DATAMATION

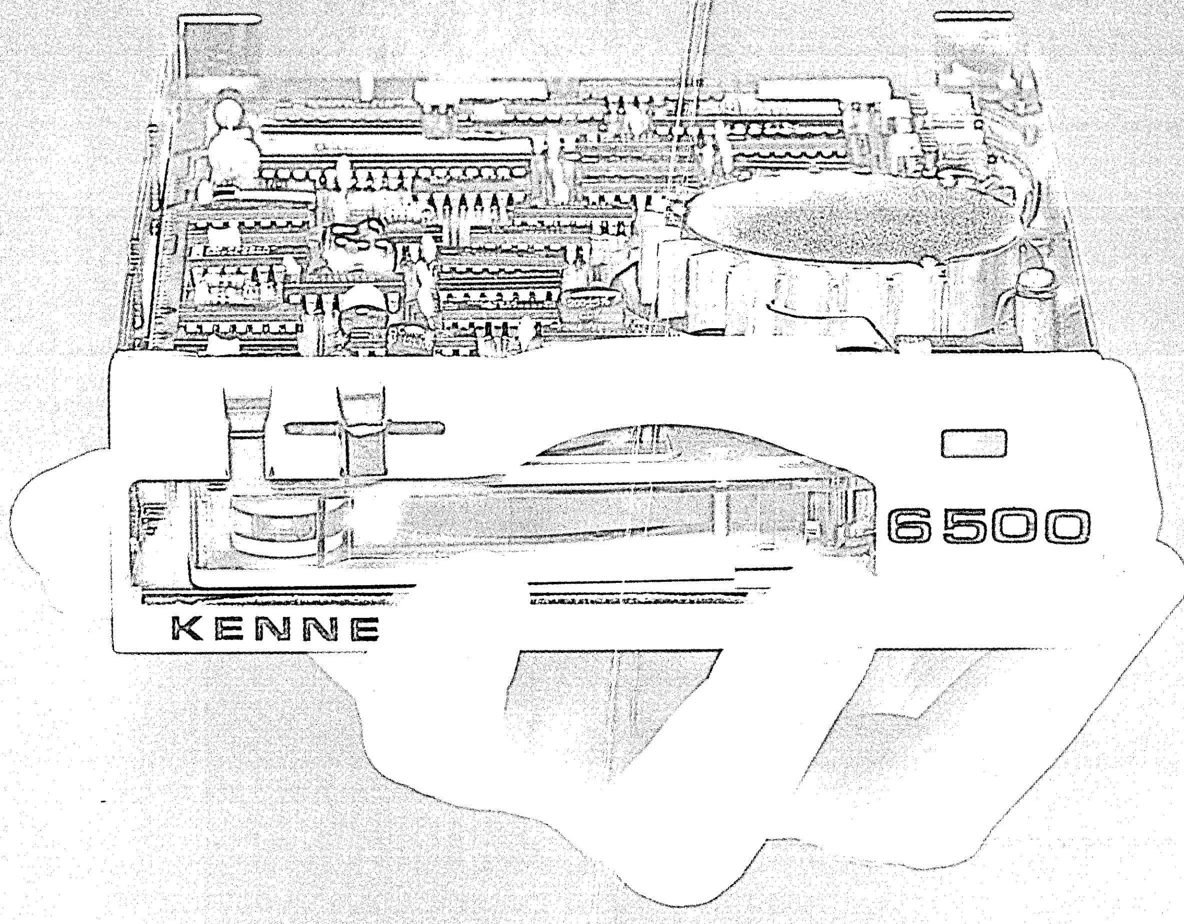
84
AUGUST [illegible] $3.00 U.S. [illegible]

UNIX: HIT OR MYTH?

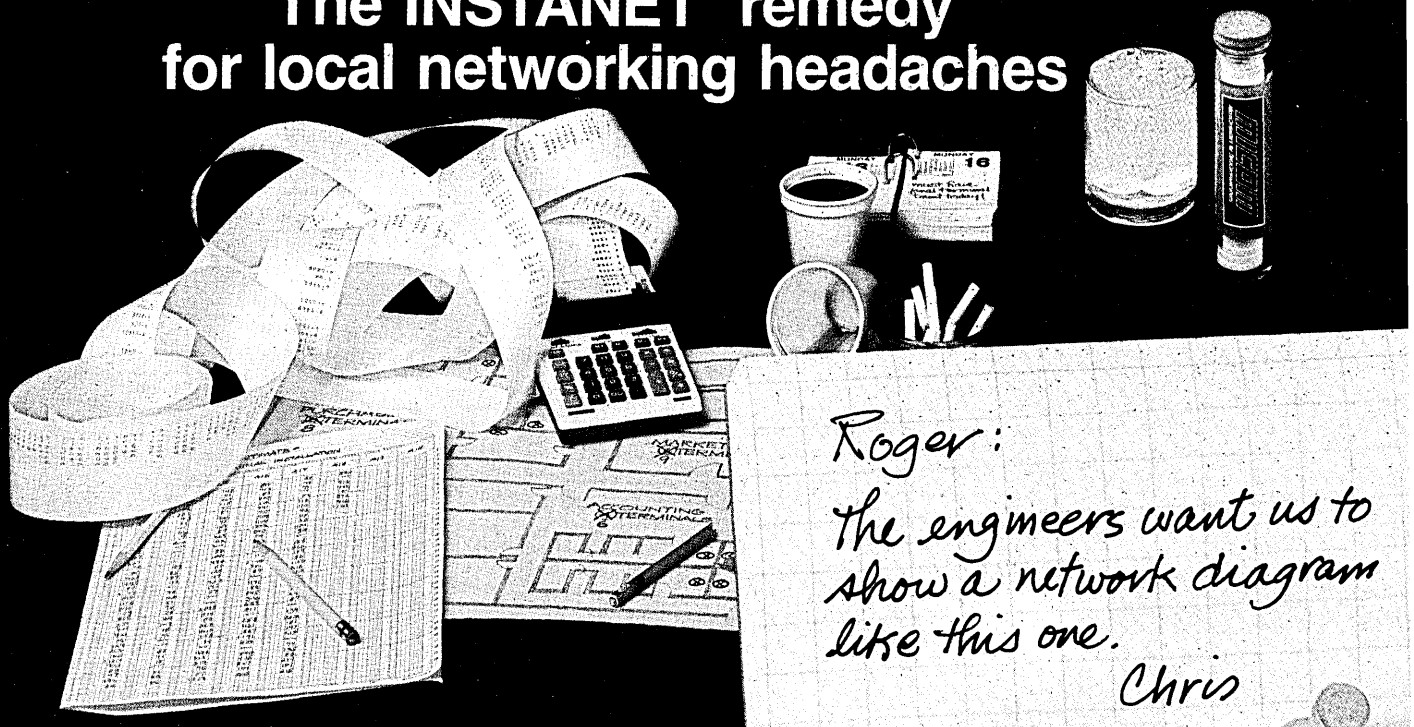
ALSO:
LOCAL NETS F[illegible] MICROS
MA BELL'S C[illegible]E KIDS

Introducing Model 6500 —

'the handful'



The INSTANET™ remedy for local networking headaches



Headache

It's too early to make a long-term commitment to baseband or broadband.

We don't want to get involved with more layers of protocol and more incompatibilities.

Fiber optic cable and coax are expensive and messy to install.

We're not ready to put in a whole network now.

We already own a good deal of datacomm gear.

Division/Group DP Managers want control of their own local datacomm.

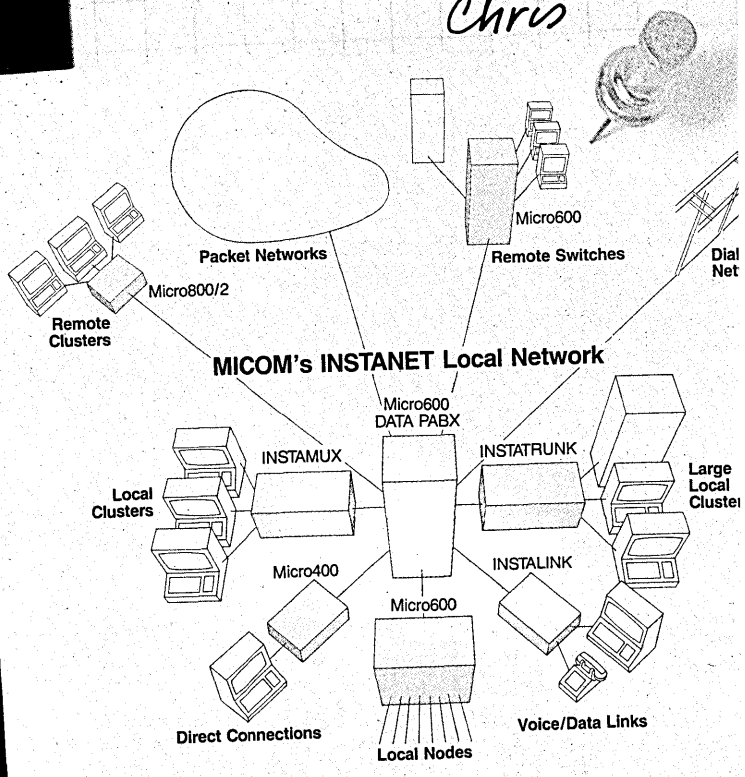
We need Gateways:

- **To the switched phone network**
- **To Packet Data Networks**
- **To other local networks.**

WE NEED IT FAST!

We don't want to spend an arm and a leg.

Roger:
The engineers want us to show a network diagram like this one.
Chris



Not in my ad!
Roger

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CIRCLE 6 ON READER CARD

DATAMATION

AUGUST 1 1984/$3.00 U.S.A.
VOLUME 30 NUMBER 12
This issue, 183,441 copies

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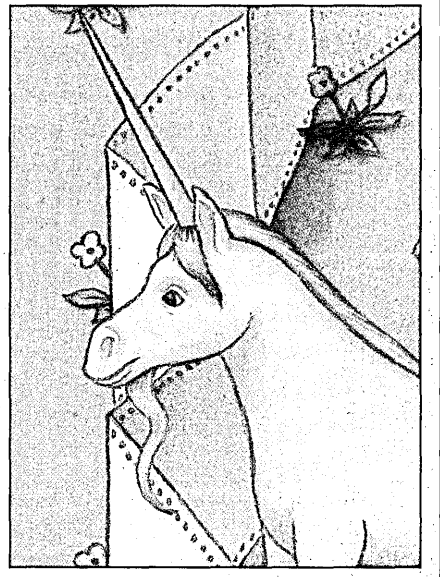
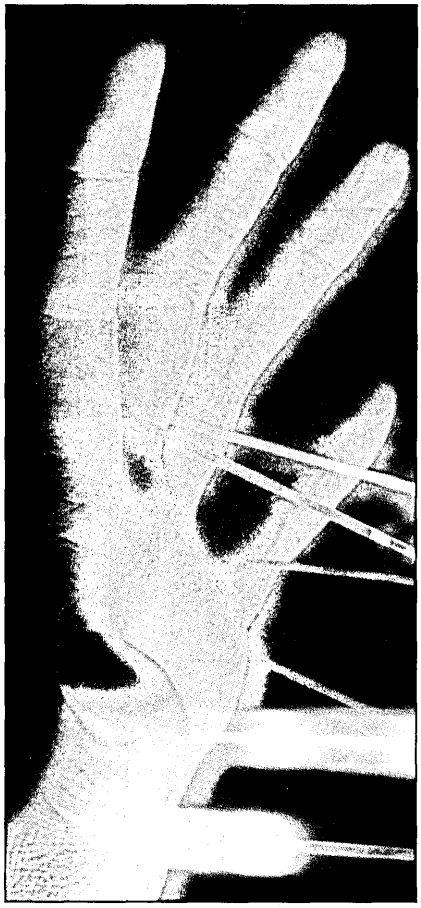
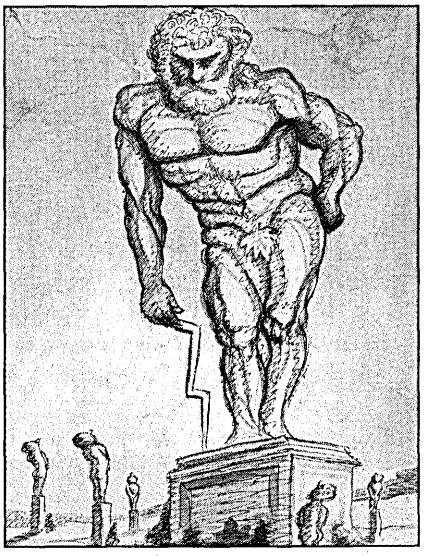




NEWS IN PERSPECTIVE

DEPARTMENTS



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BY RICHARD ANDERSON

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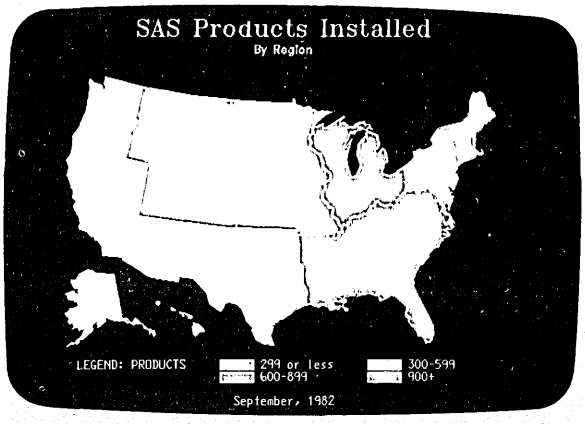
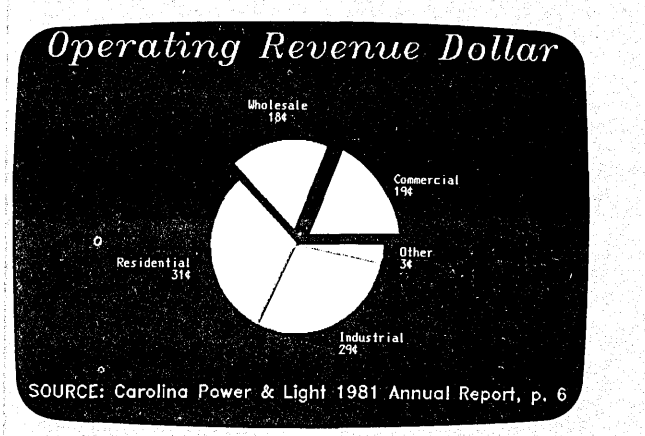
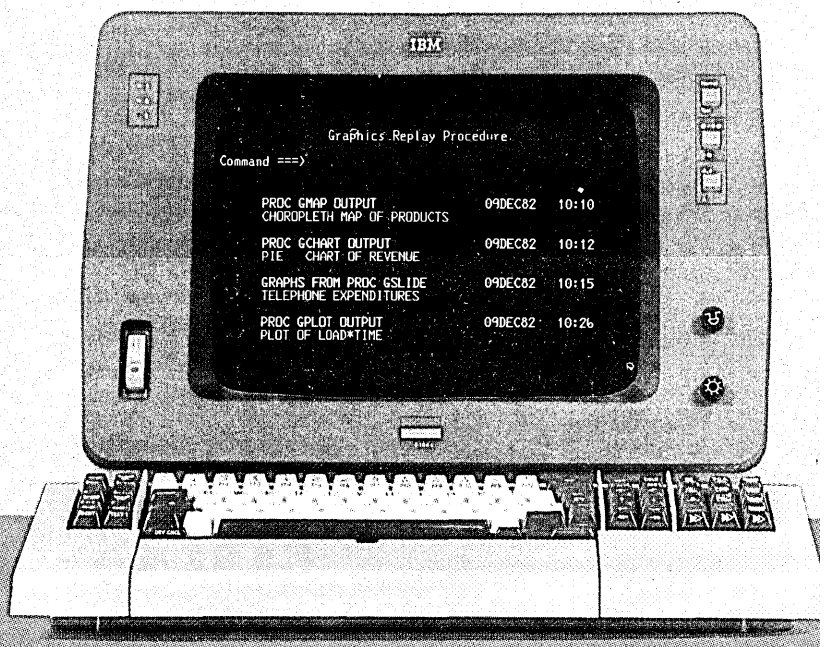


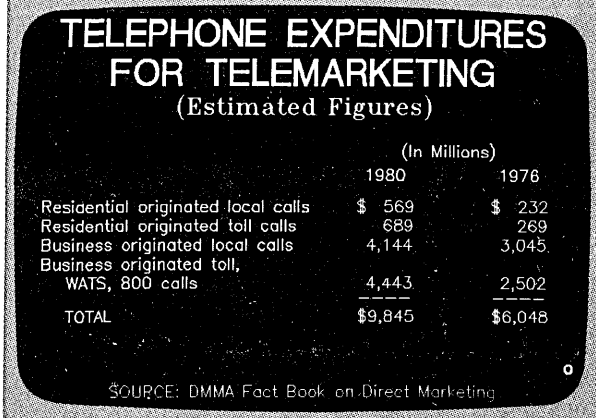
Choropleth Map of Products

SAS/GRAPH brings you Instant Replay

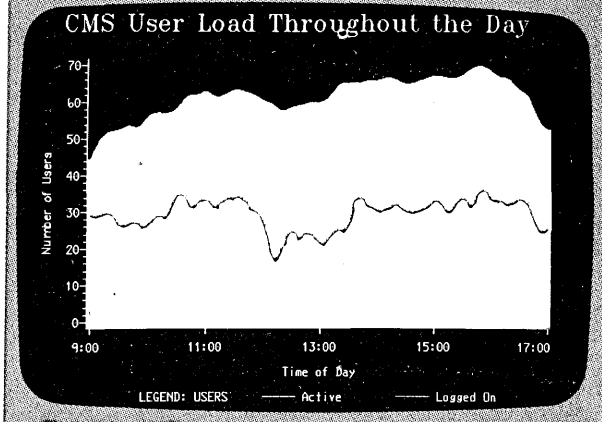


Pie Chart of Revenue





Telephone Expenditures



Plot of Load Time

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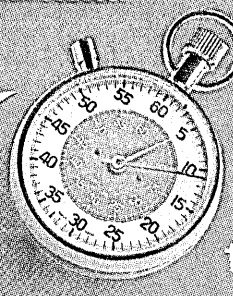

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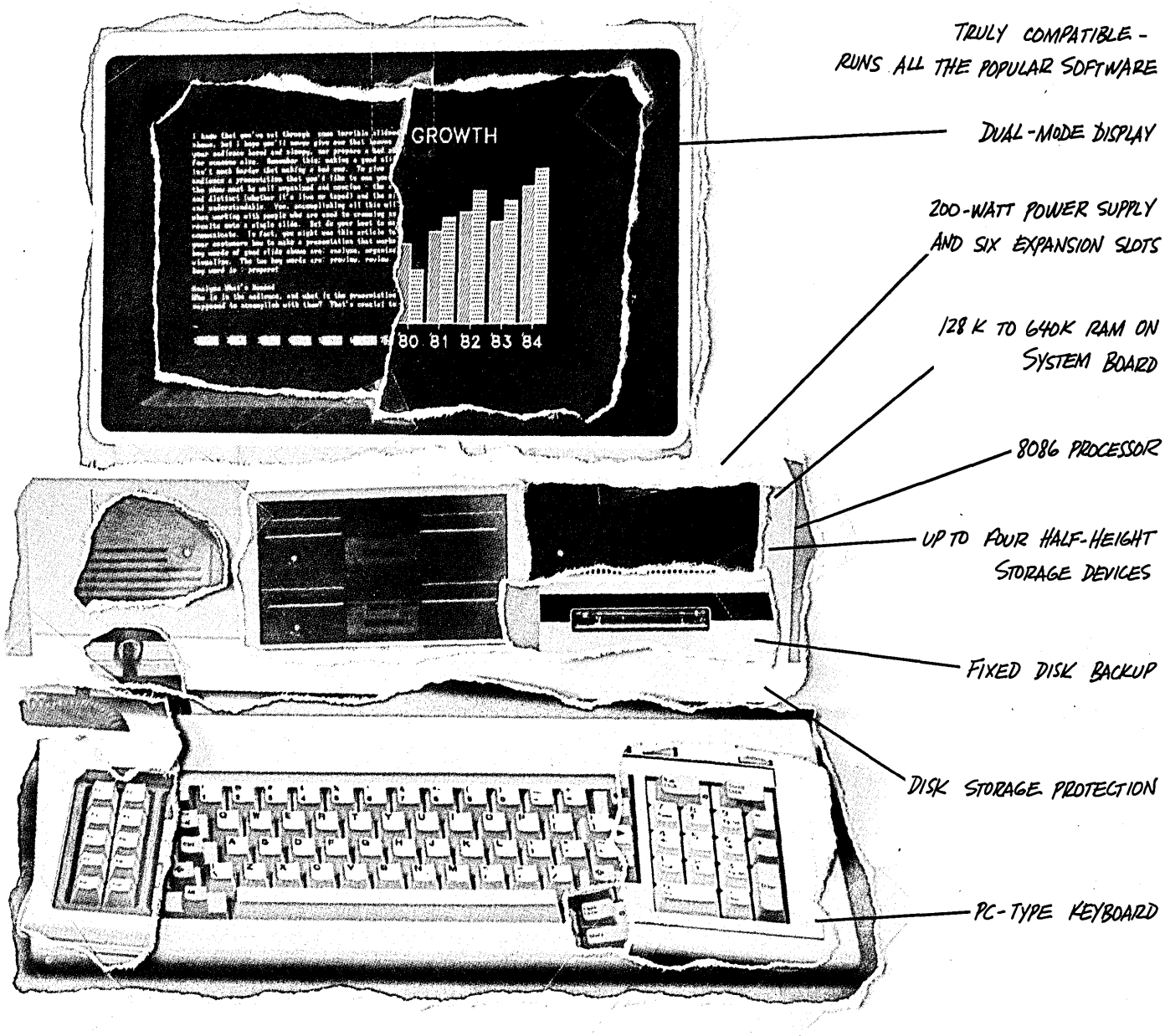

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The COMPAQ DESKPRO is the most expandable desktop you can buy. It can grow as you grow, with up to six available expansion slots and four storage devices, including a unique fixed disk drive backup—all *inside the computer instead of out*, saving your desk from clutter.

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It's also the most compatible desktop, giving you true hardware and software compatibility with the industry's most popular personal computers. The COMPAQ DESKPRO runs thousands of programs written for the IBM® PC and *XT* right off the shelf. Which brings us to the next point.

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Text and graphics on one screen, not two.

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Add up to 640K of memory on system board and save expansion slots.

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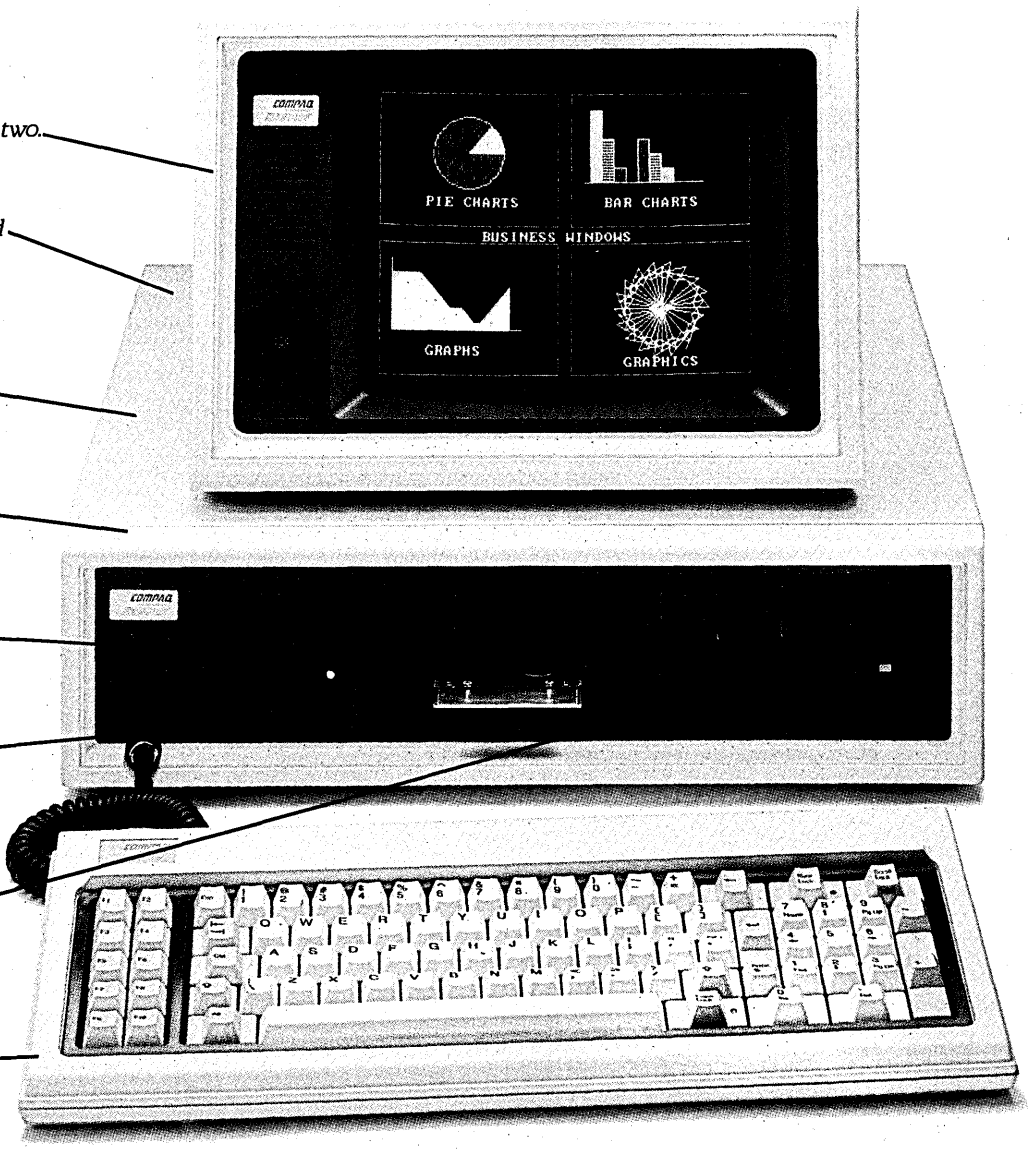
10MB fixed disk drive
10MB fixed disk backup
Two diskette drives

Exclusive tape backup helps protect data.

