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TELECOM TALENT**

**AN INTRODUCTION TO
INFORMATION ECONOMICS**



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**LAURA
SMITH**

The Others Just Don't Stack Up!



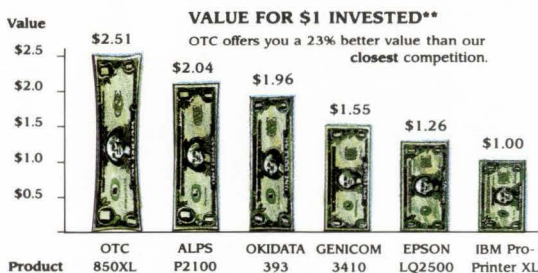
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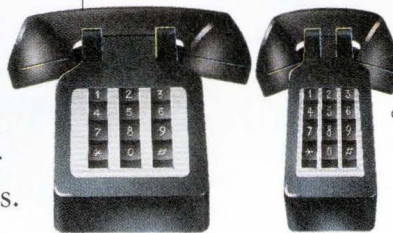
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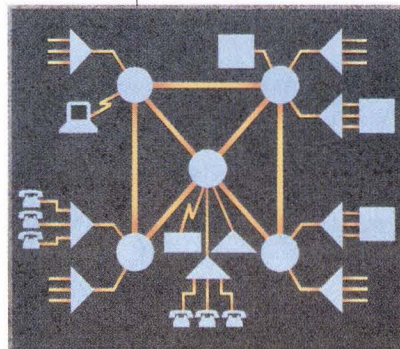
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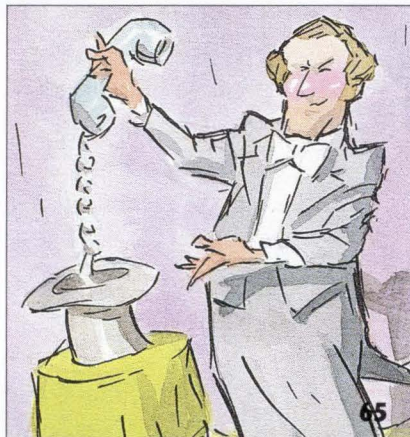
BY BILL MUSGRAVE

Integrated is the key word in ISDN. One part of the integration process is the PBX. ISDN trunks to PBXs will reach customer sites next year, but the big payoff won't come before all the pieces are put in place, probably by the mid-1990s.

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BY DAVID STAMPS

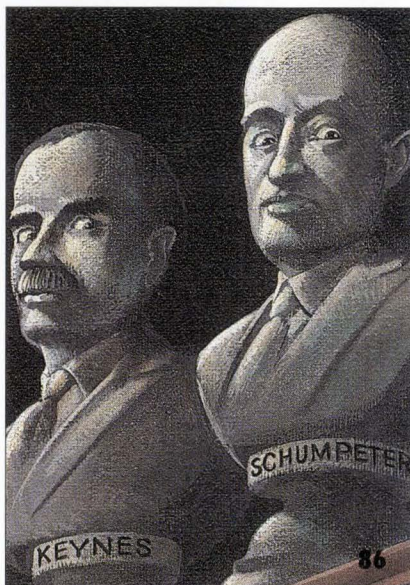
Many U.S. companies have launched Star Search programs to discover telecom talent, but the pickings are slim. Vendor raids and investment in training are among the responses.



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BY MARY JO FOLEY

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BY MARILYN M. PARKER

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BY TOR GUIMARAES

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Cover Illustration by Laura Smith

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Editorial

Check for Injuries After the Crash

Information technology has gathered its own momentum, hurtling forward unimpeded by this Fall's stock market crash. At least that is the impression one comes away with from three of the industry's largest and most recent gatherings.

Hours before the second Black Monday dawned in the United States, information systems executives from West German commercial powerhouses were flocking to Systems '87 in Munich, the country's equivalent to NCC in its heyday. They continued their pilgrimage to the Munich Fair Grounds as the week progressed, despite fallout from Wall Street that caused an 11% decline on the Frankfurt stock exchange. Conversations with several West German IS execs focused on competitiveness, not collapsing share prices.

The emphasis shifted to standards and strategies at Telecom '87 in Geneva, also held during the week of the Dow's dizzying drop. Communications vendors and customers attending the quadrennial event had ISDN, X.400, and other important issues on their minds.

Optimism seems to abound in the U.S. also. Last month's Comdex was as upbeat as any in recent years. Noise generated by the availability of 386 technology, the promise of OS/2, and the speed of new modems drowned out discussion of a possible crash-induced downturn in systems spending. Lotus ceo Jim Manzi went so far as to say, "Let the recession be damned."

But impressions can be deceiving. Many of the end users attending the three events admittedly had not finalized their IS budgets for 1988. Many vendors hadn't had direct contact with customers since the crash. That's why DATAMATION is conducting research with Boston brokerage firm Cowen & Co. to assess what damage, if any, the market's collapse is having on IS spending. The initial results will appear in future issues.

In the meantime, we suggest that customers and vendors proceed—with caution. End users should not reduce IS spending just because of the crash. Nor should they avoid determining what effect the stock market's volatility will have on their businesses. Likewise, vendors—especially those that market through indirect channels such as dealers—would be wise to get in touch with reality. They should make every effort to find out whether the business is indeed out there in 1988. If it is, they should go for it. If not, they should manage their businesses as astutely as their customers.



Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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BPA

Letters

Outstanding

Your 30th anniversary special issue (Sept. 15) does an outstanding job—my heartiest congratulations to you on it.

JOHN DIEBOLD
The Diebold Group Inc.
New York

Assistance

We appreciate the mention of PacTel Spectrum Services in Bill Musgrave's "Network Management: Keeping the Connection" (Sept. 1, p. 98). Overall, Bill does an excellent job of describing PacTel Spectrum Services; however, there was one factual error I would like to address.

The article states that PacTel Spectrum "... isolates problems, reroutes traffic around failures..." PacTel Spectrum does provide diagnostic and restoral assistance services. The operative word here is "assistance." PacTel Spectrum contacts the appropriate vendor to get a problem resolved quickly. We draw upon information in our comprehensive client database to arm that vendor with the facts that will ensure he arrives ready to address the symptoms of trouble and can quickly find the failed device, even after hours or on holidays. That's what we mean by restoral, not auto-rerouting.

RICHARD A. ANDERSON
PacTel Spectrum Services
Walnut Creek, Calif.

Tokenism

Aw, come on folks! One token female, off on the edge, the rest all apparently Caucasian males... (Oct. 1, cover illustration).

And this is your cover for the annual salary survey?

I am Caucasian, female, and have never before written on such issues. But I've also not recently seen such a blatant misrepresentation of the dp world.

CAROLYN HANKETT
Illinois Dept. of Mental Health
and Developmental Disabilities
Chicago

Misstated?

Your annual salary survey, "What Are You Worth?" (Oct. 1, p. 78) significantly misstates salaries in the San Francisco region. As president of a recruiting firm specializing in the data processing industry, and as a founder of the Association of Data Processing Recruiters, I am well qualified to evaluate and critique your findings.

Although the study was comprehensive and contained a lot of useful and interesting information, the salaries given for the San Francisco region are approximately 20% less than actual salaries.

Systems professionals who might consider a move to our region would be discouraged after seeing your figures. The threat of earthquakes and the high cost of housing is enough to overcome in our recruiting efforts. Don't let deflated salaries also be a hindrance.

Please let your readers know that the San Francisco Bay Area offers a tremendous amount of reward for their professional careers, especially in the form of attractive salaries.

PETER P. JOZWIK
Logical Options Inc.
San Francisco

Red-Faced, No Rouge

Thank you very much for taking an interest in my article for "Readers' Forum" (Oct. 1, p. 145).

However, I've attached a copy of the article and my business card, to show that my first name is *LOUIS* and not *LOUISE*. As for the ribbing I'm taking here at work, well, I wish I could share it.

Could you please provide me with a corrected copy of that page, as I'd like to distribute copies among my coworkers. As it presently reads, I'd have to get a new wardrobe and shave off my beard.

LOUIS E. SCOTT
Protection Mutual Insurance Co.
Park Ridge, Ill.

Untaxed in Rhode Island

"Tax Collectors Eye Custom Software," (Oct. 1, p. 22) incorrectly states that custom software is taxable in Rhode Island.

The Association of Computer Software Companies of Rhode Island has successfully fought this issue. We hope that there will be no changes that would tax this professional service. Certainly, attorneys, accountants, and freelance writers should be taxed if computer programmers are made subject to sales tax.

ROBERT E. RADICAN
President
Network Solutions Inc.
Providence, R.I.

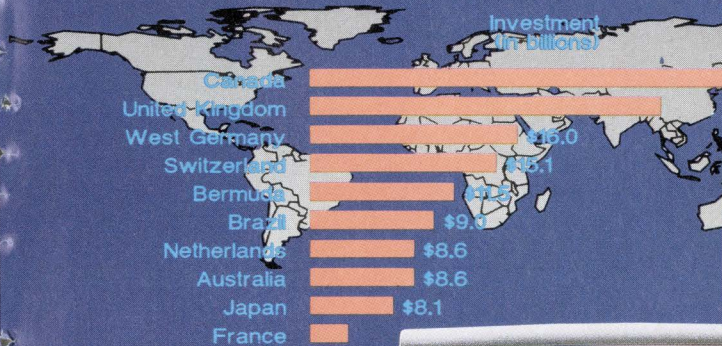
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HP PULLS THE PLUG

CUPERTINO, CALIF. -- Hewlett-Packard, after telling its largest customers over a period of months about a new, high-performance ECL-based version of its Spectrum minicomputer, has pulled the plug on the development project, sources say. HP chief operating officer Dean O. Morton, who announced the decision internally, reportedly told the 100-member ECL development team that the project was being killed to save on research and development expenses. Sources say the company already has poured over \$20 million into the project, which was targeted to yield a uniprocessor twice as powerful as the current HP 950. The ECL project, which had been run out of HP Labs in Palo Alto, had been under fire from rival developers at HP's growing Cupertino systems group for some time. As previously reported, that group plans to build follow-on Spectrum systems using circuit technology that HP will get under a secret deal with IBM.

LOWE REFUTES PS/2 ESTIMATES

RYE BROOK, N.Y. -- Disputing analysts' claims that a substantial portion of its touted 1 million PS/2 shipments are still on dealers' shelves, IBM Entry Systems Div. president Bill Lowe estimates that more than 80% of the units are in the hands of end users. He also figures that 35% to 40% of the 9,000 PS/2 systems that IBM makes daily are going to Europe. Lowe adds that IBM is now shipping an equal number of low-end systems--Models 25, 30, and 50--and high-end systems--Models 60 and 80.

UNISYS EYES TIMEPLEX ACCOUNTS

BLUE BELL, PA. -- If you're a Timeplex Link-1 customer, don't be surprised when you begin to get calls from Unisys salesmen. In the eyes of Unisys ceo Mike Blumenthal, one of the chief attractions of the \$300 million merger with Timeplex was a crack at the data communications company's existing accounts--two thirds of which are not Unisys shops. "There is a lot of opportunity for us," Blumenthal says. "Timeplex is particularly strong in financial services accounts--insurance companies and banks." Despite Timeplex chairman Ed Botwinick's new role as president of Unisys Networks (a \$500 million enterprise), Unisys and Timeplex will maintain separate marketing forces--the power of two, so to speak.

HOW MUCH IS THAT DOGGIE IN THE WINDOW?

LIVINGSTON, N.J. -- Bellcore, the research arm of the Baby Bells, recently put on a presentation for the heads of its seven operating companies to show where we all could be a few years from now. Among the projects is one undertaken with MIT to develop windows on

Look Ahead

computer screens that support video input; it's based upon the X-Windows standard. With broadband ISDN, such video transmission, as well as that of data and voice, could one day become commonplace. In addition, Bellcore is putting a lot of effort into easing the jobs of telecom managers. Future network management enhancements could include ordering new phone lines, testing bad lines, and reporting problems from a single terminal. Currently, customers have to call into the local phone company and wait for hours to get help.

INSECURITY COMPLEX

ISDN probably won't be the most secure mechanism for sensitive data and voice transmission, so vendors already are searching for ways to attract corporate and governmental customers that have expressed concern over that fact. Northern Telecom recently showed the first workings of an encryption method for ISDN, but it appears that it is not alone. An AT&T ISDN manager says that AT&T is proceeding with similar requests, in particular those from Lawrence Livermore Laboratory and Los Alamos National Laboratory.

INTO THE BREACH, ONCE AGAIN

IRVING, TEXAS -- Look for Amstrad Inc.'s renewed pursuit of the colonies' computer dollars to take a more business-related stance if its projections of penetrating the U.S. consumer market hold up. The company is the domestic subsidiary of Amstrad Consumer Electronics plc, London, currently number one in the European home computer market. It is planning a big push into the American market, having recently bought out its Texas-based distributor, Vidco, in order to handle its own marketing and distribution. An earlier attempt to enter the U.S. market fizzled when the company canceled its marketing agreement with Sears World Trade Inc., a unit of Sears, Roebuck & Co., Chicago, which sold the machines through its department stores. Sources at the company say it plans to expand beyond the consumer market once it has a good base built in that arena.

DPMA SEEKS \$ HELP...

SAN FRANCISCO -- The venerable Data Processing Management Association is looking for a way out of its financial problems, brought on by gradually declining membership and the attendance drop-off experienced in recent years by the National Computer Conference, of which DPMA is a cosponsor. The 30,000-member association's board of directors recently approved a 24% annual dues increase. The association is seriously considering the formation of a for-profit subsidiary to

(continued on p. 12)

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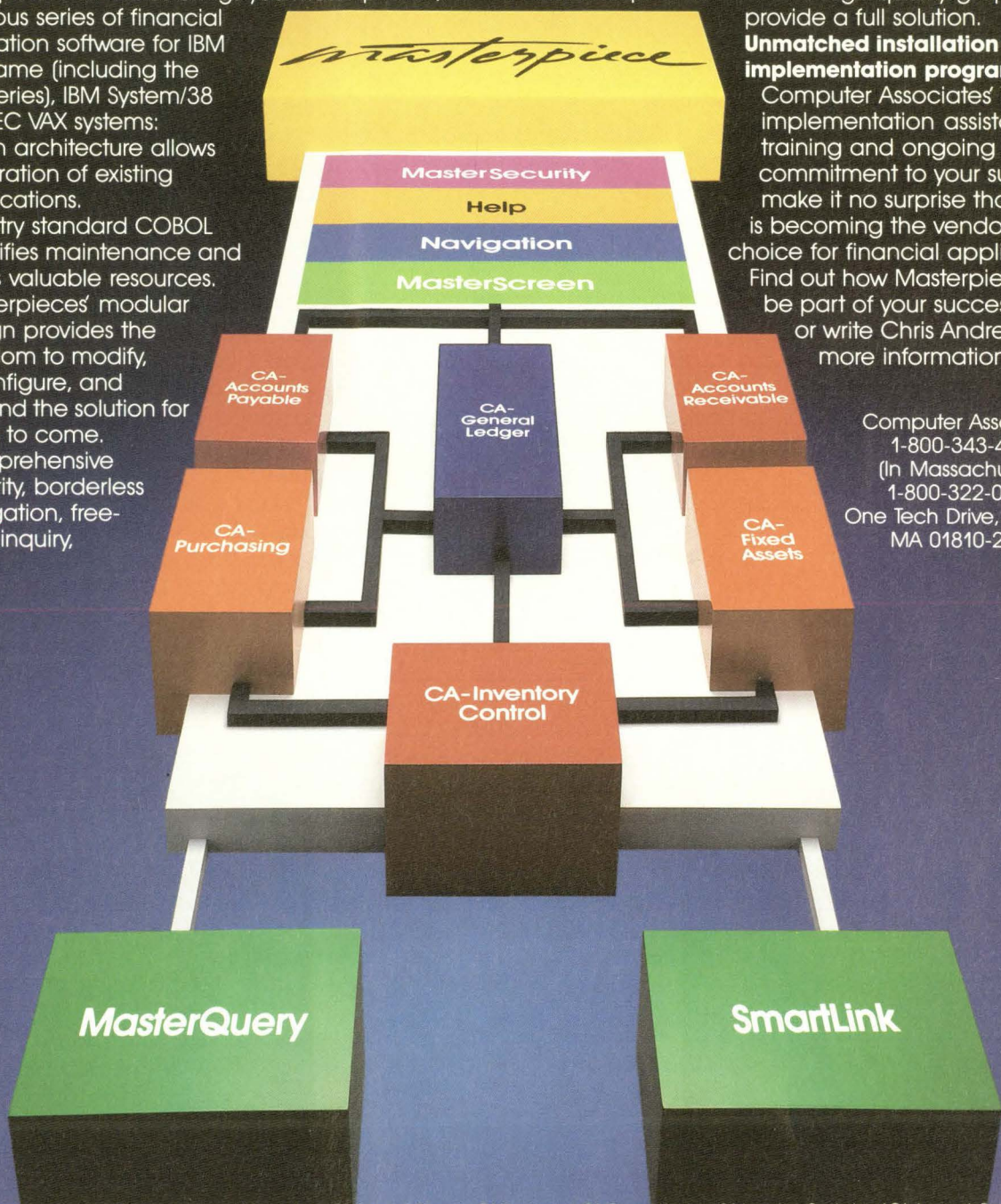
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help defray costs further. According to DPMA president Robert A. Hoadley, a study group is being formed to look into the subsidiary idea. DPMA ran up a \$100,000 deficit last year and, before some operations cuts and dues increases, was facing a \$400,000 shortfall going into the new year. Now, the association is expecting to break even.

... AS NCC TRIES TO TURN AROUND

SAN FRANCISCO -- The board of directors of the new and improved National Computer Conference is trying hard to turn around the flagging show, to be held at the Los Angeles Convention Center May 31-June 3. The board has hired a private management group to promote the event and, for the first time, will allow product sales on the show floor. The newly renamed National Computer Exposition/National Computer Conference apparently has yet to pick up much momentum. The show's new management decided to offer discounts to vendors agreeing to sign for show space before Nov. 2. Because the response has been less than overwhelming, the deadline for that discount has been pushed back to Dec. 2.

A SWITCH, LATER IN TIME

SAN JOSE -- Alcatel Business Systems is developing a next generation PABX for the U.S. market and may market it via a direct sales force. It's doubtful, however, whether the new switch will be introduced before 1989. Until then, the \$700 million subsidiary of Alcatel NV will continue to make the 3100 PBX it inherited from ITT, which it markets exclusively through indirect channels owing to the 3100's small size (600 ports maximum). The new switch, which is being codeveloped with sister company Alcatel Telique in France, may be sold on a direct basis in the U.S.--possibly by Alcatel's Courier sales force.

ALLOY EYES PS/2 PACT

FRAMINGHAM, MASS. -- Although Alloy Computer Products has focused its \$41 million business on connectivity products, a Big Blue contract could swing its business in favor of storage products. Alloy ceo Joseph Saliba tells DATAMATION that he's currently in negotiations with Armonk executives for Alloy's 40MB tape storage backup system designed for IBM's PS/2.

RUMORS AND RAW RANDOM DATA

Servio Logic Development Corp., Beaverton, Ore., will introduce an updated version of its Gemstone object-oriented DBMS for VAX environments in January. The product, priced between \$10,000 and \$100,000 depending on system configuration, is aimed at commercial environments, although most end users testing it have come from the ranks of science and academia.

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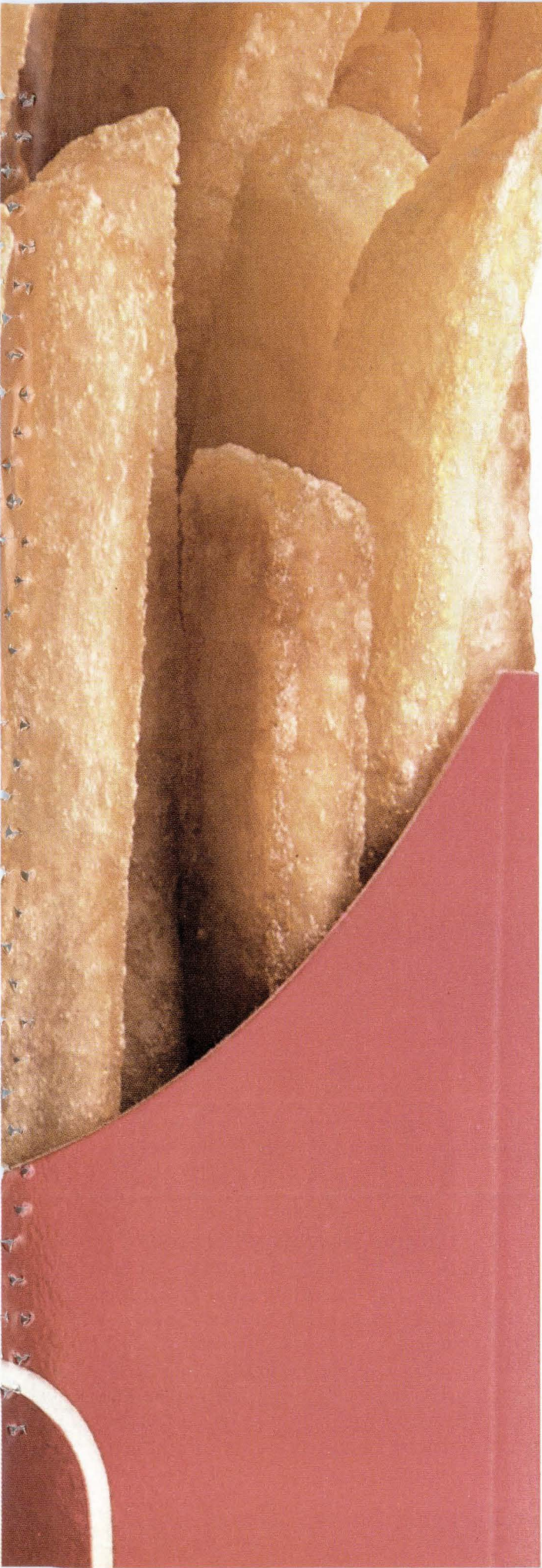
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News in Perspective

STRATEGIES

DEC Moves To Protect Flank With RISC/Unix Workstation

Inroads by Unix vendors have forced DEC into the development of a non-VAX machine, which would be a major departure from its key architecture.



HUGHES'S DAVIS: Unix devotees won't go to VAX as long as the VAX and VMS are inextricably linked.

BY GARY McWILLIAMS

Will the rising influence of Unix force Digital Equipment Corp. to depart from its commitment to one architecture based on the VAX computer family?

It's a question being hotly debated within the company these days, even as DEC prepares what analysts ex-

pect to be a final answer—a wild card in the form of a RISC workstation running Ultrix, its own version of Unix. The architectural debate, which has strong support on both sides, has occurred because of defections among VAX engineering users and software developers to other vendors' Unix systems.

As part of that debate,

the company is moving forward with a RISC engineering workstation that would create a distinctly Ultrix-based machine that does not run the VMS operating system, DEC's flagship OS.

Long seen only as a perfunctory supporter of Unix, the company recently began promoting Ultrix on an equal footing with VMS. More R&D is

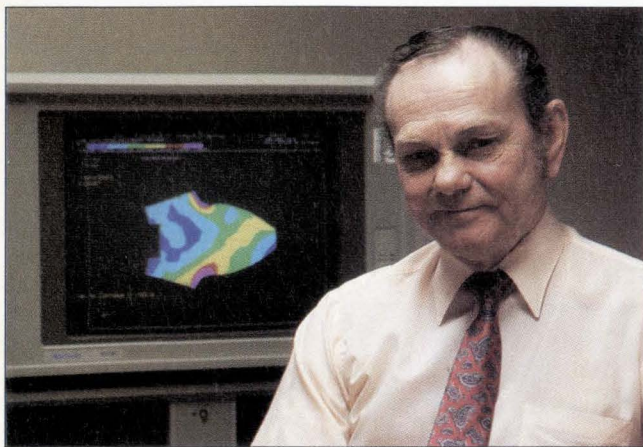
invested in Ultrix development than in the VMS kernel, say insiders. A green light for the RISC workstation, expected sometime this month, could give Ultrix the visibility it has sorely lacked. Just as important, analysts say, it could help fend off Unix workstations and minisupercomputer systems that are eroding DEC's engineering and scientific user base. What it also may do is retire the "one architecture" motto that has been the company's standard since 1983, when it canceled the follow-on processor for its 36-bit computer line.

According to insiders, the workstation project is based on a proprietary 32-bit RISC chip set and is proceeding on a fast-track schedule. Using vector instructions to achieve substantially faster floating point performance than today's VAX computers, it is derived from work at the company's Western Systems Research Lab in Palo Alto, and at its DECwest engineering facility in Bellevue, Wash.

Yet, more than introducing a unique architecture, the workstation is being argued as a necessary boost to Ultrix. The company recently assigned Donald J. McInnis, vice president of the engineering systems group, to evaluate its Ultrix position and suggest new approaches. McInnis quickly accelerated the RISC workstation effort.

While a DEC spokesman declined comment on the RISC project, McInnis refuses to rule out an Ultrix-only introduction: "There could always be point products. What we have to do is make those integrate better than anyone else." He says that such a move would not affect VAX/VMS, noting that "some issues will be less important over time. The highly religious issues will be less important."

One reason he suggests for such a scenario is the company's implementation of the



BUCYRUS-ERIE'S JOHNSON: "We're able to do everything with VMS."

X-Windows graphical interface. Future releases of workstation VMS and Ultrix operating systems will share a common user and applications interface, which masks the underlying architectures. Prior efforts to enhance its appeal include moving the VMS FORTRAN, C, and Lisp language compilers to Ultrix.

Must Clear Task Force Hurdle

The groundwork is laid for the RISC project's release, which may be as early as 18 months from now. Before that can happen, it must pass critical muster this month before the Systems Task Force, a high-level management group that has final say over development issues. The task force is headed by William D. Strecker, vice president of product strategy and architecture and the original VAX program manager.

Whatever its decision, the outcome promises to be significant. DEC stuck to the "one architecture" theme even as technical system competitors such as Prime Computer Inc. and IBM in the U.S. and Siemens AG in Europe brought out Unix product lines. To cancel the project now would only reinforce its commitment to a single architecture even as others drop theirs.

The debate over how to

approach Unix is as prevalent outside DEC as it is inside the company. Ken Johnson, chief structural engineer at Bucyrus-Erie Co., a Milwaukee-based mining equipment company, says the increasing acceptance of Unix hasn't affected his ambivalence toward the OS. "For a while," he says, "we were thinking we would have to go to Unix" for needed computer aided design software. The company didn't and has no regrets. "There was no point in doing it because we're able to do everything with VMS."

On the other hand, a green light for the RISC workstation could be just the prescription for DEC's lackluster Unix showing. J. Roy Davis, laboratories manager at Hughes Aircraft Co., Long Beach, Calif., says the VAX won't be seriously considered by Unix devotees so long as the VAX and VMS are inextricably linked. "I always mistrust someone with a small percentage of skin in the game. And Digital has very little skin in Unix," says Davis.

The small penetration of Ultrix on VAX computers suggests the sentiment may be widespread. The operating system appears on 20% of the company's VAXstation engineering workstations, says Vicki Brown, senior analyst at International Data Corp., Fra-

mingham, Mass. In contrast, Apollo Computer Inc., a Chelmsford, Mass.-based workstation vendor with proprietary and Unix operating systems, claims its Unix version is capturing 70% of new sales. Among larger VAXs, Unix controls an even smaller percentage. Ultrix and other flavors of Unix are represented on just 5% of installed VAX 8000 series computers, according to Computer Intelligence Corp., La Jolla, Calif.

While DEC does not publicly release Ultrix sales, an executive says the IDC figure is "pretty much" in line with internal tallies. Total VAXstation sales and service revenues for the fiscal year ended in June were about \$400 million, according to Jim Casey, DEC's U.S. workstations program manager.

What the figures do not show is the rise of Unix and of

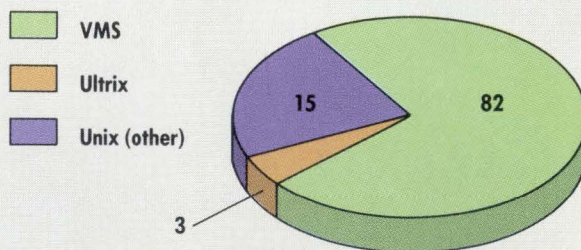
workstations from Apollo and Sun Microsystems Inc. among VAX users. David Burdick, a vice president at market researcher Dataquest Inc., San Jose, estimates that 75% of Apollo and Sun workstations last year were installed in DEC VAX shops. "They are positively stealing VAX cycles," says Burdick. "If I'm Digital and I see there's maybe \$600 million in business I'm missing out on, I've got to do something about it."

A Threatening Gap

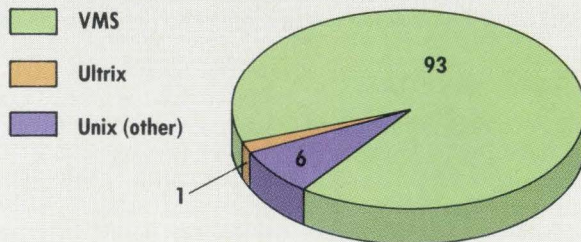
According to the 1987-88 DATAMATION/Cowen & Co. mini/micro survey, Unix is becoming a virtual standard for technical workstations, holding an estimated 56% share of existing and planned technical workstations. However, Unix appears on less than 15% of VAX users' computers. The gap threatens

Workstations Spur Use of Unix on VAX

THE OPERATING SYSTEM OF INSTALLED VAX 11/7XX OR 8000 SERIES* COMPUTERS WHERE ENGINEERING WORKSTATIONS ARE INSTALLED, BY PERCENT



THE OPERATING SYSTEM AT VAX SITES WHERE THERE ARE NO ENGINEERING WORKSTATIONS INSTALLED, BY PERCENT



*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.

Source: Computer Intelligence Inc.

software availability for the VAX. For technical applications such as computer aided design and manufacturing, Unix operating systems are expected by 1991 to host the bulk of applications, according to IDC's Brown.

Yet, Ultrix isn't benefiting. For instance, the latest edition of the Ultrix applications catalogue lists only 16 packages for graphics, CAD/CAM, and engineering—only two of which are available on VAXstations. Also, software that was once debuted on VAX/VMS today is appearing first on Unix. "Digital," says Hughes' Davis, "is depending on software to come down [to its VAXstations] from the VAX. There hasn't been a lot of original work for the VAXstation." Davis sees the applica-

tions advantage that VMS holds over Unix diminishing. "I see a point in time—maybe two-to-four years from now—when the number of important applications will be equal on Unix and VMS."

Significantly, software developers such as Applicon Inc. (Ann Arbor, Mich.), Auto-Trol Technology Inc. (Denver), Calma Co. (Santa Clara), and Computervision Corp. (Bedford, Mass.) have not migrated their applications to the Ultrix operating system. All have applications for VMS, but employ Apollo, Sun, or proprietary hardware for Unix versions.

Developers Discouraged

The relative low esteem VAX users hold for Ultrix encourages software develop-

ers to avoid Ultrix. "We haven't been pushed for Ultrix yet," says Robert McInroy, Auto-Trol's marketing manager for DEC products. While McInroy reports Ultrix is being examined in Auto-Trol's labs, there is no plan to release software for it.

It's a fact that DEC isn't taking lightly. The company is placing a major effort behind recruiting key engineering and CAD/CAM applications for Ultrix, says McInnis. Of the 85 or so graphics-oriented applications available on VMS, "a very small number are available on Ultrix today. Within a year the majority will run on Ultrix."

Some users, such as Hughes's Davis, who oversees both VAX/VMS and Sun's Unix systems, say the time may be ripe to split Ultrix from the VAX. "Digital is getting bigger and more robust," says Davis. "The question is: can it still grow with a single, VMS architecture thrust? I believe as Digital gets more robust it will have to have products in different areas."

Others who expect the workstation emphasis to remain VAX/VMS say that DEC might be forced to avoid some workstation niches—a stance that the company rules out. Charles F. Wise, software unit manager for VAX/VMS fan RCA electronic systems department, predicts DEC's commercial interests will block a price/performance conflict between VAXstations and multiuser VAX computers.

"DEC has a vested interest in minis and superminis. It is not going to build a business in workstations that reduces VAX 8000 sales," says Wise, whose group recently purchased \$1 million in VAXstations for a software engineering project. VAXstations may lag behind competitive workstations in performance, but there are other, more important, issues. To him, compatibility with existing soft-

ware takes precedence.

The performance issue is a delicate one. DEC's Casey says the newly released VAXstation 3200 surpasses 10MIPS workstations in applications benchmarks. A 20-page performance analysis comparing VAXstations to Apollo and Sun workstations is being circulated to refute disparities in published MIPS ratings. Varying demands of technical and commercial VAX users is an issue unlikely to disappear so long as the VAX architecture serves both audiences, say analysts.

Can DEC Continue To Push VAX?

"The workstation state-of-the-art is 7MIPS to 10MIPS," says Dataquest's Burdick. "Next year, it'll be 16MIPS to 20MIPS; the following year, 30MIPS to 40MIPS. Those are the numbers that will be the reality in the workstation world. Given that, how is Digital going to push the VAX architecture?"

Those who think it will be impossible include startups targeting high-performance workstation niches. Stellar Computer Inc., Newton, Mass. is one of several companies hoping to lure DEC's scientific engineering customers away with Unix-based workstations featuring high-performance graphics and vector computations.

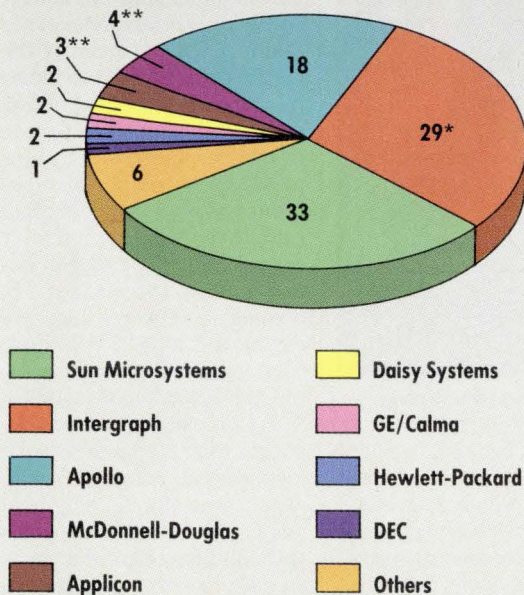
"The fastest VAX today, when they throw everything they can at it—ECL [emitted coupled logic] and what have you—is 6MIPS or 7MIPS," says Ian R.G. Edmonds, Stellar's marketing vice president. "If the goal is to bring VAX to the 10MIPS range at a cost suitable for the workstation world, it doesn't seem to be on the cards."

With so many betting on the VAX to remain the company's sole play before technical workstation users, the RISC workstation could become the unexpected ace DEC pulls from its hat.

Sun Leads the Pack Among VAX Sites

BY PERCENT

Among VAX sites, DEC's VAXstation significantly trails those of other suppliers. Determined by units, market share figures include only 1% for the VAXstation. Single-user MicroVAX computers are not counted.



*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.

**Applicon and McDonnell-Douglas market some workstation models that attach to DEC VAX and MicroVAX cpu or are based on the MicroVAX.

Source: Computer Intelligence Inc.

WALL STREET CRASH AFTERMATH: MERGERS AND ACQUISITIONS

Micro Software Merger Trend Seen As Little Affected by Crash

Some experts anticipate that the pace of acquisitions in the industry will continue even if an economic downturn occurs.

BY ROBERT FRANCIS

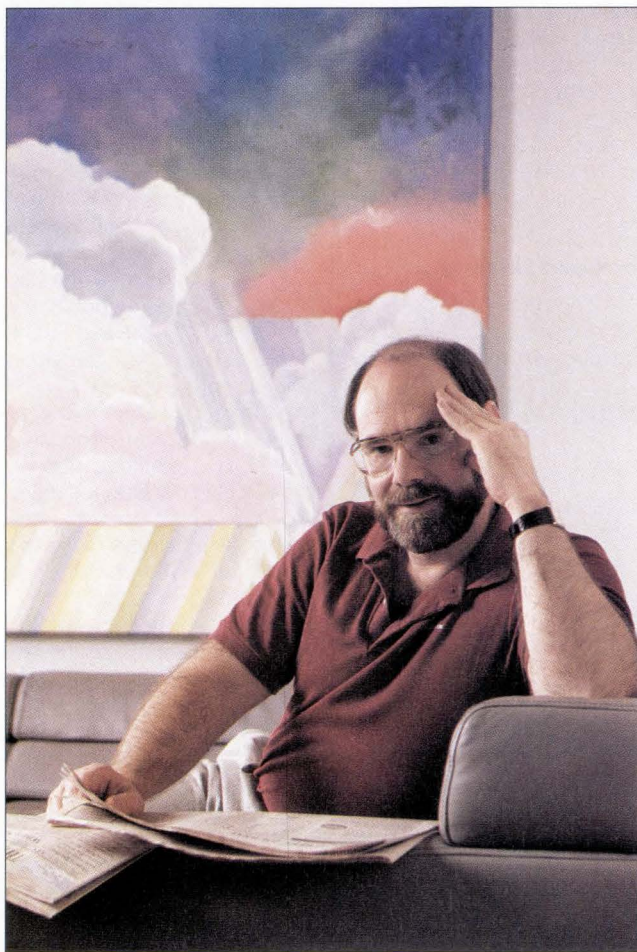
The spate of consolidations, mergers, and acquisitions in the microcomputer software industry may be briefly stymied by the Oct. 19 stock market free-fall, but it's unlikely to bring such activities to a halt.

Though no one involved in the industry or the market is willing to go out on a limb and say the market's jittery behavior will have no effect, most expect mergers and acquisitions in the industry to persist, mainly because previous economic downturns had little effect on such moves in the software industry.

"We're still in the eye of the hurricane and the problem is my vision is blurred," says Bernard Goldstein, a partner with Broadview Associates, Fort Lee, N.J., a merger and acquisition consultancy. "But my own feeling is that the pace of mergers and acquisitions will continue even if the downturn continues.

"For 16 years, the pattern of mergers and acquisitions in the information services industry has been up. In 1986," he says, "there were 306 separate acquisitions in the industry valued at \$3.8 billion. In the previous four years, there were 630 mergers valued at \$7.6 billion."

Unlike many industries, in which takeovers and consolidations often occur for tax reasons, in the information services area they take place mostly for strategic business reasons, Goldstein says. "For that pattern of deals, the beat goes on during the down tick



SYMANTEC'S EUBANKS: Acquiring technology is a long-term strategy.

as well as the up tick," he says.

This was certainly true for one merger that was announced just days before the market meltdown, according to Wynne Jennings, vice president of finance for Innovative Software Inc., Lenexa, Kans. On Oct. 15, Innovative and Informix Corp., Menlo Park, Calif., announced that they were planning to merge in a

stock trade. From the point of view of the two profitable companies, which trade stock on the NASDAQ Exchange, the merger was based on their respective strategic interests. Both sought to provide an integrated software environment for their customers. "We began," Jennings says, "by looking at a joint venture, then to ask if we weren't missing a window of opportu-

nity. They had what we wanted, and we had what they wanted."

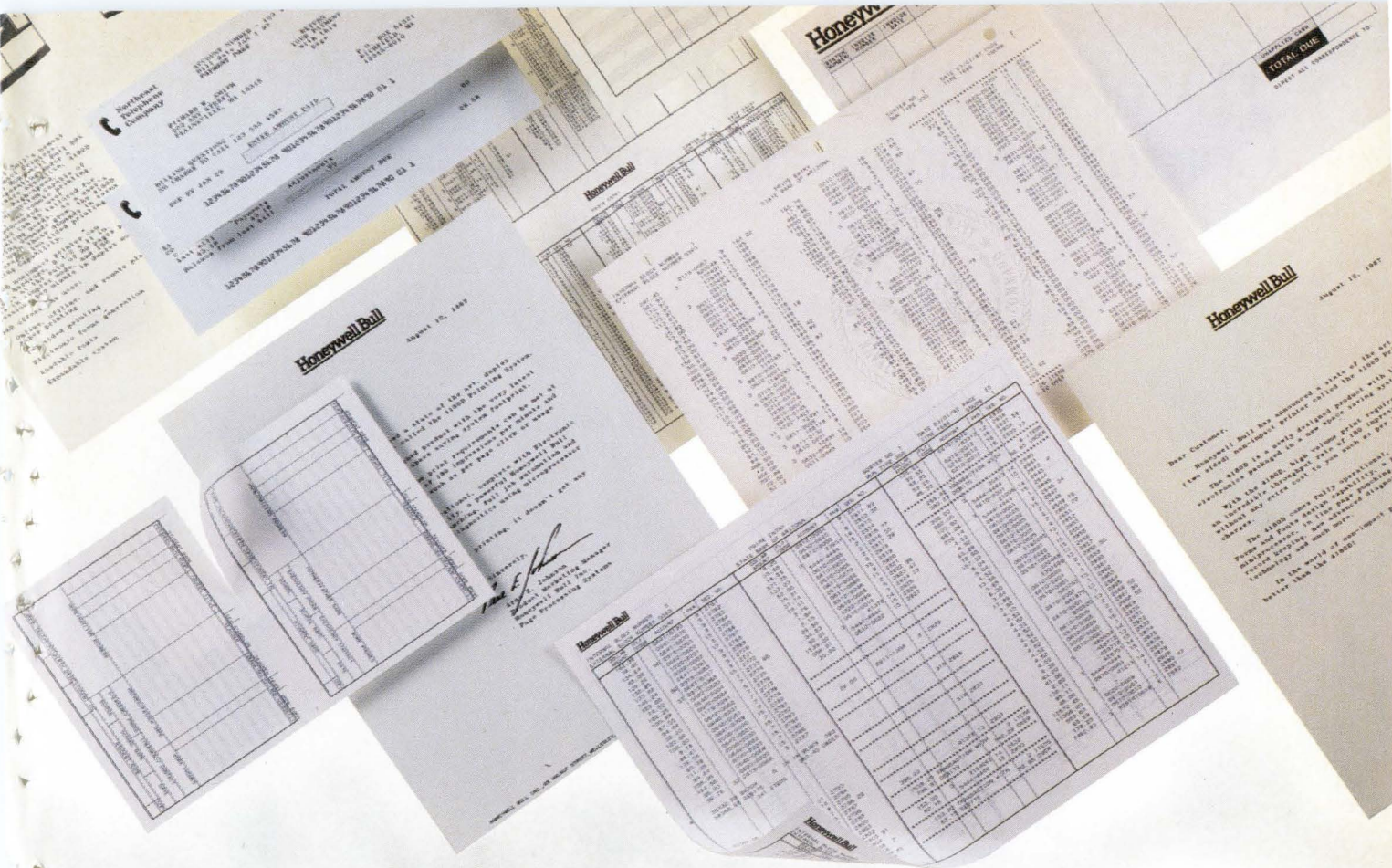
However, the market drop did not go unnoticed by the company. "We think it's a unique situation," says Jennings. "The software market continues to be strong."

The wave of mergers and acquisitions in the pc software industry has continued unabated over the past year. Among the companies that have taken the plunge are Microsoft Corp., Redmond, Wash., which acquired Forethought Inc., Sunnyvale, Calif.; Ashton-Tate Inc., Torrance, Calif., which purchased Decision Resources Inc., Westport, Conn.; and fast-growing Borland International Inc., Scotts Valley, Calif., which bought Ansa Software, Belmont, Calif.

The Right Climate for Mergers

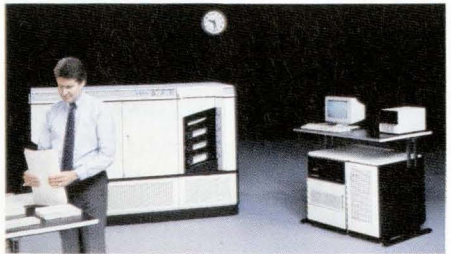
Those involved in takeovers say that the decisions are usually motivated by strategic business reasons based on the expanding market for software. This expansion has taken place because of the high growth rate of the industry as a whole, which allows successful companies to take over other successful companies, and so outperform the industry's average growth rate. According to industry research firm Dataquest Inc. in San Jose, this year's U.S. domestic software sales are estimated at \$12.6 billion. That figure will grow to an estimated \$18.8 billion in 1990.

Companies that are acquisition-minded seem to be focussing on companies with products in the development stage rather than companies with full-fledged product lines already on the market. In these arrangements, the smaller company benefits from the larger company's distribution system, while the larger company acquires a new product without the heavy R&D expense.



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grow, it grows. Yet it's much smaller than its predecessor, the ROLM CBX II, and it's easier on power and air conditioning.

On the other hand, its traffic-carrying capacity is tremendous. The 9751 can be configured so it's virtually impossible to block.

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In fact, the 9750 Business Communications System is a key part of IBM's telecommunications future. Combined with all of IBM's other ways to connect systems, it gives you new freedom to run things your way, to broaden the usefulness of your networks, and to control their expense. To learn more, call your IBM ROLM Systems representative or Authorized ROLM Distributor.

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In purchasing Ansa, Borland got its main product, Paradox, a relational database management system. Borland officials say one of the motivating factors behind the merger was the desire to take advantage of OS/2.

At Symantec Corp., Cupertino, Calif., company officials have another strategy of acquisition. Symantec allows acquired companies to remain virtually autonomous, with the new products remaining in their markets to compete without a common brand name, and often without a common interface or common file exchange capability. Some marketing and accounting functions are centralized, but generally the divisions remain separate, allowing each to concentrate on its own development and product.

It's all part of Symantec's plan for long-term growth through internal development of software and acquisitions. The company recently added Mountain View, Calif.-based Living Videotext, and Bedford, Mass.-based Think Technologies to its fold.

