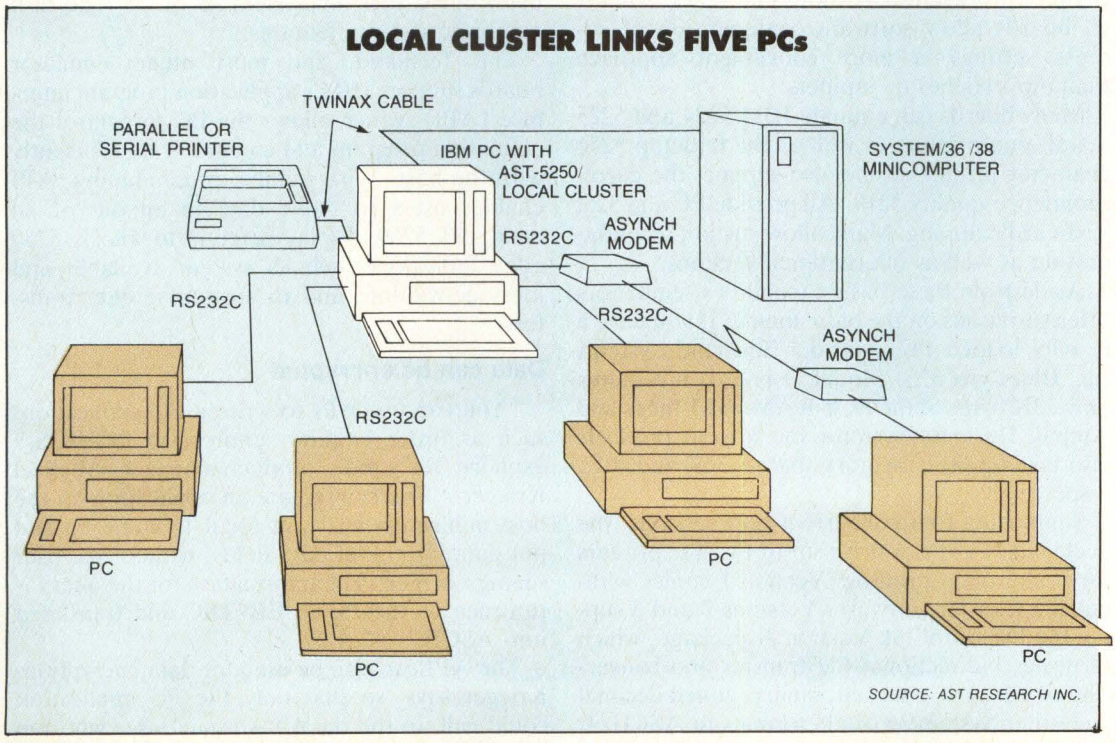
MICRO-TO-MINI OPTIONS MULTIPLY

Local and remote emulator boards, intelligent links, cluster products and LU 6.2 interfaces speed access to corporate data

Jesse Victor, Associate Editor

As departmental minicomputers become a key part of many organizations' office-automation strategies, system integrators have more choices than ever in linking these machines and disparate microcomputers. Local 5250 emulator boards and file-transfer software give IBM Corp. PCs, PC/XTs and PC/ATs access to departmental files stored in IBM System/36 or System/38 minicomputers. Remote boards provide similar access through integral or separate modems and telephone lines to geographically dispersed microcomputers.

Intelligent microcomputer-to-minicomputer products furnish more flexible and selective access to corporate data. Cluster software, application-specific links and local area network servers offer cost-effective solutions for many linkage problems. And looming on the horizon are the Logical Unit (LU) 6.2 packages of IBM's Systems Network Architecture that could radically



Cluster software and hardware, *such as the AST-5250/ Local Cluster from AST Research, allow five IBM PCs to exchange files with a host minicomputer via the cluster product installed in one of the PCs.*

All 5250 boards allow for multiple LU sessions with the host, permitting a printer to operate concurrently with a workstation session.

alter the nature of microcomputer-to-minicomputer and microcomputer-to-mainframe links.

