be read beforehand, because the book carefully guides the new RSX user through the levels of facilities in the order in which they would be encountered by a new user: logging on and using the terminal, creating files, printing files and then using a compiler and the Task Builder. The author goes from the simple to the not-so-simple without getting bogged down in technical detail and overwhelming the reader. The material is presented in a graduated way, making several passes over each subject, each pass containing more detail. I like this approach because the reader can stop when he feels he has absorbed enough detail, and yet feel confident of not having missed anything essential. Although the type of user addressed by this book

probably would want to use DCL, both the DCL and the MCR version of each command is shown. Once the basic groundwork has been laid, the author presents better ways to do things: Indirect Command Files, some of the more creative PIP commands and backup techniques.

The chapter on User Area Management is one a newcomer sorely needs, and is nicely done. People using RSX for the first time must realize that they can affect other users on the system and, therefore, must clean up after themselves. To his credit, Pieper resists the temptation to get preachy about the subject.

The author also is to be praised for not writing a chapter on using the EDT editor. Many authors of introductory texts feel obliged to include a chapter on EDT, and yet the DEC manual does a fine tutorial job. Pieper does not waste valuable page space on such redundancy.

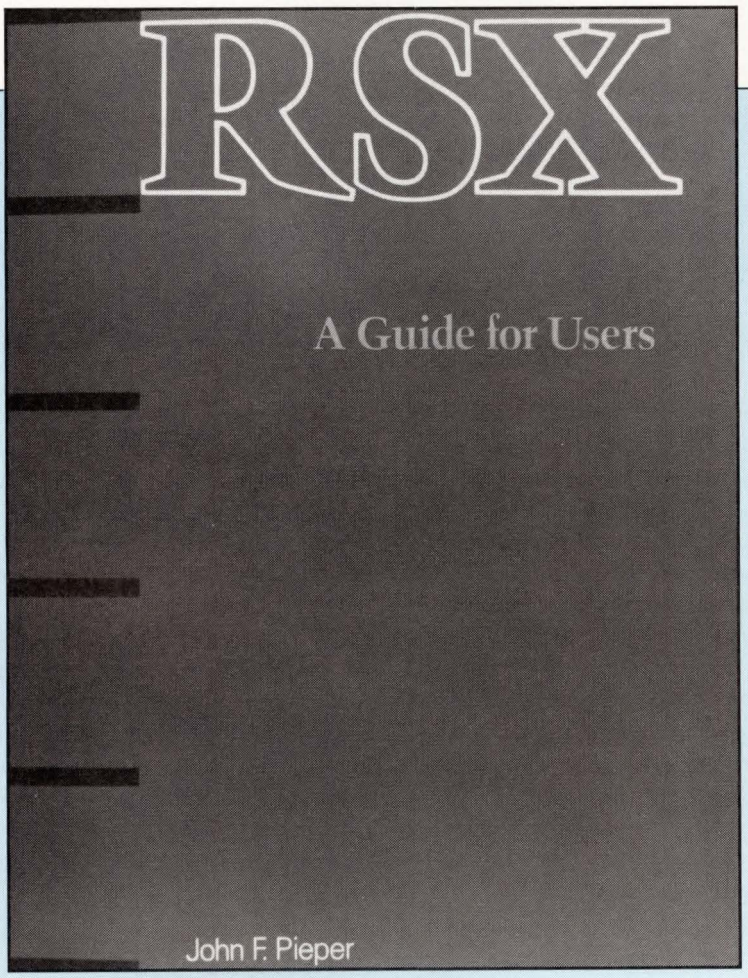
Pieper also mentions the more useful DECUS utilities, like SRD and TECO, being careful to differentiate these from the standard RSX facilities.

The material stops at the level of a generally competent user. While more can be said about RSX, the author has chosen a good place to stop. One major subject is missing: This book needs a chapter on task mapping space, including the mysterious APRs and the general methods of using overlays, because every newcomer to RSX runs into mapping space problems while doing his first major application. It's a problem that doesn't go away with experience.

This book should have been published in a lie-flat form. If used as heavily as I think it will be, its spine will break and eventually it will come apart.

I must compare this book with the *Micro/RSX User Guide*, since both seem to have been written for the same type of user. Although the *Micro/RSX User Guide* is well done, it does not offer the same style of explanation that the Pieper book does. The two complement each other.

At least one copy of this book should be available at every RSX site. Newcomers to RSX and those who would classify themselves casual RSX users should consider it required reading.
—Reviewed by James A. McGlinchey, an independent software engineering consultant specializing in the use of RSX and VMS.



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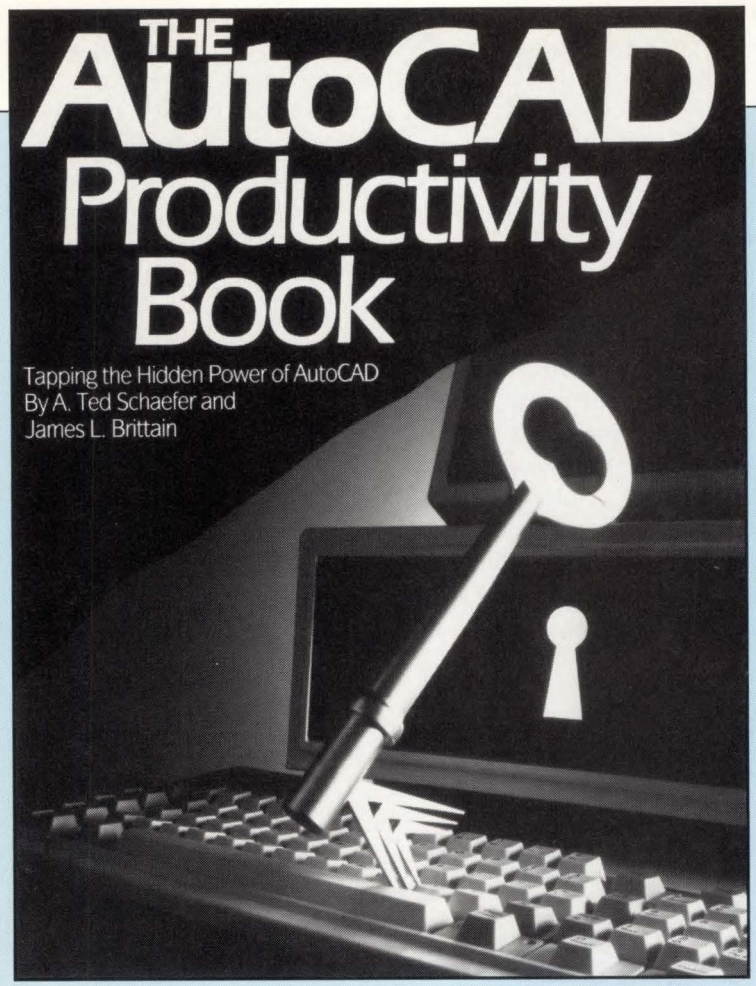

The* AUTOCAD *Productivity Book
By A. Ted Schaefer and James L. Brittain
Ventana Press Inc.
Chapel Hill, NC, 1986
314 pages, softbound $39.95
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THE AUTOCAD *PRODUCTIVITY BOOK*

Beginners and advanced users can learn how to customize *AUTOCAD* to their specific design disciplines, create and modify screen and table menus, and automate their drawings with *The* AUTOCAD *Productivity Book*.

The authors have divided the book into two sections. Section One includes seven tutorial chapters on creating and editing *AUTOCAD* macros using DOS to create subdirectories, manage directories and subdirectories, and create programs. These chapters are detailed enough for the beginner and informative enough for the advanced user. Beginners will learn a great deal about DOS, which will help them conserve time and avoid pitfalls. Those familiar with DOS will find these chapters a good review.

Section Two includes 70 *AUTOCAD* macros and LISP routines to improve productivity. These routines can be entered into the user's computer or purchased on a diskette from Ventana Press. Examples include routines for drawing parallel lines, tangents, polygons, ellipsis, scaling text, using door and window insertions, and datum line dimensioning. The book also discusses:

1. Customizing screen and table menus.
2. How to add speed, flexibility and performance to your system.
3. How to create and edit your own macros and *AUTOLISP* routines.
4. How to manipulate the *AUTOCAD* menu for optimum efficiency.

There are no special hardware requirements other than a functioning *AUTOCAD* system. *AUTOCAD* V2.15 through V2.18 are supported versions in this book, but there are some *AUTOLISP* programs for V2.5. The user must use DOS V2.1 or higher.

The authors have included several good Appendices, including one each on DOS commands and compendium, EDLIN (the editor used throughout the book), *AUTOLISP* Notations, word editors and other utilities. *—Reviewed by Dr. Charles E. Moulton, professor of computer science and mathematics at Beaver College, Pennsylvania.* ■

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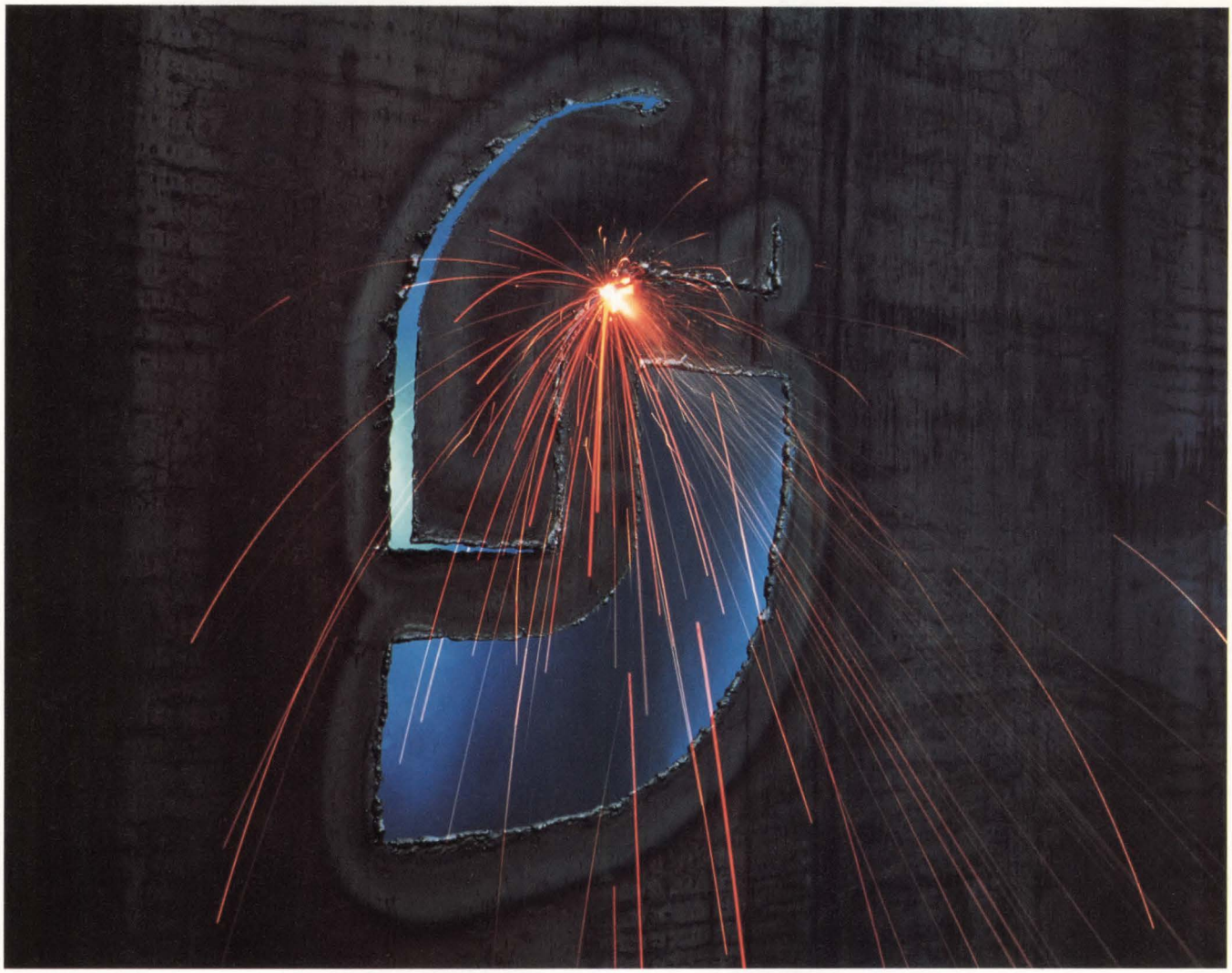

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Tracking Your Privacy On A Computer BB

Herbert Swartz

"The cycle is just about inevitable," explains attorney Julian Millstein of Brown, Raysman & Millstein in New York, editor of *Computer Law Strategist*. "First comes the new development in high technology, then the opportunities to commit crimes with that new development, and so the need for government regulation. But the regulation runs smack into hoary and traditional legal rights."

For example, there's the battle ground between the computer bulletin boards (BBs) and the law of privacy. Attorney Charles McCoy Jr. of Sheppard, Mullin, Richter & Hampton in Los Angeles, who has written and lectured on this collision course, explains, "The proliferation and misuse of computer bulletin boards have made regulation necessary. Such regulation demands a delicate balance between existing governmental authority and ensuring the rights of computer bulletin board operators and patrons. Ahead lies the challenge of walking that electronic and constitutional tightrope."

Experts estimate that at least 5,000 BBs exist today, transmitting data on such issues as cycling, cooking, parapsychology and politics. With a home computer, modem and telephone, you can connect to a BB and either access or leave messages, for the price of a phone call.

In turn, the potential for abuse is enormous. Millstein and others place the number of underground bulletin boards at 20 percent. That's approximately 1,000 BBs devoted to illegal or unsavory purposes.

The tools of the thief or criminal have changed. Instead of the proverbial wire, glass cutter, bolt breaker and lock pick, all he needs is a home computer, modem and telephone. Notes McCoy, "A criminal can sit, like any business executive or administrative assistant, in the privacy of his home or office and go to work."

Experts estimate that at least 5,000 BBs exist today, transmitting data on such issues as cycling, cooking, parapsychology and politics.

The difference, though, is that the criminal's occupation involves gaining access to stolen credit card files, facilitating the distribution of pornographic materials or performing industrial espionage by reading private corporate computer files. Moreover, the miscreant can alter the information contained in any of these files.

Then there's "phreaking," that is, providing either access codes to computer systems or stolen credit card numbers. "Sex talk" occurs when pedophiles exchange information about their victims. Also, there's the problem of entering illicit or erroneous information into legitimate BBs. Clearly, the setting for governmental regulation has been established, and Congress has gotten into the act.

Senator Paul Trible of Virginia, has proposed a bill that would extend criminal liability to any individual who knowingly transports in interstate or foreign commerce "any obscene, lewd, lascivious, or filthy writing, description, picture or other matter entered, stored, or transmitted by or in a computer."

The bill also extends criminal liability to anyone who "knowingly owns, offers, provides, or operates any computer program or system or service" to transmit obscene material, and to anyone who uses computer networks for sexual exploitation of children.

The Computer Fraud and Abuse Act, already passed, makes it a felony for BB operators to list passwords to computer systems. Other legislative efforts probably will arise out of the model statute now being drafted by the Data Processing Management Association, focusing on passwords and access codes.

To complicate matters and compound the problems, there's the indignant reaction of 50 state legislatures and the inevitable electronic and constitutional tightrope. As an example, consider the First Amendment. Some legal minds maintain that freedom of speech includes the right of privacy, a person's right to say or hear whatever he wishes in his own home.

But, McCoy says, "The imposition of criminal liability, opponents to the legislation contend, would chill the

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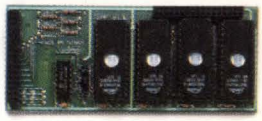

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speech of BB operators who might choose not to run their bulletin boards because their systems might contain illicit matter. Those continuing their operations would assume the additional responsibility of scrutinizing all information within their systems. This is already a substantial burden for some operators. The freedom of BB users would be restricted because their messages inevitably would be censored and not disseminated promptly, thus impairing the free flow of information."

But, the freedom of privacy isn't spelled out in the Constitution. The law of privacy is a creation of the Supreme Court, growing out of the right to have an abortion, to use birth control devices or to read pornography in your living room. The home, then, becomes off-limits to the intrusive arm of government. It's also off-limits when using a computer at home. Any regulation of such home computer use, opponents to legislation say, is Orwellian.

Even though a man's home is his private castle for reading and writing, there's a difference regarding the computer. Printed material comes to rest in the home. But information in a BB is accessed or sent in electronic transmission, so it enters the stream of commerce.

There's the tightrope. The Constitution charges Congress with the responsibility for regulating commerce. The Commerce Clause for interstate commerce (and similar powers over intrastate commerce that lie with state legislatures) provides authority for BB legislation.

The law of privacy always has tread a fine line, now highlighted by BB developments. For example, you want legislation to protect your privacy from others regarding, say, credit card information and corporate data. On the other hand, you don't want the government to legislate to enable its own snooping.

> ***". . . the freedom of privacy isn't spelled out in the Constitution. The law of privacy is a creation of the Supreme Court, . . ."***

Perhaps, however, there's another way to resolve the dilemma. McCoy explains: "Commentators have suggested that improved security systems for computer bulletin boards could alleviate some of the proposed statutes' ill effects. With improved software mechanisms to screen bulletin-board postings (preventing certain distasteful words from being posted, or requiring every user to identify a message by his name and verifiable telephone number), the chilling effect of any such laws could be counteracted."

Naturally, high technology alone won't provide a panacea. Each step is followed by the next step that permits circumvention. But at least in walking the electronic tightrope, legislatures won't be alone.

"What we need are some cases to get started," adds Millstein. High technology moves fast; the law slow. For the moment, we're walking the privacy tightrope blindfolded and without a net.

"Our only hope for now is the ethics of those who run BBs," says McCoy. That provides some solace, but not much for those who are realistic.

— Herbert Swartz, a graduate of Harvard Law School, is a veteran writer on computer law.

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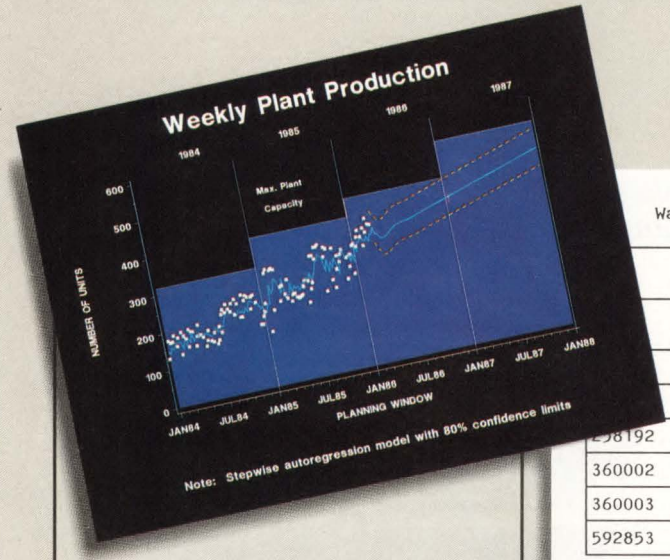

Warehouse Inventory Report - 16JAN87

	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
298192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
360003	15985	500	TUE, FEB 10, 87
592853	469120	20000	WED, FEB 18, 87

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40	6	1	6	3.5	33
50	6	3	8	5.5	66
60	6	4	9	6.5	
70	7	4	10		

* Computer Intelligence, January 1986.

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DEC WATCH

Charles Connell

Riding The BI Bus

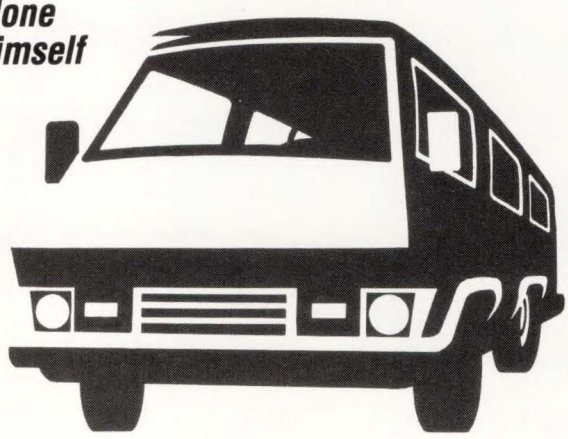
DEC has made some decisions over the last few years that affect its resellers and third-party vendors. Some of these decisions have been criticized as being restrictive, harsh and, ultimately, short sighted. Some publications, including this one, have suggested that while DEC is doing well, it also may be shooting itself in the foot at the same time.

What policies have evoked this strong response? They generally fall into two areas: limiting discounts to OEMs, VARs and distributors; and the closed architecture of the BI bus.

DEC has reduced the discounts it gives to low-volume resellers (see "Digital's Dilemma," Vol. 6, No. 9, September, 1987). DEC's discount policy is complex, varying with the type of equipment purchased, and isn't entirely public information. In many cases though, resellers who purchase less than $500,000 per year from DEC have been told that they will get a smaller price break than they previously did. These smaller volume OEMs and VARs are being encouraged to stop buying directly from DEC and to start buying from larger DEC resellers. The Mom and Pop reseller is being pushed down the distribution chain.

DEC also has made a number of moves to stop resellers from making a profit merely by reselling DEC products. The hot button within DEC marketing departments lately is "added value." Some resellers make a profit by doing little more than acting as middlemen; they buy from DEC at a discount, then resell at a higher price. DEC doesn't want people making money this way.

> ***"If someone goes it alone and figures out for himself how to connect a device to the bus, he risks a lawsuit from DEC for patent infringement."***



So, DEC has made a decision to offer discounts only to resellers who contribute a significant amount of hardware, software or service to a system. Resellers who, in DEC's view, haven't been adding value to a sale are being dropped from the discount program.

The second area of policy that's stirred public debate concerns the BI bus. A computer's bus is its main connecting point for all the parts of the computer system. The central processor, memory and I/O devices all pass data to each other over the bus. On many older DEC computers, the structure of the bus was public information. Another company was free to design hardware that could connect to the bus — and many of them did.

With the introduction of the latest VAX systems, however, DEC brought out a new bus: the BI. Unlike earlier buses, DEC didn't disclose the technical details of how this bus works; they "closed the architecture." (The VAX 82xx, 83xx, 85xx, 87xx and 88xx use the BI bus.)

Other companies wanting to make hardware devices that work with these new computers find it hard to do. They can apply to DEC for a BI license, under which DEC supplies them with information about connecting to the bus. DEC has only been granting licenses, however, to companies that make products that don't compete with DEC's. If someone goes it alone and figures out for himself how to connect a device to the bus, he risks a lawsuit from DEC for patent infringement.

Some critics feel that these two moves — a restricted discount structure and a closed computer architecture — signal that DEC is snubbing companies that associate with it. Some claim that DEC wants all the money for itself: from every vertical market and from all peripheral devices.