"For us," says Symantec president Gordon Eubanks, "acquiring stronger technol-

ogies is part of a long-term strategy that positions us with product lines to help us grow faster than the industry average." He adds that acquiring companies that do research in areas holding a potential interest for Symantec cuts down on possible R&D time on a similar product. "That's true for a lot of the acquisitions in the industry," he says.

On the flip side, a small software development company that is acquired by a larger company gains access to the market more quickly. Ed Metz, who is a partner in Broadview Associates, says that "being acquired by a larger company allows a small company to get through their window of opportunity. By being acquired, a new company has access to a corporation's deep pockets."

However, Metz says that Mon., Oct. 19, may have slammed shut the window of opportunity on some small companies that may have been prepared to enter the public market for funds. "How would you like to have been the owner of a company going public a month ago and suddenly your stock is worth \$8, not \$16?" ■

Looking Back

FIVE YEARS AGO IN DATAMATION: "Even by the standards of the computer industry, which is accustomed to phenomenal success stories, Atari's growth has been mind-boggling. . . . Acquired only six years ago for \$28 million, Atari will generate nearly \$2 billion in 1982, it's estimated. That's nearly half of Warner's projected \$4.2 billion total 1982 revenues. Atari's computer group, which really is just getting off the ground, will produce between \$300 million and \$350 million in 1982 revenues, putting Atari up there among the top 40 dp companies in the U.S. According to market estimates, the company already accounts for 10% of all desktop sales and as much as 40% of the home computer market. . . .

"'For a machine to succeed in the home computer market,' says [Robert] Renck of Oppenheimer, 'the product must have brand identity and be presold by advertising to a relatively nonsophisticated consumer without the need for significant selling demonstration. Atari clearly meets these qualifications.'" (From "Atari: Playing With House Money," by Laton McCartney, December 1982, p.89.)

COMMUNICATIONS

AT&T Readies New Billing System

The internally developed workstation may also be sold to the private network market.



AT&T'S LANZ: "Our overall objective was to provide more services."

BY KAREN GULLO

Desiring to reach out and grab more control over its customers, AT&T for the first time will begin directly billing 87 million residential and business customers by means of an in-house billing system.

Development of the system, which began more than three years ago and is costing at least \$1 billion, represents

a massive attempt by AT&T not only to gain greater control over its customers, but also to use its own products to increase its competitiveness in the long distance market, prove its ability to develop sophisticated private networks, and, not incidentally, save itself a bundle of money.

Long distance billing is currently administered for AT&T by the seven regional

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News in Perspective

Bell operating companies at a cost of over \$1 billion a year, according to analysts. Starting next year, customers will receive a separate bill for long distance service and leased equipment from AT&T, in addition to the bill they receive from the regional companies for local usage. The new bill will be an 8 by 10 inch sheet, as opposed to the smaller, multiple page bills from the regional companies (see photo at right).

A pilot program in West Virginia affecting customers of the Chesapeake and Potomac Telephone Co. (C&P) began this summer, and AT&T plans to deploy the system state-by-state throughout 1988 and 1989.

"AT&T is going to be much better able to track the services it offers and respond to customer demands," says Charles Nichols, first vice president of equity research at E.F. Hutton in New York, which studies AT&T. "It's imperative for them to stay on top of changes in customer demands and price fluctuations in the long distance market. Billing is the most important part of long distance service."

Nichols estimates that by 1990, when the new system will be fully deployed across the country, AT&T will save between \$300 million and \$500 million a year. Other analysts put the savings as high as \$900 million.

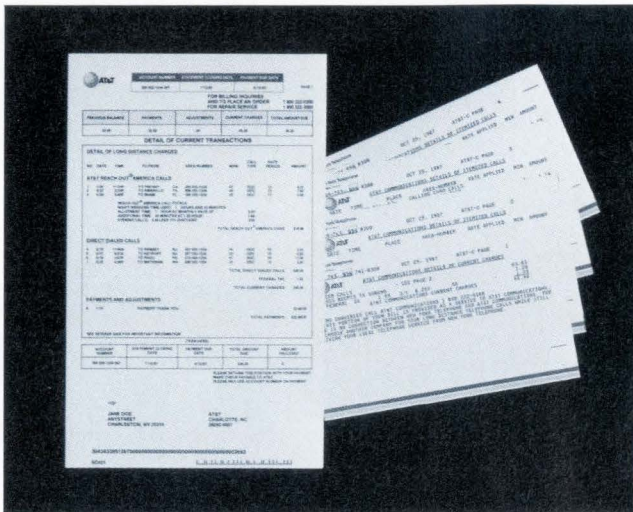
AT&T won't comment on the costs of the billing system or on how much it hopes to save by moving long distance billing in-house, but a company spokesman says that saving money wasn't the primary motivation for the change.

"We wanted to establish a more direct link to our customers," he says. "We will be able to introduce our customers to new services more quickly. Before, when we wanted to tell customers about a new service or a

change in charges, we had to get each individual operating company to change their billing software. Now we can do it ourselves."

AT&T's Intelligent Workstation

The implementation of the new billing system required the development of new software, the enhance-



The new bill will be an 8 by 10 inch sheet.

ment and upgrade of communications systems, the replacement of minicomputers, workstations, and terminals in certain areas, and the acquisition of additional mainframes to handle the processing of customer-calling data.

In addition, AT&T developed an intelligent workstation running Unix with windowing capabilities based on the recently announced 630 Multitasking Terminal with Graphics. The workstation will be used by account representatives at 24 centers around the country who handle resident customer billing inquiry calls that come in over an 800 number. A prototype of the workstation is currently in the verification stage and will be deployed beginning next year.

The billing functions are carried out at four regional data processing centers in Atlanta, Kansas City, Mo., Fair-

haven, Mass., and Mesa, Ariz. The centers house several IBM 3081s and 3084s and AMDahl mainframes. AT&T officials did not reveal how many additional mainframes it acquired, but say the new system requires heavy mainframe processing. According to Bernie McElroy, manager of the billing products and

tronic Data Systems, Martin Marietta, and Boeing will compete.

"AT&T claims to be a competitor in the midrange computer, high-performance mini market, and it just wouldn't do for them to have DEC minis running their network," Rich points out. "AT&T is a presence in the market for large corporate networks, and what better way for them to prove their ability to build networks and management systems than to install one in their own operation?"

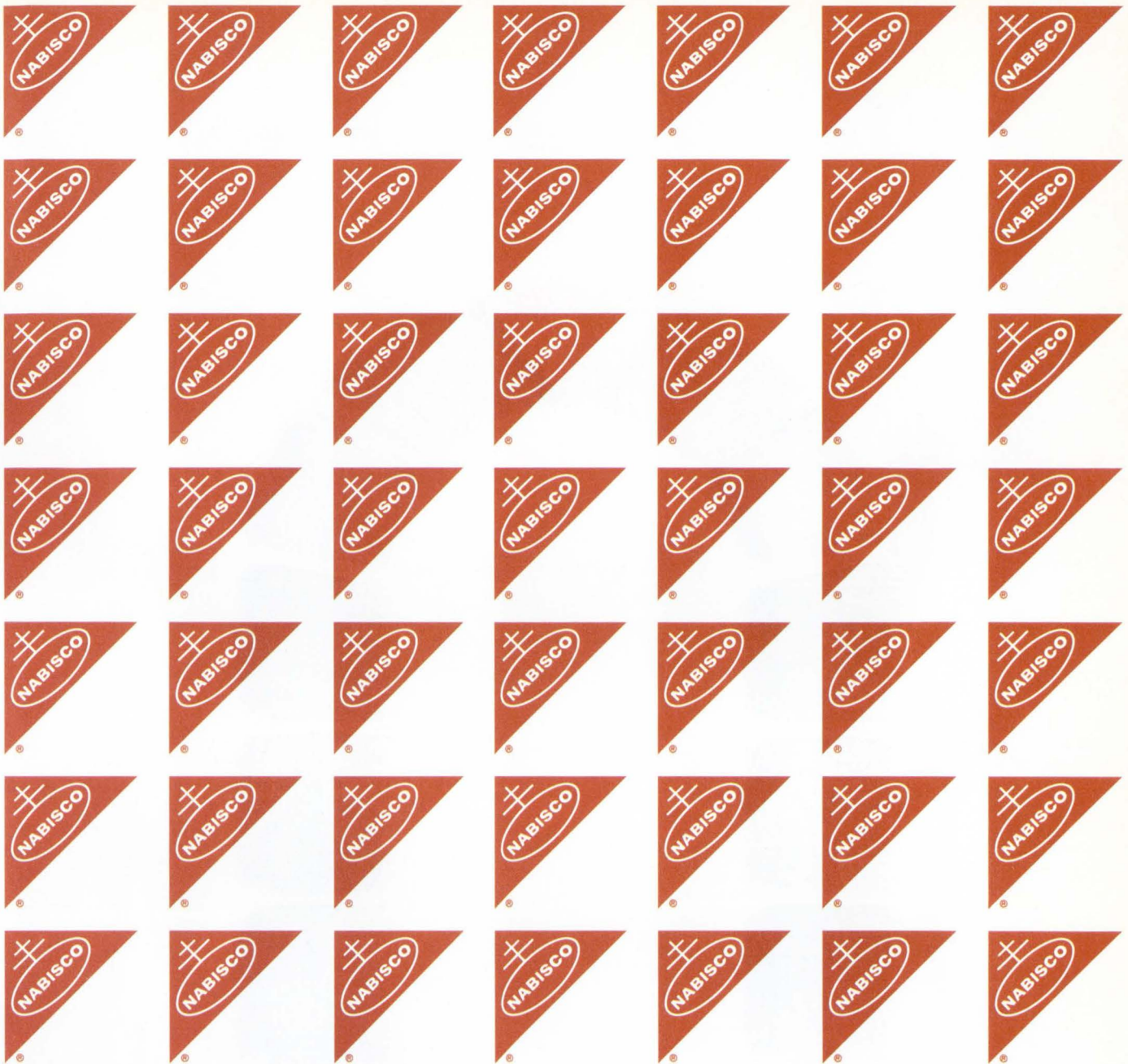
Rich and other analysts say it's likely AT&T will market the billing system and intelligent workstation to corporate customers or to other carriers in the future. AT&T wouldn't comment.

Reduce Training Costs

One of the biggest tasks facing AT&T is dealing with incoming customer calls for billing and services inquiries, which the company estimates will number some 58 million a year. The newly developed intelligent workstation is intended to give operators quicker access to more data with greater flexibility, as well as reduce training time and costs.

Linda Lanz, district manager of billing planning and strategy, provided AT&T developers with end-user requirements: "Our overall objective was to be more professional and provide more services. Our secondary objective was to create a paperless environment and to make the terminal more user friendly. We also wanted to reduce user training costs and simplify the training procedure."

The user requirements included a mouse and multiple windows that could be accessed interactively, providing reps with customer information from dozens of databases located in mainframes at the central dp centers.

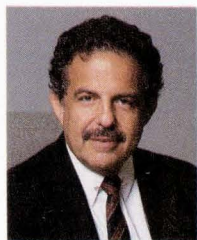


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APPLICATIONS

Japanese Securities Firms Gamble On Home Trading

Playing the stock market via home pcs hasn't gained much popularity among Japanese investors. Several firms hope to change this with a new crop of systems.

"We now use keyboard commands, which is not satisfactory," says Lanz, "because we have people who don't have much experience on a computer."

Lanz describes a scenario wherein a residential customer calls the 800 number with a question about a charge for a call he or she does not recall making. Using ISDN and a PBX switch, a search mechanism is triggered for the customer's phone number as the call is coming in. The operator's workstation displays the customer's billing information on screen, eliminating the time it takes to key in the customer's number.

At that point, the operator can retrieve data on the call in question in a window and make adjustments interactively. If the customer then has questions about rates, phone products, or other AT&T services, the operator can retrieve in windows that data as well, regardless of the database in which it resides. According to AT&T's McElroy, "They will be able to interactively switch between databases, with no log-on and log-off to get at multiple databases."

How do long distance customers feel about AT&T's reaching out and touching them more directly? Business customers in West Virginia aren't complaining, nor are they particularly enthusiastic. "There aren't as many pages [in the new bill], which makes it easier to deal with," says Ann Armignacco, cost accountant at the Charleston National Bank, Charleston, W.Va.

The bank has several accounts with AT&T and MCI for long distance, WATS, and direct-dial service. "From a cost analysis point of view," Armignacco says, "AT&T's bill is a little easier to read. But there's not a whole lot of difference. One more bill is not a big deal." ■



YAMAICHI'S SUZUKI: Not many home traders; most phone in their orders.

BY ROBERT POE

Telecom deregulation in Japan is allowing for the development of more convenient ways for investors to buy and sell securities electronically, at home. Major securities firms are hoping that the new services they are offering will spark an explosion of home securities trading.

But reverberations in Tokyo of the New York stock market crash may only lead to a camp fire rather than an explosion, at least in the short term.

"We have seen small investors getting more and more cautious, but we haven't seen a phenomenal change in the market," says Takayuki Nakajima, general manager of

the investment information services department of Daiwa Securities in Tokyo, one of the firms offering a new, inexpensive trading system. "We expect the number of [new] users will not increase so rapidly, for the time being."

The foundation for the current home trading competition was laid by Nippon Telegraph and Telephone (NTT) while it was still Japan's government telecommunications monopoly back in 1984, when its ANSER (Automatic Answer System for Electronic Request) service was introduced. ANSER is used mostly by financial institutions, including 90% of Japanese banks, and it permits customers to receive information and carry out simple transactions

over phone lines using a variety of media: telephone (either push-button tones or voice), facsimile, NTT's CAPTAIN videotex terminals, or personal computers. DIPS mainframes designed by NTT and manufactured by Fujitsu, Hitachi, and NEC, are connected to various recognition devices that convert the inputs into standard formats and route them to the proper financial institution.

Despite the convenience that ANSER offers, it has not brought a flood of home trading commissions to securities firms. According to Toshio Kikuchi, senior systems engineer at Nikko Securities of Tokyo, although there are some 2.8 million individuals who have home trade con-

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News in Perspective

tracts through NTT, few of them are active. Mitsuharu Suzuki, deputy manager of the securities information department of Tokyo's Yamaichi Securities, agrees. "There are not many home traders," he declares. "Most use only the information service, then phone in their orders to salesmen."

The Oct. 19 crash improved that situation, at least temporarily. Suzuki says that home trades on Yamaichi's system almost doubled the week before and the week of the crash.

That ANSER has been less successful as a trading medium than as a deliverer of information may be one reason the industry has decided it will not be the last word in home trading.

The major firms are in hot competition to provide the best services.

Systems Are Pc-Based

Yamaichi Securities offers the most comprehensive of the new services. Running on a Univac 1100-based value-added network belonging to its computer systems subsidiary, the company's Sunline system offers three levels of service: "P" for pasocom, the Japanese word for personal computer, which in this case means MSX-standard pcs; "E" for extra, a more sophisticated service using 16-bit pcs; and "F" for Famicon, using the popular home video game machine of that name made by Nintendo, which is based in Kyoto.

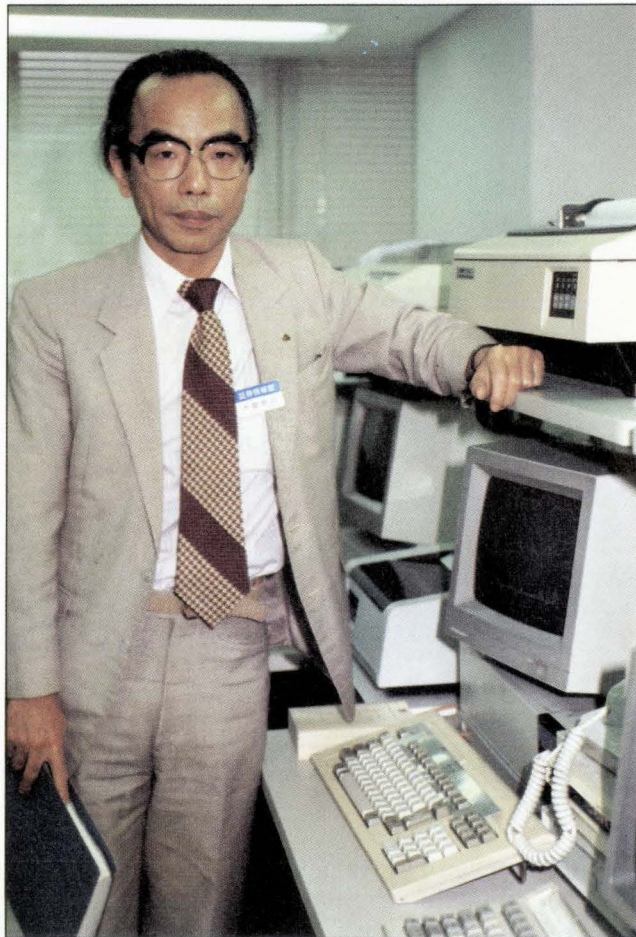
The Sunline E service is the most sophisticated of the three, and, priced at \$690 (¥100,000) per year, it's also the most expensive. Hardware also costs a lot; Yamaichi estimates that an average setup, including 16-bit pc, printer, and 1,200bps V.22 modem, costs around \$4,828 (¥700,000).

The E service offers two advantages over both ANSER-

based services and Yamaichi's other two services. One is the increased information available; subscribers can get information not only on Japanese stocks but also on overseas markets, although trading is still restricted to domestic securities. The methods of displaying information are

ing pc graphics capability until next June.

The MSX-based service is simpler and cheaper. The annual fee is \$208 (¥30,000), and only domestic market information is provided. The 8-bit pcs, which can use tvs as monitors, cost about \$200; for modems, it's a bit less. Infor-



DAIWA'S NAKAJIMA: No phenomenal change in the market.

also superior. The Yamaichi-developed pc software can handle ideographic as well as alphanumeric and Japanese phonetic characters, and can create color charts based on the information it accesses from the main database. In contrast, the two cheaper Sunline services are restricted to nonideographic characters and have no graphics capability beyond simple bar charts. ANSER will not be add-

mation is displayed in numbers and phonetic characters in monochrome. User input is restricted to numeric keys.

However, such simplicity is still not enough for some would-be users. In a culture where any task having to do with a keyboard is considered clerical, "some investors felt it was difficult to use the full keyboard," explains Yamaichi's Suzuki. "They're embarrassed to have all the other

keys because they only use the number keys." The Famicon, short for family computer, was the ideal solution, since its keyboard was "just the same as a push-button phone, and almost the same as a tv remote control."

Ten Million Systems Sold

The Famicon is even cheaper than MSX machines, generally priced at about \$102 (¥14,800), with another \$97 (¥14,000) for the modem; tvs can be used as displays. Its main advantage, however, may be its ubiquity—almost 10 million have been sold.

Other securities firms are following in Yamaichi's footsteps. Daiwa was actually the first to introduce an MSX-based system running on its own Daiwa Integral Network (DIN), in May 1986, but has not yet introduced a Famicon-based service. Nomura Securities began a six-month test of a Famicon system, using its NCC subsidiary's value-added network, last month; its only previous pc system ran on ANSER. All of the companies plan to continue using ANSER in addition to their new private networks except for Nikko, which, having no plans to develop its own system, will use ANSER alone for all of its home trading needs.

The leaders see great potential in their new systems. Yamaichi says that its Famicon service has become the most popular of its three types, although the July introduction was almost a year behind that of the other two. Daiwa claims to have 10,000 subscribers for its MSX-based service. Whatever the numbers, since fixed brokerage commissions are still the rule in Japan, competitive advantage can only result from at least appearing to offer better service. Japanese securities firms that resist boarding the home trading bandwagon will be doing so at their own risk. ■



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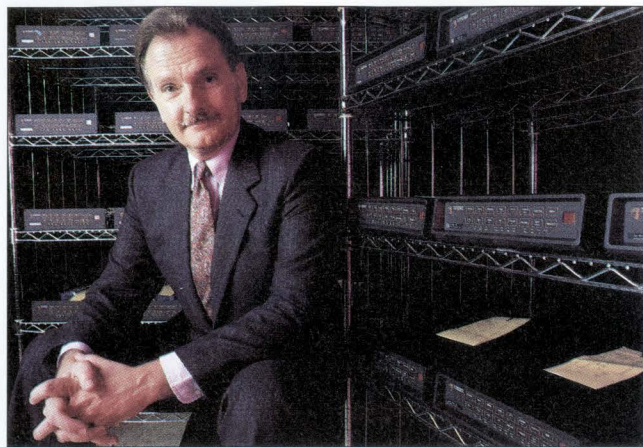
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News in Perspective

PRICING

Price-Cuts Hit Modem Market

Universal Data's 36% price drop is the latest in a series of competitive actions in the 9.6Kbps market.



ANDERSON JACOBSON'S ZMACH: Someone "hit the panic button."

BY MARY FLYNN

Their importance to computer professionals is undeniable. They are a fact of life everywhere. But some say the omnipresence of the little devices known by the acronym MODEM has resulted in a market with little excitement. Yet, judging by the intense drama being played out now in the modem marketplace, nothing could be farther from the truth.

In recent weeks, the wave of price-cutting of CCITT V.32 9.6Kbps modems, which first formed in the spring, has crested with the late September announcement by Motorola's Universal Data Systems (UDS) that it would slash the price of its 9.6Kbps modem to \$1,595, from \$2,495—a 36% reduction. Although this pricing action was the third to occur in the market since the spring—in March, Concord Data cut its price to \$2,495 from \$2,995, and, in July, Codex Corp. cut its tag to \$2,795

from \$3,495—it was the most severe to date. This move has infuriated competitors, who are growing in number.

"Prices are coming like bullets, but it's a moving target," says Tom Zmach, vp of marketing for San Jose-based modem maker Anderson Jacobson. "I think somebody hit the panic button."

The seemingly mad rush to do battle in the pricing arena may not be over. Anderson Jacobson hasn't yet dropped the price of its V.32 modem, now at \$2,995, although Zmach admits that the company is "looking at" its price. "But there's more to competing than price alone," he says. "There's performance."

For UDS, the price-cutting has, perhaps, a broader motivation, and there have been charges of performance problems. George Grumbles, president of the Huntsville, Ala.-based company, says the strategy behind the pricing maneuver is part of the modem maker's campaign to

"dominate the marketplace."

Some competitors, however, have raised the issue of performance. Says Lynn Faust-Berger, director of product marketing for Concord Data Systems, Marlboro, Mass., "They had to recall the shipments they sent out in October because of some software problem."

Bill Schlosser, vp of marketing for UDS, denies shipping or software problems. "These rumors are absolutely not true," he says. "We began shipping about Oct. 15, as we'd planned."

One explanation of why UDS cut the price of its modem to the extent that it did is to compete directly with the asymmetricals, a breed of modem that receives and transmits data at two different speeds, and which functions only in proprietary settings. It's this part of UDS's strategy that puzzles some vendors.

Peter Edelstein, manager of product marketing for dial products at Mansfield, Mass.-based Codex, which is another subsidiary of Motorola, does not feel compelled to compete with the prices of asymmetrical modems. "You are not comparing apples with apples there," Edelstein explains. "Some applications are better served by asymmetrical and some by symmetrical."

It's the asynchronous—

not to be confused with the asymmetrical—market that Edelstein thinks is inspiring the price reductions at the low end. "The asynchronous is the most price-sensitive segment of the market," he notes. "I think these vendors that are cutting prices are trying to accelerate demand in the asynchronous market, which is characterized by the pc user community. The result is going to be a much bigger V.32 market."

A Natural Process

Other vendors think price cuts like UDS's are natural parts of the maturation process. Geoff Rogers, product manager for Infinet, North Andover, Mass., says, "There's some very serious price-cutting going on, but this always happens when a technology becomes known."

Rick Clanin, director of marketing for Cermetek, a Sunnyvale, Calif.-based modem vendor, agrees. "As more companies get into the market, the competition heats up. In another six-to-nine months," he predicts, "you'll see some more pressure to drop prices again."

One other major industry player that has chosen not to enter the CCITT-compliant V.32 modem arena is Hayes Microcomputer Products Inc. of Norcross, Ga. Hayes has taken a different approach to



UDS'S GRUMBLES: "We want to dominate the marketplace."

Photograph by Mike Clemmer/Picture Group



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Circle 24 on Reader Card

the high-speed modem race.

In June, Hayes brought out a line of products called the V series, which includes a half-duplex modem that runs at 9.6Kbps. Because it's half-duplex, it doesn't comply with the CCITT V.32 specification, which defines synchronous, asynchronous, and full-duplex modems that operate at 9.6Kbps and 4.8Kbps speeds over dial-up and two-wire or four-wire leased lines.

Gary Betty, senior vice president for Hayes, claims the product runs as fast as a V.32 and seems like one to the user. But it can communicate only with other Hayes products. Hayes's 9.6Kbps product sells for \$1,199. Cost kept Hayes out of the V.32 market, Gary Betty says.

"We believe the V series is a cost-effective solution to pc users who want high speeds," he says. "I don't think pc users are going to pay \$2,000 for a modem when the pc itself is between \$3,000 and \$5,000. There's nothing wrong with the V.32 today but the price."

This consideration alone hasn't stopped new players from entering the V.32 field, nor stopped the development by established vendors of additional features and functions for their products. The autumn months alone saw new offerings from Concord Data, Cermetek, Infinet, and Telenetics Corp. of Placentia, Calif., to name a few.

Key New Features Emerging

These products offer the user a range of prices and features. For a bare-bones V.32, the lowest price out there is, of course, Universal Data Systems' \$1,595; for a V.32 with all the trimmings, expect to pay close to \$3,000. The extra bucks buy such features as automatic dial backup for failed lease lines, Trellis coding, Microcom Networking Protocol error protection, and rack mounts that hold

eight or 16 modems.

One feature that has recently begun to augment the V.32 is automatic conversion to lower speeds. Cermetek's top-of-the-line modem, introduced at Comdex in November, seems to be the first to include this function. Priced at \$1,995, it's dubbed the 9600FR—for its capacity to convert to the full range of speeds, down to 300bps.

Although Cermetek's 9600FR is apparently the only product available with automatic conversion to speeds lower than 4.8Kbps, other vendors are also developing this feature. The next product Infinet introduces may include conversion to lower speeds. Spokespersons from both Codex and Concord Data acknowledge that the companies are "looking at" speed conversions.

Jim Domanico, director of new products at Sun Guard Recovery Services, Wayne, Pa., remains nonplussed by the promise of this feature. "Speeds that low don't matter to us," he says, "because we seldom go below 4,800. If anything, we'd like to go faster." Sun Guard uses V.32s to help provide backup IBM mainframe service to approximately 60 of Sun Guard's 450 clients. Currently a customer of Codex Corp., Sun Guard installs V.32s at point-of-sale sites for national retailers.

Domanico says that the features that matter to him are "ease of use, ease of installation, and better diagnostics." In addition to these, Domanico looks for automatic dialing and remote control loop-back capabilities.

Price remains an important consideration. When Sun Guard evaluates V.32s next year, Domanico says he will take dollars into account: "Pricing is certainly a consideration. If someone can do remote control loop-back for \$1,595, I'd probably be interested." ■

BENCHMARKS

Some Sanctions Lifted

President Reagan has lifted some of the sanctions on Japanese electronic goods imposed in April. In an effort to discourage the Japanese from allegedly dumping semiconductors in the U.S., a 100% tariff was socked on such staples of life as Japanese-made laptops and tv sets. They apparently got the message, because the administration has wiped out about \$135 million of the original \$300 million worth of sanctions. The remaining \$165 million is a penalty for excluding U.S. manufacturers from the Japanese market, a charge the Japanese deny.

OS Plans Canceled

Amdahl Corp. has canceled Aspen, its long-term program to develop an MVS-compatible operating system for transaction-intensive applications. President and chief operating officer Joseph Zemke says it was killed because the company decided instead to invest more development resources in its UTS Unix operating system. Zemke says the Aspen development team will be merged with the UTS team, and many of the key features of Aspen may be incorporated into UTS. Zemke says there will be a major new release of the operating system some time in 1988. Amdahl's decision comes on the heels of the settlement of the software copyright dispute between IBM and Fujitsu, a 47% owner of Amdahl. Zemke denied that the arbitrated settlement had anything to do with Amdahl's decision to kill Aspen.

Government Phones

The General Services Administration (GSA) finally may have put to rest FTS-2000, AKA the Great Phone Procurement. FTS-2000 will modernize the government's telecom system as well as save it about \$100 million a year. GSA had planned to award one bid-

der the 10-year, \$4.5 billion deal, but Rep. Jack Brooks (D-Texas), chairman of the House Government Operations Committee was opposed. So, the agency will split the award between two vendors, with the winner receiving 60% of Uncle Sam's business and the runner-up 40%. The two vendors will vie again for their shares of the pie after four years, and then again three years after that.

Bid for UB

Taking advantage of the big stock market drop, Digital Communications Associates Inc., Alpharetta, Ga., has purchased 1 million shares of Ungermann-Bass and has made an unsolicited offer for the rest. UB president Ralph Ungermann verbally rejected the offer, saying it isn't in the best interest of the Santa Clara company, but he has placed the matter before the board. DCA has been hot on the acquisition trail with recent buy-outs of such plums as Fox Research Inc. and Cohesive Network Corp. Separately, General Electric Co. finalized the exchange of its 36% ownership in UB joint venture Industrial Networking Inc. for 3.6% of UB.

Cutting Back

Chopp Computer Corp., the one-year-old supercomputer firm, gave administrative leave to all but 10 of its 30 employees, raising speculation that the company may cease operations. The San Diego company's first product, an air-cooled system that Chopp claimed would run 10 times faster than a Cray X-MP, was scheduled to enter production this quarter. A company spokesperson says Chopp needs to raise at least \$10 million in funding to continue operating. The company is talking with unnamed venture capitalists and U.S. and Japanese computer companies. ■

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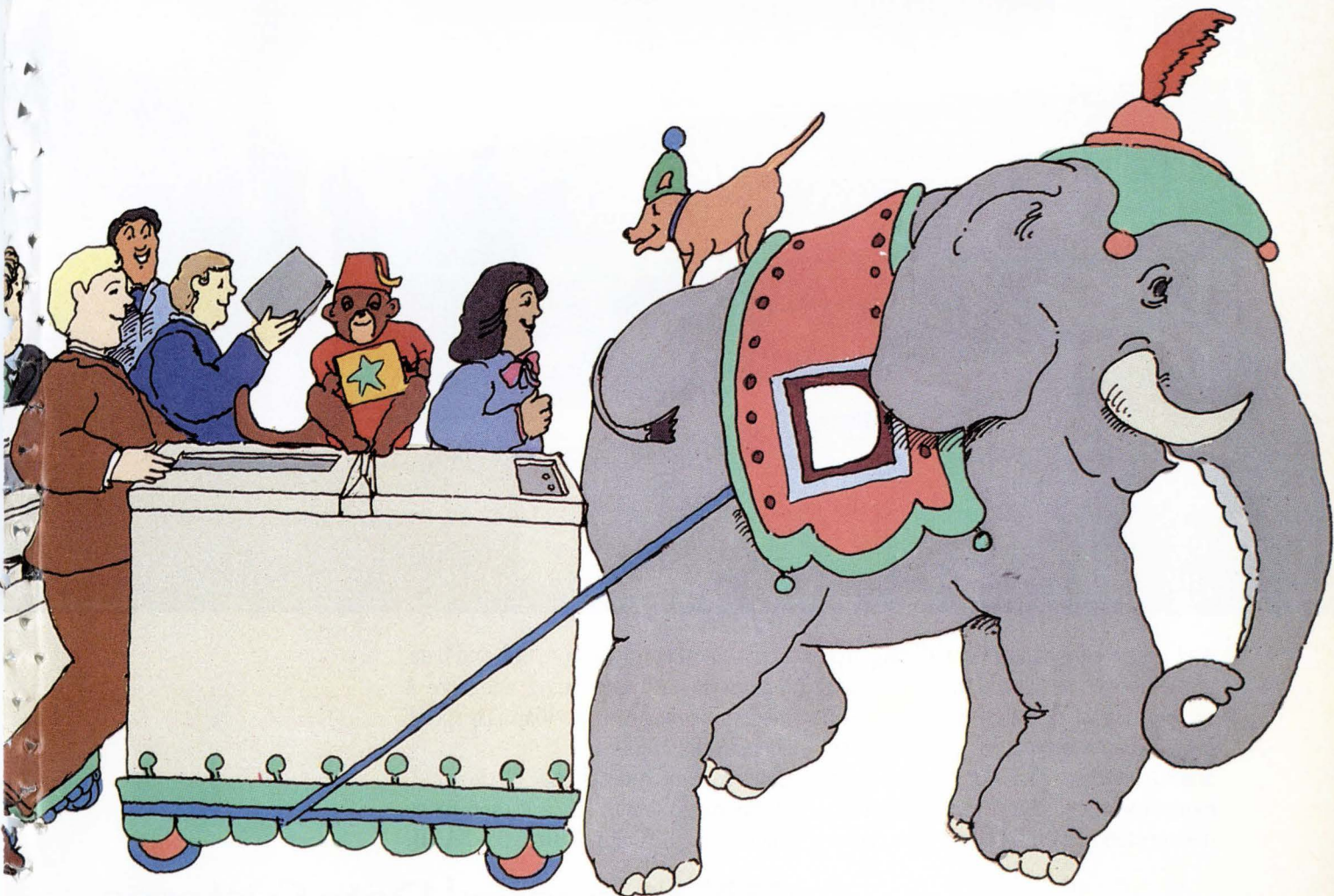
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Behind the News

DEFENSE



Testing "Star Wars" Packs May Be SDIO's Biggest Fight

It's the proposed National Test Facility's huge task to test and debug SDI programs, but experts wonder if a system this large can be handled.

BY WILLIE SCHATZ

Even the Strategic Defense Initiative Office (SDIO) concedes that this could be a tough one.

"One of the most difficult problems for the SDI is software design," the SDIO said in the "Report to the Congress on the Strategic Defense Initiative," issued last April. Furthermore, "The high-level computer language requirements for battle management demand revolutionary techniques in software development."

Hey, no problem. First, the SDIO and its subcontractors will write the millions

and millions of lines of code necessary to run the battle management/command, control, and communications (BM/C³) systems, then they'll design radically new systems to turn the disparate SDI parts into a whole.

Actually, there may be one small hitch in this grand design; this revolution won't end with a Declaration of Independence. As with any other software development program, the results will have to be tested. Name the last bug-free software program. While you're at it, name the first. Drawing a blank? No wonder. There aren't any.

And who's going to debug the battle management software? Any volunteers for a field test of what a nuclear explosion will do to a directed-energy weapon? How about checking out the effects of a missile on a particle-beam weapon?

"So, where is this revolution?" asks John Shore, vice president of Entropic Processing, a Washington, D.C.-based speech and signal processing R&D firm. Shore worked on the Office of Technology Assessment's (OTA) study on BM/C³. That report should already have seen the light of day, but at press time it was hung up in SDIO's classification bureaucracy.

"You can have a language [in this case Ada], but it doesn't mean you have the technology to write and maintain a large system, especially one the size of SDI," Shore contends.

That's just what SDIO proposes to find out. Since live debugging could be fairly difficult to do, the revolution will take place at the National Test Facility (NTF) at Falcon Springs, Colo. If all goes according to SDIO's plan, the NTF eventu-

Behind the News



ally will house 2,300 computer and military gurus to operate one of the largest supercomputer collections.

At the moment, the NTF exists only on paper. The first shot in the revolution won't be fired until next year, when the survivor of the preliminary concept design competition between Martin Marietta and Rockwell International will break ground for what SDIO calls "interim NTF capabilities." The winner had not been selected at press time.

Even with a contractor chosen, the NTF may never grow beyond the great idea stage. The Pentagon has requested \$100 million for the NTF for fiscal year 1988. That's only 10% of the proposed \$1 billion National Test Bed (NTB) total budget, but that \$100 million already has been divided along proponent-opponent lines. The House did not include the Pentagon's \$100 million request as part of its \$3.1 billion SDI budget for FY '88, while the Senate made the \$100 million part of SDI's \$4.6 billion budget. The House and Senate at press time still had not agreed on a common ground.

The Scope of the Test Facility's Job

If it stays alive, the NTF will be the center of the NTB, which in the SDIO's eyes probably will mean life or death for SDI.

The SDIO told Congress that "The National Test Bed [NTB] Program will compare, evaluate, and test the alternative architecture definitions for an end-to-end layered strategic defense and its associated BM/C³, as well as evaluate specific technology applications in a system framework defined by these architecture alternatives. The NTB will consist of a number of geographically separated experiment and simulation facilities that will be electronically linked to simulate a layered ballistic missile defense system.

"The NTB will also be the major simulation activity for the SDI Program and develop and execute large-scale distributed simulations of the system providing as much operational realism as possible within the constraints of international agreements and funding. As an integrated set of resources, the NTB will be a single national resource dedicated to the SDI for addressing the many critical issues necessary to support an informed decision on future development and deployment of strategic defense against ballistic missiles."

The NTF will be the central control and coordinating point for the NTB. It will

house both the support elements and the simulation elements. The NTF will serve as the network controller for the computer communications network that links the NTF with the distributed activities of the NTB. The communications network will consist of LANs and long distance links for interconnecting simulations and experiments of the elements of strategic defense.

"The support elements provide for the collection and analysis of the simulation results as well as the control of the simulations," according to the SDIO report. "The simulation elements create a realistic simulated threat in sufficient numbers to gain confidence that the critical information and data networks can function correctly and provide the necessary decision information to the various command and control nodes and battle managers."

No way, say a large number of experts in the computer community. The SDIO's contention that the NTF simulations will be the last word on SDI has exacerbated what is an already deep schism among proponents and opponents. If we were talking Grand Canyon before, we're talking Mindanao Trench now.

"This won't be a national test bed.

It'll be a national feather bed," says David Parnas, a computer science professor at Queen's University, Kingston, Ont., who resigned in 1985 from the Eastport Study Group, a panel of computer experts appointed by the director of the SDIO, because he considers SDI "risky and fraudulent," among its other attributes (see "All Sizzle and No Steak," Aug. 15, 1986, p. 50).

"It'll generate lots of work and lots of visits by congressmen and lots of hype by SDIO," Parnas contends. "And people will do incredible simulations.

"But you won't be able to trust any of them because there are too many assumptions that can't be verified. It's not a matter of incompetence," he continues. "There simply is not enough information available from the real world to validate the data. No matter how many simulations we have for the Russians, nobody really knows what they'll do in a given situation. And how are we going to find out? Kidnap a Russian and hypnotize him?"

A Provision for Outside Review

Wouldn't the SDIO just love that input? But if it has plans to do such covert activities, they remain classified. Regardless, the SDIO and the Air Force Electronic Systems Division (ESD), which are jointly overseeing the NTB program, believe the NTB will put all to rest. Neither organization had responded at press time to repeated requests for interviews.

If all goes according to plan, the NTB will try to disseminate command data and

Speaking SDIOSpeak

You thought the government had its own language? You ain't heard nothin' yet. Try your hand at SDIOSpeak. (SDIO, by the way, stands for the Strategic Defense Initiative Office).

Take "lethality," for example. As does most of the rest of the world, Webster's *New World Dictionary* goes with "lethal," as in "causing or capable of causing death; fatal or deadly." In SDIOSpeak, lethality "refers to the amount of energy or other beam characteristic required to eliminate the military usefulness of enemy targets by causing serious degradation (mission kill) or destruction (observable kill) of a target system." So how dead is dead?

Then there's "bus." Not the kind you take from here to there. Not even the kind used in computers. This bus is the platform for single-missile warheads. Its other name is "post-boost vehicle."

How high is high? We've got endoatmospheric—within the earth's atmosphere, usually at altitudes below 100km—and exoatmospheric—outside the earth's atmosphere, above 100km.

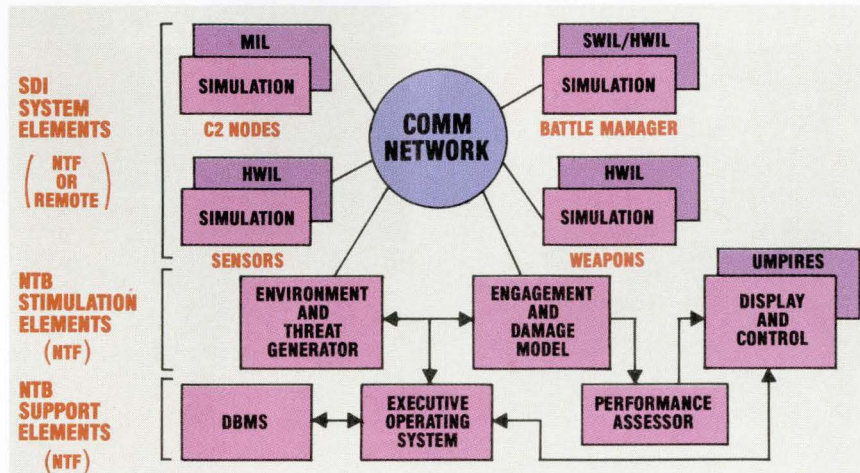
And let us not forget the term "leakage," which is defined by SDIO as "the percentage of warheads that get through a defensive system intact and operational."

So whose English is this anyway? Surely not the King's.

instructions about how to fight a battle in space to other widely scattered systems throughout SDI. The NTB also will receive and digest as much real data and independent simulations as possible from other centers. Those will be used as cross-

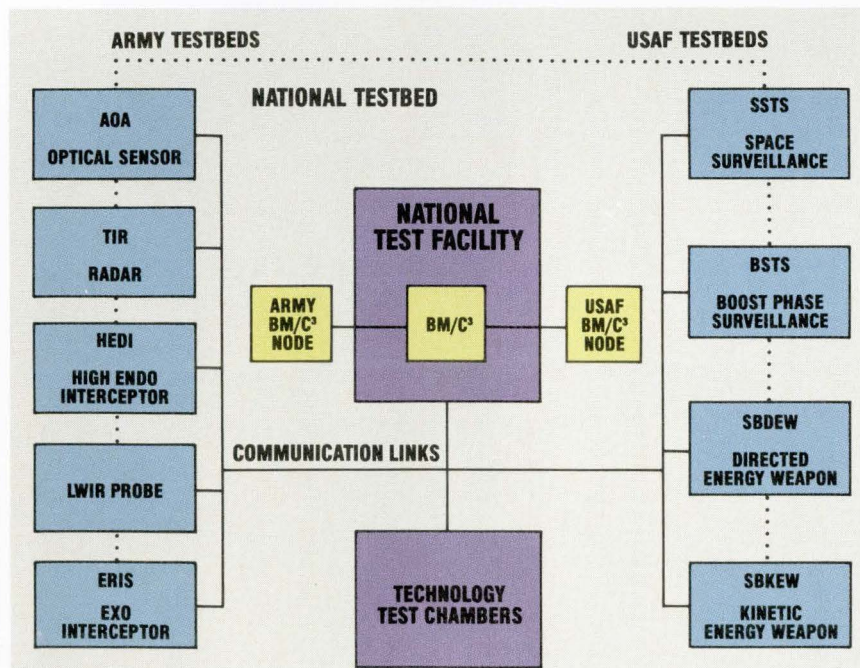
checks on the information emanating from the NTB. The work also will be subject to outside peer review, although it's unclear who would see it, when they would peruse it, and how much they'd be allowed to look at.

National Test Bed System Emulator Concept



These simulation elements will be linked into an integrated whole (NTB) via the communications network and interfaces shown in this diagram. The U.S. Space Command will also have access to the NTF through the NTB's large-scale simulation capability.

How the NTB Relates to the NTF



The NTF will house the support and simulation elements and serve as the controller for the network that links the NTF with the distributed activities of NTB. The network will consist of LANs and long distance communications links for the interconnection of SDI simulations and experiments.

Some software experts think that none of those issues will make any difference. "Software peer review right now is state of the art," says a member of the OTA panel who requests anonymity. "But that's still not good enough to bet the country or the civilization on. Most of the software engineering community thinks SDI can't be done. People who actually do simulations will tell you that the most important thing is knowing the internal details. The second problem is defining the environmental conditions. The SDI analogy is trying to figure out what happens in a nuclear environment. We don't know that. It's going to have to be a far bigger simulation than anything we've ever done. And we need to be extraordinarily sure that the simulation is correct to trust it."

What goes around comes around, and SDI has been down this road before. This isn't exactly a new issue. The Eastport Study Group reported in December 1985 that "although it is possible for SDI to test weapons and sensors individually, the possibilities for testing a complete strategic defense system—therefore its battle management system—are limited. If carried out with unprecedented thoroughness and finesse, simulation can largely (but not completely) substitute for traditional testing."

