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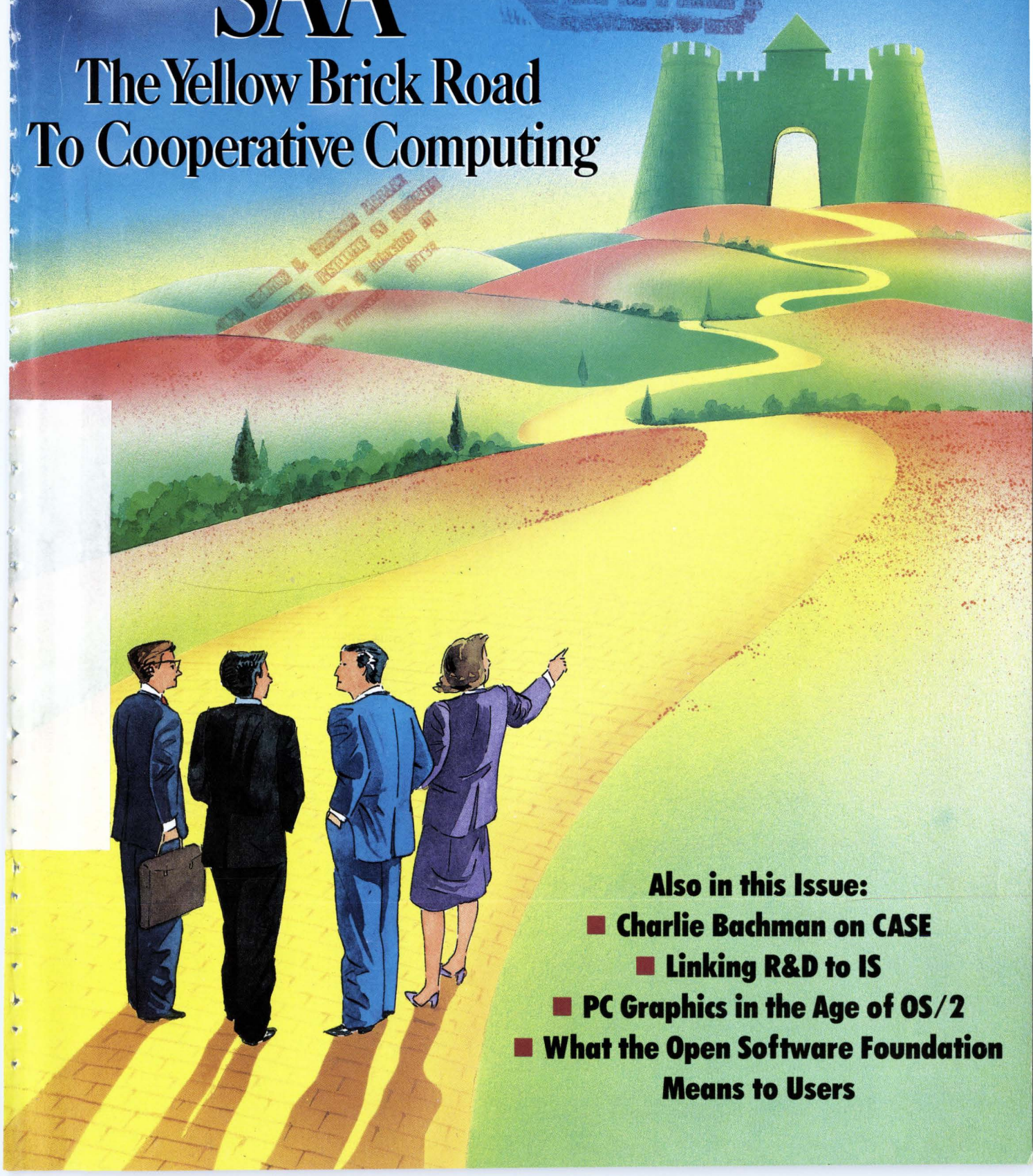
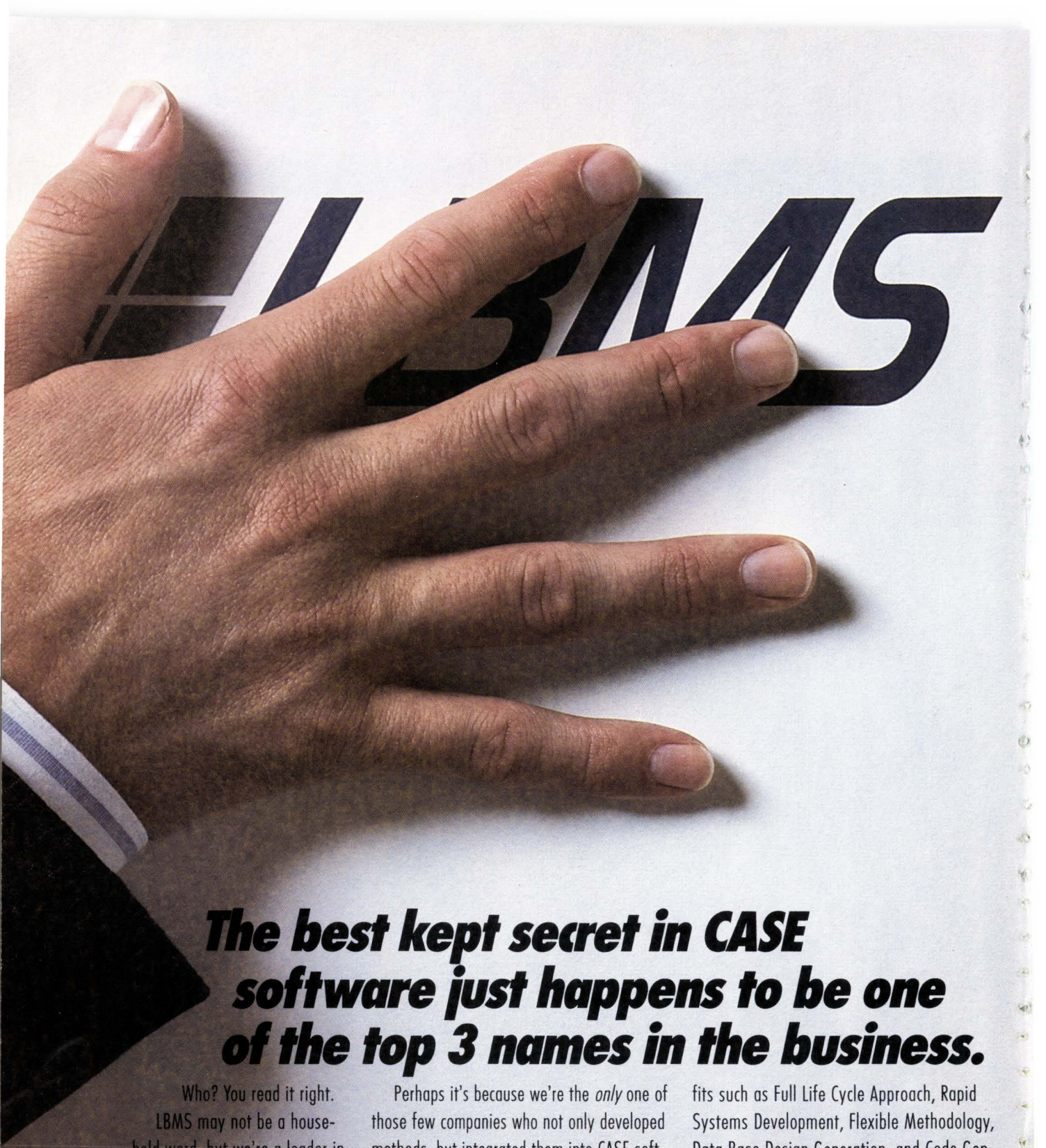
SAA

The Yellow Brick Road To Cooperative Computing



Also in this Issue:

- **Charlie Bachman on CASE**
- **Linking R&D to IS**
- **PC Graphics in the Age of OS/2**
- **What the Open Software Foundation Means to Users**



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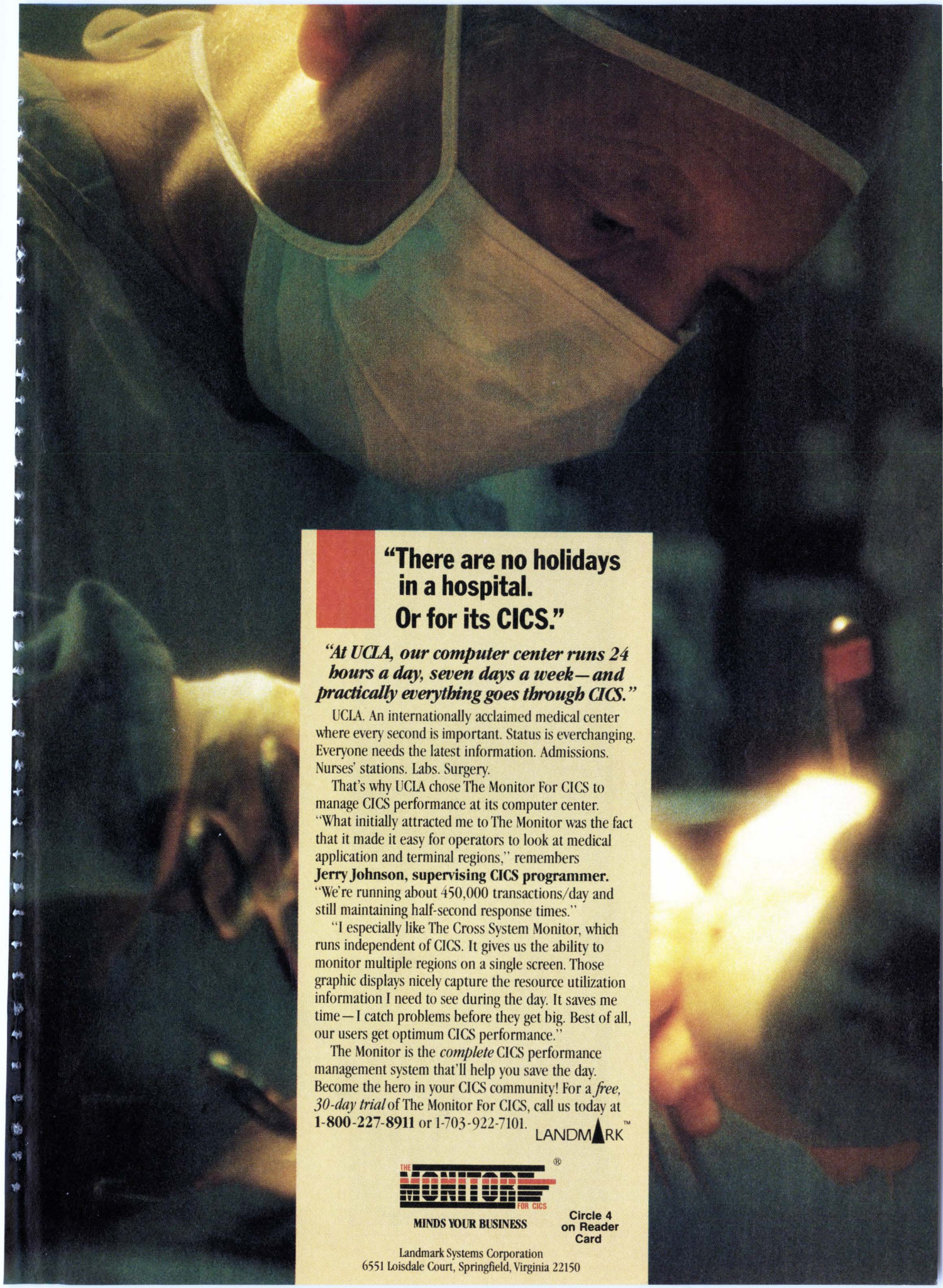

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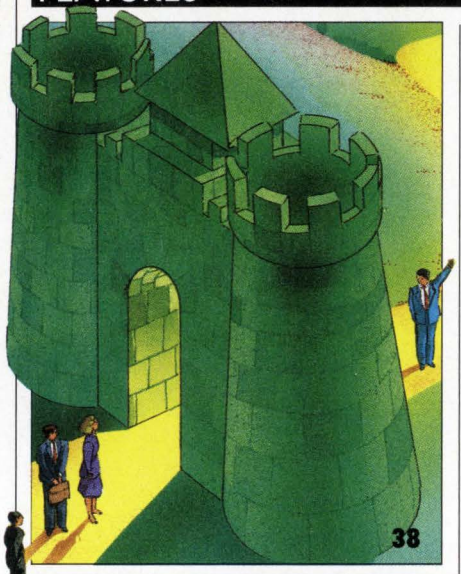

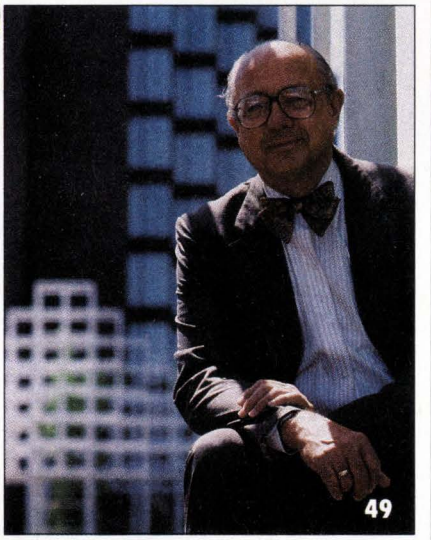

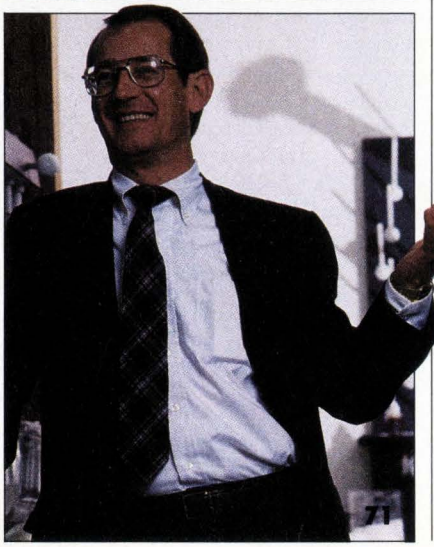

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Cover illustration by Andrea Baruffi

INTERNATIONAL EDITION

JULY 1, 1988
VOLUME 34
NUMBER 13
THIS ISSUE, 184,153 COPIES

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Editorial

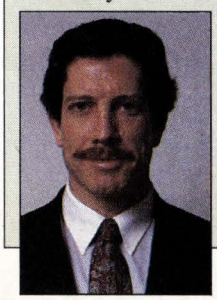
Taxation Without Representation

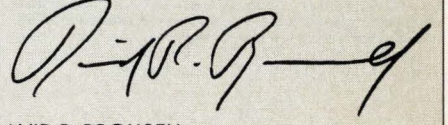
The Open Software Foundation's stated goal of an open software environment that would enable a user to implement software and hardware from many vendors would seem almost like an appeal to motherhood and apple pie. Who could not be in favor of open environments, standards, and freedom of choice in selecting elements of an information system? But as we reflect upon OSF, its stated goals, and the reasons for its formation, two concerns come to mind that considerably dampen our enthusiasm for this new enterprise.

"Openness and portability"—the two chief objectives of OSF—certainly would provide benefits to both users and vendors, but they go only part of the way toward fulfilling what you, the user, really wants and needs: integrated computer environments to run your business efficiently and seamlessly. OSF—and the industry—are still a long way from this plateau, which can be reached only via a crucial working alliance between users and vendors.

Which bring us to our second and perhaps most troubling concern about OSF. Apart from the competitive battle between OSF members and AT&T and Sun over the direction of Unix, the fact that OSF was formed without the participation of any users or user group organizations causes us deep concern (see "User Group Chiefs Lukewarm About the Impact of OSF," p. 19). How can OSF's founding members—Apollo, Groupe Bull, Digital Equipment Corp., Hewlett-Packard, IBM, Nixdorf, and Siemens—claim they have a mandate from customers to create an open software environment when the very people they purport to serve had no say in the creation of OSF? If the goal of OSF is to free users from the colonial world of machine and operating system dependency, will it please explain why it has set its agenda and decided what technologies it will consider for its architecture without the input of the people whose needs it claims to represent? If OSF isn't careful, it could give rise to a high-tech cry from users equivalent to "No taxation without representation!"

But herein lies an opportunity. OSF should actively seek user participation. Just saying anyone is invited to join the organization isn't enough. Actually making it possible would be a major stride toward establishing the credibility it has taken for granted. In the end, OSF may not be as acceptable as apple pie, but it certainly could avoid starting out half-baked.





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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office.

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All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine. Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Copyright Wrong

I read with interest Mary Jo Foley's article, "A Small Software Firm Takes on Uncle Sam—and Wins" (April 15, p. 26). I am a lawyer who practices in the computer law area, and I write to correct a statement that appears in her article, which easily could be misunderstood.

Ms. Foley writes of the case, *BV Engineering Professional Software* v. *University of California at Los Angeles*, that BV Engineering lost "due to an existing law whereby institutions under state government cannot be sued for copyright violations." This is mistaken in at least two respects.

First, it implies that one could look under U.S. or California statutes and find a law that prevents suits against state governments for copyright violations. In fact, the decision in BV Engineering was based on the 11th Amendment to the United States Constitution, which is presently interpreted by the court to prevent suits for monetary damages against states or state instrumentalities (such as UCLA) in federal court, unless either the state consents to the suit or the federal statute specifically provides for a cause of action and recovery of damages against states. With respect to BV Engineering, because the state did not consent to the suit, and because the Copyright Act does not state expressly that states may be sued for damages, the federal district court felt constrained to rule that BV Engineering could not recover money from UCLA.

Second, as indicated above, the holding in BV Engineering concerns suits to recover money. Basically, the 11th Amendment has been interpreted to preclude actions against states that may require the payment of funds from state resources. It does not necessarily preclude suits for injuncture relief. Thus, even though BV Engineering could not recover money damages, it might have been able to obtain an order from the court prohibiting the state officials from making further copies of the software.

HOWARD G. ZAHAROFF
Brown, Rudnick, Freed & Gesmer
Boston

A Different Benchmark

The May 1 Software section (p. 87) contains a story on a new release of an SQL-based DBMS from Sybase. In this item, which also discusses performance, you say that Sybase uses the TP1 benchmark, "also known as the ET1 benchmark."

Both the ET1 and TP1 benchmarks use the same Debit/Credit transaction profile. But because their implementations are quite different functionally, the results obtained from these two benchmarks are not comparable. For example, when running the variation of the Debit/Credit benchmark used by Sybase, Tandem Computers doubled the number of transactions per second compared to Tandem's full-function implementation made public in March 1987.

DAVID W. DEMPSEY
Manager of Product Marketing
Tandem Computers Inc.
Cupertino, Calif.

Newer and Improved

In "Pc Word Processing: The Era of New & Improved" (May 1, p. 75), your abbreviated list of word processors listed PFS Write as available from Software Publishing. As a contented user for several years of programs supplied by Software Publishing, I feel qualified to point out that PFS Write was replaced about a year ago by PFS Professional Write and this is currently being released in a newly upgraded version.

ROBERT G. FREIBURGER
MSI Insurance
New London, Wis.

Regarding the story "Pc Word Processing: The Era of New & Improved," your "short list" of word processing suppliers omitted the company that produced the word processor rated number one by Datapro Research Corp., an independent rating lab, last year. The company is Informix Software (formerly Innovative Software) and the product is the Smart Word Processor. The Smart Word Processor is available in MS/DOS, Unix, and Xenix—both 286 and 386—operating environments.

PAUL S. BRUSKI
Director of Public Relations
Informix
Menlo Park, Calif.

Correction

It was incorrectly reported in Look Ahead (May 15, p. 11) that IBM Deutschland would have a layoff of 500 jobs this year, following a 1,200-job loss last year. While work force totals have dropped from 1985 to 1987, the reductions have come from a combination of controlled hiring, normal attrition, and early retirement, an IBM spokeswoman says. DATAMATION regrets the error.

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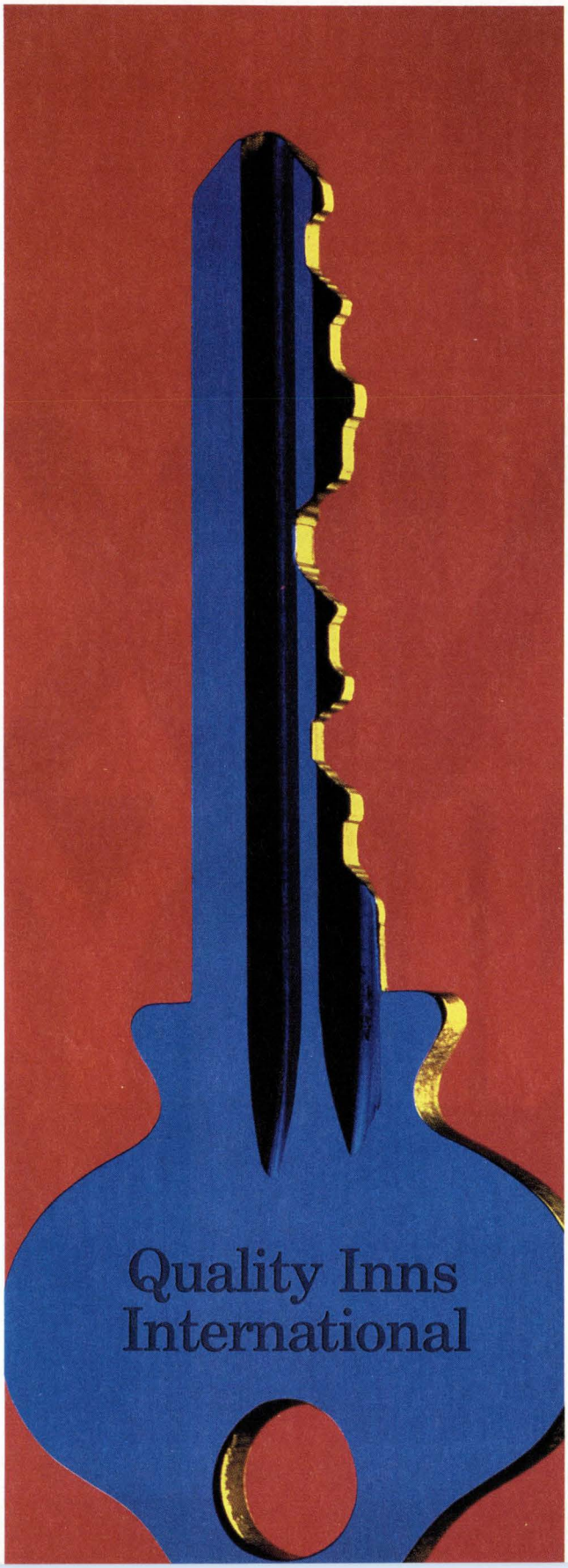

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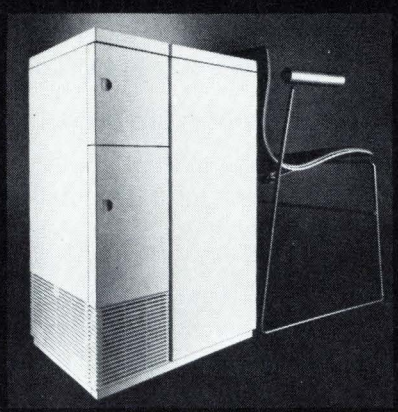

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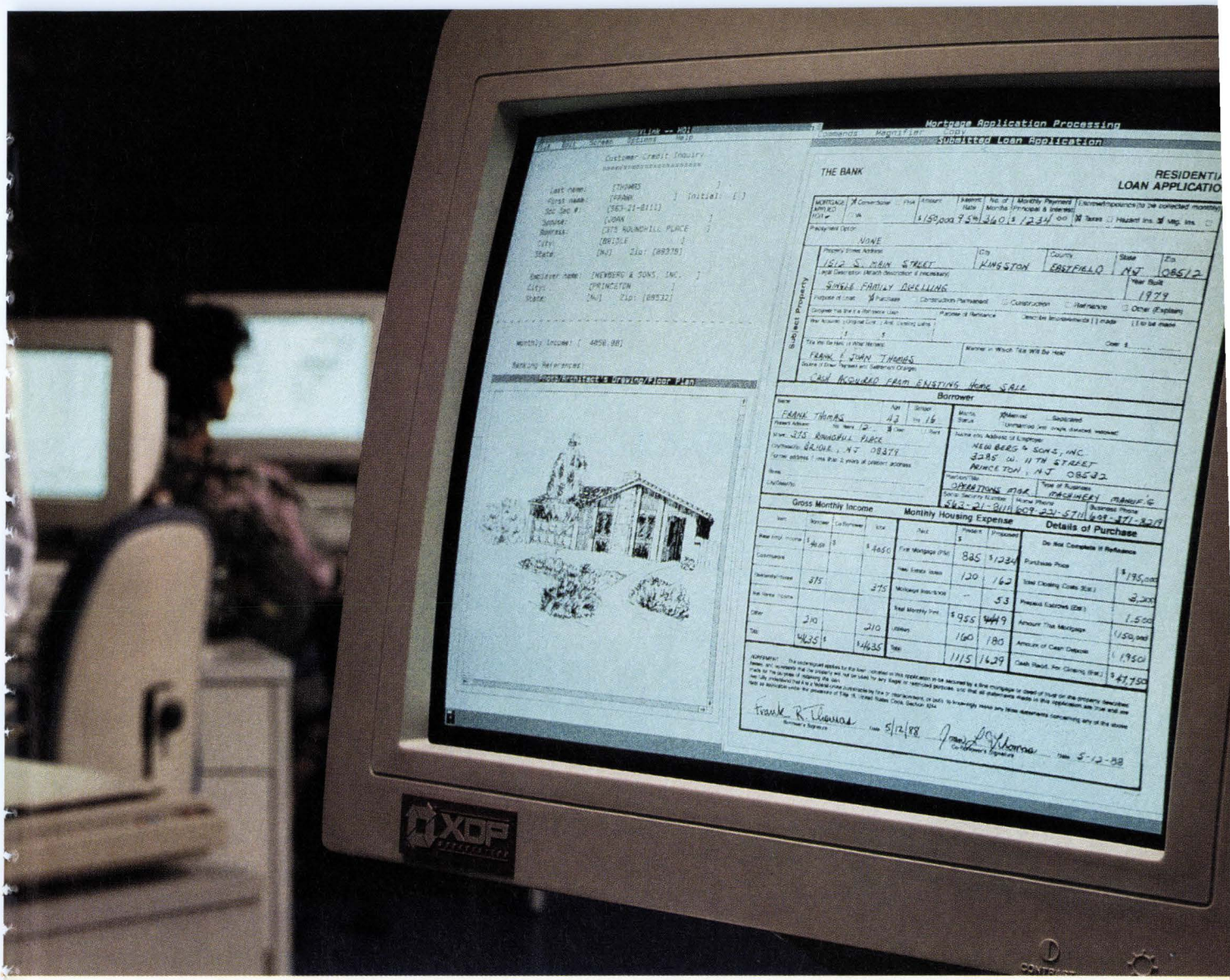

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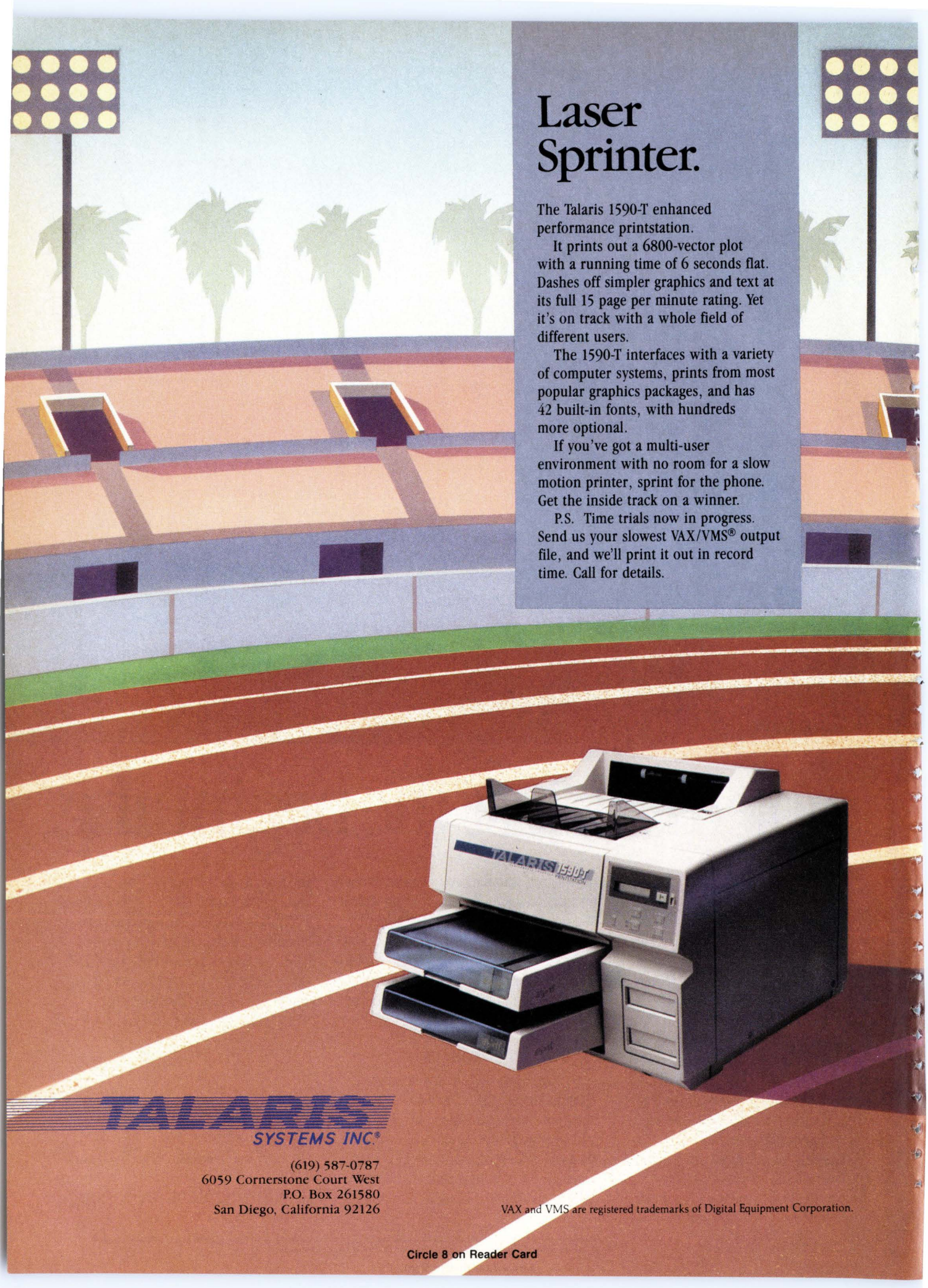
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Look Ahead

ABLE TO LEAP TALL VENDORS?

BOSTON -- Watch out Open Software Foundation. Move over X/Open. Better duck Corporation for Open Systems. Here comes Super User Group! Well, maybe. A group based in the Boston area wants to form just such an organization, initially dubbed the "Coalition of Computer User Groups." This super user group would be composed of representatives from established groups. However, one major user group head who attended the new group's first meeting says, "All we decided is that's a terrible name for a group." Beyond that, the user group leader explains, many are still undecided as to whether there is a common ground that can be served by yet another society. One obvious area could be standards making. But this super group may move even more slowly than most standards bodies. The meeting's attendees will discuss the group at their next individual board of directors meetings to decide if they want to proceed. The next step may not come until the end of the year.

IBM CASE ROAD SHOW FEATURES REPOSITORY

BURLINGAME, CALIF. -- Remember IBM's idea of a common repository to help manage object data in a software development environment? Well, it's back. IBM officials are giving users a presentation on the repository and on what IBM is calling its Application Development Environment (ADE). ADE, IBM's version of CASE, and its repository will create what IBM calls a software development view of a user's organization based on the entity-attribute relationship model developed in the mid-1970s. The repository will be supported under DB2 and SQL-DS and will support project management tools such as ADP, an IBM product currently available only in Europe. The ADE and repository announcements could come later this year, although sources say IBM is debating whether to delay the repository announcement until it is ready to discuss next-generation distributed releases of DB2, with which the repository will work.

AUSTRALIAN EMULATION

LOWELL, MASS. -- Will U.S. bankers say good-bye to IBM branch controllers and g'day to Wang Laboratories Inc. minis? It seems Wang's Australian subsidiary developed a controller that emulates IBM's 4700 branch controllers. Instead of connecting teller terminals to a mainframe, this down-under controller can drive existing teller applications, as well as communicate with a Wang VS mini. Wang's senior marketing manager for retail banking, Patrick F. King, will concede only that he's mulling over the idea of marketing the branch controller in the U.S.

Look Ahead

DEC SEEKS TELLER EQUIPMENT

MAYNARD, MASS. -- Digital Equipment Corp., meanwhile, is hunting for a new teller equipment supplier as a result of Sweden's Ericsson Information Systems' divestiture of its banking line to Nokia Information Systems. DEC, which is using the Ericsson equipment in a pilot project, has sent executives to NCR Corp. and to ISC Systems Corp., Spokane, Wash., in search of joint marketing or relabeling agreements. A new relationship is expected by fall.

MISSING SILVERLAKE ELEMENTS?

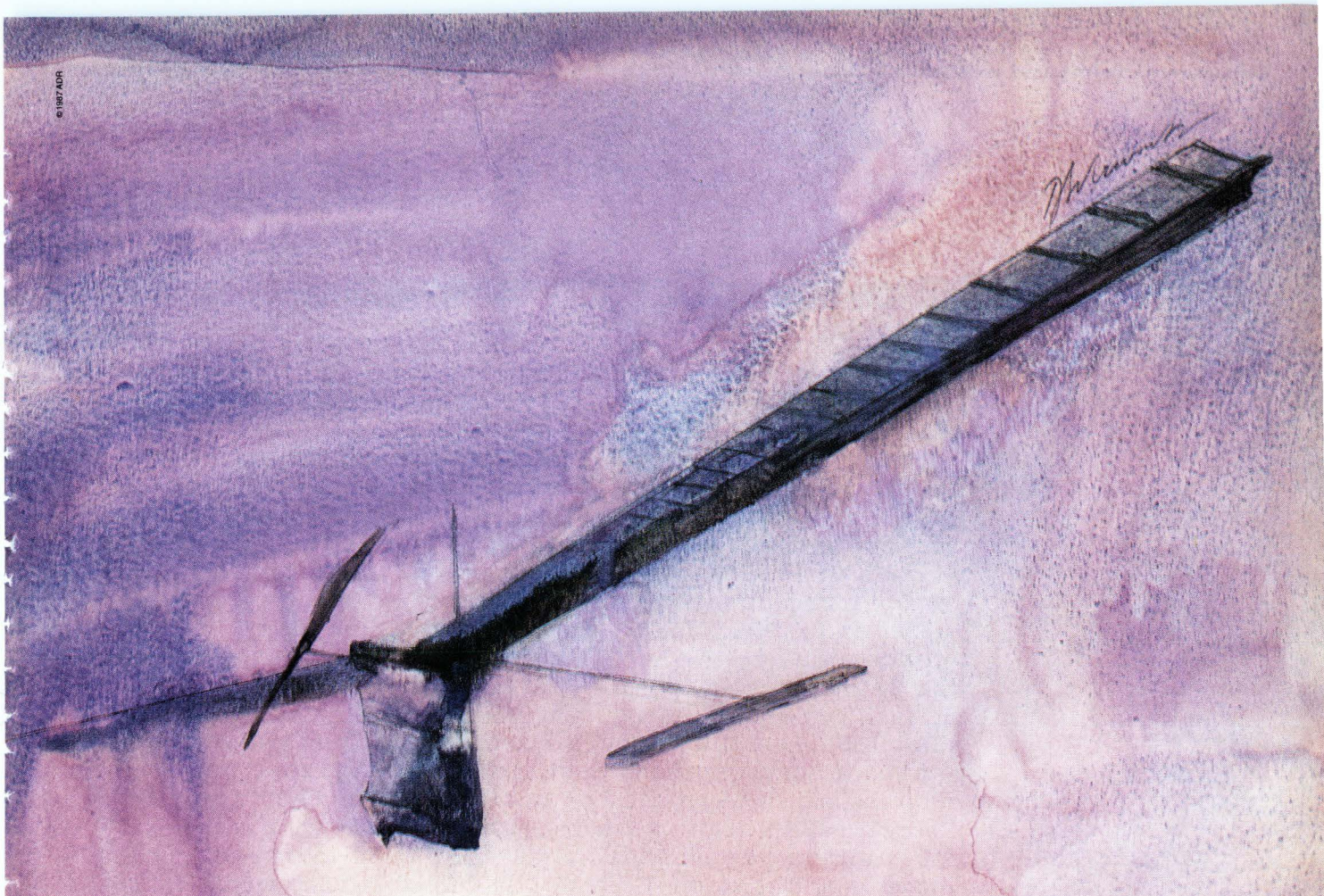
NEW YORK -- A few important features were expected to be missing from IBM's anticipated Silverlake midrange product announcement last month. In the interests of meeting its mid-June announcement target, sources say IBM was forced to leave support for the Mapics S/3X manufacturing package, the APPN S/36 low-entry networking scheme, and the SAA Rexx language compiler out of the initial Silverlake release. These are all expected to be supported in the first six months of next year, although, in the long run, Mapics is likely to be replaced by elements of a wide-ranging CIM application now being developed under IBM Applications Systems division president Joe Guglielmi. Most observers don't see the initial omission of APPN support as a weakening of IBM's long-term plan to incorporate pieces of the midrange networking scheme into SNA.

NETWORK RFP HITS SNAG AT STATE

WASHINGTON, D.C. -- The good news is that the revised Department of State Telecommunications Network (DOSTN) request for proposal (RFP) is still being revised. The bad news is that even the State Department isn't sure when the RFP will hit the street or how much DOSTN, which will link all worldwide State Department sites, will cost. DOSTN didn't make its expected May 15 release date and won't appear for a while. Cost estimates have ranged from $100 million to $500 million. So the bidding teams--Boeing Computer Systems-MCI Communications, Computer Sciences Corp.-Comsat Corp., and Contel-GTE Telenet--can only sit and wait while DOSTN winds its laborious way through the State Department bureaucracy.

DOS COMES UP FOR AIR ONE MORE TIME

SAN FRANCISCO -- Although IBM's recent PS/2 upgrade announcement did not include an MS/DOS enhancement, as some observers predicted it would, DOS devotees shouldn't give up--DOS isn't dead yet. IBM officials say they are working on upgrading DOS so that, among other things, it can accommodate larger hard disk drives. Currently, the logical limit is 32MB. The upgrade is expected later this year.



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Look Ahead

ACADEMIC TWIST

WASHINGTON, D.C. -- Battle lines are being drawn in the supercomputer industry. The International Supercomputing Institute (ISI), St. Petersburg, Fla., claims to have attracted about 4,300 attendees to its recent Third International Conference on Supercomputing and Second World Supercomputer Exhibition in Boston. Until this year, ISI had been king of the supercomputer mountain. Now, ISI no longer has the field to itself. Supercomputing '88, scheduled for November and sponsored by the Computer Society of the IEEE and ACM SIGARCH, aims to be more academic and less commercial than the ISI show. The keynote speaker will be Seymour Cray.