Unique shock mounting helps protect your data and hardware investment.

Familiar layout enhanced with LED's on caps and num-lock keys.



The COMPAQ DESKPRO is the fastest truly compatible desktop you can buy. It's two to three times faster than the industry standard. That saves time now. And in the future, as software becomes more sophisticated and integrated, it will save you even more time as well as protect your personal computer investment.

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The New COMPAQ DESKPRO™

It simply works better.

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Introducing System W's Model-by-Example.™

These days, you can't put a business model together unless you know a foreign language. And all the right commands.

Which is crazy.

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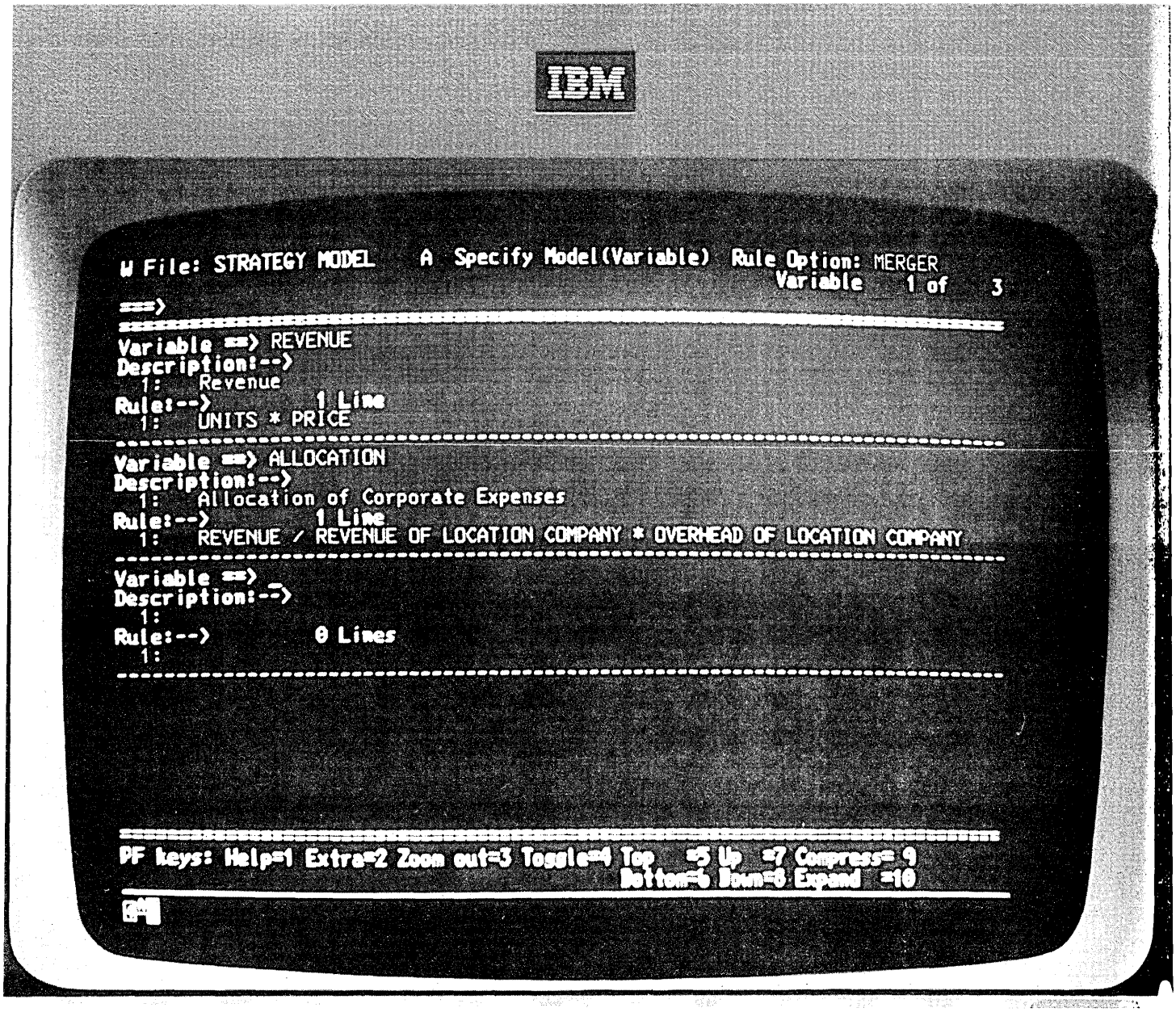

LOOK AHEAD

UNIX GOES MAINFRAME

AT&T Technologies, pushing Unix System V hard as an alternative to IBM offerings, will offer the operating system on everything from "desktops to mainframes." Might that mean the IBM 370, vicepresident of computer systems Jack Scanlon was asked at NCC. You bet, he replied, stating that work is under way on a virtual machine implementation of Unix to run under IBM's VM/370 hypervisor. Announcement of the software, which would compete with a mainframe Unix version offered by Amdahl Corp., will be made by the end of next year. AT&T is also working to improve the user interface, color graphics, networking and demand paging aspects of Unix, the executive said. Distributed resource sharing within a Unix network, Scanlon notes, is the "ultimate holy grail." Also in the works is an unbundling of Unix so users will have to pay only for what they use.

REACHING OUT TO CYGNET

Meanwhile, AT&T is said to be looking closely at the combination PC/telephone device sold by Cygnet Technologies Inc., a Sunnyvale, Calif., startup founded by microchip pioneer Federico Faggin (November, 1983, p. 108). Cygnet's Z80-based product apparently has not sold too well through retail channels because of its high price tag (about $2,000) and its relative sophistication, but AT&T is understood to be impressed enough to have ordered half a dozen units this summer, possibly to reverse engineer. Western Electric may manufacture the device or an oem arrangement may be signed to get to market quickly.

IBM GOING OPTICAL?

Word at NCC had it that IBM has ordered some 1.5 million compact optical disks from Sony Corp. of Japan. The disks, holding a gigabyte each, would probably form the basis of a read-only archive -- containing library reference information, perhaps -- for networked office automation systems.

MATHEMATICA PUSHES ON

Flush with funds from aerospace parent Martin Marietta, Mathematica Products Group, Princeton, N.J., is expanding software development efforts. Among the projects underway are a PC version of the Ramis query system and a further upgrading of English, the firm's natural language front-end. Mathematica is also delving into certain areas of artificial intelligence technology.

A BETTER RAT TRAP

A Japanese exterminating company, Ikari, is using computers to catch rats. Well, sort of. It seems Ikari found the rodents were attracted by rat-like

LOOK AHEAD

	ultrasonic sounds emanating from computer power supplies. The firm's new trap lures the animals with ultrasonic sounds after which a rat-activated vacuum pump sucks the animal off to a CO2 gas chamber. From there, under microprocessor control, no doubt, the remains are automatically disinfected and packaged for disposal.
XA MIGRATION UPDATE	Conversion to IBM's Extended Architecture (XA), which offers 31-bit addressing on 370 mainframes, is becoming easier as users and the company itself move down the learning curve. Some users are making the move in as little as three to four months, far below the 12 months originally estimated by IBM and others. Robert Djurdjevic, editor of the Phoenix-based "Annex Computer Report," says he's been told by IBM that on average, enhancements to XA will come twice a year through the rest of the decade. A recent survey of large IBM users by Cowen & Co., Boston, showed that as much as half of the entire installed 370 base will make the move to XA by the end of 1985. Among users of 308X machines, the figure is 76% (May 15, 1984, p. 88).
XEROX BETS ON AI	After two years of half-hearted effort, which had threatened to drive away several key people, Xerox says it is finally getting serious about the artificial intelligence tools market. Although one of the first vendors to offer Lisp hardware, Xerox let more nimble competitors such as Lisp Machine Inc. and Symbolics Inc. grab early market share. Now, with Gary Moskovitz, a former Mattel and RCA marketing man, at the helm, and a commitment from corporate headquarters in hand, the firm's AI Systems Business unit in Pasadena is doubling the size of its dedicated sales force, boosting hardware and software development, and seeking lucrative international business through Xerox affiliates. Watch for Loops, the firm's experimental "knowledge engineering" tool, to be made into a full-fledged commercial product.
RUMORS AND RAW RANDOM DATA	Watch for Data General to introduce the Lisp language for its MV series of 32-bit computers. The AI language is expected to work with the firm's new line of color graphics workstations. . . .Celerity Computing Inc., a San Diego, Calif., startup founded by ex-NCR, Hewlett-Packard, and Prime engineers, is readying a 32-bit, Unix workstation for introduction sometime this fall.. . .Quality control problems have delayed release of HP's 64000+ software development tool four months from the original Sept. 6 date.

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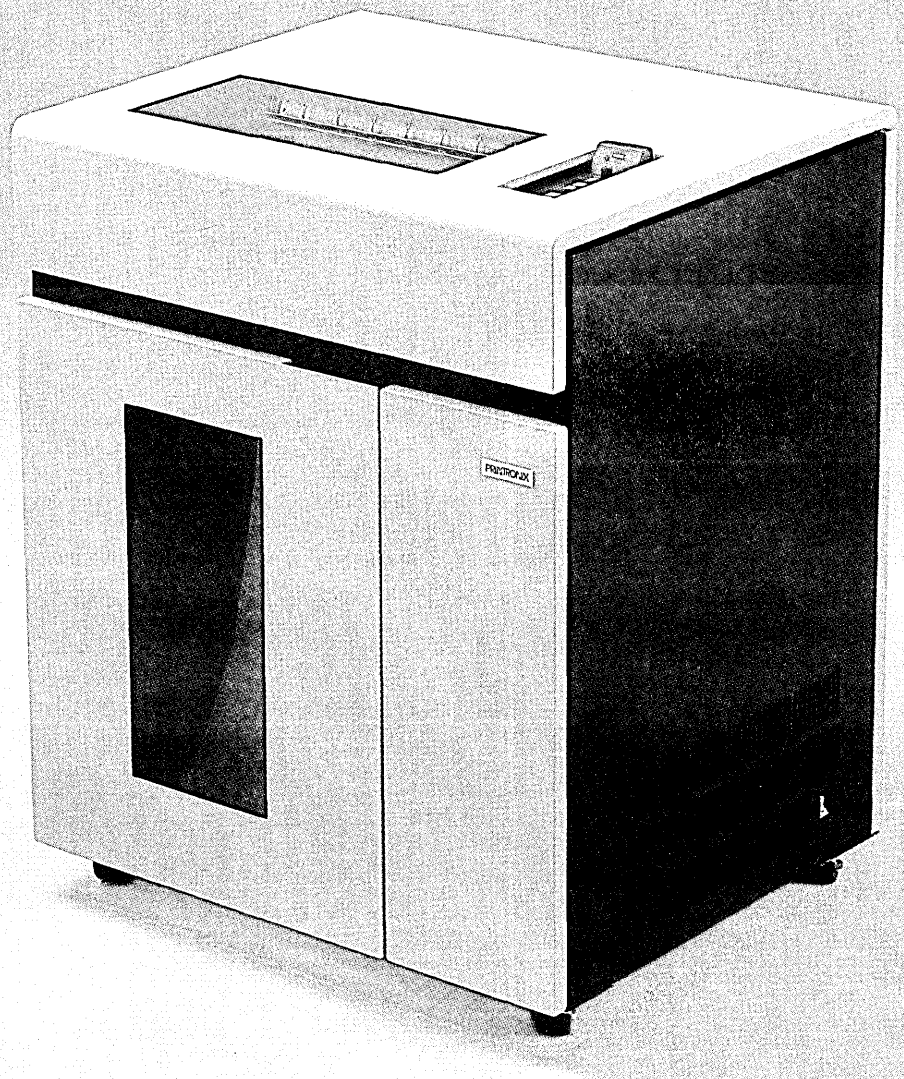

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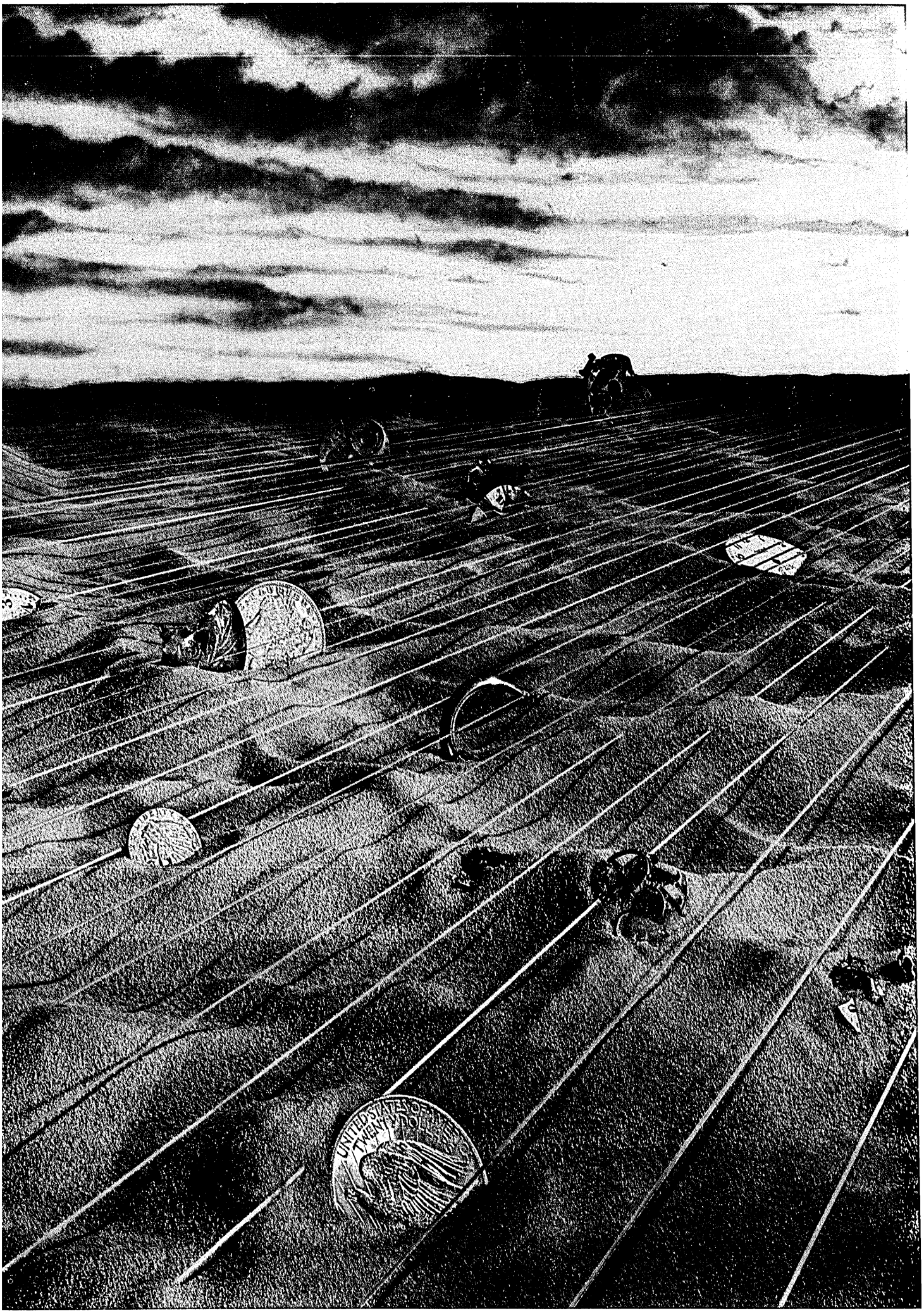
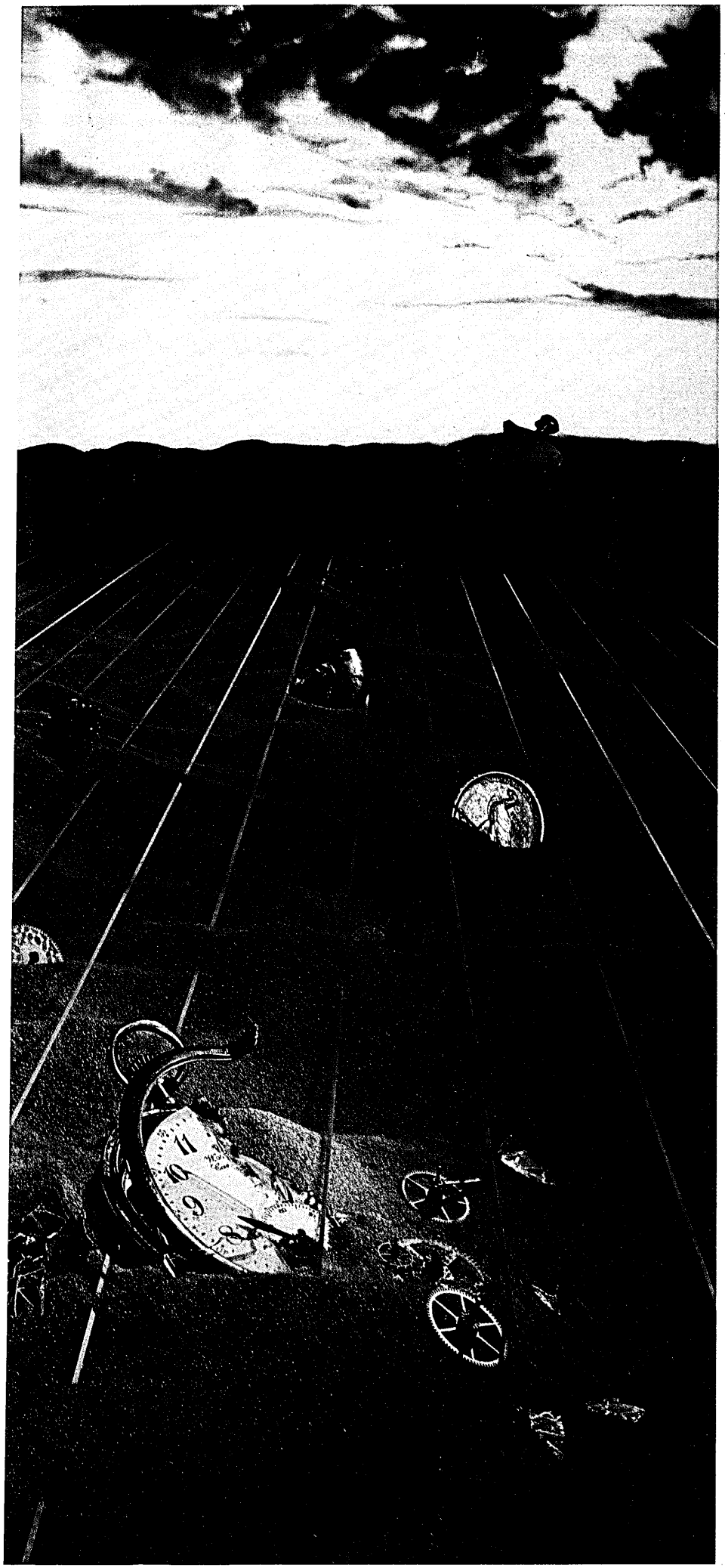

UNITED STATES OF
TWENTY DOLLARS



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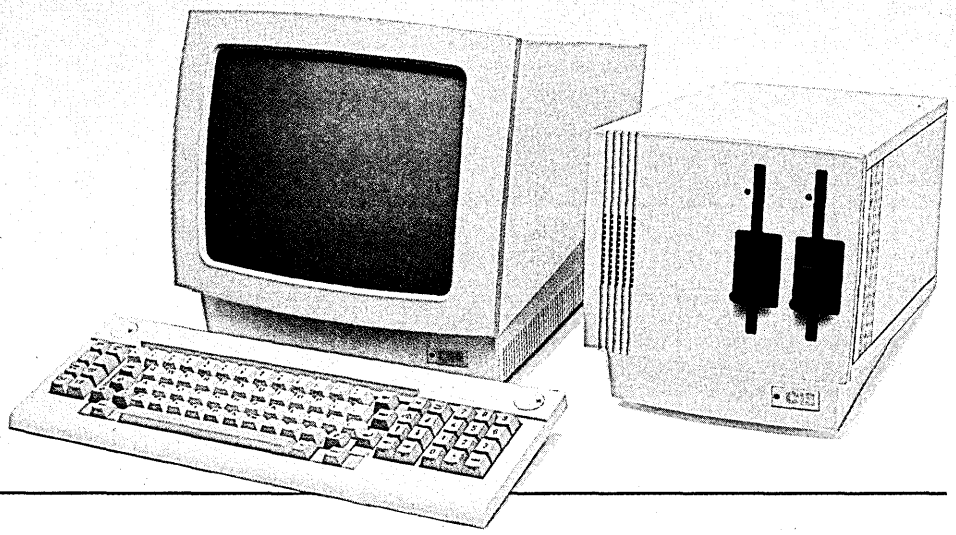

CAN YOU FIND THE SEVEN IBMs IN THIS PICTURE?

We'll tell you where to look. Inside the CIE-7800 and CIE-7850.

The 7800 terminal is plug compatible with the IBM 3178 and all five models of the 3278 series. That accounts for six IBMs.

Now, when you add in the CIE-7850, you also get 100% IBM PC compatibility. That makes seven.

Even more remarkable, the CIE-7800 costs less than any single one of those IBM terminals.

It's more compact, too. Over 40% smaller. But the screen is larger. By 36%.

The monitor tilts and weighs less than 20 pounds. Move it where you need it.

The detached keyboard has an 87-key IBM compatible layout. It can be user configured into any of 22 different U.S. and international keyboards.

The CIE-7800 is also available with concurrent alternate personalities that include DEC VT100,® IBM 3275/3276-2 (bisynch single station) and HP 2622, while still retaining IBM 3178/3278 compatibility.

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CIRCLE 11 ON READER CARD

LETTERS

GREATER INTELLIGENCE

Having read your articles "Securing the Network" and "Pirates on the Boards" (May 1, pp. 52 and 61), I feel you are underestimating the effect of advances in telecommunications technology on callback systems.

I have read about telephones that display the telephone number of the caller. These phones would be available as an option and would record the calling number even if nobody answers the phone. It should be possible to incorporate such a telephone in a modem so the computer can be aware of the source of all incoming calls. There would then be no need for a callback, and the computer center would be unburdened of the cost of the telephone calls.

I would also expect to see a tighter linkage between the intelligent modem and the computer being protected. For instance, the computer could use the telephone number of the calling party in its security software to update lists of telephone numbers from which calls are to be refused or accepted. This would greatly enhance the potential for security in the system.

BRADLEY A. ROSS
King of Prussia, Pennsylvania

PROGRAMMING TEACHES THINKING

Ben Ross Schneider Jr.'s comments on the relationship between good writing and good programming (May 15, "Programs as Essays," p. 162) should be required reading for all managers. I disagree partially, however, with his comment that "programmers aren't the best of writers." That comment is trivially true, in the sense that "programmers" can be replaced with any other job category, from corporate executive to university professor, without changing its validity. My experience is that the good programmers—the ones who tend to see design as a major part of their jobs—do tend to be good writers.

The relationship between good writing and programming is so strong that I know of some managers who use, as the major part of their hiring evaluation, the following Programmer Apptitude Test: "Write a paragraph on any subject that interests you." The applicants who turn out to be good programmers are the ones who are able to write a connected paragraph that tells a story. I'm sure I'm not the only hiring manager who can winnow 100 résumés down to just six on the basis of the prose in the cover letters.

I have long been advocating, as does Schneider, the inclusion of more programming in undergraduate (and secondary school) curricula. Of all the things that students do in school, programming is one of the few in which they can take a problem, think about it to determine an approach, plan out and implement that approach, be faced with "real-world" crises like changes in specifications, and ultimately find out from an unbiased judge (the computer, not the professor) whether their approach was correct. It is one of the few subjects in which students get the opportunity to determine that doing the job right requires tools, and then have the opportunity to build and use those tools.

Few people need to know how to program. But I believe that programming in the curriculum would go a good distance toward teaching *thinking*, which may be the greatest lack in modern American education.