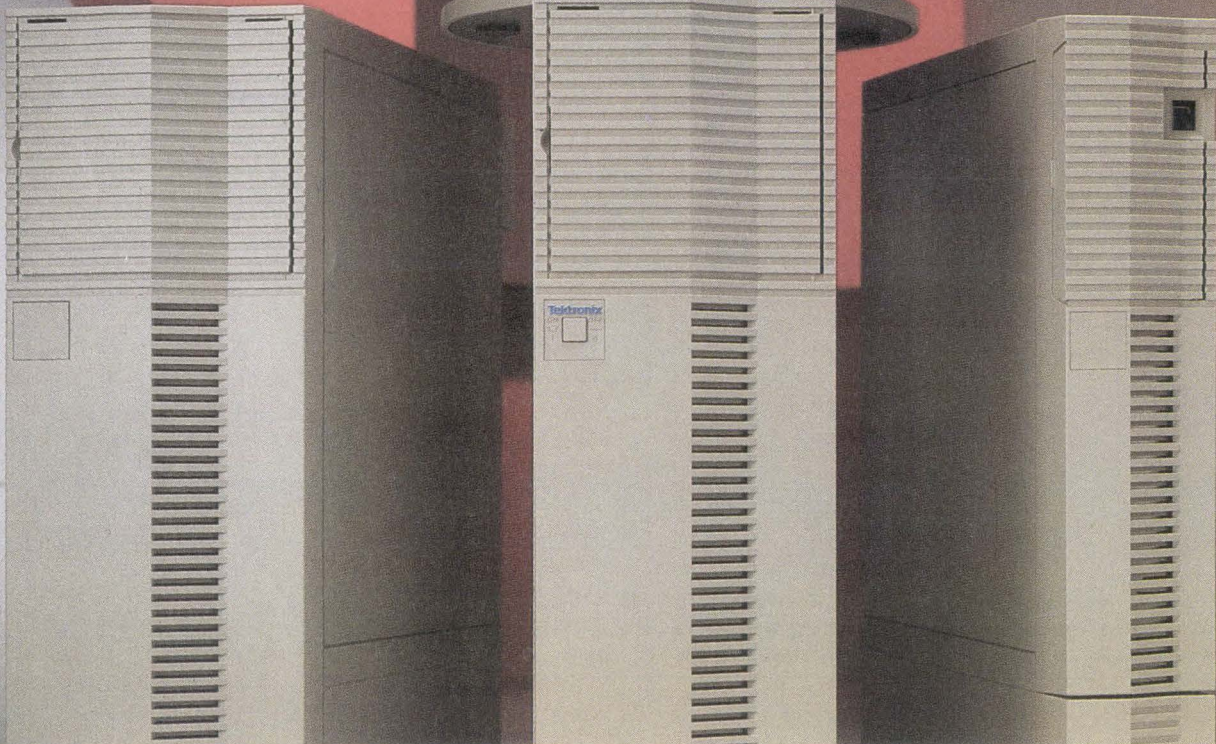
The group said that simulation should answer whether it was possible to design, implement, and test the BM/C³ software for the strategic defense system so that it would achieve the necessary level of performance and reliability

SDIO Acronyms

- AOA—Airborne Optical Adjunct
- TIR—Terminal Imaging Radar
- HEDI—High Endoatmospheric Defense Interceptor
- LWIR—Long Wavelength Infrared
- ERIS—Exoatmospheric Reentry Vehicle Interception System
- SSTS—Space Surveillance and Tracking System
- BSTS—Boost Surveillance and Tracking System
- SBDEW—Space Based Directed Energy Weapon
- SBKEW—Space Based Kinetic Energy Weapon

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Behind the News



as well as answer whether the battle management strategies embedded in the BM/C³ software are adequate to cope with possible attacks.

"Conclusive answers to these questions require that the simulation facilities have the capability of modeling the components of the strategic defense system, and its potential threats, in great detail," the group said. "These components include the sensors, weapons, communication, and battle management of the defense system, as well as the elements of a wide variety of possible attacks. The simulation facilities must also have the ability to replace simulated functions, whether hardware or software, with real components, for simulation validation and for testing purposes."

Putting it on paper is one thing. Putting the theory into practice is something else entirely. All SDIO has to do is try to simulate every possible BM/C³ encounter. But two years and several billion dollars after the Eastport Group raised the questions, the answers seem as elusive as ever.

"The NTF is probably a good idea," says John Pike, executive director of the American Federation of Scientists. "Otherwise, you're just going to have guys shooting rockets and flying satellites. The problem is how to make sure that real world data aren't getting swamped by the software assumptions. It's one thing to use off-the-shelf software to set up the operations shop. But the whole point is to write software you'd bet your country on."

Comparisons with the Phone System

In December 1985, Sol Buchsbaum, executive vice president for customer systems at Bell Labs, told the Senate Subcommittee on Strategic and Theatre Nuclear Forces that just as constructing the U.S. public telecommunications network was feasible, so would be simulating BM/C³ software, because there isn't a great deal of difference between the tasks.

"Some critics," he said, "have specifically questioned if it is possible to generate great quantities of error-free software for the [BM/C³] system, and to ensure that it is, indeed, error-free software. This is the wrong question. Designers of large real-time systems—systems that depend on complex software and hardware—know that it is impossible to generate great quantities of error-free software. They also know that

major problems in field use of software need not be the result of program bugs.

"The right question, as well as the key issue, is the broader one of whether the total BM/C³ system can be designed to be robust and resilient in a changing and error-prone environment. The key, then, is not whether the software contains errors, but how the whole system compensates for such errors as well as for possible subsystem failures."

Buchsbaum testified that those attributes of the public telecom network make the network intrinsic to the BM/C³ system. With more than 40 million lines of software needed for its operation, the network makes more errors in a day than the Cleveland Indians do during a baseball season. But the network still has high reliability, availability, maintainability, and adaptability because it is a distributed system that uses redundancies and well-specified, well-controlled interfaces in the coupling together of all component systems.

So, when one switching machine in the telecom network—which Buchs-

ROCKWELL, MARIETTA ARE COMPETING FOR INITIAL DESIGNS.

baum compared to a battle station on the SDI network—goes down, another covers for it. Thus, the total network accomplishes its task no matter what happens. And so it must be with SDI, Buchsbaum told the subcommittee.

"There are three keys to achieving high reliability, availability, maintainability, and adaptability," Buchsbaum said. "The first is the use of distributed architectures both for the entire network and for major systems within the network.

The second is the use of redundancy—again, both in the entire network and in the component systems. And the third key is the coupling together—the integration—of all the component systems by means of well-specified, well-controlled interfaces.

"These lessons learned are directly applicable to the major SDI challenges of battle management and associated command, control, and communications."

Absolutely, positively incorrect, countered Karl Dahlke, a technical assistant for software architecture in air traffic communications at Bell Labs in Naperville, Ill., in a December 1985 letter to the Senate subcommittee. He was joined in the letter by 16 members of the Bell Labs technical staff who helped create the network that Buchsbaum touted so highly. Neither the staff members nor Buchsbaum were acting as representatives of AT&T in their statements.

Dahlke and his cosigners called the comparison between the phone system and SDI "fallacious" and took Buchsbaum to task for failing to question whether the phone system's outstanding reliability is adequate or whether the two systems are in fact analogous.

The letter writers said the impressive availability of the phone system (three minutes downtime per year for telephone switches) depends in part on established procedures to ensure quick repairs. Phone switches are monitored 24 hours a day, with spare parts stored close by. It doesn't work that way in space, unless you're using the moon as a nearby warehouse. According to Dahlke, mean time to repair SDI components is measured in weeks. At worst, replacing space-based components might take years. The *Challenger* space shuttle and the Delta rocket disasters occurred after Dahlke's letter, but his timetable was right on.

The writers also cited enemy countermeasures, the necessity for SDI to work the first time, and keeping space-based communication channels secure as other reasons why the two systems are not comparable.

A Question of Trustworthiness

"Even the simplest software upgrade introduces serious errors," Dahlke wrote. "Despite our best efforts, the software that controls the telephone network has approximately one error for every thousand lines of code when it is initially incorporated into the phone sys-

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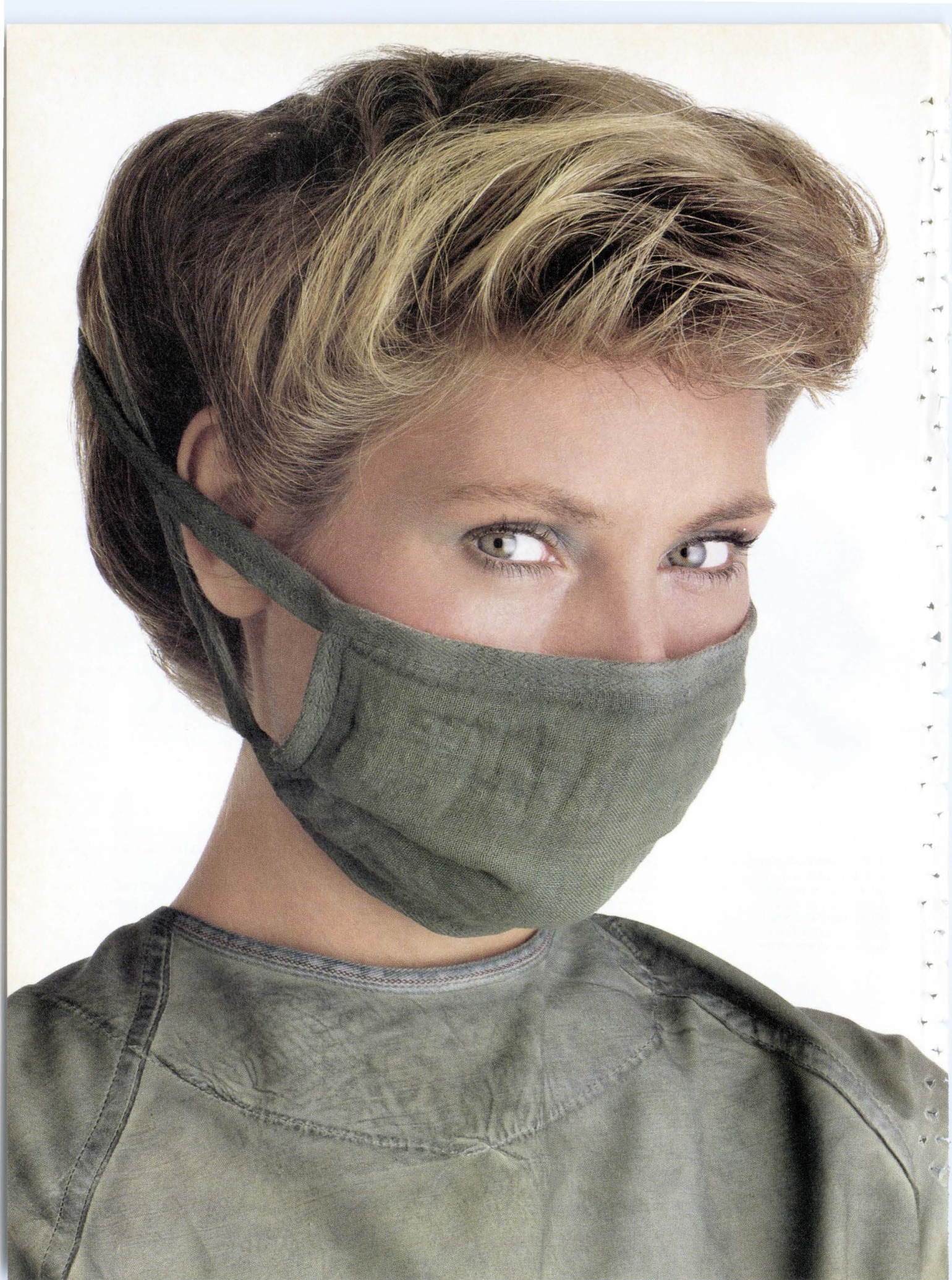
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Behind the News

tem. If SDI contains 10 million lines of software (a credible estimate), and its quality is comparable to the telephone network, we can expect 10,000 errors embedded in its software when the Soviets attack. It only takes a few disastrous software errors (one per layer) to cripple any multilayer SDI implementation."

Dahlke conceded that while the group didn't require a perfect design, any implementation had to be trustworthy. A strategic defense will never reduce the country's dependence on nuclear weaponry if it can't be trusted the first time, regardless of Soviet countermeasures.

"Would you, personally, trust such a system?" the group asked. "Would SDI, in and of itself, give you the confidence to support a bill drastically reducing the number of nuclear weapons in our arsenal? We have worked on some of the most reliable systems in the world, and based on our experience, we would not trust any SDI implementation." And that includes any system chosen even after surviving the allegedly rigorous NTF procedure.

"The fundamental problem with trying to build a test situation is that you know nothing about what the inputs are going to be," Dahlke tells DATAMATION. "Changing parameters in small ways can change the system in ways no one expects. I think the test bed is designed to prove a system which we already know is unfeasible and which we've wasted a great deal of money on. No matter how much software is working, you can only have as much confidence in it as you do in the inputs."

That's the major problem confronting the SDIO, but it's not the only one. When the inputs become outputs, what we may have here is a failure to communicate.


As with all its computer programs, the Defense Department thinks Ada is in and other languages are out. But that marriage may be broken with the SDIO's SDI software development.

The SDIO's report to Congress said, "A research group in an Innovative Science and Technology Office program is working to develop a comprehensive, novel declarative computer language which could be used to design very efficient software for battle management. The demonstration of this language on a new fifth generation computer is scheduled in the near future."

In the private sector, "near future" usually means tomorrow. In the govern-

ment, however, "near future" usually means a year.

Ada may not be totally out, however. The report to Congress indicates that the SDI system will probably run on Ada. "Work toward completing a Distributed Computer Design System software engineering environment for Ada is the thrust of FY '87's efforts," the report to Congress said. "Work will continue on an Ada-based Process Description Language (PDL). This PDL will become the standard for process descriptions within SDI BM/C³ and will help ensure compatibility of architecture descriptions, algorithms, and software. Development of



SOME SAY THERE WILL BE TOO MANY ASSUMPTIONS TO VERIFY.

the next generation of object-based software engineering environment for large-scale multiprocessor-based systems is being supported."

So Ada may be just fine for SDI's nitty-gritty operations, but it doesn't look as if it's going to save the country. "If they're touting Ada as much as they say, they wouldn't be talking something novel," says Entropic Processing's Shore. "I suspect the PDL is for a different project. It's almost an admission that Ada isn't developed enough to support this system. And it's not. I certainly don't think anybody would be foolish enough to believe that Ada by itself will sustain a system this large."

The Three Arguments

So why bother? Proponents offer three arguments: the U.S. must capitalize on the probability that science and technology can create a safer future; the U.S. needs to hedge against the possibility that the Soviets will either break out or creep out from the Anti-Ballistic Missile treaty; and the U.S. needs to hedge against possible new Soviet offensive measures.

For those worried about whether simulations are lying or telling the truth,

the SDIO's report to Congress wants you to know that "great progress has been made in some of the technologies that are key to an effective defense against ballistic missiles. Despite large reductions in the SDIO budget, much progress has been made in some key technologies, especially the more mature technologies that could support the initial phase of a phased deployment."

Which technologies? The report doesn't say. It does tend to be somewhat weak on particulars.

In the end, that probably won't matter. The SDIO will have to convince Congress to give it the money to carry on. That's a far more difficult job than it was two years ago, when Congress wasn't much more than a rubber stamp for SDIO budget requests.

"I'm overwhelmed at the 200,000 lines of code we wrote for our system," says Alvy Ray Smith, president of Pixar, a San Rafael, Calif.-based company that provides digital technology for visualization. The company's technology is an extremely hot item in the military and intelligence communities because it provides very fast, high-quality visualization. Pixar's software is being used for SDI, but Smith doesn't say by whom or for what. "These guys are talking millions of lines of code," is what Smith does say. "Those size systems are unknown. There may be some out there that have accumulated over time, but I don't know what they are. Over time is the issue, of course. SDI doesn't have that luxury."

"When I'm still doing SDI issues on my pc and [General James] Abramson [the SDIO director] says he's been running his on six X-MPs, there's a presumption of veracity," says the American Federation of Scientists' Pike. "That many computers can't be wrong. But they can. That's why I prefer to focus on making the NTF tests objective. I'm confident they'll yield the result I want."

Queen's University's Parnas contends, "You can model 'til the cows home, but there's always something else. No one's going to know whether the SDI system's going to work until you give it to the users. It's incredible to believe that you can trust any model to be accurate. There wouldn't be any way to validate the results. You can't say for sure they're going to be wrong, but you can say for sure that they wouldn't be right."

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choice for fast, reliable data transfer. But, a standard must be used by others to really be a standard: MNP is supported by scores of other modem manufacturers and value-added networks, including GTE[®] Telenet/UNINET[®] (now U.S. Sprint), GEISCO[®], CSC INFONET[®] and the IBM[®] Information Network. In fact, classes 1 through 4 are in the public domain.

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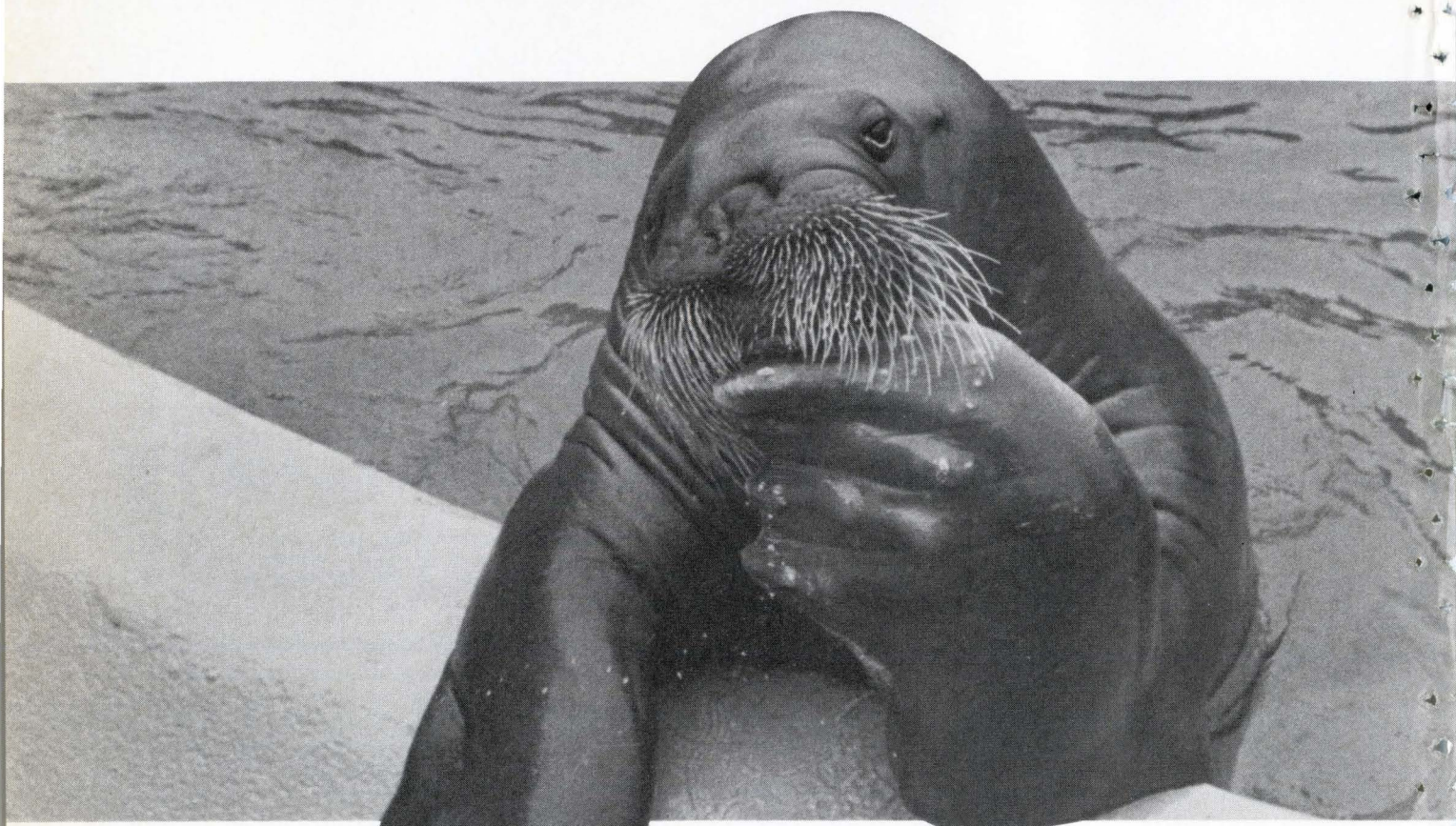
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Online Historical Data
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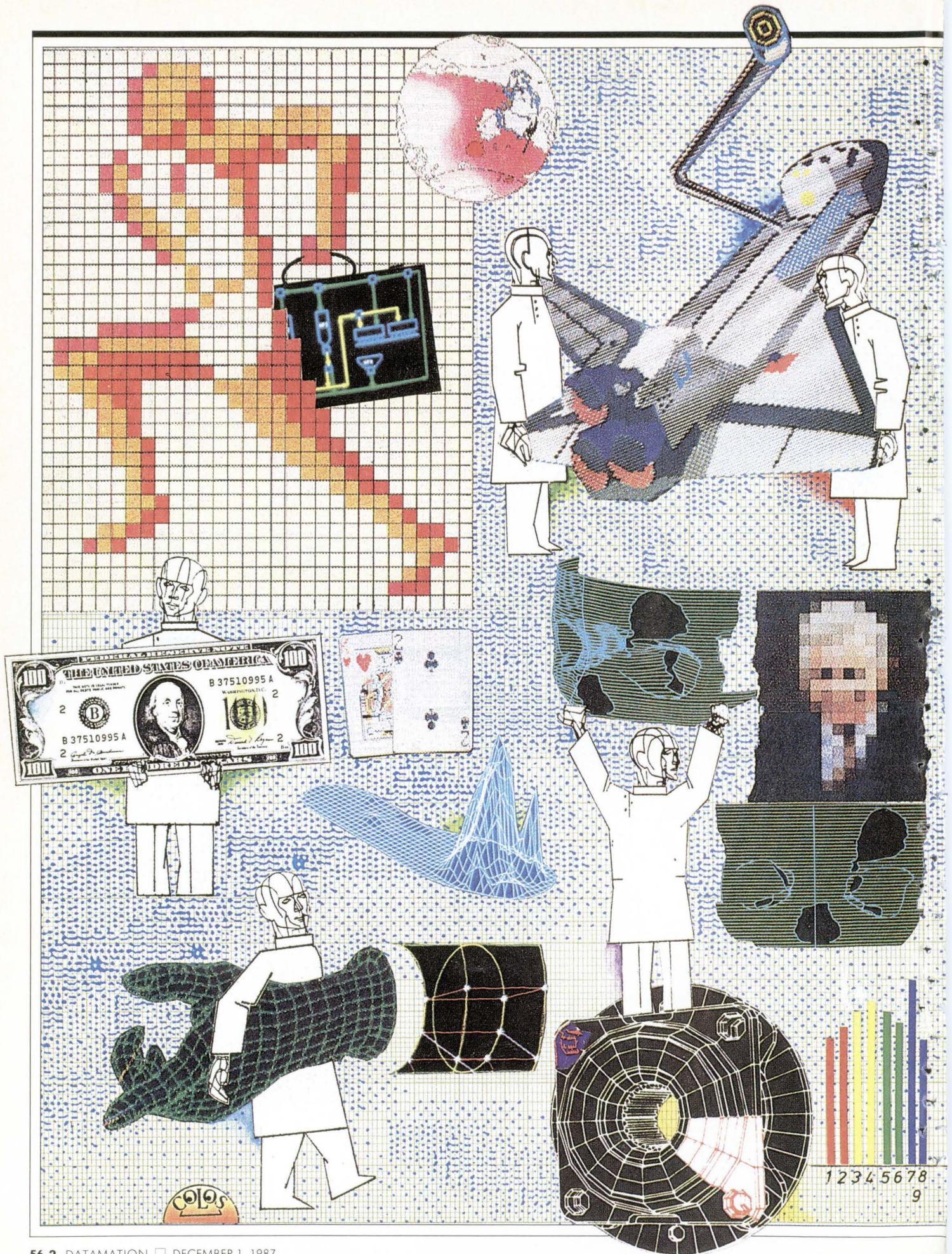
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NEC DISK DRIVES AND THE TEAM BEHIND.



Bringing together corporate data from internal and external sources is one problem. Turning that data into meaningful information for senior executives is another. Graphics-based corporate visual information systems may be the answer.

Eclectic Visions of Corporate Data

BY SCOTT RANKINE AND DAVID SACKS

In a world that is already saturated with information, the real issue is not simply making information more accessible to senior decision makers. The issue involves making that information more meaningful.

Some corporations have chosen to do this by implementing graphics-based visual information systems (VIS), capable of extracting important business performance indicators from diverse data sources and automatically translating them into meaningful images.

Although sophisticated by today's standards, these systems are the prototypes for a new generation of advanced, network-based, data gathering systems that eventually will tie together today's chaotic collection of incompatible hardware and software environments into a single corporate information storehouse. While creating these new information links will be a formidable task in itself, equally important is the way that the information eventually will be presented. The VIS allows a variety of types of data to be presented graphically so that the information can be more easily understood and remembered by users at all corporate levels.

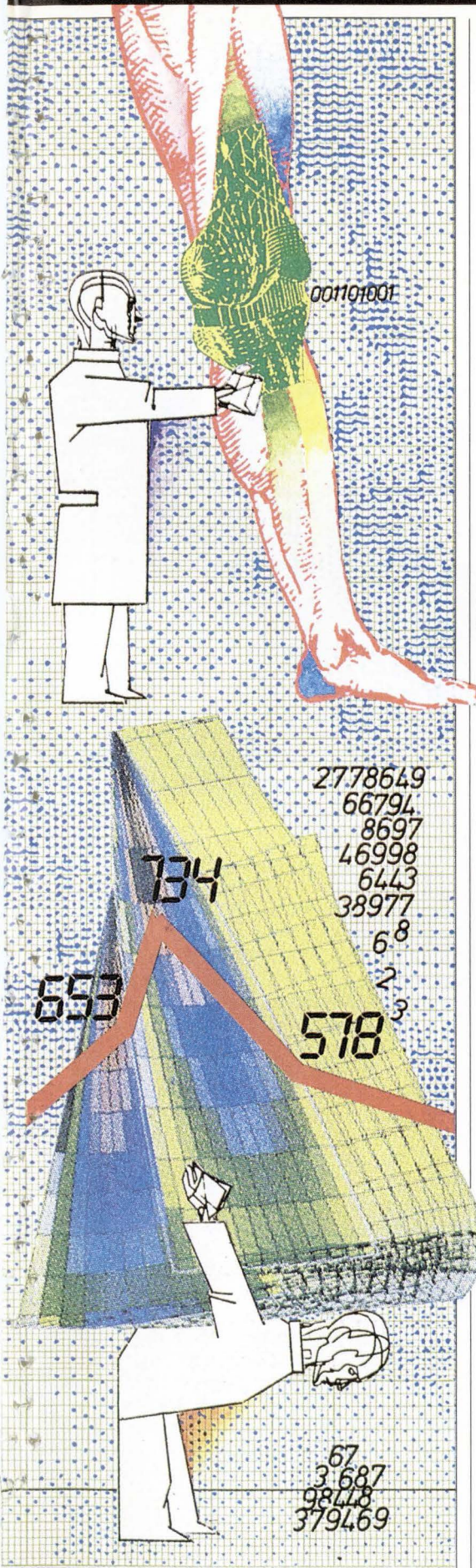
A typical high-level corporate VIS gathers data from a variety of applications, departments, or divisions, and from both internal and external databases, then summarizes and presents the data to users in a colorful and readily understood form. Designed for maxi-

mum ease of use, a VIS can also support traditional applications, such as presentation-quality graphics, and can provide users with access to local and shared output devices, such as plotters and high-speed laser printers. What is most impressive is the ease with which users with little or no computer experience can access, select, sort, format, and present key corporate data when needed.

In-house Glue Needed

Some systems simply present users with selectable views of predefined data, while other systems are more sophisticated, allowing users some level of interactive data retrieval and ad hoc analysis. These sophisticated data retrieval and processing systems raise a number of important issues, not the least of which is the need for standards when accessing corporate data and maintaining its integrity.

In reality, most of the glue needed to keep today's VIS networks from flying apart is provided by in-house technical expertise. At the moment, there is no off-the-shelf solution for creating transparent pipelines for data extraction, especially when it comes to multivendor systems. The current VIS generation is host-based and usually encompasses an array of third-party software packages, local area networks, and shared output devices tied together with considerable amounts of custom code. Sadly, popular fourth generation language (4GL) programming tools are of little use in developing this type of corporatewide decision support system.



Even without graphics capabilities 4GL-based decision support systems chew up a tremendous amount of system resources. Organizations that try to implement a corporate decision support system of any description using a 4GL approach will be disillusioned by response times. They may end up having to dedicate an entire processor just to get it going, but in the long run, it just won't fly as a corporate solution. The complexity of the problem also seems to grow as the number of data sources and machines to be accessed increases.

Originally introduced as an answer to end-user applications bottlenecks and ad hoc reporting needs, 4GLs have contributed to the problem of corporate data fragmentation by storing important information in proprietary databases that often have little or no hope of being easily integrated into a corporate-level application such as a VIS. Another drawback to 4GLs is that they are really designed for programmers and not end users.

A successful corporate VIS must make the process of data extraction presentation as transparent as possible because, according to Ed Aclly, a senior researcher at International Data Corp., Framingham, Mass., "end users haven't the skills or patience to bridge all the procedural gaps of today's archaic linking technologies." In order for VIS to become a mainstream application, he adds, corporations will have to do away with the practice of "hard wiring communications protocols and developing in-house data retrieval mechanisms to extract data from currently incompatible databases."

Much of the burden of developing tomorrow's seamless and generic information links will have to be taken up by today's independent software vendors since computer manufacturers, for the most part, are concerned only with improving connectivity within their own product lines. Unlike current linking software, these new products largely will be nonprocedural in nature, providing users with a graphics-based interface, which will enable them ready access to both local and corporate databases. To achieve this, it will be necessary to develop a new generation of information links involving both host and workstation processing capabilities. One of the first applications to feel the impact of this new technology will be mainframe-based graphics.

A good example is IBM's popular Graphical Data Display Manager (GDDM). A programmer's tool, GDDM is a high-level applications language that allows interactive development of color

graphs using either dumb 3179 terminals or a PC attached to an IBM mainframe. However, there are some major problems with this approach.

The first is the cost-effectiveness of using a mainframe for interactive graphic development. Typically, when creating or modifying a GDDM graph, a job must be submitted to the host, which then must generate the entire image and download it pixel by pixel to the user's terminal. The line costs and system overhead of this approach can be staggering, even in modest usage, as the amount of traffic generated to produce the image can be huge compared with the actual data used in the graph. The economics of transmitting complete images versus raw data is a hidden problem that will come to the fore when the use of graphics increases sharply in the next few years.

The issue of line costs is one reason some corporations have been reluctant to implement graphics systems on networks, says Francis McInerney, executive vice president of Northern Business



4GLS HAVE CONTRIBUTED TO DATA FRAGMENTATION.

Information Inc., New York. "Graphics eat up bandwidth," says McInerney, who predicts that local exchange carriers and hardware vendors will have to deal with this problem by making better use of local workstation intelligence.

"The situation is probably worse with other mainframe-based packages where graphics drivers are probably even less efficient than IBM's," McInerney says. As the basis for a corporate VIS strategy, this approach leaves a lot to be desired. Anyone who is considering providing graphics capabilities should take a hard look at the potential impact on network performance and costs before taking the plunge.

For the most part, host-based graphics systems also ignore the local processing potential of an intelligent workstation and treat it as just another dumb device. However, many industry observers feel this situation is about to

undergo a fundamental transformation.

"Every trend indicates that real power is finally coming to the desktop," says Meg Lewis, an analyst with Future Computing Datapro, Dallas. The real challenge, Lewis says, "isn't harnessing the MIPS power of the micro to draw pretty pictures"; more important is "the task of making data extraction from mainframes as easy as possible for the user."

IBM's SAA Battle Plan

Lewis says there is "a growing consensus that the PC is replacing the 3270 terminal, especially for management applications." The potential of the PC has also been recognized by IBM, which has made it a key element of its Systems Application Architecture (SAA) strategy for systems integration.

"SAA is far more than a systems design concept," says Paul Leghart, a senior analyst of Computer Technology Research, Patchogue, N.Y. "It's clearly a marketing strategy designed to fortify IBM's mainframe base against further midrange attacks by minicomputer makers like Digital Equipment Corp.," as well as "a carefully orchestrated plan to recapture corporate ground lost to PC clone vendors."

The key elements of IBM's ambitious SAA battle plan are reflected in its new PS/2 micros and its proprietary version of OS/2—Microsoft Inc.'s long-awaited successor to MS/DOS. The PS/2's higher screen resolution reflects the growing trend toward graphic user interfaces instead of the traditional command line interface. IBM's new micros also feature proprietary communications chips, which will enable these workstations to run simultaneous applications. The flagship model 80 sports a true 32-bit Intel 80386 microprocessor that supports terabyte addressing and has a potential performance rating in the 5MIPS range. Several million of these workstations are projected to be in place by the early 1990s. Their rapid spread is likely to have an impact on the way many corporations distribute applications processing tasks, especially graphics.

IBM's OS/2 Extended version reveals how Big Blue plans to lock in its biggest customers. The first component, dubbed Presentation Manager, is a full participant in SAA and provides a common graphics-based user access and programming interface that IBM says will be portable across all System/370, System/3X, and PC architectures. Eventually, all applications developed for these systems will look and feel the same. This

FIGURE 1 OS/2 Communications Capabilities

SUPPORTED SYSTEMS	EMULATION	INTERFACE/ PROTOCOL	FILE TRANSFER	LINK
IBM System/370 Architecture (including 9370)	APPC	LU 6.2	—	SDLC (3720,3725,3705,3726, & 9370 Controller) Token ring (3720,3725, 3726, & 9370 Controller) Token ring using 3174s 3720 Gateway for PU 2.0
	SRPI	LU 2	—	DFT via 3174/3274 (To SDLC, BSC, or Channel) & 9370 Controller SDLC (3720,3725,3705,3726, & 9370 Controller) Token ring (3720,3725,3726, & 9370 Controller) Token ring using 3174s 3270 Gateway for PU 2.0
	3270	LU 2	3270 PC File Transfer Program	
	3101, VT100	—	3270 PC File Transfer Program	Async
IBM PC and IBM Personal System/2	APPC	LU 6.2	—	SDLC Token ring PC Network
	—	—	XModem, Pacing +	Async
IBM System/36	APPC	LU 6.2	—	SDLC and token ring
IBM System/38	APPC	LU 6.2	—	SDLC
IBM Series/1	APPC	LU 6.2	—	SDLC
	3101	—	—	Async
IBM System/88	APPC	LU 6.2	—	SDLC
IBM RT PC	APPC	LU 6.2	—	SDLC
	VT100	—	XModem	Async
Other hosts	3101	—	XModem, Pacing +	Async
	VT100	—	XModem, Pacing +	Async

opens the door for the intelligent workstation to function as a true command console to a network of integrated hosts. Under the Communications Manager portion of OS/2, this kind of system data integration will become feasible. The Communications Manager provides PCs with direct access to virtually every IBM-supported connectivity option and network protocol, including GDDM (see "OS/2 Communications Capabilities"). This lays the technical foundation for the creation of a transparent communications environment in which PCs function as true peers with larger machines.

Equally important is a planned OS/2 Database Manager interface to IBM's

mainframe-based DB2 and SQL/DS relational databases. This further entrenches DB2 and makes SQL the de facto accessing standard for years to come. In addition to setting new industry standards, SAA also establishes "a standard for IBM and its customers to address architectural problems with incompatible databases such as IMS and CICS," says Computer Technology's Leghart.

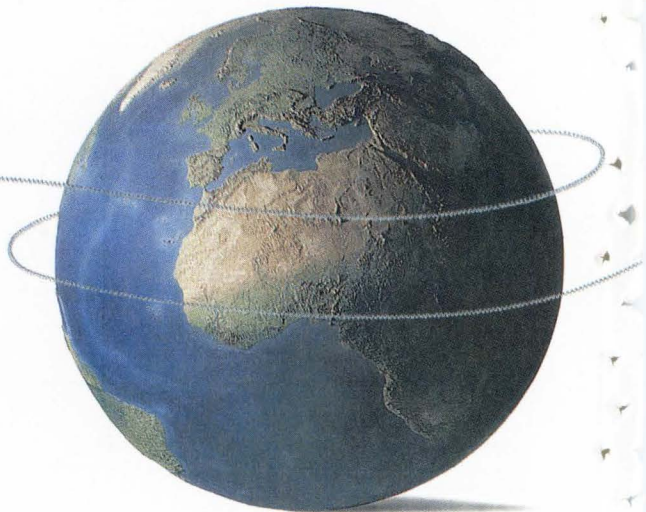
Both the Communications Manager and Database Manager are IBM proprietary products and will not be made available to other hardware manufacturers. By placing OS/2 under the umbrella of SAA, says Leghart, IBM "hopes to make connectivity concerns a key marketing

tool to help keep its flock in the fold."

Warns Bob Djurdjevic of Annex Research Inc., a Phoenix-based firm that monitors mainframe trends, "To ignore the importance IBM has placed on the intelligent workstation is foolish, especially when it comes to graphics.

"Mainframes should have a small role to play in generating graphics," Djurdjevic says. "Workstations are generally much better suited to this kind of task from a line and MIPS cost perspective than the host, which should have better things to do.

"The implications are obvious," he continues. "Any corporate graphics system should aim for an optimal blend of

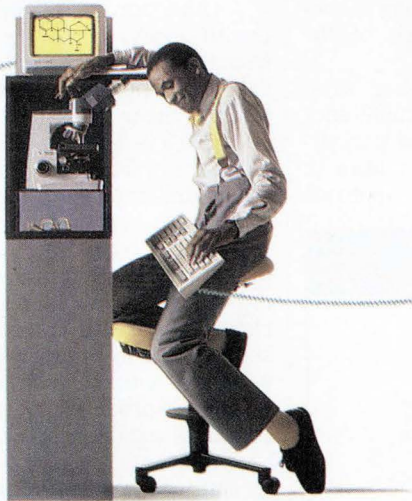


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host and workstation processing capabilities." To accomplish this requires a re-thinking of the current micro-to-mainframe relationship.

Understanding Corporate Data

International Data Corp.'s Acly feels that "one of the serious questions that must be addressed is the lack of tools that allow users to know precisely what corporate data exists and where."

Acly says better data descriptions are required at all levels, "so that both end users and MIS personnel can have a common understanding of corporate data." It will also require a smart user interface and sophisticated host and communications capabilities to help users navigate corporate databases.

To be effective, a VIS information link should provide ready and consistent access to the user's data. Some kind of easily understood data dictionary facility should also be incorporated to allow for easy browsing in order to determine what data elements are needed. The data extraction process must permit users to select or define data retrieval param-

eters based on common-sense criteria. For instance, you should be able to separate regional sales information from general files of sales-related data, even though this may run into millions of records in larger corporations.

One example of this approach is a system in use at the Canadian Department of National Defense (DND) in Ottawa. The DND system has led to an estimated fivefold increase in productivity over host-based systems for interactive and ad hoc graph creation, according to Eric Olsen, DND's manager of capacity planning and performance evaluation. The system allows a user to extract—interactively—desired performance indicators from a database according to the user's own specifications. The user can then—also interactively—display and visually manipulate the data using the sophisticated graphics features of the workstation software.

"Our own studies," Olsen says, "have also shown us that the difference in line traffic between host- and workstation-generated graphics was at least 10 to one." He predicts that this approach

will have a "substantial impact on network performance and line costs compared with current industry methods."

Overcoming Corporate Barriers

In corporations where MIS resistance to pcs is still an issue, implementing VIS can be a way to cost-justify moving from dumb terminals to intelligent workstations, especially at management user levels. Users who wish access to corporate mainframe databases must still go through MIS, which can deal with security issues and establish procedures for maintaining data integrity. Corporations may wish to have MIS control what data users have access to, in the same way a database manager now defines access to production data for programmers developing applications for end users.

Other firms may permit selected users to access corporate data directly from the workstation, using the host as a data extraction engine. Regardless of which of these techniques is used, it will be the users and the corporation as a whole that will come out on top. Individual departments also can benefit from this technology, as long as it is implemented with an eye to eventual integration with the corporate mainframe environment.

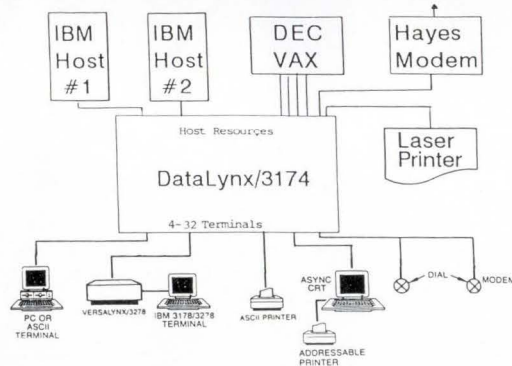
Finally, there are a number of simple guidelines that corporations should keep in mind if they are planning to provide users with graphics capabilities:

- Look for products that use simplified interfaces and don't expect end users to become programmers. This will increase acceptance of the system and reduce on-going user support and training costs.
- When considering a corporate or departmental graphics system, pay close attention to the impact on line costs of implementing a strictly host-based solution. Look for systems that offer the capability of supporting both host and workstation intelligence, as well as a variety of output peripherals.
- Avoid the temptation to develop customized linking and communications protocols. Instead, seek third-party software solutions, unless you're prepared for continuous in-house maintenance and all of the associated costs and headaches that come along with it. ■

Scott Rankine is an industry analyst who has written extensively on computer technology trends for a variety of publications. He is also marketing manager of Technetronic Inc., McLean, Va.

David Sacks is a systems design consultant in Ottawa.