ISDN ON THE MOVE, SLOWLY

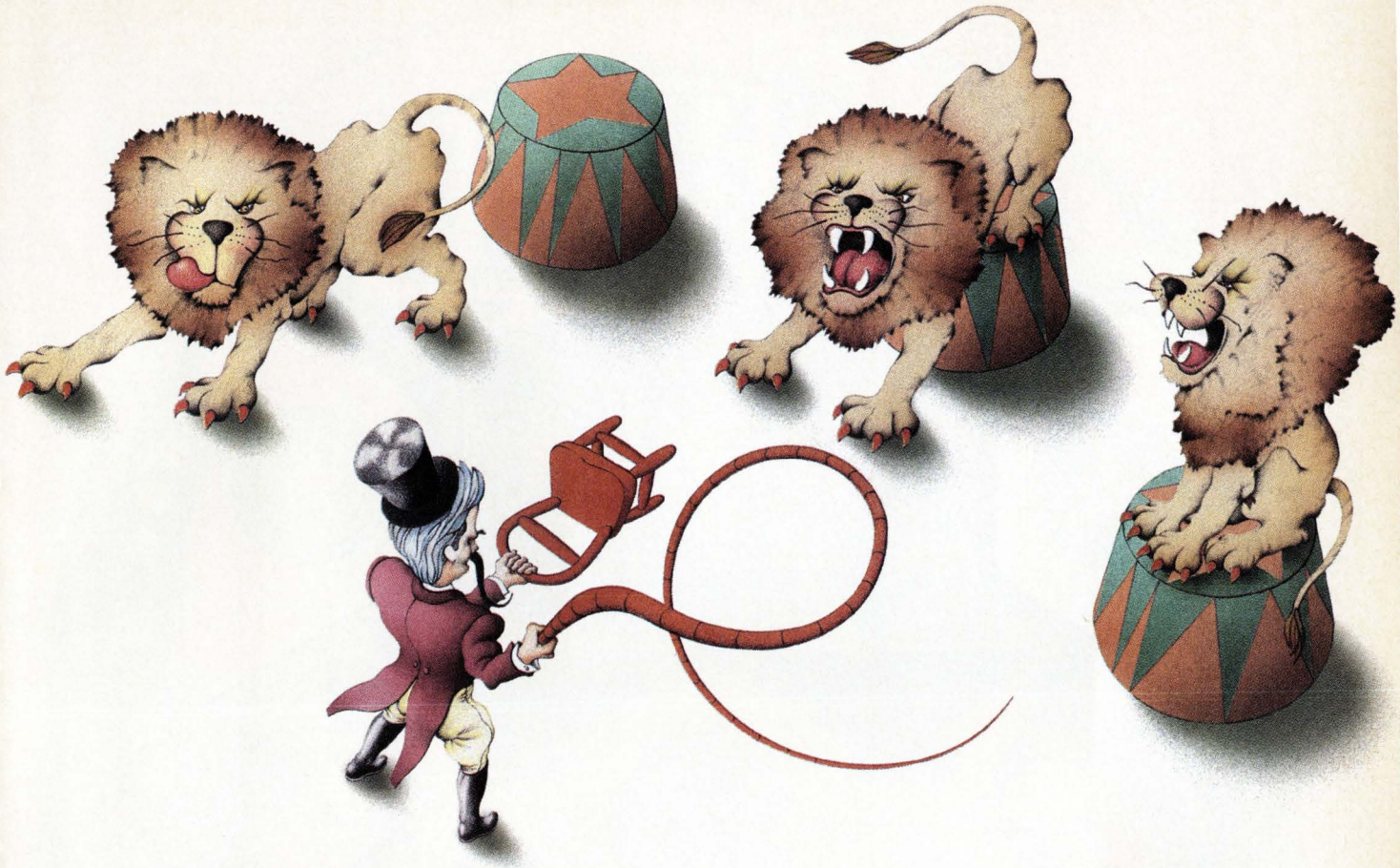
SAN JOSE -- ISDN tariffs from several big players are still a long way out, despite recent noises. BellSouth, Atlanta, tells us not to look to them for the first ISDN volume tariffs until the first quarter of 1990. This hasn't ended potential customers' interest, however. The Coca-Cola Co. is negotiating with BellSouth in regard to ISDN tests. Up north, full-blown ISDN tariffs won't come from Nynex until 1990. But that isn't hindering Nynex ISDN tests at IBM, where basic access tests should begin in the third quarter of this year.

APPLES FOR BOEING

SEATTLE -- The movement toward standards is helping at least one vendor. Richard Wilk, manager of network technology for the Boeing Commercial Airplane Support Div., says his group is in the process of approving Apple Computer Inc.'s Macintosh computer as a standard buy. The reason for this is Apple's recent movement toward the OSI networking standard. On another communications front, the Boeing group is beginning to migrate to T3 transmission.

RUMORS AND RAW RANDOM DATA

Sources say Silicon Graphics, Mountain View, Calif., will try to slow the Sun Microsystems technical workstation juggernaut this fall when it announces a low-cost workstation, which will have an emphasis on graphics. The product will sell for under $15,000 and should be announced in October. . . . BBN Communications Corp. is going to make its DesignNet network design tool available to customers. DesignNet, which is based on Symbolics AI technology, had been used internally at BBN to configure networks, but the company is "obligated to deliver it to customers within the next year," says a BBN exec. . . . Boston College is beginning a trial of central office LANs through the auspices of Nynex, say Nynex officials.



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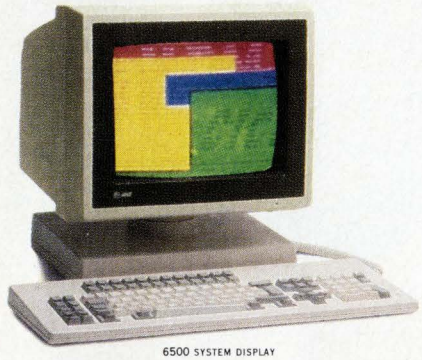

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- IBM[1] 3270 plug compatibility.
- Functionality that includes: SNA/SDLC, 3270 BSC; Netview compatible, Protocol Conversion, X.25, Async access and others.

6500 SYSTEM DISPLAY

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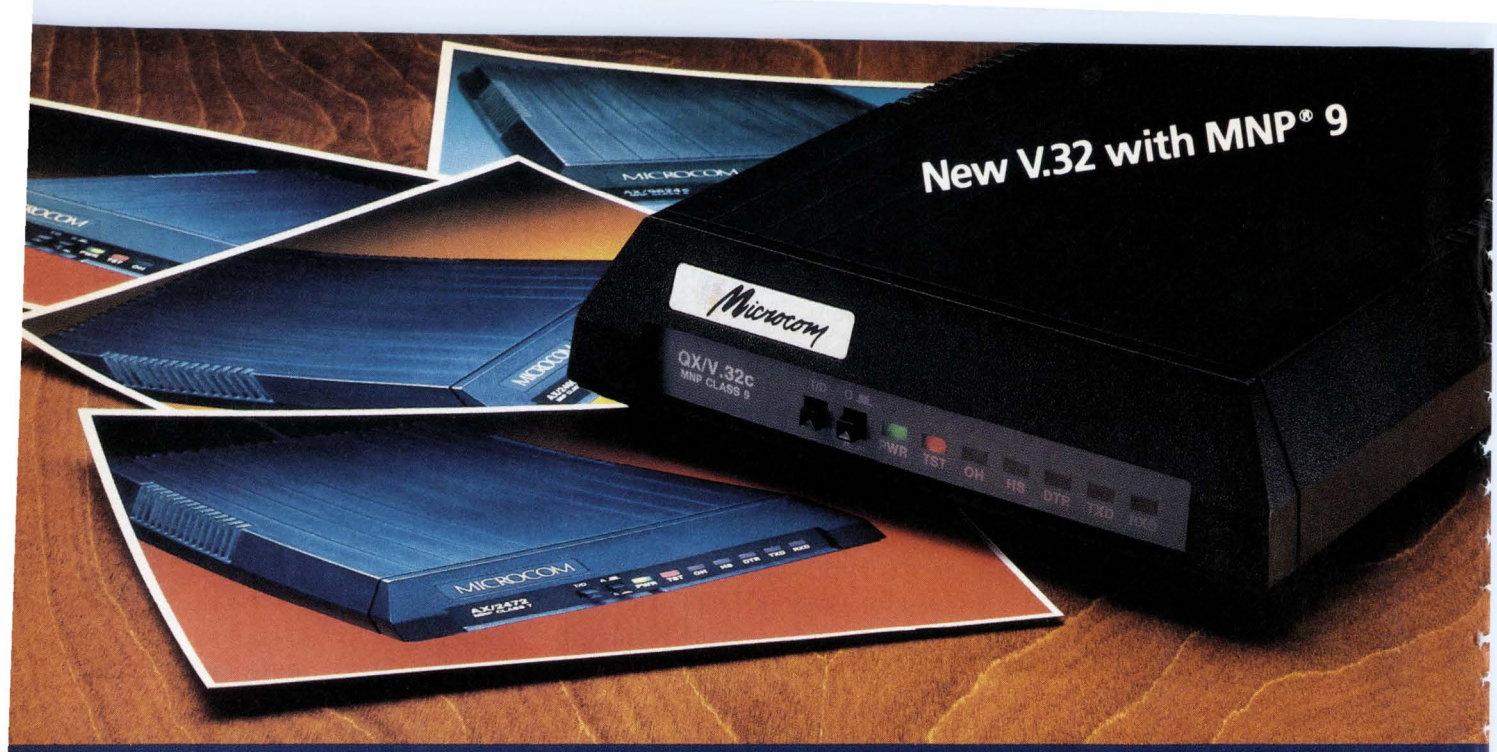

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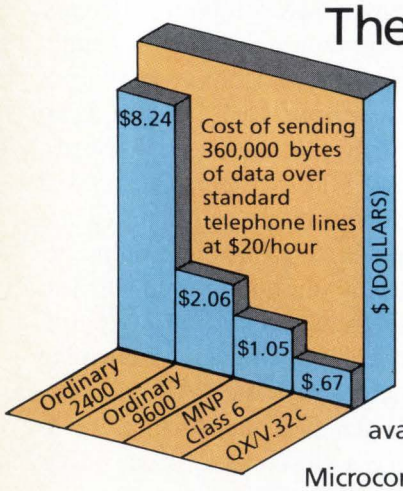

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STANDARDS

User Group Chiefs Lukewarm About the Impact of OSF

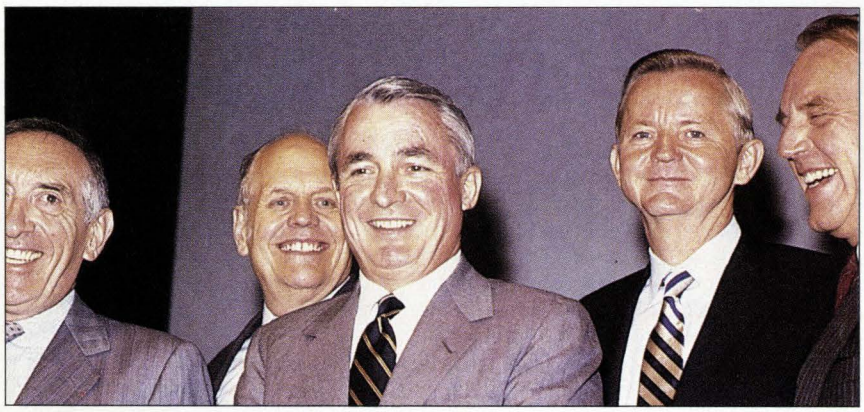
As the founding members begin their work on the new Open Software Foundation, users muse about what it will offer them, and wonder what their own input will be.

BY SUSAN KERR

Would you have confidence in the goodwill of two men who won't even shake hands in public? You might have your doubts if you had just seen the two announce they were helping form a foundation to work toward—of all things—"open" Unix software.

Of course, just because the two men, IBM president John F. Akers and his Digital Equipment Corp. counterpart Ken Olsen, wouldn't openly shake hands for photographers at the recent unveiling of the Open Software Foundation doesn't mean their work toward a Unix standard is doomed or designed for failure. Just getting the two rivals in the same room must have been a feat in itself.

But now the photographers have gone home, Olsen and Akers are back at their desks, and some of the people scrambling now to gain influence are key users of equipment manufactured by OSF members.



OSF FOUNDERS: Beyond the smiling faces, the question that emerges is, who will call the shots?

Photograph by Bill Kelly

AT&T Stays Away From OSF

The OSF wants to develop applications interfaces and extensions for Unix. Five computer companies, including Hewlett-Packard Co. and Nixdorf Computer AG, joined IBM and DEC in forming the OSF. Unix developer AT&T and partner Sun Microsystems Inc. are staying conspicuously and noisily away from the foundation.

Beyond all the smiling faces and clenched fists, the emerging question is, who is actually going to call the shots in the formation—or reformation—of a so-called industry standard? More precisely, what say have the people who may use the end product of this standard? And just how open is the Open Software Foundation?

Users were left in the dark before the OSF was announced. "There have been no talks [before forming the OSF] with proprietary user groups," according to Peter Schneider, IBM director of programming and a member of the OSF board of directors. "We haven't broached the subject yet. It hasn't come up." Schneider made this comment the day the OSF was announced. After the fact, though, some users have decided that uninvited doesn't have to translate into being ignored.

"Our group will take a role," pledges Charles Ham, president of the 119,000-member DEC user society commonly referred to as DECUS. "Yet, I can't say we as a group were polled by Digital before OSF."

DECUS took it upon itself to tell DEC that it is potentially interested in participating. DECUS currently is active in a number of ANSI standards committees and is an affiliate of the Corporation for Open Systems.

Like most user groups, DECUS must be careful with its funds—if membership fees are steep for the OSF, it won't be able to join. Bill Brindley, a member of the DECUS board of directors, says that the OSF has indicated it may begin an affiliate program that nonprofit groups could join for approximately $5,000 (see "The Price of Admission"). DECUS will decide at this week's board meeting what steps it will take.

What Return on Investment?

"We have to ask what will be the benefits to the society, what will be the return to members," says Brindley.

Michael Armstrong, chairman of the IBM International User Group Council, declines to comment on any specific plans his organization may have to influence the OSF. But Armstrong, who is director of research and systems support at transportation company Ryder Systems Inc., Miami, says rather obliquely, "We're constantly interacting with IBM as far as their information gathering goes."

There are plenty of standards bodies, the IUGC chairman says, and they all seek comments from interested parties. "Anybody who wants to participate [in standards bodies] can send in comments either as an individual or as part of a company," Armstrong remarks. Nonetheless, he admits that this level of activity usually is out of the reach of an individual.

In some cases, influence, particularly in standards making, may even be out of reach of a user organization. Thus, some groups and individuals seem resigned to taking a limited role.

Shirley Eick, president of the North American Honeywell Bull Users Association, states, "I think the big question mark is how could you implement it," meaning an active role in standards making. Groupe Bull, Paris, which coowns Honeywell Bull Inc., is one of the founding members of OSF. "I don't think users have [influence] right now and they should," Eick says. "Whether they will is questionable."

As more and more companies move away from single-vendor environments, however, standards gain in

The Price of Admission

Although founded by seven major hardware vendors, the Open Software Foundation is looking into creating special membership classifications for user groups. "We have every intent of having user groups involved," declares an OSF spokesman. "Right now, we're talking to groups and clarifying points."

As it now stands, there are four levels of potential OSF participation. At the top are sponsors, such as the cofounders, which put up $4.5 million a year for a minimum of three years. They are guaranteed a seat on the OSF board of directors and ensured that their equipment will be in the porting labs.

Next come members that fork over $25,000 a year. These are for-profit companies, such as software vendors. Nonprofit organizations can join for $5,000 a year. The OSF figures that user groups will wind up in this category. These two membership categories permit participation at conferences and access to information. There's also a $100-a-year subscription level that buys newsletters and the like, but no active participation rights.

The plan right now calls for 75% of the OSF board to be made up of sponsors. The remainder will be represented by other members, some of whom could be users. However, the OSF spokesman claims that the board will not determine what technology is put into the standards. Instead, it approves the budget, decides long-term strategic directions, and picks a president. The president in turn will pick a director of technology, who will hire at least 20 full-time technical people. The technical team, not the board, will decide what the technical direction of the OSF will be.

Still in Business at Berkeley

AT&T and Sun Microsystems Inc. say that once phase two of their joint Unix development is completed in 1989, things will get much clearer for Unix users. AT&T's System V version of Unix and Sun's SunOS, based on the Berkeley 4.2 extensions to Unix, will be unified into a single Unix version.

Easy, huh? There's just one problem: the people at the University of California, Berkeley, who actually control the Berkeley 4.2 extensions weren't told they were being subsumed into anything, and are not pleased with the suggestion that Sun controls the 4.2 extensions.

"We're still in business, and we're not going to stop what we're doing," says Kirk McKusick, a research computer scientist at the university's Computer Systems Research Group (CSRG) and one of two researchers who oversees 4.2 development. "To have them [Sun] indicate they're speaking for us gets a little dicey. We've let them know we don't appreciate it," says McKusick.

What the folks at Berkeley are going to keep on doing is developing new extensions to Berkeley 4.2. In fact, CSRG right now is working on what it calls Berkeley 4.4 extensions, which will include key functional additions such as a new file system. Berkeley 4.4 is due out in 1989, about the same time as the Sun-AT&T version.

The people at CSRG aren't saying Sun is doing anything illegal by turning over the 4.2 extensions to AT&T. Sun is a licensee of 4.2 and as such can do with the extensions anything it wants. Besides, the 4.2 extensions were based on AT&T's Unix in the first place.

It's just that Sun, in attempting to present itself as a Unix development leader and an open systems champion, has at times gone too far with its claims on 4.2 control, say the people at CSRG. "When Sun pretends to talk for CSRG, they're stepping beyond the bounds a bit," says McKusick. As CSRG continues its work, the Berkeley extensions won't necessarily track with what AT&T and Sun are doing. For one thing, says McKusick, don't expect CSRG to adopt Sun's Network File System. That popular file system is owned by Sun and that means it's not open, says McKusick.

Plenty of people will be happy to hear that Berkeley 4.2 isn't being subsumed or anything else. To date, some 1,000 users and vendors have licensed the extensions, and another 850 have licensed the 4.3 follow-on that shipped in 1986.

For the record, Sun officials say they, too, are glad CSRG isn't going out of business. "If what they do is good stuff, it can be reincorporated into what we're doing later," says SunOS senior product manager Bill Woo.

BY JEFF MOAD

importance. According to Eick, "We've been more concerned with our own little world but not that concerned with the outside. That's changing as we see more users with multivendor shops."

Neither Eick, who works at Metropolitan Life's Property and Liability Group in New York, nor DECUS's Ham, who works for E.I. du Pont de Nemours & Co. in Orange, Texas, uses Unix, nor do they have any immediate plans to migrate to it and so are not directly affected by the OSF. One user group leader who is is Victor Barry of the Rocky Mountain HP technical computers user group, which is part of the loosely organized HP 9000 Unix user associations.

Vendors with Hidden Agendas

HP was forced into the OSF, believes Barry, after AT&T gave the impression that it would make Unix more proprietary by signing a development deal with Sun. Still, he questions the "hidden agendas" of other OSF vendors, specifically IBM and DEC, some of whom are hardly known as hearty Unix supporters. HP is committed to Unix, and without that commitment Barry's company, the Public Service Co. of Colorado, would not have bought HP computers.

"There should be more user influence," Barry says. "We [the user group] have tried to influence the direction of HP software products or how they bundle hardware. But whether we have clout to do much as far as a broad-range decision, I doubt it."

Thus, when customer dollars are flashing in front of their eyes, vendors may listen a little bit more carefully to users. But in a lengthy and complicated standards process, that type of direct customer-to-vendor influence is filtered out.

With so many people in-

volved already, some with noncomplementary interests, user group heads question what really will come out of OSF, and particularly if anything valuable will emerge within OSF's stated 18-month time frame for its initial product introduction. This, incidentally, is approximately the same time frame that AT&T and Sun have given for the completion of phase two of their joint Unix development, which they say will make it unnecessary for users to choose between Unix System V and Berkeley 4.2 extensions. (For comments on the unified Unix version from the folks at Berkeley, see "Still in Business at Berkeley.")

Barry ventures that the real worth of OSF could be to force a change in position in AT&T and Sun. The eventual result may be a merging of the two camps into a single concept that will be Posix compliant.

AT&T Data Systems Group president Robert Kavner also leaves open that possibility. While AT&T will not join the OSF, that doesn't rule out some cooperation. "I pledge that we will work with the foundation's sponsors to avoid another divergence of standards," he says. "If the Foundation comes up with anything useful we will include it in Unix System V."

But the OSF could learn another lesson from AT&T. While Ma Bell is in the midst of forming its first computer customer advisory board, for the past two years it has been working with the Unix University User Group it organized, which has more than 85 universities as members.

"They've given us directions in the way they see the Unix environment tying into disparate networks," says Bill O'Shea, AT&T executive vice president, product development, and resident Unix guru. While O'Shea praises end users for the "sanity" they bring, he also says that from his experience their impact as a whole is somewhat limited.

"Most users just don't care," O'Shea says. "They want to know what the interface will be and whether it's dependable."

AT&T Has the Final Say

Some users may strive for influence, but that must not be confused with having the final say. Unix is an AT&T product, and despite rumors to the contrary, AT&T is a for-profit organization. "I need to enhance the process of how AT&T listens to the marketplace," says Kavner, "but I can never turn it to a vote because it will turn to mush."

This can be further translated into one AT&T argument against the OSF: too many cooks spoil the broth. It's no secret that standards bodies move only slightly faster than glaciers and the self-interest of members is common.

Yet, one Unix user says he's seen signs of influencing AT&T's Unix direction. David Binko, director of academic computing at Johns Hopkins University, Baltimore, says, "We've really seen our concerns addressed." As far as input to the actual development of Unix, he points to networking support for TCP/IP and support of Ethernet protocols as areas in which the Unix University User Group has been effective.

Ironically, there is the possibility that the OSF could affect the level of influence that the Unix University User Group has over Unix itself. "I certainly hope and expect our influence to be there," declares Binko. "It will be a strong influence, but balanced more and more by a base of commercial users," he emphasizes. "If Unix is to be successful as more than a de facto standard it needs that broad enclave." ■

ARTIFICIAL INTELLIGENCE

Airport Gate System Is Ready for Arrival

Texas Air is turning to a Lisp-based system to speed gate control activities in Houston and Miami.

GATEKEEPER: Ultimately will also manage aircraft routing and personnel.

BY MARSHA J. FISHER

On the site of an old twine-making factory in Cambridge, Mass., a group of alumni of the Artificial Intelligence Laboratory at MIT have been busy for the last year or so weaving their own kind of mechanism for binding together all of the flight operations of Texas Air.

As of August, flight control center staff at Houston and Miami International Airports will be relying on GateKeeper to assign gates to all Continental and Eastern Airlines flights. The sophisticated, Lisp-based distributed system is being developed by Cambridge-based Ascent Technology Inc. with help from System One Corp., the computer division of Texas Air, parent of Continental and Eastern Airlines.

Around the clock, GateKeeper will speed gate controllers' once manual and intricate task of collating various kinds of flight operations information into daily gate schedules. The system enables the nighttime gate controllers to prepare approximately 80% of the next day's schedule in about an hour. The task used to take five hours.

As the day progresses, GateKeeper will automatically collect continuously incoming flight information and updated aircraft routing and passenger information. Based on those data, it will make or recommend changes to the schedule, addressing the problems of late flights and assigning slots to the Continental and Eastern Airlines flights consequently affected.

"Radically New" Concepts

"The system should carry the airlines through the difficult expansion in the 1990s," says Philippe Brou, Ascent's vp of R&D. "We have had a lot of freedom in developing the system because it is approved all the way up to [Texas Air's chairman Frank] Lorenzo's office.

Photograph by Steve Chenn

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CHAPTER ONE

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It was not a night fit for man or beast what with the sky being as black as ink and it starting to rain like cats and dogs. As if things weren't bad enough Jeffrey Whipple had to climb all the way up to the top of Bald Eagle hill in his snakeskin boots so new their smell reminded him of a car he once leased in Flagstaff, Arizona just to check things out because earlier in the day a message had gotten through that there was going to be trouble this night so he was feeling ominous as the dry wind whipped up the dust around his feet and wondering if he should go on or go back to camp when suddenly, he heard a twig crack behind him or thought he did but as he turned he didn't see anything except the black bleakness of the landscape.

Somewhere on the other side of Bald Eagle hill a dog started to bark and there were other noises which Jeffrey couldn't quite decipher but he decided that it was time to move on so he hitched up his courage and [illegible] the trek upwards again stepping over fallen [illegible] made the

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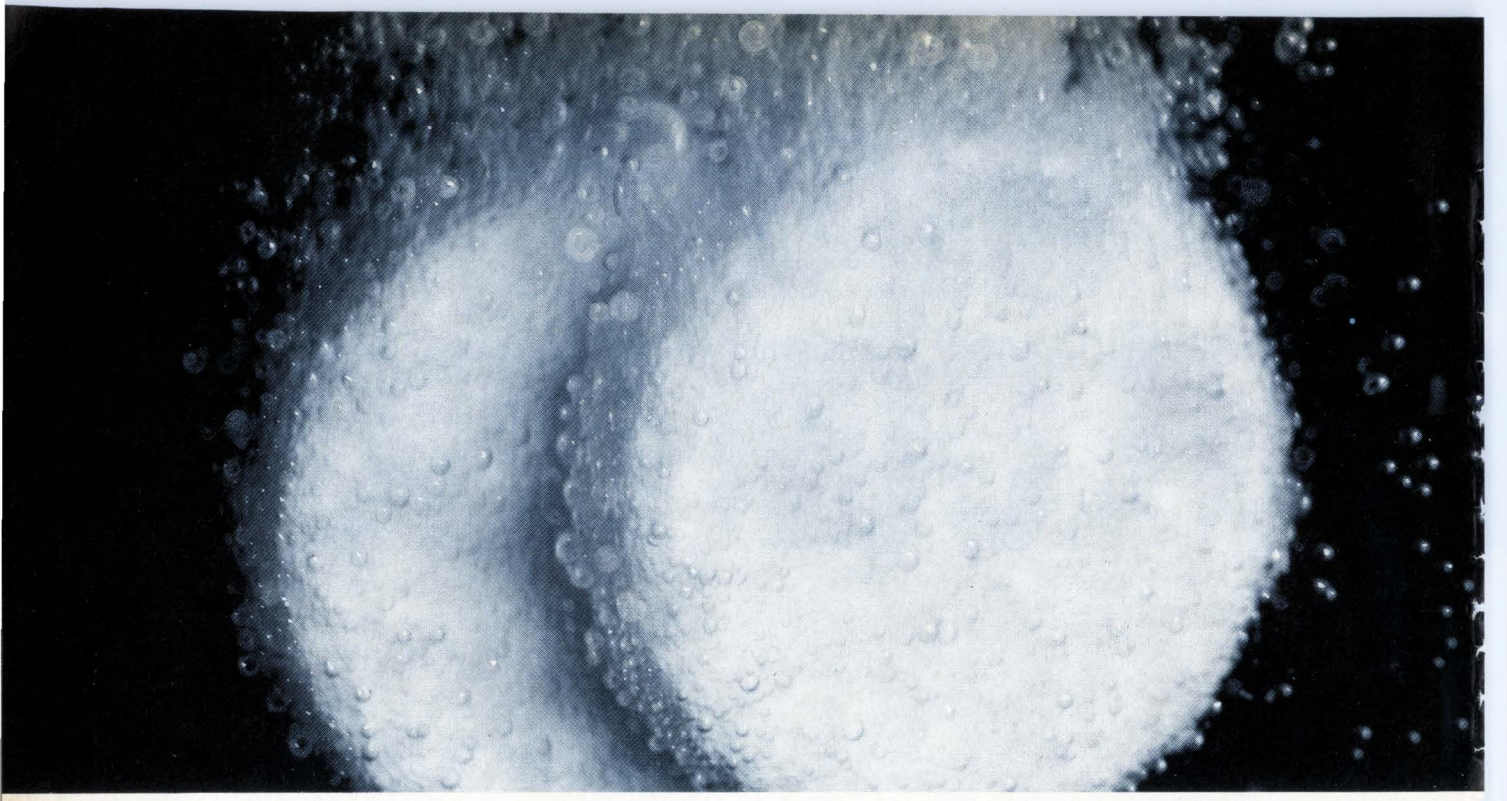

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"The [distributed computing] concepts we're introducing are not new to academics, but for airlines used to mainframe-centered systems, it's radically new," Brou continues. "Our emphasis is on distributing information throughout the airport, so that it's more usable and more centered on operations" (see "Flight Operations System.")

The Gate Is the Hub

"Any gate change affects many other things at the airport," says Bruce M. Henderson, vp of marketing for Ascent. "FIDS [Flight Information Display Systems] in the airport must be updated, catering trucks and passenger service people have to change location, and the baggage people have to know where to find the flight. The gate is the heart of airport resource management."

David Hultsman, System One's vp of technology development, says System One chose Ascent because it recognized the need for a knowledge-based application for airport operations, an application that, in Hultsman's view, needed an alternative systems architecture. "There's no way you can put a knowledge-based system into an old reservation system; it would eat up the cpu," he remarks. "Airlines have lagged in getting applications out where customers can use them. TPF [IBM's Transaction Processing Facility] is a difficult platform upon which to develop and not many people have the skill set required. If you want to speed the technology out to the field, you have to go to alternative, prototype environments."

Automating the gate scheduling process has become critical, according to Henderson, because of the change to airport hub operations under deregulation.

"Before [deregulation]," Henderson says, "with a network approach to flying, planes at the gates were staggered more during the day, but with the hub approach the planes all come in at once, filling up all the gates. So, delays and changes are more critical to monitor because they can really cascade and mess up connections."

To obviate that mess, GateKeeper is set up to receive four types of on-line information: monthly and up-to-the-minute flight schedules from the airline marketing staff; routing of specific aircraft for specific maintenance reasons; flight information (FLIFO) from the main operational computer for each airline (including estimated time of arrival/departure and take-off and landing times); and passenger information from System One's front-end passenger processing system.

The airline scheduling data are retrieved from the main operations computer. The monthly schedule can be loaded into the system and compared to operational capacity in about an hour.

As a prelude to creating the daily schedule, the aircraft-routing night shift at the airline's System Control Center spends four to five hours manually collecting data on where to send particular planes for maintenance, according to aircraft type. The information is sent out as electronic mail messages to the night-shift gate controllers, who prepare the gate schedule.

Brou says that approximately 30% of raw FLIFO data are inaccurate. Such inaccuracies can result, he says, from the ACARS (ARINC Communications Addressing and Reporting System) found on about half of the Continental fleet. ACARS is designed to automatically sense and record when planes have left or have entered the gate. If a truck moves a parked plane a bit too much, ACARS often registers the plane as having left. More problems in accuracy arise for the planes that don't have ACARS, Brou adds.

"As a result, the gate controllers have told us that we can't rely on the data blindly, so we have put in a lot of intelligence [about 15% of the system] to make sure the data are valid," Brou says.

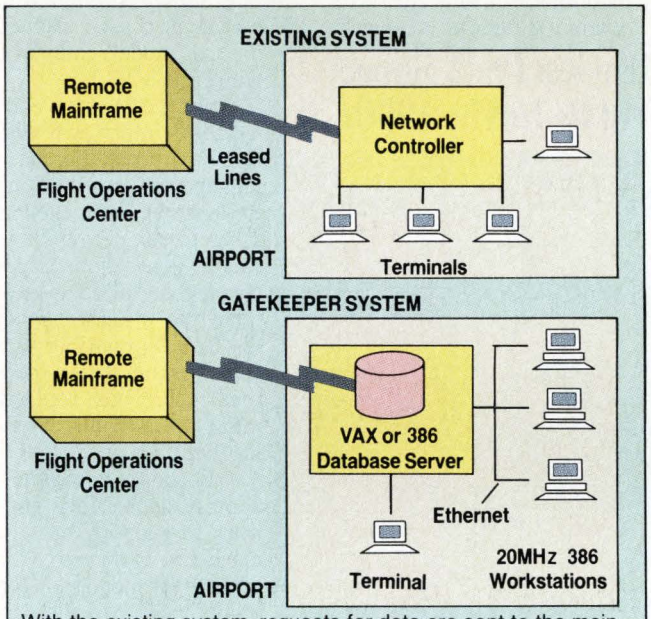
Passenger reservations and connection information also influence which gate is used. The software that provides this information to the gate controllers is not planned for operation at Continental's hub in Houston "because there are not enough gates to alleviate the problem," Henderson says. "But the passenger connection [software] code is up in Miami and will go live in early August."

How GateKeeper Works

GateKeeper ultimately will send out gate scheduling information on-line to the FIDS in the airport. Baggage, catering, refueling, and management reports are output on hardcopy to the appropriate staff. Those reports will be put on-line, onto terminals connected to the Digital Equipment Corp. VAX database server once the database is up-to-date and completely accurate, Brou says. GateKeeper outputs FLIFO to the gate control center people on its display.

Although it was developed and will run initially on Symbolics hardware, GateKeeper is designed to run on a Unix-based workstation—a 20MHz 386-based micro running X-Windows. It's connected via Ethernet to Oracle's RDBMS on a VAX or 386-based database server, says Brou. The main GateKeeper display replicates the paper charts gate controllers use—a grid of gate numbers and time of day, and bars that indicate aircraft type. The GateKeeper bars, however, are color-coded. ■

Flight Operations System



With the existing system, requests for data are sent to the mainframe via leased lines, creating heavy network traffic. The new system makes requests for information to the local database, except for only occasional forays to the mainframe.

Chart by Bob McAuley

WORKSTATIONS

Interest in PS/2 Is Strong But Adoption May Take Years

Most respondents in the DATAMATION/Cowen survey say PS/2 will be their standard in the '90s, even though a number of factors about the machines need clarification.

BY ROBERT FRANCIS

IBM's now-one-year-old line of PS/2 personal computers has captured the imagination—if not the purse strings—of IS and corporate pc purchase managers, but there's still a long way to go before perceptions about the new machines translate into a tangible hardware reality.

One of the key findings of the recent DATAMATION/Cowen & Co. Computer & Telecommunications Survey (see "IBM Puts on the Gloves with MVS/ESA," May 15, p. 56) is a significant increase in the number of respondents indicating that they plan to standardize on PS/2 in future purchases. Of IBM and compatible clone users, 52% indicate that PS/2 will be the system on which they will standardize, a substantial increase over the 29.5% citing PS/2 a year ago.

The time period for this standardization to take hold, however, extends into 1990 and beyond. Only 4.8% of survey respondents say they will replace their first generation pcs with PS/2s this year. The number climbs to 14.3% for those indicating they will do so in 1989, but a whopping 50.3% have their replacements scheduled after 1989.

OS/2 Gains Among Respondents

In addition, the survey data show that while a majority say they plan to standardize on PS/2, a rising, if still a minority, percentage indicate that OS/2 is their operating system of choice—33.7%, compared with 24.7% in last year's survey.

MS/DOS, with 61.1% of mentions, remains the overwhelming favorite in operating systems. DOS runs on all models of the PS/2 line, while the new OS/2 runs only on Models 50 and higher.

One reason that MS/DOS still claims a higher percentage may be found in the current shipment mix: of PS/2 purchases planned for this year, 73.5% were of the Models 50 and 30, up from 71.4% in 1987. The Model 50 has been gaining in popularity, according to the survey, with 53.6% of purchases planned for that model, compared with 36% in '87.

What do these trends suggest? Interviews with IS and corporate purchase managers provide some explanation. First, the PS/2 has to compete with an earlier generation of pcs already installed, something the original line of IBM and compatible machines did not have to contend with. Thus, replacement must be cost-justified.

Second, a new generation of applications software to support the new machines, particularly the higher-end models of the line that will be running the still-to-be shipped OS/2 Extended Edition must be fully developed.

Users Not Yet Convinced

Third, users are not yet fully convinced that the PS/2's Micro Channel bus architecture does indeed have the advantages over the AT bus that are claimed. And, finally, the emergence of clones—which helped drive the market for the original PCs—is just beginning.

According to Julian Horwich, executive director of the Chicago Association of Microcomputing Professionals (CAMP), another often overlooked factor that has delayed the outright acceptance of the PS/2 is that, at present, there are few third-party boards available to work with the Micro Channel. That, he says, along with the wait for OS/2 applications, will mean that a dual standard of PS/2 and AT-based machines will exist for some time.

IS managers say that a major reason they have been slow to embrace the PS/2 is the simple factor of cost. One Dallas area information systems manager estimates that replacing 30,000 personal computers with PS/2s would cost a company more than $150 million, without necessarily showing any immediate benefit.

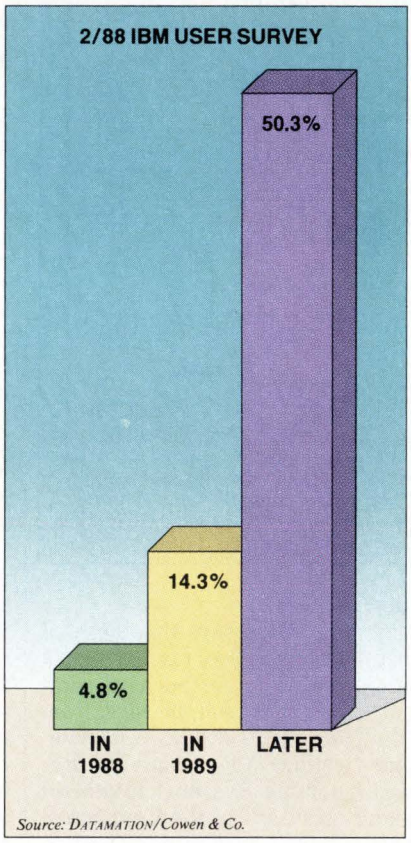
Covia Saw Clear Advantages

On the other hand, some projects simply could not have gotten off the ground without the PS/2. Covia Corp., Chicago, an independent computer-services subsidiary of United Airlines Inc., uses PS/2 Model 50s as individual workstations for its computerized reservation system. One reason Covia chose the PS/2 was that the Micro Channel bus was better suited to the high volume of transactions in its reservation system. IBM claims that Micro Channel offers several advantages over the traditional AT bus, including moving large blocks of data and managing dataflow more effectively. These features, according to IBM, are particularly important for multiuser and multitasking environments.

IBM says that it shipped nearly 2 million PS/2s as of April 2, 1988, the product family's first anniversary, and it also reports that it can't meet demand for the machines. Analysts, however, say that many of them are still making their way through distribution channels.

Despite those impres-

Heaviest PS/2 Impact Will Be In The 1990s



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sive numbers, IBM's share of the personal computer market continues to shrink. According to the survey, IBM's share of the corporate pc market will drop to 57.7% of all units purchased for 1988, down from 59.3% purchased in 1987. Most of the drop-off is shifting toward Compaq Computer Corp. (Houston), Zenith Data Systems (Glenview, Ill.), and other compatible manufacturers, the survey shows. Most IBM shipments are of the PS/2 products.

Meanwhile, other large companies are taking a wait-and-see attitude toward the PS/2. K Mart Corp., Troy, Mich., is one company still purchasing AT-compatible clones until the advantages of the PS/2's Micro Channel Architecture become clear.

"I change my mind about PS/2 and the whole Micro Channel versus traditional bus architecture all the time," adds another Dallas-area micro manager who requested anonymity. "Sometimes I think it [Micro Channel Architecture] is great, very forward-thinking, and that it was what the industry needed. But I can just as easily change my mind and support the AT bus."

Dell Sees Soft Market

Even one of the two Texas companies that announced PS/2 compatibles during the last week of April have admitted that the market for PS/2 compatibles has not been strong.

"Frankly, we haven't seen the demand for it," says David G. Chevalier, vice president and general manager for Dell Marketing Corp., the corporate accounts division of Dell Computer Corp., Austin, Texas. "When we do, we'll be ready, but right now customers want a good price/performance for their money in an AT compatible and that's what we're here to give them."

But Dell officials say they want to be ready when and if their customers begin to request machines with Micro Channel Architecture. "Right now our customers aren't requesting it, but that could change," Chevalier says.

Just a few weeks following the PS/2's anniversary, Dell demonstrated prototypes of its Model 60 and Model 80 PS/2 compatibles, dubbed the System 400 and System 500, respectively, with working models set to be available by the end of the year. Tandy Corp. announced its version of the PS/2 shortly afterward. Its version, called the 5000 MC, began shipping in limited quantities in June.

SLOW ADOPTION IS OWED TO COST.