Vendors of 3270 emulator boards for micro-to-mainframe connections have turned to 5250 emulation to offer a growing number of products linking IBM PCs to System/36 or /38 minicomputers (see table, Page 68). All vendors include both twinaxial (twinax) cable for the connection to the minicomputer and terminal-emulation software. The software makes the System/36 or /38 think it is talking to the IBM 5251 Model 11 or Model 12 (remote), or to the 5291 or 5292 (color) display station normally attached to the minicomputer.

The emulation software transforms the PC into a dumb terminal. It allows users to view files but not to download them for processing by the PC. Approximately half of the 5250 emulation-board vendors listed bundle software with their add-in boards to provide basic whole-file-transfer capabilities and enable the PC to manipulate the transferred data. Other vendors offer popular file-transfer packages, such as DecisionLink 5251/11 from the DecisionLink division of Laguna Laboratories Inc. or Software Systems Inc.'s (SSI) emulator transfer utility (ETU).

Variations on the basic theme

All 5250 boards allow for multiple LU sessions with the host, permitting, for example, a printer to operate concurrently with a workstation session. Hotkey capability (usually a two-key sequence) enables users to toggle back and forth between workstation sessions and DOS. Almost all boards allow software configuration of address settings—a more convenient approach than dip switches or jumpers.

Many boards can emulate IBM 5224 and 5225 mainframe printers as well as the tabletop 5256 character printer. Some also support the correspondence-quality 5219. All provide PC and 5251 keyboard mapping. Many allow custom reconfiguration as well as international versions.

Aside from these basic capabilities, emulators offer variations on the basic theme. If you have a heavily loaded PC, consider Techland Systems Inc. BlueLynx 5251/Model 11 board. It requires only 23K bytes of the PC's RAM. CXI Inc.'s and Ampak Business Systems Inc.'s local products also take up little memory space—36K and 40K, respectively.

Supporting four concurrent host sessions, the Techland board can drive up to two PC printers for background printing. Version 1 comes without file-transfer software. Versions 2 and 3 supply the DecisionLink Version A package, which furnishes bidirectional file transfer and conversion of EBCDIC, packed, binary, zoned decimal and other System/36 or /38 formats to ASCII. It also supports conversion of PC formats such as BASIC sequential, WKS, WRK, data interchange format (DIF) and binary image. BASIC Sequential is used by MicroPro International Corp.'s WordStar, WKS by Lotus Development Corp.'s Lotus 1-2-3 and WRK by Lotus' Symphony.

A $1,295 upgrade furnishes DecisionLink Version B, supporting additional capabilities: record selection, file-chaining, storage of up to 520M bytes of PC files on System/36 or /38 rigid disk and basic security features.

The Techland, and most other emulator boards support IBM's application program interface (API), which allows the PC to control the emulation program and communicate efficiently with the host. With suitable programming, API enables users to move data in an out of an emulated 5250 display screen; to check 5250 edge indicators such as system available and message-waiting; and to customize data transfers.

Data can be encrypted

"You can use API to write a PC application, such as order enquiry, entirely in PC-DOS," explains Techland's product manager, Michael Krieger. "You can initiate an application on the host minicomputer, wait for it to come up and put data into input data fields, without the user seeing a screen. The information for the query is returned to the PC in EBCDIC and translated into ASCII."

The API can also be used for data encryption, Krieger says, so that only the PC application could call up the data. "A casual user who ran

MICRO-TO-HOST PRODUCTS EVOLVE

Characteristic	1985	1990	1995
Open vs. closed architecture	mixed	separate	separate
Security	poor/fair	good	good
Application front-ends	few	many	ubiquitous
Modular architecture	none	common	common
Bulk data handling	little	common	integrated
Distributed data bases	none	few	some?
Microcomputer interface	program	operating system	operating system
Program-to-program interfaces	few	some	common

Source: International Resource Development Inc.

that job would get garbage." Techland and some other emulator vendors supply a board-level interface as an alternative to IBM's API that talks directly to host hardware.