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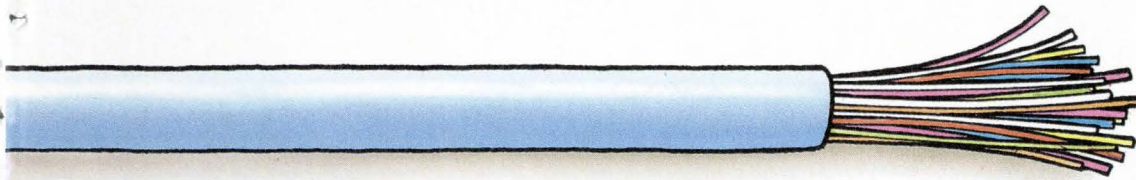
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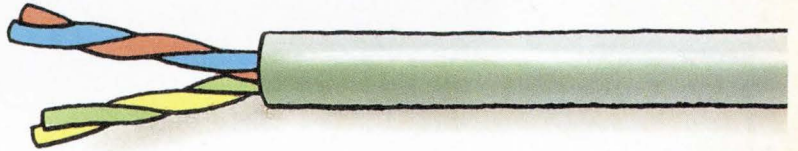
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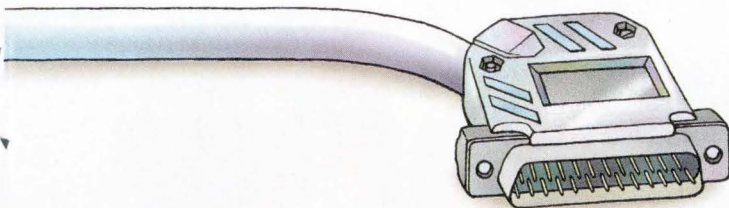
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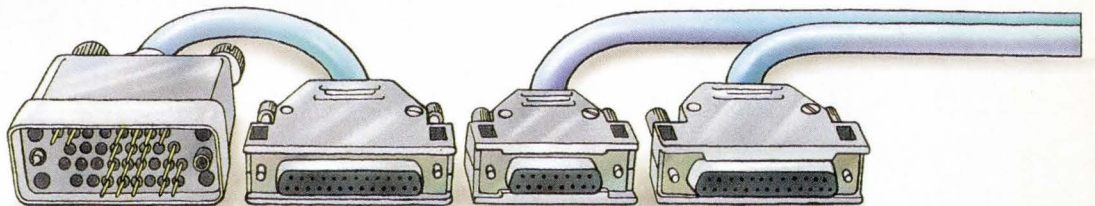
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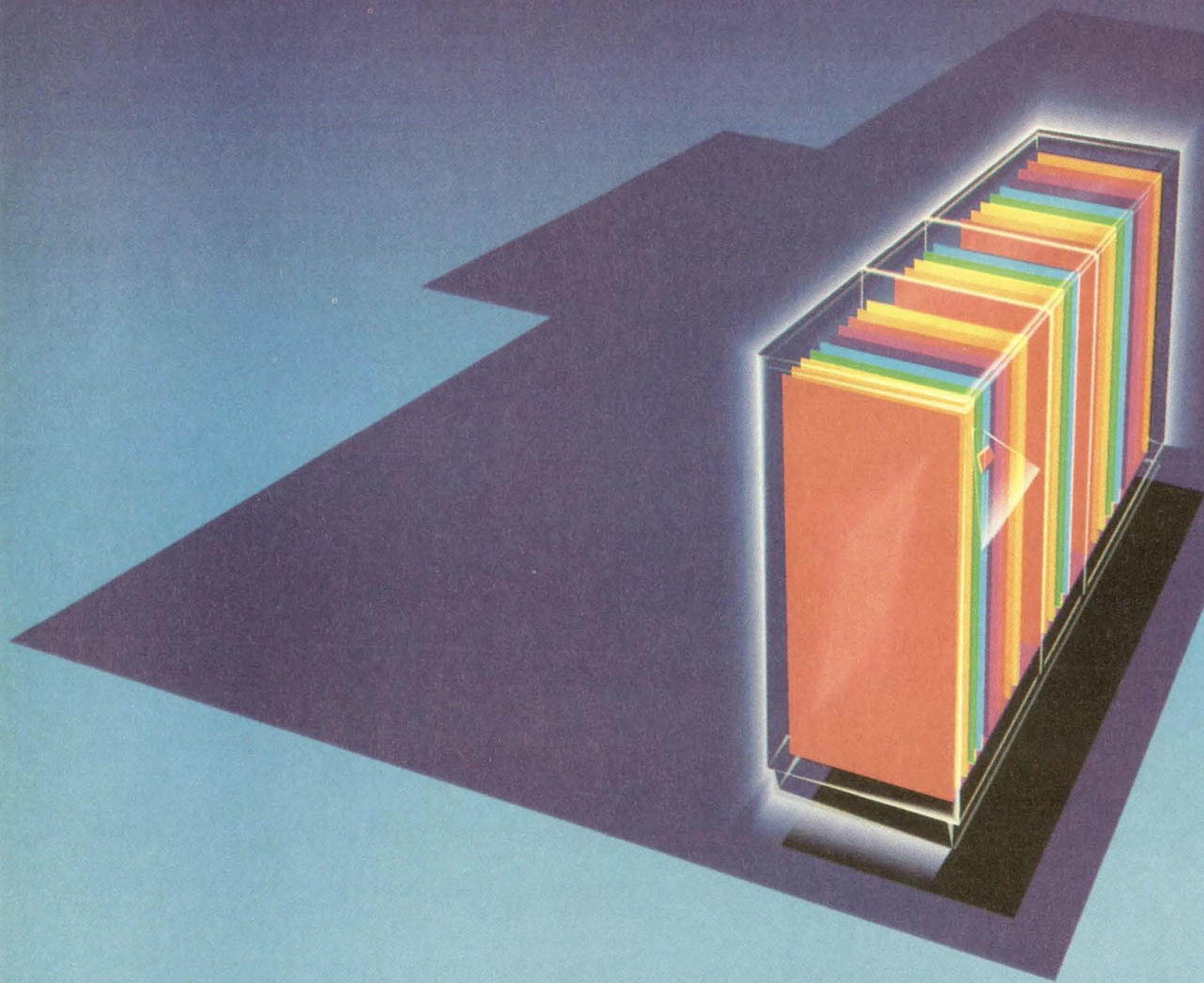
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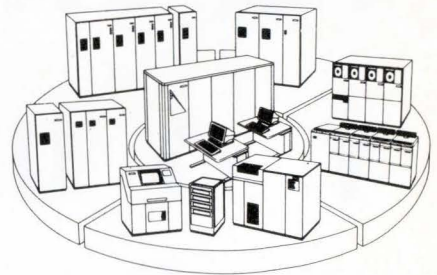
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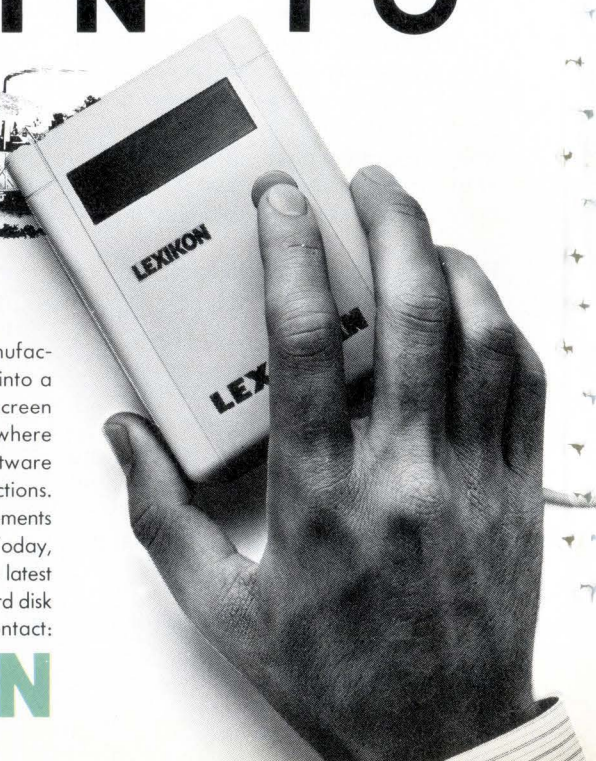
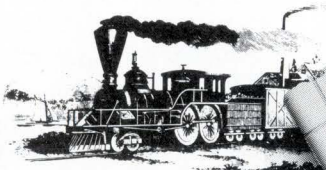


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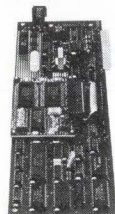
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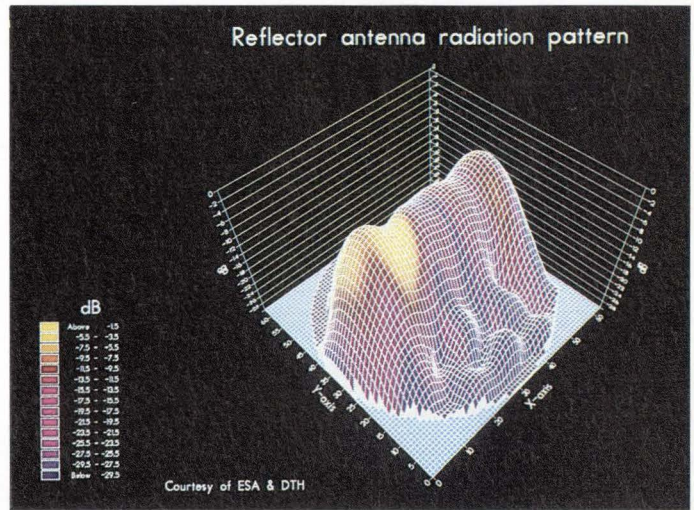
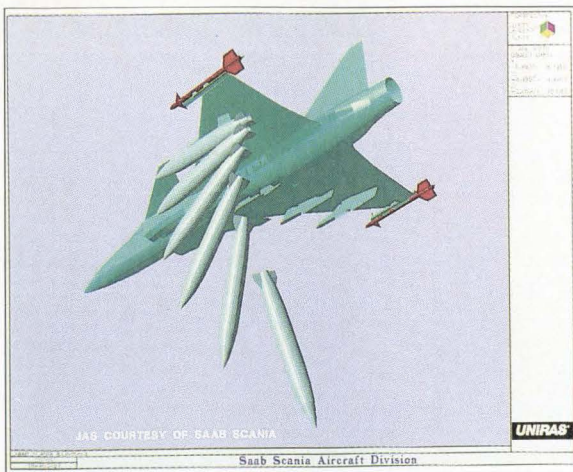
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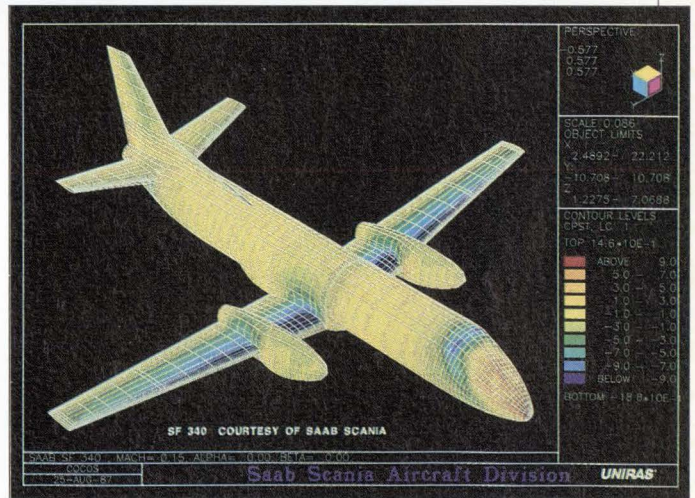
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Unravelling Graphics Standards



BY MIKAEL JERN

As a graphics standard, the Graphical Kernel System (GKS) is not perfect. Its basic design is now over a decade old and five years have passed since its last significant change. In that time, computer graphics have come a long way, especially in modern engineering workstations, which can have sophisticated image processing and advanced 3-D capabilities.

Proposals for enhanced standards would need to include additional primitives and attributes to handle these systems and their functionality. However, the potpourri of graphics standards and the battle between various proposals are causing great confusion among users. Even so, GKS was a good starting base.

It was the first major specification of computer graphics programs to be agreed upon internationally. Still, the performance of different GKS implemen-

tations varies significantly, and the performance of a given GKS implementation may vary between machines.

GKS is one of a whole suite of emerging standards that represent instances of imposition from above (see "The Graphics Standards Scene"). Other standards have been established after being tried and tested by users, but such is not the case for GKS.

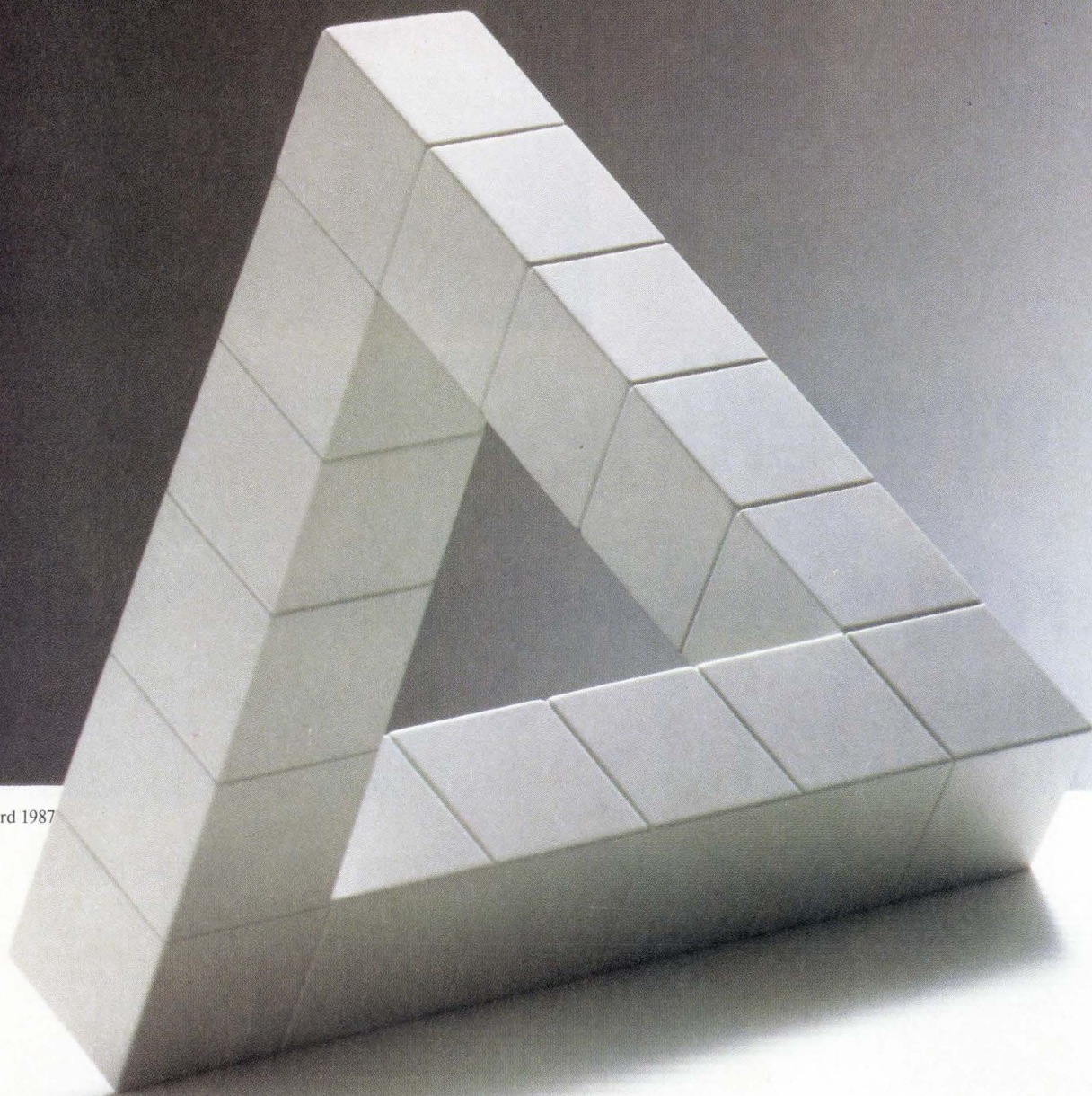
Graphics packages such as PostScript, X-Windows, and Graphical Data Display Manager (GDDM) are emerging as de facto standards; their quality alone has sparked users' interest.

PostScript, in particular, represents one of the most important developments in graphics over the past several years. It provides a dynamic language for the control of graphical output devices, in addition to very powerful functions for the generation of graphics output.

Graphics standards are intended to

The emergence of conflicting and competing graphics standards is causing confusion for users and vendors alike. The Graphical Kernel System may be an approved standard, but it is not perfect. Though it will take some years to define, PHIGS+ may be the way of the future.

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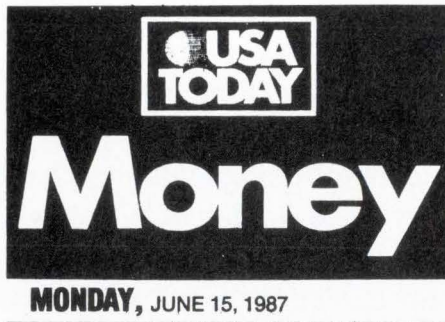
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Datamation magazine looks at the data-processing revenues of 100 firms for its annual rankings. Some of its findings:

Leading in revenues

Company (85 rank)	Revenues		Change
	1985 (billions)	1986 (billions)	
IBM (1)	\$48.6	\$49.6	+2.1%
Unisys (N/A)	N/A	\$9.4	N/A
Digital Equipment (2)	\$7.0	\$8.4	+19.7%
Fujitsu (5)	\$4.3	\$6.6	+52.6%
NEC (7)	\$3.8	\$6.3	+63.9%
Mitachi (11)	\$2.9	\$4.7	+68.1%
Hewlett-Packard (9)	\$4.0	\$4.5	+12.0%
Siemens (10)	\$2.9	\$4.4	+49.8%
IBM (6)	\$4.0	\$3.9	-2.5%
C. Olivetti & Co. (12)	\$2.9	\$4.4	+51.7%
Control Data (8)	\$3.9	\$4.4	+12.7%
Hwang Laboratories (13)	\$2.5	\$4.4	+76.0%
Groupe Bull (16)	\$3.7	\$3.9	+5.4%
Xerox (14)	\$2.4	\$3.3	+37.5%
AT & T (18)	\$1.6	\$2.7	+68.8%
Nixdorf Computer (23)	\$1.8	\$2.6	+44.4%
Apple Computer (17)	\$2.0	\$2.6	+30.0%
Matsushita Elec. Indust. (20)	\$2.0	\$2.1	+5.0%
Honeywell (15)	\$1.3	\$2.1	+61.5%
N.V. Philips (22)	\$1.8	\$2.1	+16.7%
STC (24)	\$1.4	\$2.0	+42.9%
TRW (19)	\$2.0	\$1.9	-5.0%
Tandy (27)	\$1.4	\$1.9	+34.3%
Mitsubishi Electric (33)	\$1.3	\$1.8	+38.5%
	\$1.5	\$1.7	+13.3%
	\$1.2	\$1.6	+33.3%
	\$0.9	\$1.5	+66.7%
	\$1.3	\$1.3	0.0%

Leading microcomputer companies

Company (DTM 100 rank)	Revenues		Change
	1985 (billions)	1986 (billions)	
IBM (1)	\$5.5	\$5.7	+3.6%
Apple Computer (18)	\$1.6	\$1.8	+12.5%
Olivetti (10)	\$0.9	\$1.3	+44.4%
Tandy (24)	\$0.8	\$1.3	+62.5%
Unisys (2)	N/A	\$1.0	N/A
NEC (5)	N/A	\$1.0	N/A
Compaq Computer (54)	N/A	\$1.0	N/A
AT&T (16)	N/A	\$1.0	N/A
Toshiba	N/A	\$1.0	N/A

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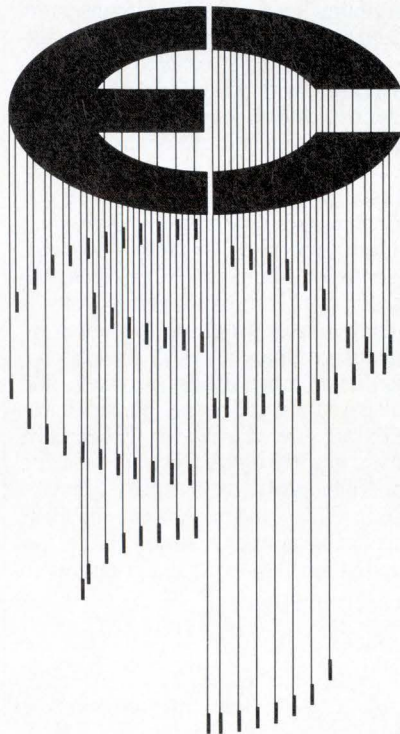
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be a means of communication between applications programs and graphics devices. All implementations should thus behave in a similar manner. In reality, however, an applications program often cannot be transferred from one implementation to another without serious problems, because the intelligent service functions provided by various implementations are significantly different. Some intelligent functions are not available at all, including opaque or transparent overplotting, and cross-hatching.

Overplotting requires CRTs, ink-jet printers, and electrostatic plotters that allow users to specify how two polygons should overlap. The raster technique simplifies the removal of hidden surfaces considerably and obviates the need for complicated algorithms for hidden lines. On the other hand, a large number of vector devices are still in use, and these cannot be neglected. The objective for transferability is not met if the software is restricted to a specific type of output.

Hatching the interior of the polygon is a feature that may not be present in a GKS implementation. Even if it is available, GKS does not allow the applications programmer to control the pattern.

A program written for one GKS implementation will not, therefore, always produce identical output on another implementation. The GKS standard leaves too many important issues open to the developer of a GKS implementation. More specific rules are required in the standards. Furthermore, because of the irritating restrictions in GKS, software vendors are adding to their GKS imple-

mentations new functionalities that are far beyond the scope of the originally specified standard.

De Facto Standards Spring Up

Graphics are increasingly being used on workstations that have limited memory and disk space but that offer the advantage of very fast, equally bit-mapped graphics. Graphics standards, however, seem to negate the very advantage that personal workstations offer. The standards are slow and cumbersome, take up a lot of disk space, and are extremely memory-hungry during execution. Attempts to establish higher-level graphics standards for personal workstations have so far failed; and, if an intervening level of standard is inserted, system performance becomes unacceptable. Thus, de facto standards such as X-Windows, with its support of low-level functions, will become a dominating graphics system in these environments.

The arrival of the new family of PS/2 workstations and the OS/2 operating system will create a new de facto graphics standard: namely, Windows Graphics Presentation Manager (WGPM) from Microsoft Corp., Redmond, Wash. WGPM is an easy-to-use programming environment for graphics in OS/2. Special routines for menus, dialogue boxes, and scroll bars fully utilize the graphics capabilities of the hardware. Essentially, WGPM's graphics interface will be made compatible with IBM's GDDM graphics system. This means that, in the near future, programmers will be able to recompile their OS/2 WGPM's programs to

run on an IBM mainframe system, under GDDM. The conclusion? IBM is creating its own de facto graphics standards.

Moreover, many implementations of standards have been built on top of other graphics packages or even other standards. This leads to poor efficiency. For example, IBM's implementation of PHIGS (Programmers' Hierarchical Interactive Graphics System), called GRAPHIGS, is implemented on top of the local graphics system, GAM (Graphics Access Message), for support of the popular 3-D IBM 5080 workstation. Users familiar with this workstation and GAM have complained about the slow performance generated by the presence of an additional layer of software.

The IBM implementation of GKS is another example: it was built on top of IBM's de facto graphics standard, GDDM. Performance is reduced by 50% to 60% for applications developed for GKS rather than for GDDM. Why use GKS when GDDM would be more efficient? In theory, the 5080 could be programmed in a two-dimensional environment by GKS through GDDM-GRAPHIGS-GAM.

Many other implementations of GKS are built on top of another de facto standard, the implementation of X-Windows. These graphics standards will always be large and inefficient compared with what might be achieved in a given computer graphics environment.

The specification of GKS defines only a flat 2-D graphics system. Work is currently going on to develop a 3-D standard, GKS-3D, which will extend both the GKS standard and PHIGS.

This proposed standard is to provide a strict extension of the capabilities of GKS to support 3-D functionality. As such, it will allow existing GKS programs to operate in a 3-D environment. Many technical and scientific computer graphics applications programmers, however, have expressed dissatisfaction and cite poor utilization of advanced hardware, slow response, inefficient data structures, and poor data structure manipulation facilities.

The PHIGS standard is being developed by those at work on the American National Standards Institute standardization process. They think that some users require a more powerful interface to write their applications. PHIGS is aimed at satisfying the requirements of the entire 3-D environment. It has been designed to address the needs of dynamic, highly interactive graphics applications, which include the definition, display, and manipulation of geometrically related ob-

The Graphics Standards Scene

APPROVED GRAPHICS STANDARDS:

GKS	Graphical Kernel System
CGM	Computer Graphics Metafile

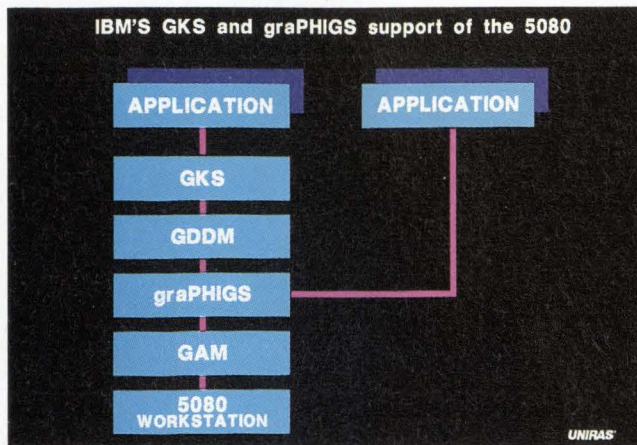
EMERGING STANDARDS:

GKS-91	Revision to the GKS standard
GKS-3D	Three-dimensional extensions to GKS
PHIGS	Programmers' Hierarchical Interactive Graphics System
CGI	Computer Graphics Interface
CGM-3D	Three-dimensional extensions to the CGM standard

DE FACTO STANDARDS:

GDDM	Graphical Data Display Manager, IBM's graphics application programming package
PLOT-10	Tektronix' graphics programming package
CALCOMP	Pen plotter standard
Postscript	Documentation graphics language
REGIS	Digital Equipment Corp.'s graphics system

IBM'S GKS and graPHIGS support of the 5080



In theory, IBM's 3-D 5080 workstation can be supported by GKS.

FUNCTIONALITIES SUPPORTED BY GRAPHICS STANDARDS

	GKS	GKS-3D	PHIGS	PHIGS+	CGM	CGI
OUTPUT	X	X	X	X	X	X
INPUT	X	X	X	X		X
WORKSTATION MODEL	X	X	X	X		(X)
BITBLK						X
SEGMENT	X	X	(X)	(X)		X
HIERARCHICAL DATA BASE			X	X		
MODELLING DATA EDITING			X	X		
3D		X	X	X		
HLSR			X	X		
LIGHTING MODELS				X		
SHADING				X		
GEOMETRIC				X		

■ SUPPORTED
■ MORE PRIMITIVES AVAILABLE
■ DEPENDENT ON LEVEL
■ NOT STANDARD

There are standards for only some of the graphics functions.

jects (i.e., hierarchically defined) and the frequent and dynamic modification of graphical entities.

Although PHIGS was originally intended not to compete with GKS-3D, but simply to provide better support for 3-D environments, standards must be compatible. Compatibility between PHIGS and GKS-3D has been an issue of high priority for the standards organizations. PHIGS is not yet compatible with GKS-3D, however, and some people on the PHIGS committee claim that the existing GKS standard is not a suitable base for compatible extensions. PHIGS is almost certainly not going to be compatible with GKS-3D.

In fact, GKS-3D will probably never be very successful as a standard because the hierarchy and editing features of PHIGS are so important for CAD applications. CAD constitutes such a large part of the computer graphics marketplace that vendors will be reluctant to build hardware that efficiently supports GKS-3D. Conversely, PHIGS is likely to become attractive to users when it is supported on high-performance workstations.

PHIGS has obvious appeal to chip and board vendors, who would instantly gain a relatively painless compatibility with much of the important code in the engineering workstation industry. Software developers, however, still have been reluctant to participate. They have seen other graphics standards proposals arrive, only to fail against the stringent requirements of interactive performance. These vendors want to see first whether PHIGS will deliver on its promises.

The result is a deadlock. Hardware vendors are hesitant to commit additional resources to a PHIGS that does not support their latest 3-D display technology and that, ultimately, may not be used. Software vendors are hesitant to use

PHIGS until it is more widely accepted.

Technology has advanced considerably in the seven years that PHIGS has been under development. The progression of an emerging standard through the various standards-making bodies is never rapid. Indeed, in recent years the process of joint development of standards within the International Standards Organization and in the U.S. has slowed the process even more. It's been apparent for some time that there are some weak areas in PHIGS, which have been overlooked during standardization.

The superworkstation vendors have now formed an unofficial working group to address the need for a standard that fully utilizes the state-of-the-art hardware technology. This PHIGS+ committee, formed in fall 1986, is made up of about 30 representatives, of which the majority are from such hardware manufacturers as Stellar Computer, Sun Microsystems, Apollo, Hewlett-Packard, IBM, and Digital Equipment Corp.

Recognition of PHIGS+ is a Few Years Off

The PHIGS+ proposed standards extensions address the capabilities of the new generation of high-performance workstations—to become widely available in 1988—that will have the performance necessary to support such tasks as geometric transformation and the lighting and shading of 3-D solids, both interactively and in real time.

It probably will be several years before the PHIGS+ work becomes officially recognized by the standards committees, but it is expected that PHIGS+ will be widely reflected in high-end graphics workstations in the near future. Hundreds of thousands of workstation users will soon be developing applications for the workstations in a PHIGS+ environ-

ment and thus will create another de facto standard.

While standardization efforts proceed, it is important to accumulate experience by considering the practical aspects of planning, implementing, and using real systems in real environments.

By 1989, most graphics workstations will provide about 20MIPS to 30MIPS and will probably be capable of real-time 3-D graphics using 32-bit or 64-bit floating point operations. The lighting module in PHIGS+ is applied on a primitive basis and does not allow any interaction between objects, such as shadows or reflections, which are required in animation. Ray-tracing algorithms, which have produced some of the most spectacular results in computer-generated images, will be implemented in hardware on the next generation of workstations.

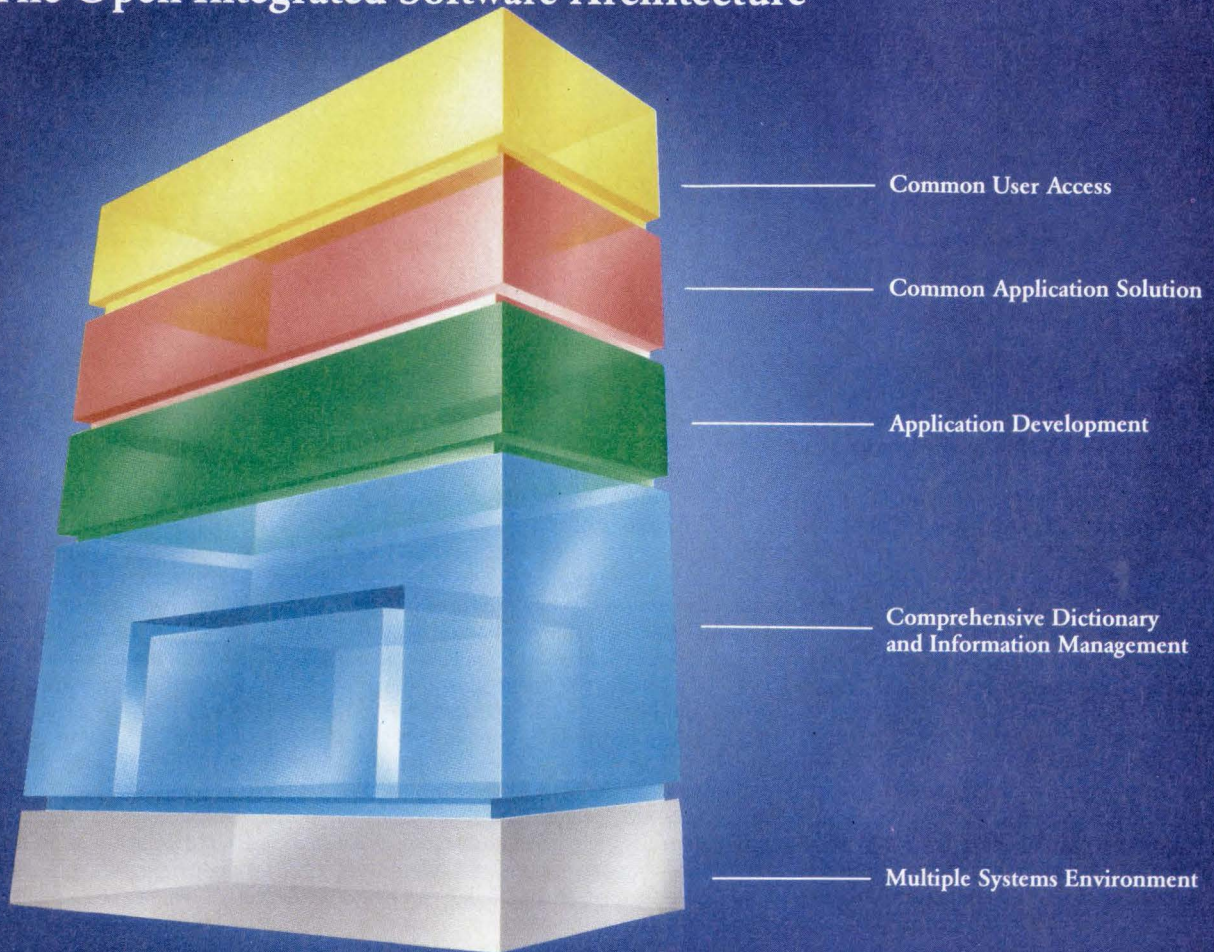
All the emerging graphics standards, with the exception of Computer Graphics Interface, lack the low-level functionality possible on raster-based devices. Graphical output cannot be displayed using the BitBLT functions, and the applications programmer is not allowed access to the underlying raster operations so prevalent on modern workstations.

Finally, the real importance of GKS-3D and other emerging graphics standards is that they have drastically opened up the discussion in the computer graphics community and have created an increased interest in computer graphics as a whole. ■

Mikael Jern is a vice president of technology and a cofounder of the graphics company UNIRASA/S in Copenhagen, Denmark. He was one of the pioneers of the raster graphics technique while at Lund University in Sweden.

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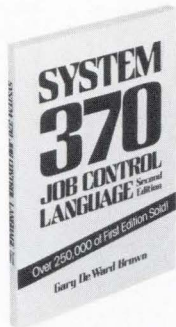
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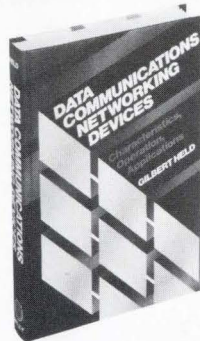
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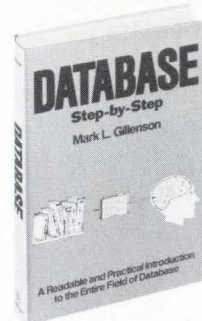
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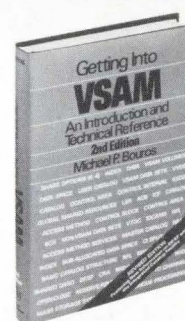
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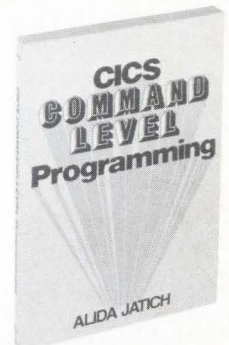
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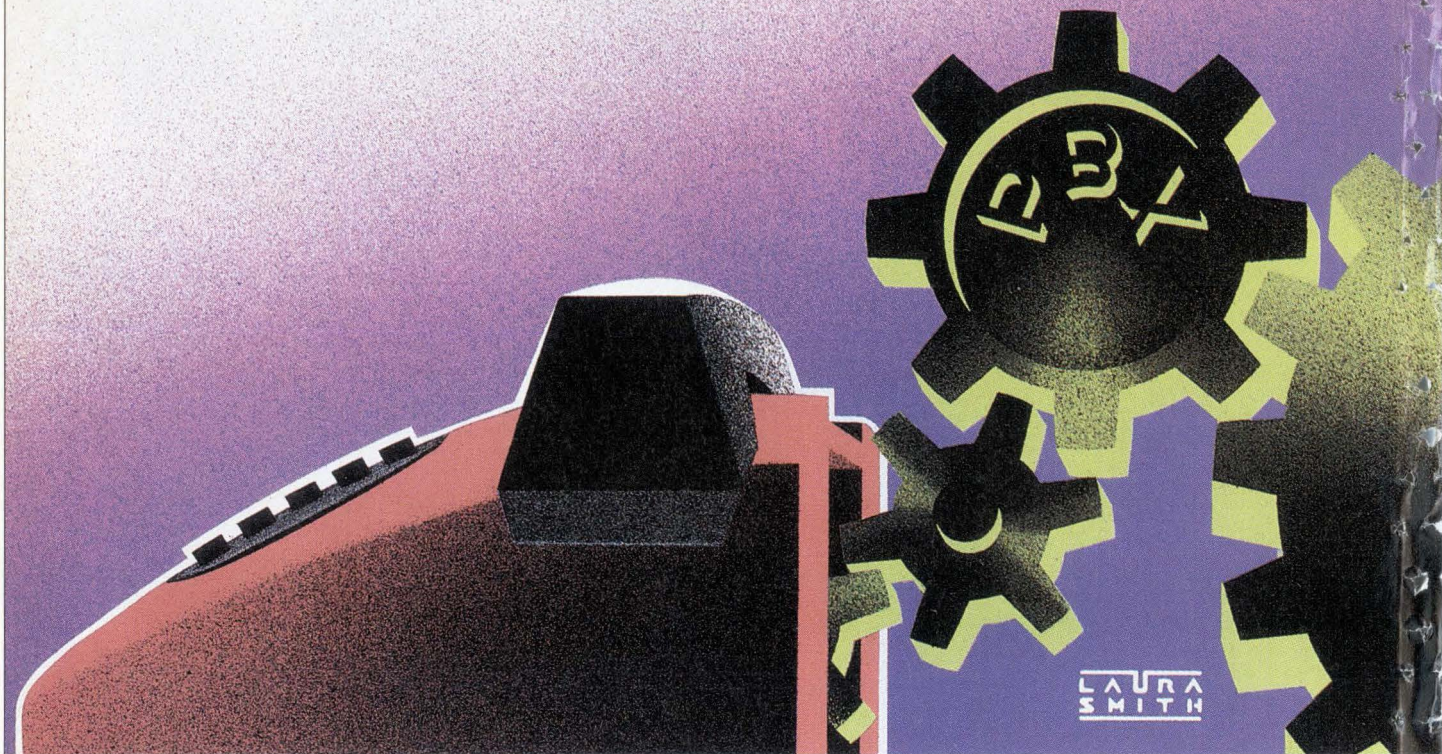
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Integrating the PBX into ISDN



BY BILL MUSGRAVE

In the realm of telecom technology that promises standardized end-to-end digital communications, the operative word is "integrated." Before you can integrate, however, you must have the necessary pieces. For the integrated services digital network (ISDN), the major elements are still evolving. The result of that evolution should be a transparent network that serves all of your company's communications needs.

That doesn't mean ISDN is the magic solution. Declares T. Doane Perry, a senior telecom consultant with International Data Corp. (IDC), Framingham, Mass., "You can do what ISDN does with currently existing technology and systems. The hope is that ISDN does it better and

more efficiently."

And with commonality. Says John Newell, head of the systems interworking department in the R&D organization of AT&T's Business Marketing Group, "A lot of people, upon first hearing about ISDN, will say, 'Oh, I just thought of a way to do that, so I don't need ISDN.' That is one way to look at it. But I think the real value of ISDN is being able to do that with standards supporting multivendor environments."

More important, ISDN provides a common method of interfacing to the network at large. "That," Newell says, "is where the real value of ISDN is going to emerge."

The attraction ISDN holds for data users hinges upon reduced costs and new and better services and applications. Right now, those advanced applications are difficult for users to imagine. "One thing we find today in talking with customers," reports Bob Jordan, enterprise

marketing manager at IBM's Rolm subsidiary, "is that they are really hard-pressed to envision those kinds of exotic applications. They're hard-pressed to think of the things they can do with ISDN that they can't already do today."

Nevertheless, ISDN is on its way. The scenario is laid out by Jordan: "ISDN will first come to customers in some proprietary fashion because the standards are not yet set. Second, it will come to customers in selected geographic areas. And third, it's going to come to customers at prices that may start out high, but will come down over time."

ISDN, which is rolling out of the public network like waves from the sea, should first reach customers as trunks to PBXs next year. Subsequently, switches with ISDN extensions to workstations will appear within the next two or three years. During that same period, single-station subscriber loops and central office ISDN services will become available.



Several years after that, ISDN may actually begin to realize its promise of more flexible and cheaper communications for customers. Carriers also stand to benefit from the technology. ISDN, which is expected to provide more efficient operations, will give carriers the ability to add new features in software. None of these improvements on the customer or carrier side will happen overnight, however.

"I think ISDN will evolve slowly," predicts Lynn Riddle, assistant vp for North American marketing communications at Mitel Corp. in Boca Raton, Fla. "Its true utility at the desktop," she declares, "will be determined by the consumer."

ISDN's Dual Purpose

The carriers, which have a role of serving the consumer, can do that and make money at the same time with ISDN. That dual purpose is candidly confirmed

by AT&T's Newell: "ISDN is probably the only way telephone companies can provide more functionality to the end user. They have a real motivation for ISDN because it offers a publicly acceptable growth path for them."

Perry of IDC reasons that "AT&T would use ISDN internally whether or not it could sell any lines outside because it helps the carrier operate its network better than before." The king of carriers, according to Perry, "is pushing ISDN, using it in Long Lines and loading it into its switches so that the BOCs can deploy it."

"There is one element of ISDN where that is correct," fires back AT&T's Newell. "But it would be silly to say we would deploy ISDN if no one would hook up to it."

The one element that Newell refers to is Signaling System 7 (SS7), an out-of-band signaling scheme that uses a packet switched net to control the entire user network. "It's an improvement," ex-

The integrated services digital network (ISDN), which will be rolling out of the public networks like waves from the sea, should reach customer sites as trunks to PBXs in 1988. Within the next two or three years, look for switches with ISDN extensions to workstations. During that same period, you can also expect to see single-station subscriber loops and central office ISDN services. But it won't be before the mid-1990s that the telecommunications technology will actually fulfill its promise of giving customers cheaper and more flexible communications.

PBX into ISDN

plains Newell, "over the common-channel signaling AT&T has used since the mid-'70s."

SS7 controls the common carriers' networks, while ISDN provides users with access to the carriers. Protection is provided at points where SS7 nets meet, so that a failure on one network doesn't disrupt the other carrier. Similarly, ISDN signaling can invoke SS7 services through a secure, limited interface recommended by the Consultative Coordinating Committee for International Telegraph & Telephone (CCITT).

The basic definition of SS7, Newell notes, "is known, so all the major switch vendors are supporting it." These vendors are also mouthing the initials ISDN in their marketing campaigns. Not too long ago, the word on every vendor's lips—and on all their equipment as well—was "digital."

"Six or seven years ago," Mitel's Riddle remembers, "people were talking about digital versus analog. When someone was making a sale on a switch you would hear all of this argument back and forth whether something was truly digital. Often, they'd be talking to the local drugstore that had no more need for data applications than the man in the moon."

"I see a lot of that happening with ISDN today," says Riddle. "Playing semantic games, vendors can put fear in the hearts of consumers and make them believe they should buy a PBX because it is 'ISDN-compatible.'"

First, ISDN trunks will attach PBXs to the public network. Vendors will have to tailor their current line of switches to the ISDN mode. To get into that mode, says Greg Carlsted of market research house Dataquest in San Jose, a PBX would need adequate bandwidth to serve new ISDN workstations, and require more processing power to support new service capabilities.

The ISDNized switch must also be able to handle out-of-band signaling. Carlsted says that ISDN interfaces to trunks and workstations along with new control software would complete the upgrade process.

"At this juncture, those that are talking about being ISDN-ready are at the basic physical level," explains Carlsted. "It is more of a marketing tool to position themselves as 'ISDN-ready' when, in fact, the marketing brochures typically say they will be compatible when the standards are settled."

There are two classes of physical ISDN interfaces for PBXs. Basic rate interfaces (BRIs) serve individual work-

stations, providing two 64Kbps B channels and a 16Kbps D channel. In CCITT parlance, the B channel carries user information, while the D channel is for signaling. (This is often written 2B+D.)

CCITT To Decide on Single-Pair Interface

The D channel can carry user data mixed in with ISDN signaling messages. A BRI that uses two pairs to carry 2B+D was defined by CCITT in 1984. CCITT is expected to make a decision on a single-pair interface during the upcoming year. Availability of the two-wire connection is crucial to widespread adoption of ISDN, since the BRI will deliver these new services over existing subscriber loops.



The second type of interface is the primary rate interface (PRI), which carries many user B channels along with a single signaling D channel, each operating at 64Kbps. There are 23 B channels in the PRI for North America and Japan and 30 B channels in the PRI for Europe. PRIs operate over the long-haul network.

Providing basic network service also requires standards at the data link and network layer for D channels. That falls at levels 2 and 3 of the International Standards Organization's seven-layer OSI model. The frame-oriented Link Access Protocol for D channels (LAPD) is an extension of the link access protocol used in X.25 networks. This enables user X.25 packets to transmit the D channel amidst signaling messages. The data link protocol ensures error-free transmission of frames on the D channel.

Level 3, the network layer of the OSI model, comprises the D channel messages that are used to communicate with

the ISDN. Messages for POTS (Plain Old Telephone Service) have been accepted by CCITT. More messages to implement ISDN functions are on the way.

Rolm's Jordan notes that a score of telephone features such as call hold and call transfer are currently being hammered out in ANSI committees, which will present the U.S. position to the CCITT. "The majority of [the features] have been defined to the point that you would recognize the features. Only a handful," says Jordan, "have been defined down to the level where a person could implement them in a standard way on any piece of equipment."

Existence of a CCITT standard for the BRI is not a requirement for getting a PBX to support connection to the ISDN via a PRI. "Given a PBX that switches voice and data," explains AT&T's Newell, "you can add conversion devices at the BRI and PRI ports to format the signals for ISDN."

Similarly, there is no reason why you couldn't have old analog telephones and RS232 terminals at workstations that are connected to the PBX and routed through a PRI into the ISDN. Obviously, those phones and terminals couldn't make use of new ISDN features, but they could communicate to the limits of their capabilities. There are already various proprietary schemes to provide functions that are similar to ISDN. Vendors are positioning these functions as precursors of things to come.

In the realm of reality are the advanced PBX features being offered by AT&T, Northern Telecom, Rolm, and others. But these features, which all work a little differently from each other and from ISDN, use different interfaces, which tends to lock customers in.

In contrast, ISDN offers freedom of choice. "In ISDN," points out AT&T's Newell, "you'll be able to mix and match vendors according to your needs."

IBM Promises In-the-Field Upgrades

Adapting an existing PBX installation to exploit ISDN will require new interface cards and new software to take advantage of the D channel. "For every PBX," explains Rolm's Jordan, "you can expect to need a new software load, and a new hardware interface. That assumes, too, that the existing architecture of the PBX can handle ISDN and that it can be field installable."

IBM is promising in-the-field upgrades to ISDN for its newly announced 8751 and 9751 CBXs. Both CBXs already support its proprietary voice/data Rolmlink. All models of the 9751 family, which

was announced in October, are scheduled to ship by February.

The primary rate interface will be the first ISDN connection supported by PBXs. Providing a trunk to the public network, the PRI can be used to interconnect PBXs in private networks. It can also interface to host computers to provide 23 (30 in Europe) 64Kbps full-duplex user channels over two pairs of wire.

Northern Telecom in Richardson, Texas, is working with an unnamed computer vendor on an ISDN application protocol built on the ISDN primary rate interface. The protocol, according to Roland Zalite, Northern Telecom's director of strategic marketing, will support enhanced messaging capabilities for developing applications on host-based systems, which can then access the net.

AT&T has a PBX-to-computer trunking scheme called the digital multiplexed interface (DMI), which it licenses to others. "Basically, it is a T1 interface with out-of-band signaling," explains Newell. It is similar to a primary rate interface 23B+D structure, which will serve the same application. But DMI uses bit-oriented signaling in its D channel, instead of the message-oriented signaling recommended by CCITT.

Last February, AT&T announced a PRI for its System 85 PBX; deliveries are scheduled to begin this month.

Newell of AT&T claims the company's data communications protocol (DCP) interface is "extremely close to the ISDN basic rate. Our installed base of sets and the newer BRI sets can coexist on the same switch and interoperate, providing the same functions. The user won't know the difference."

The five-year-old DCP differs from BRI in its signaling. Its D channel runs at 8Kbps instead of BRI's 16Kbps rate.

Another difference is that DCP uses stimulus signaling as opposed to functional signaling, which has been recommended by CCITT. Stimulus signaling relies upon intelligence in the switch, while functional methods shift some intelligence to the terminal.

Two ISDN Markets Are Forecast

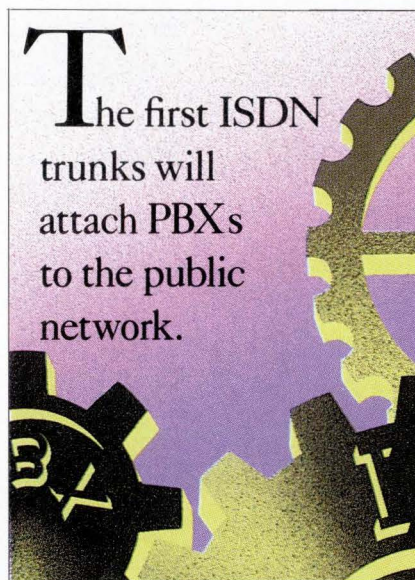
Northern Telecom's Zalite says that he sees two ISDN markets: a basic rate market and a network market. The basic rate market, he predicts, "will compete with the proprietary solutions. It will be dependent on the terminal vendors and the applications vendors like Microsoft."

In that basic rate market, vendor-proprietary terminals should be able to coexist and interoperate with ISDN-stand-

ard terminals. In the network niche, which Zalite believes "is almost independent of the basic rate side," the "benefits and applications have to do with the wide area network and the economics of networking."

Three months ago, Northern Telecom unveiled its Meridian Supernode, a scaled-down version of its DMS Supernode telco central office switching hub. The Supernode uses SS7 to provide networks to Fortune 200-class organizations. The equipment can also act as a gateway between the private network and the public ISDN.

The thinking behind Northern Telecom's market approach, Zalite explains,



is that "we see an opportunity for the customer to deploy PBXs in privately owned networks that can interface to public networks."