This really isn't the case. DEC *is* getting larger and more bureaucratic. As this happens, some of its decisions are

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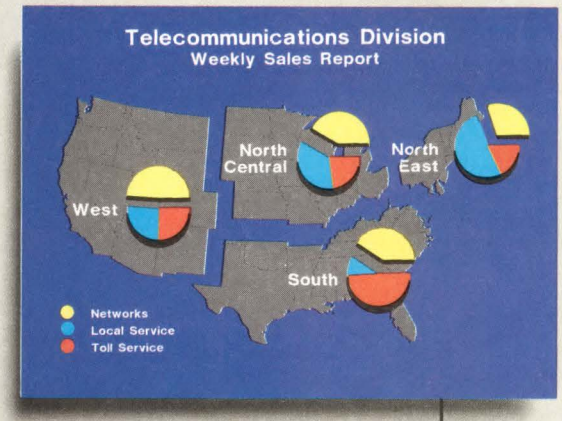

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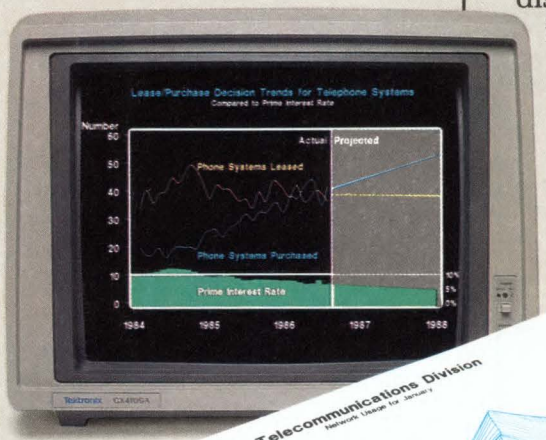

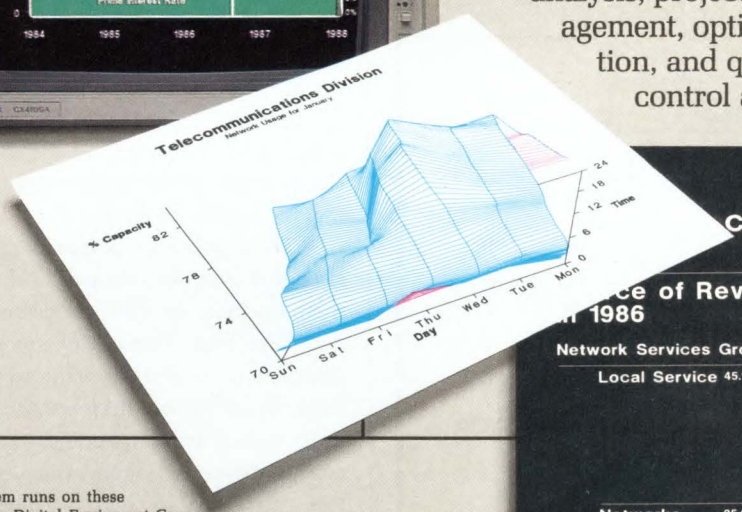

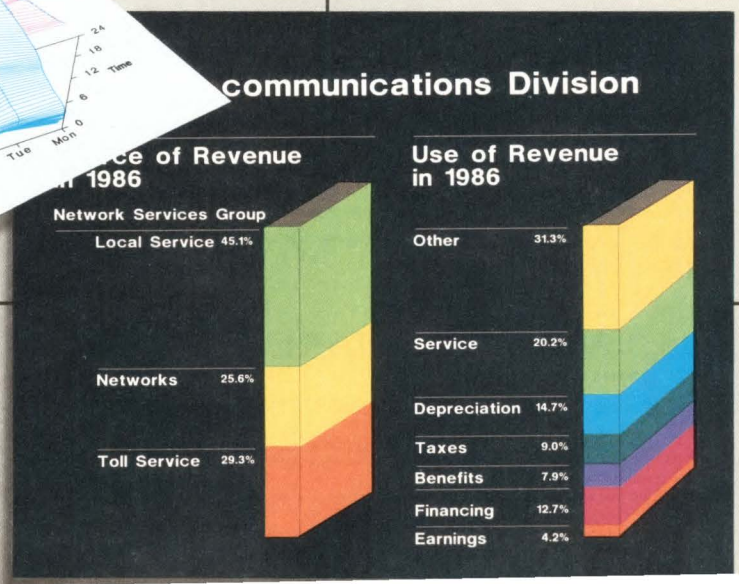

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out of touch with the world beyond Maynard. In general, however, its policy toward resellers and third-party vendors isn't one of antipathy. DEC recognizes that it has a symbiotic relationship with these companies and wants them to succeed.

> **"Previously, almost anyone could turn a profit reselling DEC computers and anybody with a soldering iron could design a circuit board that connected to a DEC bus."**

The problem for loyal DEC followers is that the rules have changed. Previously, almost anyone could turn a profit reselling DEC computers and anybody with a soldering iron could design a circuit board that connected to a DEC bus.

The new rules are:

1. You can get a volume discount on VAXs if you add substantial hardware, software or service. DEC also probably won't give you an OEM discount if you sell to the Fortune 100, because DEC wants these customers for itself.
2. You can market peripheral devices for the BI if DEC doesn't make a similar product and isn't planning to. In addition, DEC is checking on the technical competency of companies before issuing BI licenses to them.

These policies still leave large markets, however, for companies that base their business on DEC processors.

One area where DEC may have gone too far is in its decision to restrict licensing of the bus architecture. If this move makes the peripheral market noncompetitive, VAXs generally could be less attractive to buyers. This may reduce DEC's overall revenues. It remains to be seen if Maynard called this one right. ■

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FIELD SERVICE

Ron Levine

Maintenance Service Contracts

Let's go back in time. Do you remember when you chose between a Chevy or Ford if you wanted to buy a new car? (I'm told if you go back far enough, your color choices were black or black.) If you went out for ice cream on a hot summer night, your selection was limited to vanilla or chocolate. Remember the days when you bought a computer system and service was provided by the manufacturer either on a contract or per-call basis?

Well, things have changed. Buying a car isn't so simple. It now requires days to search the numerous automobile showrooms, comparing features on models with names we can't pronounce. And no self-respecting ice cream shop dares to offer less than 31 flavors. In computer maintenance services, the choices are just as varied.

Gone is the simple, "Do you want contract or per-call service?" Here instead is a maze of service choices, often with additional options and riders that can affect your actual time to repair and uptime performance greatly.

When deciding on your service options, either DEC or one of the many available third-party service vendors are the likely choices, although a few users may decide to go-it-alone. A decision also must be made regarding the type of coverage that best fits your situation: full-service round-the-clock coverage, first- and second-shift maintenance, prime-time coverage, two- or four-hour response time or per-call service with no monthly contract fees. Additional variations on these options also are available in most regions of the country. Basically, these are the choices that face the MIS person responsible for purchasing equipment service.

But wait! Let's move beyond the host DEC equipment area and into the peripherals or networking arena; here service selection becomes mind boggling. Non-DEC products may or may not be serviced by your host FEs. Yet, here is where most of your maintenance service will be required, and whoever services these products will offer a maze of options. For instance, with networking, there are PCs, workstations and terminals connected to the host computer. And, the maintenance service options available for them range from mail-in exchange to full on-site service arrangements.

> ***A typical standard service arrangement calls for full coverage from 8:00 a.m. to 5:00 p.m. . . .***

Service Options

Although you can prevent many problems simply by keeping your machines clean and away from hazards and by following the directions in the operator's manual, it's likely that sometime in the station's life it will need service. The following is a review of the most common types of service agreements available for this class of equipment. Other plans and agreements from service vendors are possible, but those listed here generally are available in most regions of the country and from manufacturers and/or independents on a national basis.

Warranty Service

The first type of service that new equipment purchasers must be concerned with is warranty service. If a problem occurs with a PC, workstation or terminal during the warranty period, you must deliver the malfunctioning unit to the service center or dealer.

The manufacturer should provide at least a 90-day warranty on all system units. Dealers sometimes provide their own extended warranty in addition to the manufacturers. These commonly are issued for periods of 120 days to six months from date of purchase.

Advantages

- *Equipment reliability is backed and, if need be, serviced by the manufacturer.*
- *Free service is offered by the dealer during the extended warranty period.*
- *The dealer usually is close by.*

Disadvantages/Cautions

- *The dealer may not be capable of supplying the required service.*
- *The extended warranty is only as good as the dealer's reputation. Find out who backs the dealer, how long he's been in business and the likelihood of his still being there when your machine needs attention.*

On-Site Service

Large installations, or those with 100 percent uptime requirements, may contract for on-site service. Few manufacturers of PCs, workstations or terminals

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provide this type of coverage themselves but it's available from third-party vendors.

On-site service agreements can be tailored to meet each customer's requirements, so no two may be exactly alike. Extremely large users have dedicated field service engineers on site. A typical standard service arrangement calls for full coverage from 8:00 a.m. to 5:00 p.m. on a five-day-per week basis. This can be extended also to include second and third shifts (24-hour a day on-site service). Total seven-day, 24-hour coverage also is available, but is expensive.

Typically, an on-site plan will be modified to include full coverage on a specified shift only, with the remaining shifts receiving on-call service. Another common modification of the on-site plan calls for full first-shift coverage, with preventive maintenance (PM) performed on the second shift.

Modified On-Site Service Plans

1. Central Site Repair Agreement — This type of service contract works well with PCs, workstations and terminals. Service is provided on-site at one designated location within a company. All units needing maintenance or repair are brought there by the user.
2. District Field Service Agreement — With this "not always" on-site type of service, an assigned FE may maintain from two to five accounts in the same area. These contracts should provide a guaranteed response time to a trouble call from the user. Typically, four hours is common. It may be reduced to two hours upon user request, with a corresponding increase in contract cost. This type of arrangement works well for smaller sites that have some leeway on uptime requirements but still want some sort of on-site service.
3. Daily Site Visit Program — One third-party service vendor we located provides a special class of service to customers who have 100 or more PCs or workstations operating on the same site. Each working day, an on-site visit is made by a resident FE to ensure that all systems are working properly, answer questions and provide other service-related assistance. This service is in addition to standard four-hour response time for remedial maintenance services.

The various on-site service contracts offered fill individual company needs by balancing service requirements versus affordable costs. Because each type can be customized and is aimed at a specific user need, we make no general advantage or disadvantage comparisons to the packages as a whole.

Types Of Service Contracts

When it comes to PCs, workstations and terminals purchased retail, there are many types of service agreements you can enter into with the dealer or a service company. The main ones are:

1. Coupon Plans — For a fee, you receive a coupon booklet with a certain number of coupons for PM (cleaning, routine service) and a specified number for corrective maintenance (repairs and/or replacements). Each time service is performed, a coupon is removed. When your service requirements exceed your coupon allowance, you are charged.
2. Yearly Service Plans — This is usually an unlimited service agreement for the length of the contract, commonly six months or one year. This contract also should include at least one free PM during the contract period.

All good coupon and yearly service plans will be for parts and labor, although usually you are responsible for getting the equipment to the professional at your expense. Labor-only contracts should be avoided as the cost of parts can be substantial.

Advantages

- *You have paid a flat fee for service for the length of your contract.*
- *Service is less costly than on a per-call basis.*
- *There are no additional parts charges.*
- *Replacement parts can be traded or loaned to you while yours are being repaired.*
- *Phone assistance is provided to help you define and/or fix the problem.*

Disadvantages

- *You have paid the fee whether you need the service or not.*
- *Again, this is only as good as the service firm.*

3. Per-Call Repair — The system is serviced on an as-needed basis. This type of service is offered by most manufacturers, third-party vendors, dealers and computer retail stores. They may provide for on-site service, or you may be required to bring or ship it to the dealer or service center when a problem occurs. Charges for labor are on an hourly basis (usually a minimum service charge is required); parts charges are additional.

Under the per-call type of service, you haven't entered any contracts and therefore, are not liable for any payments unless service actually is required. However, if a serious problem develops in your system, it'll be more costly to fix than if you are covered by either a warranty or a service contract.

Advantages

- *Pay as you go.*
- *You can switch repair firms if you're dissatisfied.*
- *You can take your terminal to a firm specializing in that brand of terminal.*

Disadvantages

- *It can be costly if major repairs are needed.*
- *Your equipment is given a lower priority than contract customers'.*

4. Express Mail-In Repair — Low-end products can be serviced adequately through mail-in arrangements. The fastest of these stipulates that the vendor ships a new replacement part to the site within 24 or 48 hours after receiving the customer's request. The customer must return the failed part or unit within a specified time period to avoid additional charges.
5. Return Mail-In Repair — This is the slowest form of repair service offered. Usually no contracts are required. The user simply ships or carries in the prob-

lem unit. It's repaired and returned either by mail or personal pick-up. A turnaround time of five days after receipt of the failed unit is average. Sometimes units must be shipped across the country to the vendor's service depot, resulting in a door-to-door repair time of 15 days or more.

Advantages

- *There are none, if local non-contract services are available.*

Disadvantages

- *Time to repair is long.*
- *You must determine which failing unit(s) is to be shipped.*
- *Damage can occur in shipping.*
- *Shipping costs add to service costs.*

6. Phone Assistance Only Service — Larger companies, with in-house technical ability may be able to cut service costs by opting for this service assistance program. While performing their own maintenance tasks, customers are able to call the service vendor for telephone assistance in troubleshooting and/or repairing malfunctions. This type of service arrangement is much more dominant in the software support area than in hardware support.

The advantages are that it's inexpensive and fast. But the disadvantage is you're on your own.

Some Recommendations

Most brand-name PCs, workstations and terminals have been engineered for long, reliable operation. During the first year that you own your system, it's unlikely that any major repairs will be required. Break-in problems, if any, usually show up well within the warranty period. Therefore, a service contract probably isn't necessary for most sites where a downed station on the network isn't fatal because its cost is likely to exceed use.

Unless the station is used heavily on a daily basis, the second and third years are usually also relatively free from any major maintenance costs. After the third year, the reliability and dependability of your system depends on how well you have cared for it.

The MIS person at each site must balance the desired amount of protection with the cost of obtaining that protection. A site that requires nearly 100 percent critical uptime must spend the extra money to ensure the availability of full on-site service, while a site with less critical service requirements can save as much as 35 percent in service costs by opting for a mail-in agreement instead of four-hour response time service.

Generally, each increase in contract hour response time corresponds to a decrease in cost, thus allowing service users to select both the service and cost level appropriate to meet their needs.■

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DCL DIALOGUE

Kevin G. Barkes

DCL Stocking Stuffers

'Tis the season for sharing, so this month I thought I'd pass along a few tiny command procedures as stocking stuffers.

To call these DCL files utilities would be somewhat presumptuous. One of my clients refers to them as uties (pronounced ooties). "They're not precisely full-blown utilities, but they're not entirely disposable either," reports my friend, who frequently calls me on the phone and asks, "Can you write me something to (fill in the blank)?"

The simplest of the three is RAD.COM (see Program 1), which displays the decimal, octal, and hexadecimal radices of the supplied integer. It's great for doing those quick conversions on Monday morning before the caffeine has kicked in.

Assign the symbol RAD to @device:[directory]rad.com and simply enter:

```
$ RAD (integer)
```

The procedure assumes the supplied number is decimal; you can supply hex or octal values by preceding the integer with %x and %o, respectively:

```
$ RAD %x10 (hexadecimal 10)
$ RAD %o10 (octal 10)
```

The procedure assigns the number to the symbol DECIMAL, then displays the symbol. DECIMAL was chosen as the symbol name simply to make the display consistent.

The second utie is ZAPZERO.COM (see Program 2), a procedure that deletes empty files in the user's current default directory.

You'll want to modify the symbol NODEL to contain the extensions of zero- length files that you don't want to obliterate. The sample procedure saves from destruction not only files with file types .DIR (directories) and .CTL (in this instance, a site-specific file that must exist), but also files with null extensions.

Notice the null type is entered as ". " (a period with three trailing

PROGRAM 1.

```
! RAD.COM
! Displays the radices of the supplied number
$       DECIMAL = F$INTEGER(P1)
$       SHOW SYM DECIMAL
$ EXIT
```

PROGRAM 2.

```
! ZAPZERO.COM
!
$       SET NOON
$       SAY := WRITE SYS$OUTPUT
!
! NODEL contains the extension of files you don't
! want deleted...
$       NODEL = ".DIR.CTL.    "
$       NODELSIZE = F$LENGTH(NODEL)
$       SAY "ZAPZERO..."
$       SAY "Your current default is ",F$ENV("DEFAULT")
$       QUALIFIER = "/NOCONFIRM"
$       INQUIRE/NOPUNC ANS -
            "Do you want to confirm deletions (CR = yes)? "
$       IF ANS .OR. ANS .EQS. "" -
            THEN QUALIFIER = "/CONFIRM"
$ DEL_LOOP:
$       DELFILE = F$SEARCH("*.*;*")
$       IF DELFILE .EQS. "" THEN EXIT
$       EXT = F$PARSE(DELFILE,,,"TYPE")
$       IF EXT .EQS. "." THEN EXT = ".    "
$       IF NODELSIZE .NE. F$LOCATE(EXT,NODEL) -
            THEN GOTO DEL_LOOP
$       IF F$FILE(DELFILE,"EOF") .EQS. "0" THEN -
            DELETE/LOG 'QUALIFIER' 'DELFILE'
$       GOTO DEL_LOOP
$ EXIT
```

PROGRAM 3.

```
! HOG.COM
! Identifies user hogging a device
!
$       ON WARNING THEN GOTO NODEVICE
$       NSYM = "NOT "
$       IF P1 .EQS. "" THEN GOTO NODEVICE
$       IF .NOT. F$GETDVI(P1,"ALL") THEN GOTO NOTALL
$       WRITE SYS$OUTPUT F$GETJPI(F$GETDVI(P1,"PID"),"PRCNAM"), -
            " is hogging ",P1
$       GOTO CHECKREST
!
$ NOTALL:
$       WRITE SYS$OUTPUT P1," is not allocated."
!
$ CHECKREST:
$       IF F$GETDVI(P1,"MNT") THEN NSYM = ""
$       WRITE SYS$OUTPUT P1," is ''NSYM'mounted."
$       IF .NOT. F$GETDVI(P1,"AVL") THEN NSYM = "NOT "
$       WRITE SYS$OUTPUT P1," is ''NSYM'available."
$       IF F$GETDVI(P1,"SHR") THEN NSYM = ""
$       WRITE SYS$OUTPUT P1," is ''NSYM'shareable."
$ EXIT
!
$ NODEVICE:
$       WRITE SYS$OUTPUT "Inaccessible or invalid device name."
$ EXIT
```

spaces). This is done so the procedure can parse accurately through the no-delete listing.

To invoke the procedure, enter @ZAPZERO. You're asked if you want to confirm deletions before they're performed; by default, the DELETE command will prompt for permission before blowing away the file.

The F$SEARCH lexical function is used to return the file names; F$PARSE extracts the file type. Note the padding of the null type we mentioned earlier.

ZAPZERO first checks that the file type isn't on our "no delete" list. If it is, the procedure loops and gets the next file name. Otherwise, the F$FILE_ATTRIBUTES lexical is used to return the file size; zero-length files then are deleted.

HOG.COM (see Program 3) is a utie that really isn't needed; a SHOW/DEVICE/FULL (device) will return, among other things, the name of the process currently hogging a device. A client who works at 300 baud from a terminal in his home hated waiting for the entire display to appear; he asked me to whip together something that would show what he needed with a minimum of screen I/O.

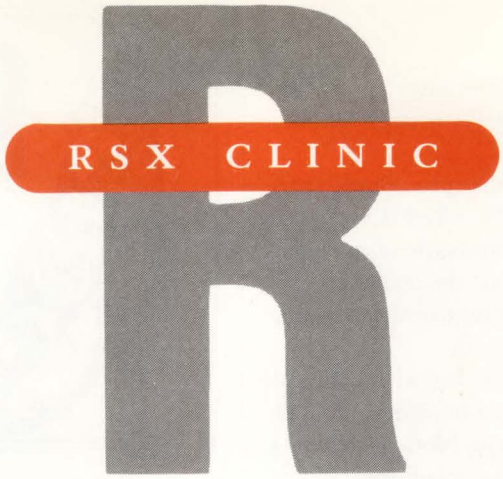
The only part of the procedure requiring elaboration is the use of the NSYM symbol. It's one method of reducing the number of lines of code required by the lack of an ELSE statement in DCL.

NSYM is toggled between a null string and the text "NOT", and is used within WRITE statements to identify the various device conditions reported. It's not exactly pretty, but it's an effective workaround for the missing ELSE construct.

These uties have two things in common: brevity and minimal error checking. They can serve as the core of more elaborate utilities or can be used as is for quick and dirty functions.

And they're the perfect gifts for those hard-to-shop-for DCL hackers.

—Kevin G. Barkes is a specialist in VAX systems software, management, tuning and training, in Library, Pennsylvania. ■



By James A. McGlinchey

I respond to those questions that are interesting and applicable to the general RSX user. Please mail your questions to: RSX Clinic, *DEC PROFESSIONAL*, P.O. Box 503, Spring House, PA 19477-0503. Questions also can be submitted through ARIS.

WHERE'S LOADABLE XDT?

QUESTION: *We've heard that M-PLUS version 3 has a loadable XDT on the kit. We don't recall anything in SYSGEN about it and can't find it in the manuals. Can you tell us more?*

REPLY: You bet. A loadable version of XDT, the RSX Executive Debugging Tool, now is included on your RSX-11M-PLUS kit (sorry, it's not available for RSX-11M). Loadable XDT is not built during the M-PLUS SYSGEN, and must be built by hand after the SYSGEN dust has settled. The object file is contained in [1,24]EUT.OLB. Loadable XDT is built by Task Building against this library with the file [1,20]XDTBLD.BLD after setting up the right pseudo device names. Loadable XDT is loaded via options in the LOA command, in a manner similar to loading device drivers.

An M-PLUS user always should use the loadable version of XDT. The resident version of XDT, which is built during SYSGEN, is large and occupies space that otherwise would be available for your primary pool.

MULTIPLE DIRECTORY ENTRIES

QUESTION: *How can I find which files on an RSX disk have multiple directory entries?*

REPLY: The multiple directory entry facility in the RSX file system is implemented incompletely. RSX does not keep a count of the number of directory entries that refer to the same file. A method for finding multiple directory entries for a given file depends on the one unique descriptor an RSX file possesses — its file ID numbers. The example directory below shows a file with two directory entries. The directory listing was generated using the DECUS SRD utility, appending the /FU switch for the full directory listing. In this case, one file has two directory entries. The file ID numbers (1216,000007) are identical for the two directory entries and, therefore, they refer to the same file:

```
TEST.BAZ;1 02-APR-87 08:21 (C) 1/1
        [20,20] (1216,000007)
BAZFAZ.TMP;1 02-APR-87 08:21 (C) 1/1
        [20,20] (1216,000007)
```

SRD's output files are produced in a form readable by editors and other utilities. The enterprising system manager then can use SORT-11, DATATRIEVE or write a program to read the directory listing, sort it by file ID and report those files with duplicate file ID numbers.

Be careful about using multiple directory entry files. Most RSX utilities cannot detect multiple directory entries, so copies made with PIP or FLX contain multiple copies of the same file. Use BRU in image mode to prevent it from making multiple copies. ■

ASCII COM.FILE CPT Convergent/DEF DEC/dx DCA (RFT)

NBI DisplayWrite 3/4

Xerox 860 MASS-11

XeroxWriter MS Word (MAC)

WPS-PLUS (dx) MS Word (PC)

WordStar MultiMate

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WordMARC Navy DIF

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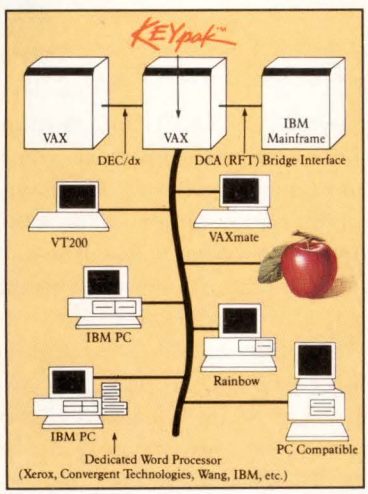

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NETWORKING EDITOR

Bill Hancock

Transparent DECNET Programming

It constantly amazes me how conservative some people are when it comes to new programming efforts. More specifically, I often find that competent programmers and system managers fear attempting to write programs for DECNET access.

Why this fear exists is a mystery to me. It may have something to do with the mystique of networks or the fear of compounding network overhead. Whatever the reason, in the case of a DECNET-to-VAX connection, much of it is unfounded. DECNET transparent programming is almost trivial and although it does impose overhead, it's still better than some other alternatives such as "sneaker-net."

Transparent programming is a program-writing technique to allow cooperating VMS programs to communicate across a DECNET network. A programmer writes code so that RMS does all the network work for the programmer and the code reflects standard I/O similar to a simple sequential file access.

This "transparency" of code is what gives the transparent mode of programming on DECNET its power. It has more overhead than the non-transparent mode of programming, wherein the programmer sets up code so that it assumes all the actions necessary to communicate with the network.

Transparent code is simple to implement and use. But, before any code can be written, there are issues to be considered. Writing network programs isn't like writing standalone applications. One major difference is in the way you handle multiple connections to the application from multiple remote systems. With DECNET, you have a choice of what to do.

THE EASIEST METHOD is to create your application as though it were going to talk to only one remote program. It may be activated by DECNET through a simple connection mechanism that's transparent to the programmer. The downside of this type of programming is that multiple copies of the code will be running on the destination system instead of shared or multithreaded code.

The other option is to include support-to-function as a DECNET network object. By including this kind of support in the code, the programmer allows DECNET to multithread the code for him. This requires some thought in both code preparation and setting up the DECNET databases on the various nodes to recognize the new program as a network object (using the network control program, NCP and the SET OBJECT command).

Access Methods

After you make a decision about how the code will be prepared, you must decide about the need for centralized or distributed access. Centralized access refers to the main application residing on a particular machine (node) and all remote systems accessing the system over the network. An example might be a centralized database that must be accessed from all nodes in a network, but the database itself cannot be split up to the various systems; the integrity and access methodology would be compromised.

> ***"Transparent programming is a program-writing technique to allow cooperating VMS programs to communicate across a DECNET network."***

In this case, a program would act as a server to various remote programs attempting to connect to the system and, therefore, the database. This kind of access method is useful if the application doesn't lend itself well to a more distributed approach and if the accessed component needs centralized access and protection.

A second method is the distributed programming approach. In this method, each system would have some local functions that occasionally may require access to a central system or to other remote systems on the network. While this approach requires more planning and setup, it provides a better distribution of power. An example is a process control environment.