The Techland board supports IBM's file support utility (FSU), which permits PC users to create virtual disks on System/36 or /38 and other IBM packages such as PC Support 36/38, IBM's "main line" of access from its PCs to its minicomputers.

Digital Communication Associates Inc.'s Smart Alec 5250 emulator can run with the company's Irma board for simultaneous microcomputer-to-minicomputer (5250) and micro-to-mainframe (3270) communication. If you have many devices on one twinax run, Smart Alec's address-bidding feature allows a PC to share one of the seven System/36 or /38 addresses with another PC.

Pathway Design Inc.'s pcPATH 5250 remote board goes beyond IBM's API. Its programmatic interface facility (PIF) allows direct access to SNA data streams via the SNA Transport Layer. "It gives you complete functionality to build applications," explains Mark Mackaman, product manager at Pathway. "You can write applications to make the emulator completely transparent to the user."

The AST 5251/11 Plus board from AST Research Inc. sports a screen-snapshot feature that allows users to save a screen in memory for future retrieval. An optional card enables a PC to emulate all 32 5250 display attributes—normally limited to approximately 20 with most boards.

IDEAssociates Inc.'s IDEAcomm 5251 has a similar capability. The D card option replaces IBM's monochrome display adapter (including a parallel port). The board can configure IBM's Wheelprinter, Hewlett Packard Co.'s Laserjet, NEC America Inc.'s 3550 and other PC printers for 5219 emulation. The enhanced emulator supports a wide variety of file-transfer packages including DecisionLink, ETU, Marcam Data Systems Corp.'s INTELINK, Software International Corp.'s Smart Link and and On-Line Software International's OMNILINK.

Finally, Ampak's PC-Mini Extra, the AST board, CXI's PCOX 5251 Twinax, Quadram Corp.'s MiniLink and Software Systems' PC 5251 Twin all support all seven 5250 sessions. The Ampak board allows concurrent flexible disk and rigid disk operation on the PC.

Basic file-transfer packages may not supply the flexibility, selective data extraction, logic- and math-processing and security procedures that system integrators and end users require for more demanding applications. Intelligent products from On-Line, Marcam, Fusion Products International Inc. and Software Research Corp. (SRC) fill the gap.

On-Line's OMNILINK for System/36 or /38 machines, for example, combines selective-data-retrieval, reformatting and math and conditional-processing capabilities. With the package, users can select fields and records from as many as 16 System/36 or /38 files, do mathematical and logical operations on the data before it is transferred and automatically download the data into PC application programs. A part of OMNILINK attached to the PC, ExecuTrieve/PC, accepts English commands to manipulate the data or to do additional ad hoc queries with it.

Explains On-Line System/36 and /38 products sales manager, Steve Camp: "If you move data from the system database into Lotus 1-2-3 and find one of the columns was incorrectly selected, you can move to ExecuTrieve/PC, do additional selecting, sorting, conditional or math processing and put that back out through the file-reformat utility into Lotus."

Access to data through the data dictionary is controlled by a 10-level file, field and function security system, which, for example, can restrict the ability of a user to print out or transfer data.

Most emulator boards support IBM's application program interface (API), which allows the PC to control the emulation program and communicate efficiently with the host computer.

Download into PC applications

Marcam's INTELINK also offers selective, record-level data transfer and automatic downloading into popular PC applications such as Lotus 1-2-3, Microsoft Corp's MULTIPLAN, Ashton-Tate's dBase II or III and MicroPro's WordStar. It can transfer as many as nine files with 99 fields in one operation, loading data directly into individual spreadsheet cells or through horizontal or vertical data strings.

"Simple file-transfer packages translate from EBCDIC to ASCII, but from there, there may be a lot of work to do in order to use the data in your spreadsheet or other PC application," contends Carole Bowers, manager of telemarketing at Marcam. "We deal with users who have purchased the basic emulation package and found it didn't meet their needs."