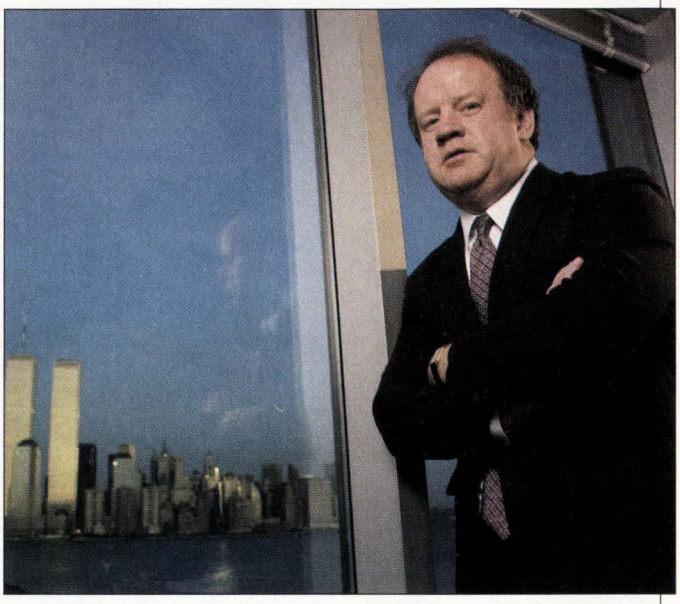
These moves may not pay off significantly for quite some time, since both companies have only a small percentage of the corporate market for personal computers, certainly the strongest market for the PS/2 at present. But Tandy and Dell are apparently willing to plant their seeds now in anticipation of a future harvest.

Furthermore, IBM-compatible manufacturers may be making a smart move in heading down the PS/2 road. The survey indicates a slightly negative attitude toward PC clones on the rise since August 1987. In the 1987 survey, 12.7% of the respondents indicated a less favorable impression of pre-PS/2 IBM clones. In the February 1988 survey, this less favorable impression rose to 17.5%. ■

APPLICATIONS SOFTWARE

U.S. Banks Turn to Trust Systems

As trust accounting becomes key to bank operations, there's a growing concern about systems capabilities.



BANKERS TRUST'S HOYLE: Capital requirements are doubling and tripling.

BY GARY McWILLIAMS

For a quick barometer of the changes sweeping through the banking world, take a look at trust accounting systems.

Once a sleepy back room operation, trust banking systems operate in a considerably changed environment these days. To some, their formerly reserved pace has been replaced by a more expensive and uncertain new world. Like the rest of banking, trust has been swept up in a financial whirlwind. It now embraces an exploding selection of financial securities involving global and time-sensitive transactions.

Competition from mutual funds, insurance companies, and other non-bank financial institutions has transformed trust banking into a high-stakes business. Moreover, some believe trust systems will serve an even greater role as banks seek to compete in the now-prohibited securities businesses.

What Can Trust Systems Handle?

More than anything, the resources needed to handle these changes is demanding attention be paid to systems capabilities. In essence, trust systems are securities processing systems with sophisticated accounting and reporting functions. They are used to manage employee pension funds, endowments, corporate investments, and even estates for the wealthy.

Some banks, such as the Bank of New England Corp., Boston, and Manufacturers Hanover Trust, New York, have poured millions into

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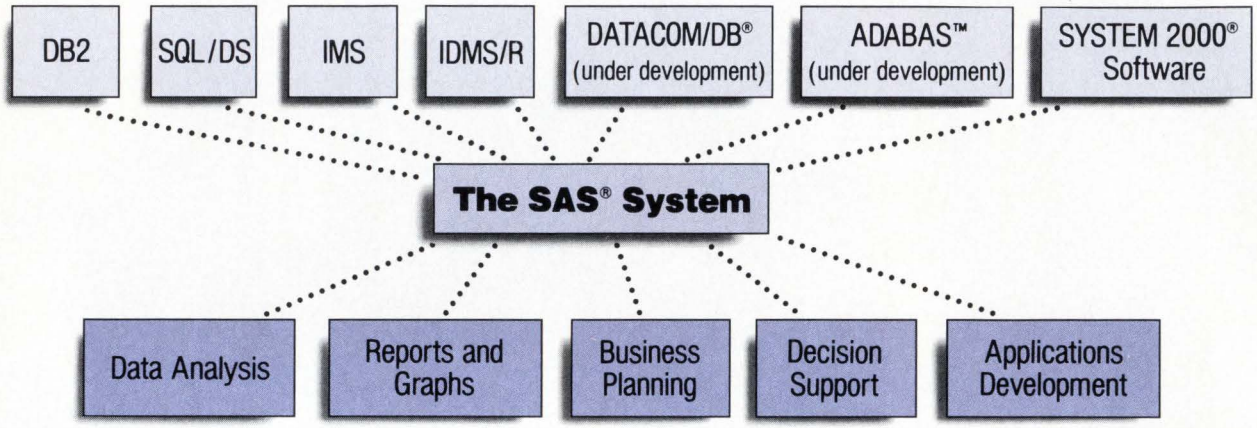

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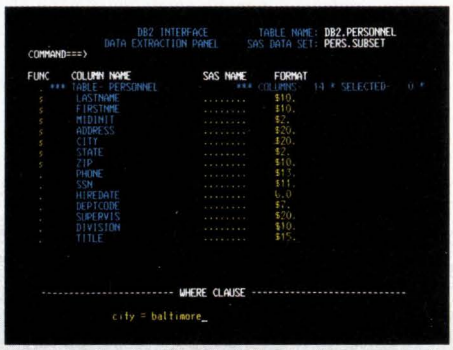

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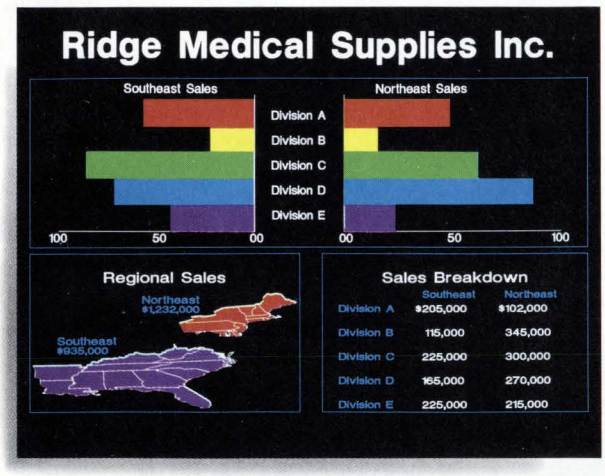

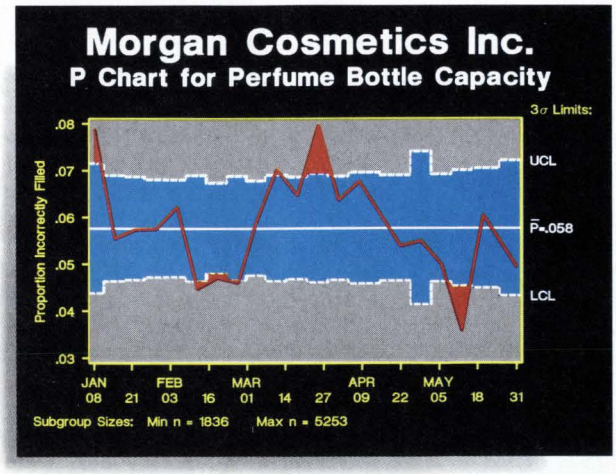

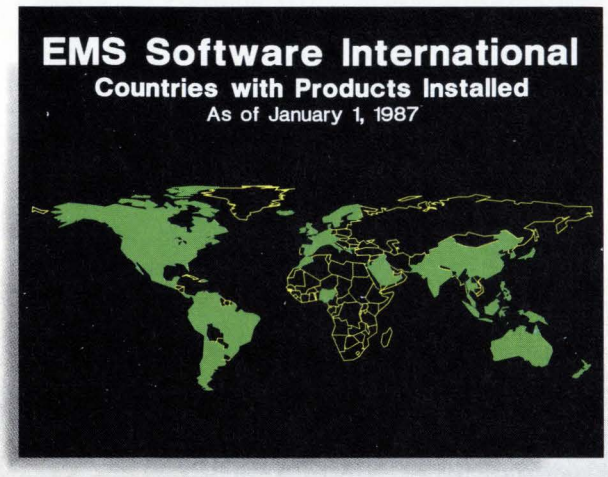

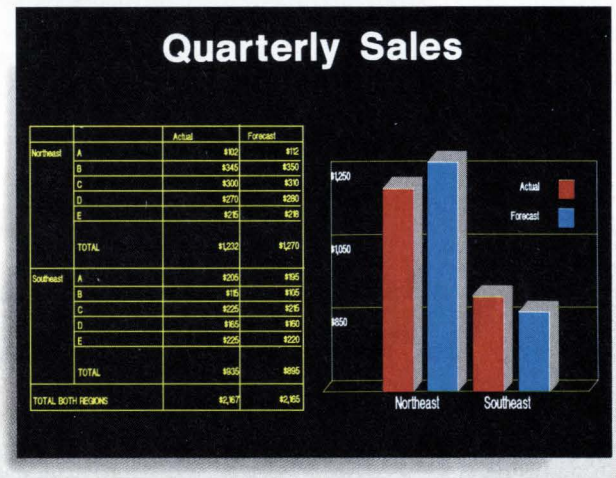

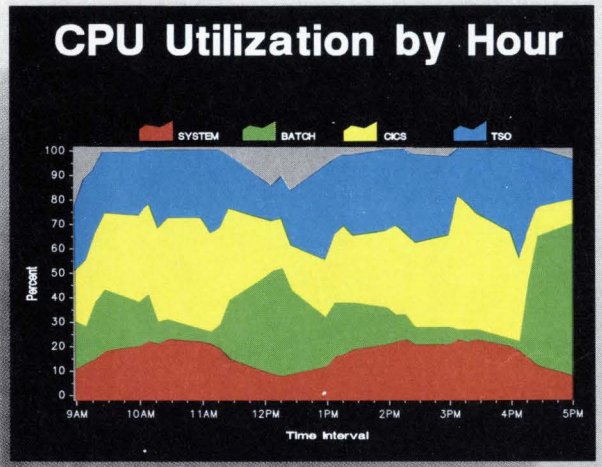

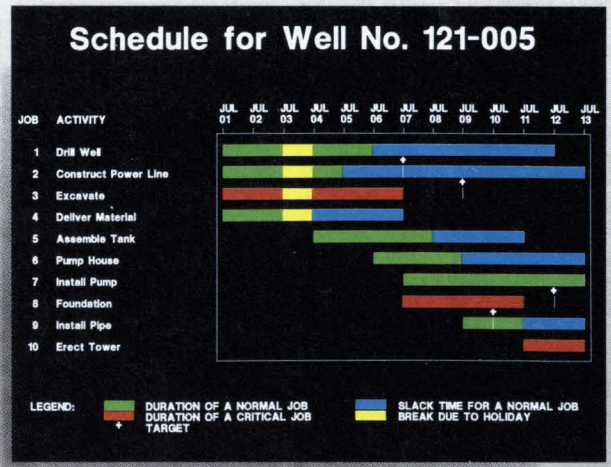

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The Complexities of Trust Systems

Trust systems are similar to the securities processing systems operated by brokerage houses, but they are more complex. Like brokerage systems, trust systems need to be able to handle a wealth of financial instruments, but their responsibilities aren't as limited as other financial systems. "Brokerage or security systems are designed for volume and only one type of transaction," says John Soldati, vp at First Union National Bank, Charlotte, N.C. "In trust, we have tax consequences, allocation, different layers of accounting, and billing."

Those detailed reporting and billing functions make trust systems complex to design and install. Designing a trust system "involves a large number of different business units and products," explains Bruce Fadem, a senior vp responsible for systems engineering development at Bank of America, San Francisco. "Very few elements are complicated in themselves, but to bring these together and leverage an end-to-end view is difficult."

Another factor involves the responsibility of trust operations in the event of a breakdown. For instance, bank clerks formerly received and credited bond and dividend payments to customer accounts.

Automation of such duties created the potential for even more errors. "A bank is fully responsible as a fiduciary," says Randall Hoyle, senior vp for fiduciary and securities trust systems at Bankers Trust Co., Jersey City, N.J. "If you goof, you pay."

The Bank of Boston recently discovered how trying such installations can be. Bookkeeping errors surfaced in May soon after the bank installed a new corporate trust system. At press time, a team of internal auditors was sorting through accounts to determine the source of the problems. In addition, three executives were suspended pending the outcome of the audit, according to a spokesman.

modernizing or replacing existing systems. Others, such as First National Bank of Chicago, have abandoned some areas. Then there are dozens, such as Bankers Trust Co. in New York, Sun Banks Inc. in Orlando, Fla., and the First Republic Bank in Dallas, which seek to remain competitive by modifying existing systems without spending millions.

A Competitive Issue

The costs associated with implementing these sophisticated systems are raising the stakes for those hoping to stay in the business. Traditionally a big moneymaker, the trust business increasingly requires sizable new systems investments to stay competitive, says Randall Hoyle, senior vp for fidu-

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ciary and securities trust systems at Bankers Trust, Jersey City, N.J. Yet, the investments that are now required come at a time when doubts about future profitability and increased competition make the trust business uncertain.

Hoyle believes that many banks are quietly reexamining their commitment to the trust business. "You can no longer invest a certain amount and be sure of obtaining a share of the market. The capital required to stay in the business is doubling and tripling," he says.

Whereas banks were once reasonably sure of the return on a large systems investment, Hoyle says, the waters have been muddied by competitors outside the banking industry and by the costs of modernizing or replacing existing trust systems. "You have to be willing to spend $20 million to stay in the business," he says. "There are a series of banks slowly getting out or no longer investing in their systems."

S. Brian Hunter, the American Banking Association's assistant manager, fiduciary and securities operations division, explains, "Periodically, banks go through the exercise of saying, 'Do we really want to offer trust services?' As competition becomes heightened, banks look at where they can generate more income and where they can cut expenses," he says.

Hunter also says if Congress repeals the Glass-Steagall Act prohibiting the distribution or underwriting of securities by banks, "trust will be more profitable." The more sophisticated the trust system, Hunter adds, the more able banks will be "to take part in what's going to occur."

Tie-in with Securities

Most often, trust systems are the banks' only tie to securities processing, an area now seen as necessary for competitive reasons. Peter W. Leppanen, a partner with systems consultants Computer Partners Inc., Wellesley, Mass., says banks interested in expanding into mutual funds and the discount brokerage business need a strong trust system, which is difficult to design and install and is often risky (see "The Complexities of Trust Systems").

Bank of America's recent experiences illustrate the risks involved in implementing large trust systems. Operational problems last year prompted the bank to scrap its $20 million trust investment and establish a $60 million reserve. Today, Bank of America continues to offer trust services but has narrowed the scope and the number of customers it supports. An affiliate bank, Seattle-First National Bank, now provides its systems.

"The many new types of securities available to customers make it essential that systems be able to accommodate these new vehicles," says Richard L. Jones, a senior vice president at Sun Banks. "A lot of large banks, in particular, are at the point they can no longer enhance their old trust processing sys-

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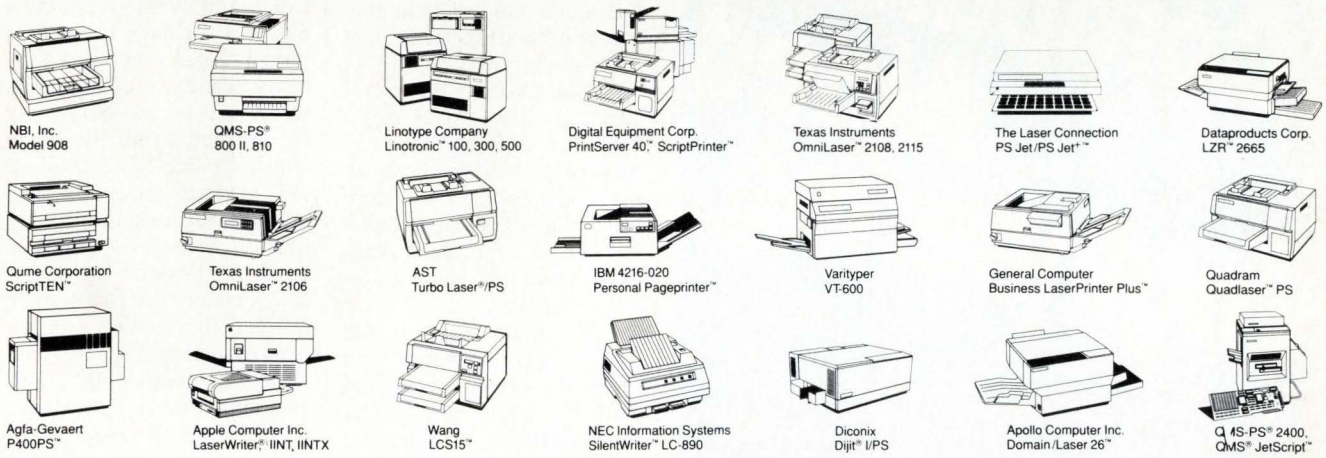

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tem without a lot of chaos."

The cost of new trust systems varies widely for small and large banks. Jones estimates purchased software can cost a small bank "from $2 million at the low end to $12 million or $14 million" for a regional bank. Custom systems development may cost anywhere between $25 million and $40 million, he says.

Easier for Small Banks

Among smaller banks, there may be fewer systems features but there are also far fewer worries. Gary Latz, vp of data processing at Washington Trust Co., Westerly, R.I., says the need to support new financial products has smaller banks searching for new trust systems, but the available selection and costs are not as onerous. "You can do it [trust] reasonably in-house or through a service bureau. You just have to be tuned in to your market," says Latz.

Among those larger banks that have written their own systems, the desire to recoup costs has driven several to bring their internal systems to market. Steep development costs have led U.S. Trust Corp. and Mellon Bank, Pittsburgh, to offer their in-house developed software for sale either through service bureau operations or as packaged systems.

The Bank of New England recently completed a $3 million conversion of several trust systems into a system purchased from Financial Technologies International, and Manufacturers Hanover Trust recently completed installation of a new AmTrust personal trust system that vp Frank Gibbs says enabled the bank to provide added functionality.

The willingness to invest substantially in new trust systems may not be typical. Among existing trust banks, there is plenty of evidence that the systems are not at the top of bankers' spending lists.

For instance, Sun Banks uses a trust service bureau, although for more than two years it has sought an in-house system to consolidate operations in Florida, Georgia, and Tennessee. "We've continued to enhance our current system as an interim step. We haven't identified the right package for us yet," says senior vp Jones.

At First Republic Bank Corp., Dallas, which last year merged with InterFirst Bank Corp., also of Dallas, an executive says the two operate separate trust systems, although it seeks to consolidate eventually. The executive, who asked that he not be identified, says First Republic also has a schedule of enhancements it hopes to implement over several years.

Computer Partners' Leppanen says, "The larger banks are grabbing more and more of the master trust business. The on-line and global trading needs are such that a lot of banks aren't able to handle it with their existing systems," he says.

It's another sign of the times. When competition raises the systems ante, the price of keeping up has to be reconsidered. "In trust, you've got a case where much of the product is the underlying technology," says Bankers Trust's Hoyle. "There has been a serious capital investment required to stay in the business."

And yet another business moves into the financial fast lanes. ■

BENCHMARKS

Copyright Ruling

The U.S. Copyright Office has ruled that when a software company copyrights a program, it automatically copyrights the graphic and textual displays produced by the program. Furthermore, software publishers do not need to register any display or textual screen separately.

The copyrighting of the "look and feel" of software programs has been an ambiguous and controversial issue. The most notable legal case of late is Apple Computer Inc.'s suit, filed this spring, charging both Microsoft and Hewlett-Packard with copyright infringement. Apple charged that Microsoft's Windows 2.03 and HP's New Wave interface programs violate visual displays and graphics images generated by its Macintosh personal computer (see "Apple-Microsoft Suit Raises Issue of Vague Copyright Laws," May 15, p. 22).

Intel, Siemens Form Computer Company

Semiconductor giant Intel Corp. and West Germany's Siemens AG have formed an international computer systems company called Biin, which will be owned equally by the two firms. Based in Hillsboro, Ore., the site of Intel's systems group, the new venture will design and manufacture computer systems to be sold to oems. European headquarters for Biin will be in Nuremberg, West Germany. Production is slated to begin by the year's end at both locations. The computers reportedly will be designed for on-line transaction processing and computer integrated manufacturing applications. Heading Biin is Joseph J. Kroger, who resigned from Unisys in December. Kroger joined Sperry Univac in 1960 as a salesman and by 1985 had risen to the post of chief operating officer. ■

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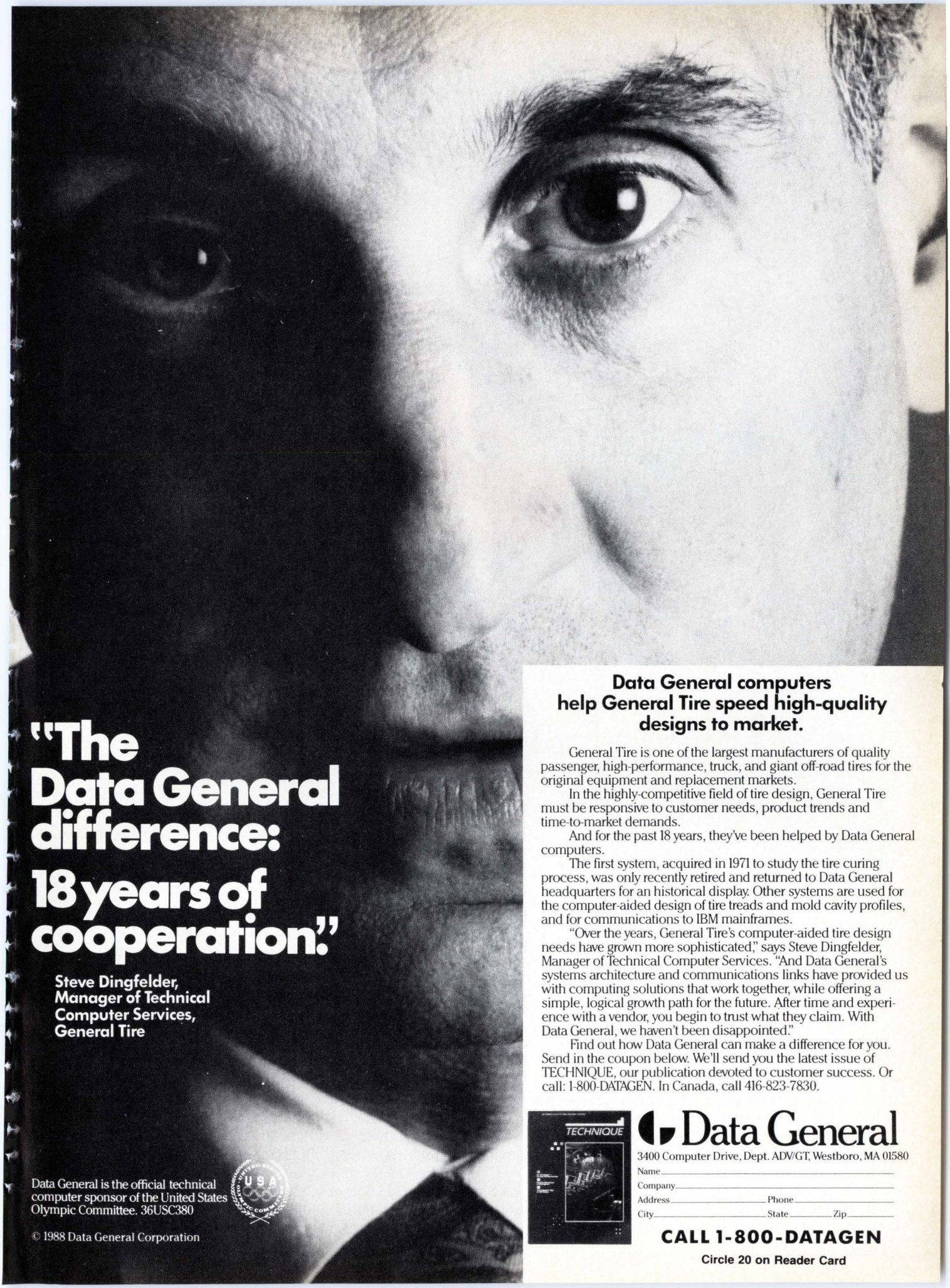

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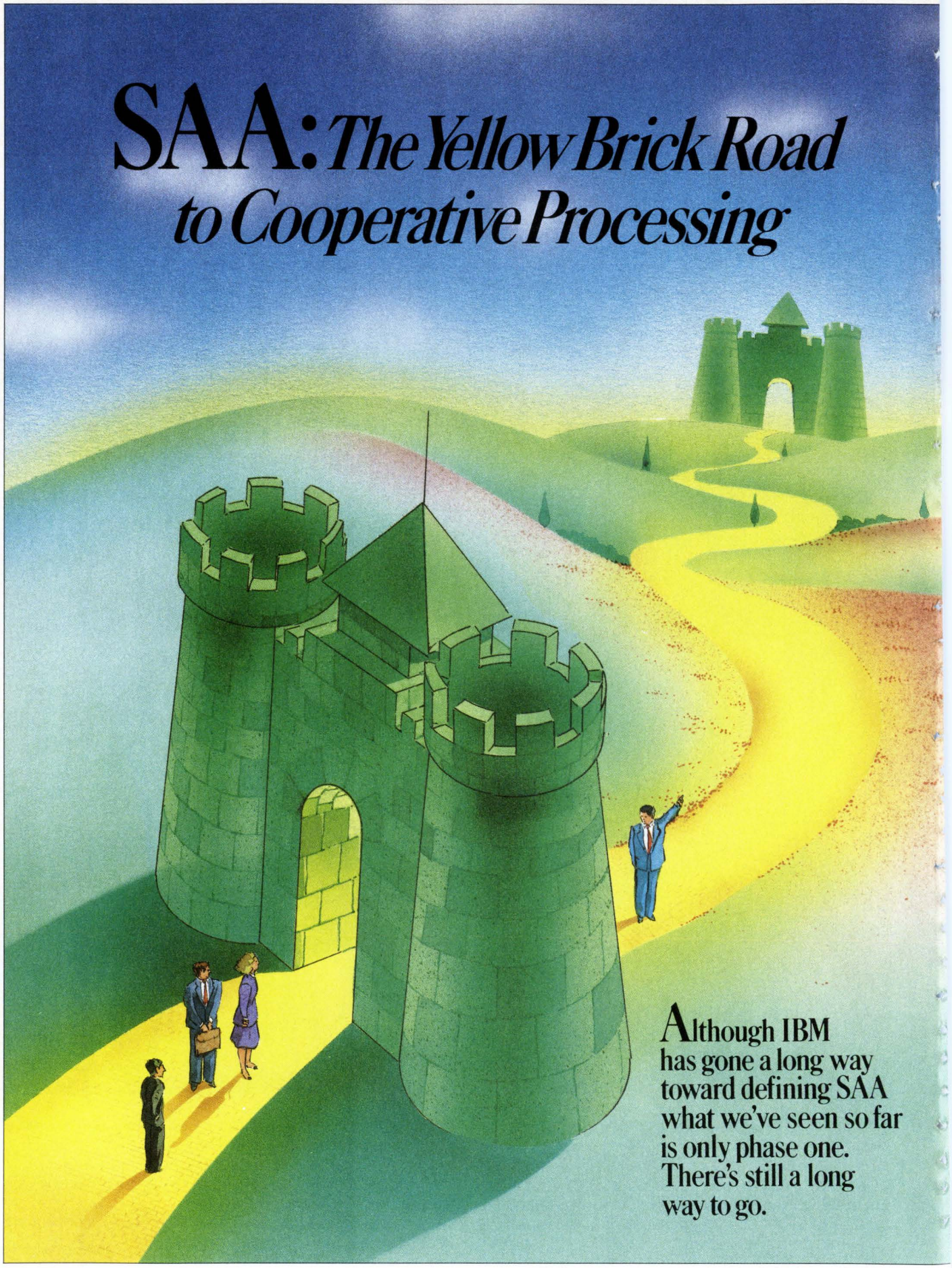
SAA: *The Yellow Brick Road to Cooperative Processing*



Although IBM has gone a long way toward defining SAA what we've seen so far is only phase one. There's still a long way to go.

Illustration by Andrea Baruffi

Behind the News

SAA, IBM's grand plan to link its computing platforms, has significantly changed direction. SAA's new goal is cooperative processing. Yet, some of IBM's customers are either unaware of this goal or see little utility in it. Nevertheless, the shift in strategy has IS managers wondering where they fit into SAA.

BY JEFF MOAD AND GARY McWILLIAMS

In the 16 months since IBM heralded its Systems Application Architecture as a grand plan for software development in the 1990s, SAA has come to be viewed by many harried users and software vendors as a glittering Emerald City. Enchanted by its promise of software portability and consistency across what today are largely isolated computing architectures, many users are anxious to follow the yellow brick road to SAA. But, even after poring over piles of documentation and absorbing IBM's presentations following SAA's debut, users still aren't exactly sure how to get on that road to SAA—or what they will find at the other end of it.

That's because in the last year, the face and focus of SAA have changed. Last March, IBM said SAA was largely about consistency and portability, the ability to move new and existing applications with little effort from one computing environment to another. Today, while IBM says portability is still important, it is largely a way station to SAA's ultimate goal—cooperative processing across heterogeneous environments.

Cooperative processing would lead to the execution of an application across networks of personal computers, midrange computers, and mainframes (see "How IBM Defines Cooperative Processing").

This SAA evolution brings two important facts to light: first, SAA proposes not just to make it easier for users to manage current host/terminal-based systems but to change those systems radically in the near future; second, although IBM has taken large strides toward defining SAA as it has been described today, what we've seen so far is only phase one, with a long way still to go.

SAA's new focus creates a challenge for IBM as it tries to sell users on building new systems in conformance with SAA specifications. Most IBM users understand the portability argument IBM originally used to buttress SAA, even if many of them don't consider applications portability a high priority. Cooperative processing, however, is another matter.

While a few leading-edge users are patching together cooperative processing systems, most are only now beginning to think about splitting up applications and distributing them throughout their companies. For that larger group, SAA is still a long-term road map rather than a blueprint for developing systems today.

What Goes Into SAA Today

As it now stands, SAA wraps together programming interfaces, communications protocols, and user access methods. In the future, it will include a set of applications. Thus far, IBM identifies three hardware families and four operating systems, along with a collection of user access guidelines, programming interfaces, and communications protocols. Products that adhere to SAA's Common User Access guidelines—such as OS/2 Presentation Manager—are trailing the continuing release of specifications.

IBM refuses to disclose elements of the architecture unless they can be available across each of the operating environments within 18 months of announcement. Because of these variations, the cost of SAA conformance will vary from site to site and cannot be determined at this early date with any specificity. Many of the languages and other low-level specifications already exist and are widely used. Yet, beyond the Common User Access guidelines, IBM continues to identify and add new specifications.

The evolutionary process notwithstanding, IBM is advancing its cooperative processing ideas whether or not users are ready for them today. "What you've seen," Lewis Priven, IBM's director of SAA, tells DATAMATION in an recent interview, "is the maturing of the concepts of SAA. A year ago, we talked a lot about portability. . . . Since that time, we've matured our views and really embraced the cooperative processing concept. We're emphasizing workstations—they're getting more and more sophisticated."

A Hint on Cooperative Processing

Like the fabled Wizard of Oz, IBM is manipulating SAA while hidden behind a velvet curtain. Last October, it began pushing the new architecture toward cooperative processing when it announced its Common Programming Interface for Communications (CPIC). This new high-level interface specification and an accompanying design guide for writing SAA applications spell out a model for writing applications in a modular fashion so that they can make use of built-in SAA services, such as communications, query, dialogue management, and common user access.

The October announcement also gave developers the specifications they need to write applications that interface in a consistent way to IBM's crucial Advanced Program-to-Program Communications (APPC) protocol running across the four identified SAA environments—OS/2, S/3X, VM/CMS, and MVS TSO/E. IBM already had told developers which languages they should use to write SAA applications. Now it was telling them how to use those languages to interface to the SAA protocols necessary to distribute those applications across environments.

More recently, IBM began to lift the SAA curtain a notch higher, acknowledging the need for SAA to encompass a whole new class of distributed services if it is to meet the demands of cooperative processing. "We have extended the concepts of SAA to what we call the enterprise information system, so now we look at the entire complex as the system," says IBM's Priven. "When you view it in those terms, you see another set of things we have to be worried about, another set of services we have to provide through SAA. Among these are such things as security and distributed services that would make the invocation of those services by the workstation transparent to the host application."

Easier said than done.

Among other things, IBM must begin to define SAA-approved common ways to access files, provide security across a network, support remote SQL calls, and control common user access screens from a remote site. In each case, IBM either must create a new technique to support those services or choose from existing approaches already used in its product line—tricky when you consider that each of IBM's SAA environments has its own file access scheme, for example, and that there are several more from non-SAA environments to consider. Then, once it has identified which protocol to use, IBM has to begin migrating the new services and protocols to each of the four SAA environments.

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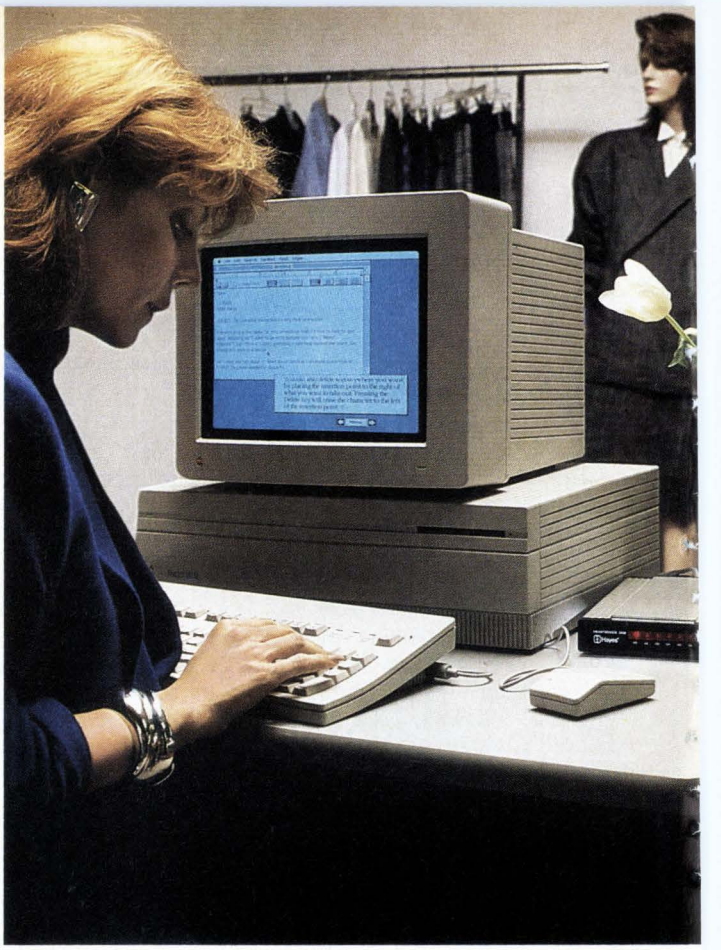

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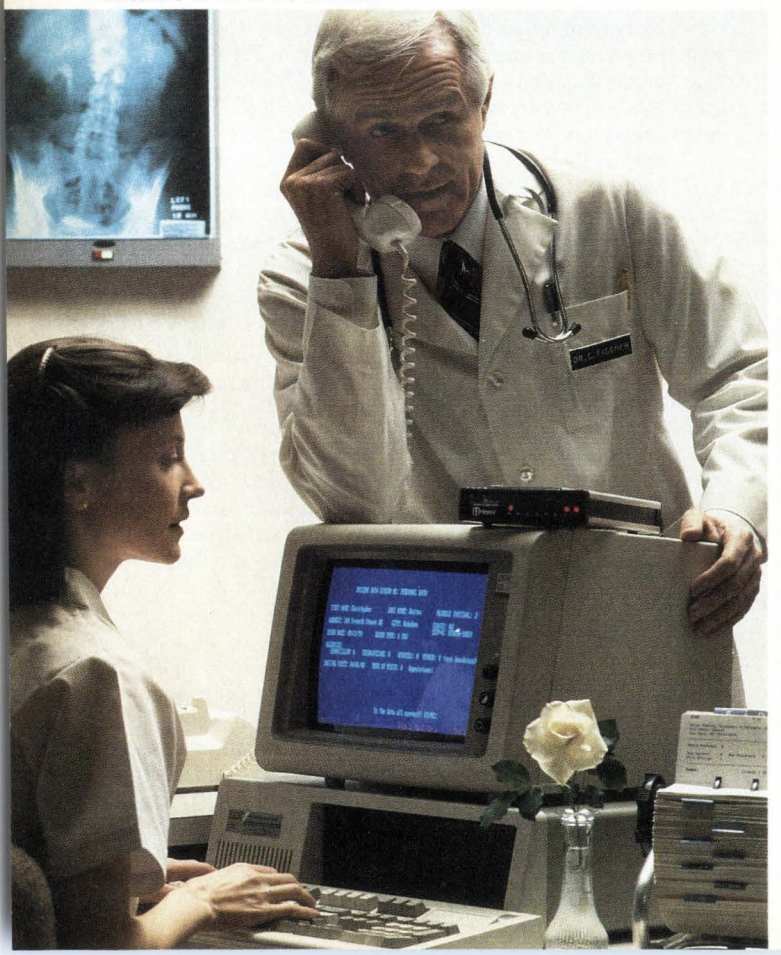

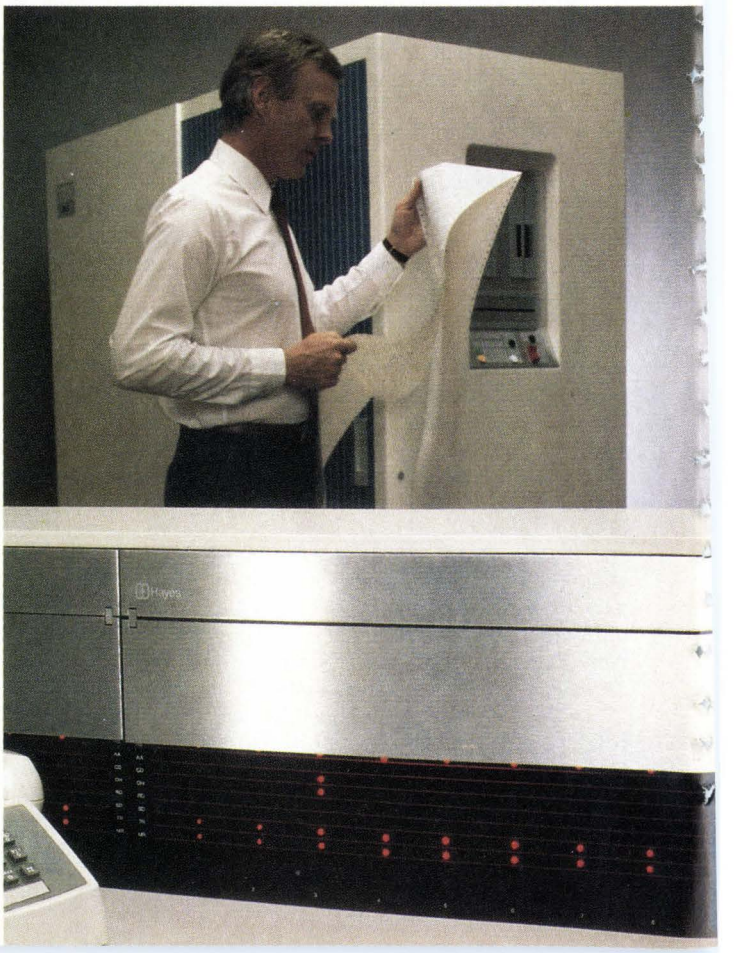

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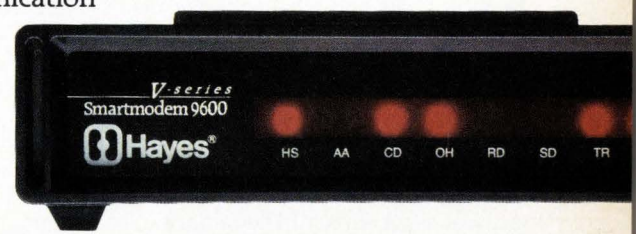

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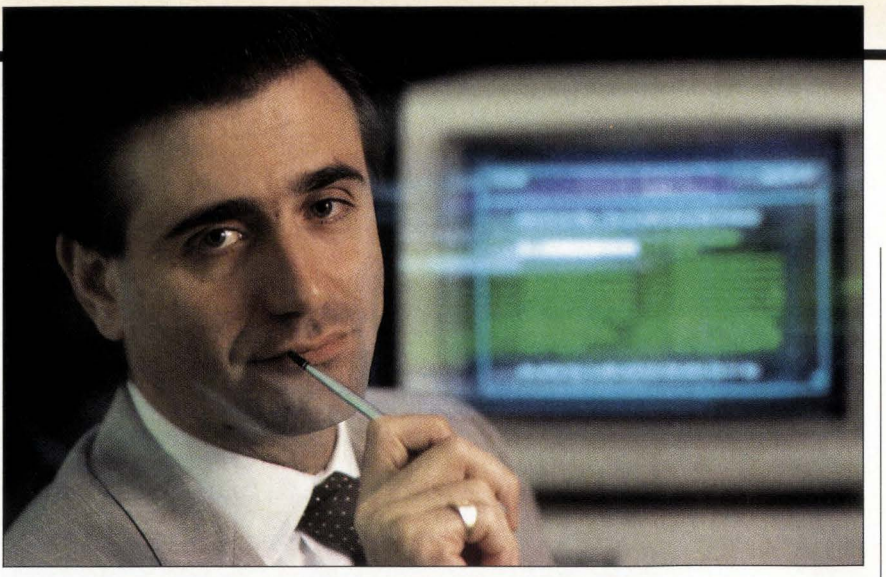
"Obviously, we're thinking about [distributed services] and working very hard at it," admits IBM's Priven, "and obviously there are a lot of problems associated with it."