Having a centralized host is dangerous because all processes would stop if the host were to fail. In the case of proc-

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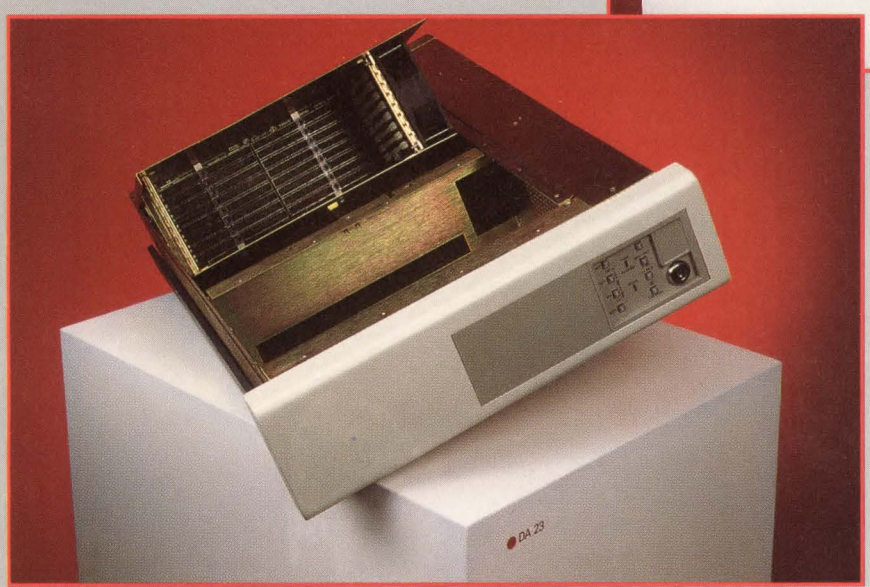
- Remote Output Connector for power control by remote device



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ess control, this could be hazardous to the application as well as to the process. Catalytic reactions continue even if the system is down. By placing compute power at the location of the local action, a distributed approach allows local activity to continue even if a remote system fails.

Imagine all the check-out counters at a supermarket failing at once! That's an example of an application that requires decentralized, distributed processing of data. Because most modern check-out counters, those with the bar-code scanning systems, are actually standalone systems with connections back to a hub, they can continue to process information even if the hub system is inoperative for a period of time. Distributed applications development is more difficult than centralized application development, but the benefits are obvious and plentiful.

Data Flow

After the application methodology has been chosen, the programmer is faced with the problem of data flow and throughput. It's difficult to tell what kind of processing hardware is necessary if you don't have an idea of what kind of processing will be taking place.

It's the same with network tasks. It's tough to decide if the applications will work properly on the network unless you have some idea about what throughput will be necessary, how much data will be sent back and forth, how often the data is going to be sent/received, etc.

A traffic analysis must be done to estimate traffic loading effects on systems that will be using the applications, especially the systems functioning as host system for remote applications. Performing a traffic analysis is fairly straightforward: Determine who is sending how much data to whom how often. While it sounds easy, many a sane person has ended up in the house of many doors, crippled by the insanity of keeping track of what the traffic matrix is doing.

After the estimate of traffic loading has been completed, the programmer is faced with the problem of system configuration. Different types of systems

PROGRAM 1.

```
$!   Assign a logical name MYFILE to a filename on ERINYC::
$!
$ ASSIGN ERINYC"HANCOCK BILL"::OTHER_FILE.DAT MYFILE
$!
$! Run the file access program
$!
$ RUN FILECHEK
```

PROGRAM 2.

```
C
C     HOST_PROGRAM.FOR
C
C                    Copyright (C) 1987 by Bill Hancock
C                         All Rights Reserved
C
C     Written by:    Bill Hancock     9/10/87
C
C     Originating program to show how to establish a connection to a
C     remote program utilizing the transparent programming features of
C     DECnet-VAX.
C
C     For this program to work properly, a logical name must be set up
C     prior to running the program so that the remote program gets the
C     proper access control string. Define the logical name DESTINATION as
C     follows:
C
C     $ ASSIGN node"""USERNAME PASSWORD""""::""""TASK=REMPROG""""  DESTINATION
C
C     The groups of three double quote (") marks are necessary so that DCL
C     properly interprets to include the single set of double quotes in the
C     connection string and not strip them out thinking that a string
C     definition is taking place.
C
C
C
C     Open the connection up to the remote program on the destination node...
C
      OPEN (UNIT=2,FILE='DESTINATION',STATUS='NEW')
C
C     Send a sample message to show that the connection works...
C     At this point, anything could be sent. It's up to you!
C
      IBUF = 100                                ! Init a buffer with a #
      WRITE (2,*) IBUF                          ! Send 100 to the remote
      TYPE *, 'Sent to the remote the contents of IBUF: ',IBUF
C
C     Accept the remote's manipulation of the buffer. Should be two less than
C     what was sent.
```

PROGRAM 2. . . . *continued*

```
      READ (2,*) IRBUF
      TYPE *, 'Received REMOTE message: ',IRBUF
C
C     Disconnect from the remote program
C
      CLOSE (UNIT=2)
      END
C
C
C     REMPROG.FOR
C
C                    Copyright (C) 1987 by Bill Hancock
C                         All Rights Reserved
C
C     Written by:    Bill Hancock     9/10/87
C
C     Destination program to show how to establish a connection to a
C     host program utilizing the transparent programming features of
C     DECnet-VAX.
C
C     For this program to work properly, it must be in the login directory
C     of the account USERNAME specified in the logical name assignment
C     made on the host node. Also, the file REMPROG.COM must exist in the
C     same directory. If either or both files do not exist in the same
C     directory, the connection will fail.
C
C     Open the connection up to the remote program on the destination node...
C
      OPEN (UNIT=2,FILE='SYS$NET',STATUS='OLD')
C     Receive a sample message from the host to show that the connection
C     works...
C
      READ (2,*) IBUF
      TYPE *, 'Received from the HOST the following: ',IBUF
C
C     Subtract two from the amount and send back the result
C
      ITBUF = IBUF - 2
      WRITE (2,*) ITBUF
C
C     Disconnect from the HOST program
C
      CLOSE (UNIT=2)
      END
$!
$!    REMPROG.COM
$!
$!                    Copyright (C) 1987 by Bill Hancock
$!                         All Rights Reserved
$!
$!     Written by:    Bill Hancock     9/10/87
$!
$!  Silly (but VERY required) command procedure to run REMPROG on the
$!  remote system. This file must be in the login directory of the USERNAME
$!  specified by the host.
$!
$!  Now for the BIGGIE!!
$!
$ RUN REMPROG
$!
$ EXIT
```

have different types of problems. Not all VAXs are the same nor are all systems tuned alike. Consider the problem of Q-bus throughput versus UNIBUS through-put and you begin to understand the issues involved.

VMS is VMS, but the tuning of the operating system and the hardware has a dramatic effect on what kinds of throughput and access may be expected. Ethernet speeds may look attractive for throughput, but the real test is how well the I/O bus, Ethernet controller and CPU work together in the Ethernet environment with the expected data rate.

It's quite possible that one system may find that the bottleneck in throughput is the speed of the controller. They vary in speed from 1.8 Mbit/second to more than 3.6 Mbit/second depending upon which one is selected.

Another system, however, may suffer from software overload, if running, say, a finite element model at the same time as network access. Or, there may be bus contention problems with other attached controllers.

In short, there's a lot to consider when configuring hardware for optimal network access and harmonious program interplay.

THE NEXT PROBLEM is how to code the application. In the case of transparent code, application development is relatively simple. The steps involved include the development of a source program and a destination program, and development of a command procedure to run the target program on the target node.

In the source program (the one originating the connection to the destination program), a simple file-open statement is required. While similar to the opening of a remote file, instead of the actual filename, a keyword to RMS is included (TASK = PROGNAME).

In the TASK = specification, you may specify a task name up to 16 characters (according to the book), which really is the command procedure name on the remote node. As such, it need not be the same name as the actual program name, but using the same name precludes any confusion. Also, be warned that the remote taskname length specified (16 characters) is only for VAX systems. Other systems may require it to be much less, such as six for RSX-11M/PLUS. Personally, I've found that anything over 12 characters VAX-to-VAX causes problems, so try to keep task names (name of the destination command file) to a reasonable minimum.

On the remote system, a process is created for the target program (running a routine called NETSERVER), and the originating program's task identifier is

placed in a logical name called SYS$NET. To complete the link, the target program simply opens SYS$NET and the connection is established.

Both programs may now communicate and send information to each other via standard language sends and receives. If either program closes the link using a standard file-close operation, the link is disconnected immediately, pending sends and receives are aborted, and the channel associated with the link is freed.

Of course, there are even easier uses of DECNET in a transparent mode. Many times, a programmer may wish to open files on a remote system simply to access data in the file or to update a remote file. Nothing could be easier. DECNET-to-VAX allows the programmer to connect directly to a remote file as if the file were local.

For programs that have hard coded a filename into the file open of the program, a simple logical name can cause the filename to be translated to a value other than the hard-coded value and allow access to files on a remote node. For instance, consider the following code example:

```
OPEN (UNIT=5,NAME='MYFILE',
  TYPE='OLD',ACCESS='SEQUENTIAL')
```

In this case, the program would open an existing file called MYFILE. Using DECNET-to-VAX, this program easily could be changed to open a file on a remote system without modifying the code. Simply set up a logical name at DCL level (see Program 1).

To make this possible, remember to include access control information if proxy logins aren't enabled on the remote system. In Program 1, the file OTHER_FILE.DAT on node ERINYC:: in the default login directory will be the file opened when the program executes the above listed OPEN statement. It's relatively easy to open a file on a remote system and access it. It requires no special programming acumen.

Task-to-task programming takes a little more coordination, but not much more. Basically, a source program on the host node, and a destination program with an accompanying command procedure on the remote node, are required for proper network access. The connection is established as follows:

1. **Host System** — Originating program assigns a logical name to the name of the destination node and program. A file open to the remote program is issued with the special keyword TASK=PROGNAME being used to identify the program name on the remote system. RMS will detect the double colon (::) in the file specification and issue a connection through DECNET.

The next time you're considering how difficult it is to manage multiple systems, think about using DECNET programs to help.

2. **Remote System** — DECNET receives an incoming connection request and activates NETSERVER to create a process for the destination program. If the access control string was sent, a process for the specified USERNAME is created or, if not, a proxy or default DECNET account may be used. Failing this, the connection may be rejected because of an access control violation.

The newly created process starts the program name specified in the host system OPEN statement. The newly started remote program issues a file open to the logical name SYS$NET to establish the connection to the originating program on the host node. A read request is posted to the logical unit number listed in the file open to SYS$NET to receive any data or messages that may come from the host side.

3. **Back To The Host System** — The file open completes and the host now may write information to the logical unit number used in the file-open statement that causes the link to be created.

Program 2 shows the necessary FORTRAN code to establish a link between two cooperating programs, some data transfer, and the link shutdown via a file-close statement on both sides.

Note that task-to-task programming isn't limited to actual programs. DCL command procedures easily can take advantage of the same DECNET capabilities with the OPEN, READ, and WRITE statements. I find this capability quite useful for writing a distributed interface to programs for which I don't have source code. With command procedures, I can easily make any non-distributed application network available quickly. Sometimes it takes effort to get things right, but network access from a command procedure opens up very powerful features to systems managers and non-programming types.

WRITING DECNET PROGRAMS isn't difficult. All it takes is some ingenuity and patience. If you're a systems manager, consider all the possibilities that distributed command files and applications can provide. For programmers, DECNET applications allow capabilities that are flexible, powerful and easy to implement. In all cases, DECNET programming is a lot easier than it looks.

The next time you're considering how difficult it is to manage multiple systems, think about using DECNET programs to help. A simple program that opens a remote file and closes it with a disposition type of PRINT or DELETE would allow a program to print off remote files or delete them from the remote directory. Stretch your mind! Think of creative and new opportunities for using your expensive networking tools. *—Bill Hancock is an independent systems and network consultant in Arlington, Texas.*

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System	Product	Capacity
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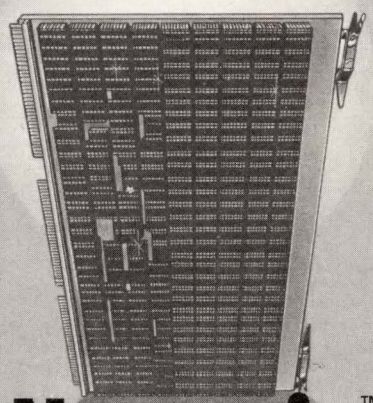

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FROM THE LAB

David W. Bynon

Diskeeper

What can you say about a product that will save you time and keep your VAX file system, big or small, in top working condition? What can you say about a VMS system software product that's well documented, installs easily and does exactly what it claims? You can say it's a dream come true.

Diskeeper V2.0, from Executive Software Inc., La Crescenta, California, is a VAX/VMS disk defragmenter. No, defragmenters for VMS aren't new, but *Diskeeper* is significant enough that its worth raving about.

Diskeeper is the first software product I've tested that feels like a Digital developed VAX/VMS utility. It's good enough to be part of VMS.

For most system managers, the term "disk fragmentation" isn't new. Many fail to realize, however, just how detrimental a badly fragmented disk volume is to system performance.

A disk fragmentation problem is two fold: file fragmentation and free space fragmentation. File fragmentation is a condition where individual files on the disk are broken up into pieces scattered around the disk. Free space fragmentation is a condition where free space on the disk is contained in small bits scattered around the disk.

When either of these conditions exists, VMS must work harder to access a disk file, create a new file or extend an existing file. In short, as a file system becomes more and more fragmented, the system incurs more overhead; it slowly bogs down.

Ideally, files and free space should be contiguous. However, due to the way VMS allocates file space, this is impossible. When a new file is created, VMS looks for free space starting at the beginning of the disk volume. This means the first blocks of free space, large or small, are allocated to the creation of that file. If the file being created is larger than the space found, VMS simply looks for extension blocks; and thus, file fragmentation begins. Free space fragmentation is created when files are created and deleted.

For example, when a fragmented file or a small contiguous file is deleted, it leaves small patches of free space, not contiguous free space. As you can imagine, when these two types of disk fragmentation progress, the problem grows at an increasingly faster rate.

A Look Back

Why has Digital never designed a VMS disk defragmentation utility? — it simply doesn't make sense to stand idly by and watch a system slowly degrade itself through file fragmentation. Digital is painfully aware of the problem. After all, Digital itself is the largest single consumer of VAX systems.

If you look back to the early 70s when VMS V1.0 was being developed, you'd see that the PDP-11, the hardware roots of the VAX 11/780, had small mass storage devices. For example, the RK05 — a 5-MB drive, and the RL02, which holds 10 MB. In its first and second incarnation, VMS didn't view fragmentation as much of a problem. After all, it only takes a few seconds to completely search a 10-MB disk. Now that we're staring multi-gigabyte disk volumes in the face, the problem is real and potentially expensive.

Diskeeper **To The Rescue**

Diskeeper, like other disk defragmenters, has a primary purpose of making fragmented files contiguous and consolidating free space into as large a chunk as possible. We've tested other defragmenters, such as *DISKIT* (November 1986) and find them to work equally well on this primary task. The significance of *Diskeeper* V2.0 is in how it does it.

First, *Diskeeper* V2.0 is the first online disk defragmenter for VMS. It performs as a detached process while everyone else works. Second, *Diskeeper* is 100 percent safe. If you've ever heard or experienced the horror stories of other disk defragmenters, they don't apply to *Diskeeper*. I proved this fact to myself again and again here in the Lab.

Why is it so safe? *Diskeeper* defragments by copying a fragmented file into a contiguous (as contiguous as possible) temporary file. When the copy is complete, *Diskeeper* then verifies that the original hasn't changed. If not, the file is locked, using a proprietary file lock mechanism, and the index file entry is redirected to the new file. The old file is deleted and the space is reclaimed. If the file has changed since the copy operation, *Diskeeper* simply scraps the operation and moves on. By only having to lock the original file for the in-

Diskeeper
Executive Software Inc.
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La Crescenta, CA 91214-2699
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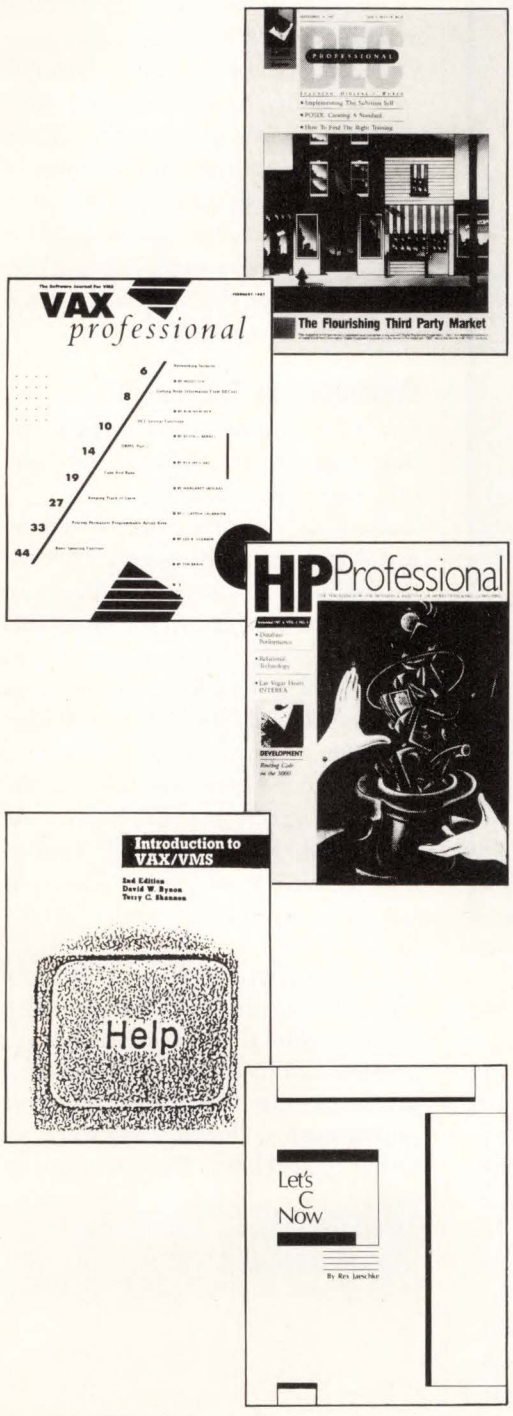

June 1987 BPA Publisher's Statement, May issue analyzed.

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FIGURE 1.

```
$ DAU DUA0: /BRIEF

                    Disk Analysis Utility

DISK_ANALYSIS V2.0
Copyright 1987 Executive Software, Inc. All Rights Reserved.
  2-OCT-1987 18:12:16.18

_DUA0:
Cluster Size                :        3
Number of Usable Blocks     :   311514[A

                Disk Fragmentation Summary

Number of Free Spaces       :      255
Total Free Space Size       :    97872
Mean Size of Free Space     :      383
Smallest Free Space         :        3
Largest Free Space          :    11706
#Spaces = 80% of Total      :       21
Maximum Number of Files     :    75343
Total Number of Files       :     3405
Total Size of all Files     :   213645
Mean Size of all Files      :       62
Total File Fragments        :     3665
Mean Fragments per File     :     2.07
Smallest File Size          :        0
Largest File Size           :    15000
# Reserved Files            :        9
# Placed Files              :       10
# Multi-Header Files        :        0
# Multi-Volume Files        :        0
# Directory Files           :      174
# Zero Length Files         :       11
# Extent Headers           :        0
Extent Cache/Lost Blks      :        0
```

***Disk analysis utility before running* Diskeeper.**

stant the index file is being changed, *Diskeeper* virtually can guarantee that a file access conflict won't occur.

To prove to myself that *Diskeeper* was perfectly safe I crashed and restarted the Lab system 25 times while *Diskeeper* was active. Not once could I catch *Diskeeper* with its pants down. The worst thing that happened to the system was that a large number of disk blocks were allocated to *Diskeeper's* temporary file. *Diskeeper* kindly deleted the file the next time it was started.

Beyond simply making files and free space contiguous, *Diskeeper* tries to move as much free space as possible to the beginning of the disk. The idea behind this is elementary: VMS searches the disk from beginning to end for free space when creating a new file. For this reason, theoretically, file creation on a *Diskeeper*-maintained volume is faster.

V2.0 has two basic modes of operation: interactive and detached. Interactive mode is suggested the first time *Diskeeper* is unleashed against a disk volume. Primarily, this is so you can control the number of passes made and other parameters that wouldn't normally be used in a detached mode; the latter is designed for normal operation. Ideally, *Diskeeper* would be started when the system is booted, through use of the *Diskeeper* startup procedure.

To control and analyze the progress of *Diskeeper*, Executive Software provides a disk analysis utility, a *Diskeeper* control utility, and a shutdown procedure. The disk analysis utility allows you to examine the fragmentation of files and free space before and after *Diskeeper* has run. It's a pretty good indicator of just how well *Diskeeper* performs its duties. Figures 1 and 2 show the results of our tests.

Diskeeper In The Lab

Executive Software, in its documentation, suggests several steps before getting started with *Diskeeper*:

1. Read the rest of the documentation first. Most system managers are like me — "Who needs documentation? Just give me the tape and let me install that bad boy!" Well, I have to admit, this time I heeded the advice, sat down and read the manual cover to cover. Within 20 minutes I was done and had gained insight into the features of the program.
2. Before getting started, backup the system disk. Knocking wood and hoping lightning never strikes twice has zero relativity when it comes to data. I backed it up.
3. It's suggested that the ANALYZE utility be turned loose on each disk volume before letting *Diskeeper* have it. ANALYZE will attempt to repair any problems the VMS gremlins have caused, such as lost files and incorrect directory backlinks. The command is:

```
$ ANALYZE/DISK_STRUCTURE/
  REPAIR DUxx:
```

In most cases, ANALYZE will need to be run several times to correct all the problems.

At last it was time to install and run *Diskeeper*. *Diskeeper*, smartly, uses the VMSINSTAL utility. The installation took a painless five minutes. Unlike most VMS utilities, *Diskeeper* doesn't modify the DCLTABLES, relying instead on the creation of symbols to invoke the executable programs.

Another Executive Software suggestion: For best results, fully back-up and restore a volume before running *Diskeeper* for the first time. When a volume is restored, the files are written contiguously, thus *Diskeeper's* job of moving files would be lessened. Had I performed this step I would have lost all measurement of *Diskeeper's* abilities, so I skipped it. Instead, I ran a full analysis of the test disk and recorded the output:

```
$ DAU == "$SYS$SYSDEVICE:
  [DISKEEPER]DISK_ANALYSIS"

$ DAU DUA0: /FULL/OUTPUT=FRAG.RPT
```

The pertinent information from this analysis report is displayed in Figure 1. Look at the amount of free space left and the the number of fragmented files. I was shocked!

Next, I turned *Diskeeper* loose to let it do its thing. I used the commands:

```
$ DK == "$SYS$SYSDEVICE:[DISKEEPER]
  DISKEEPER"

$ DK DUA0: /PASSES=DONE/DIRECTORY
  /STATISTICS/OUTPUT=DUA0.RPT
```

The /PASSES qualifier tells *Diskeeper* how many to make (DONE means do it until finished). The /DIRECTORY_FILES qualifier tells *Diskeeper* that it's OK to move directory files to achieve the best possible consolidation. And, the /STATISTICS qualifier is used to display resource consumption information at the end of each pass. Many other qualifiers are available, such as /IO_THROTTLE, /PLACED_FILES, and

FIGURE 2.

```
$ DAU DUA0: /BRIEF

                    Disk Analysis Utility

DISK_ANALYSIS V2.0
Copyright 1987 Executive Software, Inc. All Rights Reserved.
  3-OCT-1987 05:34:16.42

_DUA0:
Cluster Size                :          3
Number of Usable Blocks     :     311514

                 Disk Fragmentation Summary

Number of Free Spaces       :          4
Total Free Space Size       :      97872
Mean Size of Free Space     :      24468
Smallest Free Space         :       2244
Largest Free Space          :      44931
#Spaces = 82% of Total      :          2
Maximum Number of Files     :      75343
Total Number of Files       :       3405
Total Size of all Files     :     213645
Mean Size of all Files      :         62
Total File Fragments        :       3441
Mean Fragments per File     :       1.01
Smallest File Size          :          0
Largest File Size           :      15000
# Reserved Files            :          9
# Placed Files              :         10
# Multi-Header Files        :          0
# Multi-Volume Files        :          0
# Directory Files           :        174
# Zero Length Files         :         11
# Extent Headers           :          0
Extent Cache/Lost Blks      :          0
```

***Disk analysis utility output after* Diskeeper.**

/TOLERANCE, which I accepted the defaults on.