File-transfer products from Fusion and Software Research suit sophisticated applications and/or extensive networks of connected machines. The ASTlink option functions with the FUSION/36 information-retrieval system on the System/36, with the FUSION/4 on the System/38 and with the AST Research 5251/11 emulator board. Automatically converting data into ASCII, DIF or Lotus 1-2-3 format for the PC, /XT or /AT, ASTlink pulls data from as many as 10 files on the System/38 and up to eight files on the System/36. Users can specify sorting and selection criteria, a full range of mathematical functions and can arrange data on the screen to

Cluster products and boards with integral modems offer cost savings for remote links.

match the PC application.

The ASTlink option for the Fusion/36 package supports its menu-based retrieval processor, personal-database, file-maintenance, data-dictionary and color-graphics functions as well as specialized functions such as the link-access method (which follows pointer chains) and the alternate index capabilities of the System/36. Each logical record can be assigned a password, and an audit trail keeps track of user accesses and data modifications.

Connects diverse machines

Consider SRC's strategic network environment/file transfer facility (SNE/FTF), if you want to exchange information among microcomputers, minicomputers and mainframes from several different vendors. The network software links IBM or IBM-compatible microcomputers running PC/MS-DOS Version 2.1, Digital Equipment Corp. (DEC) VAX computers running VMS Version 4.1 or Wang Laboratories Inc. virtual storage (VS) machines running version 06.30.07 and IBM mainframes using Multiple Virtual Storage (MVS) or virtual machine (VM) operating systems.

Combining file-transfer, message, directory, operation and administration services, the product provides such functions as electronic messaging, MVS batch interfacing, checkpoint-restart capability, priority control and asynchronous delivery of information with store-and-forward services. Extensive data-security procedures are included.

SRC has a joint marketing agreement with Banyan Systems Inc. and plans to enhance its SNE products to support Banyan's virtual network system (VINES). Based on UNIX System V and Banyan's file server, the system is an alternative to 5250 emulation for connecting multiple microcomputers.

Front-end services—file transfer and terminal emulation—connect the file server to up to five LANs from six different vendors. Back-end services provide transparent access to host processors and wide-area networks. Network resources appear as local services to PC users. The StreetTalk global directory system allows users to find and access files regardless of where they reside on the network.

"If you want a group of files called 'Sales volumes for 1985,' the system will find where the sales volumes are kept and access the data," contends Anand Jagannathan, vice president for systems at Banyan. "Once you have the volume, you use DOS names to find the file. To DOS it looks like another drive, say, Drive E."

Jagannathan claims there are cost savings with the VINES system when compared to 5250 emulation. "Our approach can be an order of magnitude cheaper than that of the System/36," he asserts.

VINES Release 1.25 supports MS-DOS 3.1 with enhanced security, SNA file-capture and record-locking calls for multiuser application programs such as Cosmos Inc.'s Network Revelations and Microrim Inc.'s RBASE 5000. Also supporting MS-DOS 3.1, as well as PC Networking programs, BABY/36 release 2.0 from California Software Products Inc. allows users to run and develop System/36 RPG II-based applications on IBM PCs and compatibles. Modules include an RPG II compiler, an operation-control-language (OCL) processor, screen-format generator and source-entry utility.

Cluster products from AST Research, DecisionLink and Techland and boards with integral modems from SSI offer cost savings for