IBM won't say when it will begin to identify and define SAA distributed services. But, says Priven, "What I urge people to do today is look at what's coming, and you can see it coming with the CPI [Common Programming Interface] and separating the presentation management and dialogue management from the host processor capability and the application. I'm telling you we'll give you some transparent services to do that. . . . You can design your applications today knowing it's coming."

Some Understand, Some Are Confused

Some users understand the subliminal cooperative processing message that is becoming SAA's more overt direction, and they are taking steps to follow along, even if all the specifics have yet to be laid out. "If we're ever to get to [cooperative processing], it won't be with the architecture we have now," says Joe A. DeRiggi, director of systems development at the Big Eight accounting firm of Peat, Marwick, Main & Co., Montvale, N.J. For that reason, SAA "has to be a factor in any long-range plan in the selection of software. We'll say in our long-range plan that we should stay under the SAA umbrella for software development," says DeRiggi.



PEAT MARWICK'S DeRIGGI: SAA has to be a factor in any long-range plan.

But many users remain confused about SAA, either because IBM hasn't been clear enough in spelling out the long-term cooperative processing goal behind the architecture or because they just aren't ready to plan seriously for cooperative processing.

Even those who do accept cooperative processing aren't certain that IBM really does. Take the large New York securities firm Merrill Lynch & Co., for example. Gordon G. Sollars, a Merrill vp responsible for New York area distributed systems and office automation, states that SAA "is a hard subject for me to get my hands around." He believes that SAA will lead to one of two possible outcomes: producing applications that can be lifted intact and run in the three main IBM environments, or providing cooperative processing among disparate IBM systems. If it's the former, says Sollars, "It's the idea DEC had for the '80s. It's not a particularly exciting idea for the '90s." If it's the latter, "then it is inspiring. But it's a little early for me to say which it is."

Others perfectly positioned to benefit from SAA as a portability aid are similarly confused about its direction. Cumberland Farms Inc., an East Coast operator of convenience stores and gas stations, would seem to be an ideal candidate for SAA. The Canton, Mass., company employs all SAA-designated computer families—S/370, S/3X, and PS/2—and does most of its software development in COBOL, RPG II, and C, each designated an SAA language.

But Cumberland's director of applications development, Robert Hadfield, says SAA is not a factor in his develop-

The Effects of SAA on IS Staffing and Structure

While the full impact of Systems Application Architecture may not be evident for years, those watching SAA's evolution say that significant changes in the makeup and staffing of IS departments will be necessary.

Large programming staffs and technical specialists may no longer be necessary. In fact, SAA should change IS staffing needs and potentially lead to smaller departments overall, according to users and consultants. As more of an application's structure and components are dictated by SAA, the need for highly technical personnel may decline.

At the accounting firm Peat, Marwick, Main & Co., changes are already taking place. With an eye toward the future, the Montvale, N.J., company recently combined its 50 mainframe and 20 office systems developers into a single group.

"I told our people that if we're successful that [staffing] ratio will flip. I don't know if it's because of the desktop MIPS or functionality, but it is easier to develop applications on the pc," says Peat Marwick director of systems development Joe A. DeRiggi. "The line between pc and mainframe development will disappear," agrees Lyle C. Anderson, a systems planner with consultant firm DMR Group Inc., Montreal. "There eventually will be one development group working on all IBM's platforms."

Anderson cautions that SAA's impact on the IS organization won't be substantial for another four to five years. "The changes will be slow to come but they will require a development group that is less technically oriented and more business-oriented. That's going to be a hard shift for a lot of programmers," he warns.

"In terms of getting end users to do more of the applications work and what the implications are," notes Lewis Priven, IBM's director of SAA, "I can't say we've gone through a staffing study, but certainly change is coming."

DMR's Anderson expects that SAA's programming and data access interfaces will allow end users to develop reporting and analysis applications. In addition, database tuning and applications optimization will be needed less often, and require less technical proficiency.

"Technology will not be king; it will be the business applications and those who understand the business," says Anderson. As for the size of the organization, Anderson predicts centralized IS organizations will shrink as programming duties are assigned to business units. What's more, today's centralized IS organization increasingly will be viewed as a utility function within the corporation. "IS will be physically smaller, but the span of control of the chief information officer will extend into the business organization," he predicts.

Photograph by Ken Kerbs

ment plans. And, he says, he is not sure that SAA's suite of common programming interfaces and protocols ultimately will yield demonstrable benefits. The company's existing use of SAA-accredited languages and hardware platforms "is by accident," says Hadfield. "If [our choices] are acceptable to IBM, all well and good. But if they're not we wouldn't change them."

The reason? Hadfield sees little usefulness in SAA as it has been described to him. "I just don't believe you can have everything running on all systems. We develop applications for a particular set of users, and for a particular machine." What about cooperative processing? "I've never heard of it before," he says.

Distinguishing Between Objectives

The distinction between portability and cooperative processing is one that IBM hasn't made strongly enough, says Willem Stroeller, director of product planning at Ashton-Tate Corp., Torrance, Calif. SAA "isn't about portability as much as distributed processing and the peer-to-peer capability needed for distributed processing," he argues. Cooperative processing is an Ashton-Tate goal, but the company plans to get there by supporting only some of SAA's elements. Full support of SAA in the interest of portability isn't necessary, says Stroeller.

IBM's Priven counters that cooperative processing isn't achievable without portability: "You really need the aspects of both pieces when you talk about cooperative processing. They're both important, not one or the other."

So, why didn't cooperative processing become an issue earlier? There are several possible reasons. For one thing, IBM may have been trying to use SAA to reply to archrival Digital Equipment Corp., which had been scoring points by stressing portability within its single-architecture VAX product line. In addition, portability may be a key to IBM's internal efforts to improve its own software development productivity. "IBM probably feels portability is an important aspect to keep its own cost of software development and maintenance down," remarks Stroeller.

To many of IBM's customers, however, pure portability is not a critical issue. "We don't use System/34s or System/38s, and the likelihood of our transferring applications from pcs to mainframes is zero, so what do I have to worry about in terms of portability?" asks Jeffrey A. Alperin, vice president for corporate technology planning at Aetna Life and Casualty Co., Hartford, Conn. If portability becomes a selling point for SAA, say Alperin and others, it will be because it allows users to standardize development on a specific set of languages and development models so that limited programming resources can be applied up and down the computing hierarchy.

Lyle C. Anderson, director of systems planning at the White Plains, N.Y., office of Montreal-based consultancy DMR Group Inc., believes that IBM talks about portability and cooperative processing interchangeably to portray its own needs as those of its customers. "The key and primary factor [of SAA] is that IBM needs to be competitive in software," declares Anderson.

The Fear of Software Obsolescence

Even if the cooperative processing message hasn't gotten through to many users, the fear that SAA is obsoleting their current IBM software has. IBM has been trying to include in SAA only protocols and products that will play in a cooperative processing environment. That means older products such as IBM's widely used Customer Information Control System (CICS) transaction monitor and its IMS/DC hierarchical database management system initially were left out of SAA. Users, in turn, pressured IBM to get additional products such as CICS supported under SAA, and IBM relented. In October, it promised a special interface between CICS and IMS/DC and the Common Programming Interface for Communications, in effect providing a backdoor way for those subsystems to participate in SAA. More recently, IBM bowed to pressure to include the S/3X language RPG II.

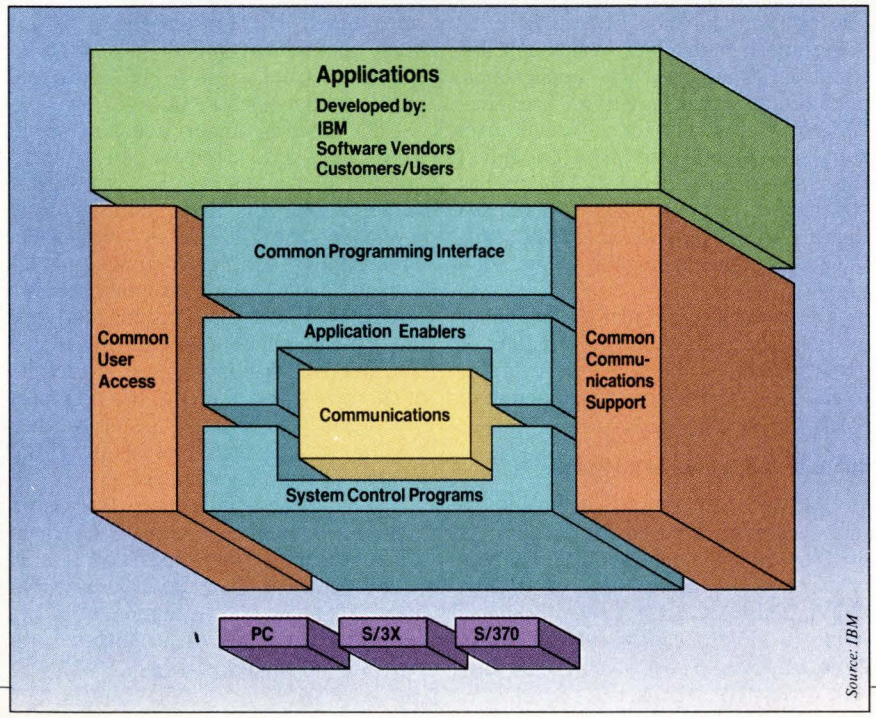
That doesn't mean CICS is the SAA-approved transaction monitor or that IMS is on a par with DB2 as the SAA DBMS. The problem is that both subsystems would be very difficult to move to the OS/2 environment, a requirement if they are to play a role in an SAA, cooperative processing future. "We are not going to put IMS on OS/2," says Priven flatly. "It is not going to go there."

As for an SAA transaction monitor, Priven says the issue hasn't been settled. IBM would like to support a transaction monitor with a single common programming interface across all SAA platforms. The question remains: will that SAA transaction monitor be CICS or something more suited to run on desktop systems as well as mainframes?

In the meantime, IBM has designated CICS for the 370 only as an SAA product. The single-family inclusion, Priven explains, is to let users know that "we're thinking about you. You're still going to have transaction processing across the lines."

The way in which CICS was added illustrates the pressure that IBM faces, and

The SAA Framework



Source: IBM

Chart by Teresa Berasi

Changing Models Of Computing

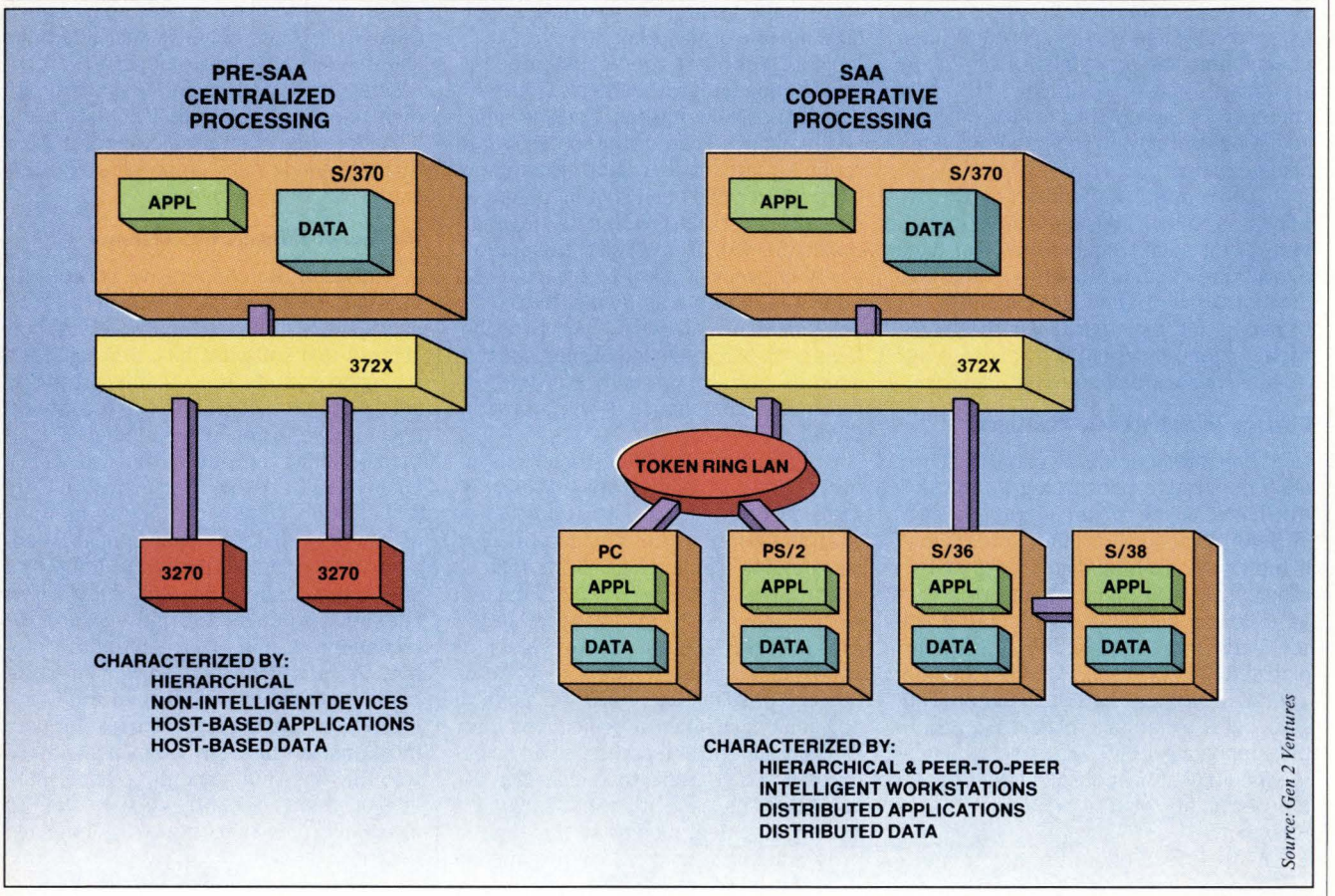


Chart by Teresa Berasi

the dilution that SAA may be confronted with if other components are similarly added. Peat Marwick's DeRiggi, for instance, held off on SAA until CICS was included. Others say it leads to the creation of two classes of SAA-compliant technologies: those that are strategic, and those that exist only for transition purposes. "For IBM, it comes down to the fact that it has a huge base of customers, and it can't afford to obsolete their products overnight," says Steve Randesi, chairman of Gen2 Ventures, a Saratoga, Calif.-based consultancy.

Others ready and anxious to develop cooperative processing applications see IBM's fumbling with various components as a sign of uncertainty. Merrill Lynch recently began applications development using LAN Manager and Windows from Microsoft Corp., Redmond, Wash., rather than waiting for IBM's SAA Communications Manager or Presentation Manager. "I'm not as confident it [cooperative processing] will come from IBM as quickly or be as unencumbered as what we can get from Microsoft," says Merrill Lynch's Sollars.

Similarly, medical supply firm Baxter International Inc., Deerfield, Ill., is going ahead with plans to develop distributed manufacturing applications, even though, according to Michael Heschel, vice president for information resources, "we still don't have enough of the specs to implement SAA." Baxter has standardized on some SAA technologies that are available, such as IBM's COBOL, but for other pieces, such as a transaction monitor, Heschel says, "we're having to be as general as we can or use a number of tools and some homegrown code to get around the problem. We were hoping to see more aggressive development of SAA by IBM by this point."

SAA Is Not All Things to All People

IBM's Priven denies that the company is watering down SAA or delaying its progress by including products that may or may not have a long-term role to play. "Very clearly, SAA is not meant to be all things to all people," he says. "We can't do that. If we do, we haven't done anything. We're really trying very hard to pick only the best that our individual lines can offer us." But, Priven admits, IBM has been under "a tremendous amount of pressure" from users to pull more and more products under SAA.

IBM also is under pressure from some users to do more to open SAA up to non-IBM environments. So far, IBM has talked in only the most general terms about supporting interfaces between SAA environments and the Open Systems Interconnection (OSI) communications protocols. To date, IBM has included only the OSI X.25 packet-mode interface as a data link control component of SAA. None of the other layers of the ISO transport model has been included in SAA. Neither has the ISO file transfer capability or the X.400 mail handling standard.

That disappoints large IBM users that also happen to use products from other vendors. Burbank, Calif.-based Lockheed Corp., for example, is a big user of IBM and DEC equipment, and, according to Dean Allen, the company's director of information services, "we pay a

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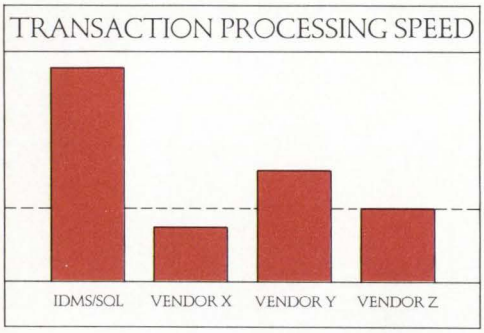

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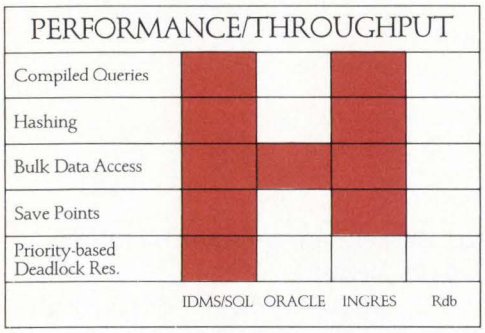

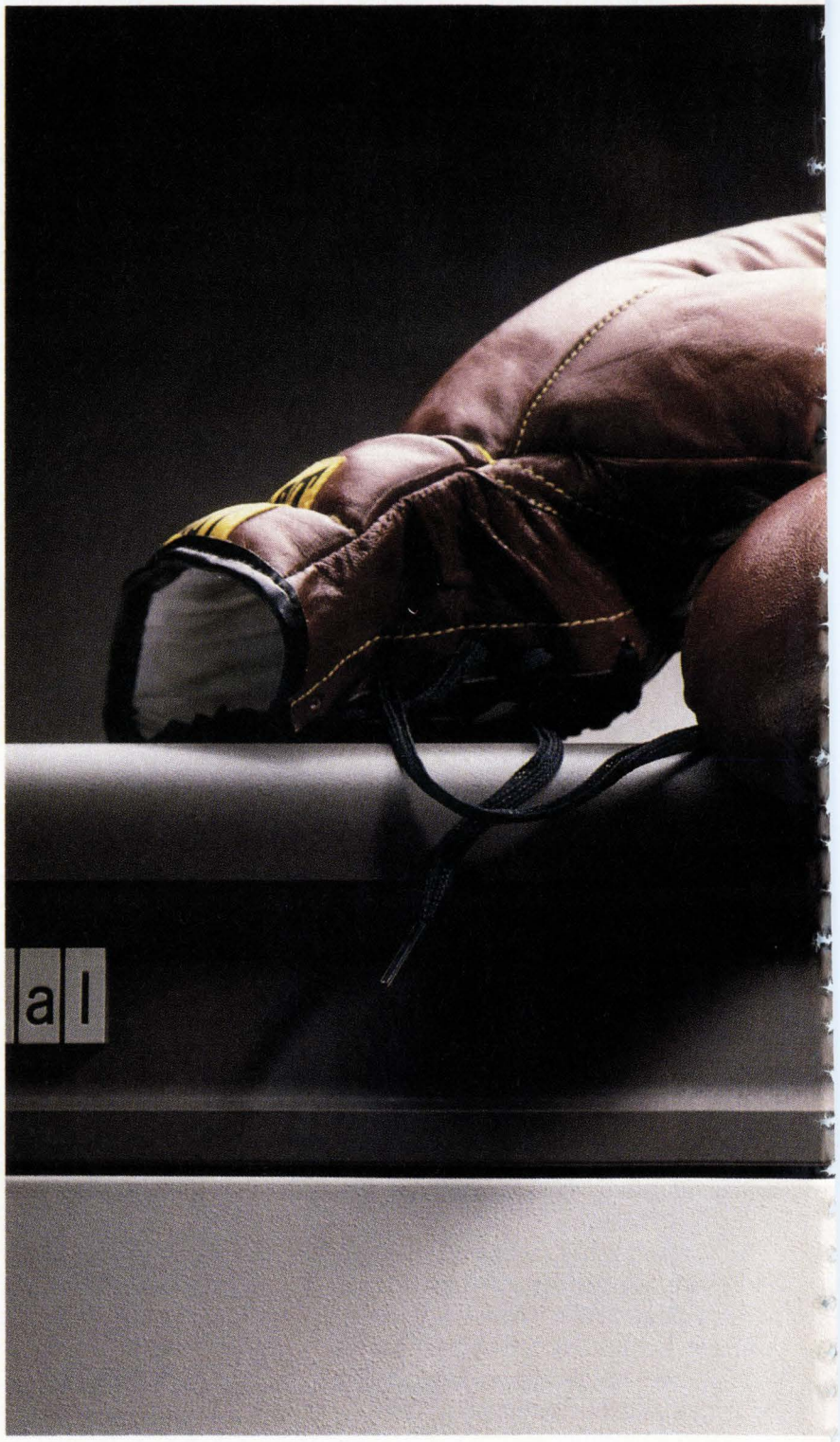

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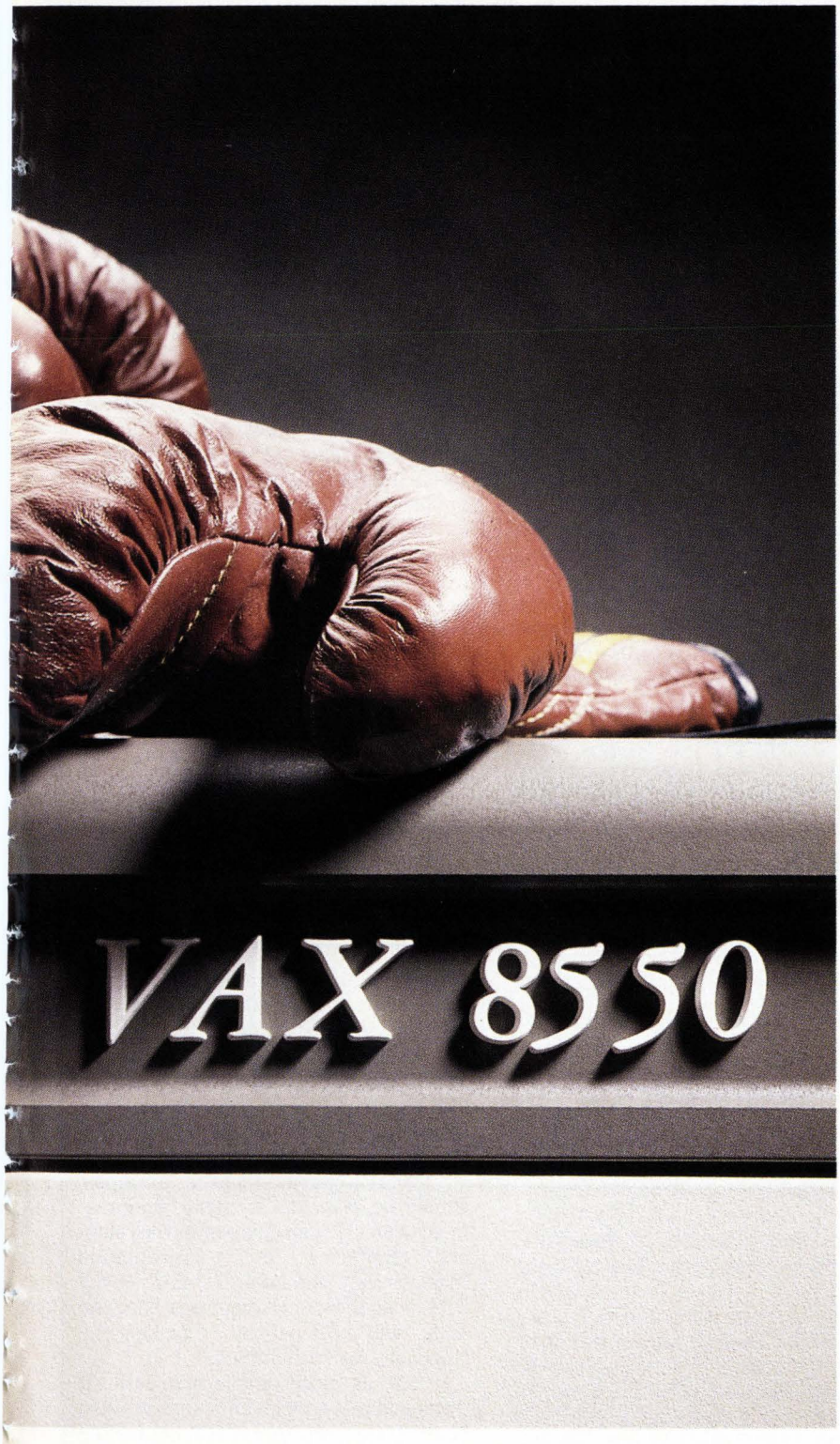

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tremendous penalty because the two worlds—IBM and DEC—don't communicate very well." Allen would like to see IBM become more aggressive about opening SAA to other vendors. "Their commitment there has not been obvious. And until IBM does that, SAA doesn't have much value for us. It's one vendor's approach to clearing up some of its problems," remarks Allen.

In the meantime, users such as Allen are paying as much attention to the Common Applications Environment (CAE) being developed by X/Open as they are to SAA. X/Open, a four-year-old international, nonprofit organization, is promoting a competing applications architecture built around Unix System V, the Posix interface, OSI networking standards, plus de facto standards such as SQL. Some users have gone so far as to require vendors to comply with CAE when bidding on major contracts. One such user is the Internal Revenue Service, which has issued a $2.5 billion request for proposals for Unix-based equipment specifying CAE.

While acknowledging that CAE, like SAA, has its holes, some users see it as a useful model for new, work group-based applications. Many of them hope that X/Open, if widely accepted, could have a positive effect on IBM. X/Open "can be a way to put pressure on IBM to open up its [SAA] environment," says Lockheed's Allen.

But IBM says that X/Open is for an environment—Unix—that is separate from the world of SAA and its users. Besides, IBM claims, SAA is already open. "SAA is built on interfaces that are defined and published, and that are international standards like OSI," says Priven. "It's not built on a set of products so the interfaces can change. The applications are protected." IBM says that SAA will include interfaces to OSI, but only as OSI and IBM's proprietary SNA network themselves merge.

Despite these declarations, Priven acknowledges that many of IBM's SAA interfaces are, in fact, based on proprietary IBM products, products over which IBM has control. The applications generator that is an integral part of SAA, for example, is based on IBM's Cross System Product 4GL. Likewise, much of SAA's Common User Access service is based on IBM's Graphical Data Display Manager, and its database query interface is based on IBM's QMF product. Priven says IBM chose to specify its own products where no industry standards existed.

IBM's willingness to identify its product offerings as SAA standards has many third-party software vendors continuing to wonder just how open SAA will be. On one hand, SAA, if it is open, could broaden most third-party vendors' markets by allowing their products to run in all four SAA environments. On the other hand, if some interfaces turn out to be proprietary—the interfaces between major SAA components such as the database services and communications services, for example—third-party vendors would find it virtually impossible to replace certain key IBM products.

The Concerns of Third-Party Vendors

Third-party vendors, through the ADAPSO trade group, have sought written assurances from IBM that SAA will include no such hidden, internal interfaces. So far, no such assurances have been forthcoming. IBM isn't making any promises either. According to Priven, "If it's an internal interface, by definition it won't be published. As in the past, where vendors have a need, IBM will deal with them one-on-one."

However the rest of SAA goes, third-party vendors and others are helping make at least one component, the Common User Access guidelines, a de facto standard for developing screens and codifying function keys. "I've recommended clients look at those and consider adopting all, or parts, as screen design standards," says DMR Group's Anderson.

Whirlpool Corp., Benton Harbor, Mich., plans to use Common User Access within its development shop and hopes for the same among third-party developers. "We want to have a consistent view into the application from all machines," says J. Jeffery Reinke, Whirlpool's director of advanced information technology. "A consistent view to the user means ease of training and use."

Such picking and choosing is enabling users and software developers to plan cooperative processing environments and applications without strict adherence to all of SAA's precepts.

IBM's Priven says that such examples should be taken as a ringing endorsement of SAA. Those IS shops and developers embracing OS/2 Presentation Manager, SQL, and Logical Unit Type 6.2 "are using the main elements of SAA," he says, "and most people are picking the languages we've identified."

Yet, as more people begin to sift through the SAA documents, they are also discovering that there are conflicting signs on the road to Emerald City. And Kansas may not even be on the map. ■

How IBM Defines Cooperative Processing

As a model for building systems, cooperative processing is not very new. The concept has been around in various incarnations since the 1970s when local networks first arrived.

Then, the ability to swap data files among multiple applications was considered the state of the art. The more recent proliferation of personal computers and local area networks has brought a further refinement. Now, cooperative processing architectures are used to enable two or more software environments to act on a single application.

In essence, cooperative processing replaces the distribution of individual applications with the distribution of individual *functions* within an application. Cooperative processing means networking, for example, a user interface on a pc or workstation with a database on a host to create a single environment.

Lewis Priven, IBM's director of SAA, says that one way to understand cooperative processing is by looking at what it allows you to do in the IBM world. The cooperative model "allows the application to be broken in pieces so that, for example, part can execute on a System/3X or a System/370 host and a piece on a PS/2," says Priven. "The idea is to get the benefits of each."

Because the technology to enable cooperative processing is so new, few examples of applications exist. Some shops, such as Merrill Lynch & Co., New York, are designing systems that achieve a type of cooperative processing by making the links between applications transparent to users.

Merrill, for instance, is now building a financial reporting system that transparently links networked pcs with a database server. Dubbed Darwin (for Database Access and Reporting through Windows), the system effectively glues the separate spreadsheet and database packages using Microsoft's Windows and LAN Manager software. "It's not anything in the realm of coprocessing," says Merrill Lynch's vp of distributed and office systems Gordon G. Sollars, "but we are certainly outside the realm of doing a database application on the workstation."

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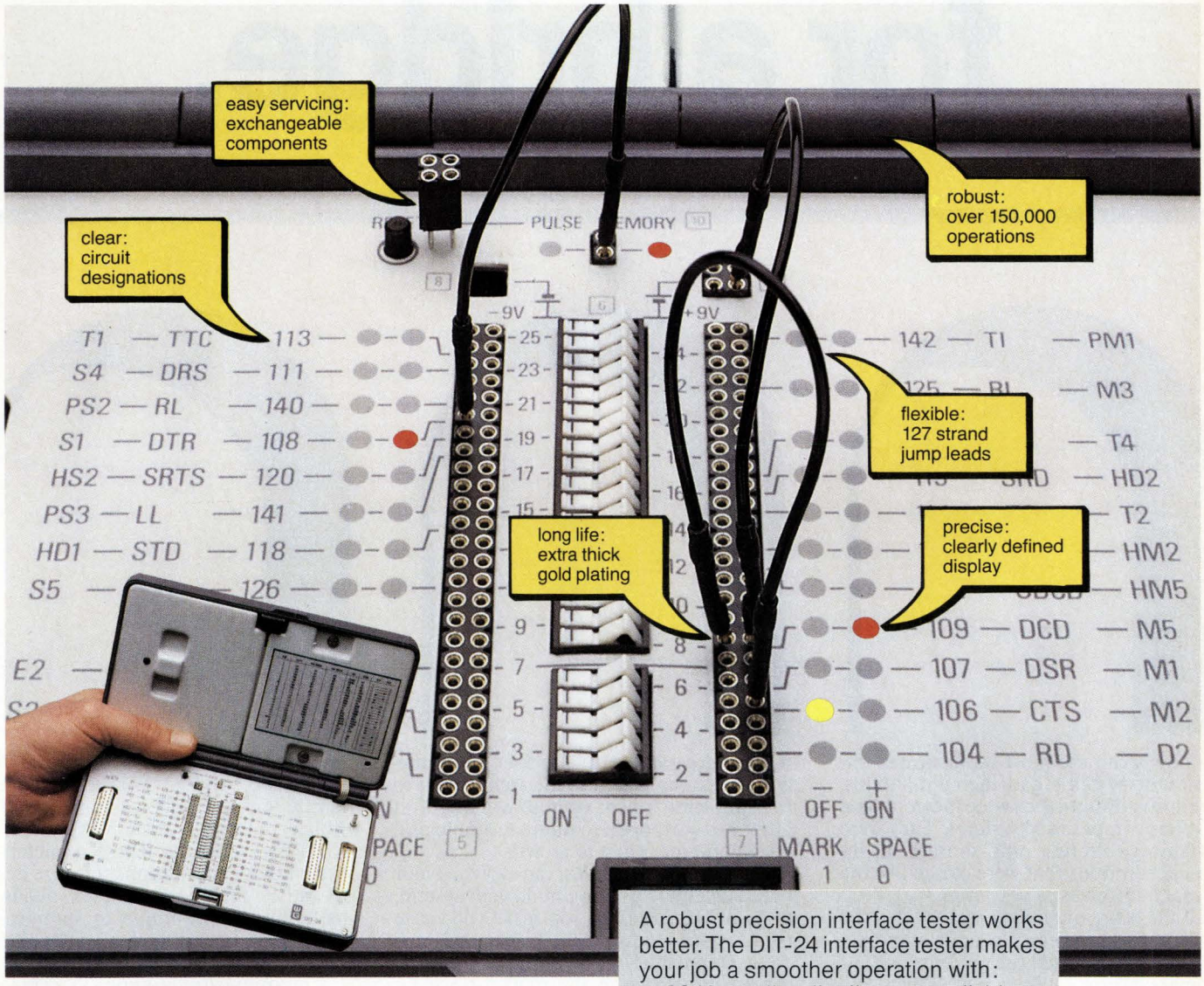

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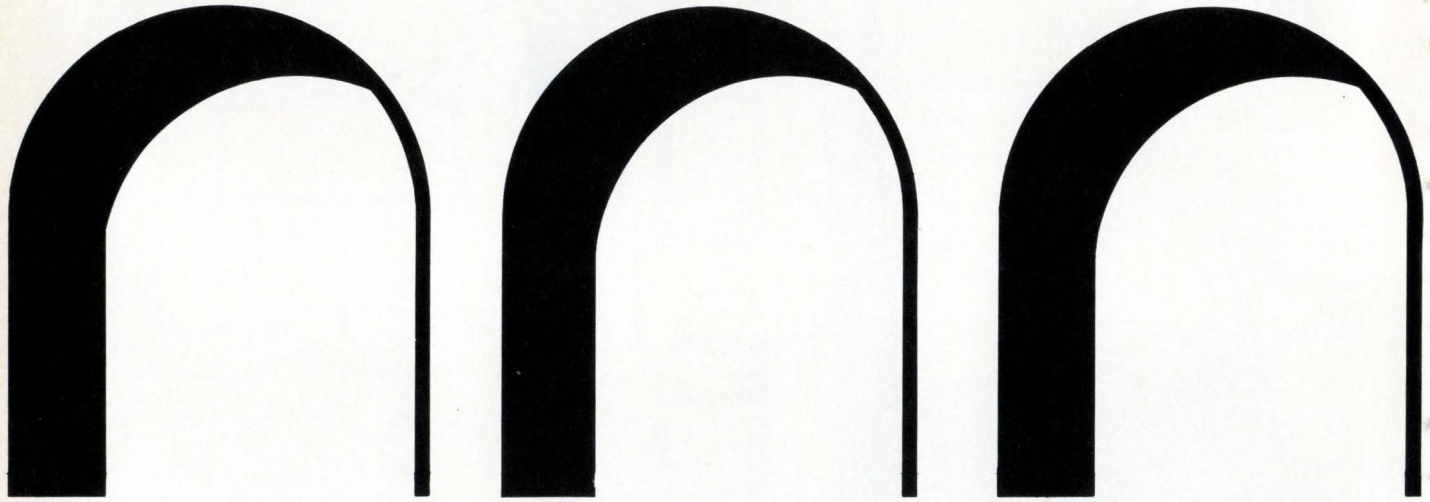

Until now, even the most sophisticated minicomputer systems had their limitations. By their very design, they were incompatible with other competitors' systems. They were constraining, offering only short-lived, incomplete solutions that were closed like the systems themselves.

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OSI: Putting World Standards Into Practice

Illustration by John Labbe'

By the end of 1988, the ISO will have approved many of the major communications standards in the OSI model. Now, IS faces the task of putting those standards into practice, which means testing products. Tests must be internationally recognized, but there is a danger of rifts developing between the U.S., Japan, and Europe.

BY TIM WELLS

For the last 10 years, groups of technicians, negotiators, and standards officials around the world have been toiling away to produce a set of basic standards to support the Open Systems Interconnection (OSI) seven-layer model of communications standards. By the end of this year, the International Standards Organization (ISO) in Geneva finally will have ratified many of the main foundation standards for OSI.

But don't get too excited. This protracted standards-setting process is only the beginning. For users to benefit, these standards will have to be applied in real products and users must be confident that the products they buy are genuinely compliant. The challenge for the next decade is to put OSI into practice.

There is only one way that this can be achieved successfully, and that is through internationally aligned and widely accepted conformance testing and certification procedures. The result will be a kind of global information systems industry seal of approval for OSI-compliant products. Sounds simple enough, right? Well, it isn't.

The communications standards involved are imprecise and they are peppered with a variety of sometimes conflicting options, while existing conformance procedures have some severe limitations. But more threatening to the future of OSI in the global information systems industry is the danger that three

different sets of tests and procedures will emerge in the U.S., Europe, and Japan—at least in the short term.

Major users must be aware of these factors if they are to put their faith in the conformance tests and certificates that vendors will cite when they propose their equipment. If these factors are ignored, users will be disappointed. It is a case of understanding how closely the reality of Open Systems Interconnection can match up to the ideal.

Standards Alone Are Not Enough

The first problem is that communications standards, in general, are not precise specifications. Sometimes, this imprecision is accidental since it's very difficult to write exact specifications for complex communications sequences. Or, the imprecision may be deliberate; only by the inclusion of a variety of options can standards groups reach a consensus. Whatever the cause, the result is the same: two independent implementers are unlikely to come up with identical interpretations or options, so interworking will not happen, or at least it will be very difficult.

This situation is not unique to computing and communications standards. Other, longer established industries have learned that standards must be precise and testable. Indeed, many standards outside computing specify exactly which tests must be applied and how they should be carried out to ensure accurate implementation. For example, ISO standards dealing with food, chemical, and metal industries are virtually all related to methods of testing.