After more than three hours and 200 passes, *Diskeeper* was finished and I was ready to run the disk analysis utility again. The new analysis reported near perfection. Figure 2 shows part of this report.

The last step was to start *Diskeeper* as a detached process and forget about it. Really, after the initial cleanup, *Diskeeper* needs no other manual intervention. An entry in the system startup file is all that's needed to bring *Diskeeper* up when the system is rebooted. Best of all, *Diskeeper* only requires one process per 16 disk volumes.

One of the questions I had was whether performance would ever suffer because *Diskeeper* was running. The answer was no, I never noticed any overhead or delay due to *Diskeeper*.

Of course there is a penalty. After all, *Diskeeper* does use memory, it takes up a process slot, and when running it competes for CPU and I/O. So how does it not interfere with normal system operations? The answer lies in how *Diskeeper* is scheduled.

When *Diskeeper* is started initially as a detached process, it makes a single pass

If I had to vote for the best VAX/VMS system software package of the year,* Diskeeper *V2.0 would win hands down.

on each disk listed. *Diskeeper* then hibernates, at a priority level of two, for approximately three hours. At the end of the hibernation period, *Diskeeper* again makes a single pass on each disk. Based on the number of files moved between hibernation periods, *Diskeeper* determines whether it should lengthen or shorten the hibernation period, hence, *Diskeeper* only runs as often as necessary to keep your file system in top condition.

Final note: Don't be fooled by defragmenters that claim to rearrange your directories for optimum performance. VMS caches directories, which means directory placement has little, if anything, to do with a file system's performance.

This is a product no VAX site should be without. Think of all the hours you'll save not performing backup and restore to rid your system of disk fragmentation. Best of all, you'll keep the performance you bought, 100 percent of the time.

If I had to vote for the best VAX/VMS system software package of the year, *Diskeeper* V2.0 would win hands down. ■

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FROM THE LAB

Dave Mallery

CMD Technology's Hard Card

Remember the first time you saw a PC hard card? You thought it was a really nifty idea; most PCs are full of empty space in the backplane. With a hard card, you were spared all the complexities of cable routing and power wiring. Just plug and go.

CMD Technology Inc. of Santa Ana, California, now has delivered a hard-card drive for the Q-bus. The unit consists of a Rodime RO3055 40-MB drive mounted on one side of a quad card. When formatted and initialized, it yields 69,240 blocks of space or just short of 35 MB. Those missing five are consumed by the MSCP alternate track and sector pools.

The beauty of this approach is that anyone can plug it into an existing MICROVAX II with little effort and in minutes be assured of a working disk. All I had to do was change one jumper so that the controller answered to the second DU device address, because my system disk's controller was on the first.

The system does make one demand: You must give up one quad slot and three half slots above it. I inserted the card in the fourth slot from the end of the backplane and filled in the space above it with A-B type dual controllers. CMD supplies fiendishly clever tiny bus grant cards to use in the slots that you must vacate for the drive.

The drive was furnished fully formatted and badded. It came to life at once. The instruction manual only supplies instructions for activating the onboard diagnostics from a MICROPDP-11.

> ***CMD supplies fiendishly clever tiny bus grant cards to use in the slots that you must vacate for the drive.***

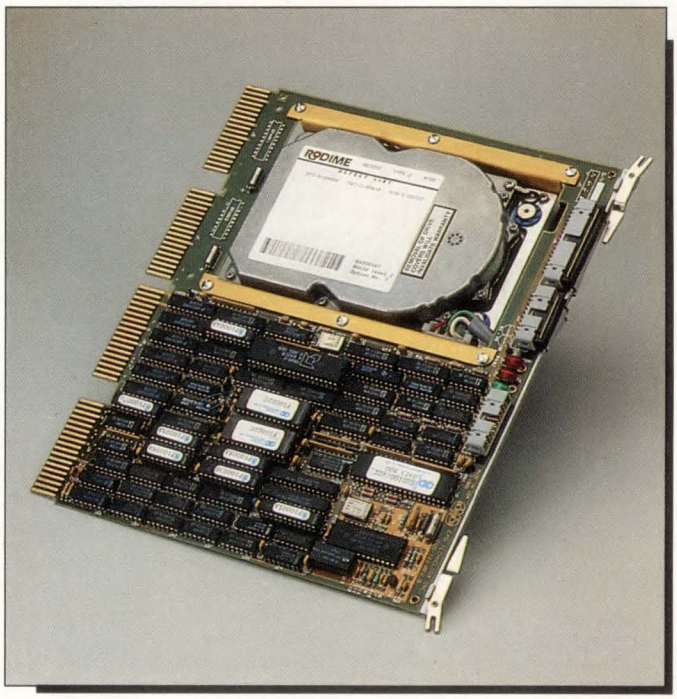
When asked, the maker promised that MICROVAX II diagnostics would be forthcoming soon.

The drive that our Lab was furnished was the CQD100/40T. This is the high-end performance model, featuring a seven-millisecond track-to-track seek, with an average of a 28- to 30-millisecond seek and a maximum of 62 milliseconds. The data rate is 5.0 Mbits/second, or about .6 MB/second. My benchmarks compare this to a FUJI 2333 with a 17 millisecond average seek and a data rate of 2.4 MB/second. The FUJI is controlled by an Emulex QD33. This drive/controller clearly is in a different league, both price and performance wise. The results are interesting.

I performed three "benchmarks." First, I timed the following command in SYS$SYSTEM:

```
COPY *.*;* NL:
```

This effectively causes all the files in the SYSEXE directory to be read into



The CMD hard card. The drive projects three slots on the other side of the card. A second drive can connect to the edge connectors, but must get power elsewhere.

the bit bucket. It's quite directory intensive:

Device	Elapsed	CPU Percent
DUA0	109 seconds	85 percent
DUB0	126 seconds	75 percent

I then used CREATE/FDL to build and format a 10,000 block-relative RMS file. This is a good highly serial and totally I/O-intensive exercise. There's almost no directory activity after the first seconds:

Device	Elapsed	CPU Percent
DUA0	192 seconds	15 percent
DUB0	221 seconds	10 percent

Last, I did a copy of the created file to NL: This is a read-only and fairly efficient version of the above, which is read/write.

Device	Elapsed	CPU Percent
DUA0	14 seconds	25 percent
DUB0	28 seconds	10 percent

The above is quite interesting. A lowly PC-grade ST506 disk drive is showing up quite creditably against a high-end mini drive. The high-end drive had four times the bandwidth and twice the seek speed, yet the worst case is a highly infrequent (in the real world) sequential read that turns in 50 percent of the performance. In directory and read/write marks, the performance is much better.

If you have a sparsely populated MICROVAX or VAXSTATION and want a fast 35 MB, this is a relatively inexpensive and hassle-free way to get it. ■

CQD-100 Disk Subsystem
CMD Technology Inc.
3851 S. Main Street
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Price: From $1,895 for the 20-MB version, to $3,295 for the 70-MB version.
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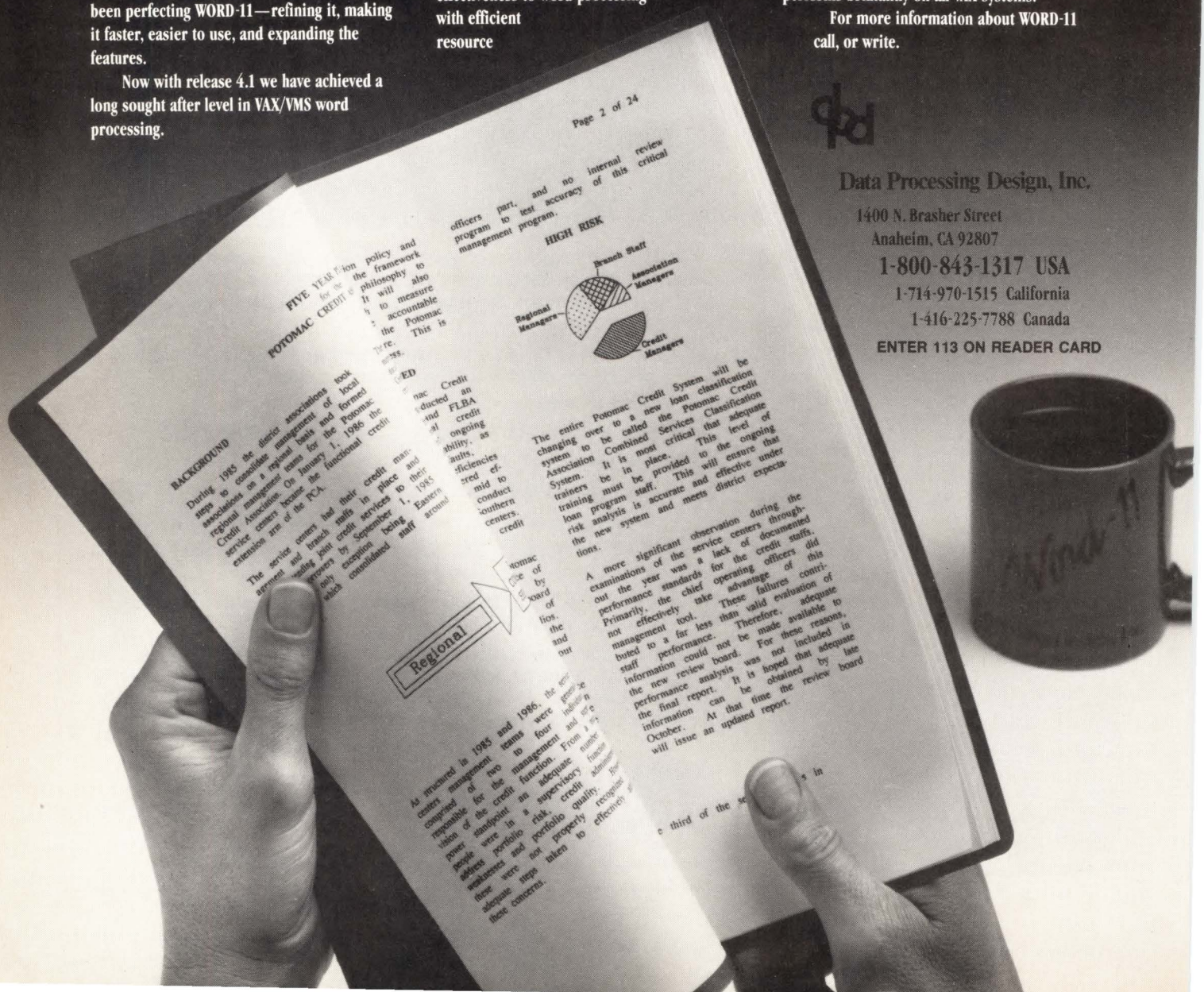
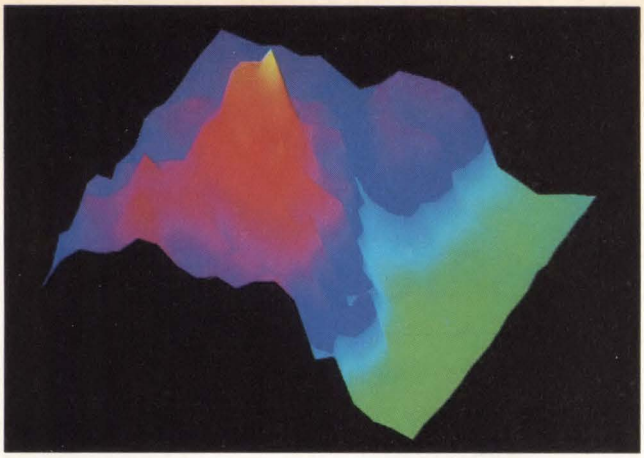
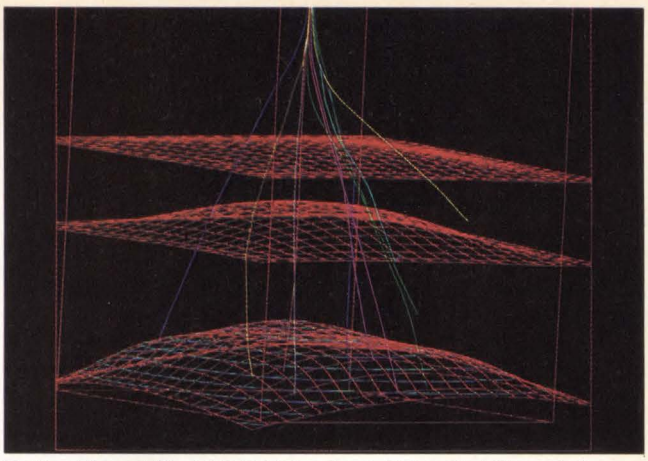
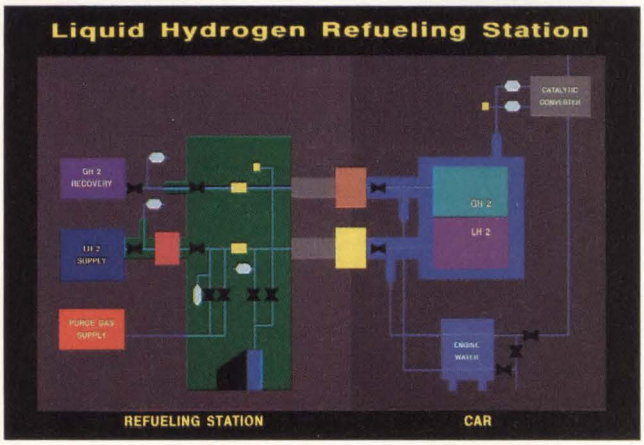




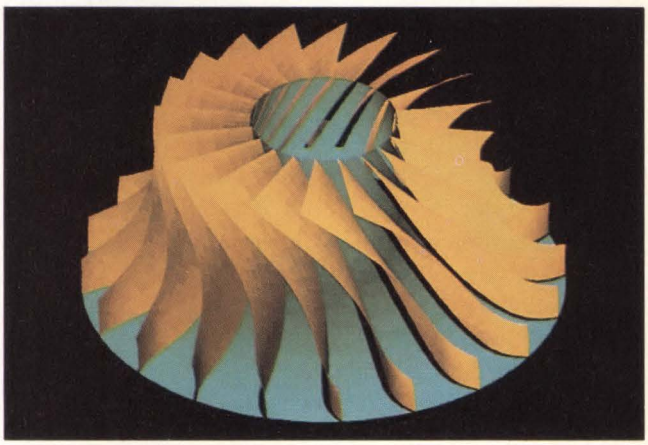
Local, interactive 3D manipulation of mapping data captured on a Tektronix 4129.



The 3D modeling capabilities of DI-3000 XPM are shown in this interactive drilling application.



The DI-3000 XPM graphics database excels at process modeling applications.



Using DI-3000 XPM, a turbine impeller is realistically rendered with local light source modeling.

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The Story

To get the full story on DI-3000 XPM, including technical information and a complete list of supported systems and users,

Call Chris Logan at:
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FROM THE LAB

Dave Mallery

MTI's Microsafe

The Microsafe, from Micro Technology Inc. (MTI) of Placentia, California, contains two kinds of removable media for your MICROVAX. It consists of a half-high RX50/RX33-compatible floppy drive mated with a half-high streaming tape cartridge drive. Together the units fill one drive slot in any MICROVAX cabinet. The floppy requires either an RQDX-type controller or a similar MTI floppy-only or MQDX3 controller. The tape drive uses an MTI MSV05B controller, a dual-high module.

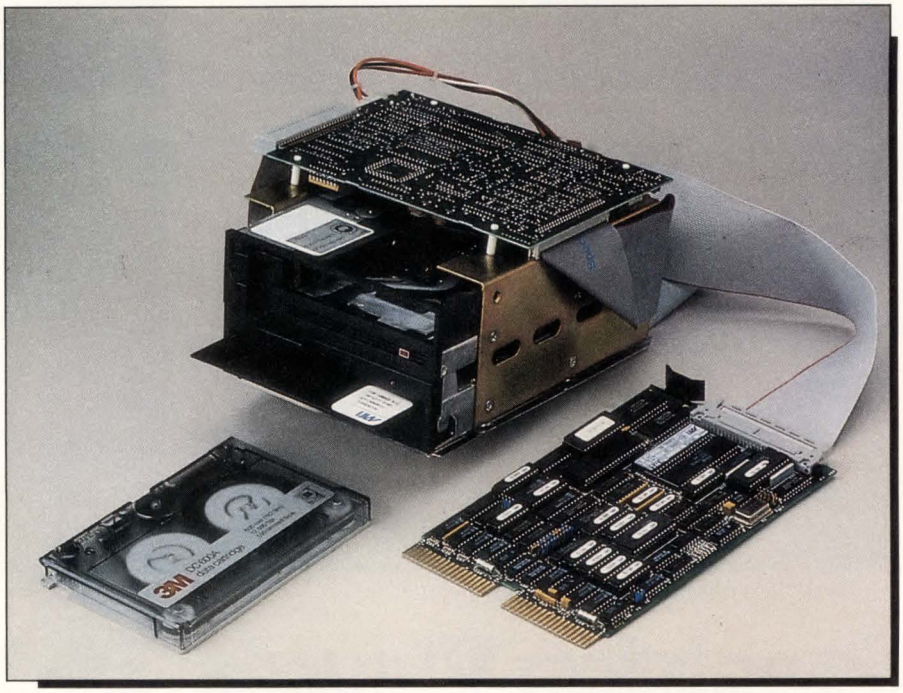
The floppy drive can emulate either an RX50 or an RX33, depending on the controller supplied. If you have an RQDX3, you're in the RX33 business. Of course, it still can read RX50 media.

The tape drive is a QIC-02-compatible unit. This one can handle 60 MB on a single 600-foot cartridge. The cartridges have the advantages of being quite standard and universally available. I found the cartridge listed in my INMAC catalog as a 3M DC-600A. There's another drive model capable of 125 MB. The quantity-one list prices are $2,995 and $3,295 respectively.

For performance figures, I'm going to rake an old controversy over the coals. I used an image backup of my system disk, a FUJI 2333 on an Emulex QD33 controller. First, to see how bad is bad, I did a simple image backup with no fancy tricks:

```
BACKUP/IMAGE DUA0: MSA0:FRED.BCK
```

This took forever, approximately 28 minutes. The drive spent most of its time repositioning. The image was 77,182 blocks, giving a data rate of 23,200 bytes/second; this was a new, all-time low record.



The MTI sandwich: floppy, formatter, and on the left the M5V05 tape.

Now I got out my backup bag of tricks and tried the following:

```
BACKUP/IMAGE/NOCRC/BUFF:5/
  BLOCKSIZE: 65534 DUA0: MSA0:
```

The fur flew! Elapsed time was 5:43 and the data rate a respectable 115,000 bytes/second. You don't need the cyclic redundancy checking (CRC) option, because the controller does one for you along with its read-after-write. The buffers and the blocksize simply ensure that the drive will have plenty to stream with.

The tape didn't pause once during the five minutes. The drive writes back and forth on the 600 feet a total of nine times for 60 MB. The 125 MB unit has 18 tracks. The head just moves up a fraction each time the tape reverses.

There's a tiny, visible pause at each reversal. Just to be sure, I did a BACKUP/LIST on the finished tape. The drive streamed all through the list. There's no adverse effect caused by the huge blocksize because the controller maintains a "logical" end-of-tape.

Next, I rigged up my trusty TK50 and gave exactly the same high-power backup command. The elapsed time was 11:23, and the data rate was 57,800 bytes/second. I guess it's reasonable to say that the Microsafe can pack twice the performance of a TK50. Considering that the TK50 and its controller list for $3,900 in my Fall '87 DECDIRECT catalog, there's a major price performance difference. Installation is nearly trivial. The photo shows the sandwich

you make of the mounting pan, the drives and the piggyback tape formatter. You only can put the formatter board on after you've inserted the drives into the BA 23.

The cabling is fairly obvious. This Y-shaped power cord brings power to

> ***"The floppy requires either an RQDX-type controller or a similar MTI floppy-only or MQDX3 controller."***

the formatter and the tape drive from one of the outlets on the distribution panel on the back of the backplane. The floppy drive cable just plugs into the distribution panel. The tape drive cable must be routed under the access hole at the bottom of the distribution panel and back to the backplane rear to mate with the MSV05B controller board.

To run under VMS, you need a driver. DEC doesn't ship a TS-11 driver with MICROVMS, so if you're not yet genning from a standard, full VMS release tape, MTI can supply a working driver. There was a diagnostic diskette shipped with my unit that turned out to have PDP-11 minimal diagnostics on it. There are no such diagnostics available for the VAX yet. They were quite unnecessary in this case, but would be nice to have them when troubleshooting at a distance. ■

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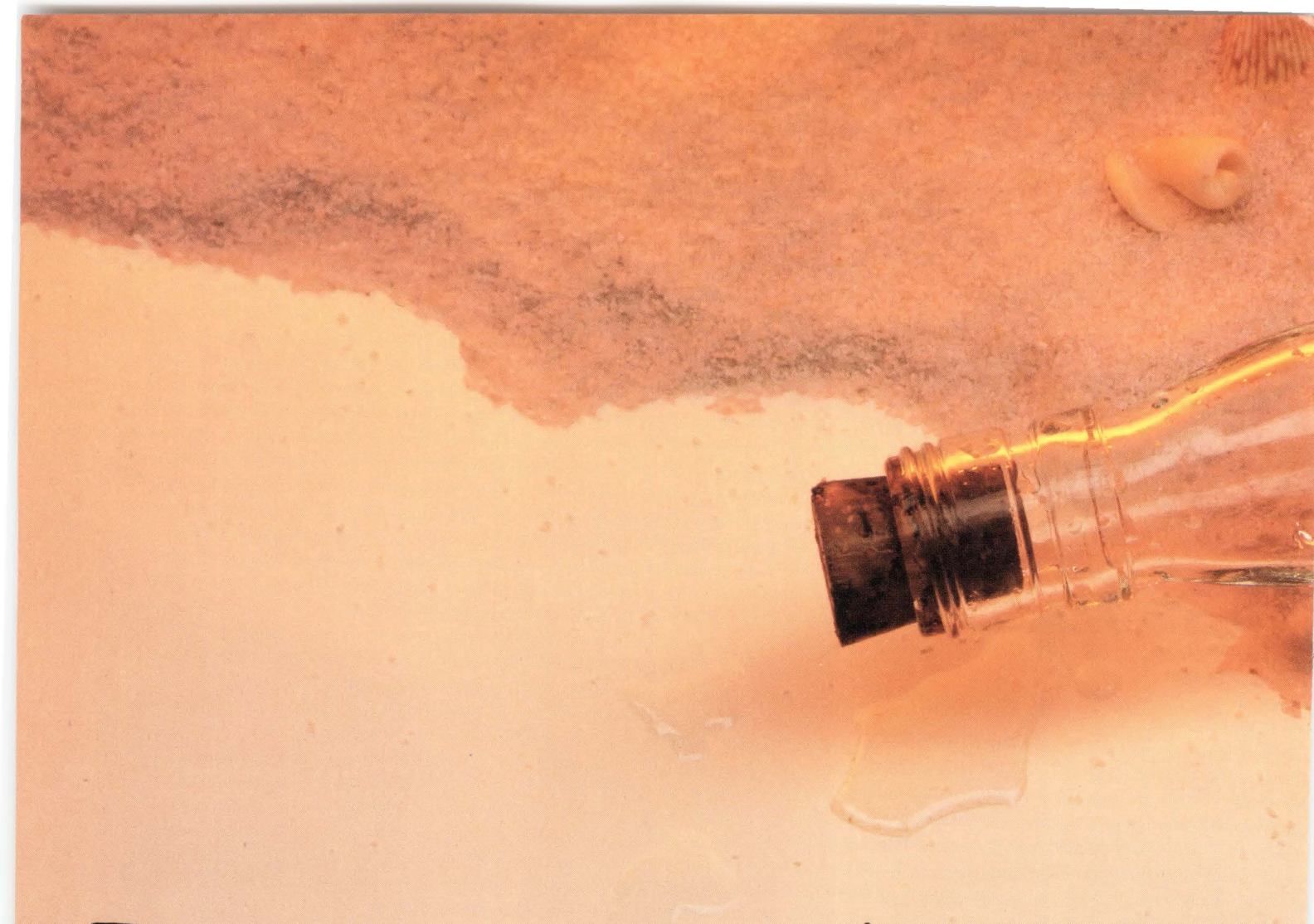
(714) 632-7580
Price: OEM prices are $2,200 for the 60-MB version, and $2,395 for the 125-MB version. Tape-only versions also are available.
ENTER 459 ON READER CARD