DENNIS P. GELLER, PhD
Director, Academic Computing
Babson College
Wellesley, Massachusetts

GRAPHICS STANDARDS REVISITED

I would like to compliment Meads on his unbiased presentation of both sides of the GKS vs. Core battle (May 1, "The Graphics Standards Battle," p. 76). I believe, however, that the author fails to emphasize the substantial opportunities and benefits users stand to realize from *one* set of internationally recognized standards (GKS and PHIGS). While it is true that standards exist for many different programming languages (FORTRAN, COBOL, BASIC, etc.), these were created to meet the needs of *different* constituencies (COBOL for business programming, BASIC for novice programmers using small computers, etc.). If both GKS and Core were to coexist as standards, they would serve basically the *same* constituency, thus dilut-

LETTERS

ing the benefits of a graphics standard. GKS and PHIGS, on the other hand, serve two separate constituencies (business graphics vs. CAD/CAM).

I believe that Meads's concern that compliance with GKS would be inefficient and "in some cases, would prevent access to sophisticated systems" is unwarranted. Compliance with GKS would not prevent access to more sophisticated systems. GKS, like most other standards, defines low-level interfaces and leaves the user-friendly, high-level interface to the applications. Thus, it is a "toolbox" of functions used to develop (sophisticated) applications. Conformance should only apply to the purchase of packages of graphics toolbox functions. This would still allow the user to build sophisticated graphics applications or systems on top of GKS (or if 3-D is needed, on top of other toolbox packages).

MARK SKALL
Chairman, X3H34 (Task Group on Conformance and Language Binding of GKS)
National Bureau of Standards
U.S. Department of Commerce
Washington, D.C.

MUCH ADO ABOUT KNOWLEDGEMAN

R. Emmett Carlyle's story, "The PC Makes Friends" (May 15, p. 64), correctly notes that Cullinet licensed our Knowledge Manager (KnowledgeMan, for short) software for its new PC product. The article incorrectly states, however, that Micro Data Base Systems Inc. is located in Indianapolis, when we're actually headquartered in Lafayette, Ind., and erroneously suggests that KnowledgeMan is limited to "relational query software," which it isn't.

While the SQL query facility is a very important component of KnowledgeMan, there are a number of other integral components that are also very important. These include the underlying data manager, a spreadsheet processor, a multicolor graphics generator, a structured programming language, a forms manager/painter, and the soon to be released text processor. These are not separate programs, but are all synergistically integrated into a single program that runs in 192K machines. The user interface is a single, streamlined language for using all the components in concert with each other. Because of KnowledgeMan's learning ability, this language can be customized by the user so that favorite terms, abbreviations, and slang are recognized. The SQL relational query facility is but a part of this more comprehensive language.

The article explains that "easy-to-use relational software is coming to the personal computer." I would like to point out that tens of thousands of KnowledgeMan users have already been using such a system since its introduction a year ago.

GARY J. KOEHLER, PhD
President and Chief Executive Officer
Micro Data Base Systems Inc.
Lafayette, Indiana

MISSED THE MARK

Efrem Sigel's article, "The Selling of Software" (April 15, p. 125), misses the mark where it criticizes making marketing driven business decisions. In claiming that "new products come from the minds of [software] developers," Sigel appears to favor the opinion of one person, a software developer, over the opinion of the customer. That was the archaic selling concept of the pre-1950s, wherein the salesman's job was to force a reluctant customer to purchase goods that were neither wanted nor suited to the customer's needs.

The marketing concept, however, encourages discovery of customers' needs and delivery of need-satisfying products and services, and relies on the market to send signals of acceptance or rejection. This means that a competitive company must possess competencies in technical as well as marketing disciplines. In the vernacular, this is sometimes called playing hardball (i.e., producing professional results).

As a clear example of playing hardball, DISC made a marketing driven decision: to withhold our DBL, a superset of DEC's DIBOL business language, from the market while we meticulously crafted, installed, and thoroughly tested a micro version of DBL to ensure a superior micro product with technological excellence in implementation and in ease of use, but also possessing excellence in business benefits that no one could match. (For example, DBL can port among DEC PDP-11 and VAX systems as well as to or from them and the micro world of MS/DOS, Unix, etc.). As a result, we are the exclusive supplier of virtual memory capability for DIBOL-like code.

DISC will not produce a product that is not clearly superior. That is our marketing decision, and it is marketing that provides the knowledge of what constitutes clear superiority. The technical aspect, while of manifest importance, must be improved on by drawing upon the technical expertise of many people—technical, marketing, and customers—if DBL is to be what our customers say they want.

DBL was designed for the *market*. And that was a marketing decision.

EARLE RICHARDSON
Marketing Director
DISC
Sacramento, California

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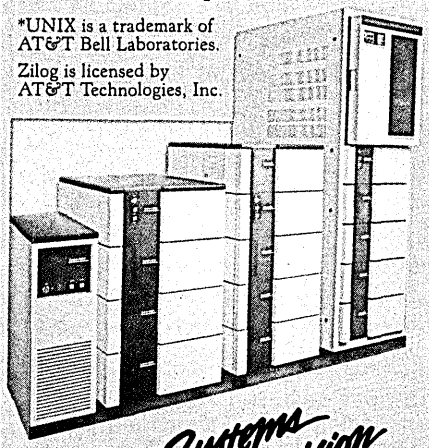

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CIRCLE 13 ON READER CARD

3M intr one less worry a

We can't do anything about your taxes. Or the rush-hour traffic. Or the person who keeps stealing lunches out of the office refrigerator.

But we can take a big load off your mind when it comes to diskettes.

3M diskettes are certified 100% error-free. And guaranteed for life.

No floppy is more reliable.

There's no way one could be. Because only 3M controls every aspect of the manufacturing process.

We make our own magnetic oxides. And the binders that attach them to the dimensionally stable substrate. Which we make ourselves from liquid polyester. Which we make ourselves.

We also test our floppies. At least 327 ways. And not just on exotic lab equipment with perfectly aligned, spotless heads. But also on office equipment like yours.

We even reject a floppy if its label is crooked.

Some people think we're a little crazy to go to all that trouble. After all, do you really need a diskette that can make one read/write

oduces thing to bout.

pass on every track, every hour, every day for the next 200 years?

Not really.

But now that you know a 3M floppy can do it, you can relax.

And worry about other things.

Like who stole your lunch from the office refrigerator.

One less thing to worry about.

CIRCLE 14 ON READER CARD

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And long before they're off the ships, they're on the Sperry MAPPER™ System. Allocated to distributors. Assigned to dealers. Complete with work orders.

Working off a Sperry computer, 300 MAPPER terminals provide a total communications system between Subaru of America and the distributor network.

Distributors get the information they need with less than a 3-second response time. No DP skills are needed. No tech people are needed. All data is visible in report format so anyone can read it.

And commands are given in plain English, giving users the capability of tailoring runs to their own individual business needs.

Locating parts, a major problem for most car manufacturers, is no problem for Subaru. Stocks of 28,000 parts are inventoried and controlled on the MAPPER System. Punch it in and you can see instantly where the parts are and how many of each is available.

Don Finello, Director of Data Processing at Subaru of America states, "At Subaru, MAPPER isn't just a report generator. Management, Accounting, Sales, Parts, Advertising—all departments use it."

MAPPER has made the user self-sufficient. Control of the information is back in the hands of the people responsible for getting the job done. The people who know the job best.

And it's a system geared for growth. An important thing when you're moving as fast as Subaru.

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SPERRY

CIRCLE 15 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

UNIX: THE DEUS EX MACHINA?

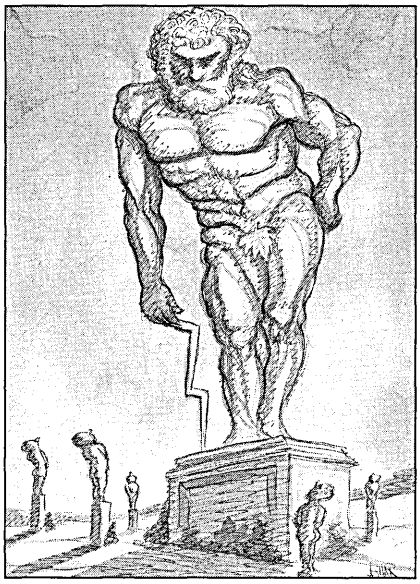


ILLUSTRATION BY DORIS ETTLINGER

Any mention of Unix, AT&T's beloved operating system, is sure to inspire at least two things. First, the obvious joke. And, second, fierce disagreement.

A system with a name that suggests unity couldn't be more divisive. Unix fans suggest the system will bring sweet reason to a world of incompatibilities and fix everything but hangnails. Its foes predict Unix will be tripped up by the real-world demand for applications and easy access.

David Morris, in "How Not to Worry About Unix," p. 83, says "Unix's claim to be an industry standard is decidedly premature." Moreover, says Morris, people don't need Unix.

But consider for a minute where Unix has been since Ken Thompson and Dennis Ritchie began building it at Bell Labs 15 years ago. As Sandy Emerson writes in "The Unix Universe," p. 76, "Before 1981, when AT&T announced a radical change in the licensing structure...Unix had been the almost exclusive property of universities and research institutions."

The ivory tower, an unreal world if there ever was one, right? Maybe. Because if the computer business has proved anything, it is that classroom habits turn into grown-up purchases.

People are buying Unix. The market is growing by 40% a year, say Norman Zimbel and Dennis Barlow in "Unix—How Important Is It?" p. 90. And everybody but Baskin-Robbins seems to be offering some flavor of Unix—either the real thing or a good imitation. That even goes for IBM. (AT&T isn't offering Unix on its new pc, but that's more a lack of marketing savvy than an insensitivity to market needs.) So why do people keep saying such mean things about Unix?

Perhaps it's the time-honored tactic of punishing the parent by thrashing the kid: Lord knows, not everyone likes AT&T. The company has been so ubiquitous that, sooner or later, it was bound to have angered everyone some of the time. So, some of the people say bad things about AT&T all of the time. (For the giant's own hopes for Unix, check out "AT&T Asks for a Unix Standard," p. 100.)

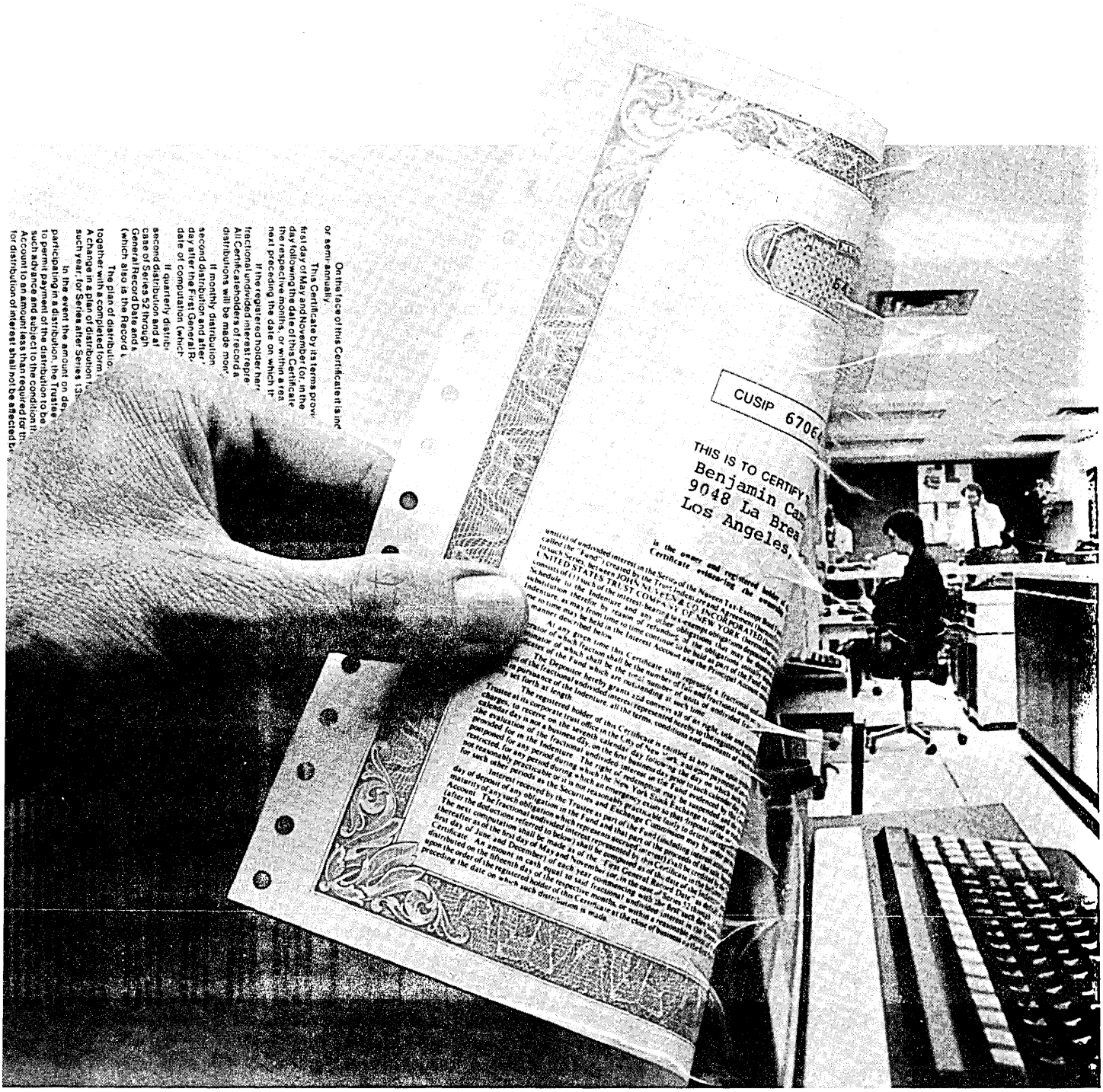
Still, as Morris points out, there are ways other than Unix to do things. For all the ads, conferences, publications, and consultants, Unix is not inevitable. Nor will a Unix victory necessarily mean a win for AT&T.

Zimbel and Barlow see a possible Armonk end run. "A very real alternative for IBM is to develop its own Unix separate from that of AT&T," they say. "IBM's Unix could stay compatible with the current software base by supporting the C language for non-systems programming. IBM could safely invalidate all the exisiting kernel-level approaches and deliver a potentially staggering blow to the AT&T standardization effort. The IBM market presence would likely override any short-term disadvantage to a Big Blue solution." But we're slipping into tomorrow; where are we today?

Unix has been called "the great communicator" almost as often as has Ronald Reagan. But unlike Reagan, Unix is not an incumbent; so far, what goes is what IBM decrees. This alone may be reason to root for the success of Unix. If AT&T were to become an equal competitor in the dp world, IBM's ability to dictate the standards by which the industry lives would end.

So far, however, Unix has promised more than it has been able to deliver. As Zimbel and Barlow put it, "For business data processing and office systems, availability of application software is a key factor in the future success of Unix, but, despite a recent flurry of product announcements by system vendors, business related application software remains scarce."

Nonetheless, the operating system's real and potential portability conjures visions of the peaceable kingdom. And AT&T's recent hardware announcements add to the system's clout. The devotees of Unix can quickly make you a believer. ◉



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"It seems that whenever we had a need, MAI had an answer. This time it was their newly developed 8000 series."

Claiborne volunteered to "beta" test the new super-mini in Chicago and within six months, "We had mastered

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CIRCLE 16 ON READER CARD

IN FOCUS

GEARS BY COMPUTER

How one company's existence depended on dp.

by Steve Moore

A Colorado entrepreneur wants to raise more hell technologically than his grandfather, former Louisiana governor Huey "the Kingfish" Long, did politically. For the past five years, Rory McFarland has thrown money and computers at a technology no one else has ever managed to develop beyond the experimental stage.

Computers made the difference. Without them, the "antifriction drive" could not have been designed, built or tested. With $500,000 worth of them, McFarland's company, Advanced Energy Technology Inc. (AET) of Boulder, Colo., brought a high-tech replacement for gears to the marketplace this spring after almost five years and more than $10 million of development. McFarland has staked his inheritance—he borrowed heavily on oil leases bequeathed to him by Long—that computers will enable AET to "go ahead into an area that has been one of the major blind alleys of power transmission for a hundred years."

The biggest question marks AET must eliminate before its "toothless gear" makes a dent in the marketplace are the ones the product itself raises in the mind of virtually everyone who tries to understand how it works. Instead of transmitting power by pushing gear teeth against each other, the antifriction drive employs a complex "rolling mesh" of roller bearings moving between scallop-shaped inner and outer "advanced energy rings."

Computers enabled AET to design and manufacture the antifriction drive; now the company finds computers essential in explaining its product to investors and customers. Even for AET staffers like executive planner Gerrit Verschuur, "It was very difficult to imagine how the drive worked without seeing it because it is such a new idea. The thought that you could have a gearbox without teeth is almost counterintuitive." Verschuur teamed up with computer graphic film producer Wyndham Hannaway to make a state-of-the-art promotional film for AET. The fully computer-generated film, which was modeled on an Evans and Sutherland PS-2 real-time three-dimensional graphics system running on a DEC 11/60 mini, excited much interest at the SIGGRAPH and other video industry film festivals in 1983.

The trochoidal shapes of the drive's advanced energy rings are extremely hard to draw. The only way to describe them accurately is by using the mathematical equations that define each point on their surfaces. In order to depict the shapes and compound motions of the drive on film, Hannaway used the actual equations derived by AET during the design process. "That film cost us $80,000, and it was very handy to have in the process of raising $10 million. It's paid itself back many times, and is doing so every day by explaining our product to our customers, suppliers, and investors," beams McFarland.

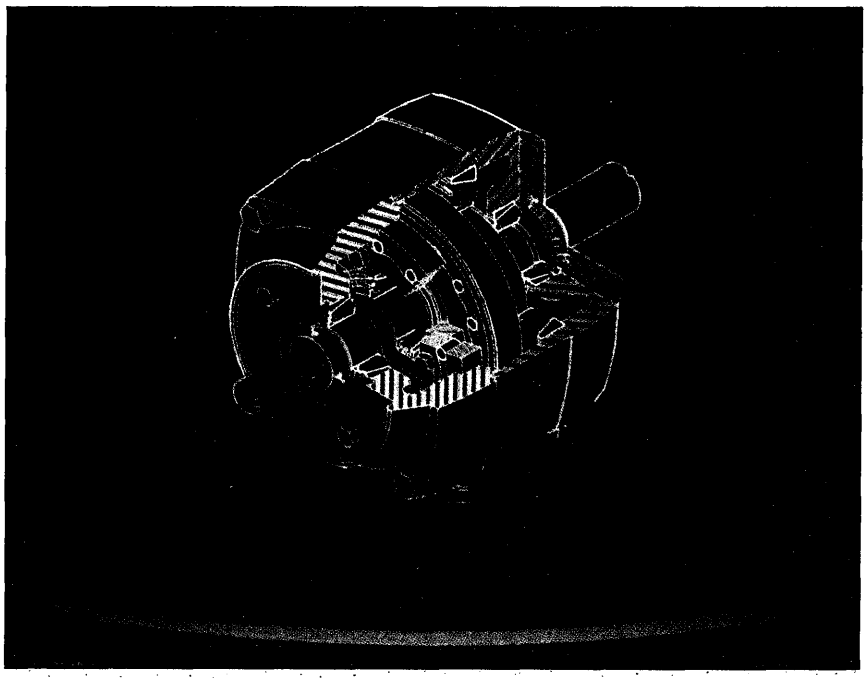
Perhaps AET deserved the handsome payoff of its computer graphics experiment—the company's marriage to computers had been more rocky than blissful. Two years of design work finally yielded an initial, theoretical concept of what the drive would look like, and McFarland and his engineers realized they had gone as far as they could with their Hewlett-Packard HP-85s, which were basically programmable calculators. They believed they had a hot new technology in their hands that had to be developed as quickly as possible before the idea got out and the Japanese or someone else beat them to the marketplace.

The HP-85s were limited by their slow speed and single-user architecture. They had been fine for the painstaking theoretical work of defining the basic shapes for the toothless drive rings, but more computing speed and power were needed for evaluating the nearly infinite range of drive configurations with regard to friction and heat, strength, reduction ratios, operating tolerances, and efficiency.

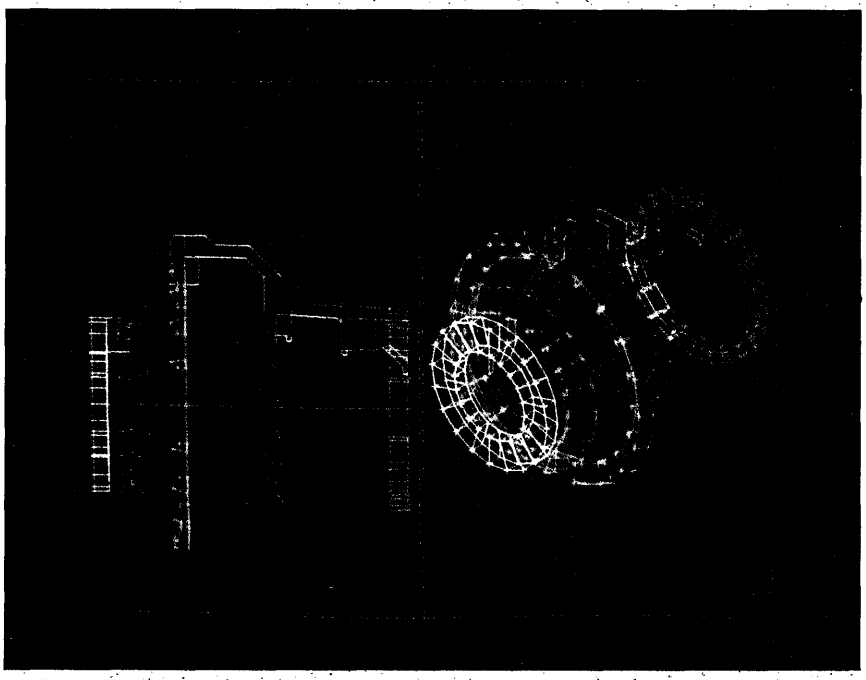
"The company was actually selling it as a complete product, but it really wasn't. One small bug after another came up in the software."

AET wanted computers to speed engineering, testing and manufacturing of the drive as well as for word processing, accounting, and marketing functions. But first they had to hire a data processing manager to select, install, and integrate all the necessary systems

Jim Sherman, a Princeton mechanical engineering and computer science grad, came aboard as AET's dp manager in August 1982, after a five-year stint working with robotics at Rockwell International, Pittsburgh. Worried about getting stuck with a 16-bit system that might not be developed further or even supported as time went on, he made his



Antifriction, or gearless, drive, seen in a CAD/CAM created cutaway view.



A graphic representation of the dual elements in the gearless drive.

first major decision: to buy a 32-bit computer to handle AET's engineering needs. It had to be made by a large company with a track record, and it had to fit within AET's budget, which mandated a $300,000 limit for the CAD/CAM system.

Sherman chose Digital Equipment Corp.'s VAX 11/750 and started looking at CAD/CAM systems that could handle three-dimensional engineering design work. He narrowed the field to McDonnell-Douglas's McAuto and General Electric's Calma, benchmarked both, and chose Calma because "Its software seemed to be more suited to the type of design work we were doing." The Calma software had just been converted from the Data General Eclipse 16-bit architecture to the VAX 32-bit architecture, and AET bought the second VAX configuration of the system.

Once he started working with the Calma system, engineer Robert Distin, coinventor of the antifriction drive, felt that "the company was actually selling it as a complete product, but it really wasn't. We expected to be able to crank out finite element models in a couple of days, but one small bug after another came up in the software. The vendor was solving the problems as we told it about them and they cost us a lot of time; we had to modify the software and did it more quickly than the vendor could. Software revisions didn't come out often enough, and then they weren't always complete. Sometimes a capability would

" Now whether it was oversold or we underbought, I don't know."

be left out of a revision although it had fixed the specific problem we asked about."

Dp manager Sherman has a less critical viewpoint. "I never expect total perfection from anything as complex as this. Calma's hardware support has been excellent. Its software support was struggling at first, but the company had just been bought by General Electric and had a high turnover rate for a while, so I understood the problems.

"It's probably an accurate statement to say that it was implied that certain things were ready when they weren't ready. Now whether it was oversold or we underbought, I don't know."

Calma's director of advertising and public relations, Alan G. Rockhold, admits that some Calma salespeople oversold the product, either through "enthusiasm, misinformation, or the fact that we brought the product to market rather quickly." GE sent Calma a new president, Bob Smuland, in March 1983, and according to Rockhold, "the first drum he started beating was customer service, product support, and that kind of thing. In the past, customer support was, frankly, not Calma's strong suit. It is rapidly becoming that. We've come a long way in terms of supporting our customers. I think we've done everything we can to atone for perhaps overenthusiastic claims that were made in the past."

Distin's rejoinder: "AET still doesn't have the finite element model capability Calma sold the company—the preprocessor works but the postprocessor still doesn't."

AET realizes it is pushing the state of the art in CAD/CAM applications and that without the Calma system the company would not be as far along as it is today. Sherman's summation of the tradeoffs of working at the edge of a new technology is, "If it enables you to do one thing that you couldn't do otherwise, and that one thing helps you get the product out the door, you can find a cost analysis for it."