REPRESENTATIVE

Manufacturer/ Model	Local	Remote	File-transfer software included	Concurrent host sessi
Ampak PC Mini Xtra	✓		✓	7
AST 5251/11 Plus	✓		✓	7
5251/12		✓		2
CXI PCOX/5251 Twinax	✓		✓	7
DCA Smart Alec	✓		✓	3
IBM Enhanced 5250 Emulator	✓			2
IDEAssociates Enhanced IDEAcomm/5251	✓			4
IDEAcomm 5250/Remote		✓		9
Pathway pcPATH 5250		✓	✓	4
Quadram MiniLink		✓	✓	7
Techland 5251/Model 11, Version 3	✓		✓	4
Advanced 5251/Model 12		✓	✓	5
Tecmar 5251/11	✓			2
Software Systems PC/5251 Twin	✓			7
PC/5251 Plus		✓		2

remote links. For example, AST's AST-5250/ Local Cluster two-board, hardware/software package allows four PCs or compatibles connected to a PC acting as a controller to emulate IBM 5251 Model 11, 5251 or 5292 Model I terminals without the cost of additional hardware or software for the attached PCs. Local PCs connect via RS232C cable; remote PCs, via asynchronous modems. Full bidirectional file transfer is provided.

DecisionLink's 5251 Cluster software furnishes 5250 emulation via RS232C cable for up to six PCs and compatibles connected to the controller PC (with emulator board in place) for $395 per PC. Techland's clustering solution allows two other PCs to connect to its emulator card via asynchronous ports. The company's new LAN gateway will provide APIs to PCs connected on a LAN to the gateway PC, allowing them to run DecisionLink or other file-transfer programs.

SSI's PC/5251 Mate remote board replaces two components: an SDLC adapter and a modem. It combines 5251 Model 12 remote-workstation emulation, auto-dial features, menu-selected configuration and unattended operation with a 2,400-bit-per-second (bps) Bell-compatible 201C synchronous modem or 4,800-bps 208A/B modem.

Access/36, Access/38 and Automated Data Transfer (ADT) utility from Access Telecommunications Corp. permit two-way data transfer as well as voice reponse between host computers and asynchronous devices (such as hand-held computers). The Access Box control unit performs ASCII to EBCDIC translation and multiplexes up to eight ASCII devices over one bisynchronous line to the host. Supported languages

5250 EMULATOR PRODUCTS

PC memory (K bytes)	Download-to-PC formats				Printers emulated				Keyboards emulated				Application interface	Software support						Price ($)
	ASCII	DIF	Lotus 1-2-3	Other	5256	5224	5225	5219	5251	Custom	International	IBM	Own	PC support/36/38	FTF (File Transfer Facility)	FSU (File Support Utility)	ETU (Emulator Transfer Utility)	DecisionLink	OMNILINK	
40	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		✓		895
190	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓		895
128	✓		✓		✓	✓	✓	✓	✓	✓			✓	✓						790
36	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓				895
64	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓		✓		895
45					✓			✓	✓	✓		✓		✓	✓	✓	✓			845
50					✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	895
					✓	✓	✓		✓		✓	✓		✓	✓	✓	✓	✓		795
256	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓							750
128	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓	✓		✓		995
23	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	1,045
120	✓	✓	✓	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓	695
60					✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓		795
64					✓	✓	✓	✓	✓	✓			✓		✓	✓	✓			895
64													✓		✓	✓	✓			750

include RPG II and III (on the host) and BASIC (on the PC).

Other specialized micro-to-host links offer performance advantages in dedicated applications. Connecting a PC to Software International's host-computer-based General Ledger and Financial Reporting System, SMART LINK software permits the selective downloading of data directly into DIF-compatible PC spreadsheets as well as uploading back to the host.

Automatically reformatting data for popular PC application programs, menu-driven INGRES/PCLINK from Relational Technology Inc. furnishes access to the company's INGRES relational database management system running on UNIX or DEC VAX/VMS host computers. PC and host components link via dial-up or direct asynchronous communications or through an Ethernet LAN.

Mini-to-mainframe links are also beginning to appear for AI-based machines. For instance, Symbolics Inc.'s new SNA Facility connects the manufacturer's symbolic processing, LISP-based, 3600 Series of computers to IBM 4300, 3030, 3080 or 370 mainframes running applications under MVS. A high-level application interface governs access to customer information control system (CICS) applications. Symbolics' DECnet product allows several computers to be intermixed with DEC VAXes.