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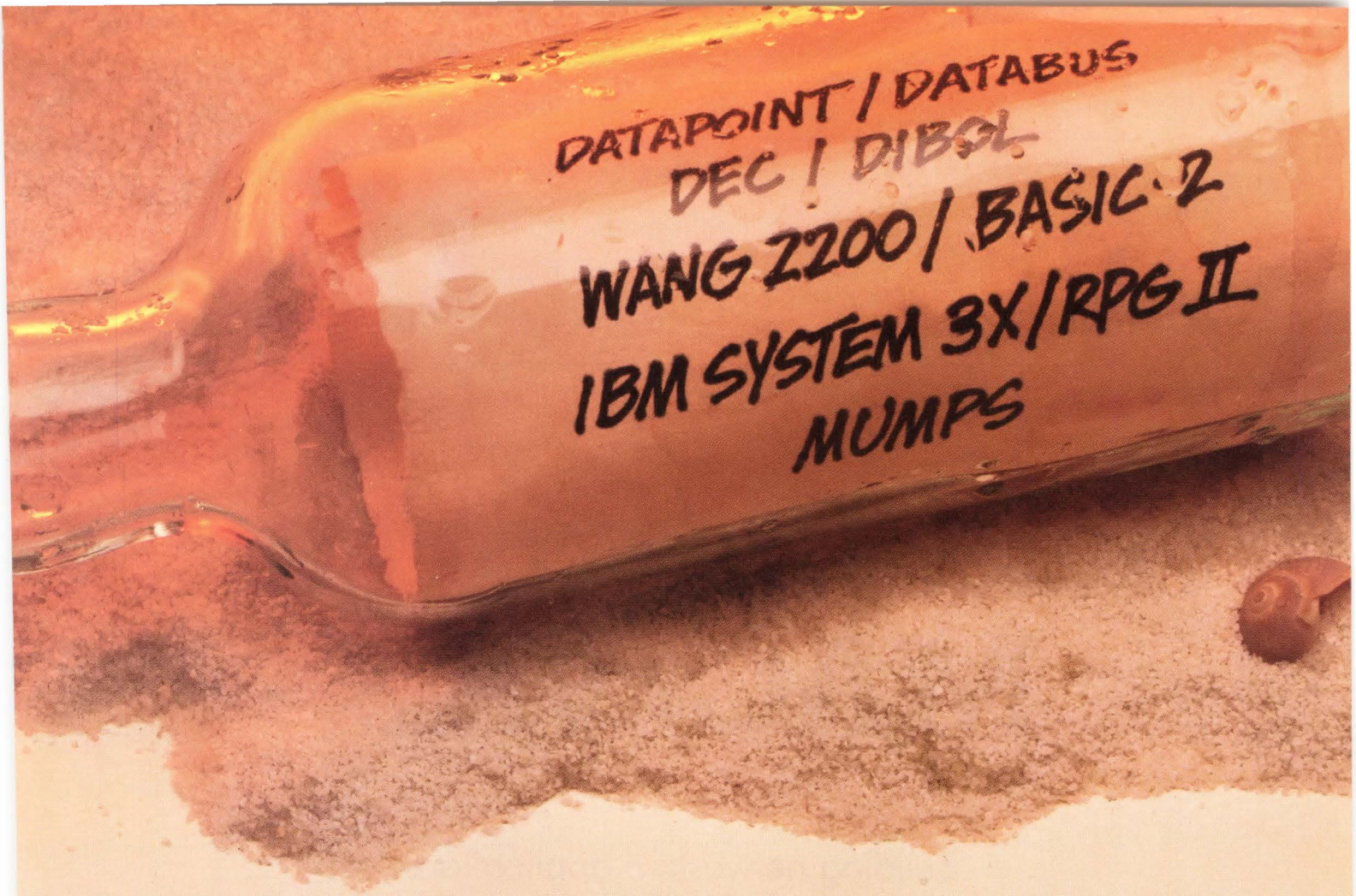

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mac vax

The Networked MAC/VAX

Building networked applications with *Helix VMX*.

BY AL CINI

A MACINTOSH AND A VAX can work together in a variety of ways. For example, a Macintosh can emulate a VT100/200 or Tektronix terminal device over a simple asynchronous line. The VAX can mimic a Macintosh disk over an AppleTalk or Ethernet connection. Running the right software, a Macintosh even can look like a DECNET Phase IV network end node.

In all of these cases, software on either the VAX or the Macintosh end of the transaction introduces a familiar function to its foreign machine, basically delivering an old service in a new way. Exciting networking, however, happens when the host computer's and the user workstation's ends of the transaction work in unfamiliar ways to produce something totally new.

Helix VMX, from Odesta Corporation, Northbrook, Illinois, is a powerful, flexible and remarkably simple information management system that can be used to build such networked applications. With *Helix VMX*, an end user on a Macintosh can retrieve and modify VAX/VMS-based data records, including text and pictures, through on-screen windows. In a new and unique way, *Helix VMX* marries the Mac's graphical user interface with the data handling capabilities of a VAX.

The many people already familiar with Odesta's Mac-only *Double Helix* information management package immediately will recognize *Helix VMX*. It's a VAX/VMS-networked implementation of Odesta's recently released *Double Helix II*, which allows users on client Macintoshes to access (visit in *Helix*'s terminology) *Helix* databases (collections) residing on server VAX/VMS systems. From a Mac user's viewpoint, *Helix VMX* is identical functionally to networked *Helix* on the Macintosh.

Helix offers a complete repertoire of development tools, a relational database, a forms manager and a

report writer, used to build applications. Application development is totally icon-driven; there's no command interface. Complex applications can be designed quickly with *Helix*, using the keyboard only occasionally to name things. After it's built, all the fields and forms associated with an application are stored along with the actual information as a *Helix* collection, existing as a single Macintosh or VAX/VMS disk file.

BUILDING COLLECTIONS

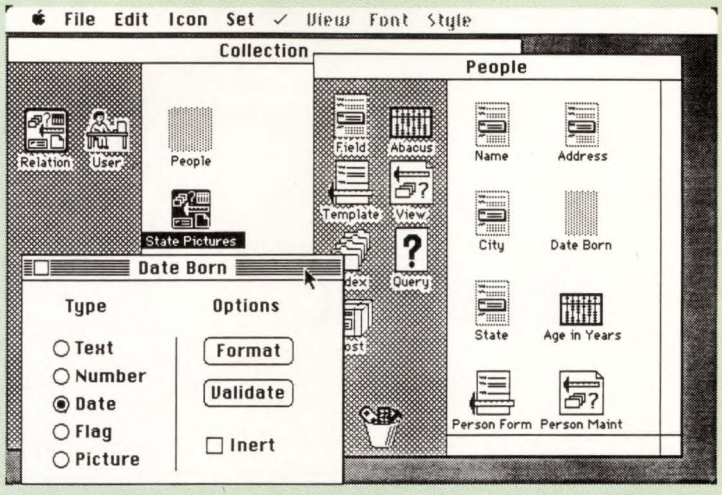
DATA IN A *Helix* collection is stored in relations, consisting of either calculated or real data fields, as well as the forms, queries and reports required to use them. *Helix VMX* collections must be designed on a Macintosh with a minimum 1 MB of RAM using *Double Helix II*. After it's designed, end-users can visit a *Helix VMX* collection either from a networked 512K Macintosh or from a conventional VT200 terminal.

Launching DH II on a Macintosh automatically invokes the *Helix* "full mode" collection design window. To add a relation to a collection, use the mouse to point to the relation icon in the gray "icon well" area of the design window and drag a copy of it into the white area, then use the keyboard to give the relation an appropriate name. To add fields or forms, open the relation by double-clicking the mouse or pulling the Open function down from the Icon menu to reveal a similar relation design window (see Screen 1). In true Mac fashion, relations, fields, forms and other structures are deleted by dragging their symbols into the icon trash can.

For all its cartoon-like simplicity, *Helix*'s data definition capabilities are powerful enough to invite comparison with very sophisticated VAX database software. *Helix* offers most of the functions found in serious relational databases, including several features, such as database triggers (*Helix* refers to this as "posting"), found almost nowhere else. *Helix* even includes built-in database journaling, transaction staging and recovery procedures.

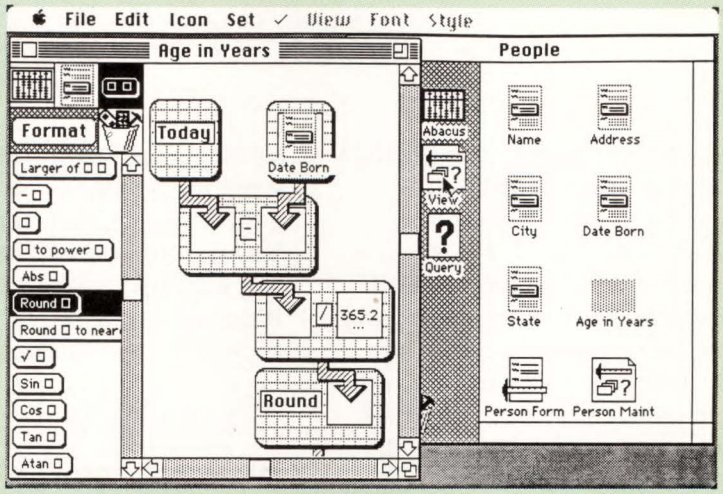
Helix's data dictionary is both active and dynamic. After a networked collection's visitors have logged off, all characteristics of its relations and fields can be modified, even after data has been stored in them. Changes to a collection's dictionary take effect immediately, requiring none of the tedious compilation or code-generation steps found in some VAX-based application generators. New relations, fields, forms and reports can be added as required, or indexes can be added

SCREEN 1.



***Helix* design mode, showing icons for various *Helix* database structures and functions.**

SCREEN 2.



***Helix* computed fields are defined by selecting and arranging function "tiles." Shown is the computation of age in years, determined by subtracting date of birth from current date, dividing by 365.25 and rounding the result.**

The Best-connected

Mac to Mac

Kinetics advances the connectivity frontier with Ethernet for the Macintosh. Now you get truly faster AppleTalk so your Macintoshes can communicate as high-speed personal workstations. And because we're compatible with the new EtherTalk standard, you can use your standard AppleTalk software packages including file and disk servers, multi-user database systems, and electronic mail.

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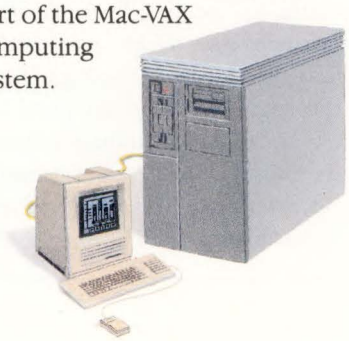
And to mix-and-match Macintoshes on Ethernet with Macintoshes on AppleTalk Personal Network cabling, the Kinetics FastPath AppleTalk-Ethernet gateway connects the two networks. The FastPath acts as a bridge between networks, providing full support for AppleTalk zones.

Mac to VAX

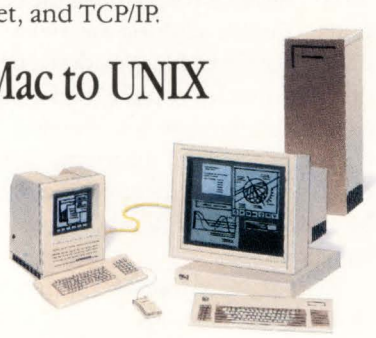
Ethernet is the network of choice in the DEC world. And the Macintosh fits naturally into the DEC world with Kinetics products for the Apple-DEC connection. Your Macintosh on an AppleTalk network, or connected directly to Ethernet, now becomes a vital part of the Mac-VAX computing system.



Let the VAX be a file server for the Macintosh. Let the Macintosh be a terminal for the VAX. Share printing resources along both networks. And access the worldwide services of DECnet.

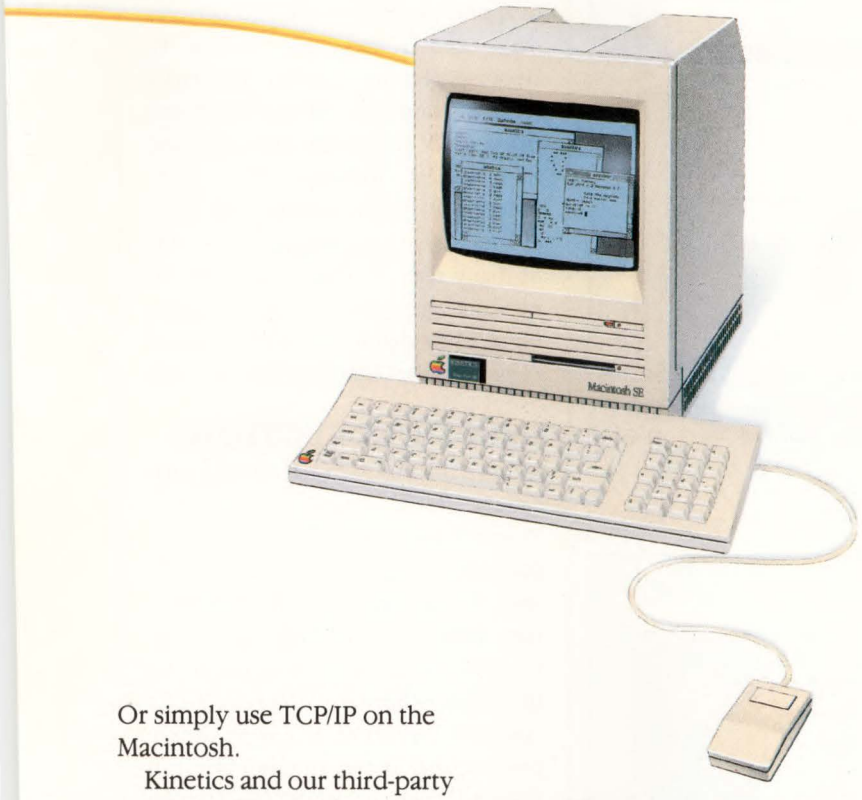
Kinetics products provide the foundation for the best third party packages adding network values and building on AppleTalk, DECnet, and TCP/IP.

Mac to UNIX



Put together the versatility of the Macintosh and the portable, programmable power of UNIX, and you have an ideal network team. Kinetics unites the two with K-Talk, Kinetics' own AppleTalk for UNIX.

Macintoshes Begin Here. . .



Or simply use TCP/IP on the Macintosh.

Kinetics and our third-party partners offer seamless software built on AppleTalk or TCP/IP to bring the UNIX and Macintosh worlds together. AppleTalk development tools are also available from Kinetics for UNIX programmers who wish to develop custom UNIX-Macintosh solutions. In addition, UNIX system vendors offer special UNIX-Macintosh packages.

Mac to PC

And of course the well-connected Macintosh cannot ignore the IBM PC and compatibles. Whether the PC is on an AppleTalk Personal

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For further information on Kinetics and Excelan products, third-party solutions, or the name of the dealer nearest you, please contact Kinetics or Excelan.

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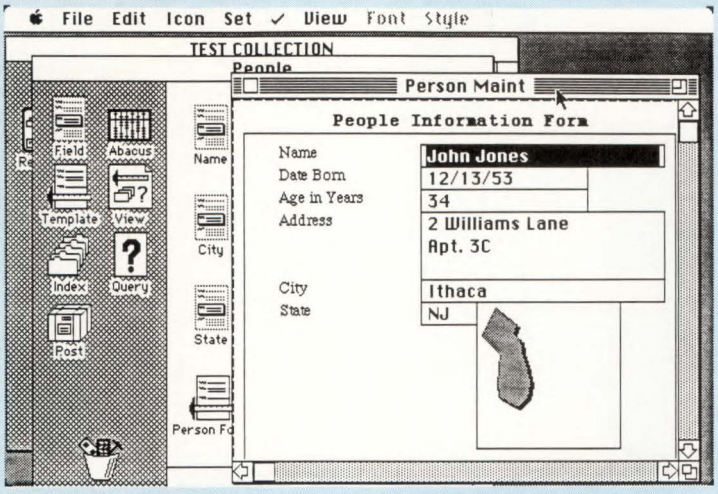
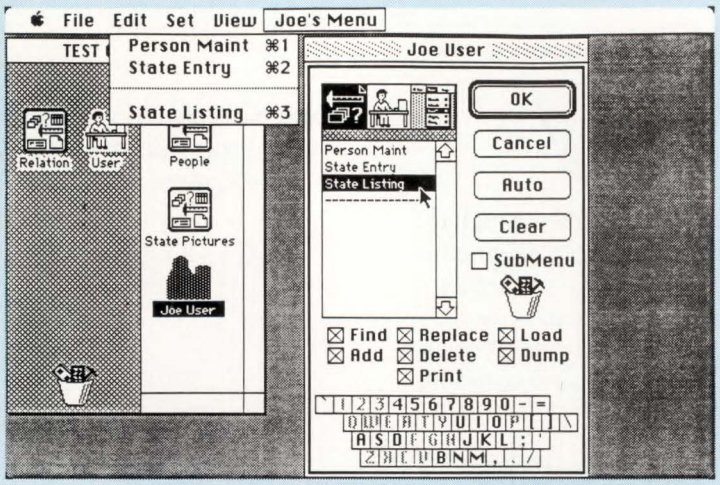
SCREEN 3.



This *Helix* procedure accepts information about a person, then finds and displays the corresponding picture of the person's state of residence.

SCREEN 4.



***Helix* custom mode allows the definition of user-specific Macintosh pull-down menus.**

to accelerate searches.

Helix data fields can contain variable-length text in any Macintosh font, numbers or dates/times. A relation's computed fields, represented as abacus icons, can perform mathematical and logical operations on other data and computed fields in the relation, as well as on indexed look-ups of fields in other relations.

In keeping with *Helix*'s command-free interface, computed fields are defined by the plumbing-like arrangement of symbolic function "tiles" (see Screen 2).

Helix fields also can contain pictures, in either bit-mapped or object-oriented formats, making *Helix* a very innovative vehicle for personnel, site security or product information applications. Look-up computations in one relation can use that relation's text or number fields to find pictures kept in another relation, for example allowing a picture of a person's home state to appear on a form with that person's name and address (see Screen 3). Because pictures entered into *Helix* records retain their original characteristics, *Helix* collections also can serve as clip-art libraries for other Macintosh-based graphics and desktop publishing packages. This is one of many features that, apart from its networking capabilities, distinguishes *Helix* from Apple's recently released *HyperCard* data management software.

USING COLLECTIONS

AFTER A DATA ENTRY or reporting procedure (*Helix* refers to this as a "view") has been defined within a collection, it can be invoked immediately by opening its icon. Recognizing, however, that end users can become lost trying to navigate among the huge collection of symbols in a complex collection, the *Helix* design process also allows the definition of simple "custom mode" interactive procedures through the User icon (see Screen 4). In *Helix* custom mode, a user logs onto a collection by providing a username and optional password. *Helix* then displays the Macintosh menu bar defined for that user during collection design, allowing the user to invoke *Helix* views through simple pull-down menus.

Note that a user may activate several views simultaneously, perhaps to look at a product's inventory information through one window while entering an order for it into another (see Screen 5). Also, under the full referential integrity feature, changes a user makes to data through one window are reflected immediately in related data displayed through other windows. Most remarkably, *Helix VMX* even automatically updates any related data that might be displayed on

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Seminar Fee: $840., Seminar Code: EY-835OE-SO.

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LOCATIONS AND DATES: Atlanta, December 14–15, 1987;* Philadelphia, January 11–12, 1988;* Orlando, February 8–9, 1988, Denver, March 14–15, 1988;* Boston, April 11–12, 1988;* Chicago, May 9–10, 1988;* Dallas, June 6–7, 1988;* Washington, D.C., June 27–28, 1988.*
*Hotel locations available upon registration.

the screens of other networked client systems. Likewise, a *Helix* record-locking facility prevents concurrent users from making uncoordinated changes to a collection's data.

CLIENTS AND SERVERS

IN ANY PEER-TO-PEER network transaction, a client process on one machine establishes a logical connection with a server process on another. Afterward, by exchanging messages over this logical connection, the client and server can work together, applying the resources available on their respective computer systems to solve problems. In *Helix VMX*, a client user can visit a VAX/VMS-resident *Helix* collection server, and then store, retrieve or modify its data exactly as though it were resident on the client's machine.

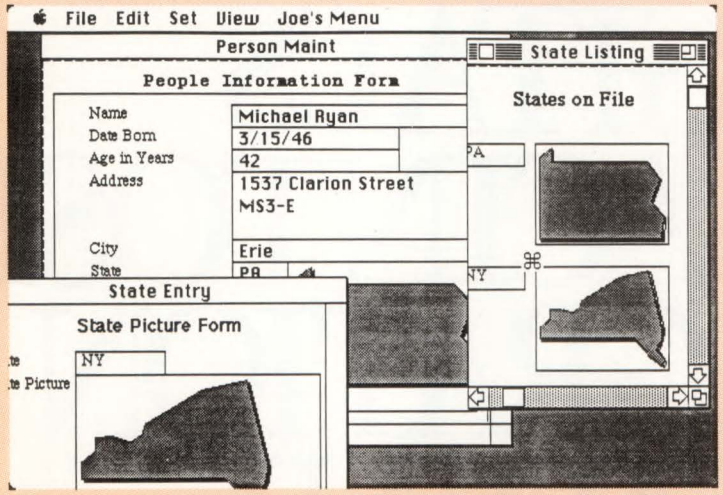
Helix VMX is based on Apple's AppleTalk protocols, using its AppleTalk for VMS software library (included with *Helix VMX*). Designed in OSI-style layers (see the article, "A Tale of Two Protocols," November 1987), AppleTalk not only peacefully coexists with DECNET on the VAX, but even can ride on point-to-point DECNET links between VAX systems to provide *Helix VMX* visitors with access to collections on VAXs thousands of miles away.

Helix fields can contain pictures, making *Helix* an innovative vehicle . . .

Several *Helix VMX* client Macintosh systems can be connected to their server VAX systems using standard AppleTalk hardware through an inexpensive Kinetics *FastPath* AppleTalk-to-Ethernet gateway. Users with higher throughput needs and more money could network their Macintosh systems directly to the Ethernet via Kinetics' EtherPort SE and Ether/SC cards, or with Apple's EtherTalk card for the Mac II.

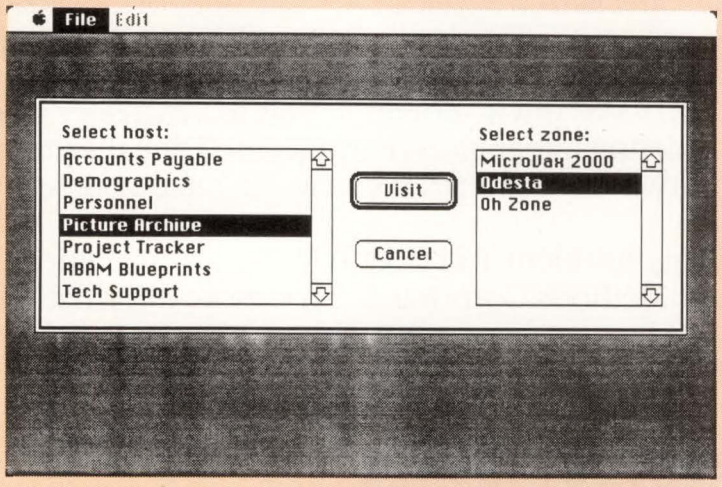
After a Macintosh has been used to build a *Double Helix II* collection, the collection's file can be transferred from the Mac to a host VAX/VMS system using a file server (such as *AlisaTalk*), or the *Helix*-provided transfer utility. A VAX/VMS collection server process can be activated on the VAX using the *Helix* Collection Manager, announcing the collection's availability over the network and ac-

SCREEN 5.



***Helix* in custom mode, showing three simultaneously active view windows. Crowded on a standard Mac's nine-inch display, this feature stands out on a Macintosh II's larger monitor.**

SCREEN 6.



Visiting a *Helix VMX* collection. In this case, the picture archive collection is selected within the Odesta AppleTalk zone.

ting as an information server for the collection's client visitors. Because a large VAX or VAX network can offer a confusingly huge number of collection-servers to its potential client-visitors, available collections can be organized into AppleTalk zones. Users can visit the collection they need by selecting its logical zone name (see Screen 6).

For the security minded, *Helix VMX* collections can be protected with passwords, which the *Helix* Collection Manager will require before starting a server for the collection. In addition, visiting users must specify the custom-mode username they intend to access the collection by; each of which can be further password-protected. Because delete, modify and display access can be selectively allowed or denied to individual custom-mode users, the *Helix VMX* security scheme can be specifically site-tailored. Note also that *Helix* encrypts passwords at each end of the dialog, to deter scavenging by network eavesdroppers.

VAX users can access *Helix VMX* collections either interactively from a standard DEC terminal or by running batch jobs.