Across the Atlantic, European PBX makers have been preparing for ISDN for some time. Most have already launched ISDN-compatible products.

"In Europe, suppliers are adopting two main strategies," according to Chris Buckley, manager of the telecommunications networking group at British consulting firm Pactel. "Some, like the U.K.'s Plessey," he says, "are concentrating on functionality, offering ISDN-type functions on a proprietary basis with their switches. Others are taking the standards approach. That means they are mostly playing a wait-and-see game until the CCITT agrees on terminal standards. That will probably happen by the end of 1988."

The demand for ISDN capabilities is much farther down the line. "The basic

question, 'Who wants two 64Kbps channels on their desks?' still exists," sums up Buckley.

Indeed. The vast majority of installed terminals can't even use 64Kbps, and new terminals that can won't get the job done any faster when they call across the ISDN and connect to someone who still uses a Bell 212A modem on an analog line.

For all the noise, there really aren't a lot of obvious applications for integrated voice and data. Automatic call distribution (ACD), whereby incoming voice calls are paired with database transactions, is one of the few well recognized applications. Examples of this are telephone order processing or customer inquiries to vendors, service providers, or government agencies. But, as AT&T's Newell is quick to point out, "an ACD operation usually is a small slice of a PBX."

According to Newell, ISDN will enhance ACDs by identifying the calling party before the call is answered. As it stands today, the BOCs identify each calling number for the long distance carrier's billing systems. ISDN could deliver this information to the ACD.

Once ISDN becomes established, interpersonal communication across the common carriers can exploit multiple media. Two people talking could also refer to data on terminals, or exchange facsimiles, or even use slow-scan video to enhance their discussion.

Some other applications may take advantage of the D channel's capability to carry user traffic. This capability could be used to monitor fire alarms or to operate an access control system.

Some telecom specialists believe that applications will evolve as ISDN services evolve. AT&T's Newell predicts that tariffed ISDN service will begin in metropolitan areas of the U.S. next year. By 1990, he forecasts that "most large businesses will consider migration to ISDN for pragmatic reasons such as telemarketing.

"Large companies," insists Newell, "are starting to understand the value that ISDN can provide across the board. I think large businesses will begin to deploy ISDN during 1988. They're likely to do it in private networks initially, then migrate to some switched services as they become available. I think 1988 is the year ISDN will start in earnest." ■

Bill Musgrave is a California-based freelance writer. International editor Paul Tate assisted in the reporting of this article.

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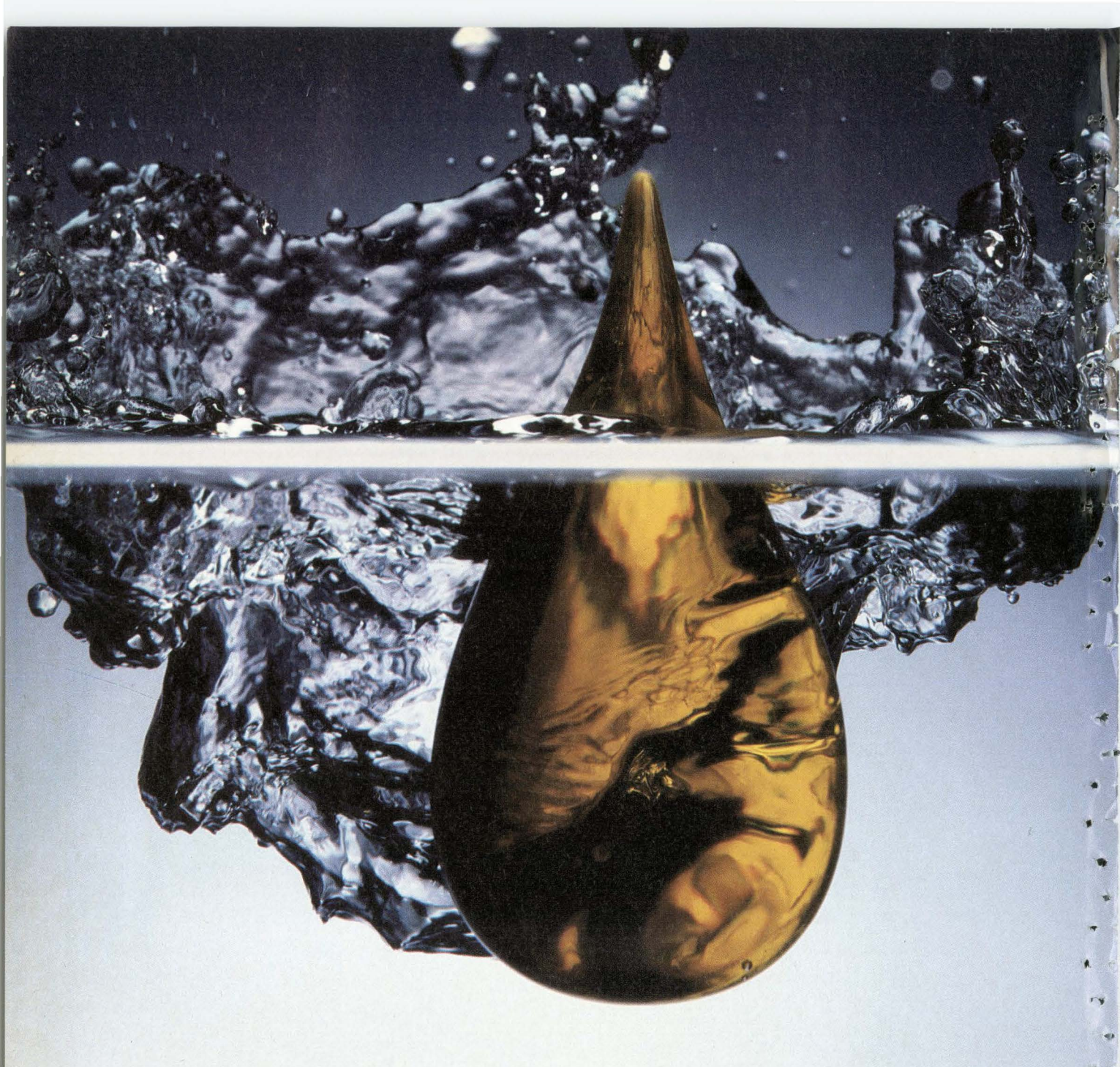
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The Tough Search for Telecom Talent

Searching for telecom talent in the network age is akin to looking for that proverbial needle in a haystack. The demand is there and the dollars too, but the right people with the right telecom skills are not. Some companies desperately seeking datacom specialists are resorting to vendor raids. Others are developing their own telecom teams, pouring time and money into training programs.

BY DAVID STAMPS

In the good ol' days before deregulation, when you needed experts to install and manage your voice communications network, you could simply hire them away from the phone company. Now, it's much more complicated and costly than that, mainly because telecommunications technology is much more complicated. Companies trying to hire and train their own in-house telecom staff are finding the pickings slim and the going rough in the new age of networking.

"Finding people to manage the new types of networks is a big problem," confesses Glen Powers, a senior analyst with Northern Business Information in New York. "There is no pool of experienced operators to hire from."

T1, which has been used by telcos for the last two decades, is a prime example of how a rapidly evolving technology can create a shortage of skilled people. One company that can attest to this

shortage is Westinghouse Electric Corp. in Pittsburgh. The company has backbone T1 connections to 10 nodes that carry both voice and data—anywhere between 56Kbps and 756Kbps—plus a private T1 microwave network in the Pittsburgh area.

"It's a real mix of facilities, including T1 lines from four different carriers, a variety of multiplexors, channel banks, and [AT&T] System 85 switches," explains Tom O'Toole, manager of telecom systems at Westinghouse. "We shop the market for the best deals and then rely on our own staff to engineer the network."

Finding the staff to do that engineering is a real problem, however, one that actually has slowed the implementation of Westinghouse's network. "We began building the network in 1983, and it's not completed yet," reports O'Toole, who goes on to note that "it takes up to six months to implement the data portion of a backbone T1 link."

While equipment delays take up

The Search For Telecom Talent

some of that six months, staff shortages are what really slow things down. "If we had a full staff," O'Toole acknowledges, "we could probably implement a T1 link in a week. But to get all the people we need on board would be long, arduous, and very expensive."

Westinghouse's policy today is to develop its own telecom staff. The company, which hires college graduates with degrees in electrical engineering, spends two years training them, using a combination of outside and vendor seminars plus in-house courses. "Counting training and salary, I'm sure we invest between \$80,000 and \$100,000 in each person," says O'Toole.

The economic burden of training your own data communications personnel becomes apparent when you consider that the average cost of earning an electrical engineering degree is about \$40,000. Companies such as Westinghouse are faced with the prospect of spending at least double that amount just to get a new hire up to speed. And they risk losing that investment if the person is stolen away by another company.

Telecom people are even more coveted if they carry T1 expertise with them, a skill that has been increasingly in demand by companies over the last five years. The rise of T1 has been accompanied by a 150-fold increase in transmission rates, which have shot up to 1.544Mbps from 9.6Kbps. Making the T1 transition from analog to digital applications has been a real headache for many users, who must choose from a confusing assortment of vendor equipment and conditions.

Beginning the Search

Where do you find people experienced in the burgeoning array of T1 gear, configurations, and applications? Not from the phone companies that pioneered T1 technology, that's for sure.

"We've found that people with analog experience can't always make the transition to software and data," declares one technical support manager at a company that builds private T1 networks. "We're happy to talk to early retirees from AT&T or the RBOCS [regional Bell operating companies], but if it's a guy who spent 20 years in a blockhouse, he's probably not going to do us much good."

Companies that need knowledgeable datacom specialists have two options. They can either hire people away from other companies or they can build their own telecom teams. But be forewarned: either route can be expensive.

Despite the steadily increasing need for experienced telecom pros, corporate recruiters say that the raiding rate appears to have slowed down. These headhunters report that telecom professionals are less prone to job-hop today than they were a few years ago.

Shakeouts and mergers among the telecom vendors have freed up some staff. These same shakeouts and mergers have also had a sobering, stabilizing

effect on the telecom market, as have economic slowdowns in the Midwest and the Oil Patch. One corporate recruiter who specializes in computer and telecommunications placements sums up the new mind-set: "The new generation of telecom manager is more security conscious. Acquisitions and mergers have made people nervous."

Management is also nervous about keeping their top telecom people. In the

Solving the Shortage: School's Out

When it comes to solving the shortage in telecom specialists, school's out. And not just for the summer semester, but all year round.

That's the blunt view of some industry pundits who feel that academia is doing too little too slowly about developing telecom talent, talent that can immediately jump into the corporate communications work force upon graduation. What some schools are doing on behalf of the cause is to provide telecom courses. About 40 U.S. universities currently offer telecommunications training of one sort or another.

That's twice as many telecom programs as existed several years ago. But don't let the figures fool you into believing that academia is giving its all to answer the demands of corporate America for more and better-trained telecommunications professionals. In fact, much of this academic effort is actually subsidized by corporations as part of their employee retraining schemes.

Under the University of Colorado's 15-year-old telecommunications program, the oldest in the nation, about 23% of the 135 students are sponsored by their current employers. At Golden Gate University in San Francisco, which offers the largest telecom program (700 students), a full 65% are getting degrees that are funded by an employer. That's 65% of the graduating class that won't be entering the job market.

To make matters worse, there's no consensus on what a university telecom program should cover. Current programs vary widely from school to school: MIT concentrates on technology; Colorado University emphasizes economic and management aspects; George Washington University in Washington, D.C., stresses regulatory policy.

Helping focus these educational efforts is the International Communications Association in Dallas. About 20 schools have collaborated with ICA's academic development committee, which is trying to define the required areas of competency for telecom graduates. Those areas include technology, management, and policy.

Having produced a 70-page document, the ICA committee is still trying to revise its definitions. This tinkering could take a while, predicts one industry representative on the committee, who says the panel has a long way to go before it comes up with a definition of curricula that will satisfy telecom users.

Users can't wait much longer for academia's answer. Phillip Enslow, director of the telecom program under the aegis of the school of information and computer science at Georgia Institute of Technology in Atlanta, declares, "Users are hurting so bad. They are looking for staff who can hit the deck running, who can solve next week's problems next week."

But that's not the purpose of education, as Enslow goes on to explain: "The goal of education is to put together a framework, to give students an understanding of network systems and concepts. The goal of education should also be to educate the teachers of the future. Otherwise, 10 years down the road, we'll be no better off than we are today."

John Morrison, vice president of voice communications at Sears, Roebuck & Co. and chairman of ICA's academic development committee, points out that if universities have not turned out telecom grads in the numbers that industry desires, industry too has its shortcomings. "Users have failed to convey to the university community that they are prepared to elevate the telecommunications manager to a rank where the salary will attract top grads," Morrison says. "Consequently, many of those graduates have gone to vendor companies."

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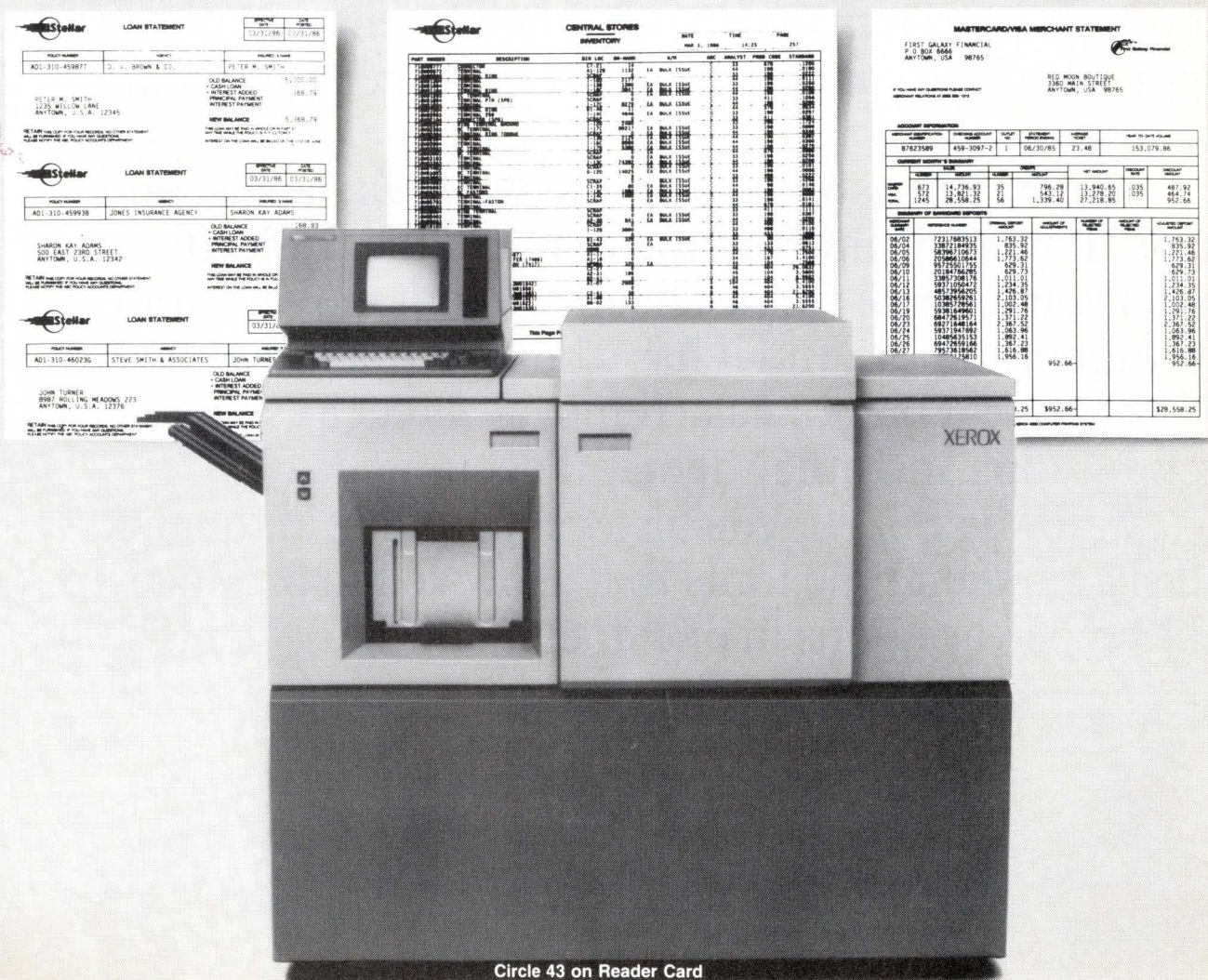
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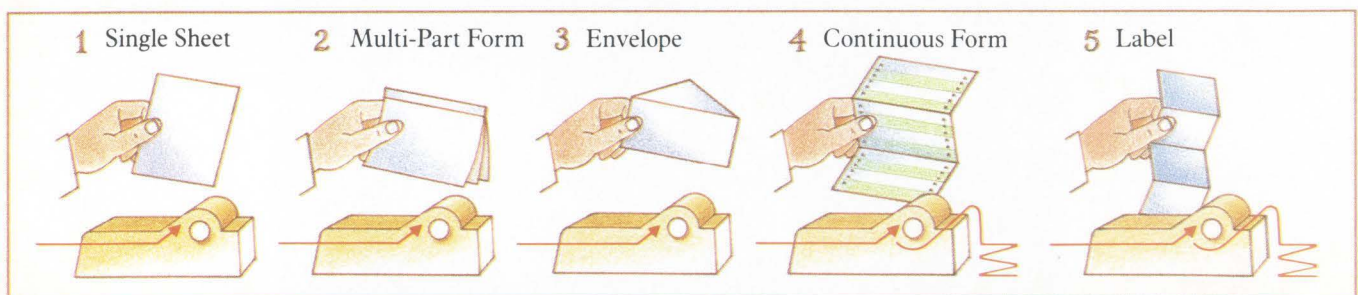


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booming brokerage industry, which is loaded with such talent, job switching is still the name of the game. Competition for qualified staff is not confined to Wall Street, however.

How To Keep Telecom Staff

One telecommunications manager at a major Midwest manufacturer reports scant turnover among his 50-person staff. In a comment that is becoming more common, the telecom manager asked not to be identified for fear that "companies will just try to wine and dine our senior people away from us."

The second way to secure telecom specialists is to build your own staff. Implicit in that building process is training, which can be a costly affair. Just how big an investment are companies making in their telecom personnel? Is the \$80,000 to \$100,000 figure cited by Westinghouse realistic?

Estimates from the American Society of Training and Development (ASTD) in Washington, D.C., indicate that U.S. corporations are pouring a substantial amount of their training funds into telecommunications education courses. According to Nell Eurich, senior consultant at the Academy for Educational Development in New York, that funding comes to a whopping \$60 billion a year, and Eurich sees the total tab for employee training in America going up each year.

According to ASTD's figures, telecom vendor companies are paying a premium to keep their staff up to speed in new communications technologies. The communications industry doles out an average of \$603 per employee per year, more than twice the ASTD corporate average. By ASTD's calculations, the communications industry pays \$1.02 billion a year on employee training.

User companies across a broad spectrum of industries, from banking to retail, are not included in ASTD's numbers. The closest they come to tracking user spending on telecom training is an overall telecommunications expenditure amount tallied by the International Communications Association (ICA) in Dallas. In its 1986 Telecommunications Expense Survey, ICA reported that a total of \$3.2 billion was spent on telecommunications by the 108 user companies that responded to its survey.

While training is not broken down from those totals, ICA manager of educational programs Jim Weinstein suspects "it's a lot of money. The actual amount may be one of those figures that management really doesn't want to know."

Nevertheless, there can be ample payoffs to companies that invest in adding staff, even if it means footing a hefty training bill. Northwestern National Life Insurance Co. (NWN), in Minneapolis, is one firm that has realized gains from adding and training staff. During the past two years, Northwestern National has increased its telecom staff to 32 people from about eight.

The extra staffing was needed to cope with the company's burgeoning voice network and the new phone services it set up for its customers. But the real reason more people power was needed was because NWN wanted to bring maintenance in-house.

As part of that maintenance move, says Sharon Black, NWN's manager of voice communications, Northwestern National hired an early retiree from AT&T and shelled out \$20,000 to send him to a six-week Rolm CBX course. Despite that



THE MAIN OBJECTIVE OF SOME SEMINARS IS TO GARNER CONTRACTS.

expense, NWN will still save money, since it no longer has to pay the \$60-per-hour maintenance fee it had given a local interconnect company.

Not surprisingly, one of the fastest-growing branches of the telecom industry is the training sector. Three-day telecom seminars are making the rounds—and making money along the way. "Five years ago," recalls ICA's Weinstein, "only the ICA and AT&T and a couple of other companies were offering professional development seminars. Now I get about 20 brochures a week from companies purporting to offer some kind of telecom training."

"There's no question that a substantial amount of money is being spent for training at \$500, two-day seminars. And some of it's being spent where the return is questionable," points out James Koerlin, dean of the school of telecommunications management at Golden Gate University in San Francisco. "Some

of the seminars are good. But there are others, taught by consultants, where the principal objective is to underscore how little the attendees know so as to garner consulting contracts."

One indication of how much is going into telecom education is the money that the ICA itself is pouring into telecommunications training. Five years ago, the association's education budget was \$50,000; last year, it handed out \$305,000 to 17 universities that have established telecommunications curricula. The ICA estimates that some 30 universities have set up telecommunications programs of one sort or another.

The actual number of these programs is difficult to nail down because telecom continues to be regarded as something of an orphan among university disciplines, showing up in the engineering school at one university, computer science at another, and in the business school at yet another. Almost nowhere has telecommunications emerged as a separate program or department.

No matter how many graduates such programs produce, one thing is certain. They will have little effect on easing the demand for telecommunications professionals. The ICA estimates that 1,000 students are enrolled in college-level telecom programs. Probably half of those already have jobs, and their tuition is being paid in part or in full by an employer. That leaves only 500 graduates.

So, where do you go to find qualified telecom specialists for your company? The answer to this question, most of the time, is directly to the industry vendors. The biggest demand in the industry today, according to recruiters, is for the electrical engineering graduate who has had three-to-five years of experience and earns a salary in the neighborhood of \$30,000—in other words, the sort of person you find working for an equipment vendor.

But Where To Find Them?

This raises the chicken-and-egg question, where are vendors finding their qualified staff these days? Apparently, there is a round-robin aspect to telecom staffing, confirmed by one leading T1 networking firm that says it gets its personnel from other companies, hiring about half from the vendor side and half from the user side.

No matter where you find them, telecom people with 10 or more years of experience command salaries that generally range between \$30,000 and

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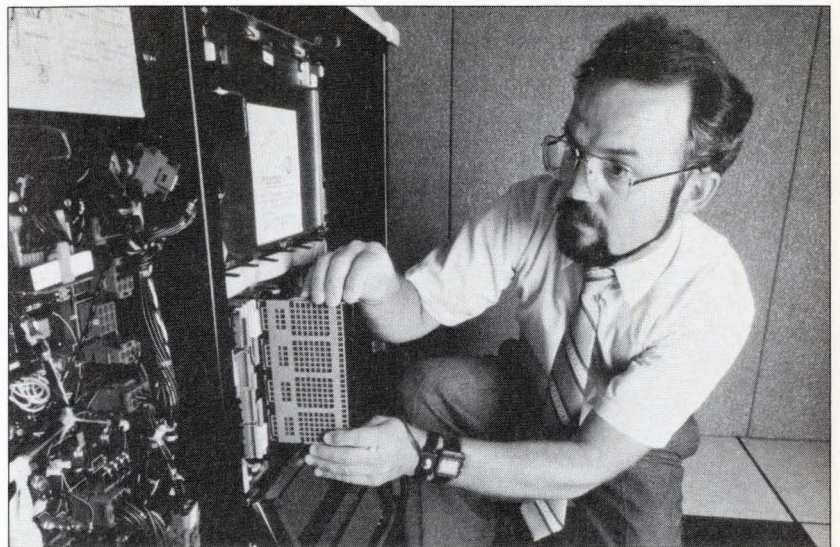
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\$60,000, depending on location (see "What Are You Worth?" Oct. 1, p. 78). The average price being paid for a telecom manager in Houston is \$60,000, while that same position goes for a paltry \$25,000 in Seattle. While the dollars for these jobs vary, the demand doesn't.

"We help support 40 user networks and are installing about one a week. At that growth rate, we have to have people who can be productive within 90 days," says Phil Normington, director of T1 network customer support for DCA/Cohesive Network Corp. (DCA/CNC), Los Gatos, Calif. "That means paying the going rate to get someone with five to 10 years' experience."

Normington vows there's no way that vendors can train people fast enough to satisfy the growing industry demand. Vendors can't even train people fast enough to meet their own needs, let alone the expanding user community. "Last year, we brought on three people who had some general experience," says Normington. "We found we could not train them fast enough to keep ahead of changing technology. We had to abandon

the idea of hiring people with less than five years' experience."

Even though DCA/CNC eschews a grow-your-own approach, it still believes in ongoing educational efforts. The company's technical staff spends roughly 20% of its time on training, according to Normington, who defines training as time spent in the lab or on research. He feels that training is necessitated by technology. "The technology is changing so fast that even our best people need to be retooled once every year."

User companies should continue to invest in training, Normington feels. He sees a need for people to become as network literate as they are computer literate. "Computer literacy among users developed over a 20-year span and it came about as a result of two things," he says. "First, users became more knowledgeable about the technology. Second, user-friendly software obviated, to some extent, the need for them to have in-depth technical expertise."

The software to close the network literacy gap is missing. "It would be great if we had the network management soft-

ware that offered users the same sort of user friendliness they've come to expect from computers," continues Normington. "Unfortunately, it's going to be very difficult to develop those tools, because of the current situation with multiple vendors and conflicting and evolving standards. The network management tools can't come until the standards are set. In the meantime, it's going to fall to the user to have a certain degree of technical sophistication."

And wariness. "Both users and vendors are being held hostage by the new technology and the technicians," declares one Wall Street telecom manager. "We put in a System 85 PBX and the AT&T technicians waltzed us around for weeks on the issue of bridging, telling us the whole time how difficult it was going to be. Well, it turned out that it wasn't that difficult. It was a classic case of the wizards being reluctant to share their knowledge." ■

David Stamps is a Minneapolis-based freelance writer specializing in technology topics.

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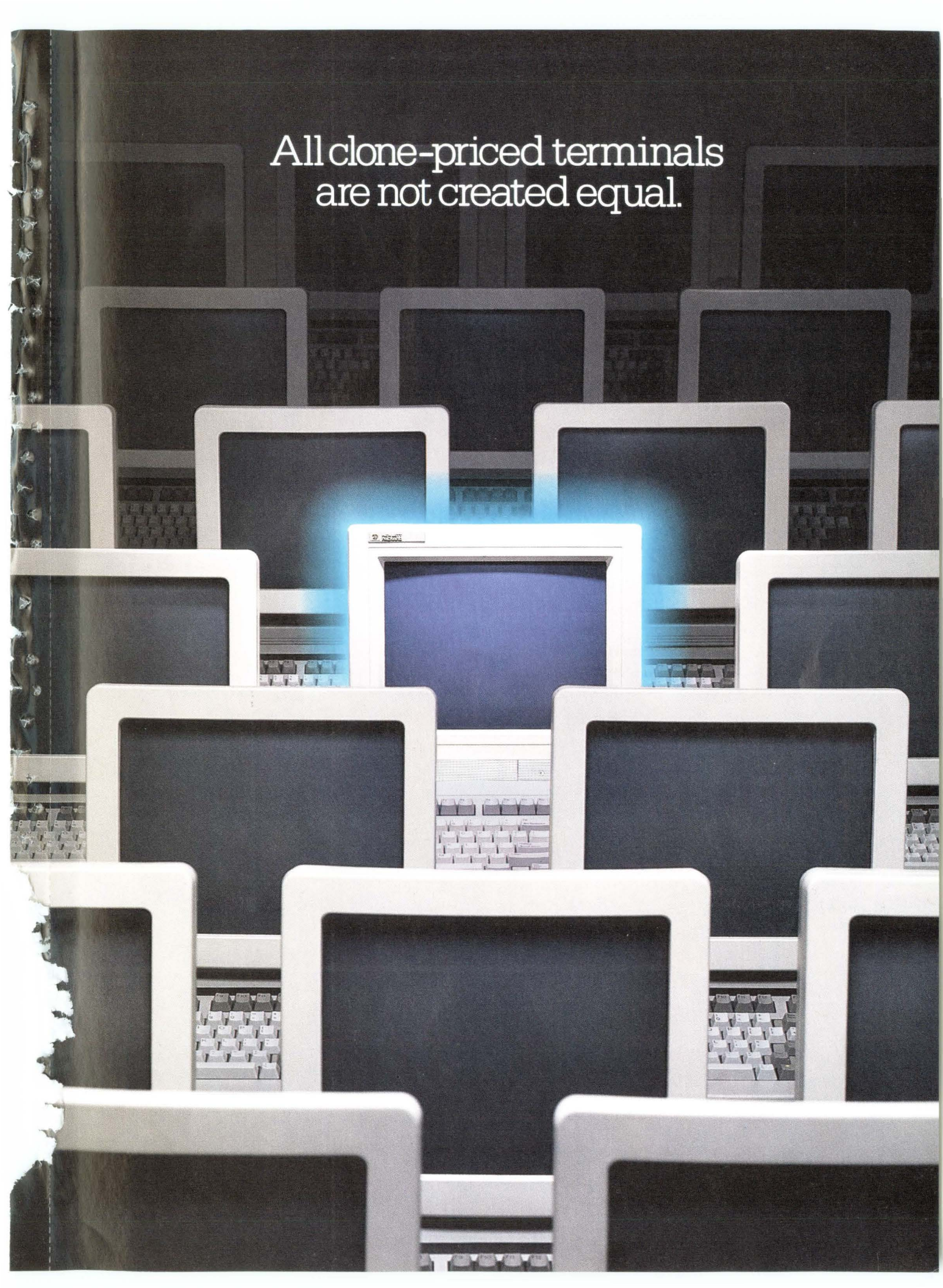
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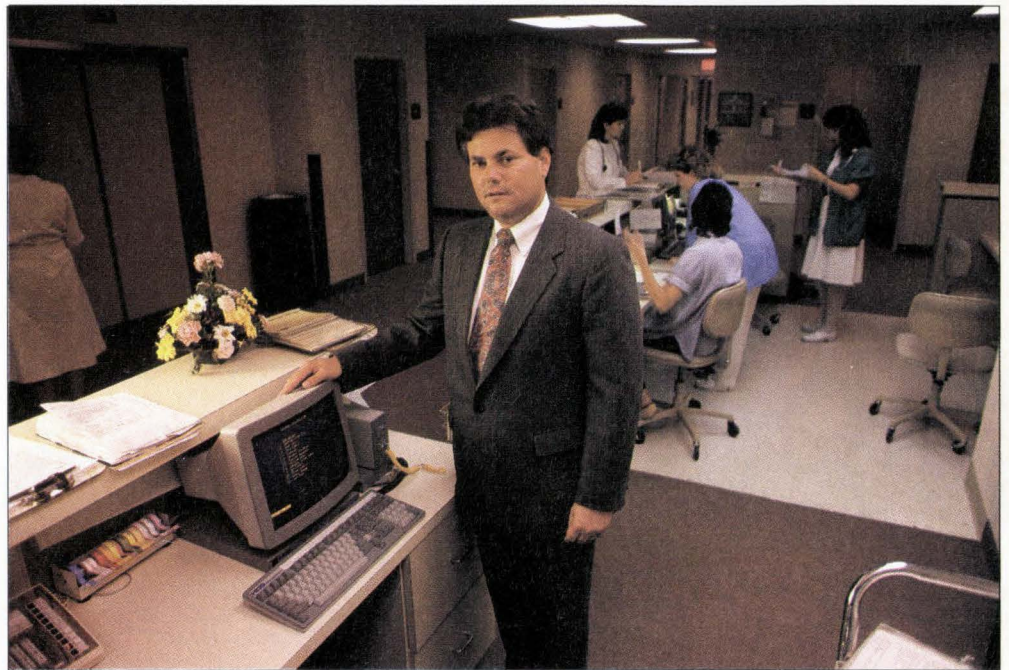
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Private Sector Systems Integration



BY MARY JO FOLEY

To help maintain existing information systems while developing new, state-of-the-art systems, users in the private sector increasingly are adopting the procurement procedures of the federal systems marketplace. General Motors (Detroit), Banc One (Columbus, Ohio), and Humana Inc. (Louisville, Ky.) are among those going the commercial systems integration (CSI) route. They're doing so for a variety of reasons, cost and time savings included.

Private sector users want CSI vendors to provide a wide range of hardware, software, telecommunications products, project management, systems design, integration, implementation, management, and maintenance. Most important, these users are counting on the CSI vendors to "help them pull it all together," explains Stephen McClellan, vp at Merrill Lynch in New York (see "Sorting Out Systems Integration with Stephen McClellan").

Following the federal systems integration (FSI) world's lead, banks, hospitals, railways, insurance companies, and manufacturers are all jumping on the CSI bandwagon. Slowly but surely, the requests for proposals (RFPs) and the con-

tracting and subcontracting teams that are a way of life in today's federal systems marketplace are becoming an integral part of the way Fortune 500 firms are supplying, integrating, and maintaining their IS operations.

So far, the FSI market—with its routine awarding of megacontracts (deals worth \$100 million or more) to well-heeled hardware, software, aerospace and defense, and services firms—dwarfs the CSI realm. Nonetheless, the CSI market was worth \$1.3 billion last year and could reach \$6.5 billion by 1991, according to Input, a Mountain View, Calif., market research firm.

Many of the top players in CSI may sound familiar to those who know the FSI world: IBM, AT&T, Digital Equipment Corp., Electronic Data Systems Corp. (Dallas), Computer Sciences Corp. (El Segundo, Calif.), TRW Inc. (Cleveland), and Boeing Computer Services (Seattle).

HUMANA'S CHAPMAN: A completely automated system never had been done to this extent before.

Private sector companies—such as hospital chains, manufacturing firms, and banks—increasingly are adhering to the procurement practices of the federal systems integration (FSI) marketplace. Users at the American Red Cross, Banc One, and Humana Inc. are seeking commercial systems integration (CSI) vendors to provide hardware, software, information management, and maintenance. Like their government counterparts, these users have been buying equipment for 30 years but still can't do everything they want to, particularly in terms of integration and real-time processing. They're hoping CSI vendors can help them pull it all together.

Private Sector Systems Integration

In addition, says Input analyst Richard Peterson, CSI and FSI "are similar in structure, in the things that happen [such as the bidding and awarding processes], in hardware content, and vendor approach.

"But the formality of the federal market is much more strict. For exam-

competition results in a growing number of requests by management for "faster real-time information on operations to enhance decision-making and to reduce costs," and "near-constant communications among all company divisions." These increased demands mean that large-scale office automation contracts

are prime turf for a CSI approach, as, traditionally, they have been for FSI.

The American Red Cross, for example, selected IBM as prime contractor for an office automation system linking its 190 largest national resource chapters. Commercial customers also are experimenting with CSI solutions in less conventional application areas, ranging from computer integrated manufacturing (CIM) to health care administration to banking/finance to insurance.

Banc One selected Electronic Data Systems Corp. (EDS) to build a new account processing system, which ultimately will replace the bank's process-focused system with one that is customer infor-

mation focused. In mid-1986, EDS won the Banc One contract, worth "dozens of millions," says Banc One's senior vp of operations Michael Elvir.

The project is still in the planning phase. Elvir says the system could be completed by 1989 or 1990. EDS, the ultimate owner of the system, reportedly plans to license it to other financial institutions. Banc One and another "super-regional" banking group, Norwest Bank NA of Minneapolis—which has, in the meantime, joined Banc One in providing

EDS with general banking and customer account processing knowledge—will have free use of the system.

"We felt the project was too big for us to undertake alone," Elvir says. "We considered a bank consortium [approach], but decided there would be too many issues to contend with. We didn't want to be the project managers. It's not that we felt we weren't good at dp, but we're a bank, not a software house."

Banc One chose EDS largely because of its proven track record as a commercial integrator. Elvir explains that EDS "had good experience in large projects, including the government, and had a high degree of self-interest," since they would be the eventual owners of the technology they developed. "They also had deep pockets, and were strong financially," he adds.

Humana Inc., a hospital chain, chose Health Data Sciences Corp. (HDS), San Bernardino, Calif., to develop its extremely complex, second generation hospital-information system. Even though Humana employs an in-house IS staff of nearly 400, a completely automated care delivery system on the scale it envisioned "had never been done in this industry before to this extent," says Richard Chapman, director of IS.

Management wanted to go beyond automating the chain's administrative and financial functions—a task it already had achieved via the Medpro system it purchased from HBO & Co., Atlanta. It then wanted to automate and integrate its entire record-keeping and patient information systems.

Humana began its request for information process in 1982. By 1985, it had narrowed its selection to a handful of vendors, including HBO, Control Data Corp., IBM, and HDS. HDS was chosen because its Ultracare product, while not totally finished, had many of the features that Humana wanted. Claims Chapman, "Had we not gone with HDS, we probably would have had to do it ourselves."

Humana's IS department is writing some of the interface and reporting programs that will link the new system, called Medcom, with Medpro. It also is aiding in the design process and plans to do the entire installation, Chapman says. HDS, a Data General value-added reseller, is providing the superminicomputers, terminals, networking and peripheral equipment, and most of the software, in addition to overseeing the rest of the contract. The completion date for the entire project is planned for either March or April 1988.



RED CROSS'S BLAKE: We don't have to handle the integration ourselves.

ple," he points out, "there are very few sole-source buys in FSI anymore."

Another difference is that RFPs—increasingly required by commercial and federal customers alike—are rarely advertised in the CSI world, whereas FSI bids are open and advertised in advance of the customer's decision date. CSI customers, however, tend to handpick a few top vendors and then issue RFPs.

Private sector customers are seeking integrators, explains Input's Peterson, as increasing domestic and foreign

Sorting Out Systems Integration with Stephen McClellan

In an exclusive DATAMATION interview, computer industry analyst Stephen McClellan outlines the issues in systems integration. McClellan is a vice president in the securities research division of Merrill, Lynch, Pierce, Fenner & Smith Inc., New York, and the author of *The Coming Computer Industry Shakeout: Winners, Losers, and Survivors*, published in 1984 by John Wiley & Sons, New York.

Q: What is driving the commercial systems integration (CSI) market?

McCLELLAN: The CSI market is barely beginning to emerge. The federal market has ballooned. There's a long list of [federal] megacontracts, and it just keeps getting longer. In the commercial market, there have been several smaller contracts—of \$50 million or less—but no purely systems-integration \$100 million-plus contracts yet. The biggest ones mostly have been hardware—the IBM-Ford contract, for example.

Users, I think, are finding they are overhardwarized but undercomputerized. They've bought mainframes and hardware for 30 years, as well as minicomputers, personal computers, and a whole host of peripherals. But they still find they can't do everything they want in terms of integration, management reporting, and real-time processing. So I think [commercial users] are going to turn the same way the federal government did—that is, to these professional data services companies. The demand is really the need to make it all work—to develop communication networks to tie the various, disparate computer equipment together, to develop and buy and put together a lot of different packages.

I think the decision isn't whether to do it in-house or go outside. I think it's whether we do the systems integration at all, or when do we do it. If they do decide to do it, they're going to have to go for outside help, at least if they're going to do it in an encompassing way. It's like database management software. You don't develop and write your own. Maybe you don't use any. But if you do, you go outside. I think it's going to be the same for systems integration.

Q: It seems as if these services are things only large companies can afford. What about midsize or smaller companies?

McCLELLAN: It's like any new market or emerging area. At first, it's the big, big firms that, number one, can afford it, and number two, need it and have the requirements to do it. I think the biggest need is in the Fortune 1000, and that's where the initial biggest demand will be.

A bigger need than that, of course, was in the federal government. The government needed the most work the soonest, and that's why that market emerged first. Corporations are a little more sophisticated and probably a little better at data processing than the federal government.

Within the next couple of years we're going to see several Fortune 500 firms awarding \$100 million contracts to companies like EDS, Computer Sciences, and others. Some of the aerospace/defense companies are players and have some capabilities. IBM's Federal Systems Div. has some new emphasis in this area. If it's a heavily communications-oriented requirement, you may even see AT&T.

Q: Will we see a lot of megacontracts—like the federal contracts worth \$100 million or more—on the commercial side?

McCLELLAN: You'll see contracts for \$40 million or \$50 million to work on a portion of the company's data processing/communications operations. If it works well, it will expand to other portions of the company, with follow-on contracts. There will be a few of those \$100 million ones, but they'll be much slower in coming. In five years, they may end up as megacontracts, but they won't start out that way.



MERRILL LYNCH'S McCLELLAN: Systems integrators can pull it all together.

Q: What are the drawbacks of going through a systems integrator?

McCLELLAN: First of all, there's a certain loss of control. You're entrusting to an outsider pretty vital, critical, lifeblood aspects of a corporation. So, delays, mistakes, or problems are pretty critical. You're really getting married to an important element here when you go outside for a great, sweeping systems integration project. Also, if the commercial market emerges quickly on a scale as big as the federal market has done, I think we'll have a handful of vendors that can supply this kind of systems integration work and which are running the risk of biting off more than they can chew—of winning too much business and getting overcommitted.

I think another risk is too much sweeping change too quickly. You go from the old way of doing data processing—fairly decentralized, fairly off-line—to massive change in 18 months' time—building huge networks, establishing regional centers off-site, running remote utilities. There are plenty of risks there.

Q: How will systems integrators be able to build up expertise in certain vertical areas?

McCLELLAN: I think two thirds of what you do in a systems integration project is transferable to other corporations, especially if it's in, say, manufacturing. So, there will be two thirds standardized, transferable knowledge, and one third customized development work, which, unfortunately, won't be that transferable.

MIS manager buys



Raymond A. Palkovic
Director
Information Management

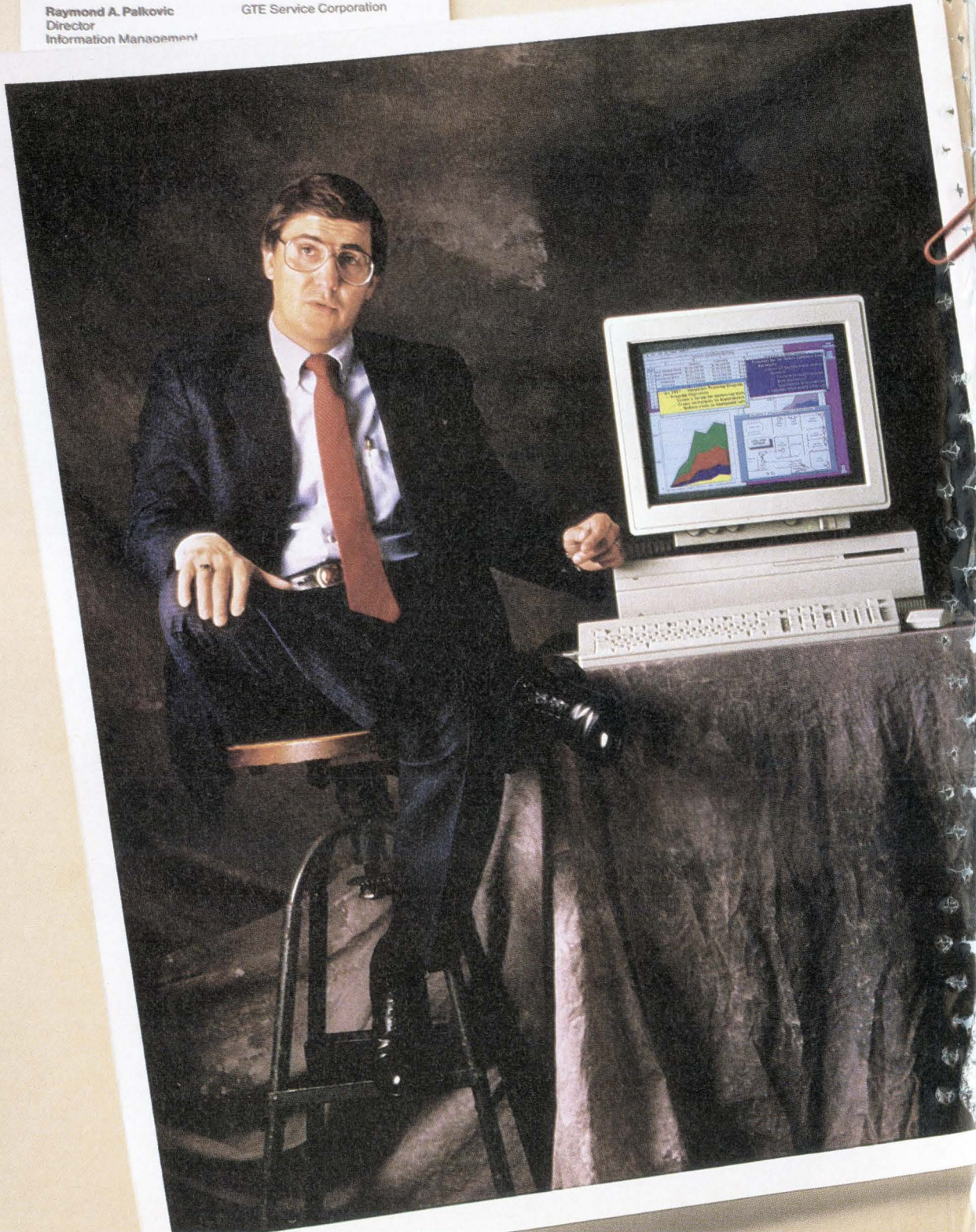
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Private Sector Systems Integration

Hundreds, if not thousands, of other CSI projects are in the works, both inside and outside of the United States. Because of the competitive advantage that customers expect to gain as a result of CSI, relatively few are either willing or able to talk specifics, such as dollar value, terms of the contracts, and target completion dates.