McFarland agrees that AET's CAD/CAM system is indispensable, but thinks the very concept of CAD/CAM is

oversold in the sense that it's much easier to buy hardware and software than it is to train people. In McFarland's words, "there are many corporate executives, who, on the advice of their engineers—like all engineers, they love new toys and new computers—go out and spend half a million dollars on a piece of hardware. Then they realize that for productivity, you have to hire someone or train someone to run the thing—and the way these things are right now, it takes at least six months to train someone to use it well."

"I believe we have spent tens of thousands of dollars of our time debugging other people's software.

A shortage of skilled people can be an expensive bottleneck in a growing industry. After a company has invested in salary and training expenses while employees learn, it must often choose between nearly doubling their salaries or having them hired away and beginning the training cycle again. McFarland speaks from experience when he points out, "It's easy to forget that as an entrepreneur, and that's when you start losing your people."

AET's people did their preliminary design work on the HP-85s, which McFarland selected partly because he was familiar with the Hewlett-Packard name after having used HP calculators in college. Sherman then chose 68000-based HP-9836 desktop computers to handle AET's manufacturing and testing processes because he wanted compatibility with the engineers' existing programs and because much of the company's test equipment (spectrum analyzers and oscilloscopes, for example) was also made by HP.

AET's loyalty to Hewlett-Packard was born of habit, but became entrenched because of the "lock-in" syndrome, and continues today because the computers handle AET's scientific applications accurately. "We have to go into double precision on the VAX to get anywhere close to the normal precision of the little [HP-9836] computers," notes Distin.

Sherman will soon have his four HP-9836s talking to the VAX so that manufacturing and testing procedures can be more closely tied to the engineering process. Dumping test data directly to the VAX will allow real-time analysis of drive units being tested and radically speed up quality control checks of the advanced energy rings, which are still being manufactured out-of-house.

"We have a contra-measuring machine to measure every ring that comes in the door because we're still not getting perfect rings from our vendors. Right now it takes the 9836 about an hour to do a 360-degree measurement on a ring, and about an hour to analyze the data. We've got a microprocessor chip that we're going to put in that will enable the data to be read in approximately one minute. Then we'll send that data over to the VAX where it will take less than a minute to do the analysis. So instead of two hours it'll be two minutes." You can bet Sherman smiled when he said that.

It was the number-crunching capacity of the VAX that enabled AET to refine the antifriction drive in a relatively short time. As Sherman tells it, "A lot of the analysis work done in perfecting the box involved trying to figure out exactly what shapes the hypo and the epi [the two drive rings] should have, because as they go through their motion the angles between the surfaces are constantly changing—the rollers are compressed at times and not at others—and so there are large numbers of iterations. The computer was able to analyze literally millions of points along the curve hundreds of times until we finally started getting the shape we wanted.

"To attempt to have an individual without a computer do this, you're talking about roomfuls of engineers with calculators, and even then you still end up with points as opposed to pictures. The CAD/CAM allows you to generate the points, draw the picture and visually see where you are getting interference, how much interference you're getting, and therefore how you can revise the form."

The VAX's four megabytes of memory and 300-megabyte disk has so far been more than enough to handle all of AET's 3-D models and finite element models, the largest of which consume as many as 3,000 blocks. If Sherman had long enough to wait, the VAX could probably crunch all the numbers in a 2,000 by 2,000 finite element matrix, but Control Data's Cybernet gets that job done much faster.

In order to conserve disk space for data generated both internally and out-of-house, Sherman periodically harasses users to delete extraneous files. "I used to have an automatic purging system to keep from getting too many copies, but then they sometimes needed the back copies." It may be, too, that Sherman fielded one too many complaint, like, "What happened to DOGBREATH?" File names are a source of endless comic creativity for most computer users, and AET's engineers are no exception.

Sherman wrote many of AET's applications and utility programs, since no commercial software was available to link test equipment to computers or to handle the company's specialized laboratory and engineering analyses. He also modified or added to commercial software as needed. As all commercial software used at AET was written in FORTRAN or BASIC, they became the languages of choice for Sherman and the engineering staff.

AET's staff grew as the push to get the drive to market intensified, and word processing and accounting needs piled up. Sherman's intentions of simply buying software to add those capabilities to the VAX came to an abrupt end when he learned the prices of VAX software: It was 20% cheaper for AET to buy a smaller PDP-11/23 Plus computer with word processing and accounting software than to buy the VAX software alone. Diston recalls that each of the five accounting packages AET wanted was priced at $10,000, so that the total price for VAX software, including word processing, was in excess of $50,000.

Currently, the PDP-11/23 Plus handles all AET's office functions—word processing, accounting, and financial analysis, but its two 10MB disks are already slated to be replaced by a 50MB to 80MB disk. The VAX takes care of engineering, CAD/CAM and marketing analysis work, and the HP-9836s automate the testing and quality control lab.

AET's ultimate aim is to have an integrated computer system that will allow an engineer to sit at a terminal, input specifications for drive elements to be used in a particular application, then sit back and let the machines spit out the parts. For now, manufacturing of the rings is done on computerized equipment owned by outside vendors.

AET has no choice but to use computer aided manufacturing techniques; a human machinist cannot approach the accuracy required to reproduce the complex curves of the drive rings in metal. Use of computer-aided manufacturing system components from a variety of manufacturers led to trouble.

"Without the state of the art of computer technology as it exists now, I don't think we would have been able to develop this product."

The firm's most serious development problem to date was first noticed as an unwanted vibration in drives under test. Six months of precious development time slipped by before the problem was traced to an error in the third-party software for the computerized jig grinder which manufactured the rings.

The curve-fit program left a 25 to 50 millionths of an inch bump on each lobe of the rings. The machine was made by one company, the computer that ran it by another, and the software by yet another. Neither AET nor the subcontractor was allowed to look at the proprietary

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software source code, so the six months were spent reverse engineering the problem by using the CAD/CAM system to model what the software was doing and then asking the software people, "What about this? What about that?"

Complains McFarland, "I believe that we have spent tens of thousands of dollars of our time debugging other people's software," adding that few programs used by the company have turned out to be as fast, accurate, or easy to use as they are cracked up to be.

AET's biggest task now is to convince the world that the antifriction drive is as practical, cost-efficient and energy-efficient as the company cracks it up to be. AET people love to speculate about how many billions of dollars worth of energy the antifriction drive will save the world because of its efficiency and how they expect to quickly lap up the lion's share of the estimated $6 billion a year market for power transmission systems. McFarland claims that conventional gear boxes use 40% of the country's electricity, and that replacing them with antifriction drives would save as much energy as is produced by American nuclear power plants—about 10%.

Right now, it's still blue sky. McFarland projects sales of $1 million a month by the end of 1984, yet the first 10 beta test units were delivered in late 1983, and only three drive units were in the hands of customers by May 1984. The unit price is about $650 each in small quantities. Though a few software entrepreneurs have accomplished that steep a ramp-up, it isn't as easy for a manufacturer of complicated gearless gearboxes in a town like Boulder. As McFarland himself has pointed out, Boulder is not a place where metal moves easily.

In the first flurry of enthusiasm

It was the number-crunching capacity of the VAX that enabled AET to refine the antifriction drive in a relatively short time.

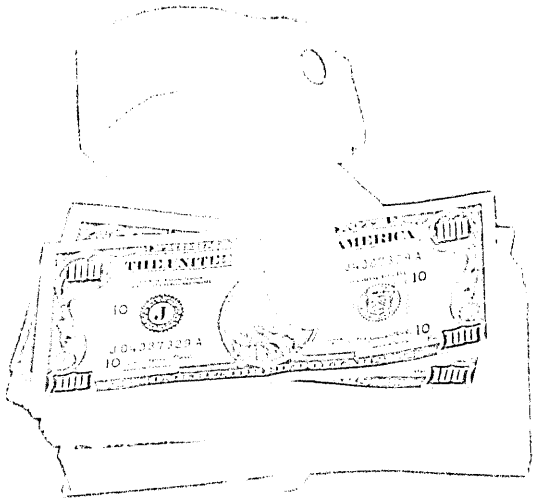
AET and the technical press gushed that the drive would be applied to any machine that rotates; now the company is more cautious and realistic. AET's primary marketing focus is on the industrial power transmission industry. Robotics comes second, and after that come the smaller niches. NASA and Ford are just two of many organizations to have expressed interest in the drive, but most have a wait and see attitude. Bob Brown, engineering services manager for the 250-member American Gear Manufacturers Association is skeptical because "we see a mousetrap trying to replace gearing every year."

Long and costly research will be necessary to determine whether a "zero backlash" drive can be manufactured for applications requiring error-free positioning capability, or whether a multispeed drive can replace automotive transmissions. Whatever the application, AET will remain absolutely dependent upon computers to develop it.

"Without the state of the art of computer technology as it exists now, I don't think we would have been able to develop this product, certainly not in the time frame that we have," says Sherman.

AET subscribes to the gospel according to the late Buckminster Fuller, whose golden rule was "Do more with less." Computers, which continue to do more with less, have enabled AET to reinvent the gear. Thus a device basic to the manufacture and transportation of virtually everything in our society may be replaced by a technology that can do all that with less. ◉

Steve Moore is a staff writer for the Alpha Micro Users Society and a master's degree candidate at the University of Colorado in Boulder.



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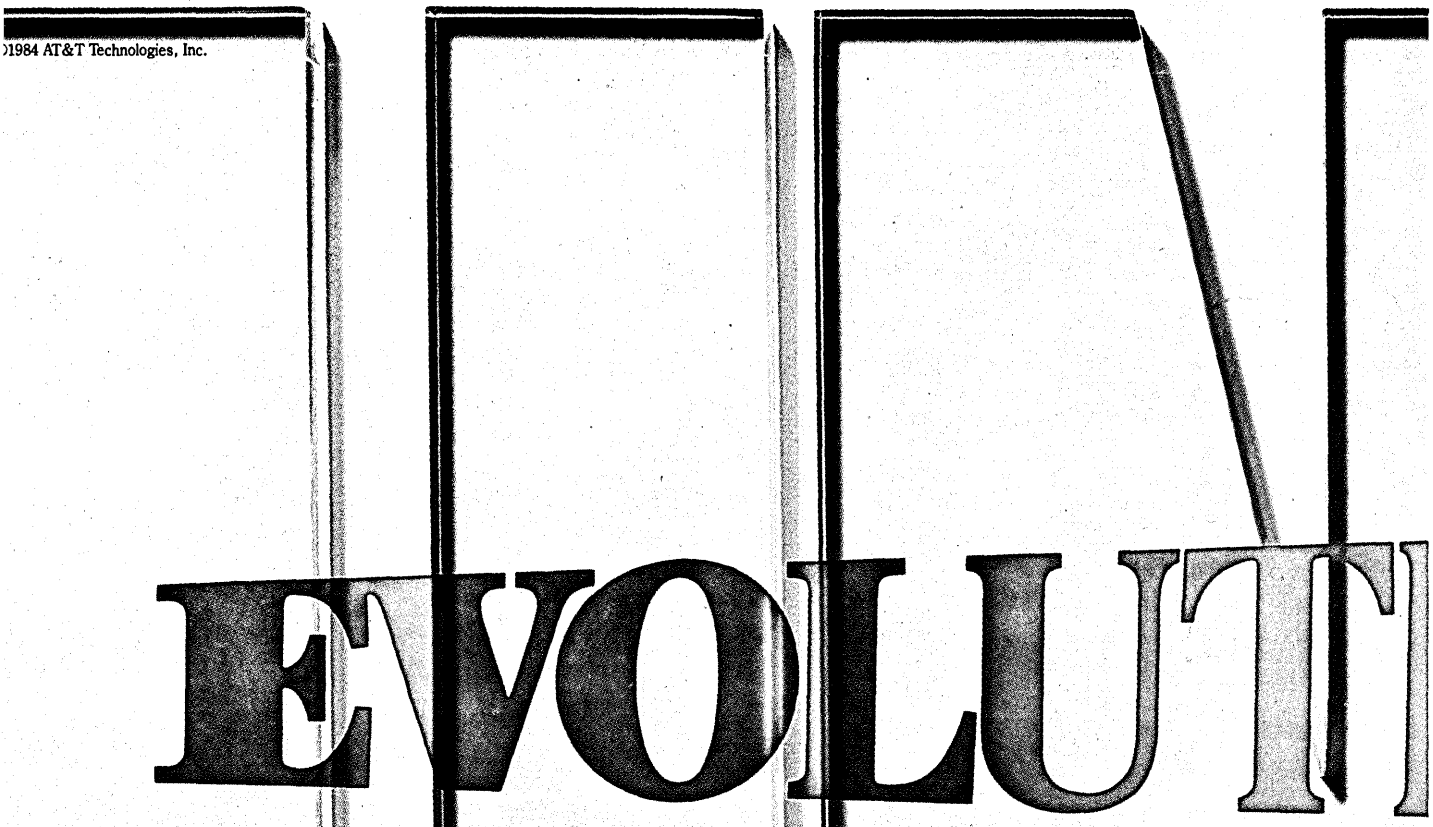

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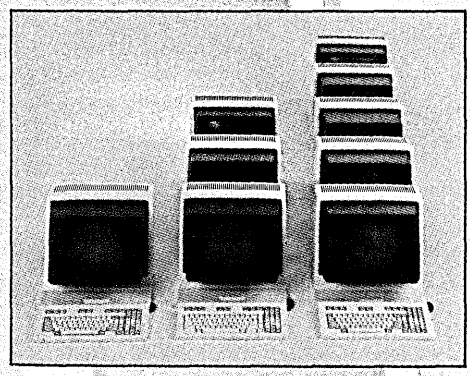

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NEWS IN PERSPECTIVE

STRATEGIES

CITI'S TECHNO BOSS

Citicorp's new chief has made his name by infusing banking with new technologies.

by R. Emmett Carlyle

A vortex of electronics and swift deregulation has created major changes in the world of banking. It has also helped propel a 45-year-old MIT-educated engineer and computer whiz to the top seat of the world's largest bank and holding company, the $142 billion Citicorp.

Generally credited with making Citicorp as aggressive as it has been in applying technology to traditional and new business areas, Reed is faced with the task of leading Citicorp into a world financial services market where the distinctions between different financial institutions is blurring rapidly. "Essentially, every act of traditional banking is now a component of the information economy," notes Richard Mills, consultant and former senior executive at Citicorp. "Money is just a specially coded form of information. Rather than move gold bars you move bleeps, bits, and bytes across communications links."

"Technology has become the sword and not the shield," says another former Citicorp executive.

Some observers go so far as to suggest that Reed's emergence as Citicorp's leader signals a new era in corporate management. The "technocrat"—a manager versed in electronics as well as traditional business practices—may now take over other banks, financial institutions, and even manufacturing companies. As the late economist Fritz Schumacher noted, scientific findings can be used for countless modes of production, "but new technologies are developed only when people of great power and wealth back their development."

At Citicorp, the quest for large-scale application of technology, and the economies of such scale, appears to be everything. "Scale was never a factor in banking before automation," says Peter R. V. Bleyleben, manager of the Boston office of the Boston Consulting Group and banking strategist. "Automation has made scale important. Since required investments in dp systems are large, the greater the volume, the faster the payback and the lower the ongoing operating costs per transaction."

"All banks at root comprise just a financial database and the power of credit and debit," adds Michael Nugent, a former ADAPSO attorney who now works at Electronic Data Systems, Dallas. "Scale becomes important when they expand this traditional core into an enormous global electronic delivery mechanism."

Citicorp has gained two satellite transponders for its own use and has designs on the terrestrial plane, moving aggressively to become a common carrier and supplier of computing services. It is also developing a corporatewide systems architecture to guide its interconnection of disparate databases and computers.

Scale, as Citicorp has shown, can also be achieved by a process of acquisition and diversification into nonlending sectors. The company's so-called five-I

"All banks at root comprise just a financial database and the power of credit and debit."

strategy—calling for activity in institutional, individual, investment, insurance, and information services sectors—emerged in the late 1970s because Reed and departing Citicorp chief Walter Wriston foresaw the impact technology would have on their traditional wholesale institutional banking business.

The wholesale bank's base of deposits from corporate borrowers has been eroding for the past decade, according to Bleyleben. "Rather than let deposits sit at fixed interest rates over long periods of time, automation allows the creation of cash management networks and software." Citicorp foresaw that eventually banks would have to face the loss of their demand deposits to higher yielding transaction vehicles, commercial paper such as money market certificates.

Currently, Citicorp depends on large deposits for an estimated 63% of its funding, and though its institutional bank has settled into a pattern of no-growth over the past three years, it still contributed 70% of the bank's earnings in 1983. Reed's problem, in a nutshell, is how to redeploy these assets away from structurally unattractive prime wholesale lending to more productive activities. He has chosen acquisition and diversification into computer-based services, but that still leaves Citicorp with the problem of where life-giving deposits will come from, ands this is where the second individual depositors come in.

Wriston and Reed saw that because of regulation and geographical restrictions, a planned foray into computer services and the creation of a national branch banking network would not be

ILLUSTRATION BY ELLIOTT BANFIELD

feasible. So, in the late '70s, according to Citicorp insiders, the bank decided to meet the regulatory and legal issues head on with the creation of a timesharing services subsidiary, Citishare (see box). The bank had been providing such services on an internal basis for several years and it lobbied vigorously that it should be allowed to take the services to the open market.

Reed argued persuasively that technological improvements in the delivery of financial services have enabled nonbanks to compete with banks through money market funds and mortgage pools. Additionally, the technology had made county, state, and regional boundaries artificial constraints. Citicorp claimed that only through deregulation could banks and nonbanks compete on an increasingly equal basis.

Citicorp's plea to take the shackles off met with sympathetic ears among federal authorities, and Citishare's petition to expand the franchise of the bank on the legal and regulatory side has so far been successful. "You might say that Citicorp both forced the issue of deregulation and created it to meet its own ends," says a former Citi executive. "At any event, by settling for nothing less than a free and unrestricted financial services market, Wriston and Reed probably saved the banking industry."

Technology had made county, state, and regulatory boundaries artificial constraints.

Reed, then in charge of Citicorp's consumer banking push, saw that the bank's future lay with individual depositors, but he still had to reach them. In 1977, he boldly chose a direct and risky course by mailing 20 million credit cards throughout the nation and almost overnight the company became the second largest credit card issuer. More recently, Reed's innovative side surfaced in the creation of a sophisticated and groundbreaking network of automated teller machines in New York City and surrounding areas. Apart from the cost, the pioneering creation of new interfaces and the necessary resculpting of branches to accommodate the teller machines were greeted with skepticism by the banking industry. Now, after several years of red ink, the devices have proven themselves an unqualified success. Citibank's consumer banking business has grown substantially on Reed's technological bet.

"Reed's technology solutions have now put pressure on other banks' brick and mortar branches, which are now vulnerable to a new competitor with lower cost delivery methods," notes Bleyleben. Branch banks flourished because of their convenience but offer little more than can be obtained through the use of credit cards and teller machines. As Bleyleben points out, "Customers no longer depend on branches, but on technology."

Reed's lust for individual depositors also has led to the creation of an extensive network of consumer finance officers and the acquisition of numerous savings and loan associations nationwide. Wriston recently boasted that Citicorp already does business with one out of every seven U.S. households.

Also with the blessing of Reed, Citicorp pursued an aggressive plan—unfortunately dubbed Project Paradise—to install minicomputers wherever possible, even at the expense of dinosauric mainframes. The move to minis unsettled IBM, among others, and prompted the industry leader to preview its Series/1 minicomputer to Citicorp many months before the machine was publicly unveiled. That didn't stop Citibank from replacing a 370/145 mainframe with two dozen Interdata 7/32 minis in a stock transfer application. It was a risk that didn't work out too well: Citibank's stock transfer operations gained a reputation for excessive delays and costly mistakes.

The bank nevertheless tried its hand at almost any and all new computing and communications technologies. It set up a Technology Caravan at a Park

Ave. office to which bank managers at all levels were invited to kick the tires of different vendors' equipment. Several in-house technology teams were set up to evaluate and recommend hardware and software to the many departmental systems groups. Buy it and try it was the edict from above. If it didn't work, so what? Perhaps the next one would.

This free-playing technological adventure may have gotten out of hand—after several years of bragging, Citibank

One of Reed's biggest successes was a network of automated teller machines installed in the New York metropolitan area.

eventually grew reluctant to discuss Paradise—but the die had been cast. The bank would never be the same from a technological point of view. Management had had a taste of the power of computing and wasn't about to go backwards.

One former Citi employee explains that Reed was brought in to make large investments in technology and delivery systems and have them pay off in the long term. "Now that he's the top man, I see no reason for him to change his modus operandi, and fully expect him to repeat his successes. But because of the deregulated environment he was instrumental in creating, he can no longer afford to do so at his leisure," this source says.

Bank of America, which among U.S. banks is second to Citicorp in assets, recently disclosed plans to create a $175 million worldwide computing network. Reed can feel the hot breath of European banks as well, as they mount ambitious electronic banking programs.

"Until recently, Reed and his technology watchdog and think tank, Transaction Technology Inc., have been able to function in a world of sliding deadlines. But the pressure to force an installation rather than just evaluate technology grows daily," says one observer.

As an illustration, the observer points to the creation of a new branch banking system for the 280 or so offices in the New York metropolitan area. For the past two years, TTI and Reed's systems group have been trying to design software which would enable a combination of IRAs, deposits, loans, and the administrative procedures for branch management to function from one database. For the past year, they have evaluated four potential vendors as suppliers of the workstations for the new software. Though no final decision was reached, TTI and the systems team were told to implement the software immediately on microcomputer hardware for 50 of the branches. The idea is that TTI would worry about the other 230 branches later.

Citicorp has been attempting to pull together its IDMS databases and data centers into a massive cash management network for multinational customers. The network would offer current economic, financial, marketing, and regulatory information 24 hours a day for multinational corporations that need it and can pay handsomely.

Senior technical staff on the project are arguing that standards, at least where the network must interface to the outside world, are essential. Sources explain that they have been using the seven-layer ISO network model and IBM's SNA as references.

One insider says that the bank could adopt the ISO model, but push for the addition of two extra layers to cover dynamic storage management and relational data from information centers. It's also possible that Citicorp will adopt the X.12 data exchange standard which defines nesting, segmenting, and loop structures for data so it can be independent of the systems sending and receiving it.

At any event, it seems clear the bank's hit-or-miss approach to technology could be giving way to a more mature marketing approach. A pilot home banking system expected to be unveiled shortly is the result of a four-year development effort. The conclusion from one former Reed colleague is that the engineer is ready to make the transition to marketer. He's "everything, in fact, but a banker," says one observer. "Reed wouldn't know a foreign loan if he fell over it."

But, adds the source, "He's part of a team and will have to sell his ideas despite the wave of technology he's riding. I doubt they would have picked him if they didn't feel he could become a banker too." ◉

R&D

WEIGHING DARPA'S AI PLANS

Will the Defense Department help or hinder advanced computing research in the U.S.?

by Willie Schatz and John W. Verity

Nine months after its unveiling, the Defense Advanced Research Projects Agency's (DARPA) Strategic Computing Initiative (SCI) is playing to mixed reviews.

There are those who believe it's worth every penny of the $600 million it has requested for the next five years. Then there are those who think it isn't worth a red cent.

Objections to the program, which is seen by many as this country's answer to the widely publicized Japanese fifth generation effort and other countries' national research projects, focus primarily on the military spirit of the program, its potential skewing of U.S. computer research away from more peacefully productive pursuits, and the applied, as opposed to pure research, nature of the program. Supporters say the program will ensure U.S. dominance not only in future information processing arenas but in global service markets as well. They speak of machinery "producing knowledge" as if it were a commodity like a toaster.

The SCI program calls for a joint government-industry-academia effort to create "a new generation of machine intelligence technology which will have unprecedented capabilities and which promises to greatly increase our national security and our economic strength as it emerges during the coming decade" (see "DARPA's Big Push in AI," February, p. 48).

As a way to drive technology development, the SCI promises a futuristic present for each of the three armed services. The Army would receive an "autonomous" vehicle able to sense and interpret its environment, plan and reason, and take action by itself. The Air Force is to get a machine-based "pilot's associate," which would assist human pilots during dogfights. For the Navy, there is a battle management system to help plan major battles at sea. The promise of these dream machines is their supposed ability to make decisions for themselves and to process "knowledge" instead of raw numeric data.

DARPA's biggest targets for the new computing technologies, however, are the space-based strategic weapons proposed by the Reagan administration. According to the Defense Department, those *Star Wars* systems would need tremendous computing abilities to act quickly and autonomously enough to knock out incoming barrages of high-speed enemy missiles.

Whether or not such weapons are built, the DARPA program is expected to push technology hard in the areas of AI, VLSI circuitry, and kiloMIPS parallel processing architectures. And, at least in theory, the military would not be the only beneficiary of these technological leaps. "The SCI promises the production of machine intelligence technology that will enable yet another major cycle of new

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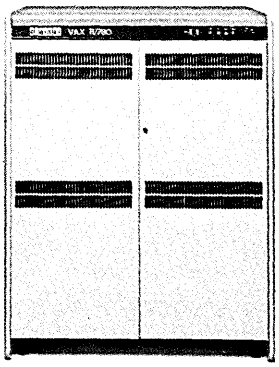

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FOR THE VAX-11/780...