A user logged onto the VAX at a standard VT220 or compatible terminal device can run a program that emulates a Macintosh *Helix* client (see Screen 7). The *Helix* VT220 program makes a conscious attempt to behave as much as possible like a corresponding client Macintosh, allowing all custom-mode functions, except Mac-specific font or picture field

Odesta and DEC join forces on *Helix*

ODESTA HAS something that DEC wants: an entry into the Macintosh world. DEC has something that Odesta wants: VAXs that can act as database servers. So, Odesta and DEC have formed a temporary allegiance to integrate Odesta's *Helix* database software with DEC's VAX/VMS environment.

Before Odesta and DEC started working together, *Helix* was a successful database system for Macintoshes. Part of the software ran on the user's Macintosh and part ran on another Macintosh that functioned as a database server. The server could take care of a number of *Helix* users, and the Appletalk network tied everything together.

Helix users were limited, however, by the size and speed of the Macintosh database server. Using a VAX or MICROVAX in this role could remove this bottleneck. VAX users, on the other hand, were limited because they were locked out of this database.

The Macintosh *Helix* system has now been united with VAX/VMS. Macintosh users can store *Helix* data files on a VAX, and VAX users can run the *Helix* front end on VT terminals.

Richard Smith, business development manager for MICROVAX systems at Digital, explained the arrangement. Smith said that DEC supplied Odesta with "equipment, software and consultation" as Odesta engineers worked on this new version of *Helix*. While Odesta undoubtedly enjoyed receiving the free hardware, "probably the most important thing they get is the technical consultation," Smith said. He explained, "We help them consider technical alternatives for achieving their product goals."

Smith emphasized that Odesta did all of the programming for *Helix*, even though some of the code runs on the VAX rather than a Macintosh.

In cooperative efforts such as this one, the engineering exchange sometimes goes both ways. The computer vendor may have to put in an operating system or hardware features to meet the third-party's needs. In this case, no modifications were required to DEC's products. Smith said that the current capabilities of VMS and DECNET were more than sufficient to support the software that Odesta created. *—By Charles Connell*

Companies Mentioned

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display/entry. Where both client and server VAX are equipped with *Helix VMX*, VT220 clients may even visit collections on other networked VAX systems. At press time, the *Helix VMX* VT220 client feature was available in field test, and Odesta hadn't decided whether to bundle it in or offer it as an exta-cost option.

Helix VMX also provides a VAX-based import/export utility that can be used to move information between a collection and standard RMS files, even while the collection is concurrently visited by other clients. This utility makes it possible to use *Helix VMX* in conjunction with existing VAX database and information management software, to lend its premium graphics display capabilities to your bread-and-butter VAX applications.

***Helix VMX* also provides a VAX-based import/export utility . . .**

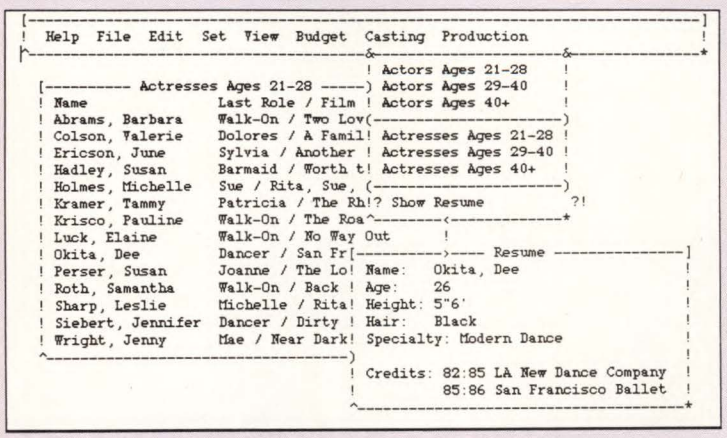
PAST, PRESENT, FUTURE

A PIONEER IN MACINTOSH/VAX connectivity, Odesta has been showing early versions of *Helix VMX* at DEXPO trade shows since the fall of 1986. Digital has signed a "cooperative development partnership" with Odesta to help in the care and feeding of *Helix VMX*. The future of *Helix VMX*, therefore, will be guided by both Apple and Digital influences, as well as by Odesta in response to actual *Helix VMX* customer experience.

Plans for future releases include a closer interface between *Helix* collections and VAX Information Architecture products, including a programmable interface to *Helix* collections. An IBM PC client software offering is also in the works.

Editor's note: A special thank you to Kinetics Inc. and Computer Methods Corporation for supplying the necessary equipment to prepare this series of articles on MAC/VAX connectivity. ■

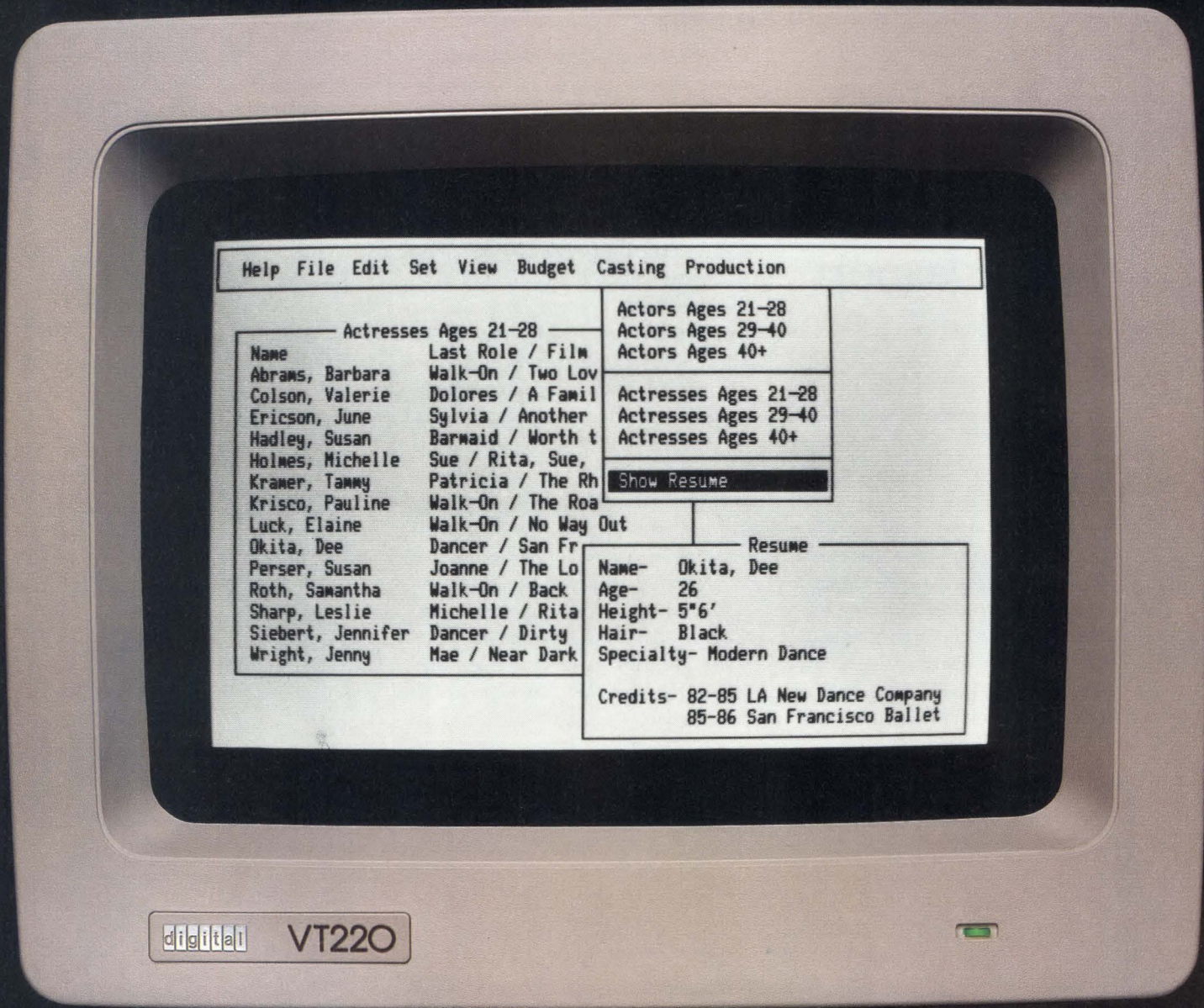
SCREEN 7.



***Helix* custom mode, as seen through the product's VT220 client interface.**

HELIX VMX

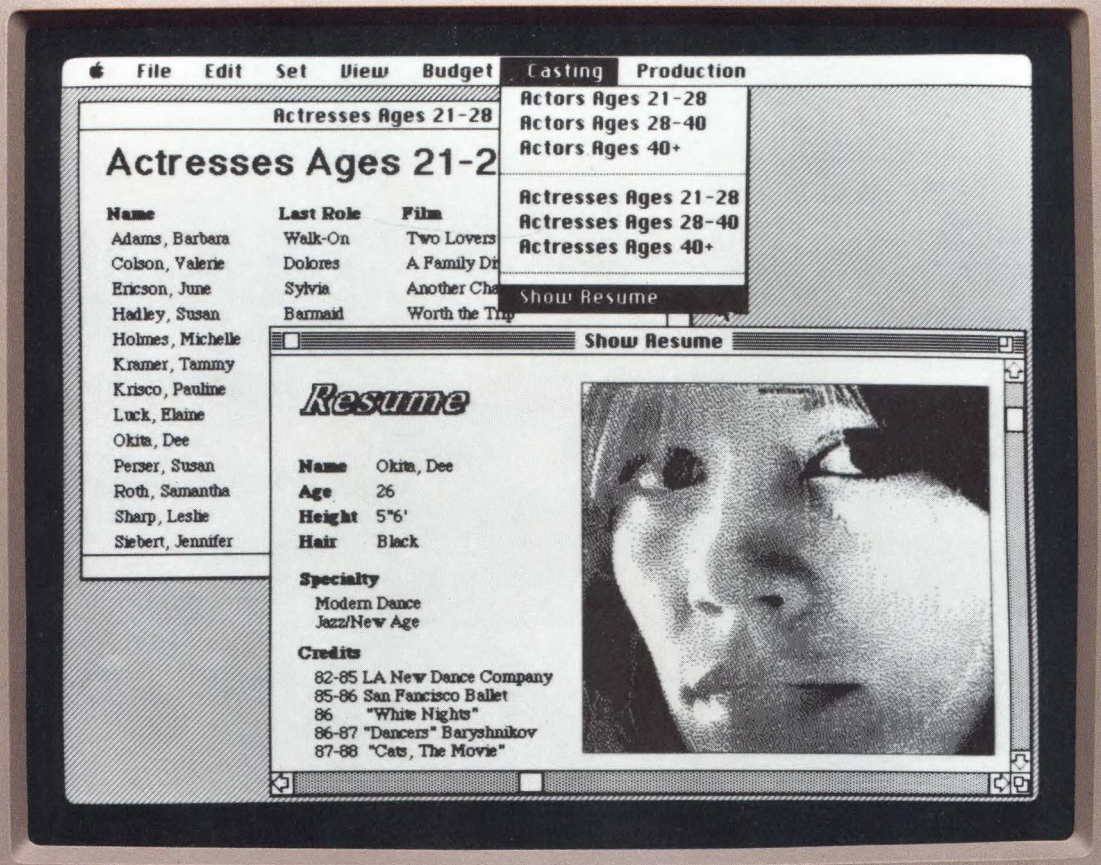
The Best of



Helix VMX *"a breakthrough software*
Digital's concept of

HELIX VMX

Both Worlds



Macintosh II

technology that exemplifies what PC integration should mean..."

Richard Smith
Manager of Business Development, MicroVAX

Odesta Corporation

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Disneyland Hotel, a 1,174-room convention resort in Anaheim, California, is the site for the 1987 DEXPO WEST Show. The largest of its kind in the world, the Dancing Waters and Lights Fantastic Show is presented twice nightly at the hotel. The show offers a display of bright lights and pulsating water fountains keeping time with contemporary and traditional music.

DEXPO

Suzanne Garr

DEXPO At Anaheim

Although California has experienced some rumbling earthquakes lately, the enthusiasm and attendance for DEXPO WEST 87, sponsored by Expoconsul International Inc., is rising above the cracks to potentially become the largest DEXPO show ever.

The buzz word you'll hear circulating on the show floor is *Connectivity*. Solutions for departmental computing, dedicated systems and PCs has created a demand for connectivity, compatibility and integration, the focus of DEXPO WEST.

While working your way through the maze of booths, you'll see the latest MAC-to-VAX technology and many products that provide connectivity solutions between Apple and DEC and IBM and DEC. These types of products comprise the fastest growing segment of the DEXPO shows.

The aisles will be filled with optical disk systems, multistation printers and graphics enhancements among many other new products. More than 10,000 DEC-compatible products, 300 hardware suppliers, VARs and other third party vendors will provide data processing solutions.

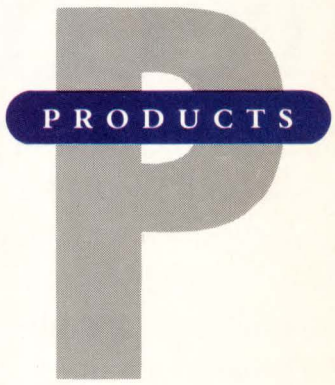
With over 315 exhibitors and 10,000 visitors expected, the 13th National DEC-Compatible Exposition has run out of room at the 79,000 square foot Disneyland Hotel. The overflow is being housed in a temporary structure adjacent to the hotel.

In conjunction with the show, International Data Corporation will hold a Corporate Computing Conference scheduled for December 8-9 at the Disneyland Hotel.

DECUS Symposium attendees can attend DEXPO WEST free. Shuttle buses will be running continuously each day from 7:30 a.m. to 5:30 p.m. to get you from the Convention Center to the Disneyland Hotel.

And, after you've covered the show, seen every booth, demonstration and display; conducted your business, and you're relaxing in your hotel room, take John C. Dvorak's "The Great American Trade Show Quiz" (November 1987) and see what type of trade show attendee you were this year at DEXPO WEST.

Professional Press' exhibition booth number will be 454. Plan to see us there. ■



Many of the companies mentioned in "Products" this month will be exhibitors at DEXPO WEST 87. Their booth numbers are indicated, so stop by and visit.

Invitation

EVENT:
The 13th National DEC-Compatible Exposition

DATE:
Dec. 8-10, 1987

TIMES:
Tuesday — 9 a.m. to 5 p.m.
Wednesday — 9 a.m. to 5 p.m.
Thursday — 9 a.m. to 4 p.m.

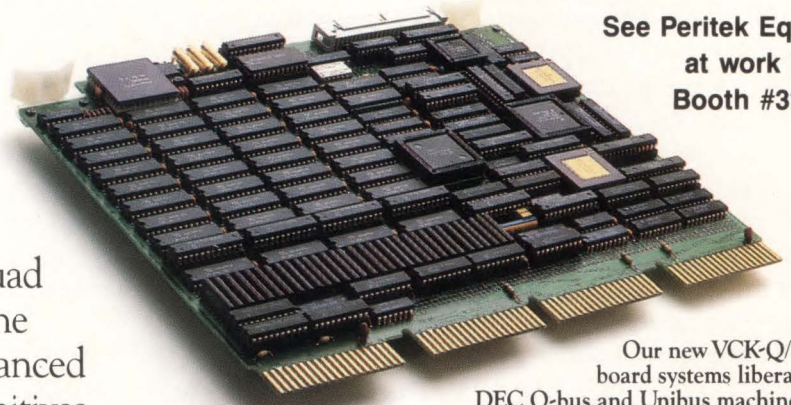
PLACE:
Disneyland Hotel, Anaheim, CA

EXHIBITORS:
315 and growing

FOCUS:
Integration

Call it the computergraphics freedom machine

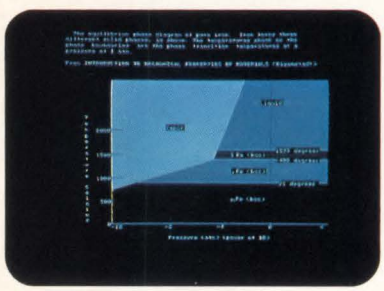
See Peritek Equipment at work in Booth #312.

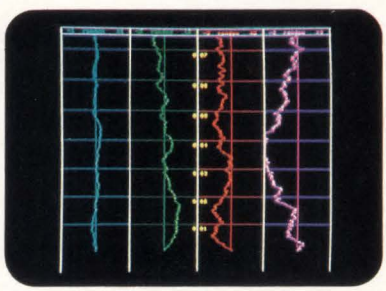


Our new VCK-Q/U board systems liberate DEC Q-bus and Unibus machines. In your VAX or Microvax, a formidable combination indeed.

Take the load off your host CPU in both Q-bus and Unibus DEC computers with our new VCK-Q/U tightly coupled combined graphics controller and single board computer. Our new quad height board gives you a stand-alone 68010-based computer and an advanced CRT controller to do graphics primitives, zoom, pan and scroll. On board to lend power to the 68010 are 1-megabyte of system RAM, fast DMA circuitry, serial I/O ports and a SCSI port for a hard disk.

One VCK-Q/U provides 1024 × 1024 × 8 to display 256 colors out of 16 million. Multiple VCK-Q/U's can be used together to extend bit plane depth to 1024 × 1024 × 16, 24, 32, and up for fine color control. Advanced applications include animation and high resolution imaging.





Use the SCSI/DMA link to quickly input and output images, display lists, commands, and programs. The DMA controller lets you rapidly move data between the SCSI port, CRT controller, computer bus, and all on-board memory.

Our microcomputer has a 9.8 MHz 68010 CPU and a 68881 FPU with access to all other on-board devices including 1 MB each of system and video RAM, two video overlay memories, and up to 128 KB of EPROM and 16 KB RAM.

For the rest of the story, phone (415) 531-6500. TWX: 910-366-2029. Or write Peritek Corporation, 5550 Redwood Road, Oakland, CA 94619.

Peritek

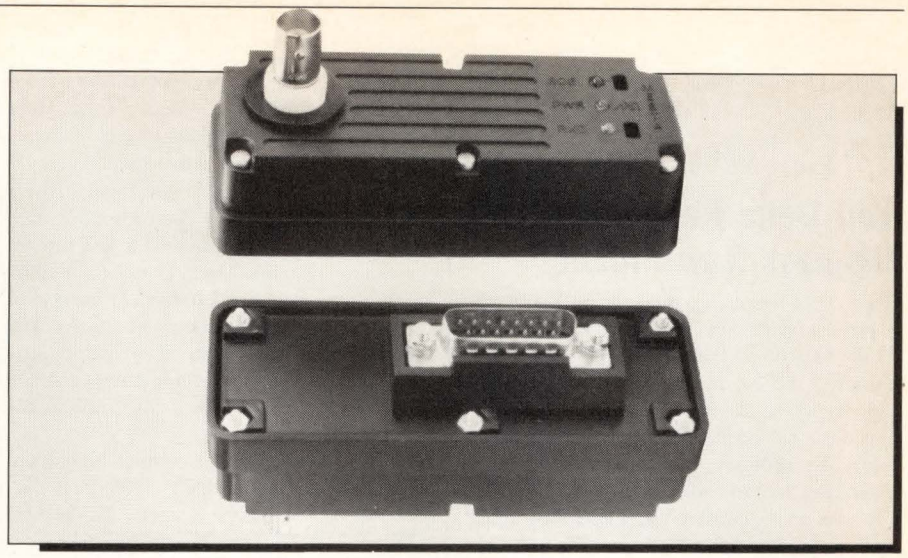
MTI Announces Ethernet To Thinwire Adapter

Micro Technology Inc. (MTI) has announced MESTA, an Ethernet to Thinwire adapter, replacing DEC's DESTA. MESTA allows connection of a single Ethernet station to Thinwire Ethernet cabling. It may be used in connection with any standard Ethernet communications controller, and is not bus dependent. MESTA is compatible with DEC's line of Ethernet products. MESTA provides a secure push mount direct to the system box bulkhead.

MESTA is priced in single quantities at $250.

For more information, contact Micro Technology Inc., 1620 Miraloma Ave., Placentia, CA 92670; (714) 632-7580. Visit Booth No. 1608.

Enter 301 on reader card



MESTA, from Micro Technology Inc., is an Ethernet to Thinwire adapter.

ISE Releases The MEDIA Librarian

ISE released its latest version of its Tape/Disk Media Librarian System for the VAX/VMS system. The MEDIA Librarian is a general-purpose media management system designed to solve the problem of managing and controlling all types of off-line storage.

Full support is provided for any combination of VAX CPUs either single, clustered or networked. The Librarian uses a detached server process to monitor and control the allocation of removable tape and disk drives. All assistance requests are sent to the system operator in a consistent fashion. Geographically distributed media libraries are supported fully while maintaining a central database.

Learn more by contacting ISE Inc., P.O. Box 241740, Los Angeles, CA 90024-1740;

(213) 837-8339; TWX: (910) 340-6449 (ISE LA); TLX: 322616 (ISE LA UW). Visit Booth No. 1844.

Enter 361 on reader card

Volt Delta Resources Displays New Product

Volt Delta Resources Inc. and its Maintech Division will be displaying its new Master Console product that provides the ability to monitor and maintain multiple DEC processors from one location, and a directory text retrieval system that gives large organizations the ability to access directory white page information directly.

To learn more, contact Volt Delta Resources Inc. and Maintech, 2401 N. Glassell St., Orange, CA 92665-2705; (714) 921-8000. Visit Booth No. 1044.

Enter 303 on reader card

MARK 12 Provides Mathematical Subroutines

Mark 12 of the NAG FORTRAN Library provides 688 FORTRAN mathematical and statistical subroutines for more than 80 computer/operating system combinations, from workstations to supercomputers, including all DEC systems. There have been 175 user-level routines added. Among these are 97 routines including Level 1 and Level 2 BLAS (Basis Linear Algebra Subprograms) that enhance performance on vector and parallel computer systems. Mark 12 now is a comprehensive, integrated library of numerical algorithms for computational science and engineering. The Online Information Supplement and Graphical Supplement also are available to complement the NAG FORTRAN Library.

For more information, contact Numerical Algorithms Group Inc., 1101 31st St., Ste. 100, Downers Grove, IL 60515; (312) 971-2337. Visit Booth No. 642.

Enter 362 on reader card

NISSHO Introduces N1100-Plus

NISSHO Electronics Corporation introduced the N1100-Plus Dual Board Computer based on the DEC J-11 Microcomputer chip. The N1100-Plus is an enhanced version of the N1100 and includes a memory capacity of 4 MB, 8K of cache, floating point accelerator option and memory management unit. The N1100-Plus incorporates an independent memory bus (IMB) which, combined with high-speed DRAM, provides any PDP-11/24/34 with PDP-11/84-type performance.

The N1100-Plus consists of two HEX size UNIBUS boards and can be installed in any standard SPC slots without backplane changes. The processor operates on the 18-bit backplane and provides UNIBUS Mapping to its own IMB.

The price for the N1100-Plus is $12,000. For further information, contact NISSHO Electronics Corp., Inwood Pk., Ste. 200, 17310 Red Hill Ave., Irvine, CA 92714; (714) 261-8811. Stop by Booth No. 362.

Enter 363 on reader card

Henco Adds Enhancements To Relational DBMS

Henco Software will demonstrate Revision 3.2 of INFO-DB+, its relational DBMS. Release 3.2 provides a concordance, a browser and free-text editing in addition to standard full-text retrieval functions such as a

CONTROL YOUR VAX

VMS utilities to help you manage your VAX

Never run out *NEW*

MINUTEMAN guards your free space. Once a minute, it checks how many blocks are free on each disk drive. If any drive has less than the minimum you've set, it recovers space by purging multiple file versions and deleting temporary files according to rules you've specified. With MINUTEMAN on guard, you'll never run out of free space again.

$395

Control your space

VDM catches the "disk demons" who are gobbling up your blocks. You get daily reports by username showing the blocks allocated to each user. Rapidly growing accounts are clearly identified.

$495

Here & There

GO moves users around VMS directories simply and easily. This is what the SET DEFAULT command should have been.

$195

☑ **FREE TRIAL**
Try any of our products on your system for 30 full days without cost or obligation.

☑ **SITE LICENSE**
Run these packages on all the VAX's at your site at no extra cost.

What's going on? *NEW*

SNITCH tells you when anything "interesting" happens on your system. Find out when a particular user logs on, when a specific terminal is used or when a DIALUP login occurs. Or, have SNITCH watch for your own private "events". You'll wonder how you ever got along without a SNITCH.

$395

Pinpoint bottlenecks

WATCH shows you where your system's bottlenecks are. Its screens are packed with key system performance indicators and detailed statistics about individual processes. A potent VMS performance monitor.

$495

Eliminate waste

HITMAN frees resources and plugs security leaks by killing idle processes. You set the maximum idle time. Processes can be hit with or without warning. All hits are logged to the system console. Processes with sub-processes are handled correctly.