EDS acknowledges that it is engaged in major CSI contracts at General Motors (EDS's parent corporation), K-Mart, Northwest Airlines, Shell Oil in Brazil, Isuzu in Japan, and Lucky GoldStar Group in South Korea. In what could be the first CSI megacontract, EDS is expected to sign a \$100 million (or larger) systems integration deal with a leading, large Japanese industrial firm by the end of 1987, claims Merrill Lynch's McClellan.

Another CSI vendor, Computer Partners Inc., a wholly owned subsidiary of Computer Sciences Corp., counts among its customers AT&T, Morse Shoe Inc., the West German railway system, the British Department of Inland Revenue, and the British Department of Health and Social Security. For these customers, Waltham, Mass.-based Computer Partners is providing consulting and systems development services. These range from the enhancement and maintenance of a complex circuit-provisioning system for network systems planning for AT&T to the integration of freight management systems to help achieve just-in-time delivery for the West German Railways.

IBM Is Well Represented in CSI

IBM—which earlier this year made public its CSI plans—has a lengthy and impressive CSI customer list itself, according to the management and computer consultancy International Technology Group, in Los Altos, Calif. ITG counts Chrysler, Equitable Life, Ford, GM, Texaco, Wells Fargo, United Airlines, and Sears, Roebuck & Co. among IBM's CSI clients.

At least one IBM CSI customer, the American Red Cross, is willing to detail its CSI project.

Primarily, this openness comes because the Red Cross's goal is greater in-house efficiency rather than having to concern itself with any competitive advantage.

According to Charles Blake, vp for corporate management IS, the Red Cross has installed the micro-based LAN system that IBM has devised for the organization at 15 pilot sites. The system consists of IBM PS/2s, XTs, and ATs, Zenith pcs, and other IBM-compatibles linked using IBM's Token Ring networks and Novell Inc.'s



**THE CSI
MARKET
WAS WORTH
\$1.3 BILLION
LAST YEAR.**

Advanced NetWork 286 product. The systems are running a programmable read-only memory version of the Total Office Management integrated word processing, spreadsheet, and electronic mail package. The Red Cross plans to develop "hundreds" of its own customized applications.

Blake is unwilling to disclose the total value of the contract, but he acknowledges that the organization received a discount of between 30% and 38% from IBM. The Red Cross uses the RFP process for all contracts over \$25,000 to prevent alienating any potential corporate donors.

The Red Cross appreciates the simplicity of working with one vendor. "By going through a single company," Blake elaborates, "we don't have to take care of the integration ourselves." Besides, he points out, "we wouldn't have the same clout with the smaller vendors [subcontractors such as Novell] as IBM does."

IBM has a novel approach to the CSI market. It plans to channel its CSI business through one of two organizations: its Federal Systems Div. or its Information Services/ Professional Services organization. If neither option is deemed appropriate, IBM's Customer Sector Organization—which oversees CSI—will designate a preapproved value-added reseller, a marketing assistance program (MAP) participant, or a CSI partner to fulfill a particular contract. IBM is concentrating on applications like CIM, in-house publishing, office automation, image scanning, and branch bank automation.

Arthur Andersen & Co., Chicago, on the other hand, is handling most of its CSI business through CIM experts within its Management Information Consulting Div. The Big Eight accounting firm is targeting vertical niches, like aerospace and defense, electronics, automotive and other repetitive-manufacturing industries, and the process industry. "We're trying to focus on both functional and technical integration," says Roger Willis, a partner at the firm.

Regardless of their marketing and organizational approach, the bottom line for CSI vendors is convincing customers that the potential benefits of employing CSI outweigh the costs and drawbacks. There are risks, Input's Peterson acknowledges. Some multimillion-dollar systems may fail to perform as promised.

Completion target dates may be underestimated by some months or even by years. Customers that do not participate in each step of the CSI process may lose control of their systems, resulting in a substantially curtailed ability to maintain and upgrade them. ■

U.S. Commercial Systems Integration Market Share

COMPANY	1986 SALES (\$ MILLIONS)	PERCENT
IBM*	470	28
Arthur Andersen	220	13
EDS	120	7
AT&T	55	3
Control Data Corp.	50	2
Digital Equipment Corp.	37	2
Computer Sciences Corp.	30	2
TRW Inc.	27	1
Systems Control	12	less than 1
Boeing Computer Services	8	less than 1
Subtotal	1,029	60

*Includes nonfederal sales by IBM's Federal Systems Div.

A frequent contributor to DATAMATION, Mary Jo Foley is a freelance writer based in Washington, D.C.

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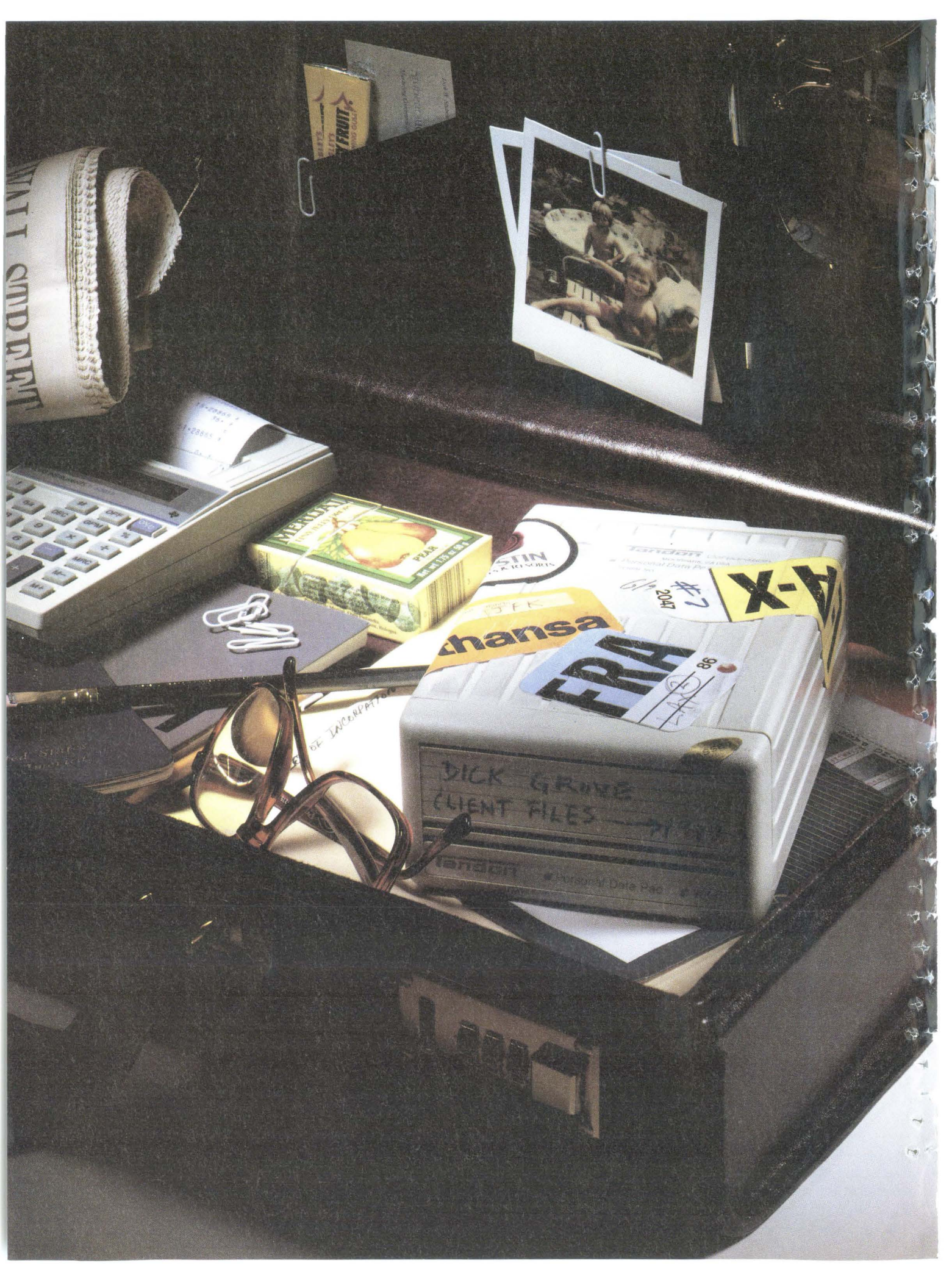
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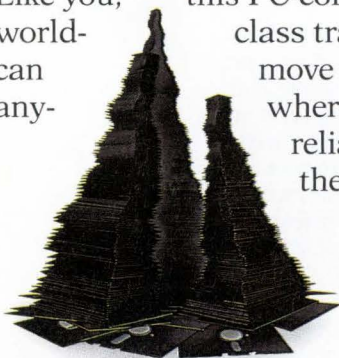
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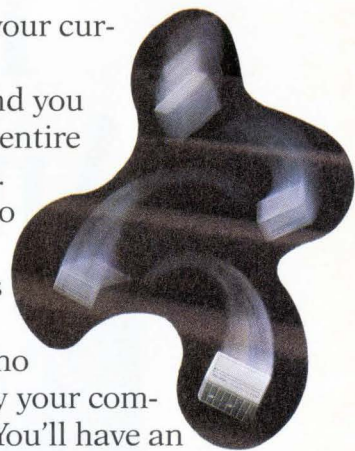
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Information economics goes beyond traditional methods of evaluating information systems projects—usually based loosely on the return-on-investment capital budgeting model. Other nonmonetary dimensions, which may be of considerable long-term value to the firm, are usually ignored by the traditional processes. Using information economics, managers can improve the way they select among IS investment possibilities by evaluating each project's perceived contribution to the corporate or line-of-business goals.

Information Economics: An Introduction



BY MARILYN M. PARKER AND
ROBERT J. BENSON

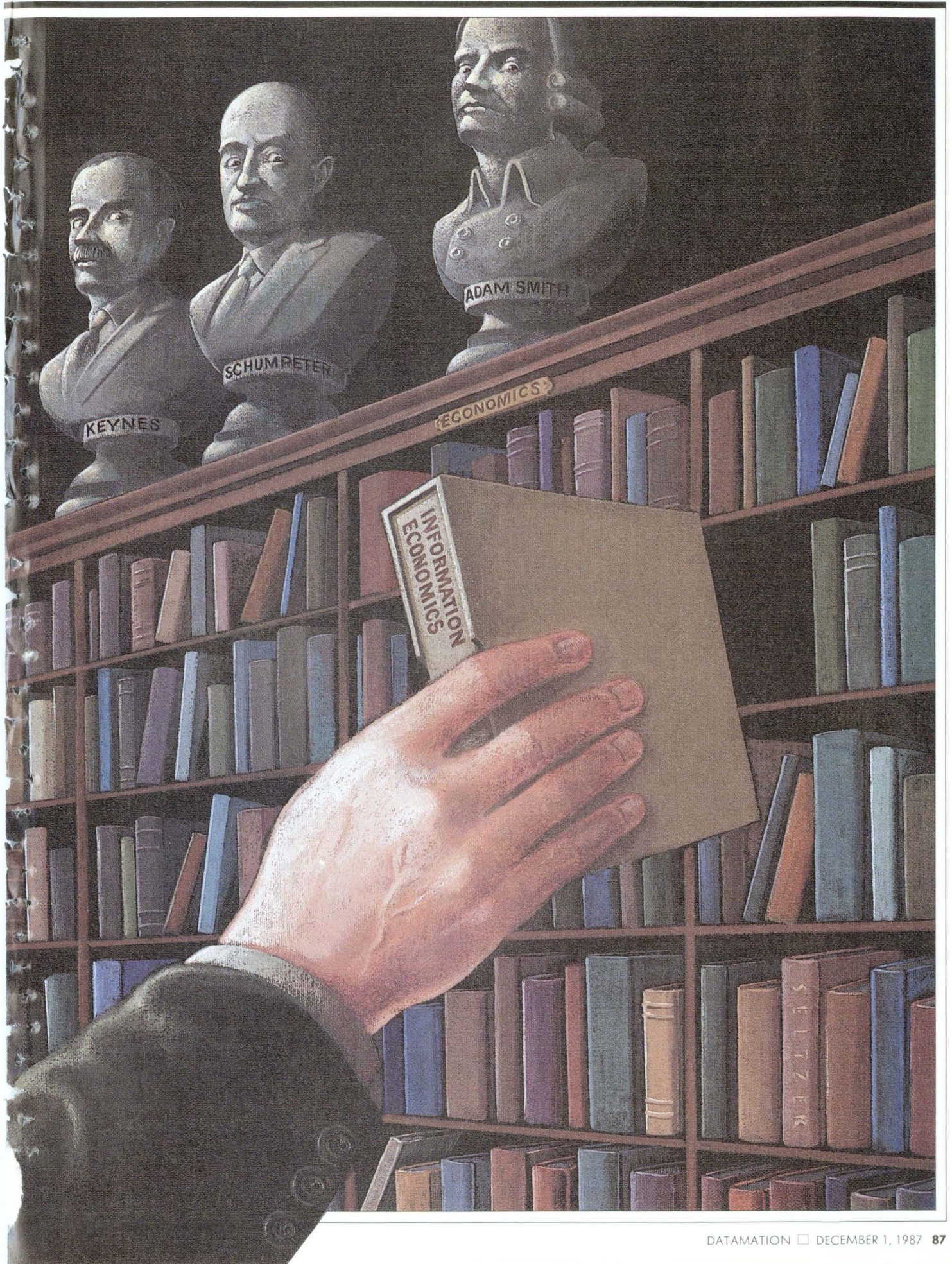
Traditional cost-benefit analysis (CBA) is no longer adequate for most information systems applications that are innovative or that produce or enhance revenue. Nor is CBA completely adequate for justifying long-term investments necessary for developing information architectures and infrastructures. Today's answer is information economics. Information economics works to measure and justify the value of information technology based on business performance. By considering justification separately from technical viability, a more accurate estimate of the economic impact of a project or investment can be determined. The challenge: ensure that proposed information technology applications result in improved business performance.

Information economics uses several financial justification techniques to assess potential information technology applications in calculating simple return-on-investment (ROI) calculations. They include the following: traditional CBA; value linking; value acceleration; value restructuring; and innovation and investment valuation.

Traditional CBA and architecture-based or infrastructure-based CBA fit most easily with the views of financial planners. These forms of CBA support the traditional views of the business domain of capital investment and consumption. Standard cost-benefit analysis is effective when dealing with cost-displacement or cost-avoidance issues. It is useful for supporting tactical plans. The technology manager can apply his or her enterprise's method of justifying long-term capital investment to the architecture-based and infrastructure-based projects. This is successful if technical management knows business strategy, and has an IS strategy, master plan, and blueprint in place to support the firm.

Value linking and value acceleration analysis are techniques to assess costs that enable benefits to be achieved in other departments. This can happen via a ripple effect (value linking), or it can occur by causing benefits to be received more quickly (value acceleration), accelerating a measurable effect on the bottom-line performance of the line of business or enterprise. Both approaches are rooted in economics, rather than business finance.

Value restructuring analysis assumes that because a function exists within an organization, it has some recognized value. Research and development, legal, and



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Information Economics: An Introduction

personnel departments are examples of such departments. They are support functions of the line of business or enterprise. Like value linking and value acceleration analysis, the basis for value restructuring is economic theory. The model assists in estimating the effects of modifying an existing job function. By restructuring employee/department efforts from lower- to higher-value activities, the value of employee/department contribution increases. This technique is useful when direct linkage to bottom-line performance is obscure or not established.

Innovation and investment valuation is applied when the financial issues change from measuring to evaluating and choosing among new, untried, and unproven alternatives. Innovation and investment valuation is useful for new, unprecedented applications of information technology, since it considers the value and benefit of gaining and sustaining competitive advantage, the risk and cost of being first, and the risk and cost of failure.

Financial officers and CEOs show little interest in state-of-the-art information technologies unless they can be convinced that financial performance for the line of business or enterprise will benefit. Information technology must either improve the performance of the current organization (alignment), or improve the outlook for new business opportunities and strategies (impact).

Financial Justification Techniques

There are several financial justification techniques for developing a straightforward ROI for alignment applications. For displacing costs, traditional methods and architecture-based and infrastructure-based investment techniques are best. If costs are not displaced, value linking, value acceleration, and value restructuring techniques are more appropriate.

Simple ROI calculations encompass both alignment and impact applications. Alignment-oriented applications of information technology focus on off-the-shelf software (through functional packages and linked databases), and have limited technical risk. Such applications rely on the ability of the management and technical team to apply proven information technology practices. Impact-oriented applications of information technology—aimed at gaining a competitive advantage—focus on prototypes and custom software. They involve a greater risk, both technically and organizationally, be-

cause success requires innovation and invention.

All of these techniques are used in addition to traditional cost-benefit analysis. Risk, uncertainty, and competitive edge have been included in the ROI calculation. Values beyond simple cost benefits to the business and technology domains have also been measured and included. The sum of these evaluations becomes the means of ranking alternative information systems projects.

The source of these values depends on the character of the business itself. They are not commonly definable in strict fiscal terms. For example, we keep reading about the information economy. Gurus and pundits forecast a new competitive order based on information and information-based services. Information becomes the foundation of competition. Consequently, the basis for planning and justifying information technology proj-



**INFORMATION
SYSTEMS
MUST
IMPROVE
BUSINESS PER-
FORMANCE.**

ects must reflect the new value of information to the business.

Underlying all of this is a current of change. First, we propose that the real benefit of information technology results from a change in the business. Information technology changes products, markets, management styles, and organizational structures. Without change there is no benefit. Second, we propose that the ways in which a company plans and manages its information technology also change, particularly in how decisions are made about priorities and investments in the infrastructure. Finally, we propose that the use of information technology should be directly linked to its impact on business performance. This is the key to information economics, since without a link to business performance, information technology is irrelevant. With it, information technology becomes a powerful tool with which management can improve economic performance and thus

the overall strength and vitality of the organization for which it is responsible.

Information economics expands the traditionally limited view of economic benefits; it shifts the focus to value. A company gains value from information technology in diverse ways. The idea of value—the benefits in cost-benefit analysis—originated with cost reduction. We have expanded the idea of value to include the following six classes:

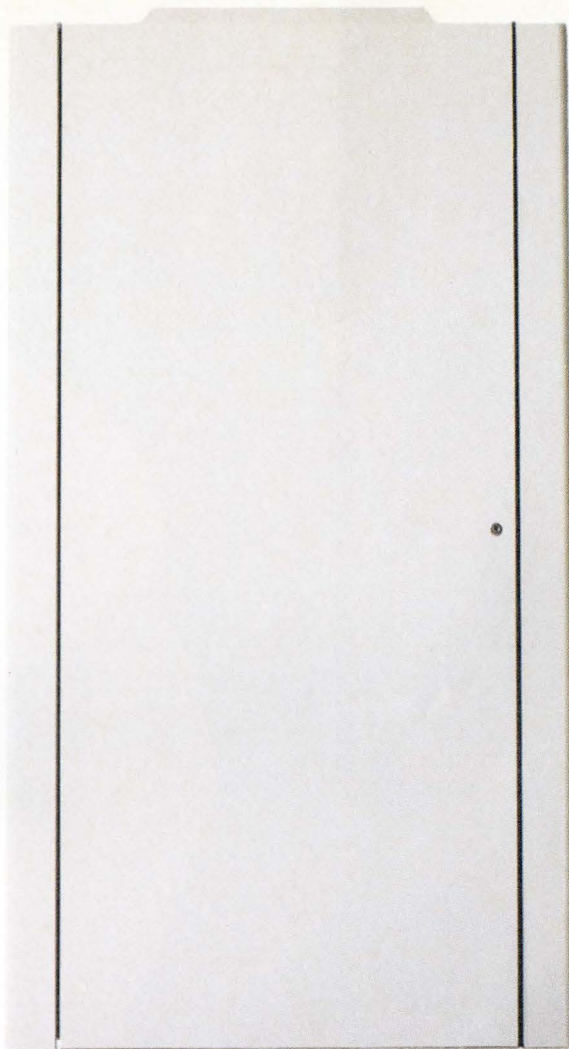
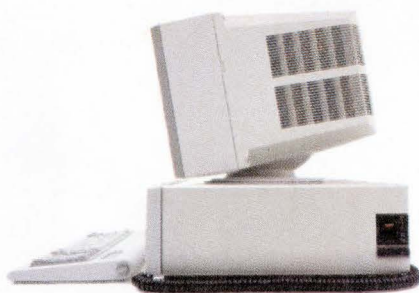
- enhanced views of return on investment,
- strategic match,
- competitive advantage,
- management information,
- competitive response, and
- strategic IS architecture.

In order to provide an enhanced view of return on investment, the commonly used ROI calculation may require special consideration when applied to IS projects. The usual difficulties in carrying out this analysis—for example, choosing an appropriate discount rate and correctly evaluating all relevant investment alternatives—apply with special force to the consideration of such projects as, say, an investment in computer integrated manufacturing. IS projects of this nature typically have a longer useful life than non-IS projects, and provide benefits—better quality, greater flexibility, technological expertise that can be leveraged into other strategic investments for competitive advantage—which a typical capital justification process does not begin to quantify.

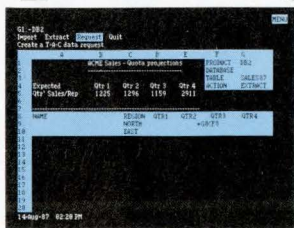
Interorganizational Systems

Furthermore, IS projects are appearing that can extend the concepts of improved operating efficiency and functional effectiveness beyond the boundaries of a single firm. These interorganizational systems are a new phenomenon. Using electronic data interchange between companies, firms integrate their strategic plans. Information economics can identify opportunities for interorganizational systems, viewing the object of analysis as two (or more) organizations instead of one.

Strategic match assesses the degree to which the proposed project corresponds to established corporate and line-of-business strategies and goals. This dimension emphasizes the close relationship between IS planning and corporate planning, and it measures the degree to which a potential project contributes to corporate strategy. For example, a university strategy is based on the recruitment of students. A system that



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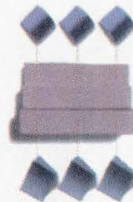
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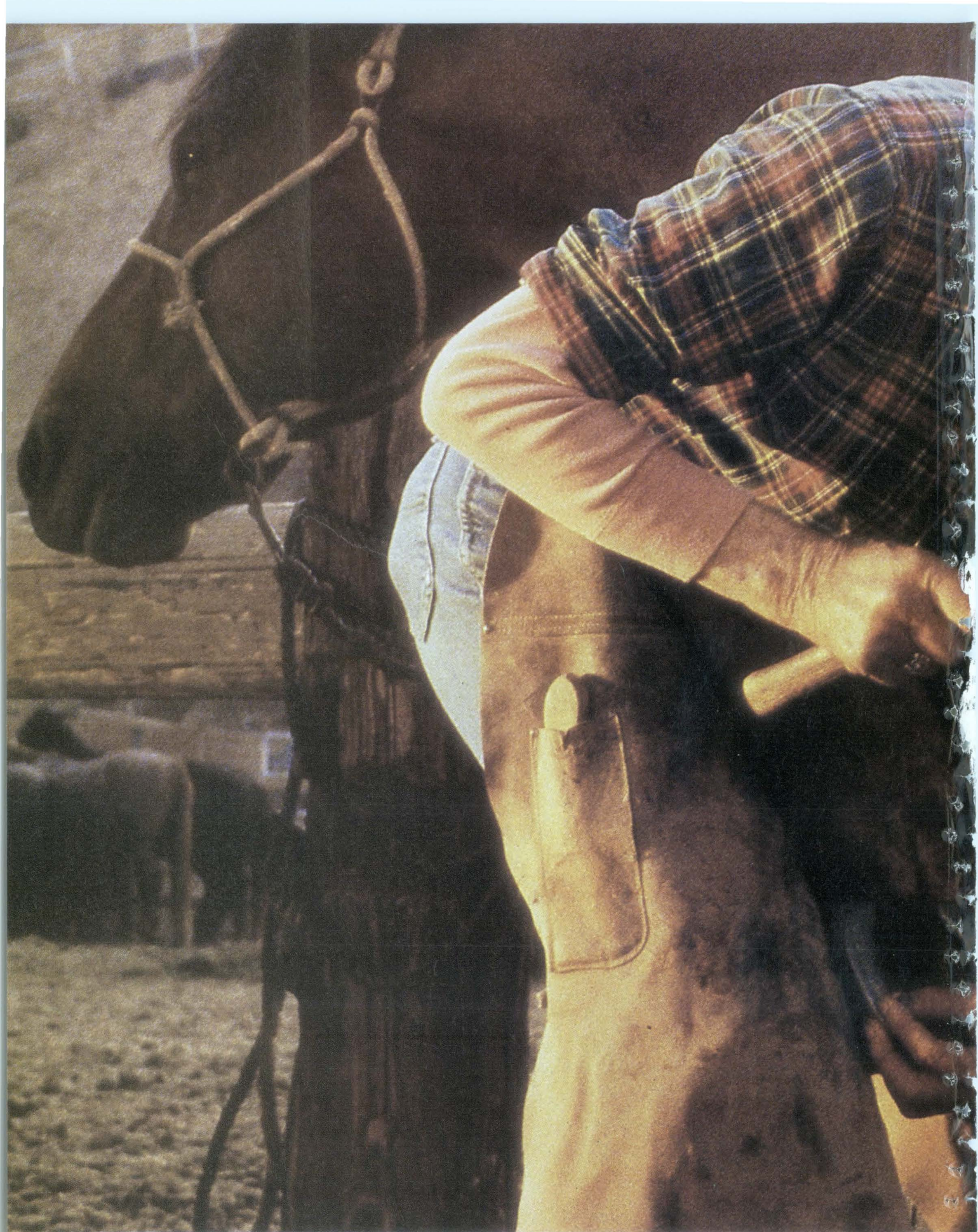
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Information Economics: An Introduction

improves recruitment performance becomes especially valuable.

Projects that form an integral and essential part of the corporate strategy will be assigned a higher strategic matching score than those projects that do not—regardless of the return on investment calculations. Obviously, there are many ways to obtain a favorable ROI. There is, however, a cumulative effect of obtaining the ROI and moving toward a broader corporate purpose. This dimension assesses the value of moving toward that long-term goal (and implicitly requires its existence).

Competitive advantage evaluates the degree to which the proposed project provides an advantage in the marketplace, e.g., interorganizational collaboration through electronic data interchange. In *Competitive Advantage: Creating and Sustaining Superior Performance* (Free Press, New York, 1985), Michael E. Porter identifies three basic goals that a company must achieve if it is to gain a competitive advantage:

- Alter the industry structure: The project must change the degree to which buyers, suppliers, new entrants, and substitutes or rivals influence competition.
- Improve the organization's position in its existing businesses: in general, this is intended to gauge the extent to which a project can differentiate a company's products or services, or change the competitive scope of its business.
- Create new business opportunities: under this heading, there are several ways a project can contribute to competitive advantage, including the sale or use of information as a by-product of the current business and the use of internal information processing capabilities to start a new line of business. Airline reservation systems such as American Airlines' SABRE and United's Apollo are good examples of this kind of value.


The competitive advantage dimension requires that a value be placed on a project's contribution to achieving one or more of these objectives.

Management information is an assessment of a project's contribution to management's need for information on core activities—activities directly involved in the realization of the firm's mission, as distinguished from support and accounting activities. Support functions supply resources to the core activities, e.g., spare parts inventory, truck maintenance, etc. Accounting activities translate the core and support functions into financial terms.

The ability of management to make

informed decisions is important to all companies. Assessing a project's contribution to the core activities of the business requires that the company has identified its critical success factors. A firm whose critical success factor is on-time delivery will use a system that reports daily performance on this factor in order to control its business.

Competitive response evaluates the degree of business risk associated with *not* undertaking the project. Although similar to the concepts of opportunity cost and competitive advantage, this dimension also includes the risk of losing market share that, once lost, may be difficult or even impossible to recover. For instance, the installation of automatic teller machines at one bank forces competing banks to offer the same service. Competitive response looks at the timely implementation of an information



RISK, UNCERTAINTY, AND COMPETITIVE EDGE ARE INCLUDED.

systems project as a possible preemptive move to prevent the competition from gaining a foothold.

Gauging How a Project Fits In

Strategic IS architecture assesses the degree to which the proposed project fits into the overall information systems direction. It assumes the existence of a long-term IS plan—an architecture or blueprint that provides the top-down structure into which future data and systems must fit. A bar code project in a library may be required to enable a variety of other applications systems. Hence its value is derived from its role in the system's architecture.

Each of the six value classes has an underlying basis for its value to the company, and information economics recognizes this value with an appropriate assessment. For example, a truck leasing company obtains new competitive advantage from a system that improves route and service station information

provided to its customers. This system neither reduces costs nor creates revenues, yet it has a significant impact on its customers and hence adds value to the company's competitive position.

When combined, the six value classes provide an appropriate method of assessing the importance of benefits previously classed as intangible. In traditional methods, simple ROI calculations represent an attempt to quantify as much as possible. Nevertheless, simple ROI calculations alone cannot represent all of the factors that management must consider in the investment decision-making process. Value restructuring and value acceleration techniques are a way of quantifying additional benefits. The suggested value categories link all forms of benefits to business performance by measuring the overall impact of information systems.

It is not sufficient to fully define value in order to make the best choices among IS projects. We also need to consider the full dimensions of cost. Just as information economics looks beyond benefits to value, it looks beyond simple costs to risk and uncertainty. Information economics recognizes five classes of risk and uncertainty:

- strategic uncertainty,
- organizational risk,
- IS infrastructure risk,
- definitional uncertainty, and
- technological uncertainty.

Strategic uncertainty is an assessment of the degree to which the business strategy is likely to succeed. That is, information technology projects associated with a risky business strategy are also at risk, a fact to consider in assessing a project's viability. Robotics and flexible manufacturing may reduce costs. Whether a strategy of reduced cost will produce additional business is another question.

Organizational risk is an assessment of the degree to which an information systems project depends on new or untested non-IS corporate or line-of-business skills, management capabilities, or experience. For example, a business unit that installs on-line terminals to interface to its customers runs the risk of lack of acceptance.

While a project may look attractive and the technical skills may be available, an unacceptable level of risk may still be associated with the project if other required skills are missing. This category also focuses on the extent to which the organization is capable of carrying out the changes required by the project, that is, the user/business requirements. This

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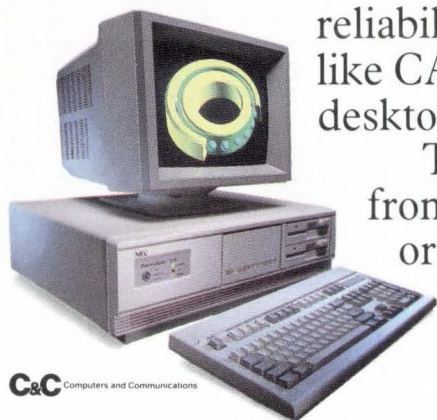
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does not include the technical organization, which will be measured under the category of IS infrastructure.

The measurement of IS infrastructure risk is essentially an environmental assessment, involving such factors as data administration, communications, distributed systems, etc. It measures the degree to which the entire IS organization is both required to support the project and the degree to which it is prepared to do so. A project that requires the support of several functional areas is inherently more complex and difficult to supervise, and it depends on factors that may not be under the direct control of the project manager.

Investing in the IS Architecture

The employment of a relational database as part of the IS strategy to improve performance is an example of investment in the IS architecture. However, the first applications system developed that depends on this database represents significant risk.

Generally, definitional uncertainty evaluates the specificity of the user's or business's objectives that are communicated to the IS project personnel. When the user cannot properly describe a problem, the technology department is hard-pressed to supply an answer. Essentially another measure of risk, this dimension relates a project's potential to reach objectives to the degree to which they can be specified.

Technology uncertainty assesses a project's dependence on new or untried technologies, which may involve a single technology or a combination of new technical skill sets, hardware, or software tools. For example, a mainframe staff designing and building a complex pc application can face major difficulties in implementation. A project may be inherently risky if it requires the introduction of an untried technology.

How do managers successfully choose between alternative investments? The problem is complicated. Some investments improve the infrastructure, e.g., a mainframe computer, personal or departmental computers, a communications network, and database and systems development software. These investments create the environment for many individual application projects, just as a factory and its utility and heating systems provide the infrastructure for the production of a company's product lines. Other investment decisions concern individual projects. Should you install an order-entry system

or a marketing intelligence system? Both infrastructure and application project decisions are ultimately priority decisions—which of the many possibilities are the best and therefore deserve support?

At one level, information economics is a simple collection of computational tools to rank benefits and costs for information technology projects. This is the traditional role of cost-benefit analysis. However, information economics looks beyond CBA to deal with projects that previously have been difficult or impossible to assess, such as those that have strategic impact on the company. Information economics also looks at supply side investment in the infrastructure, e.g., creating the environment.

At another level, information economics is a new conceptualization of the decision-making process. Every pro-



THE REAL
BENEFIT
IS
CHANGE.

posed investment—programmer, application, hardware—should be justified, but every potential investment has unique characteristics. Resource allocation means choosing between alternative investments. For example, should you install a relational database management system, buy the financial reporting system, or hire a pc support professional? The reasons for choosing among alternatives are extremely difficult to determine. Yet managers must regularly make these decisions. Our purpose is to expand the set of economic tools beyond CBA to embrace competitive advantage and infrastructure, while at the same time providing guidance to the decision-making process itself.

Making a Crucial Distinction

Information economics applies a decision framework that separates the business justification for information technology from the technical viability of the proposed application. Conceptually, this is a crucial distinction. Both are necessary, but the assessments and considerations are different and should be

determined separately.

From the business perspective, justification is based on the project's value compared with its cost. This raises two key questions. First, what is the project worth to the business? From the technology viewpoint, viability is based on the resources available compared with the resources needed to provide the services. Second, does the business have the resources to complete the project? The business must be willing to dedicate the level of resources necessary to overcome the identified risks and uncertainties. Separating the two perspectives allows evaluation of information technology values and priorities for the business as distinct from the infrastructure, staff, and facilities required.

New information economics tools help to define value more completely, and, more important, help to create an information economics decision process. The process develops a measure of value and an understanding of costs and potential sources of failure or risk. In addition, the process creates consensus among management groups. The evaluation covers both business feasibility—the value to and the effect upon business performance—and technical viability, including risk identification. By ranking feasibility as it is perceived by each of the affected management groups, information economics helps to develop a consensus and helps enhance each group's awareness of the others' concerns and evaluations.

Information economics provides a powerful tool for analyzing and allocating resources to support business strategies and performance. Information technology is a fundamental force in reshaping the business world. It is crucial that every manager be able to determine the value of information technology to his or her organization. ■

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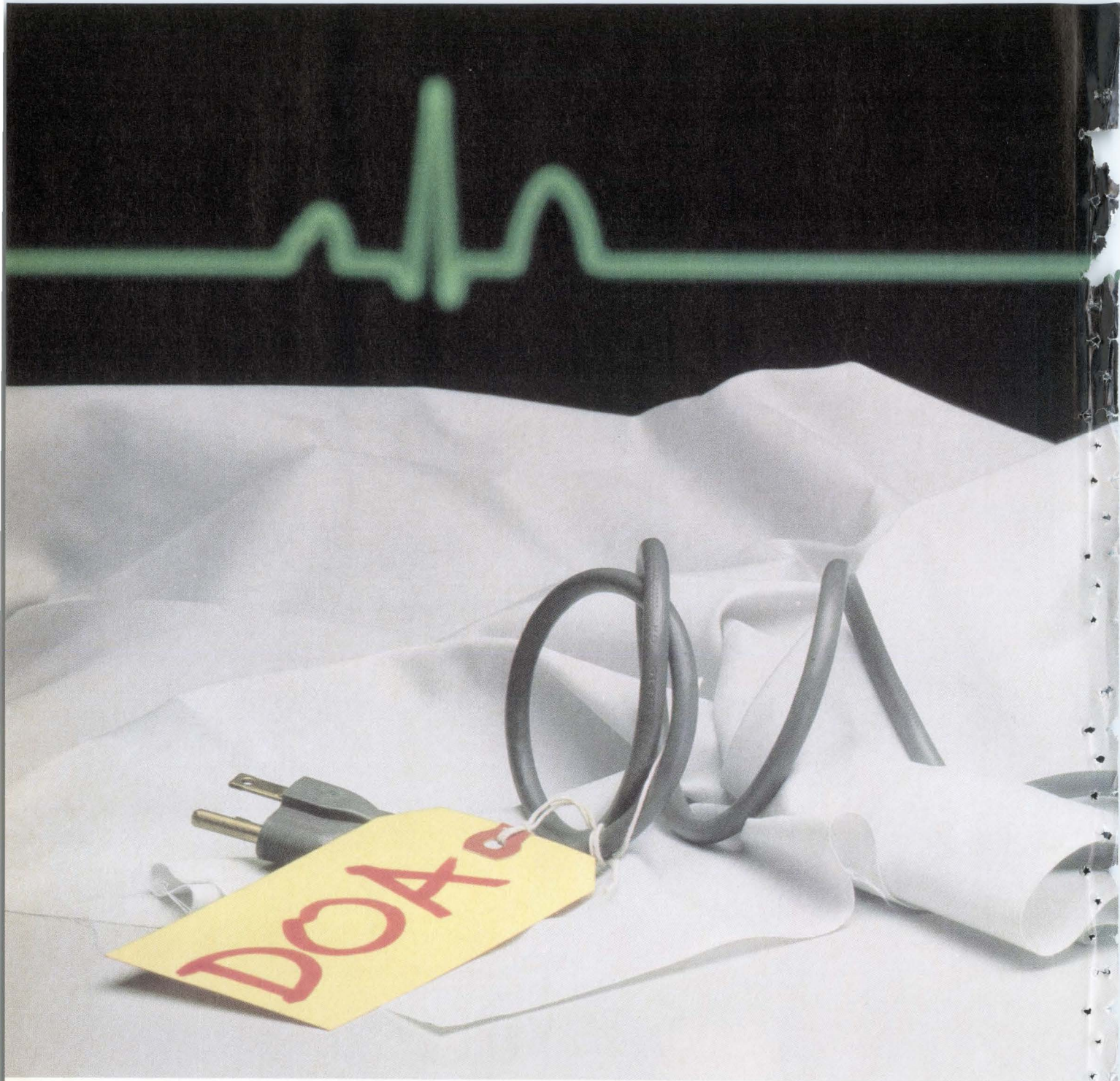
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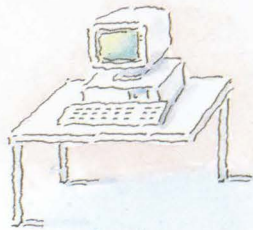
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Prototyping: Orchestrating For Success

BY TOR GUIMARAES

At a multibillion-dollar transportation company, seven end users spent six months and \$250,000 prototyping a 500-program carrier management system. The price was right. The system, which runs on a pc-based local area network, is returning profits by managing 5,000 trucks for two major clients.

A utilities company in the East used prototyping and fourth generation facilities to write 10 major high-volume applications in just two years. The productivity improvement in lines of documented, quality-assured, and user-accepted code written was 13-to-one over what they had ever been able to achieve using COBOL.

Prototyping as an "insurance policy for success" in systems development gained academic favor in the late '70s and early '80s. And as the cases above illustrate, the concept has been proven in practice. After nearly 10 years, the industry is discovering that there are a number of ways to make prototyping music. Not all of them, however, are right.

This was one major conclusion of a field study of 48 Fortune 1000 companies that was conducted by the Business Computer Information Systems Dept. at St. Cloud State University in Minnesota. Interviews with these firms, all of which have committed substantial resources to prototyping, revealed that users are just beginning to understand the best ways to use this systems development tool.



Approaches to prototyping are proliferating, and some of them can yield huge benefits, says a study of 48 Fortune 1000 companies conducted by St. Cloud State University. The narrow view of prototyping as a quick-and-dirty, throwaway development solution is giving way to the long-term orientation of evolutionary prototyping and formal, enforced methodologies, as IS discovers that what is lost in speed can be gained in lasting effectiveness. End users are making their voices heard, and for some firms, the sound is music.

FIGURE 1 Prototyping Ends and Means

BY NUMBER OF FIRMS

OPERATIONAL OBJECTIVES	THROWAWAY PROTOTYPING	KEEP-IT PROTOTYPING
User Interface Development	48	33
Functional Development	48	33
Machine Performance Evaluation	23	26
Application Development	48	31

PROTOTYPING TOOLS	QUICK-AND-DIRTY	FORMAL, ENFORCED METHODOLOGY
End-user 4GLs	32	16
IS 4GLs	13	14
Autocode Generators	3	13
Embedded 4GLs	2	7

Increasingly, IS departments are employing a variety of approaches to prototyping, for a variety of reasons (see "Prototypes and Their Purposes" and Figure 1). Our study found that firms generally practice one or more of eight different forms of prototyping. Two basic approaches—throwaway (i.e., the information is kept, but the coding is junked) or keep-it prototyping (the prototype is kept and maintained in a traditional manner)—are employed for four fundamental purposes:

- to define the user interface,
- to define the process or functional requirements,
- to model complex design configuration alternatives, and
- to develop a full-blown application.

It is rare that a company will limit itself to only one approach, although there are those with a very narrow view of prototyping. In such firms, it is often the case that politically powerful systems development groups with well-established development methodologies insist that prototyping is solely a vehicle for systems requirements definition, and that all such prototypes are to be thrown out and redeveloped through traditional means, despite the fact that enormous amounts of labor and money are sacrificed in the process.

Quick-and-dirty prototyping with no formal methodology is also creating trouble at some companies. Problems arise with this approach because undocumented prototypes that were intended to be thrown away are kept, and become the poorly planned bases for large, complex

systems that are consequently difficult to use and maintain.

Another prototyping problem these firms have encountered is that all too often the end user has been left out of the equation. Prototyping is an iterative process for developing systems that first and foremost must involve and be controlled by the end user. And they've forgotten that it may take a few iterations to get it done right.

There are several apparent reasons for these prototyping problems: lack of awareness of alternative approaches to prototyping, a limited set of prototyping tools and personnel, lack of management support for prototyping experimentation, or systems developers who are unwilling to change or to try new ways.

As Figure 1 indicates, all 48 companies use the throwaway approach for most purposes. But why do they practice such an expensive and inefficient policy? Many insist that prototypes are a quick way of establishing information requirements and are not an integral part of systems development, which should be done with tried-and-true methodologies that are oriented to quality and care.

Away with Throwaways

Consider the fact that an end user or programmer spends anywhere from a few hours to a few hundred hours developing a prototype. He or she then passes it along to the systems development group, which extracts the information on user requirements, tosses out the code, and sits down to do development the traditional way. The wastefulness is clear.

The prototyping practice of one Chicago bank provides a good measure of throwaway losses. End users spent an average of 250 hours developing each throwaway prototype (primarily requirements definition) for a group of six large applications. They then invested an average of 45 hours more per prototype on working with systems developers to add other procedures. The systems development group itself expended between 75 and 225 hours repeating what had already been done in the prototype. Thus, the bank supported efforts that were between 30% and 90% redundant.

Through careful planning and discipline, prototypes can be integrated into the development process. The utility company in our example would not have been able to develop 10 major applications in two years with the throwaway approach. Teams of end users and systems developers evolved the major applications through multiple iterations. They planned and prepared to evolve the prototypes into final, documented, quality-assured programs. This cooperative, disciplined effort ensured that end-user requirements were defined and met, and all tenets of good systems development were followed.

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EQUATION.**

Very few situations technically justify throwaways. In most cases, the reasons for throwaways are due to basic underlying problems with computing in the organization, such as lack of integration of systems development resources, lack of cooperation between prototypers and traditional systems development groups, lack of training and support for prototypers, or incompatible software packages and development languages (e.g., the end-user prototype is done in Lotus 1-2-3, but the application is part of a mainframe system).

Despite the prevalence of quick-and-dirty, throwaway work, the study showed that a growing number of companies are doing keep-it prototyping (ap-

proximately two thirds of this group) and many are adopting formal, enforced methodologies for prototyping (approximately one third). More and more IS managers are learning to integrate prototyping effectively into their systems development life cycle (SDLC) methodology. It's not an easy process to adopt, requiring trade-offs between prototyping's fast approach to development and the long-term orientation of most SDLC methodologies.

Managers are also employing evolutionary prototyping for applications development. With this comprehensive method, the whole system—user interfaces, processing functions, error control and handling, documentation, etc.—is developed through prototyping and is cut over to operations as any system would be.

Prototyping proponents who thought the method would do away with documentation, project management, and the systems development life cycle itself are beginning to realize that just the opposite is true. But when systems development groups are too firmly entrenched in their old methodologies, change is more difficult. The transportation company mentioned earlier had a successful prototyping project, but it was an end-user project; IS people weren't involved. In fact, the firm's IS organization isn't using prototyping at all and two poles are developing: conservative IS and liberated end users.

The company was fortunate in that the seven end users developing its carrier management system were "paraprofessionals," proficient in the software tools they needed (dBase III for user interfaces and FORTRAN for process requirements) and aware of the quality and documentation requirements. They have in fact become a second MIS group within the company.

Prototyping Made Easier

A wide variety of software development tools have contributed to effective prototyping. These tools may be classified under four basic types: fourth generation languages for end users (such as Focus, RAMIS, AS, and Nomad), fourth generation languages for information systems professionals (such as ADS/Online, Ideal, Mantis, and Natural), automatic code generation facilities, and embedded language facilities.

While the end-user facilities are easier to learn and much less procedural, their nonprocedural nature may ultimately restrict programming flexibility

Prototypes and Their Purposes

One of the most common reasons for prototyping is to provide a vehicle for more effectively defining systems information requirements. In the planning stage, many projects allow for a clear separation of the user interface (screens, reports, etc.) from the functions necessary to input data or to produce the data items for the screens and reports. Because of this, many companies develop prototypes to define the user interfaces for the system—which is called user interface development (UID) prototyping—or to define the processing or functional requirements—which is called functional development (FD) prototyping. Or they may develop prototypes with combined objectives.