The testing of communications equipment is an integral part of its production; no supplier offers communications equipment without subjecting it to rigorous tests. But these tests and the specifications are usually under the supplier's own control. For OSI to work in a situation where the base standards are imprecise, the necessary precision must be provided by unambiguous tests. Moreover, the tests themselves must be available to every implementer or potential implementer.

Internationally agreed upon conformance tests for products provide a perfect answer, in theory, but perhaps not surprisingly, practice falls short of perfection. The shortfall is an interesting mixture of a lack of experience, legal complexity, and other real-world constraints. An understanding of this mixture is necessary for an understanding of what must happen for OSI to succeed.

Conformance testing is not a new topic for computing. It is routinely practiced for language compilers and, in fact, the U.S. federal government requires COBOL and FORTRAN compiler certification from its suppliers.

This process has established four important precedents within computing, although again they are relearned from older industries. One is that a conformance test only tests that a product conforms to what is written in the standard. Although this sounds simplistic, its implications are devastating. For instance, in the case of COBOL, the accuracy of arithmetic calculation cannot be tested, since it is not defined by the standard.

PAROCHIAL OBSTINACY GETS IN THE WAY OF PROGRESS.

The second lesson is that products may accurately implement a standard, but actually rely on additional, or superset, features for some aspects of performance. There is nothing a pure conformance test can do about this. Although these features may be of vital interest to a user, a conformance test cannot even comment on them.

The third lesson is that there is a vast gap between conformance and usefulness. For example, the ISO Transport Standard for communications allows for a product to generate a reject at any time. Thus, a system that produces no response other than rejects may be claimed to conform, but could by no means be described as useful.

The last precedent is not a technical one. COBOL and FORTRAN validation, despite their limitations, are now widely accepted as reasonable and helpful to the industry at large. They reached this state through the backing of a powerful procurement agency—the U.S. federal government—and, indeed, without it they may not have succeeded. The moral is that standards need to be "pulled through."

These limitations of conformance testing shouldn't obscure the fact that for OSI to work there must be both precise specifications and common tests. If tests are sufficiently comprehensive, they become the specification, in de facto terms. This requirement for testing is well recognized and has led to the emergence both of highly visible demonstrations—such as the multivendor electronic mail and data exchange demonstrations at the Enterprise Networking Event, Autofact, and the Hannover Fair—and of organizations producing and offering testing technology for widespread common use.

A Higher Degree of Precision Is Needed

This leads at once to two interlinked problems that must be solved. One is that the tests actually used must be of a sufficiently high technical quality to allow meaningful communication between implementations that pass them. The second is that there must be universal agreement on the tests that will be used.

In effect, this means that the specifiers of the tests must achieve a degree of precision that has eluded the producers of OSI standards over the years.

Finding the necessary test suites will be gradual rather than instantaneous. Initial test suites may not guarantee interworking, but as each problem is identified, the suite can be enhanced. Only usage over a period of time will provide the necessary knowledge to allow deficiencies to be identified. Like standards, tests to be used must be in the public domain and under public control. This work on public standardization of OSI test suites is under way at the ISO and will take time to complete.

The complexities of conformance testing are not all technical, however. The problem of finding widespread agreement on what tests to use could take longer to solve because of commercial and/or political pressures. That arises for two reasons. In some circumstances, testing to local standards has been used by governments to favor their own industry and this is anathema to industries that are trying to achieve open markets.

The second reason is that tests used in procurement may differ in different parts of the world or in different industries. This makes it impossible for suppliers to produce consistent product lines and for interworking to take place.

These numerous issues affecting the successful testing of OSI leave the global IS industry with four main problems:

- Organizations offering tests must be prepared to stick with them until they are of sufficient quality to give a guarantee of

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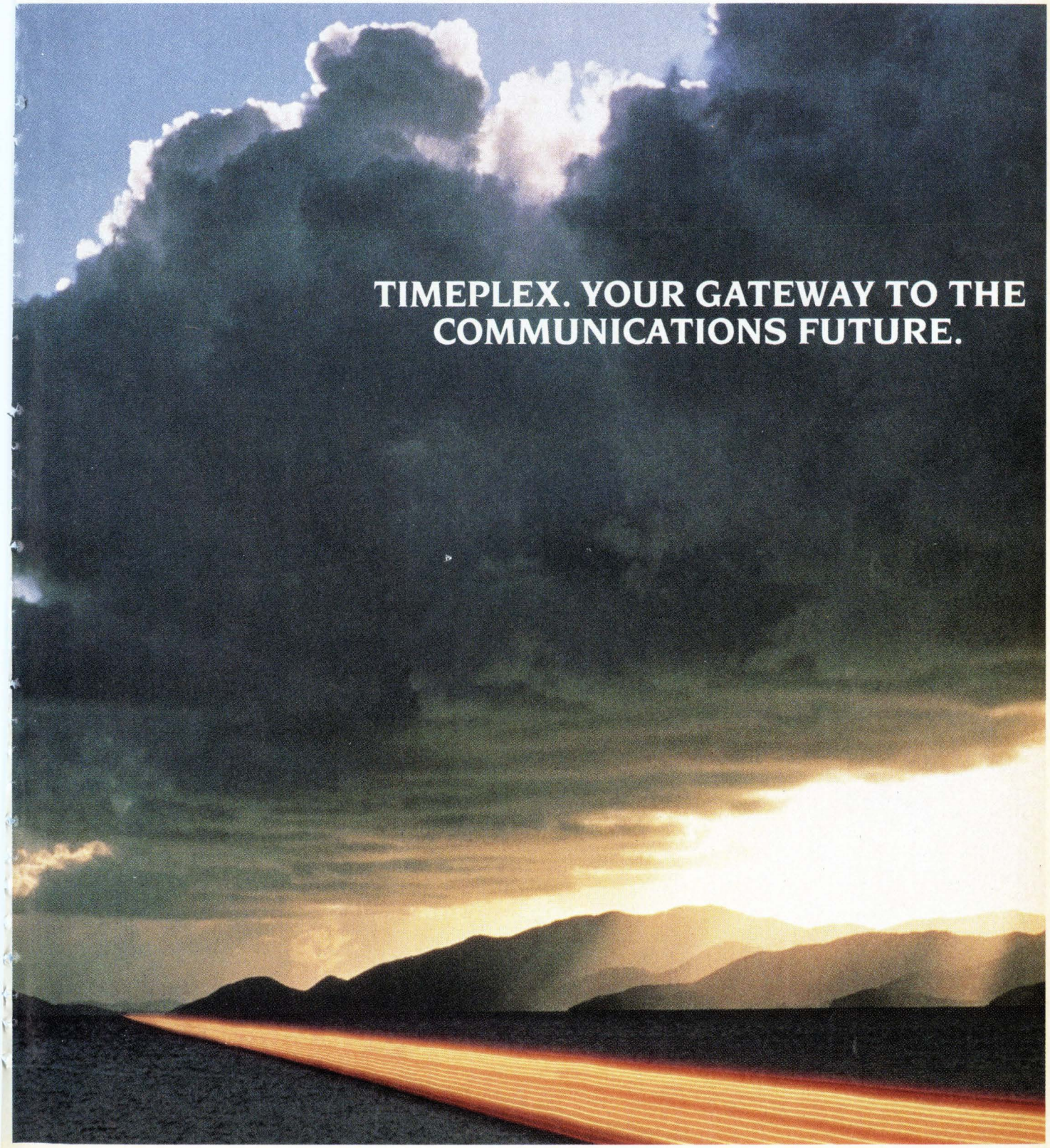

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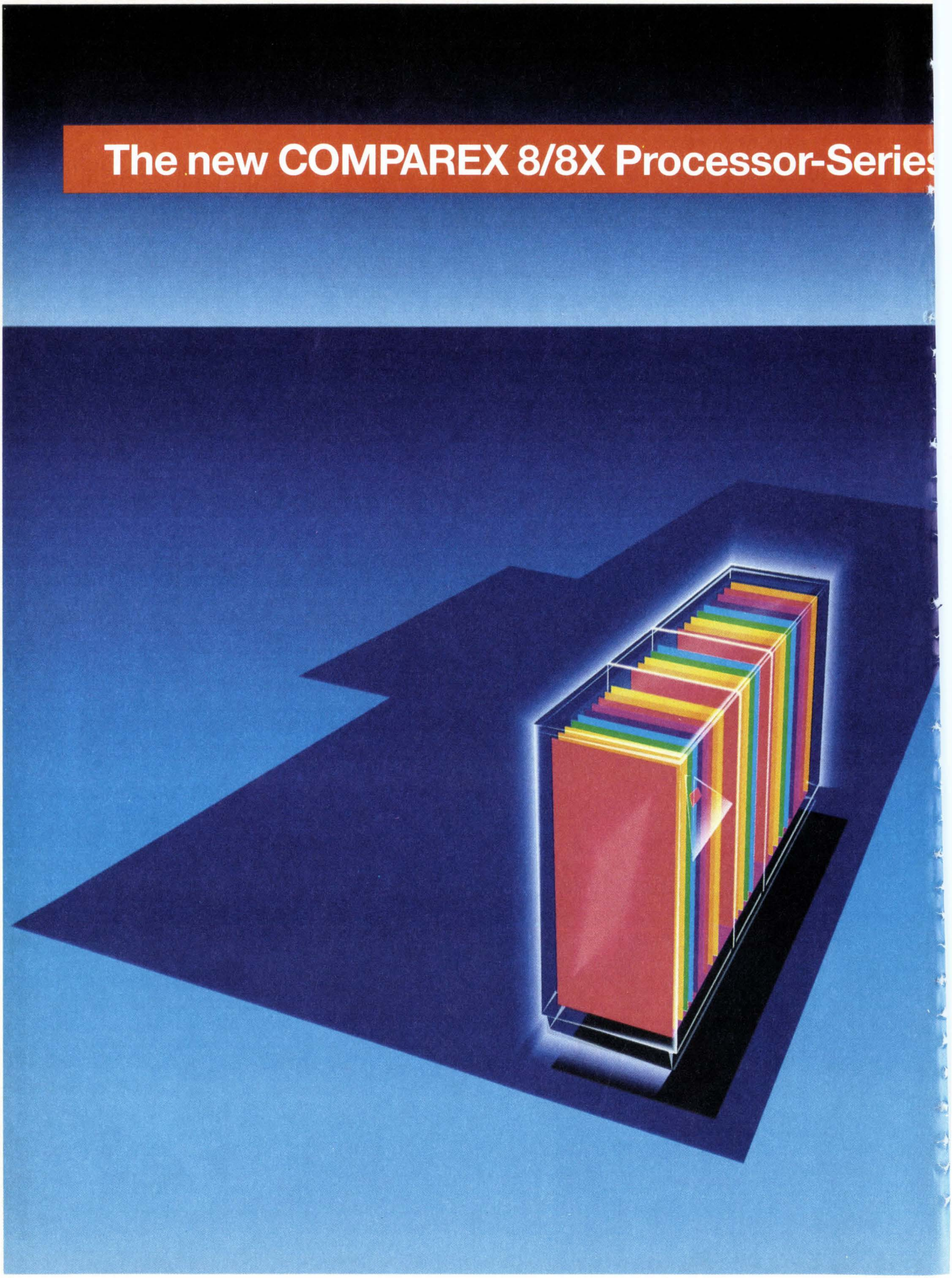

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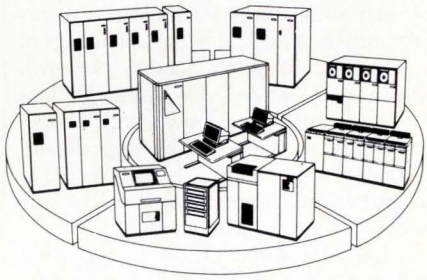

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interworking.

- Tests must have the backing of reputable organizations.
- All laboratories must apply tests in the same way, so that there is no suspicion of cheating; an inspection mechanism will therefore be necessary and there must be sanctions for misuse.
- Tests must be openly available and not locked in to any vendor or testing institution.

Two Major European Initiatives

Moves are now under way in Europe, North America, and Japan aimed at providing solutions to these problems. The European Commission has taken two major initiatives, each offering a partial solution. The first is the setting up of a formal Certification Scheme that will ensure equivalence between testing laboratories across the Continent. The second initiative is the launching of the Conformance Testing Services (CTS) program aimed at ensuring that test services of adequate quality exist.

In North America, the Corporation for Open Systems (COS) has been established to produce and make available tests and test systems necessary to make OSI a reality. In Japan, a major project is under way to offer testing services associated with Japanese functional profiles of the OSI standards.

In Europe, the problem of aligned tests must be solved for many industries if the European Commission's goal of an open market in Europe in 1992 is to be achieved. An outline scheme has been proposed by a committee operating under the aegis of CEN/CENELEC (two of Europe's standardization bodies, based in Brussels) and will be overseen by CENCER, the certification arm of CEN. Any organization is free to propose a set of tests and procedures for use within the scheme. CENCER will accept these tests and procedures as long as they are being used within the scheme and will also make them available, under license, to any laboratory wishing to operate within the scheme.

These designated laboratories will test equipment under the rules of the scheme and prepare formal test reports for their clients—the suppliers or purchasers of the equipment. If they wish, clients may then offer these test reports to national certification authorities, which will in turn issue a certificate if the test report is satisfactory. The certificate will be valid in all countries operating under the scheme and will remove the need for any retesting.

At first sight, the scheme looks complex, but it is born out of much experience in other industries and has some powerful advantages. It allows testing laboratories to be operated by a supplier (first-party testing) or by major users (second-party testing) or by independent organizations (third-party testing). It does this by rigid definition of the standards of operation that must be met and by insisting on detailed record-keeping. It also provides for proper periodic inspection of laboratories to ensure that they are operating within the scheme. This is a necessity if certificates are to be widely recognized; there must be absolute assurance that laboratories are operating consistently and neither deviating from the rules accidentally nor as a favor to local industry.

The aims of the European CTS program, meanwhile, are to encourage organizations to bring forward test services that can be offered for use within the CENCER scheme. This involves the specification of tests and procedures, as well as the establishment of laboratories prepared to offer these services for public use. The use of such testing services is seen as an essential part of European public procurement.

The program consists of a series of contracts, each involving participants from more than one country. The largest program deals with tests for wide area networking and will bring forward test services for lower levels of OSI, Transport and Session, FTAM, and MHS. The cooperating partners in this program represent Denmark, France, West Germany, Italy, Spain, and the U.K.

An Implicit Guarantee

In North America, COS is attempting to achieve the same effect by publishing tests and procedures and by licensing the use of a registered mark. This may be associated with products that meet those criteria specified by COS. As with the CENCER scheme in Europe, testing in the U.S. can be carried out by suppliers or by other laboratories set up by or approved by COS. Effectively, what is happening is that the corporation is prepared to give the market an implicit guarantee that products bearing its mark will achieve interoperability.

One major issue in the U.S. that requires clarification is whether COS testing will be recognized by the U.S. government as an adequate proof of conformance for procurement purposes. The role of specifying such tests for government procurement lies with the National Bureau of Standards. If NBS decides to use tests that are different from COS tests, a very confused situation would exist.

The situation in Japan is even more complex. There, the Interoperability Technology Association for Information Processing (INTAP) was established in late 1985 as a joint public/private sector initiative. It has several aims, the principal ones being to oversee a large demonstration project on interoperable databases. This project will be developed around OSI standards, and it is a fundamental part of the project that INTAP develops and makes available OSI testing services. INTAP is supported by all major Japanese IS producers. Although there is as yet no formally stated intention to offer certification based on tests developed by INTAP, precedent suggests that certification to Japanese standards will happen in Japan and there is no other project in existence that could be used as a base.

Meanwhile, the World Federation of MAP/TOP User Groups is considering the introduction of MAP/TOP certification marks based on approved tests. Unlike the other certification efforts, this would represent a genuine example of user "pull." Two points arise from this: financial resources must be available to do the job properly, and the tests should be aligned with the other certification schemes in operation.

Toward International Alignment

That there could be three different sets of tests and procedures operating in Europe, the U.S., and Japan, at least in the short term, represents an improvement over a situation where there is no testing at all, but it also means that different variants of OSI may find use in different parts of the world. Given the long-term goal, it means this can only be a temporary solution; the problems in finding a longer-term solution are that the individual services are dissimilar in some respects and that no formal harmonization work has yet begun.

The most sensible approach is for each standard to have associated with it an internationally agreed upon set of tests and procedures. The alignment of regional standards is the first step and here progress has been made. The recent bilateral arrangements between the Standards Promotion and Application Group (SPAG) in Europe, COS in the U.S., and the Promoting Conference for OSI (POSI) in Japan have led to wider alignment involving the European Workshop for Open Systems, and the NBS in the

U.S. Given such moves, it will not be difficult to produce common test suites and procedures, but it will take both time and resources.

There is one further factor. If there is to be alignment of testing between the U.S. and Europe, then access to those tests would allow Japanese industry access to U.S. and European markets. In theory, access to Japanese tests should allow U.S. and European industry access to the Japanese market, but, historically, this has proved to be only theoretical. This topic has much more to do with government procurement conditions than technical alignment of tests, but it should be regarded as one of the major inhibitors of OSI in the real world.

The principal problem is that alignments are usually slow to happen, and the slower they are, the more likely retroactive alignment of operational testing services will occur. We could yet have a situation where parochial obstinacy gets in the way of progress. For instance, at the current time, European tests will be used for public procurement and those of COS primarily for marketing purposes, but possibly also for public procurement.

Historically, too many attempts at alignment have meant "We are happy to align, if they will do it our way." If these arguments are extended into government procurement issues in terms of "If we change, their industry will have an advantage," progress will inevitably be slow in coming.

OSI's Greatest Achievement?

The fact that it will take a long time to implement OSI doesn't mean that it will fail, however. In the real world, it is not possible to switch immediately from non-OSI to OSI solutions. Both suppliers and users have too much invested to allow this.

The principal problem OSI must face is that suppliers will for some time be able to claim that since OSI doesn't guarantee interoperability, they really can't recommend it in preference to their own solutions. This response can be dealt with only on a case by case basis, e.g., where an application has requirements for interworking with unspecified machines outside a user's control, then an OSI gateway is a necessity and can, in fact, be provided in addition to proprietary protocols.

OSI, and the production of the enormous family of related standards, represents a tremendous feat of engineering for the world's IS community. This is all the more remarkable because it has involved—and will continue to involve—finding agreements among many different interests throughout the world. The next step is to make sure those agreements extend to conformance and certification for the benefit of suppliers and users alike.

It should not be surprising if OSI, which has been so long in coming, should take time to reach its full potential. And when it does, its greatest achievement will be that it can, at last, be forgotten about. ■

Tim Wells has worked in the IS industry for 15 years. He is the deputy group director of technology at the National Computing Centre, Manchester, England, and was formerly manager of standards, software engineering, and methods there.

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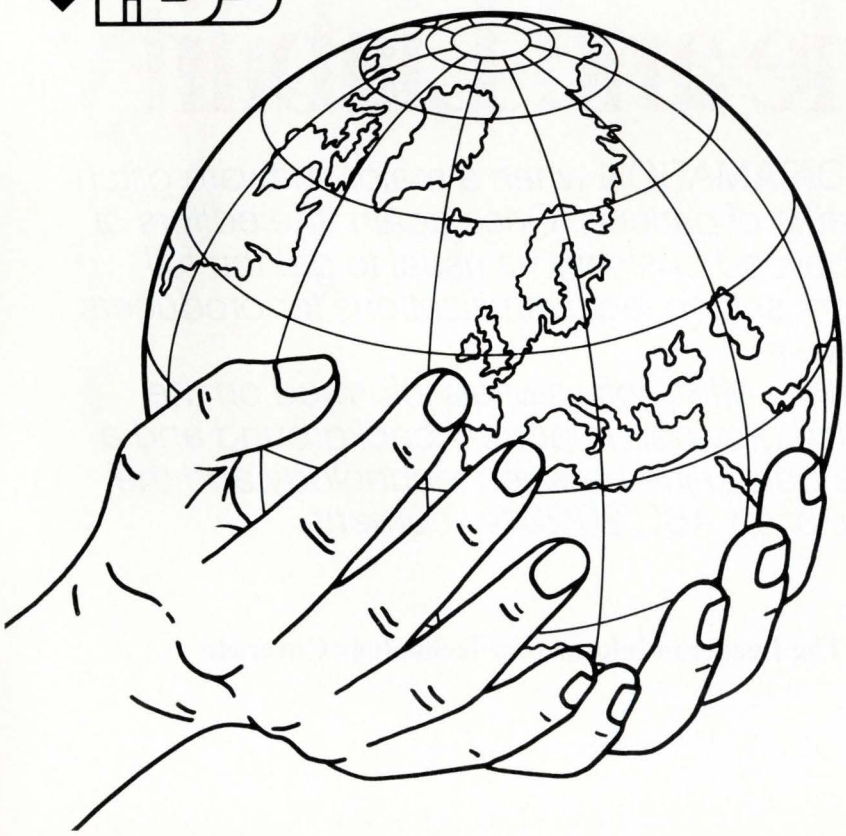

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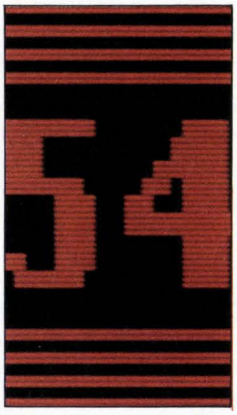

Software Bugs: A Matter of Life and Liability

You read it first in DATAMATION *when a major software glitch was linked to the deaths of patients. Once again, the editors of* DATAMATION *went beyond business as usual to get the full story and its precedent setting legal ramifications for producers of software and hardware.*

In addition to keeping MIS professionals informed on the subject, the article also provided important background and a clear mapping of the borderline between technology and the law for the producers of an ABC 20/20 tv segment.

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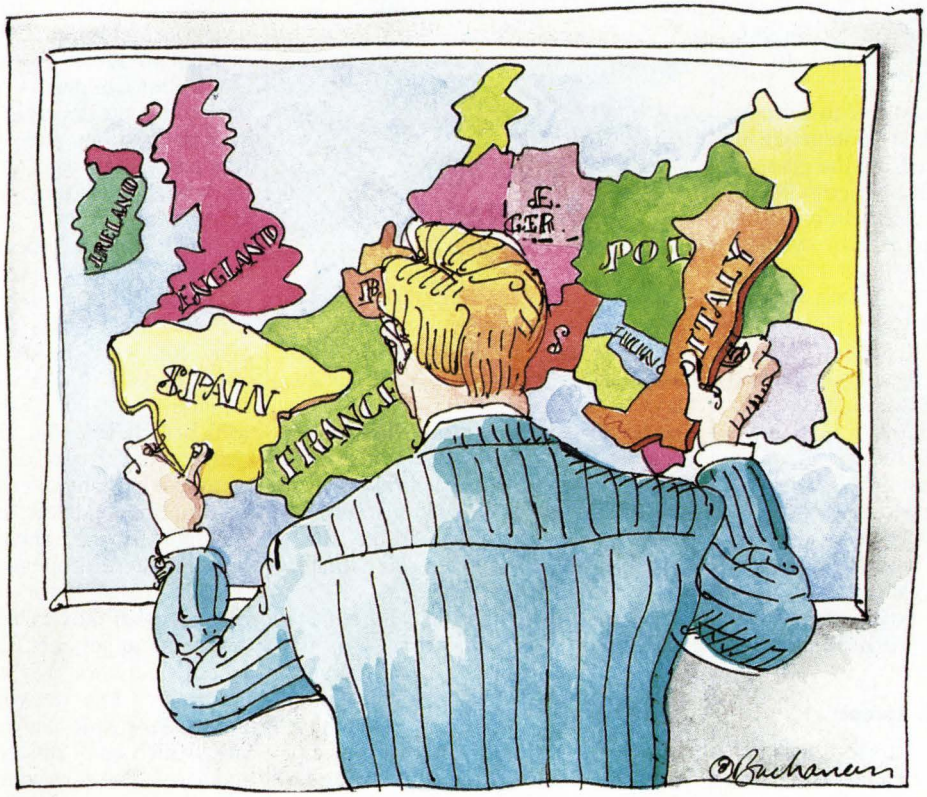
IBM Eyes EDI In Europe



IBM is developing new products and marketing strategies aimed at the $350 million market for value-added network services in Europe. Electronic data interchange is the key sector of that market. Much of the product development is being done in the U.K. IBM's European EDI team believes it is at the forefront of the company's global EDI thrust. But IBM may find its EDI investments taking a decade to pay off.

BY JOHN LAMB

If it involves a network and a little processing, it's big business in Europe these days—and IBM is determined to get a piece of the action.

Big Blue has targeted the fast-growing European market for value-added network (VAN) services, particularly networks for electronic data interchange—the exchange of formatted business data between computers owned by different organizations—as the market to dominate over the next few years. There's plenty at stake. According to market research firm Input in London, the European VAN market was worth $358 million last year and is projected to grow to $2 billion by 1992. EDI accounted for $20 million of that market in 1987 and will account for $250 million by 1992.

IBM's Joint Ventures In Europe

The prospect of a single European market by 1992, and the already increasing dependence of European companies on network services for their intracountry and intercountry links, has encouraged Big Blue to launch new VAN products and marketing strategies, some of which are already on trial in Europe. If successful, the company plans to adopt them worldwide.

As part of its VAN strategy, IBM has forged a series of joint ventures to create new network services across Europe. In Denmark, the company has teamed up with telephone company KTAS. In Italy, the tie-up is with automaker Fiat, while in France contracts have been inked with Paribas, Credit Agricole, and SEMA-Matra. Bell Atlantic, Siemens of West Germany, and Ericsson of Sweden are also working with IBM to develop improved network equipment.

The key VAN service for IBM is EDI. "In three years, 40% of our [network] business is going to be EDI," declares Ranjit De Alwis, development and service manager for IBM's U.K.-based Business Network Services. This is the

Illustration by Yvonne Buchanan

IBM Eyes EDI in Europe

group that is spearheading much VAN development work for IBM in Europe. "Revenue from our network is rising quicker than from [other] services," says De Alwis. "We wish to be recognized as best of the breed in value-added network services."

EDI is a store-and-forward application in which business documents, such as invoices, orders, customs documents, and design drawings are sent between trading partners electronically rather than on paper. Most EDI projects ultimately will require widespread participation if users are to reap the benefits associated with quicker communications and reduced keyboard errors. Standards for the presentation of data are crucial to its acceptance.

Although a slow starter in Europe, IBM already has snatched a potentially lucrative British EDI deal from the grasp of International Network Services (INS), a joint venture between GE Information Services (GEISCO) and British systems vendor ICL. INS thought it had a contract with London insurance concern Lloyd's sewn up until IBM entered the picture and ran off with an initial £10 million ($18 million) project, which could grow to be worth £100 million ($180 million) in future business (see "Lloyd's of London Attempts to Insure Its Future," Jan. 15, p. 19). IBM followed that deal with another to provide eight large European reinsurance companies with the means to exchange documents with brokers via a service called Rinet. Again, IBM has given GEISCO a bloody nose. To add insult to injury, the network will probably interface to the Lloyd's network.

New IBM EDI Products In Europe

In addition to these business moves, IBM has added some new products to its European catalog. The company has developed a package called EDIlink, which is intended to give a helping hand to users getting started in EDI. Supported by the PC, System/36, and systems running under the MVS operating system, EDIlink provides an interface to IBM's EDI service.

IBM's service is based on a standard called EDIFACT, drawn up by the International Standards Organization in Geneva, which lays down the way data should be formatted. EDIlink was produced for IBM by British software company Systems Designers as part of a pilot scheme called Shipnet, which linked the computers of 40 companies in the shipping, distribution, and freight industry. The participants swapped invoices, shipping instructions, and other documents associated with sea transportation.

In addition to supplying software, Systems Designers and a U.K. software firm called the Software Connection are the first companies to join a new agency scheme under which they will sell EDIlink and sign up new subscribers to IBM network services. It is the first time that IBM has sold services in this way. "To some extent, the business ethics by which IBM operates are being rewritten," suggests one IBM insider. By midyear, U.K. management—which originated the idea—hopes to have six agents signed up, with a roster of 25 by the year's end.

"EDI IS VERY IMPORTANT TO US."

"The agents will almost be part of our sales force," says Gavin Malcolm, IBM U.K.'s Business Network Services manager. "It's a logical extension to what we are doing now. We are able to help a software house technically, help it sell, and support it with marketing." Those involved with the scheme admit, however, that it has taken some time to iron out its legal aspects.

Of all the services that add value to leased lines, the outlook for EDI is the rosiest. The European Commission sees EDI as a powerful ally in its bid to lower trade barriers in the European community by 1992. "New technological developments are leading to new cross-border information services, such as EDI, which play an increasingly important role in our economic competitiveness," says Karl-Heinz Narjes, the European Commission's Brussels-based commissioner responsible for high-tech in Europe.

By 1992, 80% of European retailers will be conducting business via EDI links, predicts market research firm Butler Cox, London. To ensure that the necessary standards and technical know-how exist to bring about this revolution in trading, the European Commission has set up an EDI agency called TEDIS with a brief to promote the technology. IBM will need little encouragement.

"EDI is very important to us," comments IBM's Malcolm. "The '60s saw batch processing. The '70s saw processing via terminals. In the '80s, we have the confidence to do away with the terminals and have direct computer to computer connections." Malcolm says Europe is gradually coming around to the U.K. point of view and liberalizing nonvoice telecommunications: "We would hope that most of our trading systems can be offered in most European countries."

Vertical Market Approach on EDI

IBM has set its sights on the shipping, construction, and insurance markets for its EDI push. EDI vendors need to adopt this vertical market approach, tailoring applications to user groups and aggressively promoting EDI to customers that may not always be convinced of its benefits. Butler Cox warns of the difficulties involved in interfacing EDI connections to existing systems and of the three-year wait many users are going to have to put up with before they see a return on investment.

The main European EDI center for IBM is in Great Britain, which has done the most in Europe to liberalize telecom and encourage VANs. It was there, in 1984, following the deregulation of the U.K. market, that IBM hatched a bold scheme to set up a VAN in partnership with British Telecom, the local telecom carrier. That project, called JOVE, flopped when the British government decided it was too monopolistic. But the effort at least put IBM U.K. ahead of its counterparts in other European countries.

The collaborators had intended to produce what they called a data network management service. Essentially, it was a utility network that would link IBM's proprietary SNA network with British Telecom's public packet switched service, which conforms to open systems standards. The wire would be used to run users' networks and to enable third parties to supply additional applications. IBM also pitched for contracts to provide a national electronic funds transfer at the point-of-sale network. The reward for these early efforts is that IBM U.K. is now responsible for running IBM's EDI services outside the U.S. and Japan. By 1986, IBM U.K. had merged its Information Network Services-run bureau operations and Business Network Services-controlled VAN division and established an SNA network based on its communications control center in Warwick.

Information Network Services regularly tops the league of European software and services companies compiled by the European Computer Services Association. In 1984, INS earned $250 mil-

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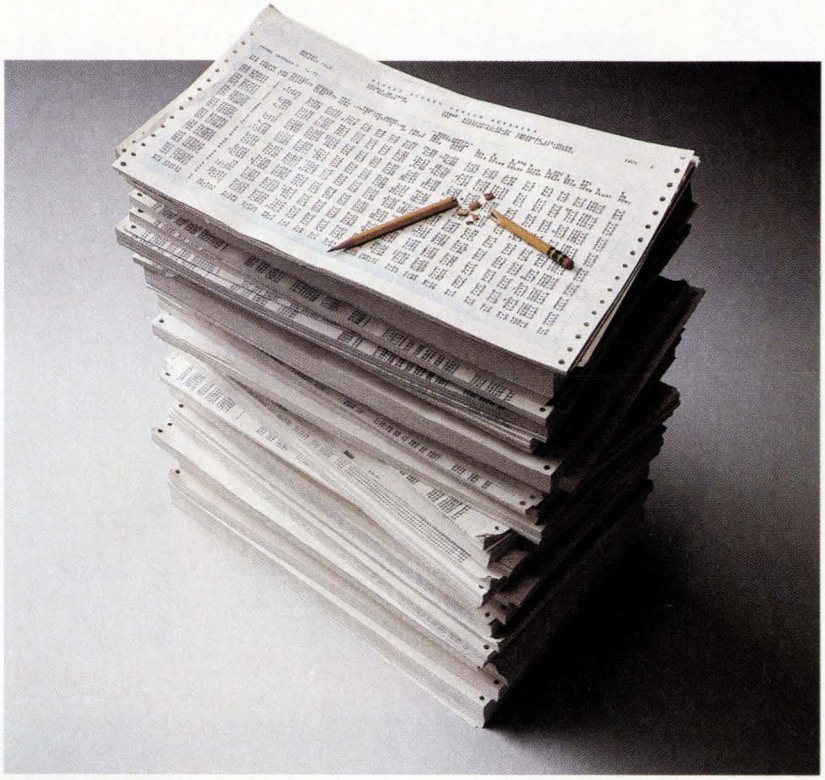

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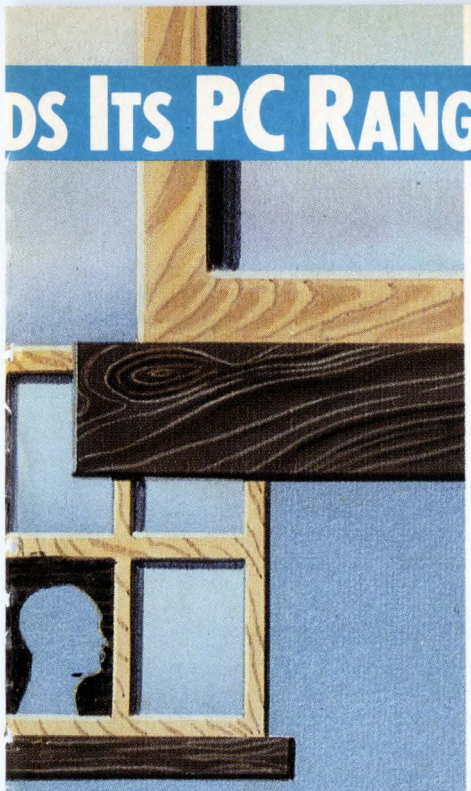
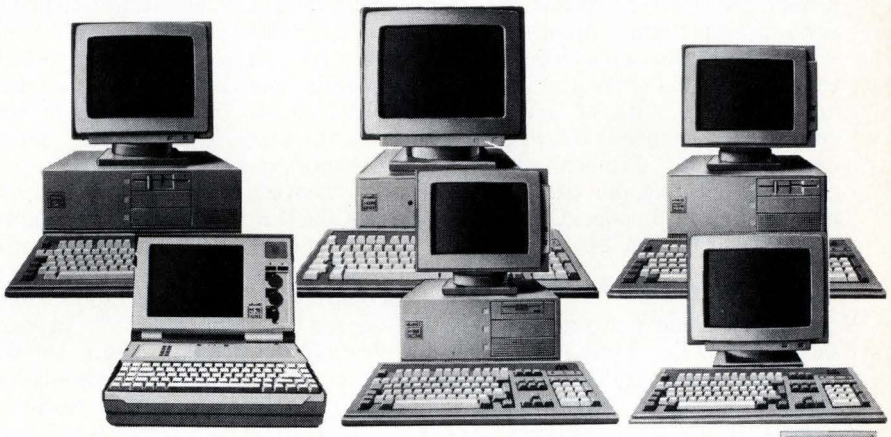


When Olivetti launched its new PC range last year, it undertook to keep you abreast of new technological developments while maintaining total compatibility with current market standards.

And today there are important new additions to the Olivetti PC range designed to do just that. At the top of the range, a new M380 line of 80386-based models offers unprecedented speed and power. Three XP (extra performance) models are being introduced. The M380/XP5 floor-standing PC offers hard disk options up to 300 MB, and is powerful enough to handle many computing functions that until a few years ago were the privilege of mainframes. The XP3 desktop model has a 135 MB HDU, and the compact XPI desktop an 80 MB HDU. All XP models have a clock speed of 20 MHz and operate in MS-DOS, XENIX/V and MS OS/2 environments.

The compact M380/C has an improved capacity of 63 MB. All the new M380 line has the Olivetti OVC VGA-compatible graphic subsystem. In the 80286 sector, Olivetti introduces the M290. This PC has revolutionary plug-in CPU board architecture, offering unprecedented flexibility in upgrading or adaptation to specific applications. The M290 is optimised to run in MS OS/2 in addition to MS-DOS and XENIX/V environments. The new M15 PLUS is a fully portable computer. It is available in two configurations: dual floppy disk or a single floppy and a 20 MB HDU. It has a 512 KB memory and an easy-to-read back-lit Liquid Crystal Display. Olivetti promised you the choice of freedom. This is yet another way in which we're keeping that promise.



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lion for IBM, but that figure slumped to $148 million the following year. IBM admits that INS revenues were boosted by the fact that its salesmen could claim hardware sales, but by the end of last year, software, too, had been removed from the VAN side of IBM's business. One of INS's main products, the AS decision support package, was dropped. Now, INS sells VANs in Europe, with Business Network Services fulfilling the same role in Great Britain.

The IBM network is arranged as a mesh, with each node connected to every other node, and with at least two routes between each pair of nodes. Back-up for the Warwick center is provided by a second site at Portsmouth on England's south coast where IBM has its U.K. headquarters. Business Network Services says its network is unique within IBM.

VTAM applications up to OSI level five are able to communicate with the network, which supports OSI standards up to level three at its nodes. Levels four and five are catered for at the Warwick center, while levels six and seven, which include the X.400 electronic mail standards, are due to make an appearance later this year. Oem attachments, as IBM calls connections to non-IBM kits, are already in place. "It's an unnatural act sometimes," confides De Alwis, "but we do have them." Protocol conversion, from X.25 to SNA, for example, takes place at the 3725 nodes. Central activities are handled by 4381s.

Applications to Doubly Powerful Nodes

Over the next two or three years, IBM plans to distribute applications to 3745 nodes, which will be twice as powerful as the 3725s currently used. Software favored by the networkers includes DISOSS, the office system, and PROFS (professional office system). CICS is offered as a bureau service based at a second center in the Netherlands.

Growth in network usage is impressive. De Alwis reports that overall traffic boasts a monthly increase of 50%. Mailbox usage is growing less rapidly, with a 20% monthly gain in traffic.

The heart of IBM's EDI service, which is still in its infancy, is the U.S. designed Information Exchange, a store-and-forward system for electronic messages. Store-and-forward makes it easier for systems of different capabilities to communicate. It also allows users the leisure to decide when to receive and process documents.

This basic infrastructure provides the managed network service, which is either served straight or mixed with applications provided by Business Network Services. Between 6,000 and 7,000 terminals are now connected directly to the network, with an unknown number hiding behind 250 host machines. IBM has 1,200 customers for the service. Total capacity of the current setup could be expanded, with upgraded network systems, to 150,000 terminals, says De Alwis. But even this number pales beside IBM's internal network, which currently supports 250,000 terminals.

Warwick is only one of four network centers, however. The others are in Tampa, Fla., Tokyo, and Zoetermeer, the Netherlands (from which IBM supplies European CICS service). The centers and the services supplied from them come under a new division—IBM Communications Systems—set up earlier this year.

IBM U.K. Out In Front In Networks

U.K. IBMers like to think that they are leading their U.S. colleagues. "We are now doing things they haven't thought of," says one. "We're having to educate the U.S. into understanding Europe is a different kettle of fish." Some even go as far as to say they are recasting IBM's business methods. "Reason usually wins in IBM, but it takes a little time," was the candid comment from another network expert.

Leaving aside IBM's internal rivalries, the U.K. certainly has contributed a number of new items to Big Blue's armory of network products. Screenmail, the company's electronic mail service that is offered alongside other VAN products, was developed at Portsmouth. The Warwick computer center is now the sole source of Screenmail for U.S. customers. Around 400 of them regularly hop across the Atlantic via satellite links to access their mailboxes even though they have to put up with a delay of a couple of seconds caused by the distances involved.