$395

VAX to VAX

VtV moves executables and data files from one VAX to another over normal telephone lines. You can transfer your data interactively during the day or by batch at night when the rates are low.

$495

Jager Computer Systems

(403) 259-0700

Call ALAN CLIFFORD for more information

thesaurus, wildcard, proximity, context, phrase and exact match searching. Users are able to recursively define search criteria. The system's open architecture also allows users to edit text in its native word processing format.

The new release of INFO-DB+ runs on VAX/VMS. It takes full advantage of the VAX Information Architecture and networking capabilities and is closely integrated with ALL-IN-1.

Learn more by contacting Henco Software Inc., 100 Fifth Ave., Waltham, MA 02154; (617) 890-8670. Stop by Booth No. 236.

Enter 302 on reader card

PSDI Offers Project/2

Project Software and Development Inc. (PSDI) will offer its project management software in a turnkey package. The package will be priced at $99,200 for two concurrent users, more than 60 percent less than the current $260,000 price for the same configuration (with unlimited users). Additionally, PSDI will offer its other products at user-based pricing, with a similar discount.

The software in the package will consist of Project/2's scheduling and graphics software, along with Oracle's relational database. Hardware includes DEC's MicroVAX II, a laser graphics page printer, and color terminal.

Learn more by contacting Project Software And Development Inc., 20 University Rd., Cambridge, MA 02138; (617) 661-1444. Visit Booth No. 1349.

Enter 305 on reader card

PowerHouse Saves Time And Money

Pathfinder Software Inc. provides adaptive PowerHouse-based application software for human resource management, materials management and financial management. The application packages are time and money savers for PowerHouse 4GL application developers, designed to run either as a stand-alone system or as part of a fully integrated system set. Interfaces are available to real-time data collection equipment for high-volume applications.

Depending on a user's needs, a package may need little or no customizing. Where enhancements are required, the process is simplified by the 4GL power of PowerHouse. Often users can make their own modifications. For more information, contact Pathfinder Software Inc., 1577 W. Georgia St., Vancouver, BC, Canada V6G 2V3; (604) 682-6633. Stop by Booth No. 1156.

Enter 306 on reader card

Softool Offers CCC/CM Turnkey

Softool Corporation has expanded its application platforms by adapting user turnkeys to its software product Change and Configuration Control (CCC), with a CCC/DM (development and maintenance) turnkey for the VAX.

Each CCC turnkey provides a menu-driven layer with on-screen panels that allow for a natural dialog between the user and the native CCC product and minimize the training time and knowledge needed to use CCC. Users can manage and control all aspects of the development, quality assurance, maintenance and production environments, and also access online help panels for prompt assistance.

CCC/DM is available for the VAX/VMS and MicroVAX/VMS systems from $12,500 to $57,000. The price for the development and maintenance turnkey upgrade from CCC to CCC/DM ranges from $3,000 to $13,500.

For more information, contact Softool Corporation, 340 S. Kellogg Ave., Goleta, CA 93117; (805) 683-5777. Stop by Booth No. 112.

Enter 307 on reader card

LaserStar Subsystem Announced By Perceptics

Perceptics Corporation announced LaserStar, an optical disk jukebox subsystem for the VAX and MicroVAX. LaserStar provides automatic, VMS-transparent access to the massive storage capacity of optical disk jukeboxes.

LaserStar may be configured with either the OSI ODSR jukebox or the Cygnet Series 1800 Expandable Jukebox. Also included are a host adapter, Perceptics optical disk jukebox software, installation and support. LaserStar also can be configured with up to five optical disk drives to accommodate a wide range of performance requirements.

For additional information, contact Perceptics Corp., Pellissippi Center, Knoxville, TN 37922; (615) 966-9200; FAX (615) 966-9330. Visit Booth No. 1134.

Enter 308 on reader card

TI To Show Portable Data Terminal

Texas Instruments Inc. will show the Silent 700 TravelMate 1200 portable data terminal with VT100 emulation and file management capabilities. The TravelMate 1200 offers users all-in-one packaging for applications that require remote access to a DEC host: a retractable, 16-line by 80-column liquid crystal display, full-size keyboard, built-in 45 cps thermal printer, and an internal 300/1200 baud Bell-compatible modem. With the MultiFile VT100 Emulation Cartridge installed, the TravelMate provides the ability to store multiple files of information for transmission at a later time. The cartridge also includes a forms generation capability that allows creation and storage of customer forms.

Send inquiries to Texas Instruments Inc., Data Systems Group, P.O. Box 809063, DSG-158, Dallas, TX 75380-9063; (800) 527-3500. Visit Booth No. 2115.

Enter 309 on reader card

Clearpoint Announces 16-MB Memory Card

A new 16-MB memory card for the MicroVAX 2000 and VAXstation 2000 is available from Clearpoint Inc. The MV 2000 allows users to achieve identical processor and memory performance to the full configuration MicroVAX IIs — at approximately half the price.

The MV 2000 replaces the 2- or 4-MB daughter card that comes with the original system and brings the system to a full memory complement of 16 MB. Memory access and cycle times are unchanged by the increase in capacity. The board uses surface mount megabit DRAM technology.

List price is $7,450 in single quantities. Further information is available from Clearpoint Inc., 99 South St., Hopkinton, MA 01748; (617) 435-5395. Visit Booth No. 1315.

Enter 310 on reader card

Codar To Show Monitor And A/D

Codar Technology Inc. will introduce its new MicroVAX system monitor and A/D. The Model 190 System Channel Monitor provides MicroVAX/Q-bus users with 16 channels of high-speed 8-bit A/D along with onboard temperature and system voltage sensors. It's the first A/D with customer software programmable upper and lower thresholds stored in non-volatile memory for each A/D channel.

The 190 can be used as a standard interrupt driven A/D converter with auto scanning or manual channel selection. The real-time clock is programmable to either drive off-board instrumentation or generate processor interrupts.

The Model 190 is priced at $595 including a one-year warranty.

For more information, contact Codar Technology Inc., 1500 Kansas Ave., Bldg. 2E, Longmont, CO 80501; (303) 776-0472. Visit Booth No. 461.

Enter 319 on reader card

Digital Village Support Partnership Announced

Digital Village has announced the Digital Support Partnership, a package of online services customized to the needs of managers of support for DEC-compatible products.

Users connect by modem using Tymnet, Telenet, Datapac or most of the public data networks of Europe, Asia, Australia and South America. The user then sees a menu of services.

The core of the menu of services is a custom-designed form that prompts the customer for information about his problem. The responses to the questions automatically are sent in a time-and-date stamped electronic mail message immediately available to the support staff.

For further information, contact Global Villages Inc., One Kendall Square, Cambridge, MA 02139; (617) 494-0189. Visit Booth No. 1422.

Enter 314 on reader card

FOCUS Faster On MicroVAX 3500/3600

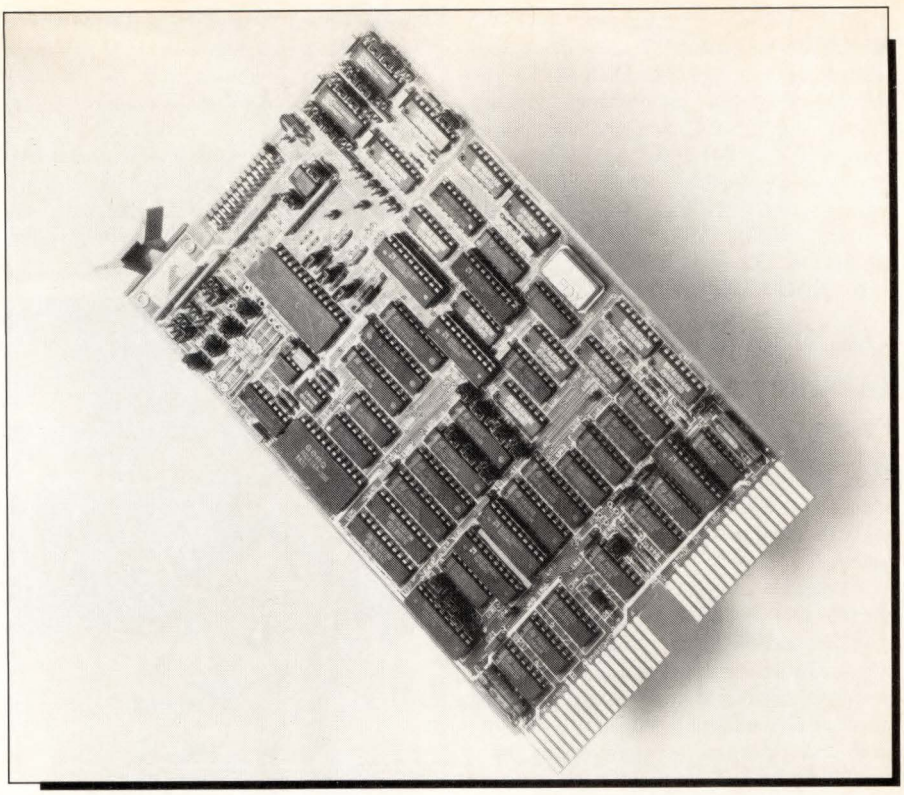
Information Builders Inc. announced that FOCUS, its popular 4GL/DBMS, runs three times faster on MicroVAX 3500/3600 systems compared to the MicroVAX II.

FOCUS contains full database and application-development facilities along with extensive decision-support features. FOCUS can read and relationally join multiple RMS, Rdb and Oracle files, as well as FOCUS database files. This can be accomplished on either a standalone VAX processor or across DECnet.

Functionally equivalent versions of FOCUS are in use across the entire range of computing environments including VAX, IBM mainframes, Wang VS, UNIX, personal computers and LANs.

Reach Information Builders Inc. at 1250 Broadway, New York, NY 10001; (212) 736-4433. Visit Booth No. 2130.

Enter 312 on reader card



Codar Technology's Model 190 System Channel Monitor provides 16 channels of high-speed 8-bit A/D to MicroVAX/Q-bus users.

Timing Device Sets To Standard Time

Precision Standard Time Inc. announced Time Source, a new precision timing device with host-resident software that synchronizes the calendar clocks of networked VAX computers. The Time Source also can be used as a time reference in standalone applications where coordination or monitoring of activities is critical.

The Time Source runs on any VAX computer using DEC's VMX operating system software.

Single-unit price, including required VMS host software on a nine-track tape, is $1,495. A component-level model that can be incorporated into the design of computers and instruments retails for $695.

For more information, contact Precision Standard Time Inc., 105 Fourier Ave., Fremont, CA 94539; (415) 656-4447. Stop by Booth No. 1947.

Enter 313 on reader card

EasyEntry Supports Data Dictionaries

Applied Information System Inc. will display a new version of the EasyEntry forms management and data entry system. This version includes support for data dictionaries, internal data types and improved handling of files with multiple record types.

EasyEntry runs on the VAX, PDP-11, Professional, Rainbow and IBM PC. It also supports heavy data validation, rekey verification, file searches, math computations, windowing and color. Users can store data in indexed or sequential files, perform keyed or non-keyed searches, call records to the screen, and modify or reverify the data. EasyEntry can be used as a standalone applications generator, or can be integrated with other software packages such as DATATREIVE.

For more information, stop by Booth No. 207, or contact Applied Information Systems Inc., 500 Eastowne Dr., Chapel Hill, NC 27514; (800) 334-5510.

Enter 346 on reader card

BASIS/ALL-IN-1 Expands Processing Capabilities

Information Dimensions Inc. developed an office automation interface product for Digital's ALL-IN-1 package.

As an ALL-IN-1 core application, the BASIS/ALL-IN-1 interface streamlines office information flow by integrating word processing with DBMS, permitting users to file to, search, read, and modify database file cabinet documents with minimal effort.

It contains extended retrieval capabilities and provides fast, flexible full-text searching based on any textual or numeric characters within a document, plus context highlighting for easy identification of search terms.

First copy license costs for BASIS begin at $15,200.

Contact Information Dimension Inc., 655 Netro Place South, Dublin, OH 43017-1396; (614) 761-8083. Stop by Booth No. 1618.

Enter 311 on reader card

20/20 WideWriter For VAX, MicroVAX

Access Technology Inc. recently introduced 20/20 WideWriter for the VAX and MicroVAX Versions 3.7, a spreadsheet text file printer program that reads and prints spreadsheets and other documents too wide to print in a standard 80- or 132-column format. It rotates the text of the document and prints it down the page instead of across it. The program is completely menu-driven and prompts the user for selections and entries. WideWriter supports LA50, LA100 and LA219 printers. Printers directly connected to terminals (slaves) also are supported.

WideWriter is priced at $500 for VAX computers and $250 for MicroVAX computers.

To learn more, contact Access Technology Inc., 6 Pleasant St., S. Natick, MA 01760; (617) 655-9191. Visit Booth No. 348.

Enter 315 on reader card

S&H To Show PC MessageNet & TSX-Plus

S&H Computer Systems will introduce its MessageNet PC. MessageNet is the data communications management system that automates the use of electronic mail via both public network services and through private networks created by linking VAXs and PCs directly via telephone lines.

MessageNet integrates all data and message exchanges under one consistent menu-driven interface. Users of MessageNet PC can communicate directly with other PCs or VAXs across the office or around the world.

Contact S&H Computer Systems Inc. at 1027 17th Ave. S., Nashville, TN 37212; (615) 327-3670. Visit Booth No. 201.

Enter 323 on reader card

ADAC Releases Model 1032 AD

The Model 1032AD from ADAC Corporation is a high-speed data acquisition subsystem contained on a full quad Q-bus-style board. It's designed to provide accurate high-speed measurements in both MicroVAX and PDP-11 system environments. Included on the board is a software selectable multiplexer that can be configured to be either 16 differential or 32 single-ended channels, followed by a software programmable amplifier that can be set for gains of 1, 2, 4 or 8 on a channel-to-channel basis. A fast Track and

Hold circuit acquires multiplexed data and settles to rated accuracy in less than 1 microsecond.

Learn more by contacting ADAC Corporation, 70 Tower Office Park, Woburn, MA 01801; (617) 935-6668; Telex 951802. Visit Booth No. 1330.

Enter 316 on reader card

Simpact Announces Carrierband Modems

Simpact Associates Inc. announced new carrierband versions of its line of integrated, high-performance MAP/DEC interfaces. The product line includes MAP network interfaces for DEC's Q-bus, UNIBUS, and VAXBI computers. The simpler carrierband networks are prime candidates for MAP applications in manufacturing cells and small areas.

Carrierband networks are limited to 700 meters or 75 ohm coaxial cable, and up to 32 stations are supported. Simpact's carrierband modems conform to the MAP 2.2 specification, and operate at a data rate of 5 megabits per second.

To learn more, contact Simpact Associates Inc., 9210 Sky Park Ct., San Diego, CA 92123; (619) 565-1865. Visit Booth No. 666.

Enter 317 on reader card

DEMAC Reveals New Products

DEMAC Software will unveil an innovative line of disk management utilities plus a more powerful and speed improved version of SQUEEZPAK, disk compression and optimization utility.

The new products will offer complete disk reporting information essential for total disk management. Also to be introduced is the long-awaited data compression tool that works transparently and online to regain valuable disk space.

SQUEEZPAK runs up to 10 times faster with a stronger packing algorithm for making files contiguous and consolidating free space.

Reach DEMAC Software at 1260 Old Innes Rd., Ottawa, ON Canada K1B 3V3; (613) 748-0209 or (800) 267-3862. Stop by Booth No. 2157.

Enter 318 on reader card

Able Introduces Resource Manager

Able Computer's new Resource Manager added to the popular ATTACH networking systems provides centralized management, user-initiated switching and security in a distributed network. ABLE's ATTACH networking system supports from eight to more than 3,000 ports and connects multiple computers supporting asynchronous communications with a variety of PCs, terminals, printers, etc.

Price of a baseline ATTACH system with the Resource Manager, 64 server ports, and two 128-port front-end processors is $18,000. Current ATTACH users can upgrade their existing Supervisor II module to the Resource Manager for $1,500.

For more information, contact Able Computer, 3080 Airway Ave., Costa Mesa, CA 92626; (714) 979-7030. Stop by Booth No. 446.

Enter 320 on reader card

Siecor Announces Token Ring System

Siecor Corporation, Electro-Optic Products (EOP), has announced a Fiber Optic Token Ring Media System for LANs. This system

is compatible with IEEE 802.5 standards at the Media Interface Connector (MIC), and with the IBM Token Ring specification. It operates at data rates from 4 to 16 million bits per second, thereby facilitating system upgrades from current data rates to future rates, without modification to equipment or media.

The Siecor Token Ring Media System is comprised of a central concentrator, plug-in dual port modules, plug-in power supply, and Token Ring Transceivers (TRTs). The TRT located at the lobe (station) connects to the concentrator via fiber optic cable.

For additional information, contact Siecor Electro-Optic Products, P.O. Box 13625, Research Triangle Pk., NC 27709-3625; (919) 549-6571. Visit Booth No. 2135.

Enter 321 on reader card

DDA Promotes 2nd DEC Market

The Digital Dealers Association (DDA) will offer complete information concerning the association. Organized in 1982, the DDA strives to promote an orderly secondary market for Digital products and maintain high ethical and professional standards by its members.

The association has been influential in obtaining clarification of some of the corporate policies of the Digital Equipment Corporation. Meetings with educational programs are held twice each year. A newsletter, "DDA NEWS," is published quarterly. The network of information among members and an increasing number of services are additional benefits for members.

Additional information may be obtained by contacting Digital Dealers Association, 107½ S. Main St., Ste. 202, Chelsea, MI 48118; (313) 475-8333. Visit Booth No. 214.

Enter 322 on reader card

Talaris To Exhibit 1590 Printstation

Talaris systems will exhibit the new Talaris 1590 Printstation, a 15-page-per-minute laser printer based on a significant advancement in controller technology.

Dual-processors help the Talaris 1590 maintain its rated engine speed even when printing complex pages with vector or raster graphics. The Printstation includes LN03 Plus, Tektronix 4014, and Diablo 630 ECS emulation and is flexible so page description languages and emulations can be added in the future. Four interfaces, including a Small Computer Systems Interface (SCSI), provide interfacing flexibility. The Talaris 1590 was designed especially for the multiuser and networked environment.

For further information, contact Talaris Systems Inc., 6059 Cornerstone Court West, P.O. Box 261580, San Diego, CA 92126; (619) 587-0787. Visit Booth No. 2030.

Enter 324 on reader card

Software Partners/32 Introduces Two Products

Software Partners/32 Inc. will show two new products, E-Z-Q, the VAX/VMS Job Management System, and CROSSnet, the VAX/VMS Remote Device Access System.

E-Z-Q maintains itself perpetually on each VAX in the cluster. Subsequent jobs can be scheduled by master jobs, depending on status values or user-defined values. User jobs can be scheduled to be submitted at specified times of the day, week or month or at a particular point in a process.

CROSSnet replaces the need for remote tape drives and facilitates easy and safe management of remote data from the main site.

For further information, contact Software Partners/32 Inc., at 447 Old Boston Rd., Topsfield, MA 01983; (617) 887-6409. TWX: 510-100-2442. Stop by Booth No. 1645.

Enter 325 on reader card

JADTEC Reveals New Products

JADTEC Computer Group will unveil several new products and services relating to financial accounting software, Depot/Field Services and Apple-to-DEC networking and connectivity. New applications to be announced are integrated job cost, purchasing and fixed assets software.

In addition, JADTEC's field services division, providing on-site hardware services for DEC and DEC-compatible systems, will debut the recent opening of its Depot repair facility located in Orange, California.

JADTEC representatives will be on hand to discuss the latest in expert networking services relating to Apple and DEC connectivity.

To learn more, contact JADTEC Computer Group, 546 W. Katella, Orange, CA 92667; (714) 997-8927. Visit Booth No. 514.

Enter 326 on reader card

CMD Technology Offers Wide Board Q-bus Disk

CMD Technology announced the CQD-100, a cost-effective disk subsystem consisting of an on-board 3½-inch hard disk drive and a Q-bus MSCP compatible controller. The CQD-100 mounts directly onto the Q-bus backplane for hard disk storage without additional cables or power supply.

The CQD-100 can be used with LSI-11/23, LSI-11/23+, LSI-11/73, LSI-11/83, MicroPDP-11, and MicroVAX IIs. It supports operating systems that use the DU driver.

List price for Model CQD-100/20, a 20-MB Q-bus MSCP 65-68ms disk subsystem, is $1,895. The price for Model CQD-100/40, a 40 MB Q-bus MSCP 35ms disk subsystem, is $2,395. The CQD-100/40T, a 40-MB Q-bus MSCP 20ms disk subsystem, costs $2,895.

To learn more, contact CMD Technology Inc., 3851 S. Main St., Santa Ana, CA 92707; (714) 549-4422; FAX (714) 549-4468. Visit Booth No. 1646.

Enter 327 on reader card

Collier-Jackson Offers General Ledger Release

Collier-Jackson announces a new CJ/ADVANCES general ledger release with improved financial reporting capabilities. Projections can be compared and analyzed against results on the same report. Through extended report definition, individual budgets of forecasts also can be evaluated at department or account levels.

A currency conversion feature has been added to administer and consolidate foreign currencies. Security has been enhanced as well, restricting access to the department level.

Direct inquiries to Collier-Jackson Inc., 3707 W. Cherry St., Tampa, FL 33607; (813) 872-9990. Visit Booth No. 650.

Enter 328 on reader card

Ethernet Family Grows By Four

T1 and fiber optic specialist Canoga-Perkins will introduce four new Ethernet products. The Model 8801 line monitor measures all signals in the transceiver or (AUI) cable. Model 8803 transceiver connects an LAN device to baseband coaxial cable, and the model 8820 LAN hub allows up to eight Ethernet/IEEE devices to share one transceiver or RF modem transparently. Model 8806 Ethernet expander extends the distance between transceivers and controllers of any Ethernet network.

To learn more, contact Canoga-Perkins, 21012 Lassen St., Chatsworth, CA 91311-4241; (818) 718-6300. Visit Booth No. 562.

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IMSL Announces FORTRAN Libraries

IMSL has restructured the IMSL Library. Contents of the Library have been expanded and divided into MATH/LIBRARY, for solving mathematical problems; STAT/LIBRARY,

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You'll find our dedication shows in a whole range of products, featuring error-free file transfers, and sharing PC files in a VAX library. Our poly-STAR, poly-SHARE and the famous poly-COM series of products have set the standards for DEC communications software.

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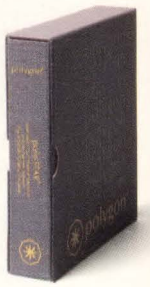

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Terminal Emulation, The Right Way.

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for analyzing statistical data; and SFUN/LIBRARY, for evaluating special functions.

The libraries' nearly 800 user-callable subprograms add more than 150 new areas of functionality to those available in the IMSL Library. The new products implement state-of-the-art algorithms and modern FORTRAN-77 programming techniques. The new task-oriented documentation is reorganized for ease of use.

For more information, contact the IMSL Sales Division, 2500 ParkWest Tower One, 2500 CityWest Blvd., Houston, TX 77042-3020; (713) 782- 6060; Telex: 791923 IMSL INC HOU. Outside TX, call (800) 222-IMSL. Visit Booth No. 716.

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TRIMM DA 123 Offered For MicroVAX II Systems

TRIMM Industries announced a new packaging solution for Micro-11s and MicroVAX IIs. The TRIMM DA 123 offers styling similar to DEC's BA 123 "World Box" and allows for mounting for any 5.25-inch x 19-inch chassis or it can be ordered with an eight-slot Q-bus card cage and "C.D" backplane.

The TRIMM DA 123 can support up to five each 5.25-inch disk drives or two each large capacity eight-inch and one each 5.25-inch drives.

A shielded power supply module is offered with a variety of voltages and the optional I/O panel has switch selectable filtered incoming power from 100-240 vac. Serial, parallel and communication connector plates are available.

For more information, contact TRIMM Industries Inc., 11939 Sherman Rd., N. Hollywood, CA 91605; (818) 983-1833. Visit Booth No. 702.

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SPSS Introduces Graphics For ULTRIX

SPSS Inc. will introduce SPSS Graphics for the ULTRIX operating system. The SPSS Graphics is an easy-to-use, interactive system for the creation of presentation and business graphics. It provides more than 40 different chart types including several types of maps, pie charts, bar charts, line charts, regression charts, text pages, and multiformat combinations. SPSS Graphics' menus and forms guide the user through the creative process and allow for quick editing of graphic output.

SPSS Graphics runs under VAX/VMS. For more information, contact SPSS Inc., 444 N. Michigan Ave., Chicago, IL 60611; (312) 329-3500. Visit Booth No. 210.