LU 6.2 interface/advanced program-to-program communication (APPC) products such as Rabbit Software Corp.'s Peer-to-Peer PLUS, Communications Solutions Inc. Access/SNA APPC and the Orion Group Inc. SNA6.2 Peer Communications Facility portend the revolution such products may cause in microcomputer-to-minicomputer and micro-to-mini-to-mainframe communications.

The LU 6.2 protocol—a completion of the

Companies mentioned in this article

Access Telecommunications Corp.
3010 Woodcreek Drive
Downers Grove, Ill. 60516
(312) 960-4455
Circle 357

Ampak Business Systems Inc.
2640 Walnut Ave.
Tustin, Calif. 92680
(714) 731-4217
Circle 358

AST Research Inc.
2121 Alton Ave.
Irvine, Calif. 92714
(714) 863-1333
Circle 359

Banyan Systems Inc.
135 Flanders Road
Westboro, Mass. 01581
(617) 366-6681
Circle 360

California Software Products Inc.
525 N. Cabrillo Park Drive
Santa Ana, Calif. 92701
(714) 973-0440
Circle 356

Communications Solutions Inc.
922 S. Saratoga-Sunnyvale Road
San Jose, Calif. 95129
(408) 725-1568
Circle 361

CXI Inc.
3606 W. Bayshore Road
Palo Alto, Calif. 94303
(800) 225-PCOX
Circle 362

Digital Communications Associates Inc.
1000 Alderman Drive
Alpharetta, Ga. 30201
(800) 241-IRMA
Circle 364

IBM Corp.
P. O. Box 1328
Boca Raton, Fla. 33432
(800) 426-2468
Circle 365

IDEAssociates Inc.
35 Dunham Road
Billerica, Mass. 01821
(617) 663-6878
Circle 366

Fusion Products International Inc.
900 Larkspur L. C.
Larkspur, Calif. 94939
(415) 461-4760
Circle 367

Laguna Laboratories Inc.
DecisionLink Division
300 E. Normandy Place
Santa Ana, Calif. 92705
(714) 835-9100
Circle 363

Marcam Data Systems Corp.
19 Crawford St.
Needham, Mass. 02192
(617) 449-5510
Circle 368

On-Line Software International
Fort Lee Executive Park
2 Executive Drive
Fort Lee, N.J. 07024
(201) 592-0009
Circle 369

Orion Group Inc.
1912 Bonita Way
Berkeley, Calif. 94704
(415) 548-0947
Circle 370

Pathway Design Inc.
1 Apple Hill
P. O. Box 8179
Natick, Mass. 01760
(617) 237-7722
Circle 371

Quadram Corp.
1009 Mansell Road
Roswell, Ga. 30076
(404) 993-4590
Circle 372

Rabbit Software Corp.
Great Valley Corporate Center
7 Great Valley Parkway E.
Malvern, Pa. 19355
(215) 647-0440
Circle 373

Relational Technology Inc.
1080 Marina Village Parkway
Alameda, Calif. 94501
(415) 769-1400
Circle 374

Software International Corp.
1 Tech Drive
Andover, Mass. 01810
(617) 685-1400
Circle 375

Software Research Corp.
1 Natick Executive Park
Natick, Mass. 01760
(617) 655-1133
Circle 376

Software Systems Inc.
P. O. Box 1766
Jefferson City, Mo. 65102
(314) 893-6000
Circle 377

Symbolics Inc.
11 Cambridge Center
Cambridge, Mass. 02142
(617) 577-7500
Circle 378

Techland Systems Inc.
25 Waterside Plaza
New York, N.Y. 10010
(212) 684-7788
Circle 379

Tecmar International Inc.
6225 Cochran Road
Solon, Ohio 44139
(216) 349-1009
Circle 380

sixth, Presentation Services, layer of IBM's SNA architecture—will allow system integrators to implement true peer-to-peer and program-to-program communications between microcomputers, minicomputers and mainframes by eliminating the master-slave relationship inherent in 3270 or 5250 emulation. Each device in an LU 6.2 network would have equal status to send or receive data without the overhead involved in having a host master control the transaction.