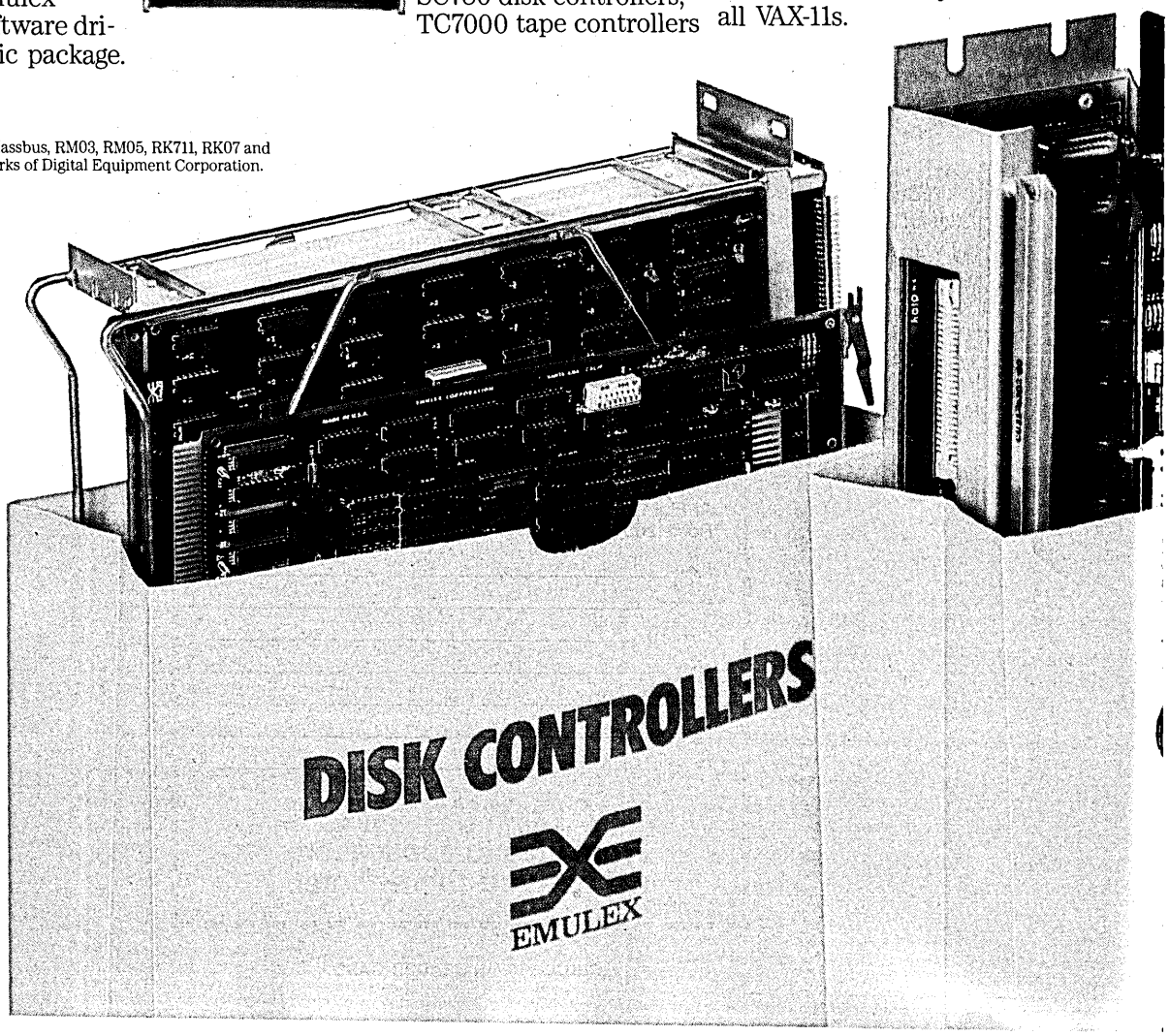
V-Master/780—A mass storage adapter that houses one or two SC780 disk controllers, TC7000 tape controllers or a combination thereof. Provides an interface and control through the Synchronous Bus Interface (SBI) of your VAX-11/780. Each SC780 disk controller supports up to four disk drives (80 to 675 MBytes). The SC788 is also available to fit in the V-Master/780 chassis and supports up to eight disk drives.

Tape Products.

FOR THE VAX UNIBUS...

TC11/V—Combines with any standard tape drive and the Emulex VMS/UT software driver/diagnostic package to emulate DEC's TM11/TU10 and provide reliable, economical tape storage on all VAX-11s.

TC12/V—Handles every industry-standard "Pertec" formatted half-inch tape transport, including conventional NRZ/PE start/stop and 1600/3200 bpi start/stop streaming tape drives. Provides software transparent emulation of DEC's TS11 subsystem on all VAX-11s.



...sers? Emulex, of course!

FOR THE VAX-11/750...

TC7000—A single-board, software transparent controller that interfaces directly to the internal CMI to support 1-4 STC or 1-8 Pertec formatted type drives. Emulates DEC's TM03/TU77 with tape speeds up to 125 ips at 1600/6250 bpi. Supports both "old" and "new" GCR 6250 kinds of drives.

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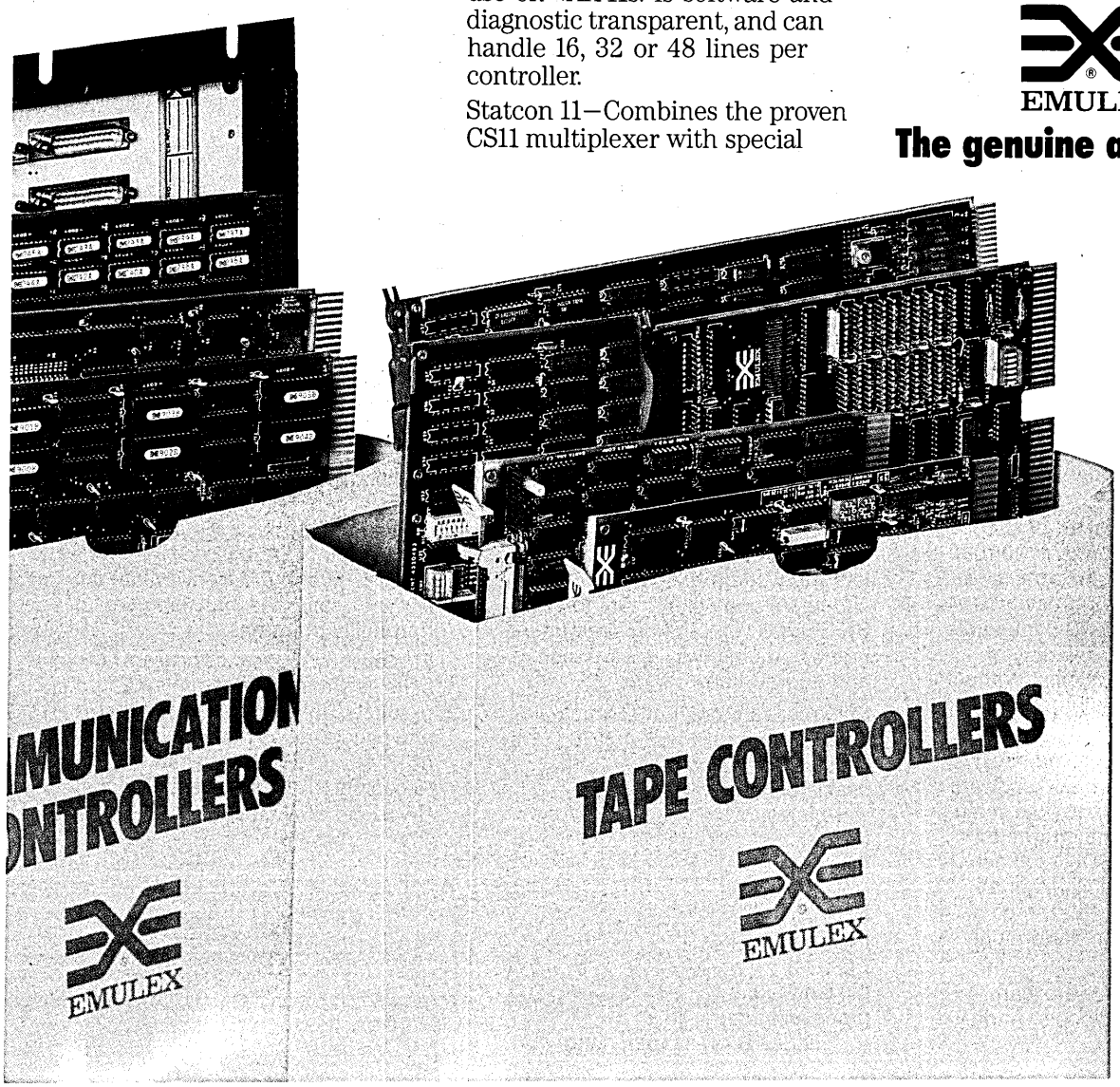

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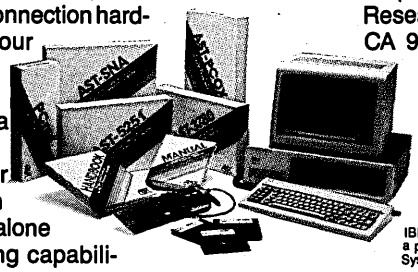

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economic activity in the computer and electronics industry," DARPA stated last fall. "If the United States aggressively competes to develop these systems, it will gain access to enormous new commercial markets that will build on top of the successes of fourth generation technology. Spin-offs from a successful SCI will surge into our industrial community."

Enormous new markets, surging spin-offs—no wonder there are so many true believers.

Foremost among them are the House and Senate. Each has authorized the $95 million DARPA has requested for fiscal year 1985, which begins Oct. 1. Appropriating those funds will not be discussed until mid-August, but there is not expected to be much opposition to DARPA's request.

Worshiping with Congress are the AI community and many manufacturers likely to reap substantial benefits from the contracts DARPA will award for SCI work. Not attending services are many individuals from the university community and industry who believe this is a bad idea whose time should never come and that not a smidgen of the new technology will ever trickle out of the Pentagon.

"It's a great thing," says Nils Nilsson, director of Stanford's AI Laboratory. "It's one of the complex of ways new AI research will get support. There's nothing more militaristic about this than most Department of Defense research throughout the years. DARPA always had to justify all the things it did. There's always been a need for relevant DOD research. This will improve the technological base and the applications will have a positive pull on the civilian base. In the end people will be very satisfied."

DARPA, of course, has for the past 20 years or so been the main source of funds for research into artificial intelligence and other areas of advanced computing, having pumped an estimated $500 million into university labs and other research organizations. But never, say critics, has the agency so aggressively funded computing research with such specific weapons applications in mind. DARPA has previously been supportive of much pure computer science research, some of which has been adopted by industry for military and commercial products.

"The range of goals is very wide. Most of them require major breakthroughs in research."

The Defense Department did not respond to inquiries for this article.

"The SCI is dangerously misleading," says Computer Professionals for Social Responsibility (CPSR), a group with 560 members and 10 chapters across the country (see "Nuclear War & the Computer," February, p. 50). The Palo Alto, Calif.-based organization has released a scathing critique of DARPA's plan and the "false sense of security" it engenders in the "minds of both policymakers and the public."

The SCI plan "blurs the distinction between straightforward progress in computer science and mere wishful thinking. In reading the SCI document, one cannot avoid the imrpression that it was meant to sell the program as much as to describe it," CPSR charges.

"Because the implications are so profound, there is a special responsibility placed on the authors to be exceedingly conservative with regard to promises made or implied. Far from manifesting such caution, the document paints a picture suggesting that its goals are within early reach if we merely pull together the various threads of computer science research. But if policymakers begin to depend on what is essentially technological fantasy, the consequences will be extremely serious."

Yet the SCI just may be talking

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> —*Auerbach Computer Technology Reports*

"JUST THE FACTS, MA'AM."

TSO/MON tells you who TSO users are and what they're doing. It allows you to forecast their future needs. And it does it from the network level right down to the individual terminal.

Yes, TSO/MON can assist you in that often-neglected area of TSO management—the performance of the TSO network. It allows you to monitor both general TSO network activity and TSO network use by specific terminal. By profiling this activity for an extended period, it lets you identify network trends.

With TSO/MON, you can also find out who's using ISPF and for what, which panels are being used and how often, which users are accessing sensitive applications, and what programs and CLISTs are being run under ISPF.

In short, TSO/MON provides the data and the reports that allow you to practice the three key management approaches to the control of TSO: daily review, problem tracking, and ongoing evaluation.

"LET THERE BE LIGHT!"

In any organization, the importance of communication by and among managers is essential to success. TSO/MON makes such communication in a TSO environment as easy as reading a one-page summary.

You see, TSO/MON maintains a file of historical TSO usage and performance data that can be reported against system and user service objectives. Then, it provides a one-page management summary as one of its standard reports.

At an East Coast utility, the Manager of the Operations Technical Support Division asserts: **"As a manager reponsible for providing quick, accurate computer service to... TSO users, it is important to me to maintain good communication with other managers. Throughout our use of TSO/MON, I've been able to do this and keep those users happy."**

A Project Systems Analyst at a major airlines says of the director of his department: **"He sees the backup TSO/MON gives him in terms of dealing with both his management and his users—there's no way to argue with someone who has hard data in hand."**

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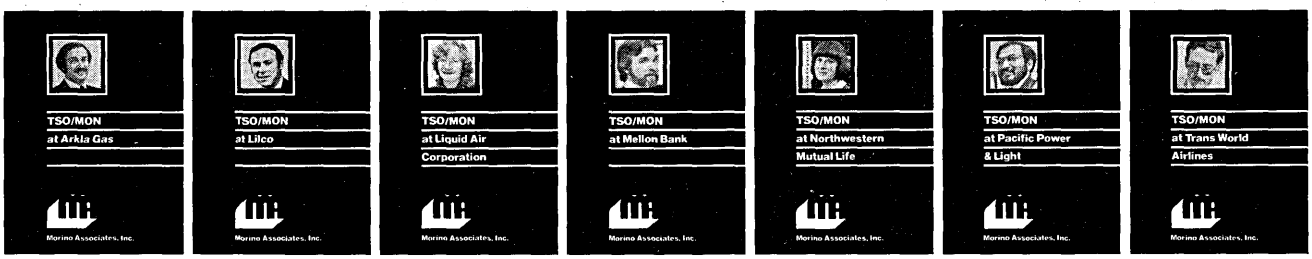

TSO/MON Promotes
Effective TSO Management

1. Daily review of service and performance
   - Is response time on target?
   - When do problems occur?
2. Problem tracking
   - Is it the user?
   - Is it the system?
3. Ongoing evaluation
   - What are the response trends?
   - What are the workload trends?
   - What are the system availability trends?

TSO/MON Monitors
ISPF Problems

- Inadequate application system dialog design
- Poorly-related panel structure and switching
- Ineffective use of ISPF facilities
- Improper language used for the dialog requirement
- Inefficient CLISTs and Dialog Manager programs
- Unauthorized use of sensitive facilities
- Ineffectively-defined table structures for retrieval
- Inefficient use of ISPF edit facilities

TSO/MON Manages
Network Use

- Quantifies TSO network capacity and usage growth
- Measures the results of TSO network tuning
- Identifies excessive TSO network traffic by peak load
- Establishes a TSO network usage profile
- Detects wide fluctuations in TSO network load
- Isolates unused communication paths or TSO terminals
- Allows you to optimize host/NCP/cluster buffer sizes
- Establishes a base for evaluating TSO network performance
- Identifies specific TSO terminal IDs ranked by resources consumed for selected category
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"HEAD'EM OFF AT THE PASS!"

Once you have the hard data in hand, you'll be able to balance resources with workload, set service level agreements, monitor unauthorized use, establish equitable charges—and plan for the future. You'll be controlling TSO, rather than being controlled by it.

As the Manager of Computer Technical Services for a West Coast utility observes: **"Part of being a good manager involves taking action to head off a bad situation. TSO/MON has made it possible to do just that."**

Another user, the Manager of Technical Support at a Southern gas utility, agrees: **"With TSO/MON, we can watch things develop and manage pro-actively rather than reactively."**

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Datapro Research Corporation reports that users who responded to its independent survey **"unanimously agreed that TSO/MON saves human resources."** Story after user story substantiates this fact. Many of them tell of dollar savings as well.

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technological reality. Neither critics nor supporters dispute the fact that the SCI has the potential to push technology far beyond its present position. They do differ on whether DARPA will ever be able to practice what it's preaching.

"It's probably all technically feasible," says David Waltz, professor of electrical and computer engineering at the University of Illinois. "Nothing they're proposing is impossible. The battlefield assessment system is possible. So are the smart weapons. There's no technological breakthrough needed to make substantially smarter weapons than DOD has now.

"It's definitely possible to make weapons that will do what you tell them to. But the question is how much a smart weapon can be tested before it's actually used. And things are very different when one of those is facing a hostile enemy."

"The technological feasibility is quite mixed," says Mitch Marcus, a member of the technical staff at Bell Labs. "The range of goals is very wide. Most of them require major breakthroughs in research. Expecting particular breakthroughs within a particular time frame is really going out on a limb. That's particularly true in the autonomous vehicle program. Whether they're capable of getting the kind of coherent, unified end product they're looking for is very questionable."

"A lot of people in AI wish the money were coming from somewhere else."

A number of other aspects are doubtful as well. Part of the SCI's thrust is to make sure the U.S. reaches the fifth generation while Japan is still in the fourth. Yet Japan's fifth generation project, which has caused so much fear and loathing in the U.S. computer industry, is explicitly based on enhancing business and consumer productivity and improving social services. That seems to be 180 degrees from the SCI's direction.

There's also the academic issue, which is far from academic. The SCI's acquisition policy calls for military applications to be "carried out by industry, drawing upon results of research carried out in the universities." Advanced computer architectures will be developed primarily in joint projects between universities and industtry. Universities will be heavily involved in exploiting most of the ideas that seem ripe for development. And one of the reasons for the purported technology transfer to industry is to build up a base of engineers and system builders familiar with computer science and machine intelligence technology now resident in leading university laboratories.

So what will this do to the science labs at universities? Will it turn them into minature weapons centers? Will academic freedom no longer be free?

"I hope it doesn't alter the direction of research," Stanford's Nilsson says. "Individual people have to make decisions about individual projects. Bob Cooper [director of DARPA] and Bob Kahn [director of DARPA's Information Processing Techniques Office] have a high regard for basic research. I don't think this is bad news at all for basic research."

"I think academic freedom is bound to be affected," contends the University of Illinois' Waltz. "I doubt a professor will say he's going to build a battlefield assessment system. Most AI people build a system acquiring knowledge scaled to a specfic topic. To get funded they almost have to choose something of military relevance. The net range of research is that it will get more militaristic."

Distortions of academic research can be subtle, says Abbe Mowshowitz, professor in the Science and Technology Studies division at Rensselaer Polytechnic Institute, Troy, N.Y. "People tend to police themselves when competing for funds. They make choices on the range of problems they'll tackle."

Mowshowitz notes that the needs of military aerospece programs prompted development of numerically controlled machine tools 20 years ago, but those tools were diffused very slowly into the commercial market. "Military development is not governed by the forces of the marketplace. The normal criteria for efficiency and cost are not present."

Much of U.S. research is already DOD-related. According to a report by the Congressional Research Service (CRS), defense related R&D expenditures as a percentage of total federal R&D expenditures were 69.4% of the FY '84 budget. That's the highest percentage since 1962, the height of the Cold War. CRS also estimates that 47% of all R&D in the U.S. is paid for by the government and that the government spent $336 million for basic and applied research in mathematics and computer sciences in 1983. More than half of that amount came from DOD.

A draft study by Congress's Office of Technological Assessment (OTA) found that in 1983 DOD accounted for 69% of the basic research in electrical engineering and 54.8% of research in computer sciences. DOD's dominance was even higher in applied research, in which it paid for 90.5% of research in electrical engineering and 86.7% of research in computer sciences.

As OTA notes, there are disadvantages for the commercial sector in receiving a DOD R&D paycheck. "Among these are security classifications, which tend to slow advancements in technology; rigid technical specifications for military procurements, which have limited utility for commercial applications; and the 'consumption' of limited, valuable scientific and engineering resources for military purposes, which may inhibit commercial developments."

So why should the SCI be different? Then again, maybe it doesn't have to be.

"These are all legitimate issues and questions, but if history is any guide, the results will be widely disseminated into society," contends Charles Zraket, executive vice president of MITRE Corp., a nonprofit corporation that does research for the Air Force. "The source of the research won't be a problem. Things have worked out in the past pretty well. I'm quite impressed with it. All the results of a generic nature will be completely useful in the civilian economy. They'll be useful in all strata of society."

"I'm quite impressed with it. All the results of a generic nature will be completely useful in the civilian economy."

Some DARPA-inspired creations, such as timesharing and the ARPANET—which connects universities, industries, and government and will serve as a model for an SCI research network—have indeed made their way into the commercial sector. In fact, they may currently have more civilian applications than military ones.

"The only drawback is if DOD puts this under such scrutiny that it doesn't allow the results to be published," Zraket cautions. "If tight security is clamped on this it won't attract the best people. They want to do independent, unfettered research that they can publish. A lot of university people don't mind doing military work if they can publish the results."

Some do mind, publish or not. In fact, a small number of researchers have publicly proclaimed their refusal to accept SCI money. Their reasons are ethical in nature.

"I'm going to keep my distance from it,' Waltz says, referring to the military program.

"I believe that increased levels of military technology will not help the future of this country, and in fact will be counterproductive," says Terry Winograd, a CPSR member and professor of computer science at Stanford. "I do not want to actively participate in increasing the killing power of the military, and refuse to work on projects whose applications are primarily weapons related."

"I think this is clearly going to chill the civilian application of AI," says Karen Weickart, an MIT graduate who

just completed a fellowship with the House Committee on Science and Technology. "There are going to be less and less researchers who will want to do this. It is not the most efficient or effective way to enhance civilian technology."

But this trio remains a significant minority. Most of the industry agrees with Kahn, who wrote in the November 1983 issue of *Spectrum,* the IEEE magazine, that "the nation that dominates this information-processing field will possess the keys to world leadership in the twenty-first century." Even the IEEE, which has taken great pains to distinguish supercomputers from the fifth generation and considers DARPA a competitor for funding, agrees that SCI will strengthen the U.S. technological base. And the opponents have all but conceded the inevitability of DARPA getting its way.

"No one doubts this will happen," Waltz admits. Indeed, the rush to compete on contracts has already caused a backlog. One company bid on a contract and was told a decision would be made in three weeks. Three months later, it's still waiting. That is an accurate indication of the acceptance of the SCI within most, but certainly not all, of the industry.

The several dozen commercial AI companies that have been started in recent years stand to gain much from the SCI, especially those firms that supply tools such as Lisp computers and generic "knowledge engineering" software. "I think the strategic computing program will benefit the whole area of AI," says Lee Hecht, president of Teknowledge Inc., Palo Alto, Calif. "It will draw resources to problems at hand. It validates the entire field. The scale of investment is much larger than previous funding levels."

While Teknowledge's Federal Systems division is bidding on SCI work, some AI companies are taking a wait-and-see stance. "The question is, can you afford to devote resources and people to a government contract? Will it result in a product?" asks Ann Drinan, director of marketing at Cognitive Systems Inc., New Haven.

"The trickle-down theory is the most dangerous selling point of the SCI," argues Steve Sanazaro, head of the Washington, D.C. chapter of CPSR. "It's just not true, and there's no way it's going to happen. If the government wants to spend large amounts of money on AI, there are plenty of ways to do it through nondefense means. AI may be a technical Maginot Line. No matter what you do, there's always a way around it."

"Military spending is lost resources," says a researcher at Information Sciences Institute in Los Angeles, a respected computing research lab that is associated with the University of Southern California. "A lot of people in AI wish the money were coming from somewhere else and that the intended result were a more peaceful purpose.

"But there's always the problem of getting funded. If the money is offered, it's hard to turn it down," notes the researcher, who asked to remain anonymous.

"I'd like to see more emphasis on the government funding things that have general government and consumer uses," Waltz says. "If the SCI is approved, we'll miss the boat on consumer products just as we have in videos, autos, and general purpose computers. Nobody has anything on the horizon that can match the Japanese machines. We may have smart tanks in 10 years, but they'll be cleaned by smart Japanese vacuum cleaners."

No doubt they'll do a hell of a job. ◉

ANTITRUST

IBM UNDER SCRUTINY

Surprising as it seems, the Reagan Justice Department is looking into potential antitrust violations by the industry leader.

by Willie Schatz

With any other company, this would be much ado about nothing. It would be just another antitrust investigation by the Department of Justice (DOJ).

But this is IBM. So it isn't any other investigation. Even if the end result turns out to be nothing, the mere fact that DOJ is looking into IBM's behavior is something.

"I don't know how this will turn out. Only Justice knows whether there's anything there," says Ray Carlson, who led the Justice trial team against IBM from 1971 to 1977. "But there's a very significant story in those settlements with Hitachi and the others. It's all about how IBM uses lawsuits or the threat of lawsuits as a weapon. They've been doing that successfully since the Telex case.