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New VAX Version Of RDM Announced

Interactive Technology Inc. has announced the beta test version of RDM 4.2A for the VAX/VMS. Version 4.2A is compatible with the upcoming new release of RDM for MS-DOS, and allows for true record locking abilities.

RDM is a table-driven database application development system. It offers application development without programming at the language level. RDM applications are compatible across the entire DEC product line and the IBM PC (MS-DOS).

Interactive Technology Inc. can be contacted at 460 Park Plaza West, 10700 SW, Beaverton-Hillsdale Hwy., Beaverton, OR 97005; (800) 362- 6203 or (800) 255-6278 in CA, or (503) 644-0111. Stop by Booth No. 370.

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All the Tools You Need For Motorola 680X0 From Whitesmiths

Whitesmiths, Ltd. now offers a complete set of 68K Cross Development Tools — specifically designed to work together — for the Motorola 68000 family of microprocessors. You get:

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Whitesmiths' C Compilers offer the closest conformance currently available to the draft ANSI C Standard. We've added 68020 and 68881 support, and dramatically optimized code generation, so you can get the code quality you need today with the language you'll need tomorrow.

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Chromatics Unveils Le Mans Display System

Chromatics Inc. recently unveiled the Le Mans Colorgraphic Display System. Le Mans offers fast vector drawing speeds and features a microcoded implementation of industry standard GKS (Graphical Kernel System) software for optimum performance.

Le Mans can draw one million fully transformed 2-D vectors and 250,000 fully transformed 3-D vectors per second. It also generates 25,000 smooth-shaded polygons per second using the Gouraud algorithm with hidden surface removal in 3-D applications.

The system is compatible with the Chromatics CX series and can be interfaced to VAX or Sun systems.

The basic Le Mans configuration is priced below $25,000.

For more information, contact Chromatics Inc., 2558 Mountain Industrial Blvd., Tucker, GA 30084; (404) 493-7000. Visit Booth No. 1017.

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New Data Switching System Announced

Applied Innovation Inc. recently announced the AISwitch 180, an intelligent device used to connect and switch a large number of computer users or devices to a limited number of computer host ports in much the same way that a telephone PBX is used to connect and switch a large number of telephone users to a limited number of outside common carrier lines. The Series 180 is used as a port selector, port contender and optionally as an X.25 PAD to synchronous packet switch networks. It may have two complete configurations stored in firmware for backup to a stand-by host or network.

For further information, contact Applied Innovation Inc., 651 Lakeview Plaza Blvd., Ste. C, Columbus, OH 43085; (614) 846-9000 or (800) 247-9482. Visit Booth No. 267.

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SciGraph Developed For Engineers, Scientists

Weyerhaeuser Scientific Computing recently introduced an easy-to-use graphics package for VAX that's rich in statistical analysis features and supports numerous graphics devices. SciGraph was designed for engineers, scientists and others who want to develop graphs and perform statistical analysis on the VAX without having to become a computer expert.

SciGraph features three interfaces, depending on the user's needs and level of computer expertise: an easy fill-in-the-blanks interface, a command interface for those not needing forms, and a programmable interface for calling SciGraph from user programs.

SciGraph sells for $3,000 (MicroVAX) to $15,000 (VAX 8800).

SciGraph is being distributed by MGA Inc., Concord, MA; (617) 369- 5115. Weyerhaeuser Scientific Computing, Tacoma, Washington, provides technical support, installation support, training and enhancements. Visit Booth No. 1050.

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Alisa Systems Introduces TSSnet

Alisa Systems Inc. has introduced TSSnet, a software implementation of DECnet for use on Apple Computer's PC Macintosh family.

TSSnet supports DECnet task-to-task communication for Macintosh programs and includes several applications: NetMail, an electronic mail program; NetCopy file utility program; File Access Listener, its file server program; Remote Terminal Service, that uses popular terminal emulation programs to log into systems connected to the network.

TSSnet attaches to DECnet via Ethernet or an asynchronous line using the modem port. Simultaneous AppleTalk operation is supported, providing access to both DECnet and AppleTalk network services.

For further information, contact Alisa Systems Inc., (818) 792-9474. Stop by Booth No. 2108.

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DISC Releases DBL Synergy

DISC has announced the release of DBL Synergy, a set of DBL utilities that aid in application software development. The first stage of DBL Synergy is "windows." Some major features of DBL Synergy's window tool include portability among operating systems, field definitions that simplify menu selections, multiple window displays, the tutor program, ability to save and restore windows, and a prototyping utility.

Learn more by contacting Digital Information Systems Corp., 11070 White Rock Rd., Rancho Cordova, CA 95670; (916) 635-7300. Stop by Booth No. 471.

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Modular Manufacturing Software Demonstrated

MCBA is demonstrating its new manufacturing system in VAX COBOL, suitable for both job shops and repetitive manufacturers in the $1- to $100 million revenue range. The 18-module system compromises a multicompany Manufacturing Resources Planning (MRP II) system, including accounting, purchasing, inventory management, scheduling and shop floor control functions. The system is modular, allowing companies to choose just those packages that they need, and is modified easily to meet the user's special requirements. The packages feature transfer codes, allowing the user to move rapidly between applications, or to initiate non-MCBA processes without exiting from the MCBA system.

Learn more by contacting MCBA, 425 W. Broadway, Glendale, CA 91204-1269; (818) 242-9600; Telex 194188. Visit Booth No. 264.

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New Calendar Software For VAXs and PCs

Microsystems Engineering Corporation will debut MASS-11 Calendar Management, a time management package for both VAX and PC users that can be integrated fully with MASS-11 word processing. MASS-11 calendar management users easily can find a time slot when all parties are available. After meeting invitations are sent, invitees can accept or decline. If the invitation has been accepted, the time slot is blocked out automatically on the invitee's calendar. Other features include a search feature, online help, reminders and archiving capabilities.

Pricing for MASS-11 Calendar Management is $5,750 for VAX 8500 and larger; $2,875 for VAXs between 11/780 and 8300, and $1,850 for MicroVAX II, 11/730 and 11/750. The PC version of the product is priced at $195.

For further information, contact Microsystems Engineering Corp., 2400 W. Hassell Rd., Ste. 400, Hoffman Estates, IL 60195; (312) 882-0111; Telex: 703688. Visit Booth No. 1800.

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PEP70 Improves PDP-11/70 Performance

Digital Data Systems Inc. will showcase a performance enhancement product for the PDP-11/70 computer. The PEP70 improves performance of the PDP-11/70 so that this system will compete favorably with newer technology systems. Users of 11/70 now can enjoy a system that performs twice as fast as before.

To learn more, contact Digital Data Systems Inc., 1551 N.W. 65th Ave., Plantation, FL 33313; (305) 792-3290; TWX: (910) 997-4751; FAX: (305) 581-1325. Visit Booth No. 2049.

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HDS Introduces New Generation Of VDTs

Human Designed Systems (HDS) introduced a new generation of video display terminals with workstation-like features including graphics, windows and multisession support. The HDS3200 Image Leaders includes full DEC terminal compatibility, plus features that aren't offered on DEC terminals. The products offer VT330 graphics performance to customers who would otherwise have to purchase VT320 text terminals because of the large price difference between the two terminals.

The HDS3200 Image Leader Terminal Series includes three models with a range of capabilities. Customers can choose the features they need, and can upgrade from one model to another if their requirements change.

Additional information may be obtained from Human Designed Systems, 3440 Market St., Philadelphia, PA 19104; (215) 382-5000; Telex: (710) 670-1460 HDS PHA. Stop by Booth No. 536.

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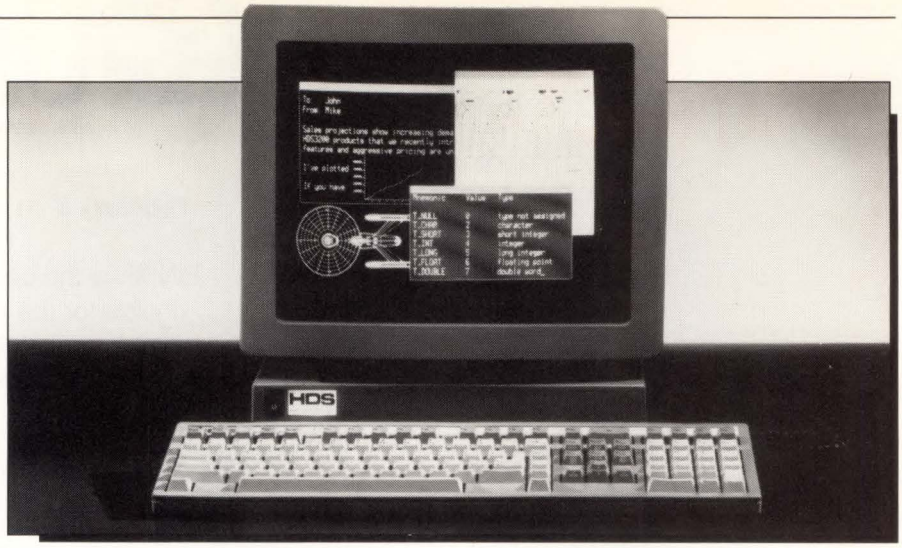

Human Designed Systems Inc.'s HDS 3200 Image Leader Terminal.

Mobius VAX NIU To Be Demonstrated

FEL Computing will demonstrate a new product to integrate the VAX into the UB Network. Mobius VAX NIU is software that makes the VAX appear to the Ungermann-Bass Network as a regular Net/One device. Any standard Ethernet adapter (DEC or Interlan) is the only hardware required. With Mobius VAX NIU, an unlimited number of PCs or terminals on the UB Network may be connected to the VAX. No additional hardware or software is required to add more connections.

The price for Mobius VAX NIU is $2,500 per CPU for any VAX except MicroVAX, which is $1,500.

To learn more, contact FEL Computing, 10 Main St., P.O. Box 72, Williamsville, VT 05362; (802) 348-7171. Visit Booth No. 1639.

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BBC Debuts VCL And DESK EXECUTIVE

Boston Business Computing Ltd. (BBC) will demonstrate DESK EXECUTIVE and VCL, two new DEC-compatible software products. DESK EXECUTIVE, VCL, and other BBC products provide a VMS-like environment for MS-DOS and UNIX machines.

DESK EXECUTIVE, office automation software, provides an ALL-IN-1 environment for non-DEC machines. Some of DESK EXECUTIVE features are file cabinet, menu system, electronic mail and access to existing applications, such as spreadsheets and databases.

VCL provides MS-DOS and UNIX machines with VAX/VMS emulation of the Digital Command Language (DCL). VCL features 60 DCL commands, line editing, logicals, command files, online HELP and symbol names.

Contact Boston Business Computing Ltd., Riverwalk Center, 360 Merrimack St., Lawrence, MA 01843; (617) 683-7920. Stop by Booth No. 1635.

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CDSA Offers Special VAX Prices

C.D. Smith & Associates Inc. (CDSA) will be exhibiting at DEXPO West. CDSA specializes in the VAX product line and buys, sells and rents new and used VAX systems, options and CPUs. CDSA maintains an extensive inventory of VAX-related items. Anyone considering selling or purchasing a VAX system or option should stop by Booth No. 556. CDSA will be offering specially priced VAX systems and options to qualified buyers during the convention.

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External Keypad For Laptop Terminals

Random Corporation will announce an external keypad for the Colleague and Colleague PLUS laptop terminal. The keypad connects to the back of the terminals to provide a numeric/application keypad comparable to VT-style terminals.

Colleague remains the only battery powered, VT100/200-compatible laptop ter-

minal offering a full screen, a full-travel keyboard, an internal 300/1200 baud modem and a serial port for under $1,000. Colleague PLUS is $300 more, allowing on-line users to capture or record up to 60K in 36 files while Screen-Snap stores individual screens. Files can be edited or created, on or off-line, to be printed locally or sent back to a host. Playback allows a sequential viewing of a recorded communications session.

For more information, contact Random Corp., 581 Northland Blvd., Cincinnati, OH 45240; (513) 825-0880. Visit Booth No. 2044.

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KOM Inc's OPTIFILE II Enhanced

KOM Inc.'s OPTIFILE II, now supports a fourth 5¼-inch optical disk drive with better performance. OPTIFILE is a software/hardware package that effectively handles the write-once nature of the optical drives by still allowing files to be indexed, updated and deleted exactly in the same manner as magnetic. OPTIFILE II is an implementation of this technique with Digital's series of VAX computers.

The latest 5¼-inch drive supported offers 800-MB storage and higher performance. For OEMs who wish to integrate their own optical disk subsystem, OPTIFILE is available without drives.

Learn more by contacting KOM Inc., 145 Spruce St., Ottawa, ON K1R 6P1; (613) 238-7766. Visit Booth No. 1745.

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Wollongong Ships BI Bus For VAXs

The Wollongong Group has begun shipping WIN/TCP Release 3.1, which fully supports DEC's VAXBI family. It also supports Simpact Associates' multiport X.25 feature on the ICP 1632 interface, which allows up to four commercial X.25 connection, or three commercial and one DDN X.25 connections. This multiport feature affords VMS system users the ability to cost effectively configure a connection to the DDN, while providing access to public data networks using a single native VAXBI interface and WIN/TCP.

Other new features include improved support for the Network Virtual Terminal (NVT) and addition of a line mode for TELNET, VMS record mode support for FTP, and support of an anonymous FTP capability.

For additional information, contact the Wollongong Group, 1129 San Antonio Rd., Palo Alto, CA 94303; (415) 962- 7200. Visit Booth No. 1641.

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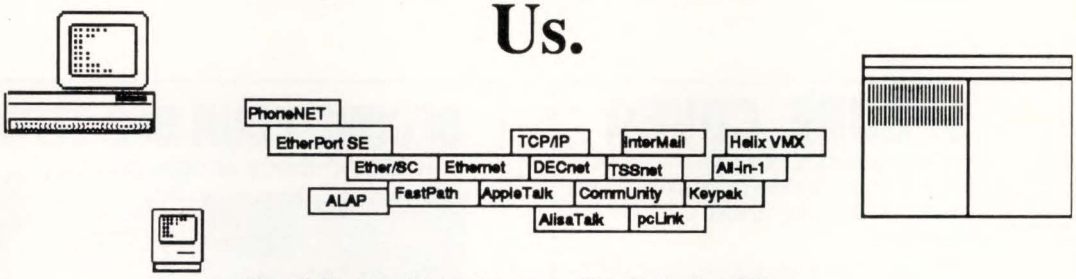

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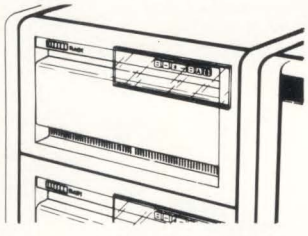

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BACK END

John C. Dvorak

The Madison Avenue Mentality

Do you ever wonder where all those great ads for computer companies come from? Well, the top agency in high technology is the secretive Kraut, Peppers & Corndog Agency in New York. Recently, a disgruntled employee sent me the minutes of one of its meetings.

Frank Corndog opened:
KP&C
Oct. 15, 1987
Morning Meeting

"Now that the Rupert Burpee Baby Bib account is all settled in, let's get onto the Phudware Software account. Does anyone know what this software stuff is all about?"

"Sir, it's used in computers, I think. It's like on these little record-like things and stuff," said Gordy Weinstein, one of the newcomers to Kraut, Peppers & Corndog.

"Sir, *The Phudware Superstar* is a how-to-use-computers package for new users. It's supposed to be ultra-user friendly," explained Ms. Elizabeth Funk, the only woman in the group.

"Good. Any images, gentlemen?" Corndog coughed a few times. "Jenkins?"

"Sir? Ahh, my image is..." Jenkins paused, "...ahh, a female bosom."

A rumble stirred through the room. Corndog coughed, and Kraut, as usual, said, "What?"

Jenkins continued, "Yeah, a breast is soft. Software! Get it? And, it's user friendly, right? We could make Phudware synonymous with the warmth of a mother's bosom."

Corndog sat back in his chair, "Mmmm, yes. Let's hear more."

"Ahh, well. We could have a young blonde, in a bathing suit, cradling the software in her arms like a baby. The caption could read something like, "I Like My Men To Use Phudware!" He looked around nervously. "Well, er, I have to work on the idea a little more."

"Hummph. Anything else?" Corndog bellowed. "More ideas!"

"I've got one," whispered Peppers, one of the senior partners. He seldom attended meetings because he was more interested in his hobby — collecting rare vegetables.

So here was Peppers, at the meeting. "Let's get some weird egghead guy with glasses and a rumpled shirt to stand in a cluttered office with a Phudware box," he said. "The caption can just list what the darn thing does, whatever that is."

"Excellent! That idea has awards written all over it. OK, that's settled. Next we have the Zooper Microcomputer account. These guys are introducing their newest computer, the Superduper Zooper Computer. Ideas?"

Weinstein spoke first. "A picture of the moon with the earth in the background, like the Apollo Lunar landing. A picture of the computer superimposed, so it looks like it's on the moon. Yeah! Then the caption reads, 'It's Outta This World.' "

Corndog stuck out his lower lip and nodded. He looked around the room. "Hmmph. Any others?"

"Sir?" This time it was Ms. Funk. "I think an office shot with a bunch of really neat and tidy, attractive people clustered around the Zooper Computer would be nice."

"Jenkins? What about you?"

"Me, sir? Well, I'd have a shapely brunette in a bathing suit sit on the computer. She could have a big coy smile and large... ."

Peppers spoke up. "I say, let's just take a slightly fuzzy picture of the darn thing and list its attributes, company name and address."

Corndog nodded. "Exactly what I was thinking. Darn good, Peppers. You should come to more of these. That's settled. Now, on the Dinko Durable Drive. What in tarnation is that thing? Ms. Funk?"

"It's an add-on hard drive for a computer. It's so you can store more information. The *Wall Street Journal* would call it a computerized filing cabinet."

"Oh, I see." Corndog nodded. "What image do you have on this? Anyone?"

Jenkins chimed in. "I think of virility, the rock-hard strength of a man. How about a Solarflex kinda guy, a GQ model? Good looking, rugged, deep blue eyes. Maybe wearing a hard hat and a tight skivvy shirt. Lots of muscles. Then, next to him could be this Snap-on-Tool type of model with a hard hat and a bathing suit. She could be a redhead! He could say, "Dinko Durable Drive, be a man and use it."

Corndog rolled his eyes. "Peppers, you have an idea?"

"Yes. I say let's just do a page of text. We could just have a chart that lists the qualities that this thing has against the others. Two-, maybe three-color graphics and a little photo of the thing in the corner. The headline would read: 'Good Disk Drives Come From Dinko. At the bottom we could use the tag line 'Dinko, No Stinko!' "

"Fabulous! That's all for today, gentlemen. Thank you for your input."

I can hardly wait!

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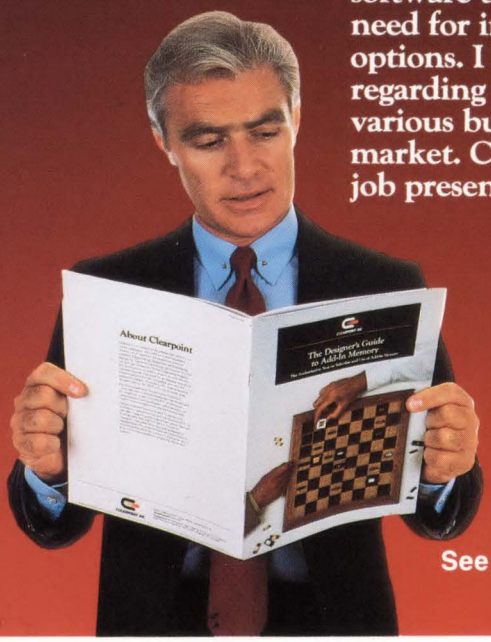

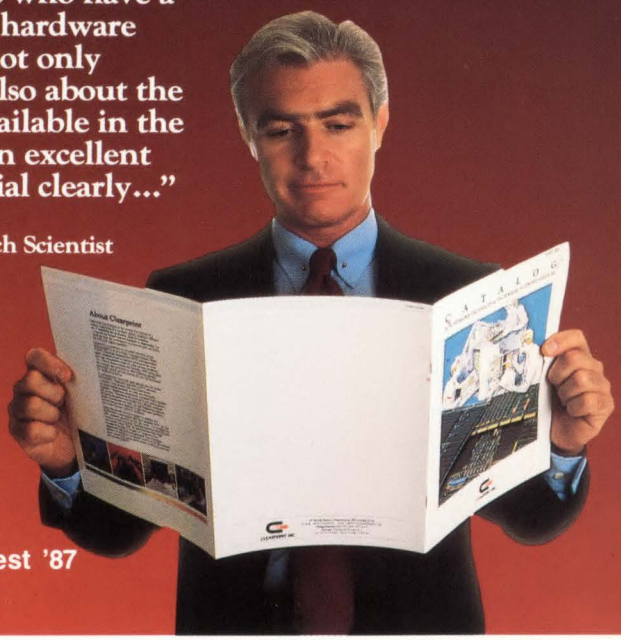

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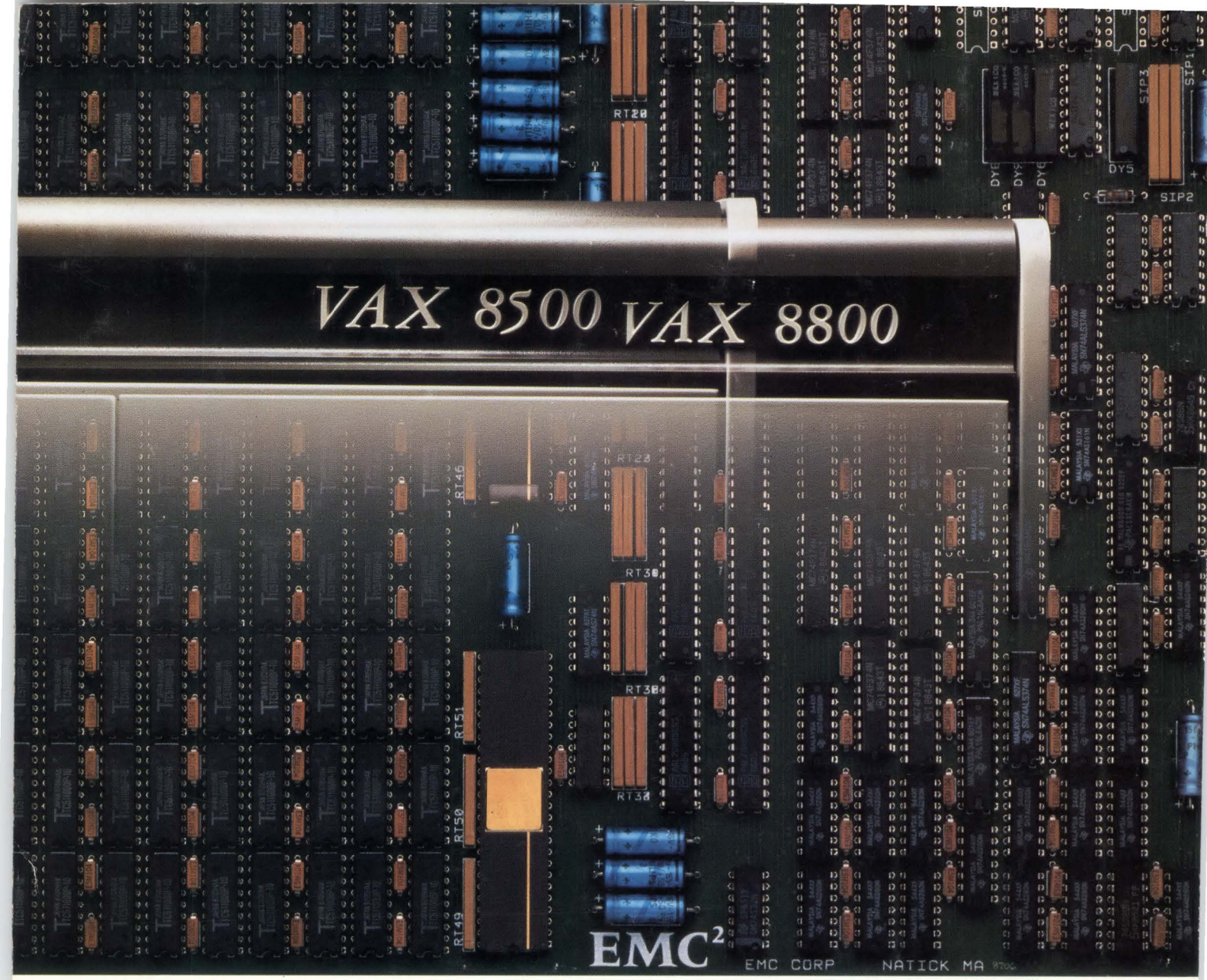

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