Trials of cellular radio connections to IBM's managed network service via the two cellular radio networks in the U.K. are also under way. Insurance salesmen are among the groups testing the system. They are using the links to inspect documents held at the head office and to file reports from accident sites.

In the U.K., IBM has identified some 40 industry sectors that are potential users of EDI. Malcolm believes he can cope with some five or six new ones on the network each year. "One group will draw in others," says Malcolm, "but it is difficult to implement EDI in a dp sense and in a management sense. Most businesses have a culture they are familiar with, but EDI is a thing that runs outside your company. Having said that, companies without EDI are not going to do well."

Aerospace companies are likely to be an IBM target soon for EDI services that would enable them to transfer engineering drawings between companies and their subcontractors. It's likely to be a tricky application to crack. Standards for drawings are not well established and major companies already have their own systems in place.

Pie In the Sky or Sour Grapes?

IBM's rivals are quick to condemn much of Big Blue's thinking on EDI as pie in the sky. "IBM does a lot of posturing and positioning, but I see very little evidence of any results," says Phil Coatup, business development manager of Istel, a U.K. EDI supplier. "For a long time, they did absolutely zilch. Even now, they haven't really got their act together."

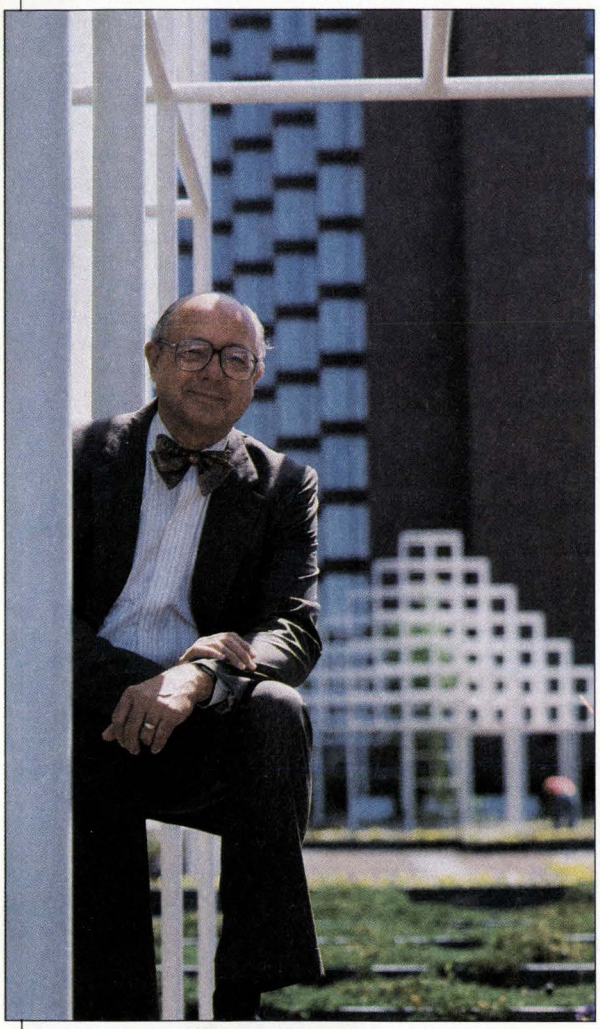
Coatup is realistic enough, however, to admit that EDI is barely off the ground. IBM has everything to gain and the thought of what it might do does not let him rest easy. Presumably, that fear for the future is behind Digital Equipment Corp.'s latest move, a follow-the-leader effort to get into the market for financial VANs. DEC opened a new division in April in the U.K.: the company's first foray into networking.

Digital Value Added Network Services, as DEC's new baby is called, hopes to take advantage of changes in the laws relating to financial products. The changes should open up a mass market in life insurance and other personal savings products. Patrick Hedgeland, manager of business strategies for the division, hopes to provide an electronic market in life insurance. He has his eyes on 20,000 potential users and is backed by a budget of at least $40 million for software alone. There are no plans as yet to take on the EDI market, says Hedgeland.

With such markets opening up, it's no wonder vendors are knocking themselves out to plant markers in the European VAN environment. With so much at stake, vendors are going to have to dig deep before they see a payoff—it may take as long as 10 years, some observers think. It remains to be seen whether IBM, which certainly has the deep pockets, has got its act together enough to make an impact on the international stage. ■

John Lamb, a freelance computer and technology journalist based in London, is a longtime contributor to DATAMATION.

A CASE for Reverse Engineering



BACHMAN: CASE tools must encompass existing systems.

Computer aided software engineering (CASE) tools have yet to realize widespread usage because most CASE products have ignored the main IS tasks: the maintenance, enhancement, and migration of existing applications. To get that base, CASE tools, with the help of embedded expert systems, must facilitate that work.

BY CHARLIE BACHMAN

CASE technology and products have been creeping into the marketplace for several years. Creeping, but not rushing in as one might have expected considering it's such an important new idea and considering all of the industry hype. This apparent failure seems reason enough to reexamine the concepts wrapped up in the expression, computer aided software engineering. Is there fire behind all of the smoke? Yes, but only when all of the essential pieces have been ignited.

The primary MIS development activities have been new applications development and the maintenance, enhancement, and migration of existing applications. But the long-term trend has seen, and will continue to see, MIS resources increasingly redeployed in maintenance rather than new development, though exact percentages vary from one company to another. One user says that development resources would be totally consumed by maintenance by 1992 unless something changed radically. Says another, "There are no new application systems in development, only radical maintenance of existing ones."

Original CASE concepts and products focused solely on creating new applications systems, but such applications represent a rapidly shrinking market, with the exception of military systems and the embedded systems found in new cars, sewing machines, copiers, audio and video components, toys, and other intelligent products. This is not a sign of failure in IS organizations. Rather, it is one of success.

As they already have customer, product, manufacturing, financial, and personnel systems, all that is needed for CASE to acquire a broad base of usage is the ability to revise the existing applications quickly as new requirements come from the marketplace, the government, and the technology. To do that, new CASE products must expand to encompass the maintenance, enhancement, and migration of existing applications systems, represented by the estimated 77 billion lines of COBOL code residing in IBM production systems alone.

A Look at Reverse Engineering

Reverse engineering enables IS to extract business rules from old applications and use them as the basis for refurbishing and maintaining those applications. However, the original source code, which is sufficient to run the applications, is not enough for them to be automatically reverse engineered.

The programmer or DBA has to identify and fill in the missing pieces, using his or her own experience or by talking to others with a more specific knowledge of the business requirements. Since it is impractical for one individual to uncover all the missing pieces, an expert system incorporated into the CASE tool can provide assistance by telling the programmer what information is missing and filling it

Photograph by Julie Houck

in as the user makes it available.

Original CASE concepts were based on the familiar top-down school of software engineering, where the requirements for a new system are carefully studied and documented by the business analysts and, after final approval by management, thrown over the partition. There, the data and systems analysts create functional specifications defining what is to be accomplished. The file and database designer and programmer must then define how the business requirements are to be satisfied. Once the file and database designs and programs are completed and compiled, the design is then thrown over the partition for a third time to the operations people.

Experience teaches that top-down development does not progress as neatly as the theory predicts. In most cases, people need to negotiate the design, taking into consideration the new requirements, the capabilities existing within present applications systems, and what can be created within an acceptable amount of time using available resources by modifying those systems. In addition, the lessons learned in the latter steps of the design process must be fed back into the higher-level design information and some early decisions must be reevaluated.

Give and Take In the Design Process

In targeting the maintenance, enhancement, and migration of existing applications systems, the next generation of CASE products must open the door to a more reflective, cooperative mode of development. Such a design process is not the one-way street of top-down design, but assumes a give-and-take whereby changes can be propagated up and down at any point in the design process. "The Re-Engineering Cycle" chart (see below) provides an architectural view of this new CASE world, which features both forward and reverse engineering.

In this process, the data analyst and DBA focus on the data-oriented problems, while the systems analyst and programmer deal with the process-oriented parts. Vertically, it identifies the domains of MIS professionals and the design objects on which they work. Design objects at the various levels—requirements, specifications, implementation, and operation—relate to each other in a progression from the most conceptual at the top to the most physical machine instructions at the bottom.

The requirements level identifies where the business analyst works developing the definition of business requirements and its design objects, which include goals, requirements, organizations, and critical success factors.

At the specifications level, CASE supports the definition of the information required to run the business, the flow of information through the business, and the rules by which business decisions are made. Those definitions, created by data and systems analysts, are independent of any particular programming language, DBMS and underlying data model, operating system, transaction monitor, or telecommunications system. Design objects here include entities, relationships, messages, processes, and procedures.

The implementation level identifies the area where the database administrator and the applications programmer develop the source-level description of the file, database, and programs. Design objects here include records, sets, reports, screens, programs, and statements.

Everything in IS exists so that, at the operational level, computer and terminal operators can successfully execute programs, store real data, and support the business. Design objects here include end users, terminals, computers, record instances, programs in execution, volumes, and tracks.

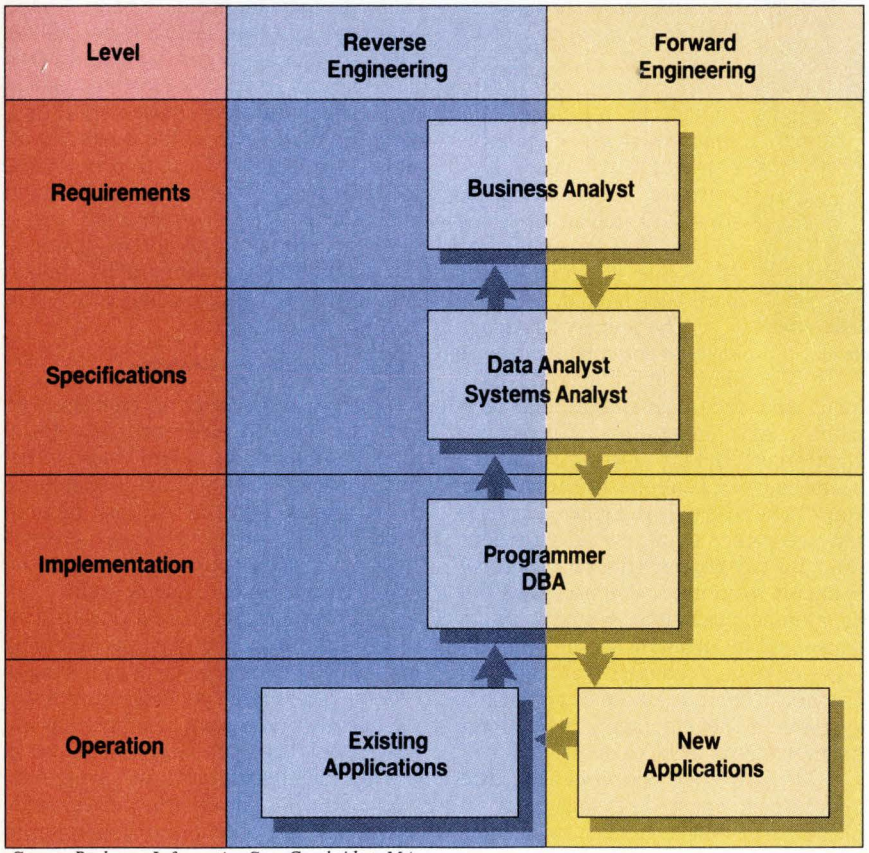
Across the horizontal axis, reverse engineering begins at the bottom left with the definition of existing applications and raises the applications to successively higher levels of abstraction. Forward engineering begins at the top right and at the bottom with the revised application systems.

The re-engineering cycle described above constitutes the new CASE software life cycle, because it mirrors the continuity of applications systems and their revisions over time. At the top, the design objects created by the reverse engineering steps are enhanced and validated to become the revised design objects used in the forward engineering process. At the bottom, a new applications system becomes an existing applications system the moment that it goes into production.

Six Development Steps In CASE Activity

With tools to support this new CASE re-engineering life cycle, it would be possible to embark on all of the activities of the MIS development organization: main-

Re-Engineering Cycle



Source: Bachman Information Sys., Cambridge, MA

Chart by Bob McAuley

Now, you can speed the emergence of new systems while you extend the useful life of existing ones.

Maintaining existing systems is as difficult as it is necessary.

Difficult, because there are so few good tools. Necessary, because existing systems are a strategic asset, crucial to daily operations.

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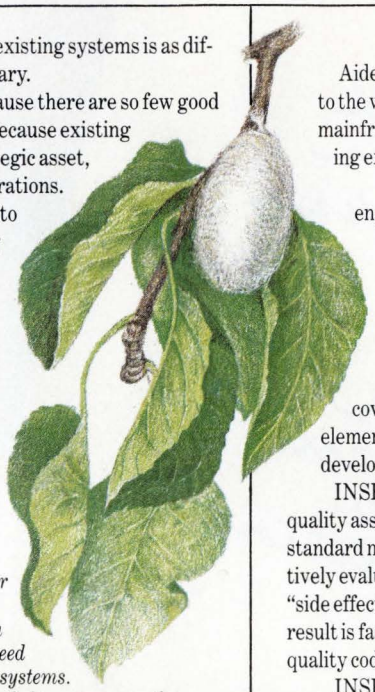

Wrapped inside your present systems are fundamental design concepts that can speed development of new systems. Re-engineering tools help you uncover them.

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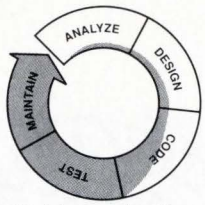

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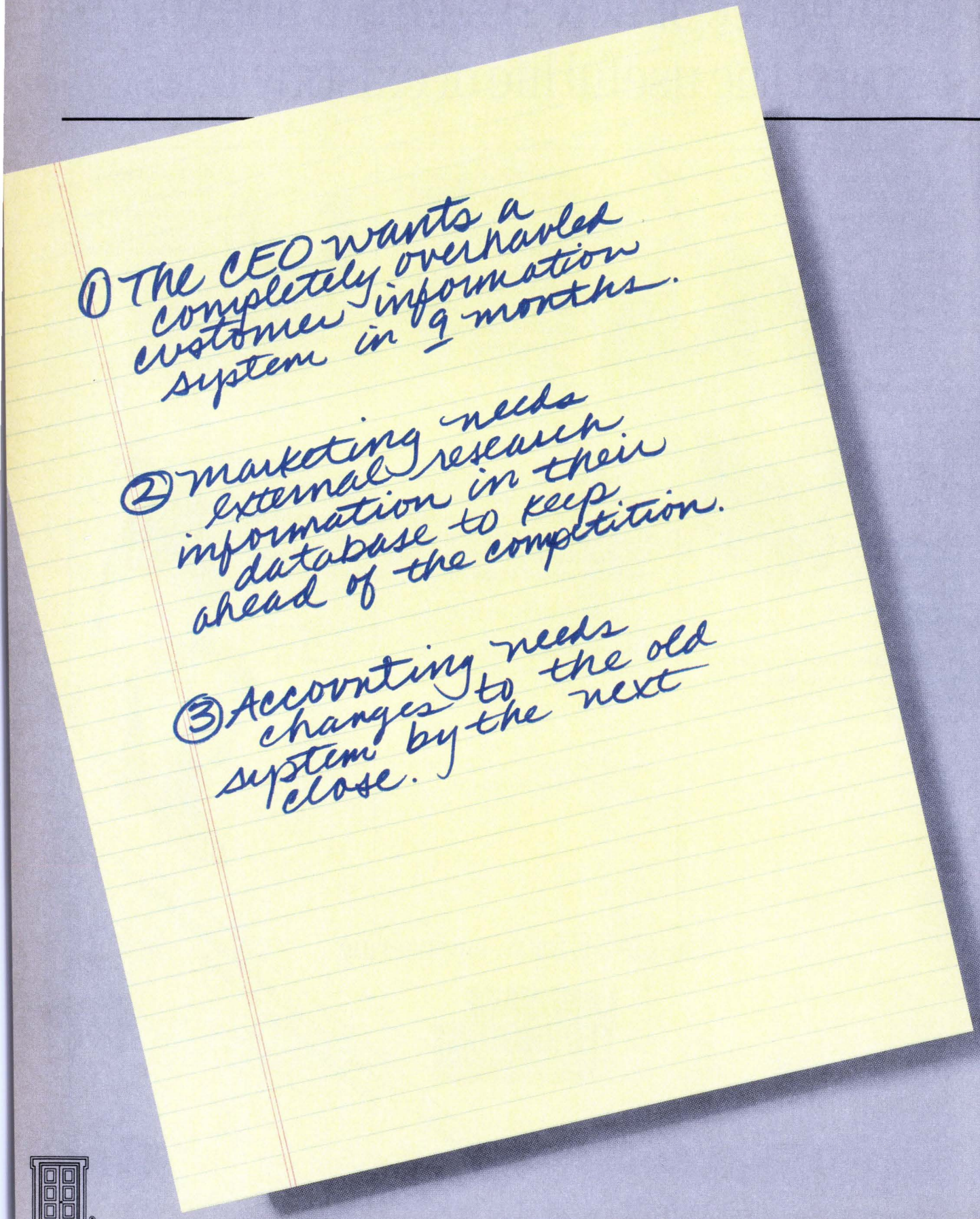

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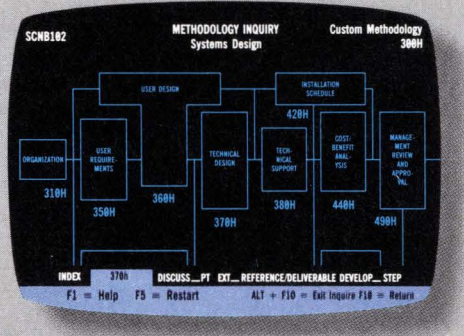

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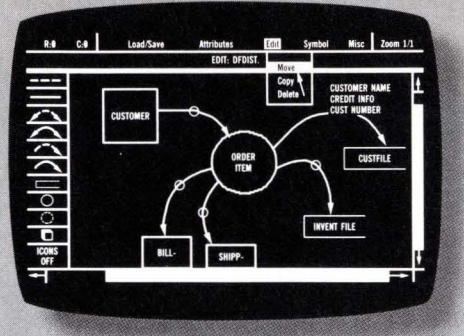

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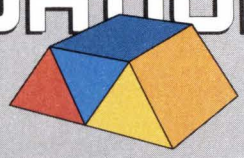

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tenance, enhancement, new development, and migration. Those four basic CASE activities use some or all of the same six development steps: capture and generate source code, reverse engineering, enhancement/validation, forward engineering, and design/optimization. In a truly cooperative design process, these steps cannot be clearly separated and frequently must be repeated, so the new CASE re-engineering cycle enables them to be used in any combination deemed appropriate. "Steps Used in Various CASE Activities" (see p. 56) lists the particular steps required in each type of activity.

The steps identified are of two types. The capture source code and generate source code steps are fully defined translators. That is, they can completely translate between the original source code and the implementation-level design objects without the loss of information. "Source code" here means the file and database descriptions and the COBOL programs.

The capture source code component is responsible for accepting source code for file and database designs (DDL), programs (COBOL), and job control language (JCL), and it translates them from their native languages into its deep semantic equivalent. The translation process can be carried out without human intervention. The completed result is stored in the design repository for future reference. Errors can be noted in the processing log and can thus provide the basis for making corrections if the source code is found to have syntactic errors.

The generate source code component is responsible for taking designated implementation-level design objects, which are stored in the design repository, and translating them into source code. Source code here includes the same elements identified in the capture source code step.

The other four steps are known in the expert systems world as problems of incomplete information. Completing the transformation for these types of problems is a highly complex, interactive process that cannot be fully automated because of a lack of information.

To deal effectively with these problems, the new generation of CASE re-engineering products will incorporate expert systems as copilots to check details, advise, and carry out routine tasks. Ultimately, they help reduce labor costs, improve quality, and shorten the time required to address each of these problems of incomplete information.

CASE MUST COVER EXISTING APPLICATIONS.

Reverse engineering means taking existing programs and their associated file and database descriptions and raising their design objects from the implementation ("how") level to the specification

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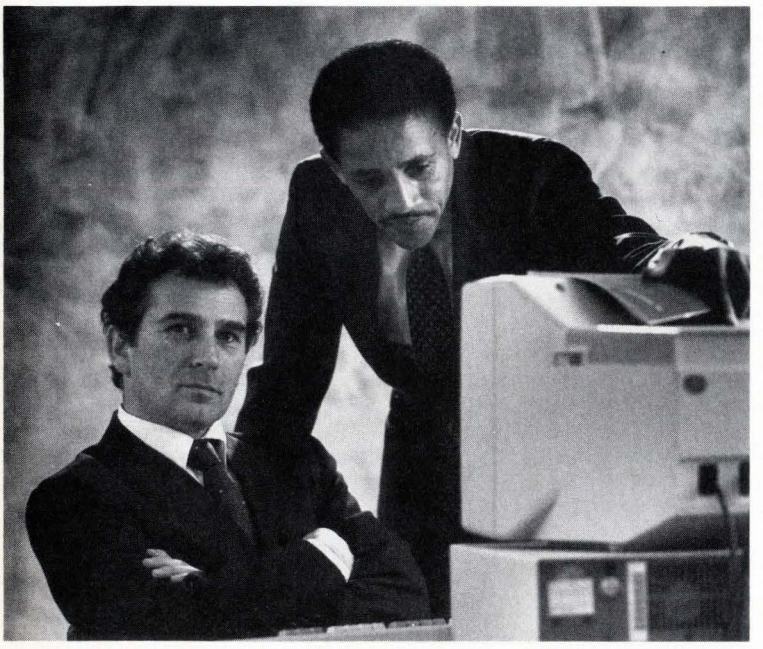
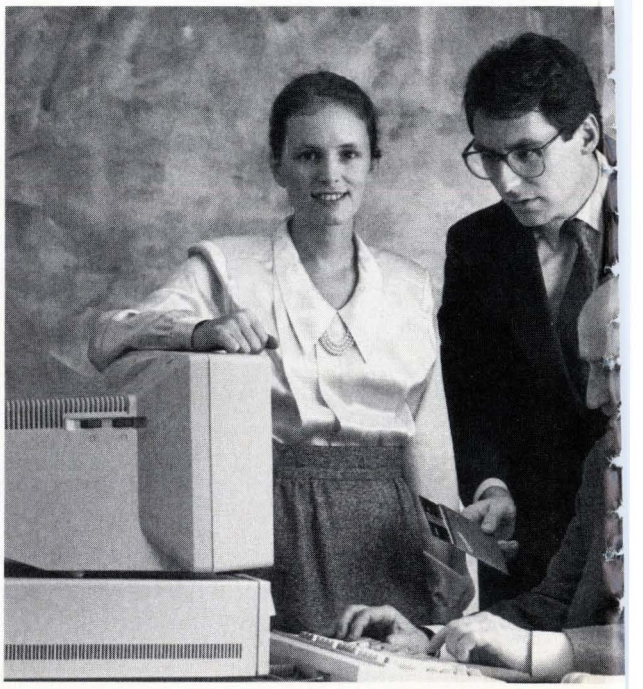




("what") level of design. Records, databases, items, programs, labels, "go to" statements, assignment statements, and data manipulation language statements are some objects on the implementation level of definition. Examples of specification-level objects are entities, information stores, attributes, processes, messages, control blocks, and iterators.

Automatic Reverse Engineering Is Out

It is clearly impossible to reverse engineer a file, database definition, or program automatically, because some of the information essential to the task is not present in existing COBOL programs, data descriptions, and JCL decks.

A reverse engineering product built as an expert system can work interactively with the IS professional and identify the missing information, determine its nature, propose alternatives, and insert the user's choice where required to complete the process.

Reverse engineering also involves the removal of optimization mechanisms and implementation artifacts that were introduced in an earlier implemention of the application. Those mechanisms still directly applicable to the revised application will be reintroduced during forward engineering as originally written. Those that were made obsolete by changes to the specification, the qualitative and response time factors, or hardware and software configurations, will be recreated to meet the new circumstances. This reoptimization is a complex intellectual task and can be greatly assisted by the use of an expert system built into the forward engineering facility.

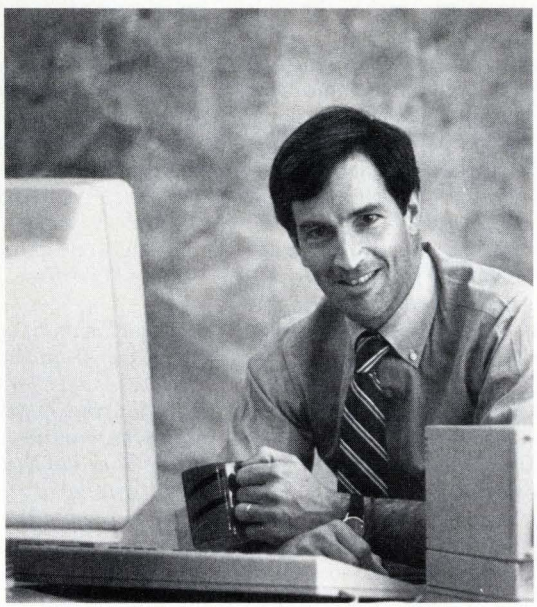
At the point of enhancement/validation, data and systems analysts attempt to create or enhance the specifications-level definitions of applications. Some definitions will come from the reverse engineering step, some from information model libraries, and others will be created directly by the analysts. These include the definition of information structures, information flow, and the procedures that control the behavior of the business in response to various business transactions.

An expert system can greatly assist in validating proposed definitions by checking them against a knowledge base of existing designs and looking for similar patterns. From that base, it can suggest missing elements and consolidations that have proven useful in other circumstances and note modeling practices that lead to redundant definitions or other ambiguities.

Further, the expert system can check the information flows to see that each piece of information is received from some source at the boundary of the applications system or is being created within the application. It can also question every piece of information to assure that it has some purpose within the application.

Forward engineering must translate the "what" specifications that define an applications system into the "how" of its physical counterpart. The DBMS or file system to be used to implement each information store must be designated. The entities defined in the information structure, and their attributes and relationships, must be translated into the records, tables, or segments known to the target file or DBMS. The transaction

with the way you work.



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monitor, the programming language for the actual programs, and the operating system must also be designated.

Freedom To Choose a DBMS Lies Ahead

Early CASE systems usually selected a single DBMS, a single transaction monitor, and a single programming language and expressed their procedure definitions in those languages to avoid the translation process. Next generation CASE products most likely will first offer the freedom to select between major DBMSs and transaction monitors and leave the choice of programming languages and operating systems for later.

The forward engineering step also packages the processes and their procedures into programs and their code at the implementation level. It must also generate additional applications code to compensate for any weakness in the selected DBMS, data communications system, or transaction monitor with regard to the integrity of the information being processed. Some DBMSs do not support referential integrity; some do not support hierarchical structures; some do not even support control over the duplication of information.

REVERSE ENGINEERING CAN EXTRACT BUSINESS RULES FROM OLD APPLICATIONS.

When new records are added to a file or database, for example, it is essential to check that all of the references between the newly added records and the existing records correlate accurately. If a purchase order record refers to a customer who is making a purchase, the existence of a record for that customer must be validated during the storage process. If the customer record does not exist or cannot be found because its customer code has been entered incorrectly, then the DBMS should reject that new order record. The same type of error checking should happen when the order references products that are to be shipped with the order. Some DBMSs will check the correctness of this information as part of the routine function of storing a new record. With other DBMSs, the expert system must create the procedural statements necessary to assure referential integrity.

The design/optimization step accepts idealized file and database designs and program specifications, and upgrades them into an optimized design ready for compilation and efficient use. It must be capable of accepting and using additional descriptive information about the real-world environment in which the data is to be stored and communicated, and in which the programs are to be executed.

Part of this optimization will be to design indices to assist in the retrieval of the most frequently accessed information. Another part will be to work out the clustering rules to make the virtual memory work most efficiently. The expert system can advise on tasks of this type, but the user must make the final decisions.

The expert system for design/optimization uses quantitative information concerning the amount of information to be stored, the access frequencies that will affect the stored information, and the response times acceptable for each type of business transaction.

It may be necessary to introduce redundant data into the file or database to ensure that each of the business transactions can be processed with an acceptable response. Where this is done, the system must also generate the extra statements to guarantee that the redundant data is maintained in correct time synchronization with the original information. The duplicate storage strategy is one that can be recommended by the expert system, but it requires careful scrutiny by the user as the storage of redundant data consumes more storage space and requires additional processor time in the update mode.

The expert system also offers an important documentation system, which records both its design decisions and the explanations for them. When the user overrides the expert system, it provides a means to record the user's explanation for making an alternative choice. This information is maintained in the design repository and can be reexamined later, for maintenance and enhancements.

Freedom To Evolve as Business Does

These six steps provide the capabilities for CASE to maintain, enhance, and migrate existing applications as dictated by business conditions and technological changes. As one sage said, "While old computers go to the Computer Museum, old programs go into production every night." Once CASE can handle those, it frees up staff to develop new applications, as well.

CASE products based on this CASE reengineering life cycle will have tremendous impact on the evolution of IS practices and on the businesses that depend on computer aided applications systems for success. Three-year projects will become three-month projects. Being able to do what is needed today frees IS to make changes as the business environment evolves, rather than trying to predict three years ahead. A half dozen short-term changes can offer a business more than one grand leap, which is often misdirected and seldom well executed.■

Steps Used in Various CASE Activities

	Maint.	Enhance	New Dev.	Migrate
Capture Source Code	yes	yes	no	yes
Reverse Engineer	yes	yes	no	yes
Enhance/Validate	no	yes	yes	no
Forward Engineer	no	yes	yes	yes
Design/Optimize	yes	yes	yes	yes
Generate Source Code	yes	yes	yes	yes

Source: Bachman Information Systems, Cambridge, MA

Charlie Bachman is often referred to as the "father of database management." He holds patents for several data models, including the CODASYL *model. Bachman is also the founding chairman of the* ANSI *Study Group on Distributed Systems and the International Standards Organization's Subcommittee on Open Systems Interconnection. Involved in the computer industry for 45 years, he is now president of Bachman Information Systems Inc., Cambridge, Mass., which has just introduced a new* CASE *product based on the philosophy outlined in this article.*

A Guide To Selecting CASE Tools

Choosing among the never-ending parade of products that claim to provide computer-aided software engineering is a monumental effort. Only by discovering precisely a product's functional capabilities can IS managers determine whether it suits their particular IS installations. Herewith, a checklist of vital CASE tool features.

BY MICHAEL L. GIBSON

The ever-growing array of CASE products presents a potential buyer with a dizzying number of choices. The following questions constitute a comprehensive set of CASE tool selection criteria. Some of these questions pertain to all three components of the CASE environment (planning, systems design, and systems development), others to particular components.

■ *Is the tool a DBMS or dictionary software system?* Dictionary and database management systems provide greater integration capabilities. As a result, CASE tools with these underlying structures have a greater capacity for sharing specifications across functions.

■ *What is the future direction and functionality of the tool?* When evaluating CASE tools, remember that CASE systems development is still in its infancy, so don't reject a tool with valuable attributes just because it currently does not have the full capabilities that you want.

■ *Does the tool's manufacturer have an open architecture philosophy?* A manufacturer's willingness to share file formats with all viable, noncompeting CASE manufacturers means that you can move smoothly from planning through to systems development because you will be able to integrate specifications across CASE components. Moreover, you will have a healthy variety of options for CASE software configurations. CASE manufacturers entering into exclusive hierarchical integration agreements with other noncompeting CASE tool manufacturers ultimately limits choice.

■ *Does the CASE tool produce utility software that will read procedure and source libraries and create CASE component specifications for existing systems?* The acquisition of CASE tools in a non-CASE environment creates a potential for inconsistencies in maintenance activities. Design and development specifications for systems designed and implemented before the installation of CASE components will not be consistent with those created after installation of CASE tools. Thus, a multiplicity of maintenance activities will be necessary. Certain CASE tools offer utility software that will read procedure and source libraries and create development specifications for existing systems, thereby mitigating the difference between pre-CASE and post-CASE systems documentation.

■ *Does the tool have an effective interface to other CASE design tools already purchased or under evaluation?* Often, several methodologies are used to design a system, so it is important that a CASE tool provide a healthy array of methodological techniques to use in the process. The dictionary entries must be capable of being shared across these methodologies, so the dictionary should be strong and versatile.

■ *Does the tool have graphical methodologies capable of "exploding" design diagrams and dictionary specifications to a reasonable depth?* Most of the CASE design tools provide graphical methodologies for representing proposed systems design. The graphical diagrams and the dictionary entries behind the components of the graphical diagrams must be capable of exploding to a reasonable number of lower, more specific levels.

■ *Will the tool be capable of executing with windowing capabilities?* An advantage of the windowing capability is that multiple portions of the design can be displayed simultaneously and can therefore compensate for weaknesses in embedded explosion capabilities. As a result, the levels of explosion will not be restrictive and the comprehensiveness and integration of CASE design and development specifications should improve.

■ *Does the planning model in the CASE planning component provide comprehensive coverage of corporate and functional unit strategic planning and systems planning?* The planning component contains a model for representing the corporation and for use in determining the direction of the corporation and systems development. The strength of the CASE top level components lies in the comprehensiveness of this planning model.

■ *Does the tool provide a thorough means of prototyping?* CASE development tools, rather than CASE design tools, provide the strongest prototyping methods. While it is not necessary that both types provide strong prototyping capabilities, at least one must provide this capability.

■ *Will the tool soon be able to generate automatically first-cut physical design specifications from logical design specifications?* The conversion of logical design diagrams into initial physical design diagrams should be automatic because it involves simply the exchange and addition of graphical display table entries. While most CASE design tools currently do not offer this feature, ask your CASE vendor if the tool will offer it in the future.

■ *Does the CASE design tool provide analysis support for design documentation?* This concerns the capacity of the CASE

tool to analyze design documentation and determine if the specifications entered by the analyst conform to prescribed methodological rules. The analysis should also indicate where design dictionary entries are incomplete. For example, a DFD diagram with a free-standing block should be highlighted as violating one of the rules of structured methodology. In addition, blocks on a DFD not having a corresponding dictionary entry should be highlighted.

■ *Does the tool have the capacity to generate design specification reports automatically?* The specifications created during logical and physical design activities serve as a source of documentation for the system. While they are permanently stored on disk devices, it is often advisable to get hardcopy printouts of the design specifications for reference. Many CASE tools provide various report formats for this purpose, including the capability of indicating design flaws.

■ *Does the lower-level CASE development component provide methods for convenience and comprehensive customization of the generated system?* The CASE development component can already generate the major portions of the coded systems. Systems development activity using CASE involves providing the customization of the generic code to fit the system. The custom specifications must provide comprehensive coverage of the system requirements. The generated programs must also be able to call on existing routines to prevent the system from "reinventing the wheel."

■ *Does the tool permit distribution of design/development responsibilities?* CASE design and development tools must provide a serviceable means of segregating job responsibilities and interfacing the individual efforts into a single system project.

■ *Do the CASE design and development tools have the capacity to export portions of the design and development dictionary specifications?* This is important, as design and development specifications for one system may be reusable in the design and development of other systems. "Reusable design" will join "reusable code" as a result of this capability.

■ *Can the tool interface design and development specifications to the functional DBMS be used to maintain the company's data?* It is rare to develop systems that are not affected by the database environment, and the development of systems using CASE tools is no exception. Therefore, it is important that the CASE tools can interface design and development specifications of application systems to mainframe DBMSs and database creation or modification.

■ *Does the tool have word processing capabilities?* In addition to built-in word processing capabilities, the tool should have an effective interface with standard word processing systems. An added feature of some tools is the ability to pass documentation to a desktop publishing software system for more professional representation.

■ *Does the tool enhance project management?* The use of CASE tools does not preclude the need for effective project management. In fact, their use can enhance such management. Specifications that are entered using the planning component provide a boundary for design and development activities. This boundary provides a built-in means of determining when design and development activities diverge from originally planned specifications. Some CASE design and development tools can generate reports on the progress of individual project assignments and some can interface to existing project management software systems. Currently, this interface is a temporary exit from the CASE tool into the project management system, but the interface will become much stronger in the future and provide more automatic updating of the project schedule.

■ *Is it possible to modify the CASE design and development tools relative to your firm's internal or existing methodology?* CASE tools are prepackaged systems and may need modifications to make them more suitable for individual installations. Thus, it is important that the system has the ability to add or delete menu options or to modify the style of graphical or dictionary entry screens.

■ *Can the tool automatically generate design, operations, and end-user documentation?* As systems are designed and developed with CASE tools, documentation concerning components and users of the system are entered into the dictionary. Thus, the majority of design, operations, and user documentation required for documentation manuals is available from these dictionary entries. CASE systems should provide this documentation in either on-line or hardcopy form, with little additional work required from the project development team.

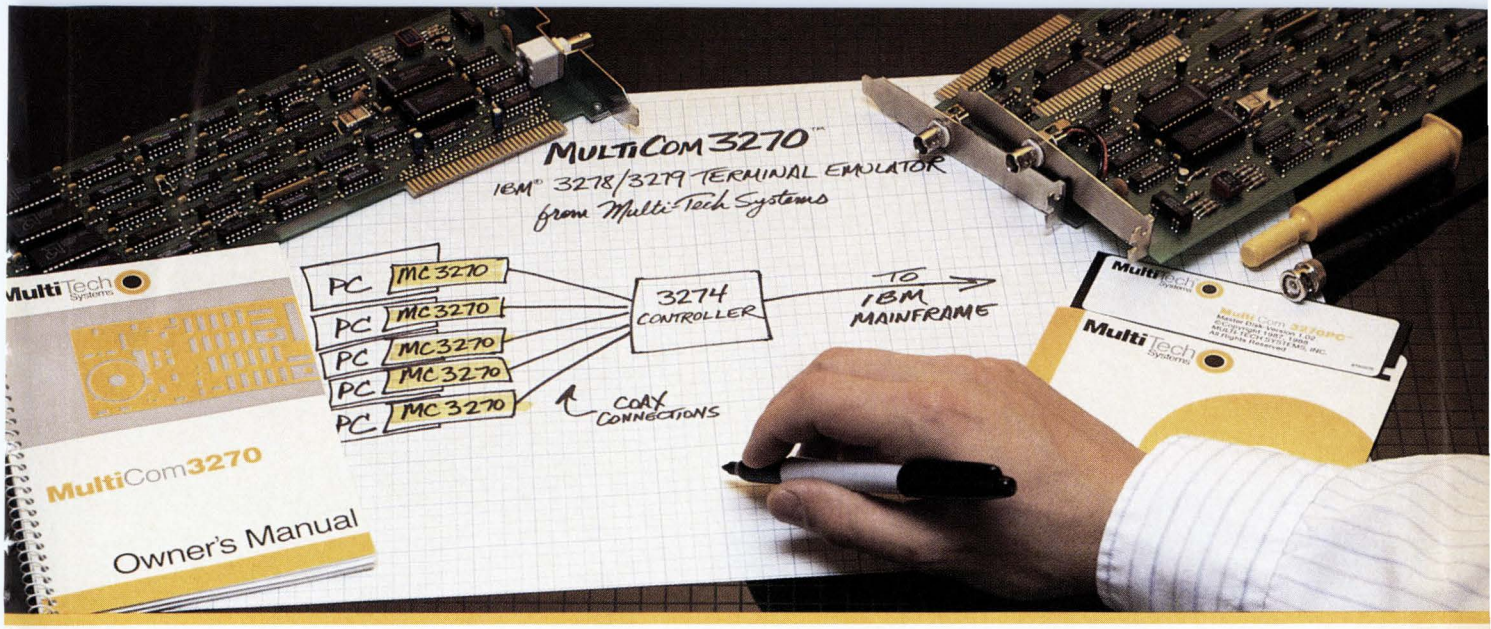
■ *Does the tool have facilities for maintaining design as well as systems?* When conditions in business warrant changes in the information systems function, the people responsible for maintenance should be able to effect the required system changes in the system's design specifications automatically. Or, once those changes are made, the development tool should be able to designate where the current systems need changing, as well as indicate which users need to be notified of the changes and what they need to be told. Some development systems already provide some of these capabilities. As the interface between CASE design and development software systems becomes stronger, modifications to design specifications entered into the design software will be able to modify development specifications, and, ultimately, the entire system. Since the planning component was the last to emerge, the interface between it and the design component is weak. Subsequently, as the interface between planning and design strengthens, it should have the same effect on those activities as the strengthening of the interface between design and development did.