"What they're doing now is what they wanted to do all along. They're making anticompetitive agreements. We monitored all their other suits when we were on the case. We monitored the Control Data settlement directly. Now they're doing what a monopolist can't. But now they're not a monopolist, are they?"

They haven't been, at least officially, since the government dismissed its 13-year-old antitrust case in January 1982, claiming the case was "without merit." The times just may be a changin', however.

Big Blue began catching Justice's eye last December. Bob Djurdjevic, publisher of *Annex Computer Report,* a small monthly newsletter in Phoenix, wrote to the antitrust division expressing his concern over IBM's alleged abuse of the judicial system and the company's purportedly questionable motives in bringing certain litigation involving misappropriation of its proprietary information.

Djurdjevic continued his lone crusade throughout the spring, writing senators and representatives and getting a pretty good response. Hearing nothing from DOJ, he wrote them again on March 6, raising anew the question whether Big Blue was illegally making its competitors blue. Djurdjevic cited the Hitachi settlement as a prime example of the issue, although IBM has been very tough legally on other competitors like National Semiconductor Corp. and Cybernex Corp., a magnetic head manufacturer started by former IBM employees. It's even sued industry consultant Gideon Gartner. IBM has also filed and settled copyright infringement suits against several makers of IBM PC-compatible machines, including Corona Data Systems and Eagle Computer Inc. Eagle, trying to restructure $10.8 million of unsecured debt, attributes some of its current financial woes to the IBM settlement.

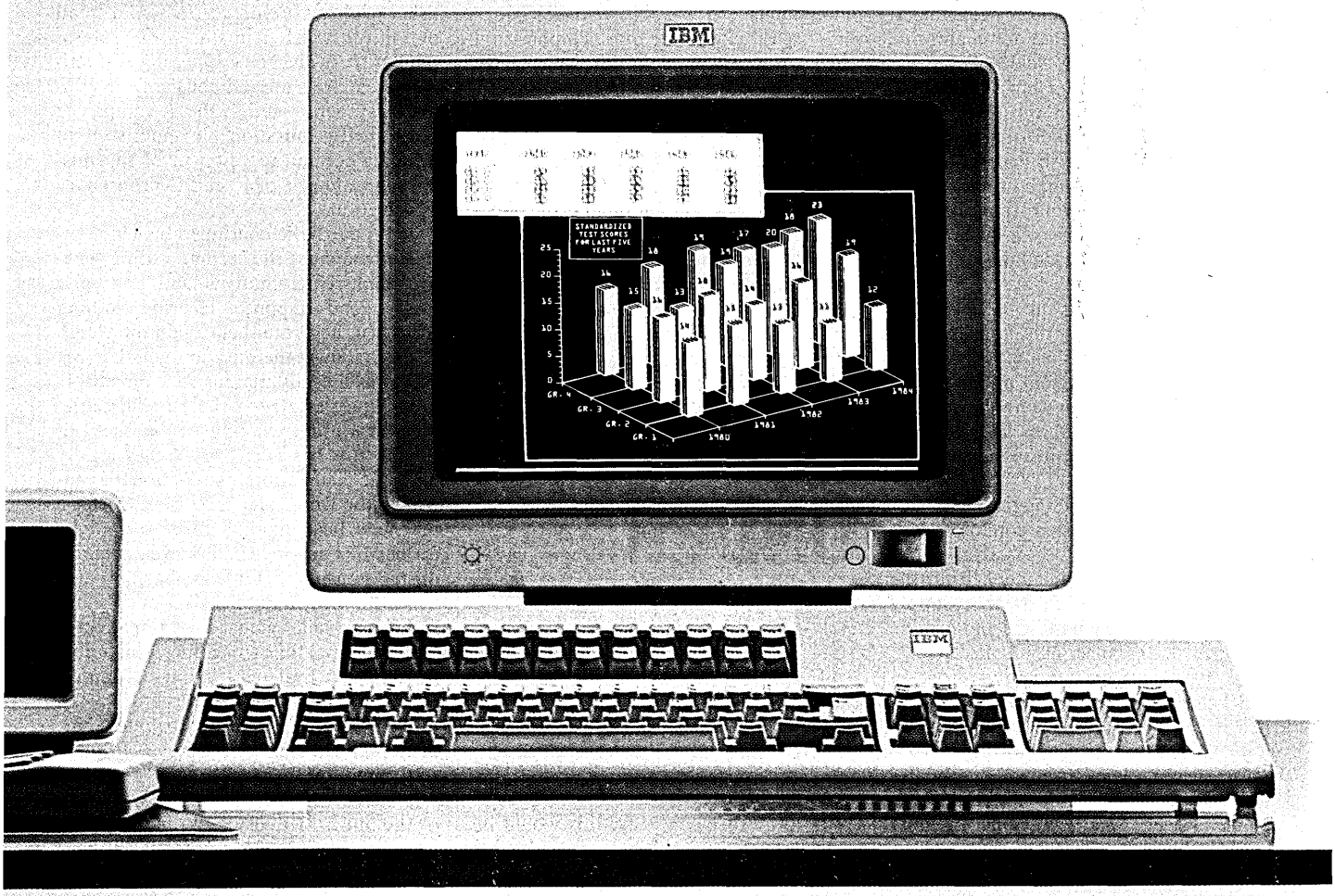
Former assistant attorney general of the antitrust division William Baxter, who dismissed the government's antitrust suit, was succeeded in January by J. Paul McGrath. One month later McGrath authorized the preliminary investigation. He finally responded in June to Djurdjevic, indicating he might have something after all.

"Your letter raises two distinct issues regarding this trade secret litigation," McGrath wrote. "First, whether IBM prevailed in the lawsuits on other than legitimate, good faith grounds and second, whether, because of its considerable power, IBM was able to obtain settlement terms that were more favorable to IBM than those it was entitled to obtain on the merits of the lawsuits."

McGrath cleared IBM on the first charge, saying that DOJ has no reason to believe that IBM's allegations in the suits were made in bad faith or that IBM won when it should have lost. But Big Blue didn't get off so easily on the second allegation.

"The fact that IBM can use the

IBM introduces more



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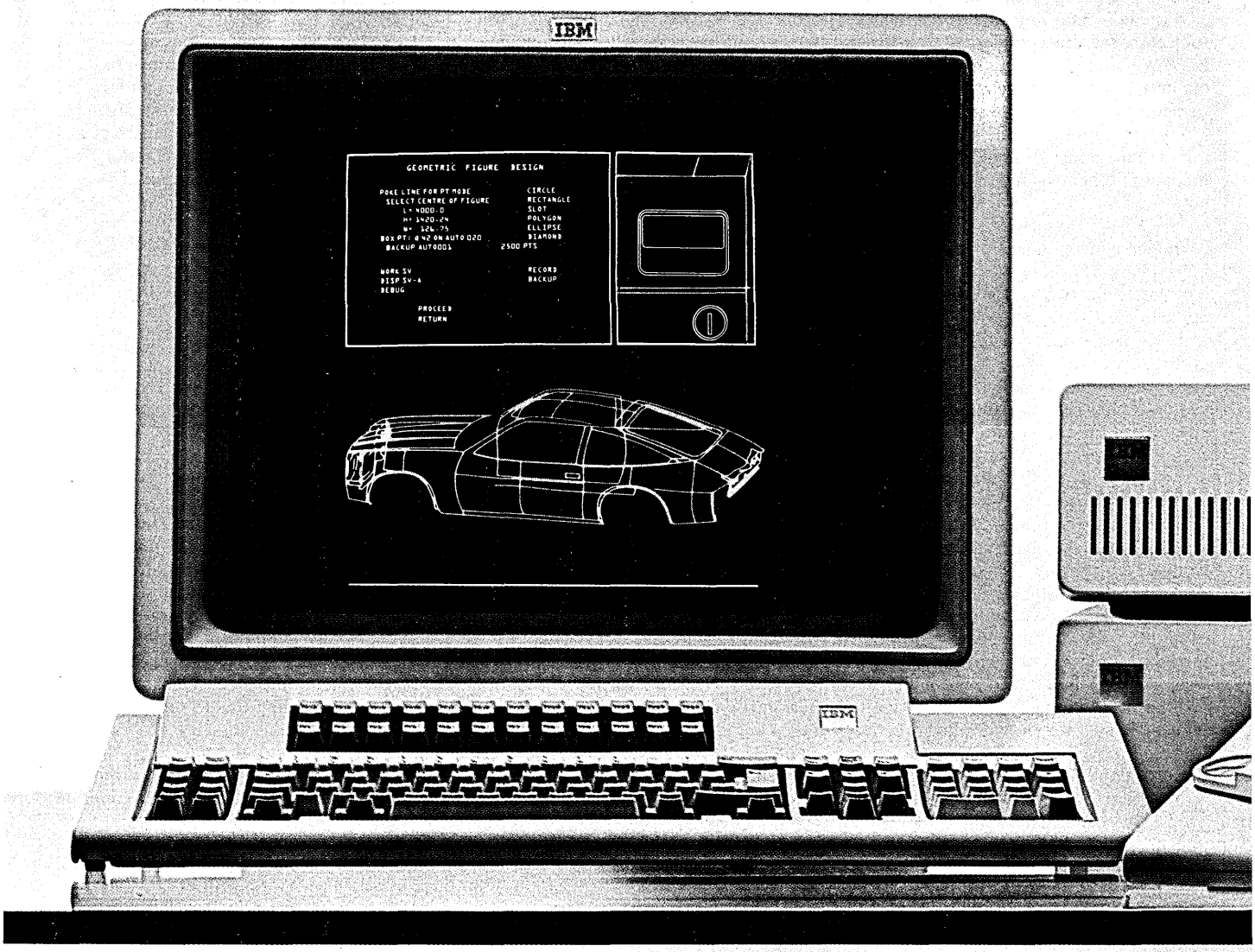

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courts freely to pursue its claims does not mean that it can lawfully extract from its opponents settlement terms that have anticompetitive effects," McGrath said. "To the contrary, any such settlement is subject to scrutiny under the antitrust laws. We have initiated an antitrust investigation to determine whether IBM's settlement of certain lawsuits involving misappropriation of trade secrets, including its suit against Hitachi, raises any significant problems under the antitrust laws."

So there you have it. An official acknowledgment that the government is indeed looking at IBM, of which it supposedly lost sight two and a half years ago. Some think it's the best find since Sutter's Mill. Others wonder why even a single eyebrow is raised.

Most ecstatic, of course, is Djurdjevic, who has been pursuing Big Blue for at least a year. He has done extensive research into several IBM cases, although he admits that, ironically, he has never seen the Hitachi settlement. McGrath actually replied to his December letter, but Djurdjevic didn't make that public for fear it would hamper any investigation. After DOJ attorneys told him it would not do so, it was he, not DOJ, who made public McGrath's June letter. Justice was thus forced to confess publicly to the investigation, although it is department policy not to comment on such cases. It was also highly unusual for DOJ to release the letter. That move further fueled speculation that DOJ could be on to something.

"It was more than a question of proprietary information protection or ethical conduct by IBM," Djurdjevic says.

"It does not mean that IBM can lawfully extract from its opponents settlement terms that have anticompetitive effects," says McGrath.

"We are perhaps seeing information control by IBM. The next think I know my number may come up. You might say it's a preemptive strike by me.

"I've seen and heard so many people intimidated by the mere mention of IBM. It's very unhealthy for the industry. They've smeared many innocent people's reputations. It's not a proper thing to be allowed to get away with."

The consensus is that IBM has become much more aggressive and litigious since the antitrust suit was dismissed. Without meeting the government in court every day, the theory goes, IBM can use its immense resources to hold competitors hostage. Often the mere mention of a lawsuit—as in the case of Eagle, to which IBM sent three lawyers who "suggested" that Eagle immediately change its programming of an I/O chip—is enough to entice a rival to sign on the dotted line before the case reaches trial.

"They've unquestionably gotten more aggressive in pursuing those they felt benefited from their technology," says an executive with a company that settled rather than go to trial after being sued by IBM. "They're much more active in the courts. Their intent was clearly to intimidate us.

"We thought the settlement terms were tremendously onerous. It was highly similar to other settlements. It was almost a carbon copy. But they've got a tremendous amount of clout. If the government couldn't beat them in court after 13 years, how can we be expected to beat them?"

Good question. So the companies do the legal equivalent of joining them. They sign settlements on Big Blue's terms. Hitachi admitted stealing trade secrets, for which it is now paying the following penalties: parting with a reported $2 million to $4 million a month over the next several years; allowing IBM to inspect any new Hitachi computers and accessories within 60 days of first shipments; having its customers switch their software contracts to IBM if the programming violates IBM's copyright; and forgoing future litigation against IBM in favor of a private arbitration panel.

But Hitachi is a rarity. Most often a company won't admit making a mistake, but it will capitulate rather than fight. National Advanced Systems was exonerated by DOJ, but IBM sued it anyway.

"You don't have to be a keen observer to know that whoever is sued is going to settle rapidly," says Mark Ludwig, corporate vice president of the Gartner Group. "Nobody can match the resources IBM has. They're kind of a corporate state. When IBM spends $3 million in legal fees, that's like $670 to me. What are we supposed to do?"

"Forget the merits. It's tying up the company executives for a year that's the killer. The cost of gaining the resources to fight the case is like deep-sixing the company."

IBM begs to differ. It contends it has been on its best behavior. It plans on staying that way.

"That theory about us being more aggressive since the suit was dismissed is a lot of junk," IBM spokesman Peter Kuhn contends. "This isn't something we started doing in 1982 when the suit was dismissed. We are where we are today because of decisions made in the mid-1970s. People ignore the fact that our business tripled in the '70s. I'm not sure we'd be reacting or acting differently if the antitrust had not been dismissed.

"The only indication we've had as to why Justice did it is the confused and conflicting press reports. They came to us in early April and asked us to send them the stipulation, order, and judgment in the Hitachi case. That's all we've sent. We haven't heard from them since."

That may be it. And it may not be. DOJ has several alternatives. It can forget the whole thing. It can request further documentation, such as the papers surrounding the settlements. It can authorize the staff to proceed with the inquiry. It can authorize a Civil Investigative De-

"You don't have to be a keen observer to know that whoever is sued is going to settle rapidly," notes Mark Ludwig of the Gartner Group.

mand (CID) proceeding. Or, if it determines that there's enough evidence, it can order the FBI or a grand jury to check it out.

"The aggressive conduct by IBM can be attributed to the dismissal of the antitrust and the overall antitrust environment," says Phil Verveer, former chief of the Federal Communications Commission common carrier bureau and a leading Washington antitrust attorney. "The present antitrust environment is much more hospitable to aggressive competition by dominant firms. I doubt seriously that Justice is doing this to repair its image following the dismissal. I don't think it has any sensitivity to that.

"IBM had Hitachi dead to rights. It's among the most sophisticated companies in the economy at understanding its environment and knowing just how far it can go. It's always pushing the line of how far it can go, and it's very prudent about it.

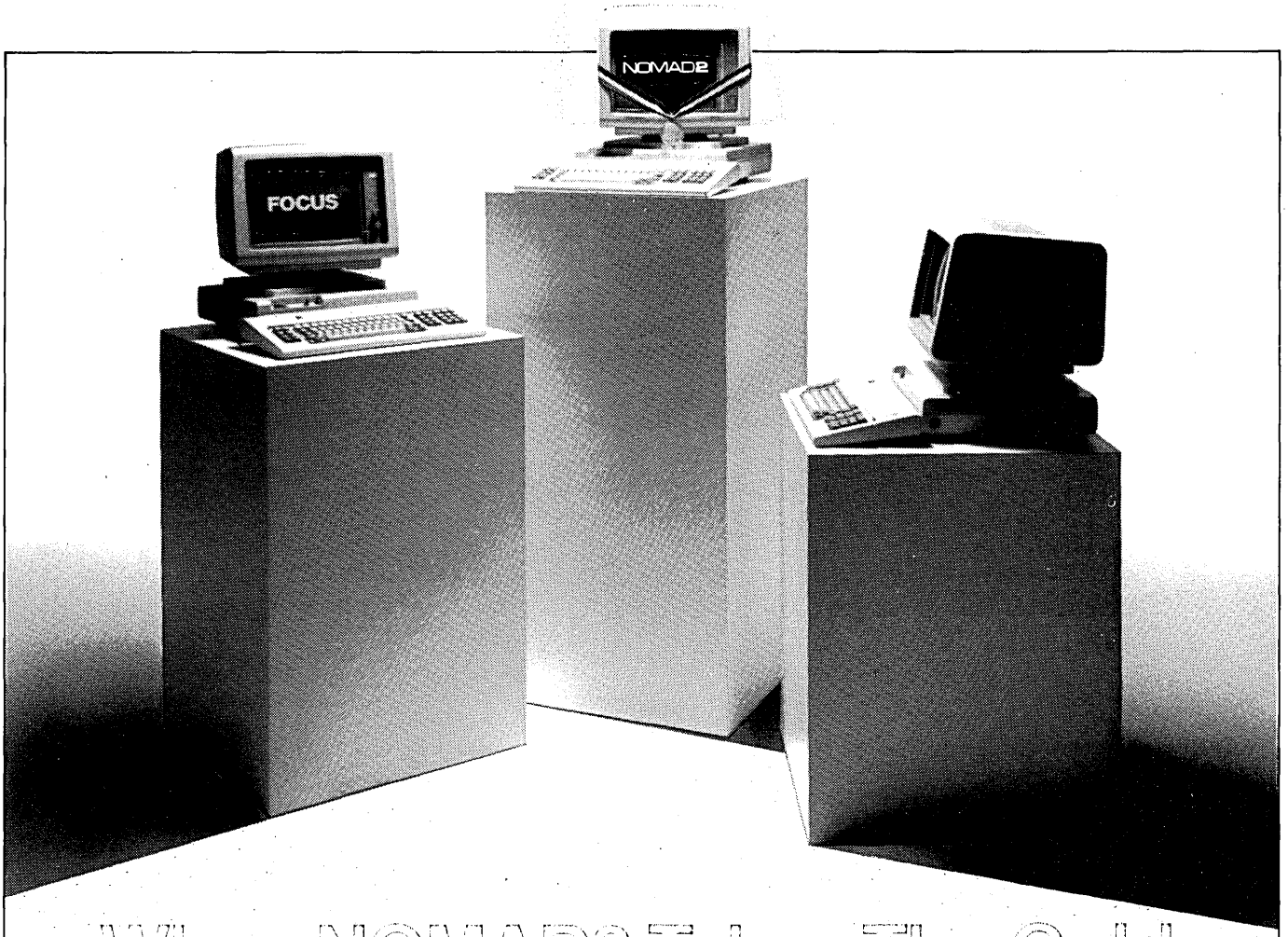
"It might have overreached this time. But I'll bet that it stops here. When you combine the environment and this company, you come away with the strong sense that nothing else will happen. If it does, somebody at IBM has made a gross miscalculation."

That's not likely, although it has happened before.

"Such a review process can't help but clarify these recent rulings to the benefit of both users and vendors," says Dave Smith, vice president of communications at National Advanced Systems. "It's a relief to have the feeling that someone cares about the settlement terms."

"When Justice reviews the documents, they'll find absolutely nothing wrong with them," IBM's Kuhn contends. "To think they'll find anything in there that violates the antitrust laws is preposterous."

Only DOJ knows that for sure, and it isn't telling yet. ◉



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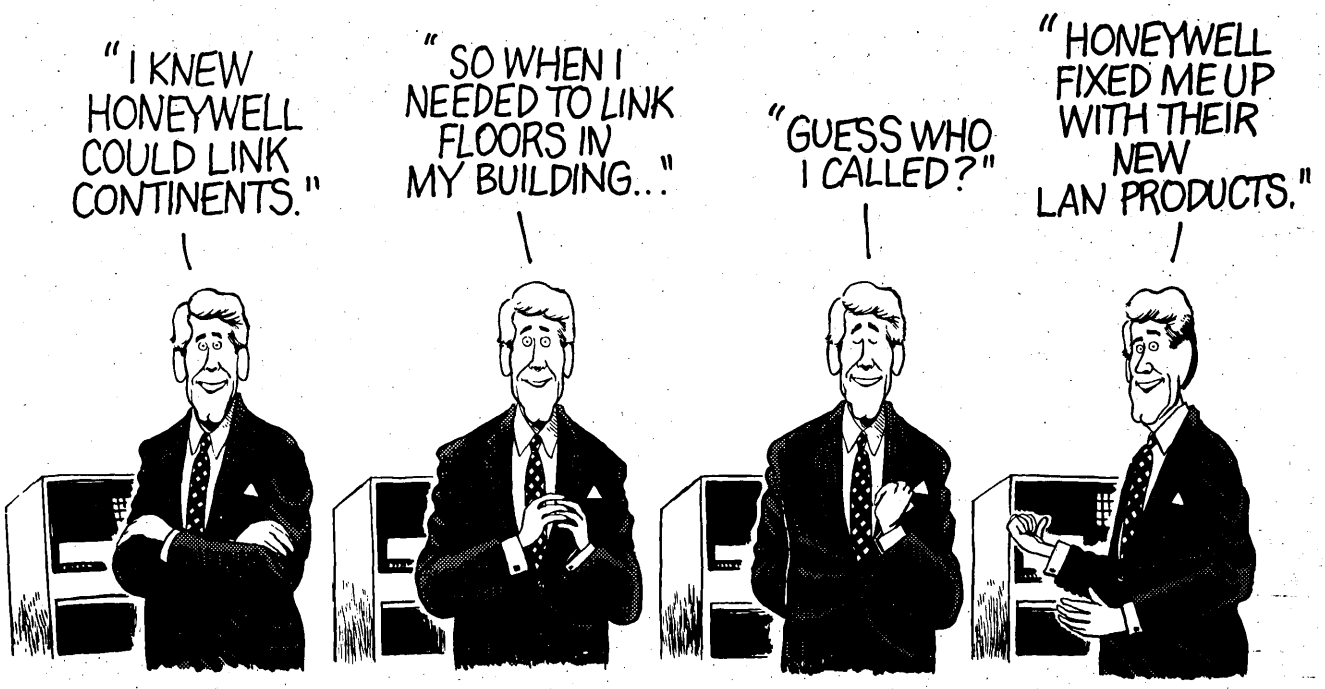

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CIRCLE 26 ON READER CARD

SOFTWARE

CA GOES SHOPPING AGAIN

The mainframe software house has discovered that buying other vendors is often cheaper than developing software in-house.

by Michael Tyler

Much as the oil industry has discovered that reserves are more easily found on Wall Street than in Texas, mainframe software vendors realize that new software packages, especially for microcomputers, are more easily bought than developed in-house. Perhaps no firm has embraced the idea more firmly than Computer Associates International Inc., Jericho, N.Y., which in the space of three weeks recently added Johnson Systems Inc. and Sorcim Corp. to a growing list of acquisitions.

The company bought Information Unlimited Software Inc. (IUS) and Stuart P. Orr & Co. a year ago, and acquired Capex Corp. a year before that. The tie that binds all five purchases is that CA saw a gap in its own product line and found competitors whose products could fill that gap more easily than CA could produce its own programs.

In Johnson Systems, for which CA paid $16 million in cash, CA ceo Charles Wang found job accounting and operations management packages that were easier to use than his own CA-JASPER series. Arnold Mazur, vice president of marketing for Computer Associates, says the firm will merge the Johnson Systems UMAX and JARS products into the JASPER line, taking the strengths of each.

The Sorcim acquisition more directly relates to CA's goal of invading the micro market. Computer Associates introduced the CA-Executive micro-to-mainframe link early this year, and since then has been intent on tying corporate pcs into its mainframe software. The CA-Executive package includes three of the IUS EasySeries programs—word processing, spelling, and mail merge—as well as a database program, a spreadsheet, an intelligent communications link to mainframe files (which do not need to be under the control of the mainframe CA-Universe DBMS), program development tools, a window manager, and an on-line tutorial.

In Sorcim, Computer Associates found two important assets. The first was the SuperCalc III micro spreadsheet package, which fills in the major weakness in the IUS EasySeries of micro software. The second was Sorcim's R&D operation in San Jose, within commuting distance of CA's Bay Area field office in Sausalito.

"Sorcim has a really capable R&D organization, but they were never able to market effectively, especially to corporate accounts," says Ruthann Quindlen, a micro software analyst with Alex. Brown & Sons in Baltimore. "Sorcim could convert SuperCalc 80 million different ways for oems but they just couldn't market it well. IUS on the other hand is a publisher, with little strength in software development and a lot in marketing." CA needs the Sorcim R&D operation more than it needs SuperCalc III because it does not have the resources in-house to enhance the current micro packages within CA-Executive.

Computer Associates paid $17.6 million for Sorcim, $10.6 million of which was delivered when the deal was signed and the remainder divided into five equal annual payments of $1.4 million. In addition, Computer Associates agreed to pay Sorcim's former owners as much as $8.9 million over the next four years if certain sales goals, which management refused to disclose, are met.

So far, the strategy of acquiring products rather than developing them has worked. Computer Associates has grown from a fledgling outfit with one product in 1976 to an international organization with 60 software products installed in 16,000 IBM mainframe locations and a revenue of $76.7 million in calendar 1983. The company is highly profitable, with a net income in calendar 1983 of $7.8 million. Moreover, the company's cash position is strong. CA raised some $79 million in a public offering in June 1983, and used part of that to buy IUS, Sorcim, and Johnson Systems. The firm currently has $25 million in cash and no debt.