The "silly empty shell" problem is one commonly associated with UID prototyping. For an end user, this means that a system's impressive-looking user interface lacks the processing needed to support it. Coordinating the completion of UID prototypes and their corresponding functions must be timed carefully to minimize this problem.

Provided this coordination is achieved, the major advantage of UID prototyping is that while end users or information center personnel are working on the user interface, IS professionals can be developing the functions concurrently. Thus, development is speeded up and people are deployed doing what they do best.

In FD prototyping, actual processing is done, producing information. The primary risk associated with this type of prototyping is that a prototype originally intended as a throwaway, quick-and-dirty solution is retained—often because of the will of a powerful user manager—and becomes the basis of a large, complex system that is expensive to operate and maintain. Such systems may contain incorrect algorithms and may process invalid data, with little provision for backup and recovery.

In situations where systems developers are unable to see through complex design alternatives, building a prototype to model particular design configurations can be a great advantage. The primary objective of this type of prototyping—machine performance evaluation (MPE)—is the determination of response times and/or memory requirements associated with various design alternatives that involve different numbers of files, file sizes, transaction processing approaches, physical database designs, or communications volume.

One of the few cases where throwaways are justifiable is MPE prototyping. It is less expensive to model the specific design aspects that are problematic than to develop alternative versions of the system. In MPE prototyping, the model is likely to be so incomplete that it will be discarded after the problem is resolved.

Applications development prototyping encompasses the user interfaces, the functions, and, in some cases, all other elements necessary to produce a full-blown system. In applications development, often a particular application cannot be easily decomposed into user interfaces and functional components. The prototypes for such applications actually represent combinations of the UID, FD, and MPE prototypes. In addition to employing applications development prototypes for large, monolithic applications, prototypes for small systems also tend to be developed in this fashion, since there is little benefit to breaking down small systems into components.

for systems developers. In addition, systems produced by means of these facilities are likely to be relatively slow at execution time and may cause severe response-time deterioration for other systems. But as we have seen, end-user participation in systems development is critical, and the limitations inherent in end-user tools must be complemented by other facilities.

Fourth generation facilities for IS professionals are not likely to be user friendly, but they provide much more programming flexibility and permit a great deal of intimacy with the machine.

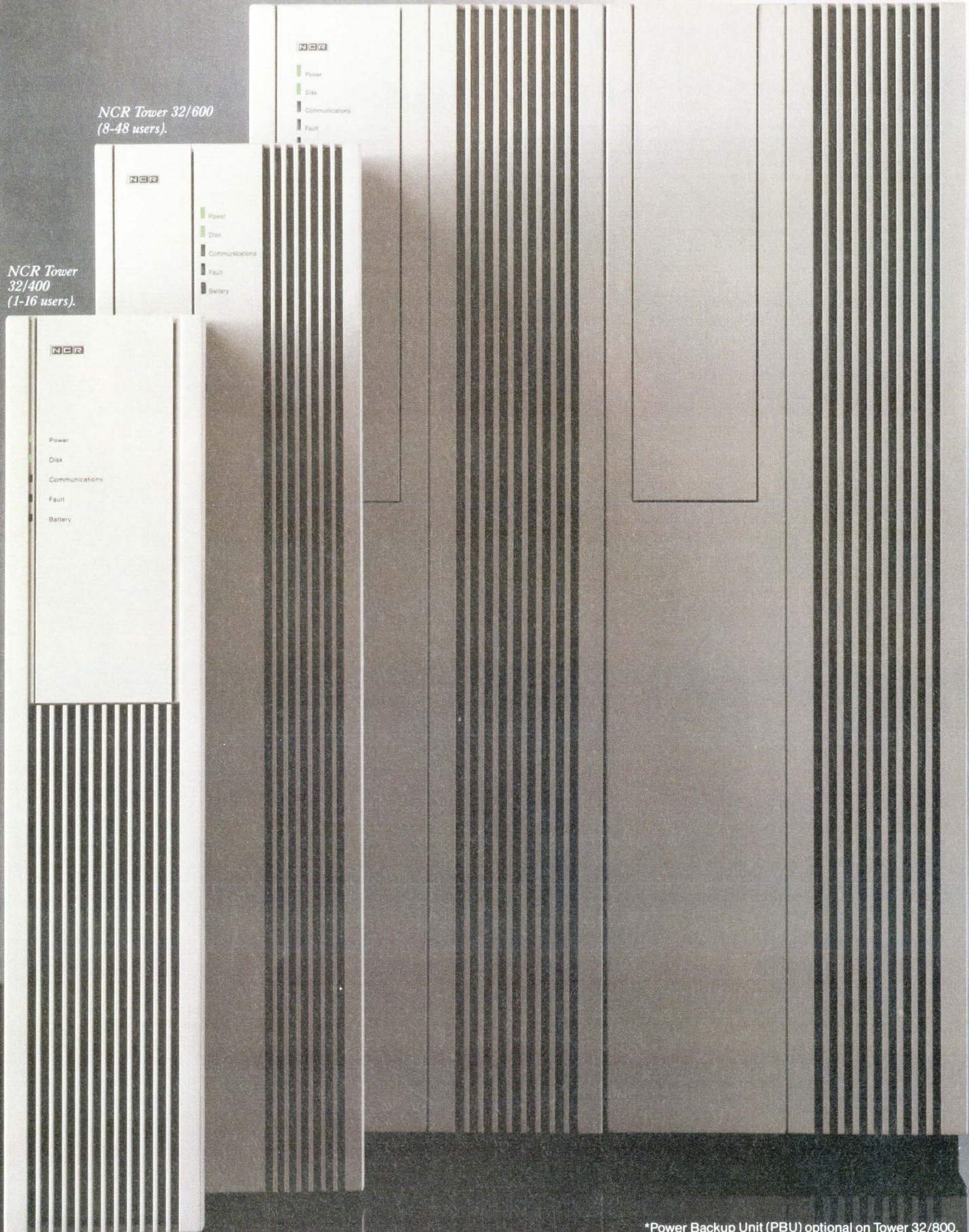
This intimacy is an important feature in the development of prototypes that are to be kept and executed often, thus making machine performance a major consideration. While some companies have trained end users in the use of these facilities for specific tasks such as screen painting and report generation, they are primarily used by IS personnel.

Automatic code generation facilities for COBOL or other third generation languages are exclusively in the domain of the IS pro. While they are valuable for rewriting some of the vast number of applications done in COBOL or for applications

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Prototyping: Orchestrating for Success

where coding represents a substantial part of the development effort, they are not useful for new prototype versions when requirements are unstable. Since automatic code generators need detailed systems design information to produce code, translating these shifting requirements into detailed design specifications becomes a cumbersome task.

Embedded 4GL facilities are also tools for IS professionals. These tools enhance programming flexibility by embedding nonprocedural or semiprocedural 4GL statements in 3GL programs. For applications that are developed using substantial amounts of 3GL programming, however, systems development productivity usually suffers with this approach compared with what can be achieved through exclusive use of IS fourth generation facilities.

While our study found that firms are employing a variety of fourth generation facilities for prototyping, end-user and IS

END-USER PARTICIPATION IN PROTOTYPING IS CRITICAL.

fourth generation facilities—when they are properly matched to the application at hand—are the most common, as well as the most effective, prototyping tools.

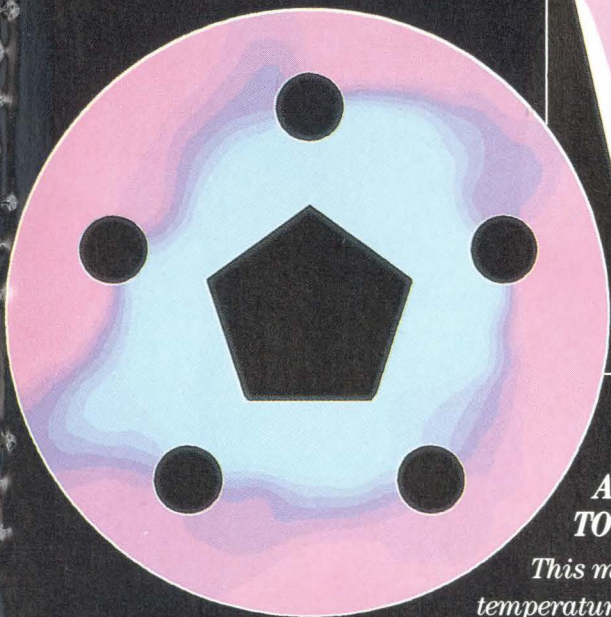
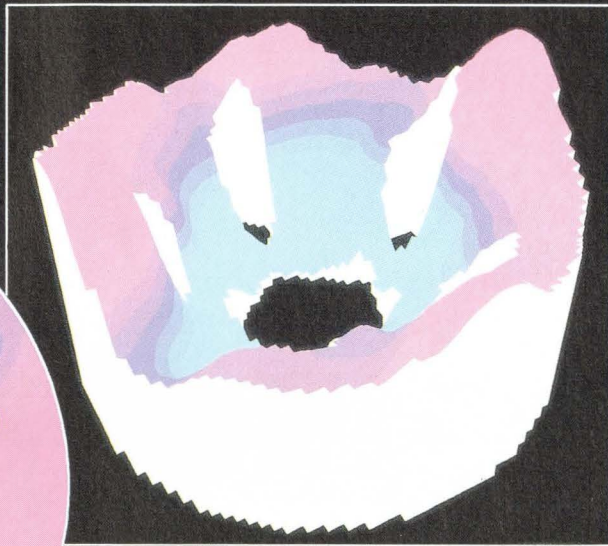
But beyond the right complement of tools, the firms achieving the greatest prototyping success are those that are discovering the right complement of end user and IS professional cooperation. The key to the utility company's success was to have teams of end users and developers working together closely.

Unfortunately, such consonance is still the exception, not the rule. But as the richness of the prototyping concept unfolds, more IS players will trade their johnny-one-note, throwaway tunes for harmonies with end users. The orchestrations invariably create more effective systems. ■

Tor Guimaraes is professor of MIS and chairman of the Business Computer Information Systems Dept. at St. Cloud State University in Minnesota.

CIRCLE 68 ON READER CARD

TAKE THE BRAKES OFF YOUR ENGINEERING DATA



**UNIRAS GRAPHICS SOFTWARE
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ACCURACY AND IMPACT YOU REQUIRE
TO MAKE DECISIONS FASTER.**

This materials testing application maps the temperature distribution across a brake disk.

UNIRAS software was used to interpolate, contour and display the data in two and three dimensions.

UNIRAS' graphics range from simple monochromatic XY plots to complex 3D and 4D color shaded models. For presentations, or as a permanent record, any display can be hard copied in the form of high quality plots, overheads and slides.

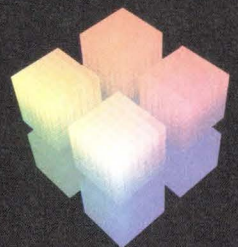
UNIRAS makes its software available in two forms to benefit different user groups. Interactive, user-friendly packages enable non-specialists to apply the extensive facilities quickly and easily, while the wide range of subroutines provide the professional programmer with an impressive choice of tools for integrating color graphics with new and existing applications.

UNIRAS software runs on most mainframes, minicomputers and workstations, plus the IBM PC/AT. It supports the many graphics terminals and hardcopy devices at work on over 1,000 computers worldwide.

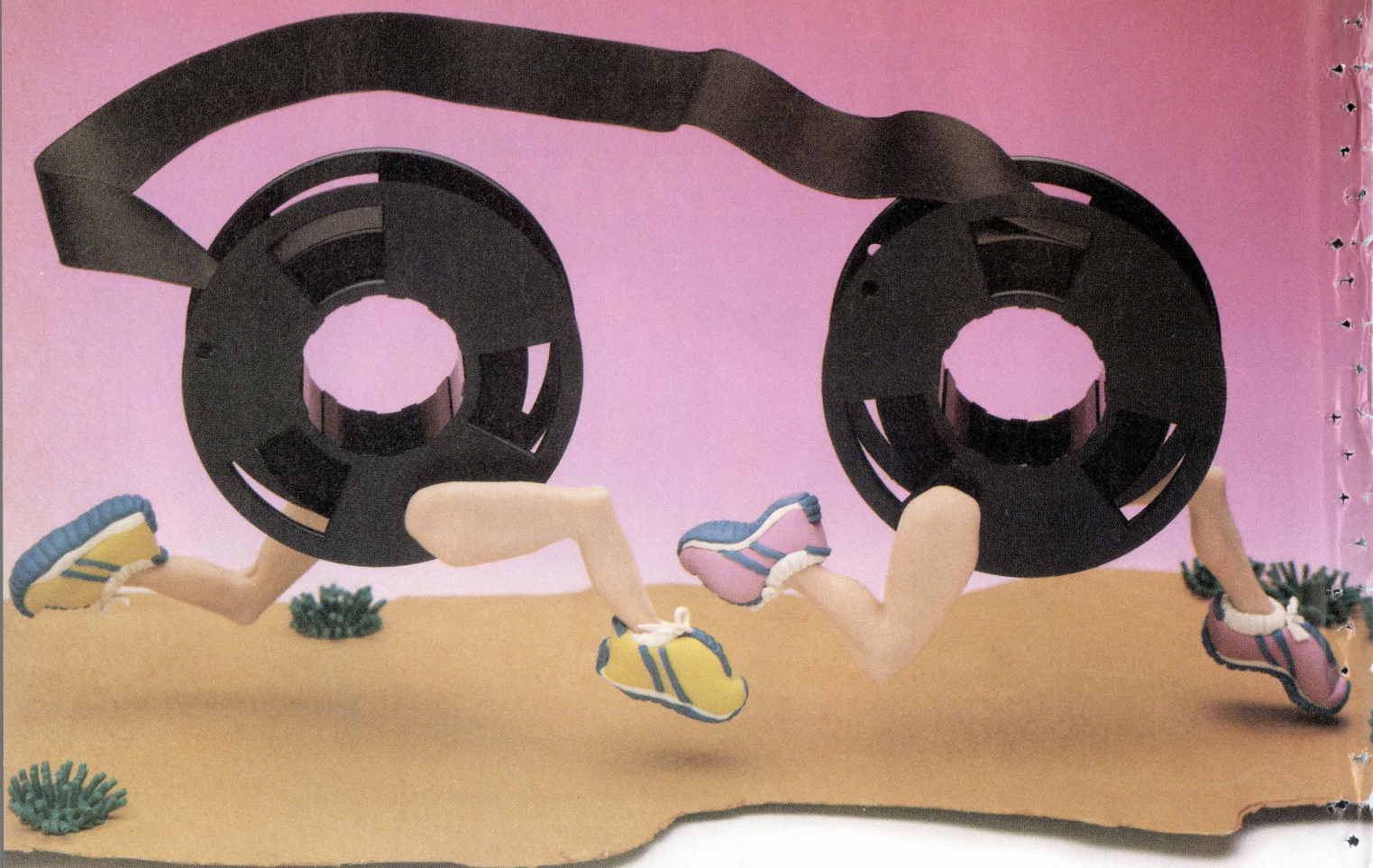
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Circle 59 on Reader Card



UNIRAS

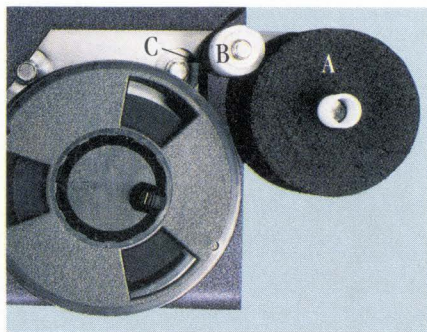


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Real Time

OFF-LINE

AN MS/DOS MAINFRAME COMPUTER has been announced by Data/Voice Solutions Corp. (DVSC), Newport Beach, Calif. The Centaur II Mainframe is an MS/DOS-compatible, multiuser, multiprocessor computer that uses the Novell NetWare operating system.

DVSC, which was founded in early 1985, develops and markets "computing networks" that integrate computers and communications systems, including PBXs, ASCII terminals, and cabling installations. DVSC's first product, Centaur I, which was introduced in mid-1985, is a multiuser MS/DOS system for small work groups. DVSC says it has been installed in 150 corporate sites.

The new Centaur II is being offered in two configurations—as a mainframe and as a minicomputer. Both configurations are based on a parallel processor architecture. The mainframe version contains up to 100 applications processors, each of which, says DVSC, is a complete "pc on a card." The mini version incorporates up to 14 processors. The Centaur family works with standard ASCII terminals and turns each user's terminal into a fully functional MS/DOS workstation. The attached terminals use the microprocessors on board the applications processors to run MS/DOS programs. Terminals can be wired directly to the processors with standard telephone wiring or via a voice/data PBX, which controls access to the processors on the basis of dynamic port contention, says DVSC.

IBM PCs, PS/2s, and compatibles can be tied to the Centaur by way of Novell-compatible LAN hardware or through the ASCII terminal's emulation software via the PC's serial port. Each system includes a file processor, peripheral controller cards, up to six floppy and/or hard disk drives for up to 1.8GB of storage, and streaming-tape backup systems. The applications processors communicate with each other and the file processor via a PC-compatible parallel bus.

The Centaur II Mainframe, in a typical configuration of 40 users, is priced at about \$50,000. Fully configured, the price is \$185,000. The mini is priced between \$25,000 and \$60,000.

Late last year, DVSC formed an alliance with Gandalf Technologies Inc., Ottawa, which markets data PBXs. Gandalf will distribute the Centaur line and jointly develop new products with DVSC.

If you'd like additional information on products covered in this issue's Off-line, please circle 301 on the readers' service card.

HARDWARE



Tolerant Boosts Throughput of Eternity Series

New machine is available with 4MB, 8MB, or 12MB of memory.

BY THERESA BARRY

Tolerant Systems Inc. has introduced the P300 System Building Block (SBB), the newest member of its Eternity Series of Unix-based fault tolerant systems. Along with the machine, Tolerant also announced the P440 System Interconnect Bus. The company says it hopes to expand beyond its traditional niche of on-line transaction processing and will be marketing its systems as data communications tools as well.

The P300 SBB (SBB is Tolerant's term for cpu) uses the National Semiconductor 32332 VLSI 32-bit microprocessor, whereas the previous machine, the P200, used the 32032. This, claims Tolerant, gives the new machine more than twice the throughput capability of its predecessor. The system, which is available now, can be configured with 4MB, 8MB, or 12MB of main memory and one or two I/O channels. Prices range between \$64,250 and \$98,850. An upgrade kit for the P200

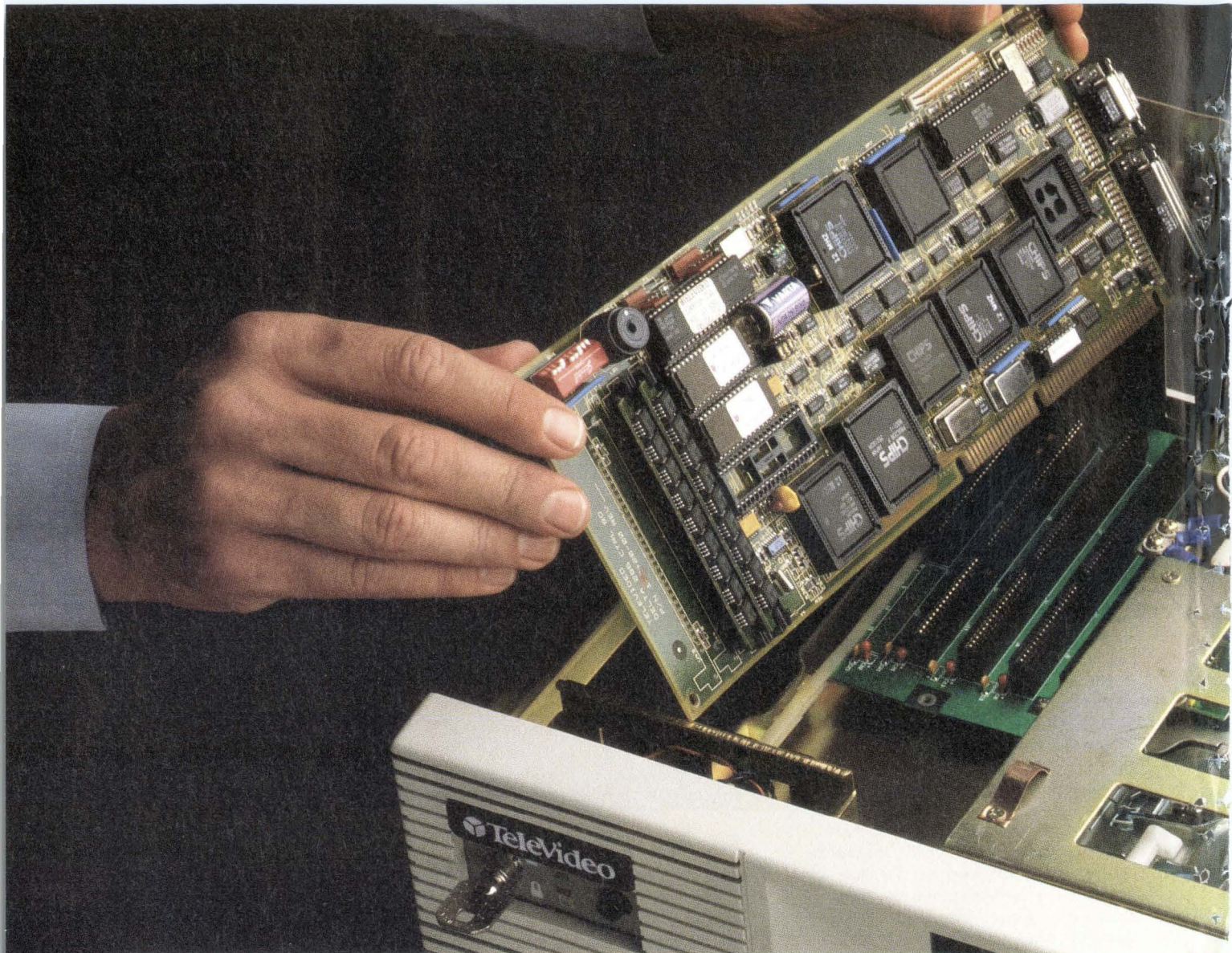
costs \$20,000. Tolerant will continue to manufacture the P200; its P100 has been discontinued.

The new P440 System Interconnect Bus (SIB) links multiple SBBs in a loosely coupled system. Tolerant says it provides twice the bandwidth of the existing P400 SIB. Based on Ethernet, the P440 manages all application-generated messages among SBBs. The bus operates at 2.5Mbps and can handle up to 4,000 messages per second. Four data paths each provide a speed of 1.25Mbps. The P440 SIB, which is priced at \$10,900, is available now. TOLERANT SYSTEMS INC., San Jose. **CIRCLE 250**

Communications Processor

Telestream offers a 1.28Gbps parallel computer to oems.

The Bitstream Processing System 128 from Telestream Corp. is a parallel computer that provides 1.28 gigabits per second of data throughput and up to 160MIPS



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TeloAS/I has a passive back plane with 4 board slots. It accepts 8088 or 80286 boards in a low-profile case with a small footprint that fits anywhere. Use it as a LAN diskless workstation. Or, if you configure it with an

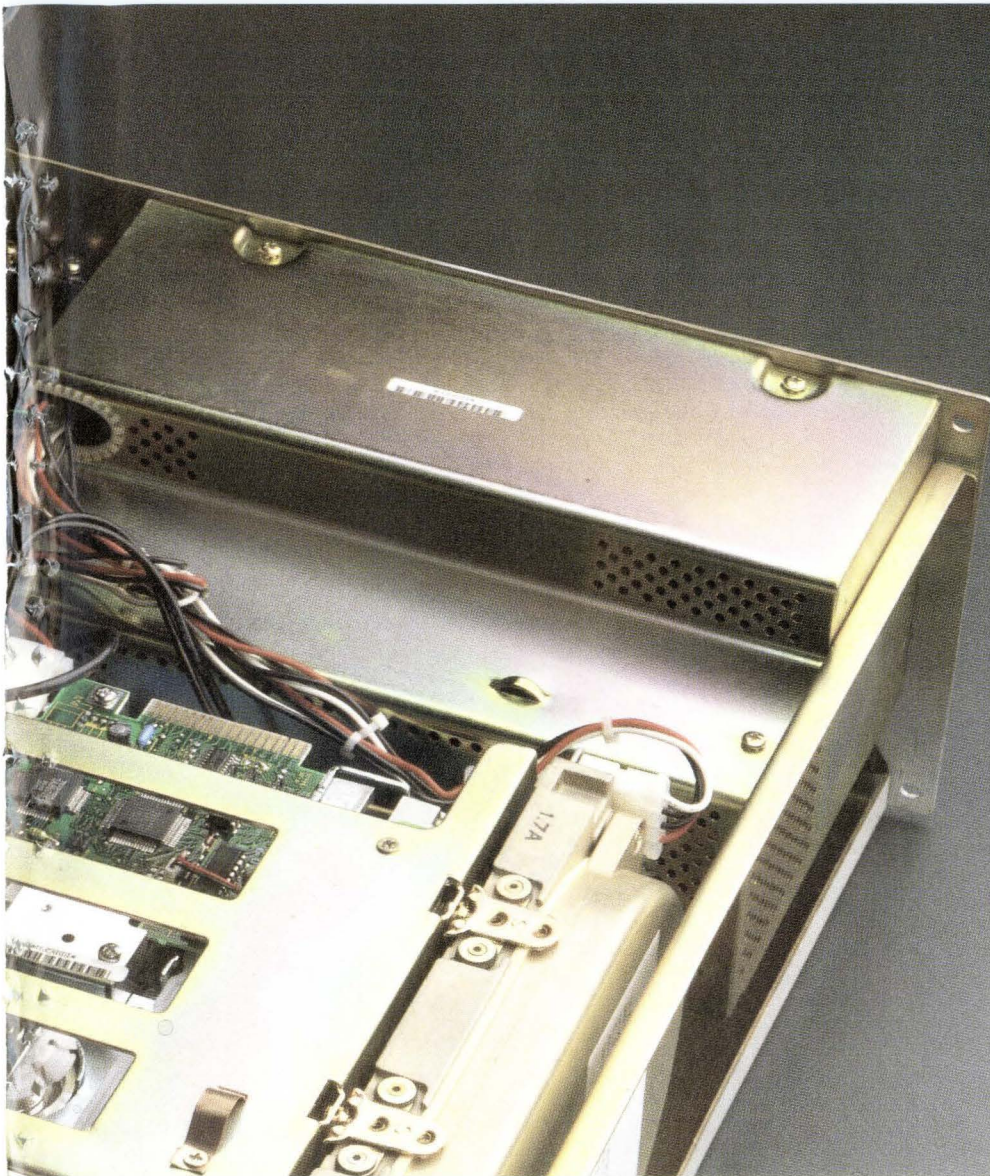
8088 board, floppy disk drives, a 14" monitor and keyboard, you have an IBM® PC/XT™ compatible pc.

TeloAS/II.

TeloAS/II has 5 board slots for 3 half-height drives and accepts either the 8088, 80286 or 80386 boards. You can configure it as a 386 with a high resolution monochrome monitor, hard disk and streaming tape drives, and Microport DOSMerge® 386 software and have a small-footprint workstation that runs both MS-DOS and UNIX System V.3.

TeloAS/III.

TeloAS/III has 8 board slots, room for 4 full-height and half-height drives,



Kinds Of Possibilities.

and is suitable for either the 80286 or 80386 boards. One of your many options is to configure it as a 386 and add an EGA standard color monitor, 80387 math co-processor, optical mouse, a hard disk and the right software to get a powerful 386 engineering workstation. It's also the right size for a LAN file server or multi-user host system.

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Real Time

of bitstream processing, according to the company. Telestream is offering the product to oems and systems integrators as a communications processor for designing network products, such as protocol converters, multiplexors, and ISDN gateways.

The parallel computer consists of up to 16 processors, each with 10MIPS of bitstream processing, interconnected by the 1.28Gbps, synchronous Telestream Bus. Each communications line operates at up to 160Mbps. Circuit switched and packet switched traffic are carried simultaneously. Single unit pricing of the BPS/128 ranges between \$15,000 and \$50,000, depending on the processor configuration.

Telestream is also offering the BPS/128 Development System, which is a set of tools for design, coding, testing, and integrating application-specific software for the BPS/128. It runs on Sun workstations and is priced between \$40,000 and \$50,000. TELESTREAM CORP., Mountain View, Calif. CIRCLE 251

386-Based Portables

Compaq, Toshiba offer 20MHz, 16MHz portable computers.

Both Compaq and Toshiba have introduced Intel 80386-based portable computers. Compaq is offering two models, both with 20MHz 80383 microprocessors, and Toshiba is providing PS/2 compatibility.

The Compaq Portable 386, models 40 and 100, incorporate a 20MHz 386 microprocessor; up to 10MB of 32-bit RAM; 40MB (model 40) or 100MB (model 100) of shock-mounted fixed disk storage; a 5¼-inch, 1.2MB diskette drive; an optional 120MHz 80387 coprocessor; and an op-



tional expansion unit with two 8-bit/16-bit expansion slots. Also included are a dual-mode gas plasma display, a full-size detachable Compaq portable enhanced keyboard, an optional 40MB fixed disk drive backup, an expansion unit, and an

optional 1,200-baud or 2,400-baud Hayes-compatible internal modem. The dual-mode adjustable plasma display has a high-resolution, 640 by 400 graphics mode, and a 640 by 400 text mode.

The Model 40 weighs 20 pounds and is priced at \$7,999. The Model 100 weighs 21 pounds and is priced at \$9,999. Both of the portables operate with MS/DOS version 3.2 or higher. Compaq will include Microsoft Windows/386 with each Portable 386, Deskpro 386/20, and Deskpro 386 shipped through the end of the year. COMPAQ COMPUTER CORP., Houston. CIRCLE 252

Toshiba's T5100, which will be available next month, features a 16MHz 80386 microprocessor and 80387 coprocessor socket, 2MB of RAM, and a



40MB hard disk. Toshiba says it's fully compatible with the PS/2's 1.44MB diskette drive. An optional 2MB memory card can be used as Lotus/Intel/Microsoft expanded memory, extended RAM, or a combination of both, the company says.

A built-in EGA with a high-resolution gas plasma display and EGA monitor port is featured. The screen supports four grey scales and has 640 by 400 bit-mapped graphics and 80 by 25 line text with adjustable contrast and brightness controls. Weighing in at 15 pounds, the T5100 also has an 82-key keyboard with an embedded numeric keypad and dedicated cursor control keys. Slots are available for an optional interface card (\$199), for a five-card IBM-compatible expansion Chassis (\$999), or an optional 1,200bps Hayes-compatible modem card (\$399). Peripheral interfaces for a parallel print-

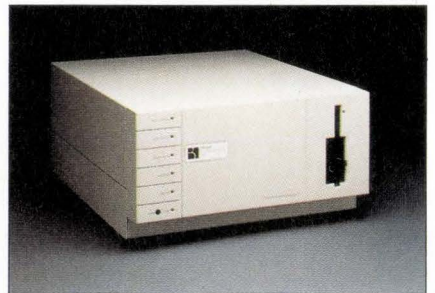
er, 5¼-inch diskette drive, and RS232C serial device are standard.

Included with the T5100, which is priced at \$6,499, are MS/DOS 3.2 and Lotus Metro, a desktop manager. TOSHIBA AMERICA INC. Irvine, Calif. CIRCLE 253

OSI Protocol

Bridge introduces LAN communications server adhering to ISO OSI.

Bridge Communications Inc. has unveiled the Communications Server/1-OSI (CS/1-OSI), a LAN network communications server that implements the ISO OSI protocol standard. Bridge says it is




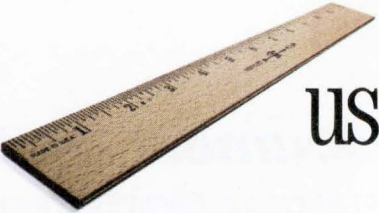





the first in a planned family of OSI products.

The CS/1-OSI is a modular processor running Bridge's internally developed implementation of the seven-layer OSI protocol specification. Bridge says it connects up to 64 terminals, micros, printers, host ports, and modems to a LAN, and it networks any combination of asynchronous, bit- and character-synchronous, and IBM 3270 Category A or compatible devices. The OSI Virtual Terminal Protocol (layer 7) provides the connection to terminals and other devices on the network. Bridge says this permits distributed access to any networked host computers that implement this protocol.

CS/1-OSI is compatible with the Technical and Office Protocols (TOP) version 3.0, an Ethernet-based implementation of OSI protocols. In addition, the company is making CS/1-OSI versions available for token ring and Bridge 5Mbps CSMA/CD Broadband local area networks.

The CS/1-OSI uses the same multiple-processor hardware architecture as Bridge's TCP/IP and XNS-based servers. New features of Bridge's OSI software implementation are network user log-in, which allows each port to be independently configured to restrict network access, and a built-in packet generator for

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Circle 62 on Reader Card

It's one thing to fill a document with data, another to fill it with content that makes someone take action. The document that best persuades not only has a typeset appearance, with visual as well as typographic elements, but also has superior content—facts and figures drawn from all possible sources to make a point of view, a point of sale.

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vary from page to page and must incorporate extensive changes right up to the last minute. (Isn't that just about every job?) Even the most sophisticated PC-based desktop publishing systems lack this critical ability to handle instant change.

The Documenter effortlessly draws on external data through networking, so your documents can be information rich as well as presentation perfect. With PC emulation, it supports the whole range of available PC software. It can also draw upon host data bases,

files, electronic mail, print and communication resources using standard industry protocols. And because of the Documenter's electronic mail capability, the documents you create can be anywhere in the world in minutes.

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network diagnostics.

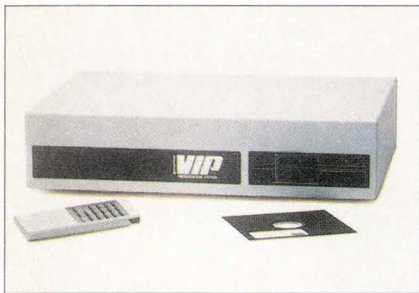
The new network communications server is available now. It costs \$9,999 in an eight-port configuration; with 64 ports, the cost is \$16,000. OSI software is priced at \$250. Users that have Bridge TCP/IP- or XNS-based servers will be able to upgrade to OSI software for \$250. BRIDGE COMMUNICATIONS INC., Mountain View, Calif. CIRCLE 254

Presentation System

Matrix system integrates multiple audiovisual capabilities.

Matrix has announced the Matrix VIP, a product that combines multiple audiovisual capabilities in one system. Three configurations of the system are being offered.

The VIP Director is the standard configuration. It includes an electronic presentation unit with a 1.2MB AT-com-



patible disk drive, 1MB of RAM, a wireless remote control, a built-in speaker, a library of sound effects, a user's guide, and a carrying case. VIP Director software sets the order of the graphics and then adds in interpicture transitions, sound effects, previously animated sequences, and segments of prerecorded video. The software works with computer images that are generated in Matrix's MVP data file format, making it compatible with popular pc graphics packages.

VIP Producer is an enhanced version of VIP that provides additional features, such as a keyboard and graphics program that allows for the editing and creation of charts and animated sequences.

The third system, VIP Studio, has all of the components of Director and Producer, plus three other capabilities: capturing photographs and custom sound clips with a combined video/sound digitizer, merging graphics over live video and outputting to vcrs using a built-in genlock feature, and outputting hard-copy to Matrix digital film recorders and color printers. A hard disk is included.

Matrix VIP systems are priced at \$3,995 and up. MATRIX INSTRUMENTS INC., Orangeburg, N.Y. CIRCLE 255

386 Processor Board

Aox says it doubles or triples the speed of an IBM AT.

Aox Inc.'s Master 386 is an Intel 80386-based processor board, which Aox says can be installed by "nontechnical" users since it doesn't require cable installation or removing chips from the pc.

Aox claims the board doubles or triples the speed of an IBM AT or compatible. Features of Master 386 include the Intel chip running at 16MHz; a high-speed, zero-wait-state cache memory; a socket for an optional Intel 80387 numeric coprocessor; and a connector for the Aox 32-bit memory expansion card for upgrades of up to 16MB of memory.

Master 386 is compatible with IBM PC and AT expansion cards, including those supporting EMS (Enhanced Memory Specifications) and EEMS (Enhanced Expanded Memory Specifications). The list price of the Master 386, which is available now, is \$1,595. AOX INC., Waltham, Mass. CIRCLE 256

Communications

Network Systems provides Ethernet/Hyper-channel connections.

Network Systems Inc. has unveiled a communications router for Ethernet-to-Hyperchannel connection, three Ethernet bridges, and TCP/IP software.

IP router EN641 is a communications router between four Ethernet LANs and a Hyperchannel-50 TCP/IP host. Additional trunks are optional. The IP router automatically creates a device map for each network associated with it and any neighboring IP routers. Changes and significant network events are communicated by the IP router to neighboring IP routers in accordance with the Exterior Gateway Protocol. Software included in the IP router implements the Internet protocol. Both protocols are de facto standards as defined by the government and they allow for communication between routers from different vendors. The IP router, priced at \$35,000, will be available next month.

The Ethernet bridge for Hyperchannel-10, EN601, is a communications bridge between an Ethernet LAN and Hyperchannel-10. It creates device maps for filtering and routing traffic. Ethernet

packets travel over Hyperchannel as Hyperchannel diagrams. The bridge operates at the ISO data link layer and can communicate mixed TCP/IP, DECnet, or XNS traffic between Ethernets. The price is \$8,500, and it's available now.

Ethernet bridge for Hyperchannel T1 Link, EN602, bridges Ethernet and T1; Ethernet Bridge for Hyperchannel-50, EN603, bridges Ethernet and Hyperchannel-50. Each features the capabilities of the EN601. They are priced, respectively, at \$12,500 and \$13,500, and they are available now. The TCP/IP software supports IBM's VM and MVS, DEC's VMS, Cray's Unicos, and the Berkeley 4.2 version of Unix. NETWORK SYSTEMS CORP., Minneapolis. CIRCLE 257

386-Based Micro

AST announces 20MHz personal computer with new architecture.

The Premium/386 is a 20MHz, 80386-based micro using AST's new Smartslot architecture. According to AST, Smartslot is divided into three components—a dedicated 32-bit pathway from the processor to the memory, a feature bus, and an arbitration bus—which provide a direct path to the system memory without cpu interaction.

Other features of the Premium/386 are up to 13MB of memory, seven expansion slots, three user-selectable speeds, a hard-disk capacity of up to 150MB, and an AST disk controller. Four models are available: models 300 and 340 provide 1MB of RAM and are priced at \$4,695 and \$5,695, respectively; models 390 and 3150 provide 2MB of RAM and are \$7,695 and \$8,995, respectively. The systems

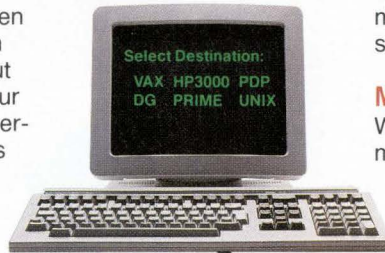


can accommodate up to four drives, including three half-height and one full-height drive. All systems run at 20MHz and at AT- and XT-equivalent speeds, and all come with a 101-key enhanced keyboard. The systems will be available as of Jan. 1, 1988. AST RESEARCH INC., Irvine, Calif. CIRCLE 269

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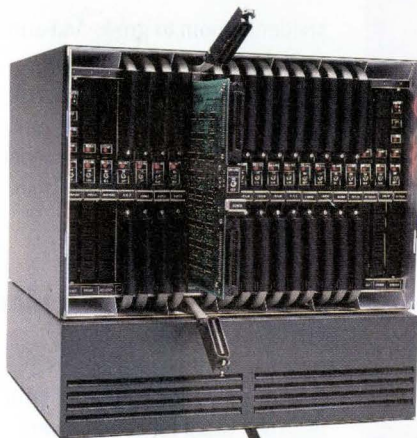
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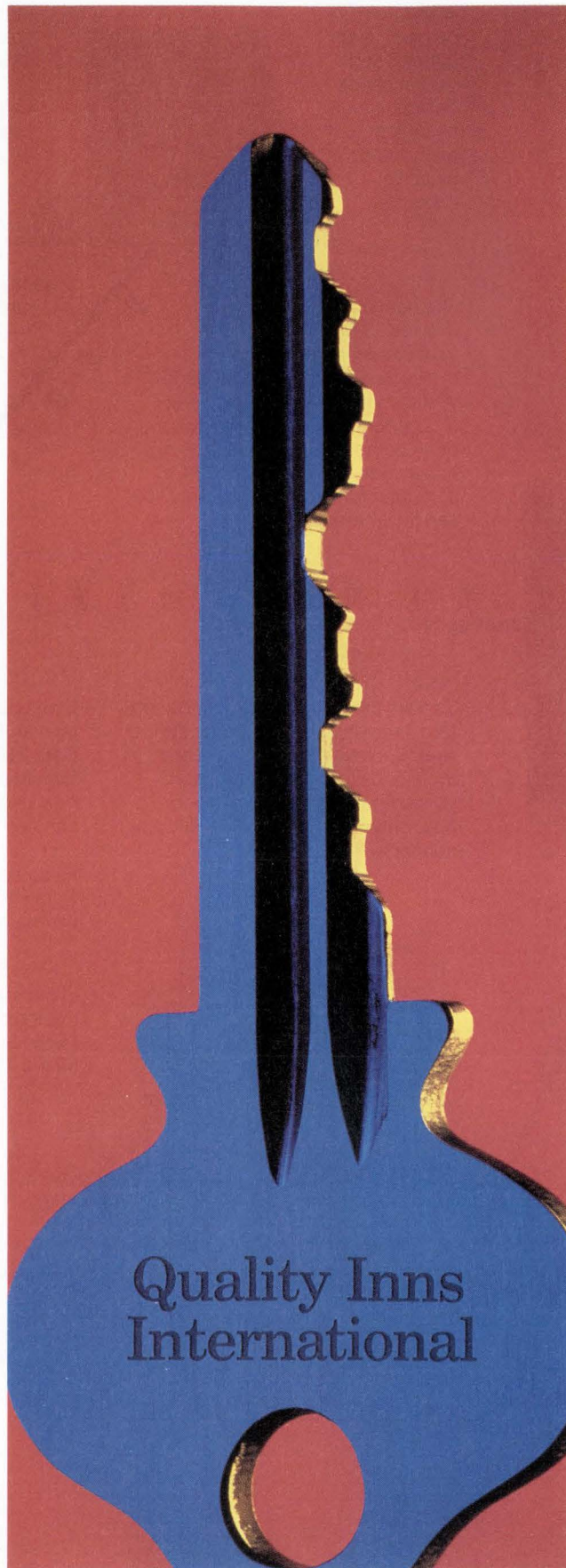
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Circle 65 on Reader Card

UPDATES

INTEGRATED NETWORK MANAGEMENT systems are being talked about by a number of network management equipment suppliers. AT&T recently announced its Unified Network Management Architecture, which, when implemented, will adhere to the Open Systems Interconnection Network Management Protocol (NMP), a protocol based on standards set by the International Standards Organization. With this architecture, the manager of a large data network can oversee and operate from a single console a network comprised of equipment from several different vendors. AT&T plans to publish initial NMP specifications soon and is actively seeking vendors' participation in this effort.

AT&T's first product for integrated network management is the Accumaster Consolidated Workstation, which provides control from one terminal of AT&T's Starkeeper Network Management System, Dataphone II System Controller and Acculink Network Manager, Accunet T1.5 Customer Controlled Reconfiguration, and IBM's NetView. The workstation is based on AT&T's 6300 series pc and AT&T Starlan; it will be available in the first quarter of 1988, and will cost between \$7,000 and \$15,000.

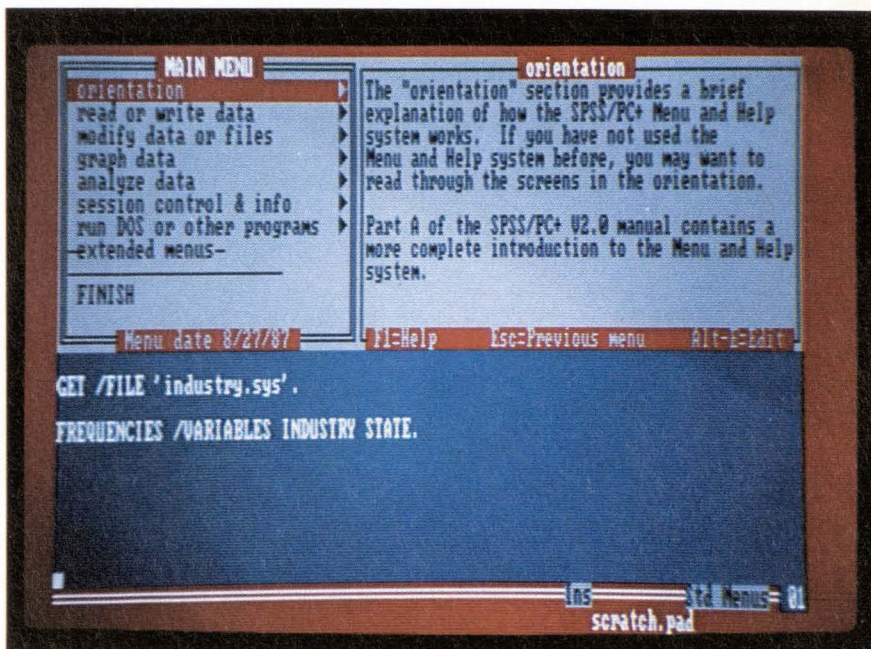
Meanwhile, other network management suppliers are announcing integrated network management products. Codex Corp., Mansfield, Mass., has announced that it will have available by the end of next year a system to manage its X.25 networking products, its LANs, and its high-end T1 multiplexor. In-*finet* Inc., North Andover, Mass., has already delivered a product it says provides single-point control of diverse network transmission devices. The product, NIS Series 90 Integrator, allows, from a console with multiple windowing capabilities, the testing, reconfiguring, and monitoring of T1 multiplexors, analog and digital modems, X.25 network PADs and switches, and In-*finet*'s PMS-III performance measurement system.