■ *Can the tool generate programs that span a range of systems?* The hardware and software to create a transparent micro, mini, and mainframe environment are not far off. Consequently, the programs that the CASE tool generates must be able to provide the same execution services on a desktop micro as on a mighty mainframe. Some of today's CASE development systems already offer this.

It goes without saying that the CASE tool manufacturer should be willing to provide a list of installations using its software and grant permission to contact them. This major criterion should govern the purchase of any software system. Should a software vendor refuse to supply this information, you have reason to doubt the validity and comprehensiveness of its product.

Making intelligent CASE choices need not be mysterious. Considering the dividends that CASE can pay, the more informed your investment choices are, the greater your IS potential. ■

Michael L. Gibson is associate professor in the Department of Management of Auburn University in Auburn, Ala.



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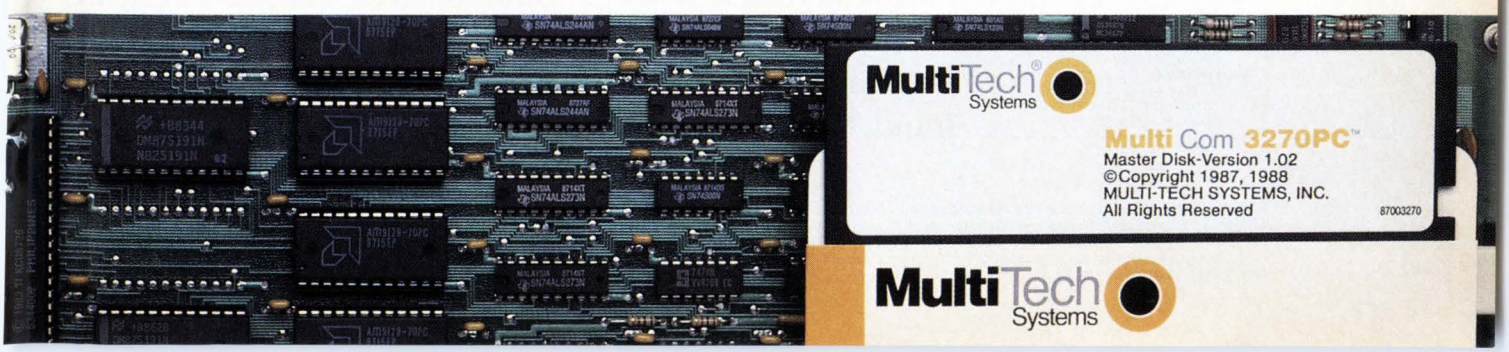

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Data Base
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Microprocessor
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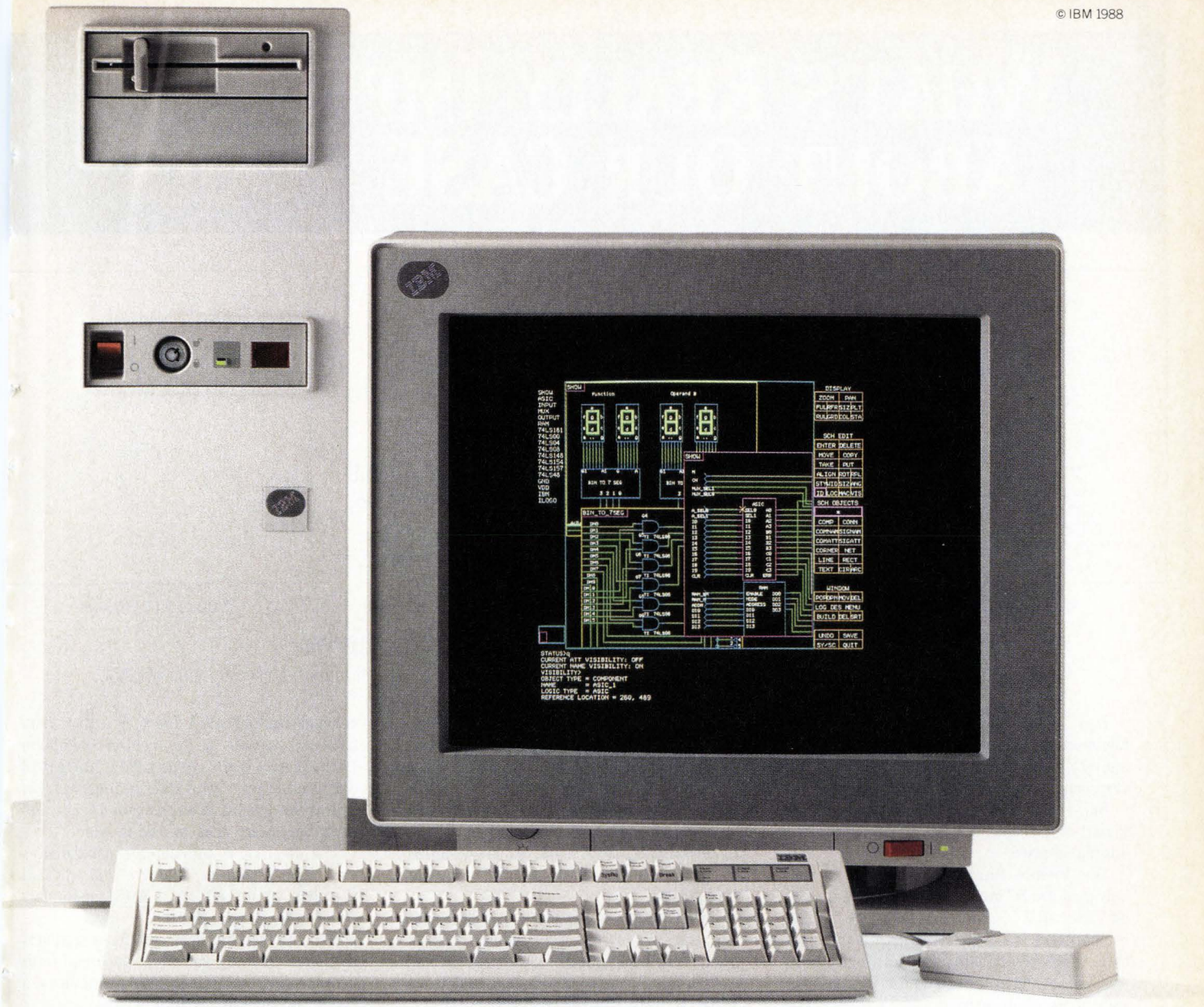

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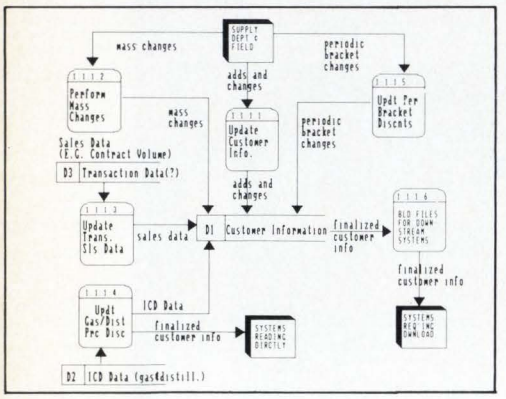

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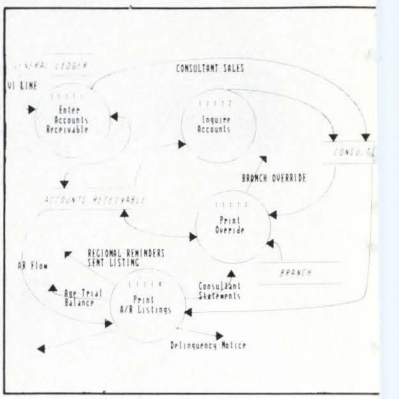

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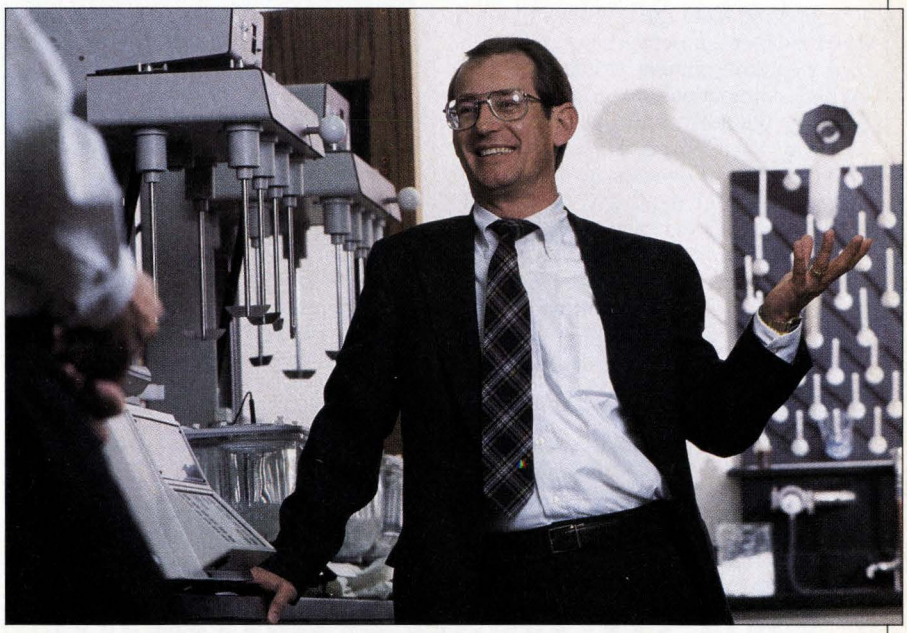
Linking R&D Computers to Corporate IS



KIMBRELL OF MARION LABS: Systems strategies cross division boundaries.

BY DAVID STAMPS

Historically, the corporate research lab has always been totally segregated from other units within the corporation. Now, however, as companies find themselves required to make split-second responses to market currents, many are moving to crack open the previously isolated ivory tower's doors, tap the invaluable R&D data, and pass it on to other company divisions—and even beyond.

Integrating research computing with other corporate information systems can be a tortuous process that has to overcome ingrained cultural differences. Nevertheless, progress at some leading firms is increasingly apparent. At Marion Laboratories Inc. in Kansas City, Mo., for example, the formula for a new drug, along with engineering process control data, is passed directly from a computer in R&D to systems in manufacturing. In addition, because extensive testing is required before the product can be marketed, similar information is transferred directly to a database in sales and marketing. There, it is used to create educational materials for physicians who will be testing the drug.

At Federal-Mogul Corp., a Detroit auto parts manufacturer, R&D has developed an analysis program for main bearing performance. When one of the firm's automaker customers is designing a new engine, the quickest way to determine which bearing will work best is to transfer engine specifications, via the corporate mainframe, to Federal-Mogul's R&D lab, where the specs are run through the analysis program.

"The pure research people can perhaps get away with a separate environment for a while longer," says Alan Porter, associate professor of industrial and systems engineering at Georgia Institute of Technology in Atlanta. "But [for] the product development people, it's recognized as critical that they need to share databases with engineering and marketing. You can't leave designers off in the lab and then worry later about making the product meet with manufacturing or customer needs."

Porter is co-conductor of a 1986

Computer use in R&D labs is on the rise, and links between R&D systems and corporate IS are beginning to take shape. Some companies have established physical links between VAX networks on the R&D side and SNA networks on the commercial side; others have settled for dotted-line organizational links between the two sides. Distributed processing networks may help bring the two environments closer. But synergy between IS and R&D is still the exception, not the rule. Many R&D managers express fear that IS, with its roots in accounting systems, will stifle R&D innovation.

Photograph by Hank Young

survey that explored computer use in 158 U.S. industrial R&D labs. The survey found that computer use has increased rapidly: in 1972, only 8% of R&D professionals used computers; by 1984, the percentage had ballooned to 42%; and, in 1986, it was up to 55%, fueled by the popularity of powerful pcs and workstations. Porter predicts that the next phase in R&D computer use will be "the creation of a computerized environment."

R&D Should Retain Control

Judging from the attitudes of many R&D managers, however, any computerized R&D environment would have only limited connections to commercial IS. Seventy percent of the R&D managers polled in the Georgia Tech survey say R&D has control over its own computer operations. And most say they would prefer to keep it that way.

Says Porter, "R&D believes it has to maintain control of its own computing destiny. The needs and perspectives of financial and accounting personnel in general management are just too different from those of R&D."

WALLER OF AMOCO: Successful companies control their computing.

That is not to say that cooperation between IS and R&D is nonexistent. But, except for efforts at some firms that have taken steps to tie finance, manufacturing, and scientific computing into a single "enterprise architecture," cooperation between IS and R&D appears to be minimal.

Says Donald Peterson, director of information systems at Ecolabs, a Minneapolis-based manufacturer of cleaning products, "R&D systems are pretty much a roll-your-own affair. We [IS] offer some advice and guidelines, so R&D can be part of our network if they choose. For the most part, they don't. Intuitively, though, I feel there are advantages to establishing some links between R&D, manufacturing, finance."

Tony Ossanna, director of technology support services at Ecolabs, sees things somewhat differently. "If there were appropriate support people in IS, we'd work with them, but there aren't and I don't foresee that there will be at any time soon. Their orientation is toward financial applications. They don't have the scientific and engineering background needed for our problems."

Differences Are Rooted in the 1970s

The reason R&D and commercial systems maintain their separate lives can be attributed to three basic differences: hardware, software, and cultural.

On the commercial side, the 370 architecture and its SNA architecture prevail, while on the scientific computing side, Digital Equipment Corp., Hewlett-Packard, and other vendors' minicomputers have predominated.

In the 1970s, while other user organizations tended to rely on IS for technical guidance, R&D, because it had the scientific wherewithal, tended to take responsibility for its own computer system. In the late 1970s and early '80s, full-blown scientific computing networks grew up completely apart from corporate IS. With the dramatic increase in distributed computing resources, such as relational databases, more powerful

Photograph by Mark Moore

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workstations, and more easily transportable code, generic systems are now showing up in both environments.

"The effect," says Michael R. Waller, vice president of research at Amoco Production Co., "has been a much more homogeneous environment . . . . a blurring of the distinction between scientific research computing and traditional business computing."

In some respects, the systems gap may have been little more than a manifestation of the enduring cultural difference between science and the "more corporate" side of U.S. companies: accounting, sales, and marketing.

As with most cultural differences, this one has a rich history. For example, at Sun Refining and Marketing Co., Marcus Hook, Pa., Sheldon Thompson, director of applied R&D, recalls the days before the department had its own DEC computer center and had to rely on the corporate data center in Dallas to run its number-crunching applications.

"It's not that the commercial people weren't supportive . . . they just didn't understand our applications," he says. "They'd see a job still running after two hours and figure it was stuck in a loop, so they'd kill it." Sun's R&D data center still maintains a one-way link with the corporate database in Dallas. At issue, however, is whether the R&D database should be opened up to other Sun units.

"Some people in R&D believe that if there is an error in the data, people outside R&D just won't have the technical background to spot it," says Thompson. That, in essence, seems to be representative of how skittish R&D remains about getting too close to IS.

"Collaborating with IS on a project basis is one thing. Dealing with IS on a day-to-day basis, when they control how many cycles are available to you, is quite another," says Amoco's Waller. "Companies that have the most successful use of computers in R&D are those that have retained control of their computing."

Gap Between IS and R&D Closes Slowly

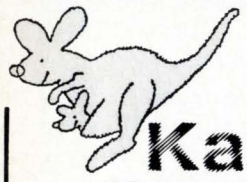
For the companies that have made impressive progress in closing the gap between IS and scientific research systems, the process has been slow.

E.I. du Pont de Nemours & Co. has always had three different computer sectors: an Information Systems Div. (ISD); a Scientific and Technical Computing Div.; and Engineering Computing, which oversees process automation and controls. Since 1985, all three sectors have reported to the vp of technology.

Most Important Applications in Industrial R&D

Application	Percent of Mentions Each Survey Year						
	1974	1979	1982	1984	1986	Projected 1987	Projected 1991
Statistical Analysis of Data	25.5	25.6	21.1	21.1	15.7	11.7	4.2
Lab Automation/ Data Gathering/Process Control	13.3	17.2	16.3	19.7	17.8	16.3	13.5
Database Management, Storage, Retrieval	8.5	12.6	12.7	16.1	15.2	15.3	9.8
Modeling and Simulation	17.0	14.9	17.5	14.6	13.4	15.3	15.2
Scientific and Engineering Calculations	15.8	11.2	9.6	8.5	4.2	2.3	1.4
CAD/CAM/CAE	6.1	5.6	6.4	5.9	6.8	5.2	5.5
Professional Support	3.0	3.7	4.8	5.3	10.8	10.8	9.0
Graphics	2.4	1.9	4.0	4.4	6.3	5.9	3.8
Communications	0.0	0.9	0.4	2.1	3.4	7.2	6.9
Software Development/ Engineering	6.1	2.8	4.0	1.5	2.9	2.3	1.4
Artificial Intelligence/ Expert Systems	0.6	0.5	0.8	0.6	2.6	4.6	21.1
Hardware Development/ Supercomputer/Micros/Etc.	1.8	3.3	7.4	0.0	0.8	3.3	5.2
Robotics	0.0	0.0	0.0	0.0	0.3	0.0	3.5

Source: Research • Technology Management



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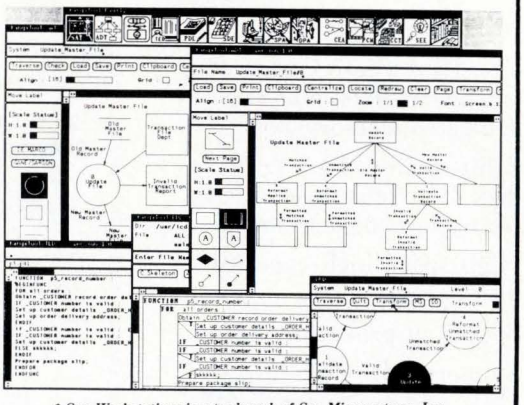

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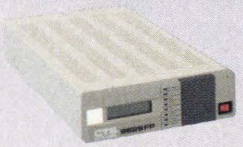

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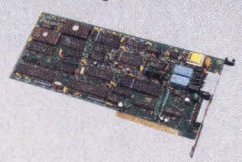

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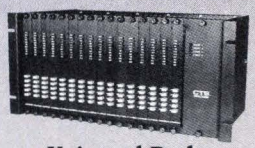

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Ray Cairns, head of ISD, was architect of the arrangement that merged the three computing sectors. As part of that effort, Cairns undertook to limit the diversity of computer architectures within the company, an effort that was only moderately successful in the early days, recalls John Taylor, manager of Du Pont's scientific computing.

"Within ISD, Cairns was able to limit systems to IBM/370, DEC VAX, and HP 3000. He was not able to make it stick in the other sectors, nor did he try too hard," says Taylor. "I think it was because he [Cairns] was good at facilitating, not dictating, that we've been able to make the transition to a new era of cooperation."

Maturity of an integrated R&D and commercial IS may also be a factor, he notes, for it is within the past three to five years that "a lot of synergistic activity has begun to develop."

Taylor cites an example of that recent cooperation: "Two years ago, we needed to free up some of our people, so we contracted with ISD to take over support of the All-In-1 [network] system for a fee. Five years ago, we'd have used clubs to keep them out."

For Marion Laboratories, the synergy that is developing between scientific and corporate systems began eight years ago with a technology transfer study with IBM that created a set of requirements for systems in the scientific computing area. As a result, Marion decided to have a separate IS organization in each of the following areas: sales and marketing, manufacturing, and R&D. Each divisional IS director reports to the head of the division, but has dotted-line reporting to corporate IS.

"It enables us to have systems strategies that go across division boundaries," says John Kimbrell, director of R&D Information Systems and Services.

As part of the study, Marion identified the elements of its common corporate architecture: IBM mainframes, databases, and communications software. Each division can have indigenous software and hardware (R&D uses IBM and HP equipment) that need only be able to connect to the IBM mainframe.

Marion, like other companies trying to link R&D and corporate IS, still faces the problem of overcoming a resistance to interdivisional communication. "Each division needs to understand the other's disciplines and needs if you are going to share data in ways that are useful," says Les Clark, vp of information systems at Marion. The company has attempted to solve the problem through task forces to promote what Clark calls "cross-divisional understanding."

For Some, IS–R&D Synergy Is Elusive

While companies such as Du Pont and Marion Labs appear finally to be enjoying the fruits of IS-R&D synergy, other industrial firms are not as advanced.

"I cannot find any synergy between business systems and engineering systems," says Sezer Soylemez, vp of information management at Scientific Atlanta Inc., a maker of video and cable communications equipment. "The overhead of the 370 architecture does not add any value in the engineering world," he says.

However, the company has found opportunities for collaboration between IS and research. Soylemez's information management group recently embarked on a joint project with research to put R&D cost data into a database that is accessible to marketing, engineering, and plant managers. "This is a major step to pull R&D and MIS together," says Steven Ecker, vice president of R&D for Scientific Atlanta. "We need to shorten development cycles and do a much better job of forecasting product development costs."

Mobay Corp., a Pittsburgh chemical firm, recently made its technical computing group a separate unit from IS, added a number of DEC systems, and installed several new applications.

"We perceived we were behind in terms of technical and research computing," says Richard Baker, Mobay's IS director. Baker concedes there's a need for sharing data between research and business systems. Medical materials data running on a DEC system are needed also on the commercial IBM system. For now, data are batched over to IBM "with some difficulty," says Baker.

"It's an area where we'll be looking for stronger links in the future. For now," he says, "we hope that making research and technical computing a separate unit will give it more clout and more freedom to concentrate on its own applications. As a part of IS, it just wasn't getting the support it needed." ■

David Stamps is a Minneapolis-based freelance writer.

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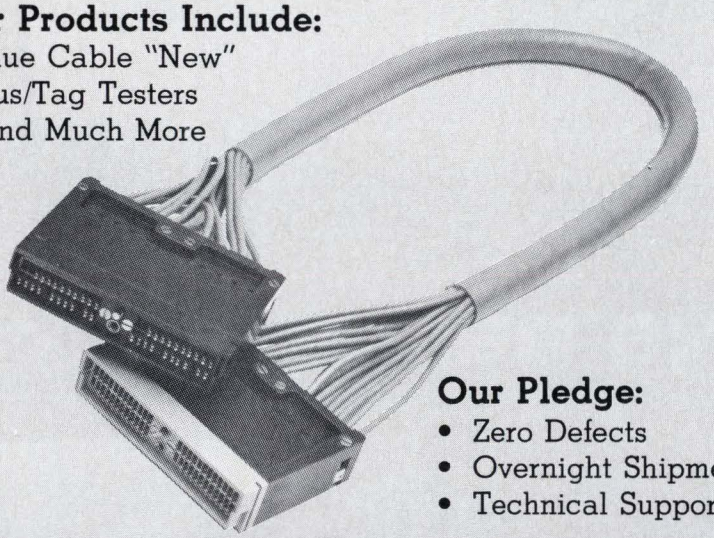

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New Products

TRENDS

FDDI ALREADY HAS QUICKENED the pace of high-speed networks, but a new technology, developed by a high-performance computer vendor, may leave Fiber Distributed Data Interface in the dust.

Last month, Scientific Computer Systems Corp., San Diego, crossed the 1.4Gbps threshold and brought out VectorNet, which, it claims, transmits data at 1.4Gbps (or 1,400Mbps)—140 times faster than Ethernet. The minisupercomputer maker is offering its customers a VectorNet Interface Processor, which will enable them to connect SCS minisupers to workstations and other devices on a network. SCS plans to license a VectorNet Interface Adapter to other hardware vendors.

It remains to be seen whether or not anyone outside the high-performance world needs this kind of speed. SCS marketing vp Steve Campbell thinks commercial applications such as transaction processing could benefit from the technology. Some commercial and scientific users tell DATAMATION that Ethernet is too slow (10Mbps) for their needs. Corporate users want high speed for their campuswide backbone LANs, and some dream of future video and voice applications, which would require considerable speed.

For users satisfied by 100Mbps, products that incorporate FDDI have begun to hit the market. Not yet finalized by the American National Standards Institute, FDDI is a token ring passing protocol for fiber-optic LANs.

Last year, Fibronics International Inc., Hyannis, Mass., brought out the industry's first FDDI-based product. Priced at $36,800 per node, System Finex provides a campuswide backbone LAN for Ethernet networks.

In January, FiberCom Inc., Roanoke, Va., announced a "migration path" from Ethernet to FDDI. Customers that buy its WhisperNet—a fiber-optic Ethernet LAN—will get 100% credit toward its future FDDI products. FiberCom founder Albert Bender tells DATAMATION that customer requests inspired FiberCom's FDDI strategy. Bender, who is "happy to be [the] third or fourth" FDDI vendor, expects to buy chip sets when they come out this summer from Advanced Micro Devices Inc., Sunnyvale, Calif. He hopes to deliver an FDDI line next year, although "that could slip a year," he says.

Other companies, such as Digital Equipment Corp., are developing their own FDDI chip sets, but had not announced specific products at press time.

If you'd like additional information about products covered in this issue's hardware Trends, please circle 248 on the reader service card.

HARDWARE

Amdahl says its 5990 1400 is the fastest 370-class machine around.

Amdahl 5990 Series Boasts 50% Performance Gain

Dual processor and four-way multiprocessor are fastest in the industry, Amdahl claims.

BY MARY KATHLEEN FLYNN

Amdahl Corp. has rolled out a two-model family of mainframes that, it claims, provides up to 50% performance improvement in commercial processing applications over the earlier 5890 mainframe series. In addition, Amdahl has added a two-way processor to its older 5890 mainframe line.

Amdahl says the 5990s have cycle times of 10nsec, compared with the earlier machines' 15nsec cycle times. The vendor says that benchmarks have measured performance improvements of up to 50% in commercial on-line and batch environments and of up to 100% in highly intensive engineering and scientific applications. These improvements would make the 5990 1400 the most powerful general purpose processor in the IBM System/370-compatible marketplace.

Like the 5890, the 5990 mainframes incorporate a dual processor, a four-way multiprocessor, and the vendor's Multiple Domain Feature (MDF), which permits a single mainframe to be partitioned into several systems. The 5990 700 dual processor supports up to four MDF domains; the 5990 1400 four-way multiprocessor supports as many as eight.

Amdahl's new 5890 390E two-way multiprocessor addition to its 5890 line also supports eight MDF domains. The new machine offers nearly the same power but twice the memory of a 5890 300E dual processor, according to the vendor.

The 5990 series runs on MVS, VM, and UTS, Amdahl's proprietary Unix. The vendor plans to offer support in the future for IBM's newly announced MVS/ESA operating system.

Pricing begins at $7.1 million for the 5990 700; at $13.1 million for the 5990 1400; and at $7 million for the 5890 390E. All are available now.

Amdahl also has released three new storage products. Base prices range between $99,000 and $264,000 for the 6100 Storage Processors, with cache available at an additional charge of $90,000 per 32MB increment. Prices for the new disk storage units are $53,100 for the 6380J and $94,500 for the 6380K, plus $20,700 for the unit that contains the interface electronics to link itself and up to seven other storage devices in the string to the storage controller. AMDAHL CORP., Sunnyvale, Calif. CIRCLE **249**

New Products

Laptop

Mitsubishi's Computer Systems Div. enters laptop market.

The Computer Systems Div. of Mitsubishi Electronics America Inc. has entered the IBM-compatible portable computer market with the MP286L series of 80286-based machines.

Among the selling points that Mitsubishi is touting for the MP286L are its ability to function both as a desktop and as a laptop; the readability of its 11-inch diagonal "page-white" backlit LCD screen; and its light weight (15 pounds).

The CGA display controller supports either the built-in display or an external monitor. EGA will be an option in the fourth quarter, as will VGA by the year's end, Mitsubishi promises. Other options include a built-in 2,400Kbps, 1,200Kbps, or 300Kbps Hayes-compatible modem card and a 17-key keypad. The laptop runs MS/DOS 3.3. MS OS/2 is available as an option. Pricing for the MP286L portable, which is available now, begins at $3,195 with dual 3½-inch, 1.44MB floppy disk drives. MITSUBISHI ELECTRONICS AMERICA INC., Computer Systems Div., Torrance, Calif. CIRCLE **251**

LAN and Midrange

AT&T's 50 new products include improved Starlan and 3B addition.

Enhancements to AT&T's Starlan local area network and a new 3B2 midrange computer were featured in the telecom giant's Comdex unveiling of 50 new products.

New operating system software for the Starlan network allows it to respond twice as fast as before to users' commands, according to AT&T. The new Starlan 10 network operates at 10Mbps, using unshielded twisted pair wiring, coaxial cabling, or fiber media. The vendor is targeting the product at the high-speed networking requirements of database management, engineering, and desktop publishing applications. Other Starlan upgrades include a new command set and a menu interface.

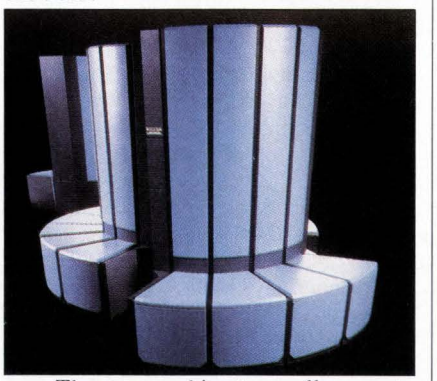
AT&T also has brought out new networking packages—which conform to the International Standards Organization's Open Systems Interconnection model for communications—for 3B2 and 6386 WorkGroup System machines.

The 3B2/700, which supports up to 80 users simultaneously and operates at a speed of up to 9MIPS, is AT&T's latest midrange offering. Prices begin at $69,000. Also announced were extensions in processor power and memory for the 3B2/500 and 3B2/600. More complete product descriptions, pricing structures, and availability dates can be obtained from AT&T. AT&T DATA SYSTEMS GROUP, New York. CIRCLE **250**

Supercomputer

Cray enhances X-MP series, boasting better price/performance.

Cray Research Inc. has brought out the X-MP Extended Architecture (EA) series of supercomputers. The new line, which is based on the architecture of its recently debuted Y-MP series, replaces its X-MP series while offering a migration path to the Y-MP.



The new architecture offers up to four times the memory of existing X-MPs at approximately the same prices or better, claims Cray. For example, the vendor explains, the X-MP EA/464, featuring 64 million words of memory, is priced at $14 million, whereas the old X-MP/416, with 16 million words of memory, was priced at $16 million.

Shipping for the new product is expected to begin in the third quarter. Prices for the X-MP EAs range from $2.5 million to $14 million. CRAY RESEARCH INC., Minneapolis. CIRCLE **253**

BRIEFS

Chips and Technologies Inc., San Jose, has brought out a new **CMOS single-chip Micro Channel communications interface controller.** The 82C575 supports communications applications such as modems and SDLC/BISYNC/UART adapter cards. It is available now for $7.20 in 1,000-unit quantities. CIRCLE **254**

Wang Laboratories Inc., Lowell, Mass., has unveiled **a PC LAN and a set of PC LAN/Wang VS integration products.** The PC LAN incorporates VINES network OS from **Banyan Systems Inc.,** Westboro, Mass. Prices for servers, available now, begin at $8,625. CIRCLE **255**

MIPS Computer Systems Inc., Sunnyvale, Calif., has introduced the M/120 RISComputer, **a RISC-based Unix machine.** Available now, typical configurations are priced at $30,000 for 12MIPS, and $26,500 for 9MIPS. CIRCLE **256**

Digital Equipment Corp. has made price cuts of up to 40% on its **rtVAX 1000s** (now between $5,347 and $14,522), **IVAX 620s** (now between $6,963 and $17,939), and its **KA620** computer (now $3,145). CIRCLE **257**

Ardent Computer, Sunnyvale, Calif., has introduced a **molecular simulator version of its Titan Graphics Supercomputer.** The Molecular Simulator was developed with **BioDesign Inc.,** Pasadena, Calif. Available now, a single-processor version is $129,990; a dual-processor version is $164,500. CIRCLE **258**

Advanced Micro Devices Inc., Sunnyvale, Calif., has rolled out a **microprocessor peripheral** that sorts and manipulates data and increases database management task speeds by up to 400 times, AMD claims. In 100-unit quantities, the Am95C85 is priced at $49.20 for 12MHz, and $66.50 for 16MHz. CIRCLE **259**

Convergent Technologies Inc., San Jose, has added an **entry-level model to its S/Series of Unix work group servers.** The S/80 supports up to 16 users, is priced between $7,000 and $10,000, and is available this month. CIRCLE **260**

Multi-Tech Systems Inc., New Brighton, Minn., has brought out a **CCITT V.32 9.6Kbps desktop modem,** available now, and priced at $1,495. The dial-up modem operates at 9.6Kbps, 2.4Kbps, 1.2Kbps, and 0.3Kbps, and it incorporates MNP error correction. CIRCLE **261**

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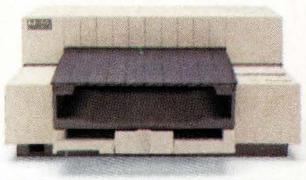

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TRENDS

PC GRAPHICS PACKAGES stand to gain much from OS/2 and Presentation Manager, say two software vendors that have joined IBM and Microsoft's PS/2-OS/2 applications road show. Software Publishing Corp. (SPC), which puts out the Harvard Graphics line, and ZSoft Corp., which makes the Paintbrush family, recently have introduced packages running OS/2. Both have announced plans to release Presentation Manager versions of their pc-based graphics packages.

Ken Whitaker, vp of R&D for Mountain View, Calif.-based SPC, tells DATAMATION that OS/2 with Presentation Manager will enhance graphics because it provides "the use of a large amount of memory, an integrated environment for importing and exporting data from other applications, multitasking, standard interfaces, and accessibility to a wide range of peripherals."

When comparing OS/2 with Unix, which offers some of the same benefits, Whitaker says "OS/2's multitasking, as opposed to the multiprocessing of Unix, is more efficient." Presentation Manager, he says, provides "a consistent user interface, which Unix doesn't offer yet." Although Whitaker applauds the moves that are being made to give Unix a standard graphical user interface, he states, "It hasn't happened yet. We do have Presentation Manager in-house, and although it's buggy, we're very pleased with the richness of that platform."

OS/2 and Presentation Manager will offer more for animation than PC/DOS, Whitaker explains: "Concurrent animation of graphical elements—rotation, movement, providing different views—all that requires the concept of a multitasking environment."

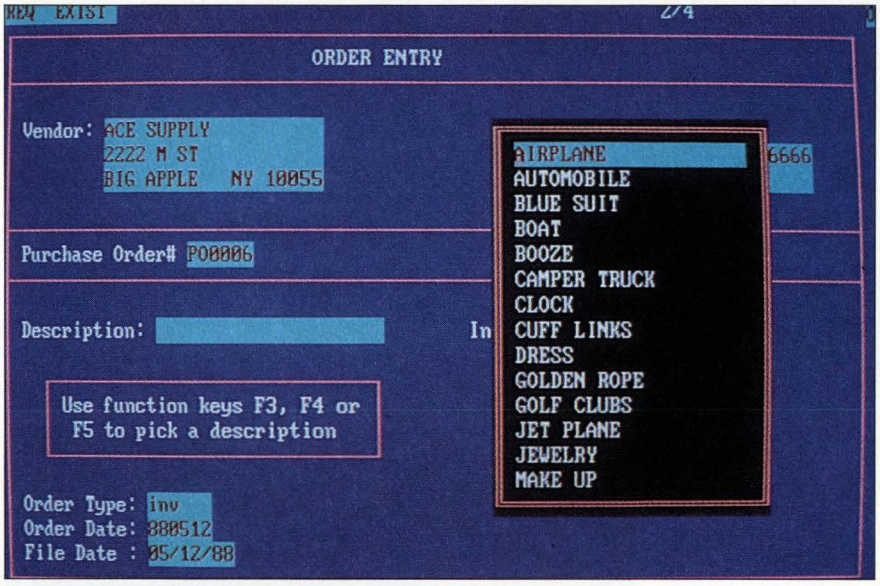
Because Presentation Manager includes standard device drivers (which PC/DOS doesn't), it will facilitate applications development, says Whitaker: "We can concentrate on the application and leave specific device drivers to the peripherals makers."

Neal White, senior programmer with Marietta, Ga.-based ZSoft, elaborates: "With OS/2, it's easier for a programmer to include nice-looking graphics—for instance, a histogram—in applications, without having to fool with the intimate details about how it gets drawn on a particular display."

OS/2's virtual memory is also a key, says White. It will satisfy demands for "higher and higher resolution, bigger and bigger displays, more pixels, and more colors."

If you'd like additional information about products covered in this issue's software Trends, please circle 238 on the reader service card.

SOFTWARE



Its new RDBMS offers flexibility to the user, according to vendor Caltex.

Combined 4GL & RDBMS Is Caltex's First Product

Speed and ease of use are touted for the interactive personal computer-based system.

BY MARY KATHLEEN FLYNN

Caltex Software Inc. has introduced its first product, a pc-based fourth generation language and relational database management system called D the data language.

Caltex is billing D as a highly interactive command- and menu-driven system that offers an integrated environment for the applications developer. Caltex claims the program is faster in run time and development time than several products already on the market. In addition, Caltex claims that its new product saves time in maintenance because it requires less code than other database management systems.

Caltex has enlisted the help of outside consultants to run extensive benchmarks on the product. The consultants each produced 16 reports from a five-file database (supplied by the vendor) using D the data language and six competing products. Run time, development time, and number of lines of code were measured with each product.

In run time, the vendor says, the results show its relational database management system is three times faster than Oracle, Database III, and R:Base System V. However, tests also indicate that D the data language is 3% slower than Dataflex. More information on the benchmarks is available from the vendor.

The package includes an integrated text editor, which allows users to create reports in both the editor and in the open database. Users get immediate feedback about the progress of the desired report, says Caltex.

According to the vendor, the system's features, functions, and utilities give the user flexibility in designing or importing databases, in making ad hoc queries, and in developing procedures and reports.

Priced at $395, D the data language is available now for IBM PCs, XTs, ATs, and compatibles. It requires DOS 2.0 or higher, 512KB of memory, one floppy disk, and one hard disk.

The vendor's plans include introducing a local area network version and an SQL layer later this year. In the first quarter of next year, Caltex expects to deliver a version that will run on OS/2. CALTEX SOFTWARE INC., Dallas. CIRCLE **233**

New Products

Word Processing

Addison-Wesley's Wordbench includes information manager.

Addison-Wesley Publishing Co. Inc. has introduced Wordbench, a "tool for people who write." The word processing package was developed by the Bank Street College of Education, New York, and independent software developer Franklin E. Smith.

Wordbench is comprised of six components: the Outliner; the Notetaker, an information manager; the Writer, which includes such tools as a speller, a thesaurus, and a style guide; the Print Manager; the Folder Manager, which performs file maintenance; and the Add-in-Manager, a pathway for future applications and features that currently includes one add-in, Brainstormer, which provides writing guidelines.

Wordbench is available now for the IBM PC and compatibles at $189, and for the Apple IIe, IIc, and IIG at $149. ADDISON-WESLEY PUBLISHING CO. INC., Reading, Mass. CIRCLE **234**

DB2 Query

On-line retrieval package offers a choice of four querying methods.

Dylakor Inc., a division of Sterling Software, has introduced Dyl-IQ Express, an interactive query program for DB2, IMS, and VSAM data structures. Available in three on-line versions—for CICS, IMS/DC, and TSO—it can also run in batch, according to Dylakor.

Targeted at a wide range of users—both information systems staffers and nontechnical users—Dyl-IQ Express offers four different querying methods for gaining access to corporate data.

Users can employ a menu-driven facility, with blanks to fill in for data and report layout specifications; a natural language facility, which was designed for non-IS professionals; a free-form query facility, aimed at more advanced users; and a facility that stores frequently used queries.

The vendor says it plans to add SQL syntax to the product in the fourth quarter. DB2 access, which is currently included in the IMS/DC and TSO versions, will be added as an option to the CICS version by next year's first quarter.