Modules supply flexibility

Rabbit Software's Peer-to-Peer PLUS UNIX-based implementation of LU 6.2 and Physical Unit (PU) 2.1 for microcomputers is one of four software modules that together provide application services, a device handler/LU manager, protocol handler and data-link control. When implemented on a network, the LU 6.2 package gives PCs access to mainframe applications as well as to devices on a token-ring LAN via a gateway PC. One LU can engage in multiple, simultaneous conversations with another LU or in single sessions with different LUs.

The modular structure provides flexibility for distributed applications contends Eliot Kane, director of marketing. "Each module has enough intelligence to handle data streams and arbitration. Lower levels of synchronous data link control (SDLC) can be exchanged for X.25. I can talk through Ethernet between modules, through data streams, shared memory or pipes."

Most manufacturers of 5250 emulation boards indicate they will eventually support LU 6.2 on their products. Many minicomputer vendors have also announced support for the protocol. Over the short term, however, LU 6.2 is unlikely to supplant emulation for microcomputer-to-minicomputer or micro-to-mainframe communications. Implementations will have to work their way down from heavy-transaction-processing-oriented applications on large mainframe networks. The International Standards Organization rejection of LU 6.2 as the basis of an open systems interconnection (OSI) transaction-processing protocol may slow down the LU 6.2 bandwagon and spur alternative, OSI-based means of accomplishing the same functions.

"To say that the System/36 supports LU 6.2 is one of IBM's positioning statements," comments International Resource Development Inc. senior consultant, Naomi Kalmus. "They are saying, if you stick with us, we will solve all the problems." The heavy mainframe overhead associated with LU 6.2 may also deter system integrators. "LU 6.2 is clearly a mainframe strategy. I see no reason to think IBM has abandoned its goals for the mainframe market or its belief that everything should rely on the mainframe."

LU 6.2, however, is only one possible direction for the evolution of microcomputer-to-host computer (minicomputer or mainframe) links. The Norwalk, Conn. market-research company expects link products to change from closed or mixed architectures to more clearly defined open, or proprietary, implementations. They would provide greatly enhanced security, a more modular architecture, a greater number of application front ends and a microcomputer interface more integrated into the operating system.

"Users are now confined to 5250 emulation," notes Kalmus. "They will need a different type of operating system to break out of the emulation mold."

For the time being, at least, the emulator market is expanding. Input Inc., a Mountain View, Calif., market-research company, expects the number of business microcomputers linked to host computer via emulator boards to grow from 200,000 in 1984 to 2 million in 1990—with competition from modem links and LANs—according to Bonnie Digrius, program manager at Input.

However, long-term growth of the 5250 emulator market is directly linked to sales of IBM System/36 and /38 minicomputers. Although IBM has identified the System/36 as the keystone of its departmental-computing strategy, analysts indicate that end users are concerned about the lack of a clear upgrade path and what they see as limited interconnect capabilities on the System/36. Some IBM representatives tout the System/38 as the upgrade to the System/36. However, its different (relational) architecture, operating system (control program facility) and primary program language (RPG III) may make migration difficult. Large-scale defections from System/36 or /38 to other computer manufacturers' solutions will hurt 5250 emulator sales.

"IBM's moves in this area are a little unclear," comments Kalmus. "They are inclined to route all communications through a mini. That could be misleading. When they reveal another piece of the puzzle, it may look very different." The "missing link" in terms of connectivity, could be support of Token-Ring Network by System/36 or /38 and mainframe machines, enabling NETBIOS and APPC to coexist on the token ring as alternative methods of peer-to-peer communications.

How end users and system integrators react to these imponderables will determine the future of microcomputer-to-minicomputer and mini-to-mainframe links. □

The LU 6.2 protocol eliminates the master-slave relationship inherent in 3270 or 5250 emulation.