The Integrator also incorporates a problem management system that provides data on trouble tickets for multiple categories, assignment groups, and escalation levels, and calculates the downtime for all devices.

In-*finet*'s NIS Series 90 Integrator runs on the Sun 360 workstation. It's available now and is priced at \$74,995, including the hardware.

If you'd like additional information about products covered in this issue's Updates, please circle 300 on the readers' service card.

SOFTWARE



SPSS Enriches Data Analysis Programs

Makes major additions to micro and mainframe versions and unveils new forecaster program.

BY THERESA BARRY

SPSS Inc. has released new versions of SPSS/PC+, its data and statistical analysis package; SPSS-X, its mainframe version; and an optional forecasting program to SPSS-X called SPSS-X Trends.

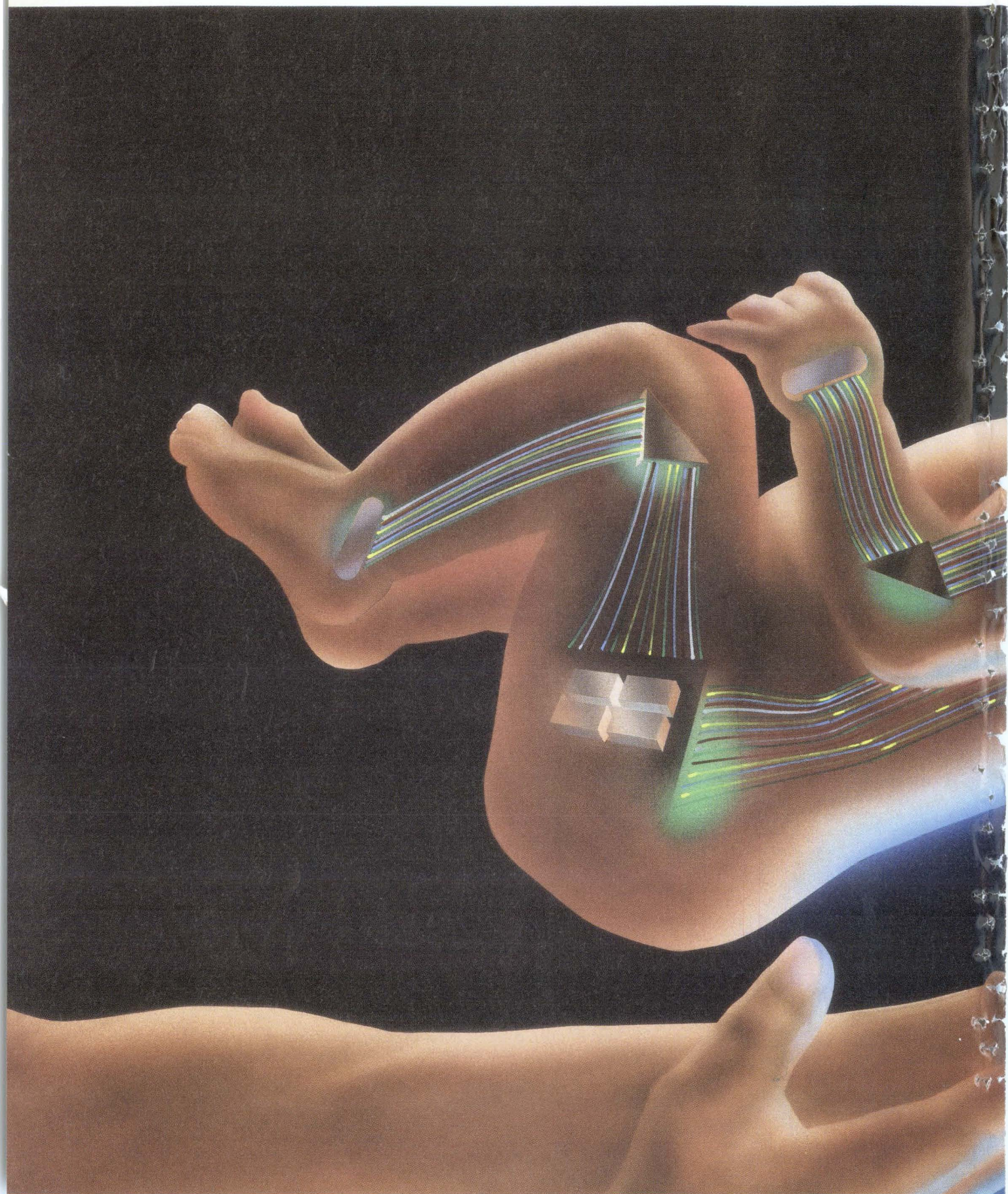
New features in version 2.0 of SPSS/PC+, the micro-based data and statistical analysis program, include a menuing system and an on-line statistical glossary. Also included are integrated computer-based training; the ability to modify variables during a session; automatic formatting of reports, including page centering, line wrapping, and underscoring of columns and headings; and the ability to display characteristics of a PC+ system file without affecting the current active file.

Also, SPSS has enhanced the op-

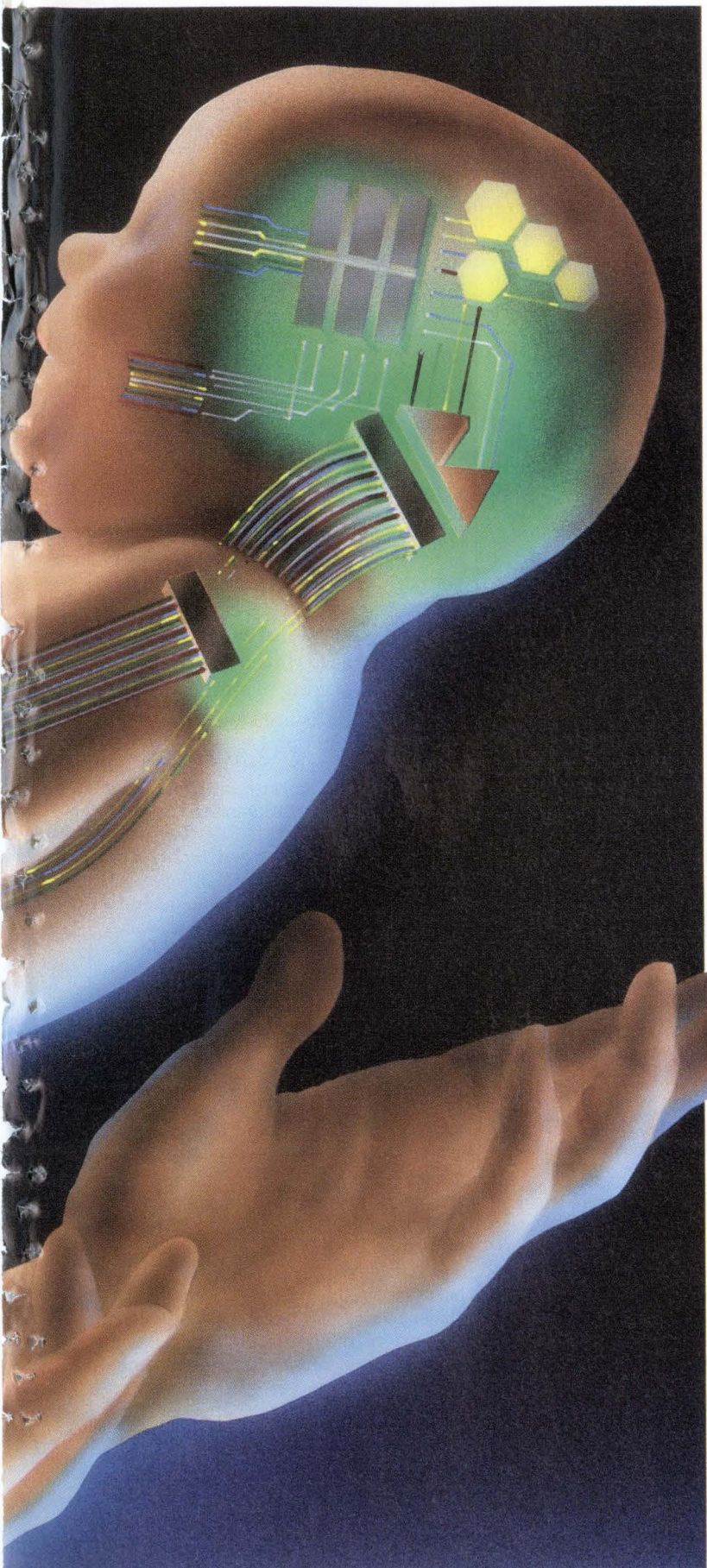
tional programs to SPSS/PC+, including Advanced Statistics version 2.0; Tables version 2.0; Trends version 2.0; Graphics version 2.0 featuring Microsoft Chart; Mapping version 2.0 featuring Map-Master from Ashton-Tate; and Graph-in-the-Box version 2.0. SPSS Data Entry II, a standalone product that allows users to enter, verify, and edit data also complements SPSS/PC+ version 2.0, the company says. SPSS/PC+ version 2.0 requires a pc with 512KB of RAM, a hard disk, and PC/DOS or MS/DOS 2.0. The price is \$795.

SPSS-X release 3 includes an interactive interface that allows users to run the product in a batch mode. Other new features are a macro facility, nonlinear regression procedures, on-line help, a new report procedure, integrated matrix reading and writing facilities, and new tabular capabilities. Release 3 now oper-

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ates under IBM CMS and DEC VAX/VMS. The company says that in the first quarter of 1988, SPSS-X will be available for IBM MVS/TSO and various Unix systems. It's priced between \$3,000 and \$10,000.

SPSS Trends is a forecasting and time series analysis option to SPSS-X. SPSS says that it provides full diagnostic plots, graphics, and statistics and includes 10 different curve-fitting methods and 12 different smoothing models. Available under the same operating systems as SPSS-X, it's priced between \$1,500 and \$3,000. SPSS INC., Chicago. CIRCLE 258

PC to Mainframe

DB/Access's new program runs under Microsoft Windows.

DB/Access has made available a new program, View/PC. It gives micro users access to data from minicomputers and mainframes and runs under Microsoft Windows, according to the company. DB/Access has also joined the Microsoft Independent Software Vendor program with View/PC.

View/PC is an addition to the vendor's Access/Star family of data sharing software. The company says that View/PC is geared more toward application end users, while the other programs in the Access/Star family are application programmer tools. DB/Access says Access/Star provides users with access to data on remote computers without requiring any knowledge of networks or remote database languages. Its data access language is SQL.

View/PC eliminates the need for MIS involvement in providing access to host DBMSs for PC users, says the company. It runs on any IBM XT, AT, PS/2, or compatible running Microsoft Windows. It's available this month for \$250 per copy. Access/Star mainframe software is priced between \$6,000 and \$32,000. DB/ACCESS, Cupertino, Calif. CIRCLE 259

RDBMS for Workstations

InterBase provides new interface and new forms package.

Version 2 of the InterBase relational database management system, which provides distributed database access among networks of similar or diverse systems, has been released.

New to the product in this version is a forms package, which includes FRED, an interactive screen painter. Other enhancements are support for SQL; the abil-

ity to access data in external files from within the database application; support for Ada in both SQL and GDML, InterBase's proprietary language; hierarchical help; command editing, interactive forms, and startup command files; multiple-file databases; and an enhanced report writer.

InterBase supports DECnet, Apollo's Domain, and TCP/IP communications protocols. OSS supported include VMS, Ultrix, Apollo, and Sun; Ada, BASIC, C, COBOL, FORTRAN, Pascal, and PL/1 are the host languages supported. InterBase version 2, priced between \$5,000 and \$75,000, is available directly from InterBase. INTERBASE SOFTWARE CORP., Tyngsborough, Mass. CIRCLE 260

Motorola Adds Life

Computer Systems Div.'s multi-module software for work groups.

Motorola Computer Systems Inc. has unveiled Life (Linked Information Environment) software, composed of inter-linked software applications designed for work group computing. The emphasis of the product line is on data capture and processing as well as electronic forms creation and management.

The software included in Life runs on Motorola's Unix-based System 8000 family of supermicros. Life•Works is a data capture and transaction processing



tool, which Motorola claims can do batch-oriented data entry to sophisticated transaction processing. Motorola says it's designed with an open architecture and allows integration of the work group with established networks, pcs, LANs, and corporate mainframes. The price for Life•Works ranges between \$2,000 for one to eight users and \$4,500 for up to 32 users.

Life•Forms allows for the creation, editing, management, and printing of complex forms. Motorola says the package is suited for automating office functions, using complex fill-in-the-blanks

forms to capture and process data. The input screen adapts in response to specific data to guide the user through the entry process. Motorola says it can be used in conjunction with Life•Lines, its integrated electronic mail system, so that forms can be routed and modified live as they move through a network. Life•Forms with Life•Lines is priced at \$1,195.

Life•Plans is a spreadsheet and graph analysis tool, specifically designed to analyze the data input from Life•Works and Life•Forms, says the company. Life•Plans is priced at \$796.

Life also provides other office tools, including word processing, business graphics, communications, and project management. The second release of Life will be out in the first quarter of '88. MOTOROLA COMPUTER SYSTEMS INC., Cupertino, Calif. CIRCLE 261

TCP/IP-Based Network

Excelan and SCO bring together divergent operating systems.

Excelan has introduced EXOS 10614T, a TCP/IP networking package that provides users of SCO Xenix System V with the ability to communicate with dissimilar systems across a TCP/IP-based Ethernet LAN. It also supports SCO's Xenix-Net Distributed File System and the latest release of SCO Xenix System V, release 2.2. The Santa Cruz Operation simultaneously announced SCO Xenix-Net 1.2, which includes a generic Xenix-NetBIOS device driver interface for LAN hardware. SCO Xenix-Net is SCO's version of Microsoft Net (MS/Net).

Both Excelan's EXOS 10614T and SCO's Xenix-Net 1.2 provide MS/DOS users running on IBM's PC LAN Program with a transparent file server, and SCO Xenix users with both a distributed Xenix file system and MS/Net file service. The products are implemented on top of TCP/IP, so that both groups of users have concurrent access to dissimilar systems.

Xenix-Net, says Excelan, enables users on multiple MS/DOS and Xenix machines to use remote files transparently and perform other network services controlled by standard Xenix system administration concepts and facilities. It resides on top of the NetBIOS layer of Excelan's TCP/IP software, allowing Xenix and MS/DOS users to run Excelan TCP/IP pc-to-host terminal emulation of file transfer applications among dissimilar systems

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Circle 67 on Reader Card

Real Time

on a network. NetBIOS and BSD socket interfaces for Unix are also included in EXOS 10614T. These allow developers to build distributed applications between dissimilar systems.

Excelan's EXOS 10614T is available now for \$1,295. The TCP/IP software can be purchased separately for \$595. SCO Xenix-Net release 1.2 is priced at \$595 for a single-server license and \$1,295 for a three-server license. EXCELAN INC., San Jose; SANTA CRUZ OPERATION INC., Santa Cruz, Calif. **CIRCLE 262**

LU 6.2 PC-to-PC Link

NSA provides transmissions using standard async line and modem.

Async/APPC from Network Software Associates Inc. is a communications software package that provides IBM's peer-to-peer LU 6.2 PC-to-PC transmissions utilizing serial ports and asynchronous lines.

Async/APPC is application program compatible with other NSA LU 6.2 products. It uses the PC's standard serial port plus an asynchronous modem. Two PCs can also be hardwired together via their serial ports without the use of modems.

Other NSA programs that are compatible with Async/APPC are AdaptSNA LU 6.2/APPC, which allows a PS/2 or PC to communicate with any other LU 6.2 device over an SDLC link; Adapt3274 LU 6.2/APPC, which allows a PS/2 or PC to communicate with a host computer through an IBM 3274 or 3174 cluster controller using LU 6.2; and Assist, an applications subsystem and interactive development tool kit for implementation of PC/DOS APPC applications. Async/APPC implements two sets of IBM-defined APPC functions: basic conversation verbs and mapped conversation verbs.

Async/APPC is available now; it is priced at \$285, including the Assist development tool kit, which runs on an IBM PS/2, IBMPC, or compatible with 100KB of memory and an asynchronous modem. NETWORK SOFTWARE ASSOCIATES INC., Laguna Hills, Calif. **CIRCLE 263**

Project Management

PSDI adds graphics to its high-end micro-based program.

Qwiknet Graphics from Project Software and Development Inc. (PSDI) is an add-on graphics program for its PC-based project management software package, Qwiknet Professional.

PSDI says Qwiknet Graphics allows Qwiknet Professional users to produce histograms, network diagrams, and bar charts to illustrate data graphically on up to 250 projects. The graphs can be customized through scaling, coloring, and zoning options and exported to graphics programs such as Lotus's Freelance.

Qwiknet Graphics can print in up to 256 colors and in sizes up to 27 feet square, depending on hardware capabilities. The package requires MS/DOS or PC/



DOS 3.0 or higher, a graphics card, and an IBM PC, XT, AT, PS/2, or compatible. It supports popular printers and plotters, and monochrome, CGA, EGA, and VGA graphics adapters. Qwiknet Graphics is priced at \$645.

PSDI also announced that Qwiknet Professional will support 3½-inch diskettes for PS/2, and offer a 24-hour user bulletin board, training courses, and foreign language adaptations. PROJECT SOFTWARE AND DEVELOPMENT INC., Cambridge, Mass. **CIRCLE 264**

Statistics on the Mac

Abacus program provides mainframe speed and color graphics.

StatView II from Abacus Concepts is the newest in its line of statistical software packages for the Apple Macintosh.

Abacus claims that Statview II provides mainframe speed and color graphic capabilities and that the new package runs 30 to 50 times faster than its previous package, StatView 512+.

StatView II can produce scattergrams; line, pie, and bar charts; histograms; box plots; and error bars. They can be customized by resizing, adding text, drawing arrows, changing point types and sizes, filling bars, and changing patterns. Text can be added on screen. Abacus says the package offers a full range of descriptive and comparative statistics. StatView II can import data created by other Macintosh applications and data downloaded from mainframes or

minis. StatView II runs on all Macintoshes outfitted with a 68881 processor. The price is \$495, and the package is available now. ABACUS CONCEPTS, Berkeley, Calif. **CIRCLE 265**

CAD Package

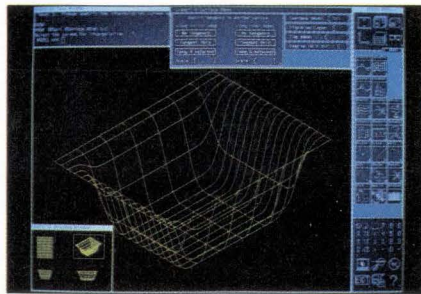
Computervision enhances CADDs 4X with new modules.

Thirty additions, including three new modules for mechanical design, manufacturing, and database management, have been incorporated into the newest release of CADDs 4X, says Computervision.

The three modules are NURBSurface Design for designing and editing complex surfaces; CVNC Five-Axis numerical control programming; and a new release of Product Data Manager (PDM), Computervision's software for CAD/CAM data management.

NURBSurface can be used to model complex sculptured surfaces in automobile bodies, aerospace structures, turbine blades, castings, forgings, and ship hulls. It was created from the same database as the company's geometric modeling products, such as Advanced Surface Design, Solidesign, and Imagedesign. This module is priced at \$7,500.

CVNC Five-Axis Numerical Control Programming handles complex surfacing machining on CADDs 4X models composed of large collections of Advanced Surface Design surfaces, says the vendor. Features include full integration with CADDs 4X geometric modeling software, tool orientation controls, automatic collision and gouge avoidance, and tool



shape support for ball-end and end mills with or without corner radii. This module is priced at \$22,500.

PDM, release 3.0, adds five features. The data management tool now has command lists, authority groups, expanded PDM file naming, enhanced universal backup, and optional PDM IGES. Prices for PDM begin at \$70,000. COMPUTERVISION CORP., Bedford, Mass. **CIRCLE 268**

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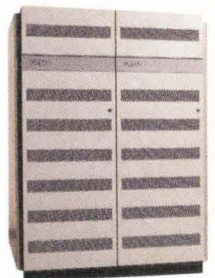
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SEQUOIA

Circle 70 on Reader Card

PEOPLE

Master of Mergers and Melodies

Though Ed Metz chose a career in electronics and business over music, he never let go of his ambitions at the piano.

BY WILLIE SCHATZ

*Sing us a song, you're the piano man,
Sing us a song tonight.
Well, we're all in the mood for a melody
And you've got us feeling all right.*

—Billy Joel

As they say on the playgrounds, Ed Metz can *play*.

In real life, he's a partner in Broadview Associates, the Fort Lee, N.J., firm that marries buyers and sellers in the software world. There were 308 mergers in that industry last year, and there should be another 320 or so by the time 1987 says so long. So there's plenty for Metz to do.

But Broadview is only a vocation. It's in his avocation that Metz, 52, takes his pleasure where he finds it. Like being the piano man for the Bob Crosby Orchestra for the past four years. That has gotten him onto the program at President Reagan's 1985 inaugural ball. It's also brought him such diverse gigs as the world's largest jazz festival, held in Sacramento, Calif., the Indianapolis Jazz Festival, and a free cruise through the Panama Canal. It means that he and his son, Ed Jr., a 28-year-old drummer for the Count Basie Orchestra, could spend a July weekend together entertaining crowds at the Friday Harbor Festival near Seattle. And you can't count the number of times colleagues and friends have passed the night away listening to Metz's magic at the keyboard.

So what's a superstar pianist doing locked away in an office five days a week?

"Part-time has always been good enough," explains Metz. "When it got to the point where I had to decide between the piano and getting a job, it wasn't much of a decision. I made a wise move. I never got fed up enough with music so that it became a strain to do it."

Metz first met the keyboard when he was five years old. The lessons continued unabated until fifth grade,

when peer pressure to become a ballplayer got to him. It was hello sports, good-bye piano.

The piano came back into his life in high school. He earned some spending money playing weekend sets in dance halls around his hometown of Bath, Pa.

"Much of the area was Polish, and they were real big on polkas," Metz says. "We'd do American music about

in physics. The five-year co-op program guaranteed him a job in the electronics industry after he graduated.

Metz didn't wait. He began working at Philco, in Philadelphia, while he was still in college.

Philco eventually decided there were better businesses in which to be, but by now the computer bug had a death grip on Metz. Since there was no place to go at Philco, he migrated to its parent, Ford Motor Co., where he became manager of hardware development.

Independence day came in 1969, when Metz and several other Ford employees started Cyphernetics, a DEC-based timesharing system based in Ann Arbor, Mich.

"It was the riskiest thing I'd done," Metz remembers. "We had no idea what was going to happen. I was



BROADVIEW ASSOCIATES' METZ: Playing part-time has always been enough.

every third song."

The fork in the road came the summer after he graduated high school. Between 9 p.m. and 2 a.m., Metz was a musician at a jazz club; between 6:30 a.m. and 4 p.m., he was a mill worker. He managed to work in the rest of his life between shifts.

"I realized that if I was working, I couldn't be playing," Metz recalls. "I loved playing, but it was clear to me that I couldn't make a living at it. And I didn't want to sleep in shifts the rest of my life."

So it was off to St. Joseph's University in Philadelphia, where he had been awarded a half-tuition scholarship

scared to death."

Not to worry. It was the right time to share time. Six years after its creation, Cyphernetics had 30 offices in the U.S. and eight in Europe, plus the venture was doing business from Ann Arbor via satellite to seven countries. Where there had once been eight employees, now there were 400.

The success, naturally, didn't go unnoticed. It didn't take long for the sharks to smell blood.

The winner was Automatic Data Processing Corp., which paid \$32 million for a company that had revenues of only \$20 million.

"We said yes to ADP because we decided that to be a powerhouse required far more resources than we had," Metz says. "ADP was a \$100 million company at the time, with a national image and considerable prominence in the industry. Those of us who were principals in Cyphernetics did pretty well. But I drew the short straw. I had to move back East."

That hit home on the first Saturday in September, when tv provided the only way Metz could watch his beloved University of Michigan Wolverines play football.

The transfer put him in charge of ADP's new corporate development staff. The honeymoon lasted two years. When it became clear that Metz's mentor, Bruce Anderson, was losing the presidential succession contest to Josh Weston, Metz felt it was time to move on.

It wasn't much of a trip. Peter Anderson, the president of Input, Mountain View, Calif., asked Metz to get the company rolling on the East Coast.

"I figured it'd be fun for a few months," Metz says. "Seven years later, I was still there."

He had had enough by July 1984, when he left Input with no plans other than to take it easy for a few months. His plans changed in far less time than that. A chance meeting with Broadview founders Bernie Goldstein and Gil Mintz led to their making an offer he couldn't refuse.

"Talk about a business that helps shape the industry," Metz says. "We're a major force in doing that. We bring together people of diverse backgrounds, skills, and chemistries and see how we can help the buyer and the seller.

"We're like a marriage broker," he says. "Nothing is more rewarding than the feeling of success when the deal is completed."

Not even playing the piano? "It's a different feeling," Metz explains. "I don't look back on my decision. I don't even get a twinge when I see how well Ed Jr. is doing. I even tried to

talk him out of it. But he's got more guts than I have."

Metz hasn't had to confront the sense of déjà vu with his two other sons. Tim, 26, is working for Market Direct America, a telemarketing company in Princeton, N.J. Michael, 22, is a senior majoring in environmental science at Rutgers University.

"I've got the best of all possible worlds," Metz says. "I've been able to grow up with the computer industry from the ground floor. That's been very rewarding."

So has stroking the keys on the Bösendorfer in his Montville, N.J. home. Metz says the Vienna-made piano is so special that George Shearing owns one of the only other ones in the New York area. "My playing has gotten me to places I never would have gone to in ways I would have never traveled," Metz says. "I'm doing just enough to keep myself knowing I can perform pretty well when I have to. I don't have any regrets."

Neither do his listeners. ■

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BOOKS

Facts and Fantasies Of Federal Funding

TARGETING THE COMPUTER:
GOVERNMENT SUPPORT AND
INTERNATIONAL COMPETITION
by Kenneth Flamm, The Brookings
Institution, Washington, D.C. (1987,
255 pp., \$31.95).

BY ED ZSCHAU

For anyone who believes that the U.S. computer industry is the paradigm of "go it alone" free enterprise—not needing or getting federal subsidies to achieve its success—Kenneth Flamm's *Targeting the Computer* will come as a shock. Flamm, a Brookings Institution researcher, has assembled a convincing case that government support of computer research for military applications over the past 40 years has played a central role in the advances of American computer technology.

Extensively documented (the book contains 383 footnotes and four technical appendices), the work is written with a style and organization that make it interesting and valuable for both the serious student of U.S. technology policy and the casual follower of the current debate concerning international competitiveness.

The Flamm study comes at an opportune time. The issue of international competitiveness has moved to the front burner in Congress and in the upcoming Presidential campaign. There is evidence that our once vaunted technological lead has shrunk (see "How Competitive is the U.S. IS Industry?," Oct. 1, p. 39). We see the governments of our trading partners using proactive policies to assist their companies in achieving new technical breakthroughs. As a partial response, a proposal to form a government-subsidized research consortium—called Sematech—to improve semiconductor manufacturing in the U.S. is now being considered in Washington, D.C.

Despite the image that the U.S. computer industry sprang primarily from the innovations of freewheeling entrepreneurs, Flamm documents the extensiveness of U.S. government support in the past and indicates that such research funding has been a "good deal" for the public.

Flamm provides a detailed analysis of the benefits to the U.S. that have resulted from our government's investment in computer research. Drawing on several studies of computer cost/performance trends, Flamm observes that, over the past two decades, the cost of computer power has decreased between 20% and 30% annually. The magnitude of the benefits to consumers of these annual cost reductions, when compared with the government expenditures that helped spawn such benefits, leads to the conclusion that government funding of computer research has generated a 50% to 70% annual rate of return to society. Accordingly, Flamm emphasizes, federal funding of technology research can be justified purely on economic grounds, rather than solely by a military rationale.

The book provides a thorough history of the U.S. government's funding of computer research. Flamm documents, for example, the important role that the Defense Advanced Research Projects Agency has played in fostering such cutting-edge computer technology as networking and artificial intelligence.

Flamm's discussion of Japanese and European policies toward technology reveals interesting contrasts and some lessons for us. For example, the Japanese encourage groups of companies to work together in the precompetitive stages of a new technology. Japan has used government procurement extensively as a tool to foster its domestic companies' successes. Conversely, the Europeans have tended to focus support on just one company in a given area, in order to make it a "national champion." The Europeans have not used the leverage of government procurement to give a boost to their own firms as effectively as have the Japanese.

In his comparison of national policies, Flamm undermines the conventional wisdom about the relative extensiveness of Japanese "targeting" by revealing that the U.S. government's role in the funding of our computer industry research exceeds Japan's direct support of its computer companies.

The main value of *Targeting the Computer* is the historical and theoretical framework it provides for analyzing pub-

lic policy proposals to foster U.S. competitiveness. It reminds us that the U.S. government is already heavily involved in technology advances and that such involvement has had an economic payoff. Therefore, the issue is not should we do it, but rather how can we do it right?

One can draw several guidelines from Flamm's analysis about the proper federal role for advancing technology. Among these are the following:

- We should justify federal support of advances in technology on economic grounds and not always rely on the rationale of national security.
- Government support should focus only on the most basic and revolutionary research that is so risky that it is unlikely to be pursued adequately by private companies.
- Like the Japanese, we should encourage the formation of cooperative R&D consortia to spread the risk of basic research while we maintain the current competitive structure for commercialization of the innovations produced.
- Protectionist measures to keep our research results from foreign companies are both futile and counterproductive. Instead, we should participate with our trading partners in selected areas of research and then, to stay ahead of the game, work hard applying the results of the research.

As an unabashed, free enterprising entrepreneur, I was surprised by some of Flamm's data and analyses. Although I remain suspicious of the visible hand of government meddling in the process of industrial innovation and growth, it's useful to understand exactly how we got where we are today so that we can determine how we can better extend and apply technology tomorrow. ■

Ed Zschau, a former U.S. congressman (R-Calif.) and the founder and former ceo of System Industries, Milpitas, Calif., is currently a partner of Brentwood Associates, a Menlo Park, Calif.-based venture capital firm.

Reprints of all DATAMATION articles, including those printed in 1986, 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.

CALENDAR

DECEMBER

Conference on Superconductor Markets.

Dec. 15-16, Boston. Contact Kessler Marketing Intelligence, 31 Bridge St., Newport, RI 02840, (401) 849-6771.

AMS West (Advanced Manufacturing Systems Exposition and Conference).

Dec. 15-17, Anaheim, Calif. Contact Pat Dickinson, Cahners Exposition Group, 999 Summer St., P.O. Box 3833, Stamford, CT 06905, (203) 964-8287.

JANUARY

Computer Graphics '88.

Jan. 13-15, San Diego. Contact Carol Every, Frost & Sullivan Inc., 106 Fulton St., New York, NY 10038, (212) 233-1080.

Image Processing and Optical Disk Storage Conference.

Jan. 20-22, Phoenix. Contact Jean O'Toole, CAP International, One Snow Rd., Marshfield, MA 02050, (617) 837-1341.

CN '88 (Communications Networks Conference and Exposition).

Jan. 25-28, Washington, D.C. Contact Nancy Thayer, IDG Conference Management Group, P.O. Box 9171, 375 Cochi-tuate Rd., Framingham, MA 01701-9171, (617) 879-0700.

FEBRUARY

IFIP Conference on Computers and Law.

Feb. 8-10, Santa Monica, Calif. Contact Michael Krieger, P.O. Box 24619, Los Angeles, CA 90024, (213) 208-2461.

Usenix Winter 1988 Unix Conference.

Feb. 9-12, Dallas. Contact Usenix Conference Office, P.O. Box 385, Sunset Beach, CA 90742, (213) 592-1381.

PTC '88 (10th Annual Pacific Telecommunications Conference).

Feb. 15-18, Honolulu. Contact PCT '88, 1110 University Ave., Suite 308, Honolulu, HI 96826, (808) 941-3789.

MARCH

FOSE '88 (Federal Office Systems Expo).

March 7-10, Washington D.C. Contact NTP Inc., 2111 Eisenhower Ave., Suite 400, Alexandria, VA 22314, (800) 638-8510 or (703) 683-8500.

READERS' FORUM

The Need for a Bill of Data Privacy Rights

Recently, I've been intrigued by the aggressive and creative data handling tactics pursued by some government agencies and private sector corporations. These tactics include computerized matching of tax files, unauthorized sale and distribution of database information, and computerized telephone sales techniques, to name a few.

Although I've read much in the media about protecting the government's classified data for national security purposes, I haven't seen enough attention focused on the data security rights of individuals. While encryption algorithms and classified military top-secret controversies are "sexy" topics that compel the interest of the general public, it is equally crucial that data privacy rights in the private sector also be defined and debated.

The recent Computer Security Act of 1987 proposed by Rep. Jack Brooks (D-Texas) and passed by the House of Representatives is intended to decentralize control of federal agency security regulation. This requirement, however, applies only to federal government agencies. The next logical step—or perhaps what should have been the first step—in the evolution of a national data security policy is to identify the general principles that will guide individual data privacy rights into the twenty-first century.

The supremacy of the individual is at the heart of our system of government. I believe that the foundation of a national data security policy must be built upon the protection of individual rights and not upon the priorities of government agencies, searches for tax cheaters, spy surveillances, or the secrecy of ultraclassified weapons systems.

Obviously, there are many important issues:

- Who is the "owner" of a computerized data record—an individual, a government agency, a corporation?

- What rights does data ownership encompass?

- Should a commissioner of one government agency be allowed to share my personal data with other public agencies without my knowledge and based on his or her determination that the data are unclassified?

- Should financial institutions be required to explain to me beforehand which data sources will be accessed to verify my credit application?

- Should public and private corporations be required to obtain my permission to release any personal or historical data that they wish to make available (i.e., sell) to others?

- Can corporations include my name and address without my permission when they sell their databases for marketing purposes?

- Can a company input my telephone number into an autodialing, voice-synthesized recording of a sales pitch without my release for that purpose?

- What penalties and compensation are justified in the event that inadequate procedures lead to the dissemination of inaccurate personal data?

These issues are real. The lack of a "Bill of Data Rights" national policy is allowing corporate profit motives and governmental bureaucratic power plays to set potentially damaging precedents. Legislation, such as the Computer Security Act of 1987, has begun to solve this problem. The process must now continue so that the true foundation of a national data security policy can be accomplished.

MARTIN A. SNOW, CISA
EDP Manager
Wolf & Co.
Boston

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 249 W. 17th St., New York, NY 10011. We welcome essays, poems, humorous pieces, or short stories.

Looking Back

THIRTY YEARS AGO IN DATAMATION: "It is to [the automatic handling of information] that we wish to devote this publication. All of automation is young. . . and the field of handling information automatically, even younger. Because this field of endeavor is presently pioneering, it needs a voice—a voice which is responsible, intelligent, and which will assist its people by reporting and interpreting the industry's developments. DATAMATION intends to be that voice." (From "A Publisher's Vision . . .," by Frank D. Thompson, November/December 1957, p. 3.)

TELECOMMUNICATIONS OPPORTUNITIES



The future of the Network Support Systems Division of Northern Telecom Inc. can be found in helping telecommunications providers adapt to changing operations environments.

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- RDBMS experience desired

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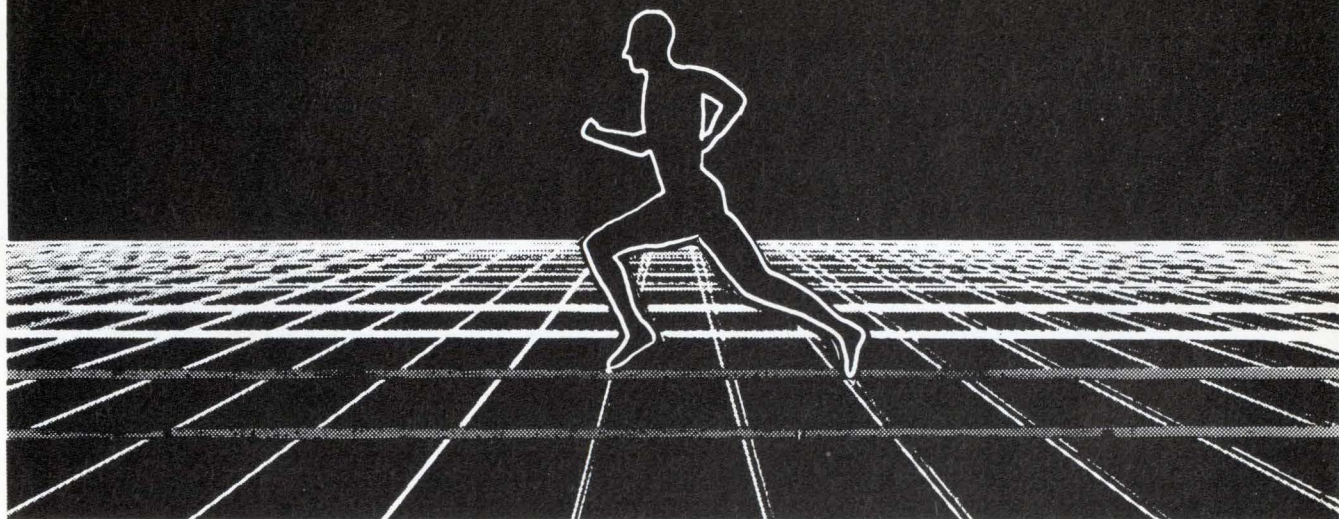


Career Opportunities

DATAMATION 1988 Editorial Calendar and Planning Guide

Issue Date	Recruitment Deadline	Editorial Emphasis
Jan. 1	Dec. 10	IBM
Jan. 15	Dec. 28	Technology Forecast
Feb. 1	Jan. 14	DEC
Feb. 15	Jan. 27	Parallel and Multi Processing
Mar. 1	Feb. 11	Managing IS at Multinationals
Mar. 15	Feb. 26	On-Line Transaction Processing
Apr. 1	Mar. 11	Cutting Over New Systems
Apr. 15	Mar. 25	1st Quarter Update
May 1	Apr. 13	Supercomputers and Minisupercomputers
May 15	Apr. 27	Mainframe and Communications Spending
June 1	May 11	32-Bit System Race
June 15	May 24	DATAMATION 100
July 1	June 10	Computers in R&D
July 15	June 23	Mass Storage
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

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- CSS7
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- OSS Interfaces
- Application Processor Features/ Intelligent Network

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TOOLS SUPPORT ENGINEERS

SWITCHING SYSTEMS DIVISION

We are also seeking Tools Support Engineers with the following qualifications:

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- Familiarity with development methodologies and tools in a large production environment

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This start-up group has rapid expansion plans! With responsibility for software development, our teams are searching for Engineers to perform in all areas, from high level design to detail design. Our areas of involvement are:

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- PBX-Call Processing
- OSI
- HDLC
- System Analysis
- PC or Mainframe
- Communication Protocols: Transport Layer, Session Layer—X.25, BSC, X.200
- Real Time Software Development

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We have recently completed a large strategic planning study and have a significant backlog of technical and application development projects. We are transitioning from a largely maintenance mode to an aggressive development mode. We are seeking talented individuals for the following:

COMPUTER OPERATIONS & SUPPORT

- **Vendor Software Support Analysts**

3-6 years experience in vendor software support or applications development. MVS and/or VM vendor software knowledge and support skills for products such as COBOL, SAS, PROFS, and graphics packages are preferred. CICS applications knowledge a plus. Good interpersonal, verbal and written communication skills required. Will be responsible for vendor software evaluation installation, customization, and documentation and will serve as technical consultant for application programmers and end-users.

- **Change Management Analyst**

3-5 years experience desired in: IBM large systems (MVS or VM); project management; change management or problem management; change/problem management software installation; and IBM info/management UCC-8 NETMAN or Peregrine PNMS III. Good written and verbal communication skills required. Will provide project leadership and technical advice in the installation of hardware, system software, application systems, data base, and network.

- **Performance Analyst**

- **Capacity Planning Analyst**

- **MVS Systems Programmer**

4-5 years in the technical computer area and at least 2 years of systems programming experience or performance experience. Prefer a 4-year degree and good interpersonal skills. Experience with VM/HPO, MVS/XA, and strong oral and written communication skills desirable. Project planning experience highly desirable. Will analyze disk placement and its affects on performance and the performance of in-house written code and identify bottlenecks created by code; will monitor and report on the status of the achievement of performance and reliability goals for the network components, VM/MVS system, and major subsystems such as CICS or DATACOM. Will work with other individuals to manage the configuration of both VM system and MVS/XA system.

Additionally, Performance Analyst will provide tuning and performance expertise for an operating system of MVS/XA or VM/CMS. Experience with VM tuning products such as Smart and Omegamon/VM would be helpful.

APPLICATIONS DEVELOPMENT

- **Programmers**

2-5 years structured coding experience in a development environment versus a maintenance environment. Highly desired experience would include: DATACOM; COBOL; IDEAL; CICS.

- **Systems Analysts**

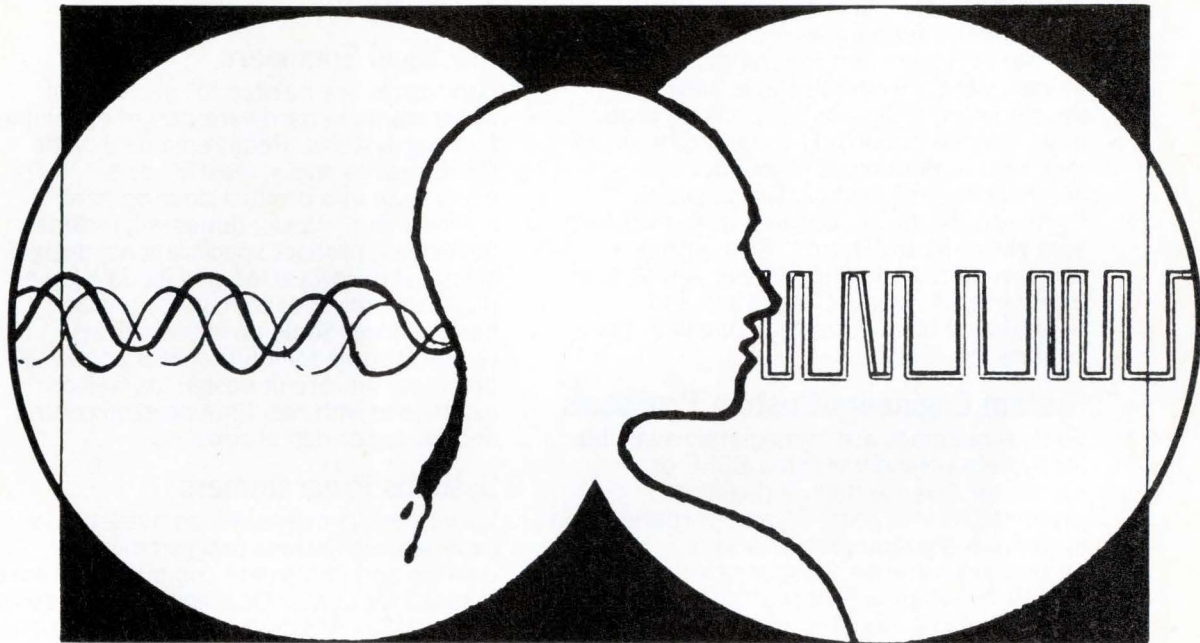
5-plus years experience in a development environment versus a maintenance environment. Highly desired experience would include: Structured analysis techniques; Relational Data Modeling; DATACOM/DB; On-line real-time systems; Arthur Andersen's Method/1; Prototyping; Application Generators.

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- **Systems Test Engineering**
- **Systems Administration**
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- **4GLs & UNIX Relational DBMS**
- **ISO/OSI Networking Protocols**
- **Local Area Networks**

- **BAL, PL/1, COBOL**
- **OS/MVS, VM**
- **IBM IMS or DB2**

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System Engineers/Custom Proposals

Several openings are immediately available for system engineers with a BSEE or Computer Science degree (Masters preferred) and at least 5 years' experience in systems design/integration and/or application software. Responsibilities will include developing proposals for customers in the financial industry for custom image systems based on standard products. Duties include initial customer contact, generation of system design and development of the proposal as well as presentation to the customer. Exceptional technical and communication skills are needed for this creative and highly visible role in product development activities for the banking community.

System Engineers/Architects

Our engineering staff requires several senior level engineers to coordinate the development of hardware and software for a major commercial computer product. The person that has strong analytic and technical skills plus 5 or more years' related experience, would play a key role as a systems architect. Primary responsibilities include assessment of hardware/software tradeoffs as well as design recommendations. The preferred candidates should have a degree in Electrical Engineering or Computer Science. A Master's degree in either field would be a definite advantage. Other desirable experience includes performance and capacity modeling using tools such as GPSS, as well as real-time

electromechanical hardware and/or software systems development experience.

Electrical Engineers

Candidates are needed for a variety of assignments in hardware design of complex banking systems. Requirements include BSEE degree and at least 3 years' experience in a product development environment. Typical duties will include developing product specifications, designing electrical hardware, as well as developing diagnostic routines to monitor product performance. Some positions will also require knowledge of Intel 8085 and Z-80 processors in circuit design, as well as experience with real time process control and analog or digital circuits.

Systems Programmers

Various assignments will be available for experienced systems programmers to develop and implement computer software systems for banks. Qualified candidates will have a BS or MS degree in Computer Science or related technical area plus 3 or more years' experience in a product development role. All positions require knowledge of high level languages such as Pascal and C. Knowledge of RMX operating systems and Intel based processors is desirable for these positions.

Application Programmers

Requirements include at least 3 years experience developing mainframe and workstation programs to perform automated financial services using high speed electronic imaging equipment. Candidates must have a college degree in Computer Science, Information Systems or equivalent. COBOL programming skills and experience with Unisys V series or PC computers are a plus.

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