Dyl-IQ Express, which is available now, is priced between $20,000 and $60,000. DYLAKOR INC., Chatsworth, Calif. CIRCLE **235**

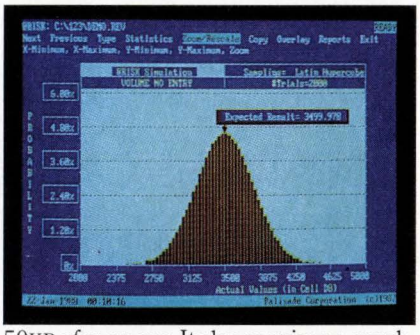
Spreadsheet Add-In

Add-in program enables Lotus 1-2-3 users to do risk analysis.

Palisade Corp. has brought out @Risk (pronounced "at risk"), a Lotus 1-2-3 add-in for risk analysis.

Risk analysis is useful when uncertainty exists in a spreadsheet's entered values; by assigning a range of values as probability distributions to any spreadsheet cell, the vendor says, @Risk can help users avoid errors. The program produces results that tell the user the probability of any outcome occurring.

Palisade targets @Risk at analysts in financial decision-making, oil exploration, engineering applications, and strategic planning. With 1-2-3, @Risk needs



50KB of memory. It also requires a graphics adapter. @Risk's price is $395. PALISADE CORP., Newfield, N.Y. CIRCLE **237**

Data Collection

IMRS brings out numeric and textual data collection system.

FinalForm, a pc-based data collection system that automates corporate numeric and textual data collection requirements, has been unveiled by IMRS.

The developer says its product can be used for a variety of applications, such as tax reporting, intercompany invoice control, product tracking, and financial data collection. FinalForm includes an administration system that provides control of development, maintenance, and security of the application. It also contains a rules generator that automates the creation and maintenance of the customer's rules for data entry.

FinalForm runs on IBM PCs and compatibles using DOS 3.0 or higher. It requires a hard disk and 630KB of memory. Available now, it is priced at $40,000 for a headquarters license, with an additional $10,000 for up to 10 remote sites and $40,000 for up to 100 sites. IMRS, Stamford, Conn. CIRCLE **236**

BRIEFS

Digital Equipment Corp.'s Printing and Circulation Services, Northboro, Mass., this month is publishing the fourth edition of its free **VAX Software Source Book**, which describes 3,500 packages available for VAX machines. CIRCLE **239**

Advanced Computer Communications, Santa Barbara, Calif., has released V.2.1 of its **ACCES/MVS, which connects IBM mainframes running MVS to TCP/IP networks.** The new version is available now. It is priced between $17,000 and $22,000. CIRCLE **240**

Triangle Consulting Corp., Woodbury, N.Y., has debuted **a software utility for the IBM System/36** that simulates the larger IBM System/38. Q-PGMR is priced at $750 and is available now. CIRCLE **241**

Ross Systems, Palo Alto, has delivered a new **executive information system** for financial executives. For use with its MAPS family of accounting software on VAX computers, the packages are priced starting at $5,000, and are available now. CIRCLE **242**

Interlink Computer Sciences, Fremont, Calif., has introduced the SNS/937X, a **high-speed communications link** between the IBM 9370 Information Systems and systems on a DECnet network. Available in the third quarter, it is priced at $30,000. CIRCLE **243**

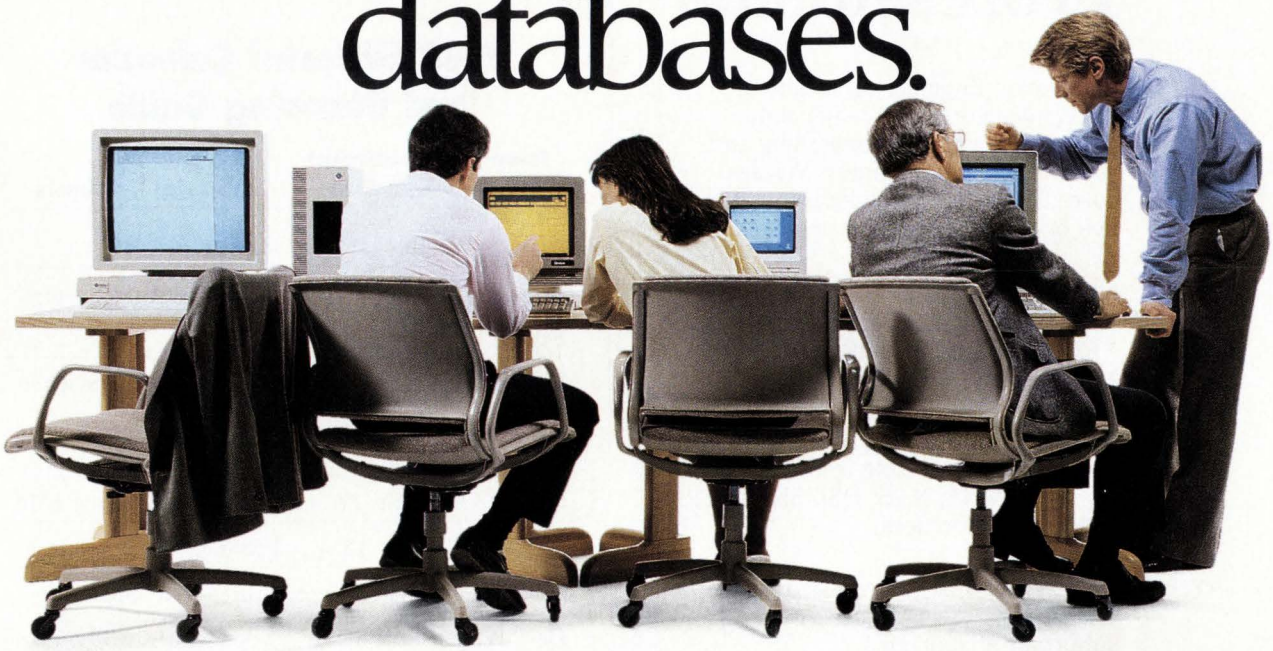
Blaise Computer Inc., Berkeley, Calif., has brought out a new **screen management system**, which is designed to help programmers create and use efficient, flexible input screens. The DOS package will become available this month and is priced at $129. CIRCLE **244**

P-Cube Corp., Brea, Calif., has introduced **a personal computer-based package, which is designed to assist MIS executives in reaching decisions on new technology** and systems development projects. Opportunities+/IRM is available now, and is priced at $9,500 for a site license. CIRCLE **245**

Meridian Technology Inc., Atlanta, has released a new version of its **remote control communications software package** for the IBM PC, XT, AT, PS/2, and compatibles. Release V.5 of the Carbon Copy Plus is available now. It is priced at $195. The price for current Carbon Copy Plus customers that wish to upgrade is $50. CIRCLE **246**

STRATUS INTRODUCES SQL/2000™

Suddenly, the rules have changed for OLTP databases.



Stratus and SYBASE,® two masters of on-line transaction processing, worked hand-in-hand to develop SQL/2000 for the Stratus XA™2000 architecture. Result: The first distributed RDBMS that surmounts the demands of OLTP and meshes with workstations of your choice.

1. CHANGE THE RULES OF YOUR DATABASE ON-LINE, ACROSS YOUR NETWORK. While many RDBMSs let you make on-line changes at the data level, SQL/2000 takes you deeper: You can change the rules that dictate how your business is carried out – and effect that change across your network without a ripple in the workflow. That's because the rules that run your business are enforced centrally in the database. You make changes in one location for your entire network. And you never touch your application code.

2. PROCESS AT OLTP SPEED. Designed specially for OLTP, SQL/2000 is the fastest around. It was built on the requester/server model, uniquely suiting it to Stratus' multiprocessor architecture. You simply add requesters and servers as your business expands without degrading performance. And since SQL/2000 is built into the Stratus Virtual Operating System (VOS®), the database foundation comes with every system.

3. PRESERVE YOUR STRATUS INVESTMENT. You might have expected SQL/2000 to offer full data integrity. Distributed processing. Easy, modular growth. But maybe you didn't expect that your current Stratus files are easily integrated into SQL/2000 without any conversions. That's because SQL/2000 and VOS share the same query language and interface, making SQL/2000 the most productive environment for programmers.

4. INTEGRATE WORKSTATIONS OF YOUR CHOICE. Compatible with SYBASE, SQL/2000 lets you integrate applications with a broad range of workstations. Utilizing Suns and other UNIX-based workstations, IBM PCs, PS/2s, and soon Macintoshes as intelligent workstations, SQL/2000 brings OLTP to the local level on the workstation of your choice.

5. PLUG INTO AN UNRIVALED SERVICE NETWORK. Every Stratus user is united with the most sophisticated and successful on-line 24-hour remote service network in the industry.

For more information on doing business by your own rules, call your local Stratus representative or phone (617) 460-2192.

The XA2000 family of on-line transaction processing systems.

Stratus®

The OLTP Database Solution.

Circle 47 on Reader Card

Network Software Professionals

The Devon Engineering facility of Unisys Networks is a major data communication and networking software development center. We are currently seeking individuals with five or more years' experience in:

NETWORK DESIGN
NETWORK ARCHITECTURES
PROTOCOL DEVELOPMENT
NETWORK STANDARDS

As part of our staffing plan, positions are currently available in the following areas: BNA, X.25, OSI, SNA, and TCP/IP Development.

Our facility offers a professional atmosphere and is located in suburban Philadelphia.

For confidential consideration, write or send resume to **Human Resources, Unisys Corporation, Devon Engineering Labs, Dept. HBD, P.O. Box 1874, Southeastern, PA 19398-1874.** An affirmative action employer.

UNISYS

Career Opportunities

DATAMATION

1988 Editorial Calendar and Planning Guide

Issue Date	Recruitment Deadline	Editorial Emphasis
Aug. 1	July 13	European 25
Aug. 15	July 27	Enterprise Computing
Sept. 1	Aug. 11	Japan 10
Sept. 15	Aug. 24	Best Computer Science Universities
Oct. 1	Sept. 14	Salaries
Oct. 15	Sept. 26	Changing Roles of MIS
Nov. 1	Oct. 12	Productivity
Nov. 15	Oct. 26	Mini-Micro Spending
Dec. 1	Nov. 10	Applications Software Spending
Dec. 15	Nov. 28	Information Assets

Call today for information:

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Roberta Renerd
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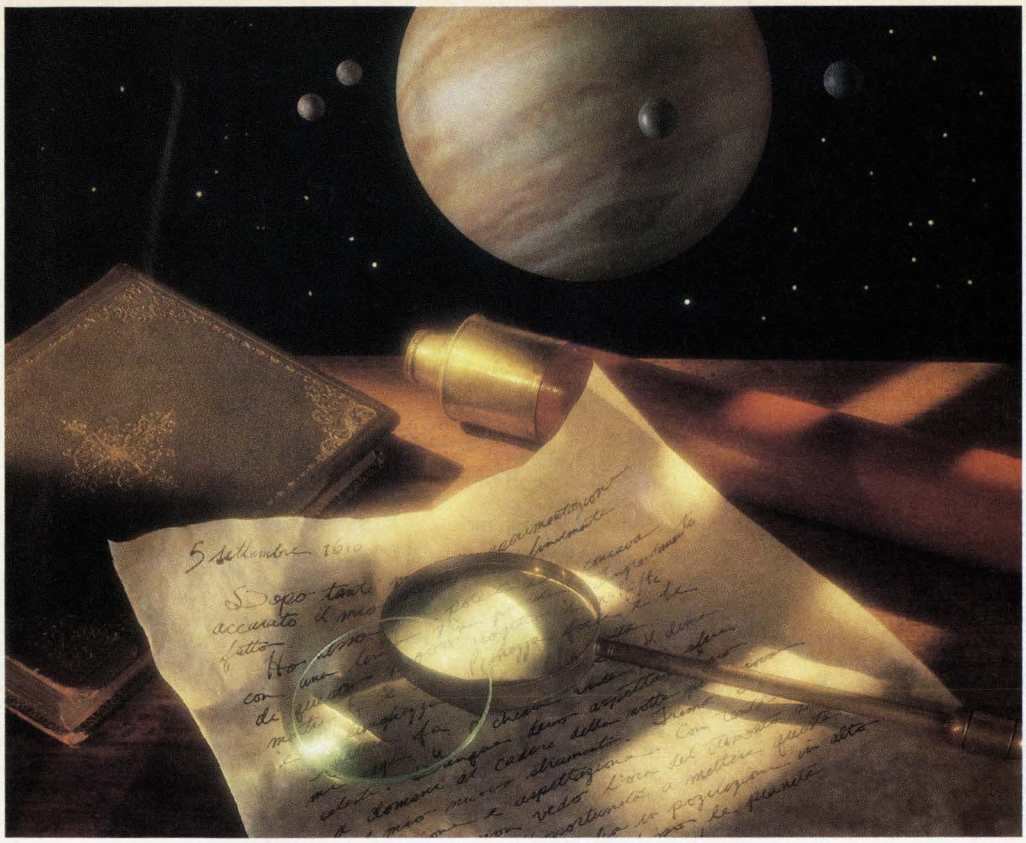
Janet O. Penn
(201) 228-8610

West Coast
Ellen Sherwood
(714) 851-9422



Galileo examined an assortment of magnifying lenses and asked, "What if..."

At Hewlett-Packard, we never stop asking, "What if..."

At the beginning of the 17th century, Galileo experimented with a new combination of magnifying lenses. He then used his discoveries to create an incredibly powerful telescope. A telescope that enabled him to closely observe the topography of the Earth's moon — and to discover four of Jupiter's moons.

This quest to push the limits of existing knowledge — to always ask, "What if..." — underlies the innovative spirit you'll feel at Hewlett-Packard's Networked Systems Group. This newly consolidated group forms a technological hub for our company's computer systems and networking activities. It's an organization that encourages and inspires its people to look at things from a different point of view. And where you'll always find the necessary support and resources to reach your professional objectives.

We're currently seeking experienced engineers to continue our forward momentum in the following areas:

SOFTWARE DEVELOPMENT ENGINEERS

- OS with kernel level knowledge
- File systems, commands, compilers, and standard libraries
- I/O subsystems
- User interface/usability
- Trusted systems/computer security
- Systems administration
- High availability
- Program language development
- Tool development

PERFORMANCE

- UNIX* performance
- Systems performance
- Workloads modeling
- Measurement tools

SOFTWARE TESTING

- Test strategies, plans and suites
- S/W quality assurance
- System level s/w testing and integration
- OSI, MAP/TOP and MHS

INTERNATIONALIZATION

Develop strategy for new product design/development

- Experience with non-U.S. markets
- Operating systems experience
- Excellent English communication skills
- Good negotiation skills

DATABASE SYSTEMS S/W DEVELOPMENT

- SQL
- Online transaction processing
- High availability
- Extensions for CAD/CAM and office database

Opportunities are available in lab locations in Cupertino, CA and Ft. Collins, CO. To inquire about these opportunities, send your resume to the location you prefer: Hewlett-Packard Company, Professional Staffing, Dept. SR11, 19447 Pruneridge Avenue, MS: 42U4, Cupertino, CA 95014; or Hewlett-Packard Company, Professional Staffing, Dept. SR11, 3404 East Harmony Road, MS: 86, Ft. Collins, CO 80525. Hewlett-Packard is an Equal Opportunity/Affirmative Action Employer.

*UNIX is a trademark of AT&T.

we never stop asking

"What if..."

HEWLETT PACKARD

"YOU CAN'T DO THAT"

Sunnyvale, CA

Build a large scale mainframe computer that will outperform the competition's leading model?

"IMPOSSIBLE!" they said.

But Amdahl did it back in the early 1970s. And today we are a leader in the development, manufacturing, marketing and support of general purpose and scientific computer systems, storage products, communications systems and software.

In less than two decades we have grown from 5 to more than 8,000 "can do" employees around the globe. Our success is a result of teamwork, innovation and commitment to achieve the impossible. If you are ready for challenge, creativity and growth, explore your opportunities with Amdahl in one of the following areas:

DATA CENTER SUPPORT

YOU CAN be first to utilize our newest products as well as share major technological advances. Our Corporate Computer Center is one of the largest on the West Coast. You will be in strategic partnership with our product development and marketing teams. Your 3+ years in VM, *UNIX® or MVS/IDMS systems programming will make you a valuable technical support contributor while charting new courses for technology and usage in one of the following small team environments:

- **UNIX or UTS** Performance Analysis**
- **NCP/VTAM/SNA Support**
- **Software Instructors**
- **Technical Support Managers**
- **VM Internals Support**
- **UTS/UNIX Kernel Support**
- **Project Managers**
- **IDMS Systems Programmers**
- **IDMS Data Base Administrator**

Contact Susan Raskin at (800) 338-8460, extension 6191 or send your resume to her at Mail Stop 300.

UNIX AND COMMUNICATIONS SOFTWARE DEVELOPERS

YOU CAN help introduce program compatibility and interoperability to SNA, OSI, and DoD environments. Employing some of the most sophisticated software tools, such as UNIX System V Release 3 STREAMS and Amdahl's own UNIX timesharing system, UTS, you can contribute as a:

- **Network Management Development Manager**
- **Network Management Architects**
- **UNIX Kernel Developers**
- **4705/4725 Support and Enhancement**
- **X.25/BX.25 Support and Enhancement**
- **Tools Developers**

Contact Bill McCarthy at (800) 538-8460, extension 8843 or send your resume to him at Mail Stop 336.

DESIGN AUTOMATION

YOU CAN develop strategic automated tools which take our mainframe designs from concept and verification through to manufacturing. Your 3+ years extensive design automation experience, including C/UNIX based technical skills and/or project management expertise, is essential for the following challenges:

- **Manager, Physical Design Automation**
- **Manager, Logical Design Automation**
- **Manager, Design Automation Tools Development**
- **Software Application Specialist**
- **Software Test Engineer**
- **Database System Design Engineer**
- **Software Design Engineers**
- **Hardware Design Engineers**
- **Software Development Engineers**
- **Manager, Software Development**

BSCS/EE/CSE or equivalent, (MSCS/EE/CSE preferred).

Contact Ranell Durgan at (800) 538-8460, extension 6216, or send your resume to her at Mail Stop 300.

YOU CAN join in the excitement of creating the computer systems of the future, while enjoying the benefits and competitive salary you would expect from an industry leader. Send your resume to Amdahl Corporation, Employment Department 6-6, P.O. Box 3470, M/S 300, Sunnyvale, California 94088-3470. Principals only, please.

Amdahl Corporation is proud to be an equal opportunity employer through affirmative action.

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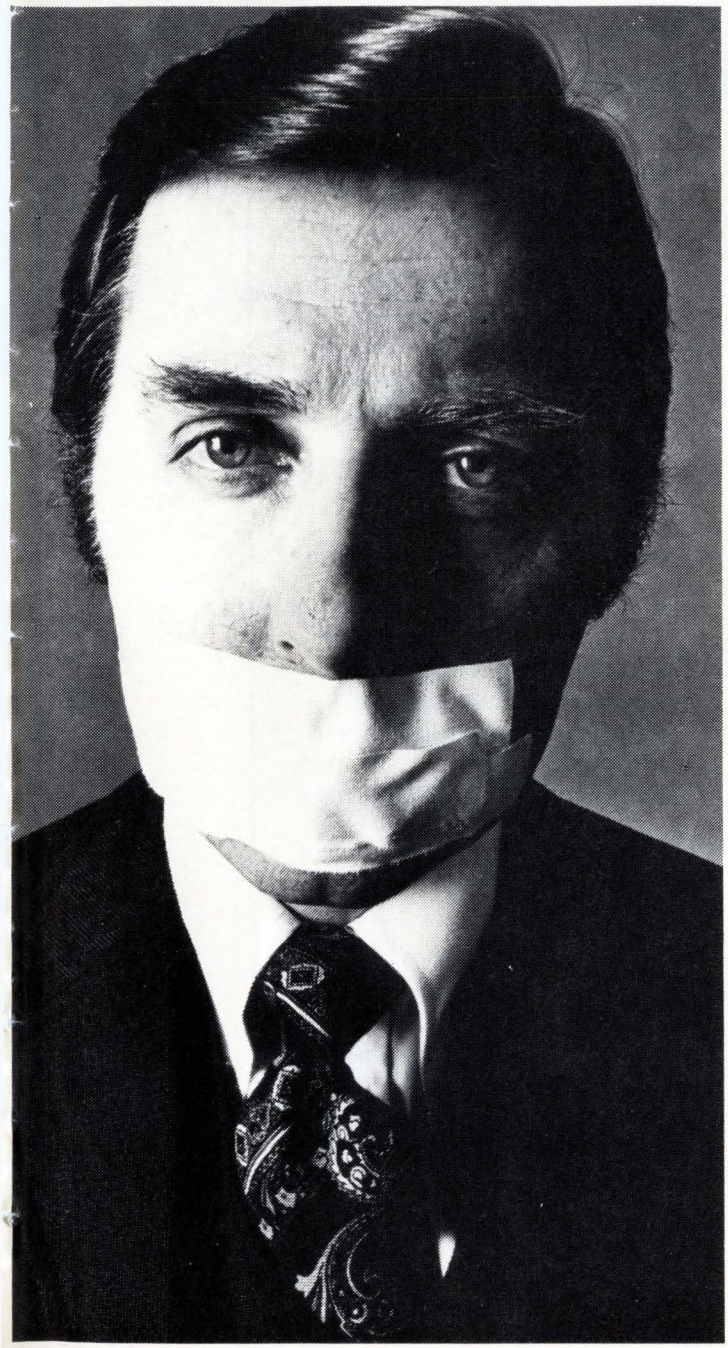
**UTS is a trademark of Amdahl Corporation

YOU CAN AT amdahl

Standard Tactic:

They just aren't being open about networking strategy.



If your company has a closed mind about the meaning of open communications, it's time you communicated with Data General.

We're a Fortune 200 company that's earned its stripes in high performance information systems. Witness the decision of Japan's NTT to join us in a strategic alliance. Not because of our name. But because of our commitment to build the integrated information networks of the future, bridging data communications, telecommunications and computing technologies.

If you want to work where a standards-based model is providing the platform for integrating communications and computing from the top down, you want to be working at Data General. It's an open and shut case.

IBM Communications
* 3278 Terminal Emulation * RJE * HCF * Office Interconnectivity * Token Ring LAN * SNA Transport * SNA LU 6.2

PC Communications
* NetBios * MSNet * LAN Manager Systems

ISO Systems
* File Transfer & Management * Virtual Terminal * Transaction Processing Services * Presentation & Session Services * Transport, Internet, and Link Level Protocols

Network Management
* Monitor and control systems * Directory services using relational DBMS * Distributed database and expert systems technology

Wide Area Networks
* Information Access * Document Exchange * Gateway-to-Gateway Interconnect * Communication Server Software * LAN-to-ISDN Interconnect * High Availability Systems

To find out more about these opportunities, send your resume to Data General Corporation, Denise Peppard, M/S D112B, 4400 Computer Drive, Westboro, MA 01580. An Equal Opportunity Employer, M/F.

DataGeneral

We Don't Compromise Standards.

S O F T W A R E
S P E C I A L I S T S

Now is the time

Challenging opportunities exist for experienced Technical Professionals in our Customer Support Center in Colorado Springs.

We are looking for professionals who have superb communication skills—who thrive in a customer support setting—to consult with our customers on a one-to-one basis. You should be able to work as an active team member while researching and structuring innovative solutions to complex software problems.

We are looking for qualified applicants with a degree in Computer Science and/or the equivalent experience specific to the following disciplines:

VAX/VMS* Support

You must have 2 or more years experience with VMS as a system manager or from a strong user level support role.

Network Support

You must have 2 or more years experience with one of the following Digital Networks and Communications products:

- DECnet,* VAX* and/or DECnet RSX*
- Ethernet Technology
- Ethernet Terminal Servers
- DECserver 100/200*

For immediate consideration, please send your resume to: Ms. Barbara Cusack, Dept. 0701 8807, Digital Equipment Corporation, 305 Rockrimmon Blvd. South, Colorado Springs, CO 80919.

We are an affirmative action employer.

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Be part of the story. . . now.

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Help Us Shape The Future Of Interactive Computer Graphics!

INTERGRAPH CORPORATION is the world's largest company dedicated to developing and manufacturing interactive computer graphics systems. We provide businesses and governments around the world with integrated system solutions for a host of design, engineering, earth science and publishing applications. Now, you too can contribute to the innovation at Intergraph Corporation in one of the following positions.

SOFTWARE ENGINEERS

Develop software for a variety of graphics applications. All positions require at least 2 years software development experience with graphics, preferably using "C" in a UNIX environment, and a related BS/MS degree. The following applications experience is also required:

Electronics Applications: Software development for PCB routing; hybrid layout, schematic capture or circuit logic simulation.

Commercial Mapping and Utilities Applications: Software development for automated mapping and facilities management. Additional industry experience with GIS, utilities distribution engineering, central office engineering or telecommunications is desired.

Civil/Structural Applications: Software development for finite element analysis, structural piping, bridges, transportation, HVAC and facilities.

Federal Systems: Software development for automated mapping systems, image processing and display, document scanning systems and interfacing relational databases with graphic workstations (U.S. Citizenship Required).

SOFTWARE ENGINEERS— NETWORKS

Project management responsibility for network protocol development. Requires strong ISO/OSI background, UNIX experience (kernel level), familiarity with controllers, "C" programming ability and a BS/MSEE (U.S. Citizenship Required).

APPLICATION ENGINEERS

(Opportunities Nationwide)

Provide pre- and post-sale technical support for graphics applications, including: Mechanical design and manufacturing, electronics design, architecture, civil/structural engineering, plant design, HVAC, mapping, utilities and energy exploration/production. Positions require at least 2 years experience with CAD/CAM/CIM/CAE packages and a related BS/MS degree.

APPLICATION ENGINEERS— ELECTRONIC PUBLISHING

(Opportunities in Huntsville, AL and Reston, VA)

Provide pre- and post-sale technical support for Electronic Publishing applications. Requires at least 2 years experience with product demonstrations and customer engineering for scanning, text, graphics and composition systems, and a related BS/MS degree.

WORKSTATION SPECIALISTS

Provide pre- and post-sales support of interactive graphics applications in "C" and UNIX. Requires a BS/MS in Computer Science with at least 2 years experience with development and/or support of graphics software.

FEDERAL MARKETING

(Opportunities in Reston, VA)

Conduct marketing efforts for interactive graphics products with Washington, DC customer base. Requires at least 10 years marketing experience with D.O.D./INTEL entities (U.S. Citizenship Required).

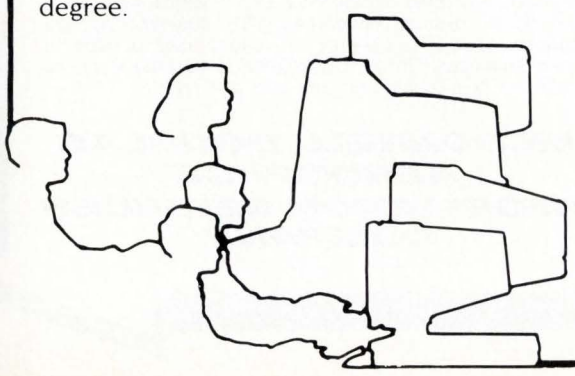
FIELD SERVICE ENGINEERS

(Opportunities Nationwide)

Provide on-site troubleshooting, maintenance and repair of customer's equipment. Requires technical school plus 3-5 years experience with maintenance and repair of mainframe computers and peripheral equipment (disk and mag tape).

Unless otherwise indicated, all positions are located at our Corporate Headquarters in Huntsville, Alabama.

Intergraph offers competitive salaries, comprehensive benefits and professional growth opportunities. For confidential consideration, please send resume with salary requirements to: **Dick Thompson, Intergraph Corporation, Dept. DM, One Madison Industrial Park, Huntsville, AL 35807-4201.** *Please indicate to which position you are responding.* An Equal Opportunity Employer, M/F/H/V. Proof of eligibility to work in the U.S. is required.



INTERGRAPH

Computer Technologists

GE Information Services — one of the world's leaders in teleprocessing — is committed to keeping up with emergent commercial technologies.

If you're an aggressive technical professional interested in joining a focused team of experts in charge of identifying and evaluating new technologies, then developing pilot applications to demonstrate their impact on our business, we invite you to consider us.

You will have high visibility and the freedom to work in a multi-project environment. You should have a unique blend of applied research skills and demonstrated project management experience in bringing your ideas to fruition.

Requirements include:

- BS/MS in CS or EE + 5 years experience in information processing
- Direct experience with emerging hardware systems technologies such as massively parallel processors, CD-ROM's, video disks and specialized sensors — or
- Direct experience with software tools including UNIX®, O/S2 and extensions; C, Ada, 4GL's, SQL relational and distributed databases; IBM Systems Application Architecture — or
- AI applications experience, such as knowledge-based systems, expert systems and generators, and natural language processors.

We offer excellent salaries, benefits and a convenient Washington, D.C. suburban location. Please call John DePolo at (301) 340-5208, or forward your resume to his attention at: GE **Information Services, Dept. DM6, 401 N. Washington Street, Rockville, MD 20850.** An equal opportunity employer. ® UNIX is a trademark of AT&T Laboratories.

GE Information Services

SOFTWARE PROFESSIONALS

McDonnell Douglas Aerospace Information Services Company is set up to handle the substantial data processing and telecommunications requirements of McDonnell Douglas Corporation. Our dynamic organization addresses a variety of multi-faceted information needs. **Positions are available in St. Louis, Missouri and Long Beach, California.**

OPPORTUNITIES EXIST IN THE AREAS OF:

SCIENTIFIC APPLICATIONS

Requires experience in the development and maintenance of engineering or scientific related software. Programming languages include FORTRAN, PASCAL, Ada, C, PL/1, IBM Assembly, ATLAS, JOVIAL and MATE. Hardware includes VAX, IBM, HARRIS, and PRIME. **(St. Louis & Long Beach)**

ARTIFICIAL INTELLIGENCE

Requires AI experience in areas such as: Natural Language Processing, Pattern Recognition, Object-Oriented Programming, Knowledge Based Systems, Neural Networks and Expert Systems. Experienced with AI tools; OPS, LISP, PROLOG, C++, Smalltalk, and High and Low End Commercial Shells. **(St. Louis & Long Beach)**

SENIOR APPLICATIONS DATA MANAGEMENT SERVICES ANALYSTS

Will consult on Data Base Management Systems and perform data base design reviews of those systems (IMS, DN2, SQL/DS, CICS, Nomad 2). **(Long Beach)**

BUSINESS APPLICATIONS PROGRAMMERS

IBM Mainframe - COBOL/IMS, FORTRAN, OS/370 JCL, CMS/TSO, Nomad 2/TIF/ADA Data Base experience a plus.

HP3000 - COBOL programming on HP3000 with knowledge of Powerhouse and IMAGE, MM3000 experience helpful.

VAX Programmers - VAX/VMS, OMNI Base, Digital ALLIN 1 experience**(Long Beach)**

SYSTEMS PROGRAMMERS/ UNISYS/MAPPER SOFTWARE

Responsibilities include: software installation/support; performance analysis/tuning; problem analysis on Sperry/UNISYS 1100/92 and 1100/72 systems with multiple interfaces to large IBM mainframes. **(Long Beach)**

SYSTEMS PROGRAMMING

Requires experience with IBM or DEC/VAX mainframes. Provides installation for TSO, VM, MVS, VM/SP, CDC, NOS or CICS, thorough knowledge of assembly language programming, and the ability to perform in a teamwork environment. **(St. Louis & Long Beach).**

DATA BASE MANAGEMENT

Requires experience in areas such as: Relational Data Base Design Consulting (Oracle DB2), Spatial Data Base, Distributed Data Base Technology, Data Modeling. **(St. Louis & Long Beach).**

Positions listed require a BS, MS or PhD in a technical discipline (or equivalent experience), plus a minimum of 2 years' work related experience.

We are offering excellent salaries fully commensurate with your background. We are a corporation that realizes its people are fundamental to its success. Please forward resumes to the area of interest: **MDAIS, Human Resources WO75-303-4W, (31), 325 McDonnell Blvd., Hazelwood, MO 63042-2598 or MDAIS, Human Resources, 5701 Katella, WO78-K34-4E (B68), Cypress, CA 90630.** Equal Opportunity Employer M/F/H/V.

MCDONNELL DOUGLAS AEROSPACE INFORMATION SERVICES COMPANY

SOFTWARE / HARDWARE ENGINEERING

Digital has it now.

A Northwest Passage.

It's called DECwest. Located in the great Pacific Northwest, it gives technical professionals the chance to find new options for their personal and professional lives.

We're Digital's Northwest Engineering Group, developing enhanced VAX/VMS* products that will revolutionize the way computers are used—not just 5 years from now, but for decades to come.

If you know about the Seattle area, then you already know about our unmatched lifestyle. We enjoy all the amenities of a major metropolitan area, as well as every recreational activity imaginable, a choice of city, country or waterfront living, and a high quality of life that is still affordable.

So if you're ready for a change, check out the following opportunities and send us your resume. Then get ready for a new direction.

UNIX+ Kernel Experts

You'll need experience in one or more of the following:

- I/O and device support
- Virtual memory systems
- Symmetric multiprocessing
- Threads and lightweight processes
- BSD and/or System V-based systems
- Graphics support and graphics devices

You should also have programming experience in high-level languages (in addition to C), a BS or MS in Computer Science, and 5+ years of experience (or equivalent combination of degree and experience). Knowledge of VMS* internals is a plus.

Course Developer

You will develop Operating System, Compiler, Assembler, and/or high-level language software or hardware courses for Digital employees and customers. Ideally, you'll have the following experience:

- Developing course specifications including budgets, milestones, schedules, and reviews
- Conducting courses and instructor workshops
- Interfacing with other organizations to determine training requirements (i.e. Engineering, Field Services, Marketing, etc.)

Requires a BS in Computer Engineering or equivalent and 4-6+ years of experience in course development, training, software services programming and/or hardware maintenance.

Client/Server Environments

We need an experienced individual interested in implementing a client/server computing environment. You'll need experience in one or more of the following:

- Distributed client/server development
- Remote procedure call mechanisms
- Operating system job control
- Programming techniques in a network environment

BS/MS in Computer Science and 5+ years' programming experience in high-level languages required (or equivalent combination of degree and experience). VMS or UNIX knowledge is a plus.

System Test Engineer

Our project team views product testing as an integral component of system design, not a necessary afterthought. We're looking for a highly motivated professional to help us achieve unprecedented quality goals.

You will work with system development and product management teams to:

- Define product quality goals
- Provide test system support to development engineers
- Design/implement test system framework
- Perform test coverage measurement
- Develop tools and workloads
- Interface with other testing and development organizations in the corporation

Requires 10 years of industry experience, including system software testing, and knowledge of operating system internals (or equivalent combination of degree and experience), VMS preferred.

Diagnostic Engineer

As a Diagnostic Engineer, you'll be responsible for perfecting our next generation computing system in the following areas:

- Functional unit testing
- Stand-alone system exercising
- System-directed diagnostic testing
- Device diagnostic testing

Requires 3 years of diagnostic or test experience. Knowledge of Assembler and a high-level programming language is required. BSEE with CE or CS and hardware experience or MSEE or equivalent degree and experience a must.

For consideration or more information about the above positions, please send your resume to: **L. Taylor, Manager, Dept. 0701-8807, DECwest Engineering Group, Digital Equipment Corporation, 14475 NE 24th, Bellevue, WA 98007.** Proof of legal right to work in the U.S. is required.

We are an affirmative action employer.

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Datamation Databank

Professional Profile

Announcing a new placement service for data processing professionals!

Datamation feels an obligation to help its readers advance their careers. So, Datamation has affiliated itself with Placement Services, Ltd. to form the **Datamation Databank.** What are the advantages of this new service?

- Your qualifications and career goals are entered into PSL's computer system. And the computer never forgets. When your type of job comes up, it remembers you're qualified.
- It's absolutely free. There are no charges, fees or obligations to you as a Datamation reader.
- Service is nationwide. You'll be considered for openings across the U.S. by PSL and their affiliated offices.
- Your identity is protected. Your resume is carefully screened to be sure it will not be sent to your company or parent organization.
- Your background and career objectives will periodically be reviewed with you by a PSL professional placement person to ensure current information.

We hope you're happy in your current position. At the same time, chances are there is an ideal job you'd prefer if you knew about it.

That's why it makes sense for you to register with the **Datamation Databank.** To do so, just mail the completed form below (with a copy of your resume) to **Placement Services, Ltd., Inc.**

IDENTITY

Name _____

Home Address: _____

City _____ State: _____ Zip: _____

Home Phone (include area code): _____

PRESENT OR MOST RECENT EMPLOYER

Parent Company _____

Your division or subsidiary: _____

Location (City, State) _____

Business Phone if O.K. to use: _____

EDUCATION

Degrees (List)	Major Field	GPA	Year Degree Earned	College or University

POSITION DESIRED

_____

EXPERIENCE

Present or Most Recent Position From: To: Title:

Duties and Accomplishments: Industry of Current Employer:

_____

_____

_____

Reason for Change: _____

PREVIOUS POSITION:

Job Title: _____

Employer: _____ From: _____ To: _____ City: _____ State: _____

Division: _____ Type of Industry: _____ Salary: _____

Duties and Accomplishments: _____

COMPENSATION/PERSONAL INFORMATION

Years Experience	Base Salary	Commission	Bonus	Total Compensation	Asking Compensation	Min. Compensation

Date Available

I Will Travel ☐ Light ☐ Moderate ☐ Heavy

☐ I own my home. How long? _____ I rent my home/apt. ☐

☐ Employed ☐ Self-Employed ☐ Unemployed

☐ Married ☐ Single

Height_____Weight_____

Level of Security Clearance

☐ U.S. Citizen ☐ Non-U.S. Citizen

My identity may be released to: ☐ Any employer ☐ All but present employer

☐ WILL RELOCATE ☐ WILL NOT RELOCATE ☐ OTHER _____

Datamation Databank

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265 S. Main Street, Akron, OH 44308 216/762-0279

Departments

CALENDAR

JULY

International Computers in Engineering Conference and Exhibition.
July 31-Aug. 3, San Francisco. Contact A'ndrea Elyse Messer, American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017, (212) 705-7740.

AUGUST

SIGGRAPH '88 (Conference on Computer Graphics and Interactive Techniques).
Aug. 1-5, Atlanta. Contact SIGGRAPH '88, Smith Bucklin and Associates Inc., 111 E. Wacker Dr., Suite 600, Chicago, IL 60601, (312) 644-6610.

ECOOP '88 (European Conference on Object Oriented Programming).
Aug. 15-17, Oslo, Norway. Contact the Norwegian Computer Society, P.O. Box 6714, Rodelokka, 0503 Oslo 5, Norway.

National Conference on Artificial Intelligence.
Aug. 21-26, St. Paul. Contact Claudia Mazzetti, American Association for Artificial Intelligence, 445 Burgess Dr., Menlo Park, CA 94025, (415) 328-3123.

SEPTEMBER

International Society for Optical Engineering (SPIE) Symposium and Exhibition.
Sept. 6-9, Boston. Contact the International Society for Optical Engineering, P.O. Box 10, Bellingham, WA 98227-0010, (206) 676-3290.

Capital Microcomputer Users Forum.
Sept. 7-8, Washington, D.C. Contact Kelly Fitzgerald, National Trade Productions Inc., 2111 Eisenhower Ave., Suite 400, Alexandria, VA 22314, (703) 683-8500.

ShowCASE Conference III.
Sept. 20-21, St. Louis. Contact Donna Skaggs, Washington University, Campus Box 1141, 1 Brookings Dr., St. Louis, MO 63130, (314) 889-5380.

OOPSLA '88 (Conference on Object Oriented Programming: Systems Languages and Applications).
Sept. 25-29, San Diego. Contact Barbara Noparstak, Digitalk Inc., 9841 Airport Blvd., Los Angeles, CA 90045, (213) 645-1082.

Reprints of all DATAMATION articles, including those printed in 1987, are available in quantities of 500 or more. Details may be obtained by telephoning Frank Pruzina in the Reprints Department at (312) 635-8800, or by writing to Cahners Reprint Services, Cahners Plaza, 1350 E. Touhy Ave., Des Plaines, IL 60013.

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