Analysts expect CA's purchases to contribute handsomely to the firm's bottom line. Johnson Systems' revenues last year totaled $10 million, and Sorcim brought in $15 million in the fiscal year that ended in June. The Johnson products, once integrated into JASPER, should generate about $13 million this year, Mazur says, and the Sorcim products should account for $20 million. IUS should also account for $15 to $20 million, and revenues for the company as a whole could top $135 million, Quindlen says. Profits are also expected to rise handsomely, although not at the 80% clip of 1983.

Other vendors may follow CA's example in shopping for micro packages. "The pc business is the Achilles' heel for mainframe software companies because there is so much leapfrogging today as product life cycles get shorter. To get a foothold is very difficult," says Stephen T. McClellan, vice president of Salomon Brothers. "If they are smart, they won't invest very much money themselves developing products from scratch, but will go for a joint venture or acquire a micro software company."

Yet there are pitfalls to Computer Associates' approach, as competitors are quick to point out. "It's cheaper to buy a desired product than a whole company and be saddled with products you don't want," says Jack Armstrong, product manager of Cullinet Software's Golden Gate micro-to-mainframe link. The Westwood, Mass. firm developed Golden Gate almost entirely in-house. "With different corporate mentalities and structures, it can take over a year to acclimate the new people to the corporate environment. There's also a significant risk that the acquired firm may go off in a different direction from the way the parent would like."

Computer Associates has already experienced its own problems with buying other companies. According to one analyst, the firm is a cost-conscious, streamlined organization that likes to eliminate redundant positions and to merge and centralize where possible. Consequently, sizable layoffs have accompanied each CA acquisition.

CA needs Sorcim's R&D operation more than it needs SuperCalc III, because it does not have the resources in-house to enhance its current micro product line.

Fifty Johnson Systems employees, mostly in administrative and marketing positions, were terminated as a result of that takeover, and at Sorcim, Mazur says, "The top management across the board either resigned or was terminated. We simultaneously reduced the IUS staff where we felt there was duplication and where we felt the Sorcim people were better."

Nonetheless, about 30 Sorcim employees were cut from most departments except R&D, leaving some bitter feelings among the San Jose firm's employees. "It was a bloodbath. This New York group took over a California company and started swinging axes," one fired executive reportedly said. Mazur counters that Sorcim had realized prior to the acquisition that it was "bloated" and had planned to cut more people than CA actually did.

The acquisitions of both Sorcim and Johnson Systems were further troubled by logistical concerns. Computer Associates, in keeping with its style, had

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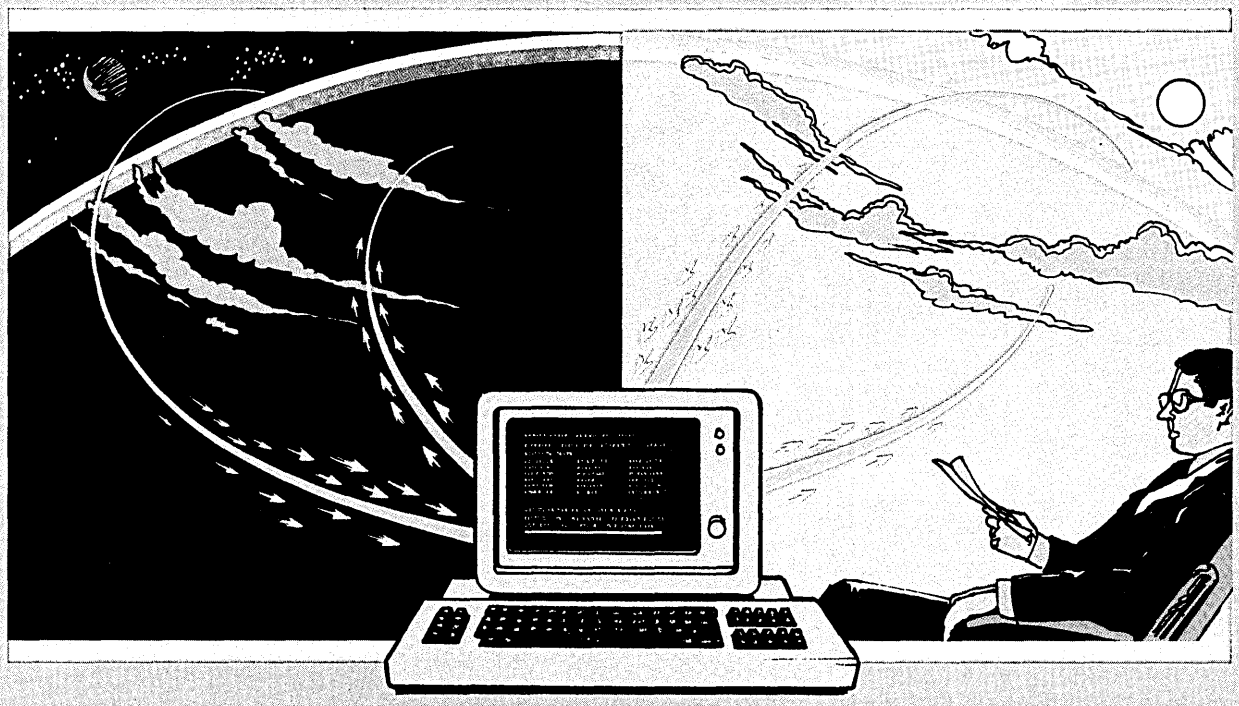

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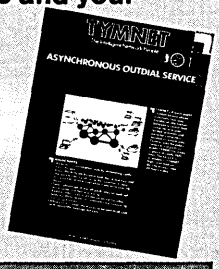

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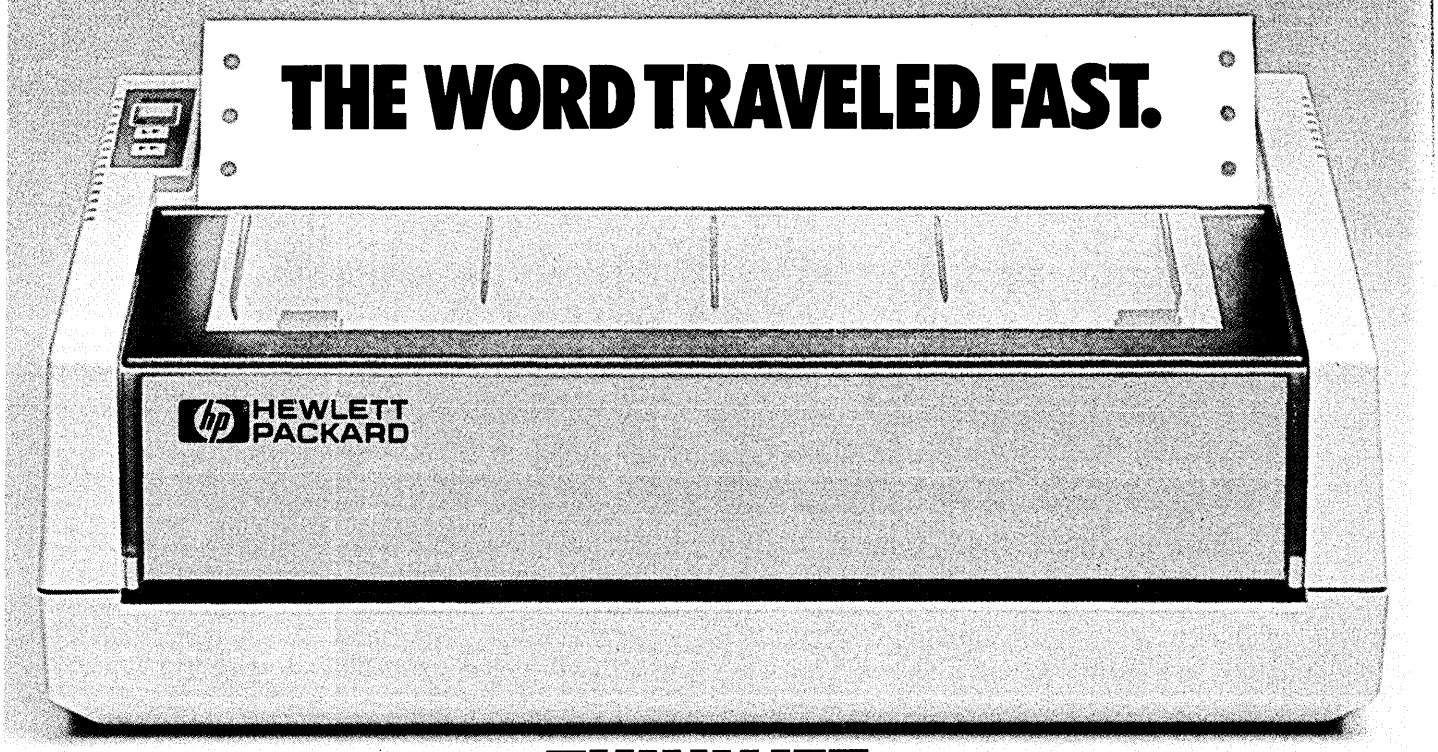

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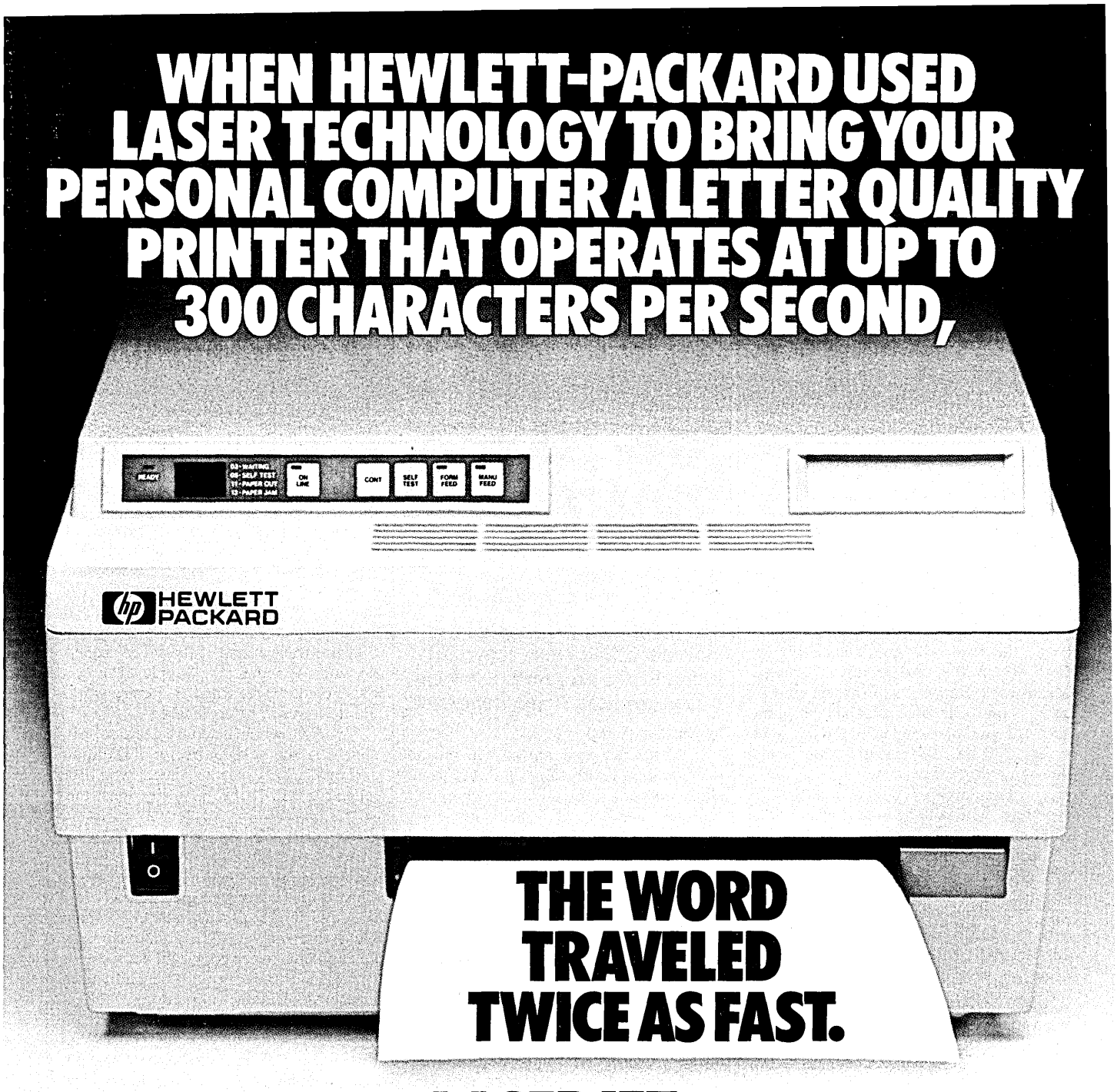

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moved its own people to Sausalito to run IUS when it was bought, and had moved its San Francisco sales office to the building that housed IUS's headquarters. With the Sorcim acquisition, the sales force will remain in Sausalito but the entire IUS operation will move into the Sorcim facility in San Jose. The Sorcim and IUS organizations have been merged into a Sorcim/IUS division under John Callanan, the CA executive who was shipped to California to run IUS.

On the East Coast, Mazur says, "Johnson Systems no longer exists. We moved our Washington, D.C. sales office from Alexandria to the Johnson headquarters in McLean, Va., and have begun integrating their R&D facility into our own on Long Island."

While the Johnson products are expected to be integrated smoothly into the CA line, Sorcim employees are bitter about the way that SuperCalc III will be handled by Computer Associates. Despite CA's belief that it is a superior spreadsheet package—a belief shared by many analysts—the firm will not include SuperCalc III in the CA-Executive package, Mazur says. Rather, the firm will continue to supply its own CA-Calc program with the package. SuperCalc III can be accessed from CA-Executive, but only through a PC/DOS window.

The Sorcim products, like the IUS products, will still be sold through the Computer Associates direct sales force to corporate accounts as well as through the firm's existing dealer and distributor channels. Still, because it is not included

"There is so much leapfrogging as micro product life cycles get shorter, so mainframe software houses should go for joint ventures or acquire a micro software company."

in CA-Executive, SuperCalc III may not benefit as much from the CA sales organization as the EasySeries has.

That could have a direct financial impact on the Sorcim management since the contingent payments are based on combined sales of the Sorcim/IUS division. Terence M. Quinn, an analyst with Dean Witter Reynolds in New York, tags the goal for that division at $200 million within four years—more than twice Computer Associates' entire revenues in 1983 and seven times the combined Sorcim and IUS revenues in 1983.

One way that Sorcim hopes to increase its sales toward that goal is through a novel distribution scheme developed by Softra Inc. of San Diego. That micro software distributor plans to place a software duplication machine in each dealer's showroom. Softra will then ship product documentation and packaging to the dealer for 20% of the wholesale cost, and the machine will duplicate the software whenever a sale is made. The Softra machine is connected to a host in San Diego enabling Softra to compile customer lists and to bill dealers the remaining 80% of the product cost. It also includes several safeguards against software piracy. Softra president John Downing noted that CA's Callanan supports the idea and intends to use the distribution to increase sales of both the IUS and Sorcim products. ◉

SOFTWARE RIGHTS AFFIRMED

The Australian government has moved swiftly to give copyright protection to programs following a case involving Apple Computer.

by Norman Kemp

The Australian government will amend the Commonwealth Copyright Act to include interim protection of computer software pending agreement by other countries on the best methods for legal safeguards.

The revised act is scheduled to come into force later this year, but does not include provisions for the prosecution of users of illegal or unauthorized copies of popular imported software packages, notably Lotus 1-2-3, dBase II, WordStar and some specialized educational programs. Neither are there any sunset clauses limiting the duration of the legislation, which will continue until international aspects of computer copyright have been considered and promulagated.

The announcement by Attorney-General Senator Evans came shortly after the Australian Federal Court overturned on appeal a ruling by Judge Beaumont in an earlier hearing that Apple Computer Inc. was not entitled to copyright protection on the read-only memory in its Apple II computers (see "Software Down Under," February, p. 94).

Apple had claimed that look-alike Wombat computers imported from Taiwan by a Melbourne company, Computer Edge, had infringed the copyright of Apple's computer chips by copying the Apple operating system. This claim had been dismissed by the judge on grounds that operating system software was not covered as a "literary work" under the 1968 Australian copyright act as it stands.

The court empowered Apple to sue Computer Edge for damages if it wished. It also stated that by supplying buyers of Wombat computers with Apple manuals, Computer Edge was engaged in misleading or deceptive conduct under current trade practice law. Presenting the majority two-to-one decision of the three appeal court judges, Justice Fox said there was no necessity for a literary work to be of any literary quality.

"It is accepted that the term includes mathematical tables, codes and, in general, alphanumerical works," he said. It was clear that Apple Computer owned the copyright of these works, and that they were original in the relevant sense. The judge found that the object code contained in the Apple chips was an "adaptation" in terms of the copyright act and therefore entitled to copyright protection.

"The object codes contained in the Apple ROMs are a straightforward electronic translation into a material form of the source codes, and it would be entirely within ordinary understanding to say that they are translations of the source code," he said. Whether the Apple II object codes could be regarded as literary works did not have to be considered.

Following the court decision, Michael Suss, managing director of Computer Edge, stated that an appeal would be lodged against the majority decision.

Computer Edge is expected to appeal the high court's ruling.

That action is not expected to go before the high court of Australia until about November, however. In announcing the amendments to the copyright act, Senator Evans said these would be short-term measures pending international consensus on the legal status of software, databanks, and computer-created works. As this consensus seemed to be some way off, the government would bring down interim protective legislation not only to safeguard the vendors of imported products but also domestic companies, which were marketing Australian-developed software overseas.

Evans said the definition of literary work would be changed to include a computer program written in any language, code, or notation including high-level programming languages. A program may also require conversion to a different material form before it could be used to operate a computer, such as transferring a handwritten program to disk. Computers would be defined not only as devices having digital information processing capabilities that could perform more than one function, but also those that have some programmed computing ability like ignition switches and telecom networks. ◉

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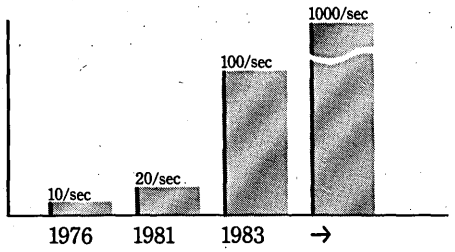

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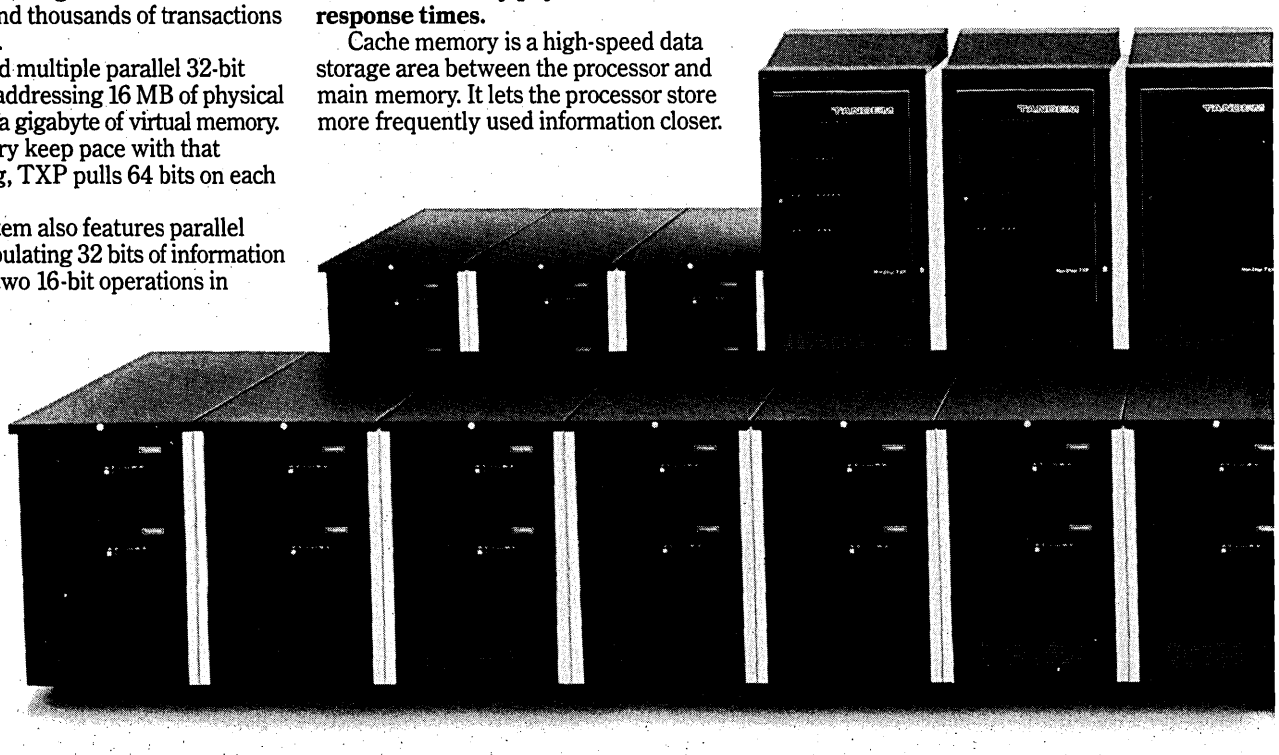

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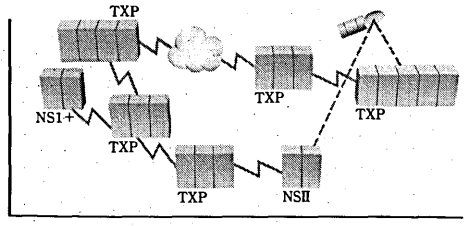

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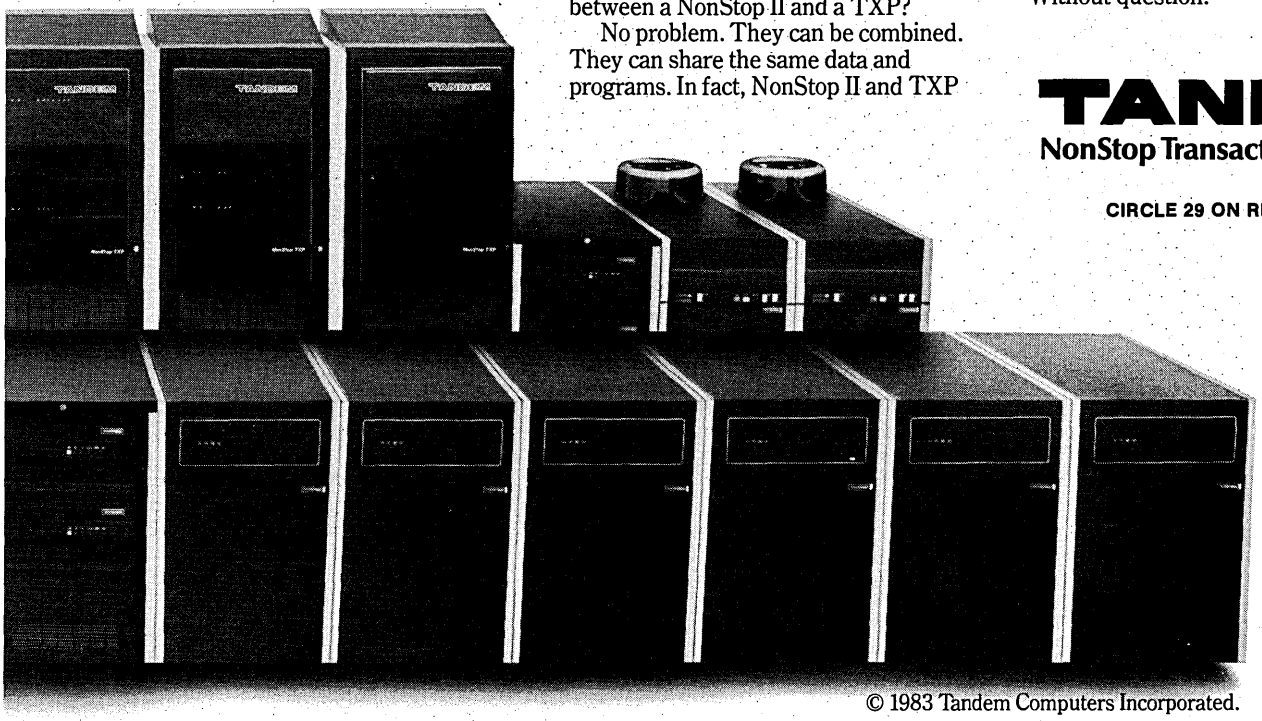

A COMPASS FOR MRP

A new package from Western Data Systems helps defense contractors and others save costs.

by Edith Myers

"It's a pulling market," says Steve Owen of the customers and prospects for his new company's newest software product.

It was this same product that "pulled" Owen from the warm comfort of Xerox Corp. (he was a vice president at Xerox Computer Services) to the more challenging post of president at tiny Western Data Systems, Woodland Hills, Calif.

The product is Compass-Contract, a material planning and control system for project and contract-oriented companies. It was developed in response to a request from a division of the Whittaker Group, a customer.

What impressed Owen was that Western Data was able to devote the manpower and the whole of the company's resources to solve a problem that "speaks to the specific needs of a hitherto untapped market in the manufacturing industry."

He describes the magnitude of the problem: "There are stringent government reporting requirements that necessitate being able to track parts by lot number, and verification of Department of Defense and Military Specifications must be applied at each step of the way, using approved vendors for parts and components. Finance has to be able to track ongoing costs on a real world basis, not according to some standard model. Constantly changing manpower and machine requirements had to be included in the planning."

The fact that there are only two or three layers of top-to-bottom management in a small company like Western Data meant that the decision to take such a risk could be made quickly, he said. "In a large company, trying to get approval for this type of undertaking through 15 or so layers of management could mean a decision made in millenia instead of hours."

Owen joined the Woodland Hills firm in January, when it employed 23 people. He expects this number to grow to 100 by the end of the year. "We can't expand our company fast enough."

Beta versions of Compass-Contract have been out since February and regular deliveries began last month. "We'll live closely with anything we sell this year to get customer feedback," said Owen. "We're modifying on a weekly basis based on meetings with customers."

"Project and contract-oriented manufacturing firms have planning and control needs that differ greatly from those of other manufacturers," says George J. Miller, Western Data's vice president, technical services. "This is due, in part, to the nature of their products, which often are custom-made or assembled from options.

" Even if a standard product is manufactured in these environments, the infrequency of manufacture, variance in lot sizes, or special terms and conditions of contracts may cause costs and lead times to change considerably between production runs. When products are being built for the first time, the uncertainty about costs and schedules is magnified considerably."

He said most standard material planning and control systems are designed to handle intermittent or high-volume repetitive production of a standard product in a standard cost environment.

Compass-Contract is complicated but not complex, says Miller. It plans and tracks by project, handling such tasks as estimating, budgeting, cost accounting, and quality/configuration control.

The product also provides standard management functions such as accounting software, net charge, MRP, and master scheduling and it is integrated and on-line so that manufacturing, finance, engineering, sales, and other departments all use the same information.

Owen said it also can cut the cost of bidding on a contract, a cost he says runs 20% to 25% of a contract's value.◉

RCS VENDORS' SHIFT

Timesharing companies are finding new opportunities in software and the personal computer market.

by R. Emmett Carlyle

If forecasters are correct there will be 12 million personal computers on the desks of corporate America next year, each one a potential nail in the coffin of the remote computer services (RCS) industry.

As hardware prices plummet and in-house alternatives to remote timesharing pop up, the venerable RCS industry is showing its years.

The woeful tale is there for all to see in the balance sheets of one of the industry's top computer service companies, the $225 million Informatics General Corp., Woodland Hills, Calif. The company is a veritable microcosm of the software and services industry, since it straddles most of its sectors. While it continues to show moderate growth (about 6% a year) in its traditional business of professional services, or the "body shopping" of programmers, its general timesharing service is declining precipitously. The company's financials show a 23.8% drop in this business during 1983. A projected 1984 estimate by Al Berkeley at Alex. Brown & Sons research company, Baltimore, Md., shows an even bigger drop of 25%.

"Informatics' experiences in timesharing," says Berkeley, "closely parallel

Informatics General saw its general timesharing business plummet by 25% during 1983.

the experiences of others in the industry. Unless a timesharing vendor offers specialized software or data, the timesharing business will be rapidly eroded by the personal computer."

But the personal computer is a two-edged sword. When enhanced in vertical markets (like banking, insurance, or law) by remote timesharing support, software packages, and turnkey systems, the benefits to computer service companies can be spectacular. Berkeley predicts that all the vertical businesses Informatics has scampered into will grow a minimum of 30% this year. He claims that its business in the legal sector will grow a whopping 111% (from 53% last year), information resources and distribution will each top 30%, and so on.

Informatics has articulated a shift in emphasis from computing capability sold to a wide client base to software-intensive solutions aimed at specific target markets. If it wants to avoid an RIP on its tombstone in the immediate future, the traditional RCS industry must make the same transition, and must push for a larger piece of the overall computer services marketplace.

"It's a case of demise or transition," says Len Bergstrom, vp of marketing for Real Decisions, Stamford, Conn., a watchdog of the RCS industry. "The signs are that vendors are alert to the problem and are undergoing major changes in direction," says Bergstrom, whose company's annual report, *Timesharing Decisions*, has been benchmarking the rival claims of RCS vendors since 1975.

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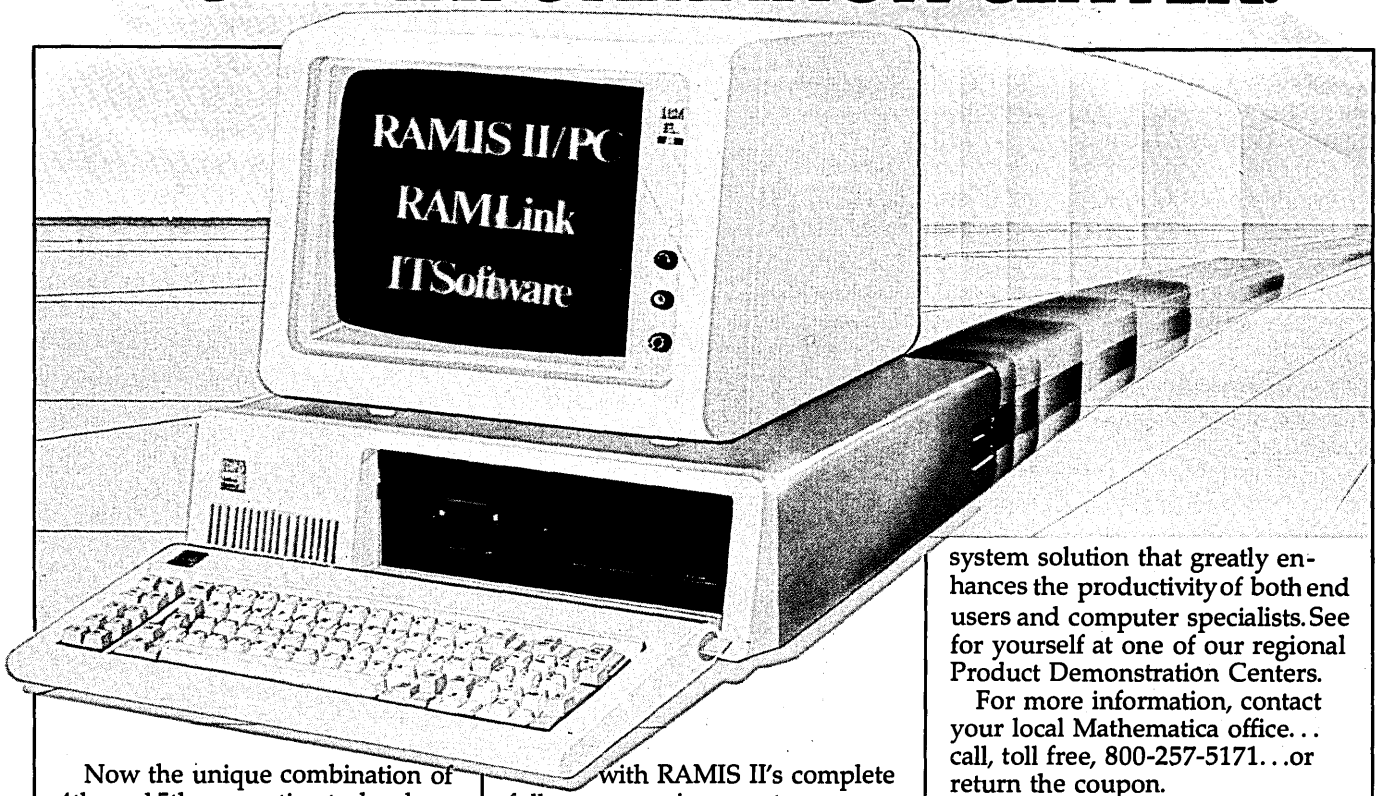

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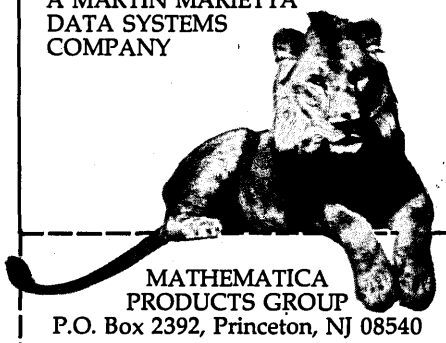

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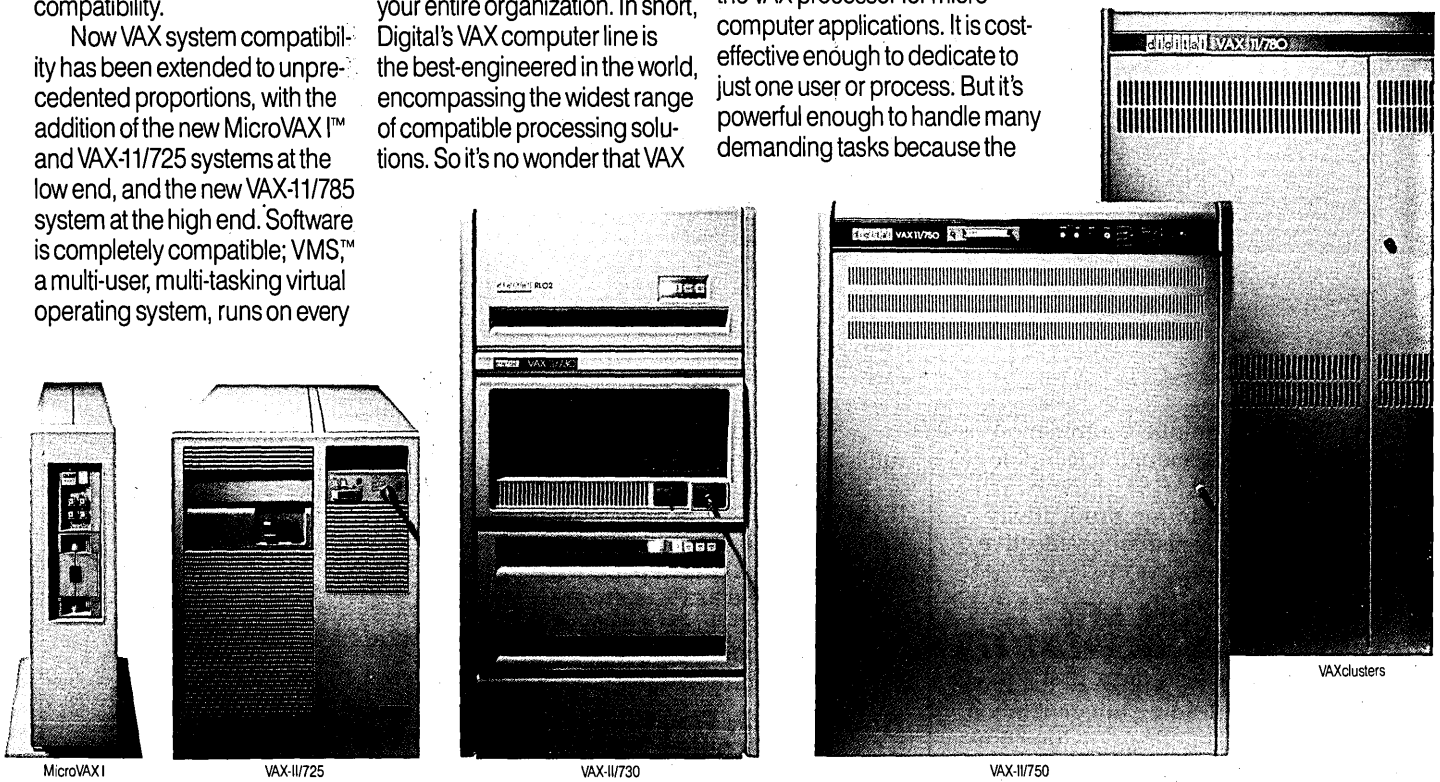

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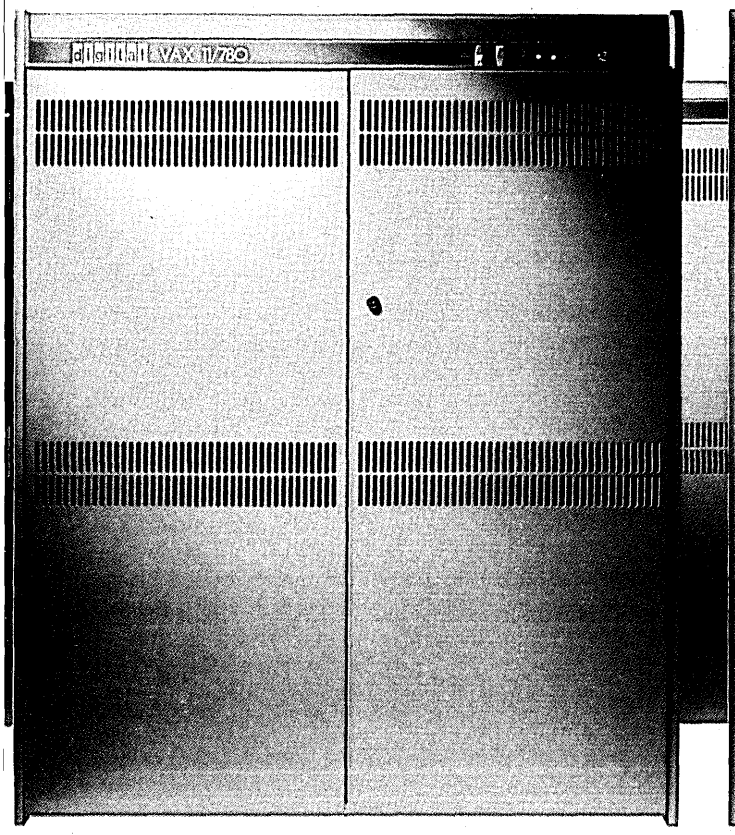

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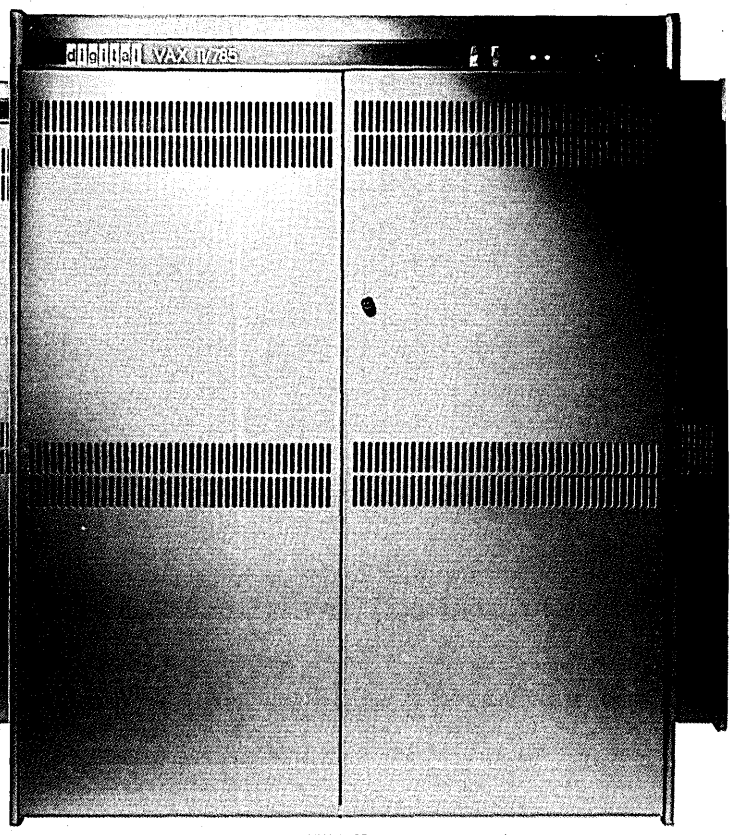

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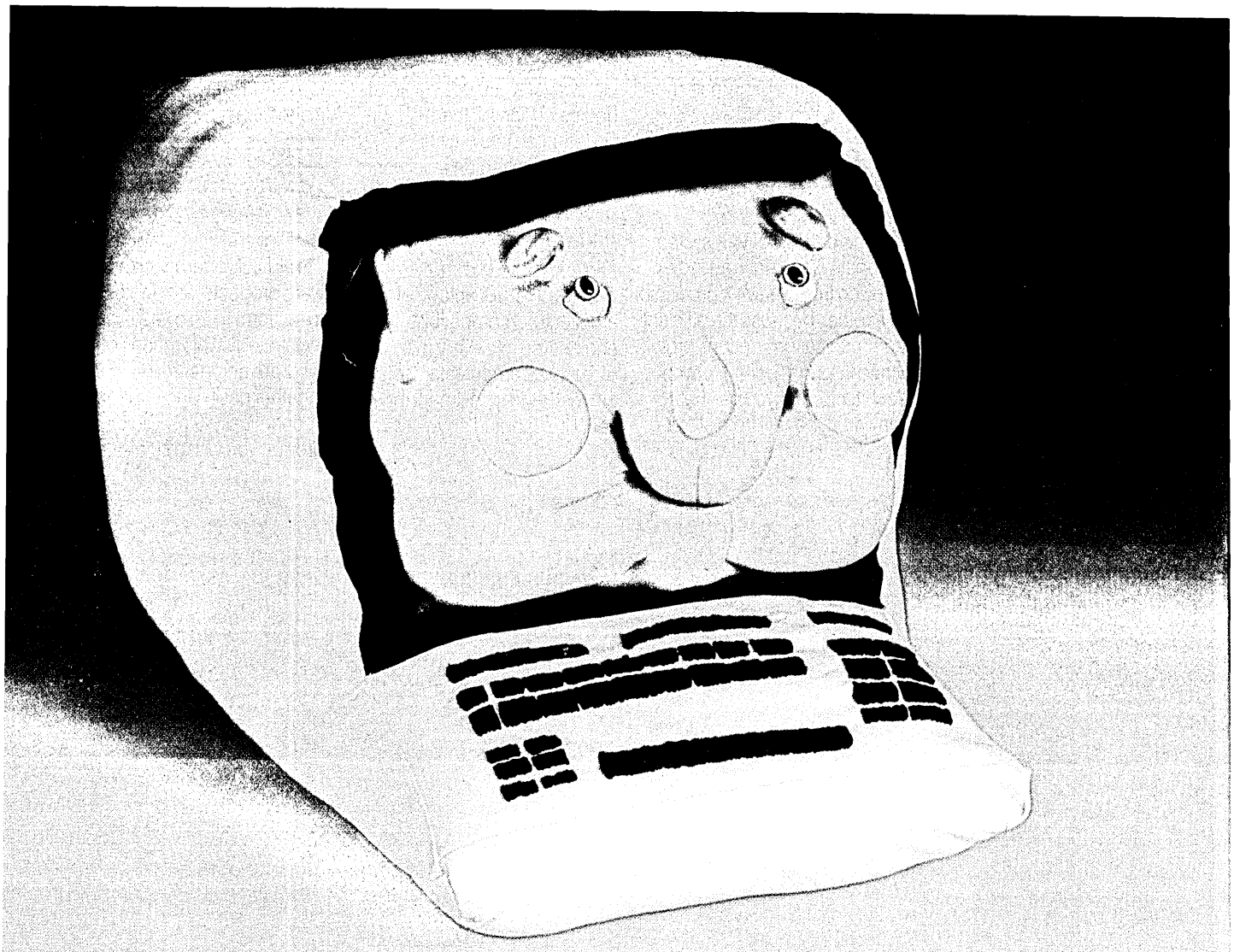

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Central to this transition is what Bergstrom calls the emergence of "supervendors." One is Control Data, which boosted the number of its services by acquiring United Information Services. McDonnell Douglas Automation Company (McAuto) is adding to its already considerable girth by acquiring Tymshare, and so on. The quickest route to instant "solutions" capability in vertical markets is to buy one. These giants are also adding strength in niches by building large external databases and, above all, pushing into integrated network solutions, which enable them to deliver and support their applications in any mode the end user deems appropriate.

But according to Bergstrom, the biggest change in the RCS business has not been brought about by massing to gain more muscle (that has been an ongoing feature of an industry that has survived many shakeouts in its 20-year history), but by its attempts to make up with its traditional competitor, the corporate dp center; and in a related vein, to make its traditionally remote offerings available for in-house installation.

Like the RCS vendors, the central MIS site personnel have been pushed into a position where they must deliver solutions to their end users to avoid having undermined their central power as the last word in dp. "Let's be allies," the RCS vendors are now saying. "Lets beat this thing together."

RCS vendors have moved recently to make friends with the dp managers at customer sites.

This shift, as Real Decisions points out, has required vendors to reorient their marketing and remold their image. "In many cases difficult transitions have had to be made from unpopular, even antiquated hardware and software environments to standard offerings," Bergstrom explains.

"Standard" in the dp world, of course, means IBM. One of the strongest trends in the remote services industry over the past few years has been the shift to IBM hardware and software. In particular, MVS/TSO and VM/CMS are the targets for vendors making the switch into the IBM world from Xerox, Univac, and other suppliers' equipment. This transition has often been traumatically painful, at least to the corporate ego, for Univac and Xerox machines, noted for their prowess in timesharing, have been carefully tuned and nurtured over the years by certain timesharing vendors, only to be discarded in favor of IBM gear. Comshare Inc., Ann Arbor, Mich., and Computer Sciences Corp., El Segundo, Calif., are two companies that have made the move.

"It's been tough," says Comshare's chief executive Rick Crandall of his firm's four-year journey into the IBM world, "but we've come out in better shape at the other end." After plowing in $20 million to transform Comshare into "more of a software than services company," the new corporation bears little resemblance to the old. True, the company still has the same revenue, $73 million, this year as it had three years ago, "but it's increasingly being generated by the decision support software we created for the IBM Information Center environment," Crandall reveals.

Comshare estimates that about one third of its business is a "drag" on the company, namely, its general timesharing arm. "But even here, this remote service is vital for supporting our end-user software after a sale has been made, and in aiding the customer in his software development and migration activities when his in-house resources are tied up," he says.

By the same line of reasoning, Comshare has concluded it would be fool-

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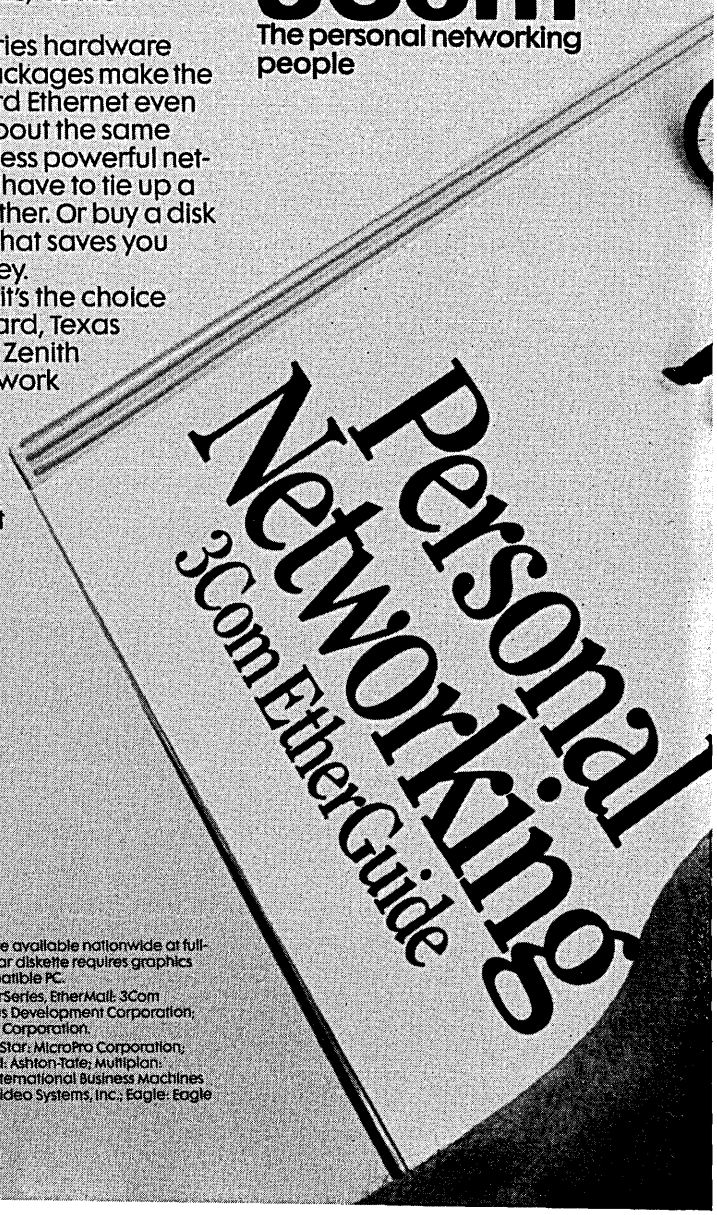

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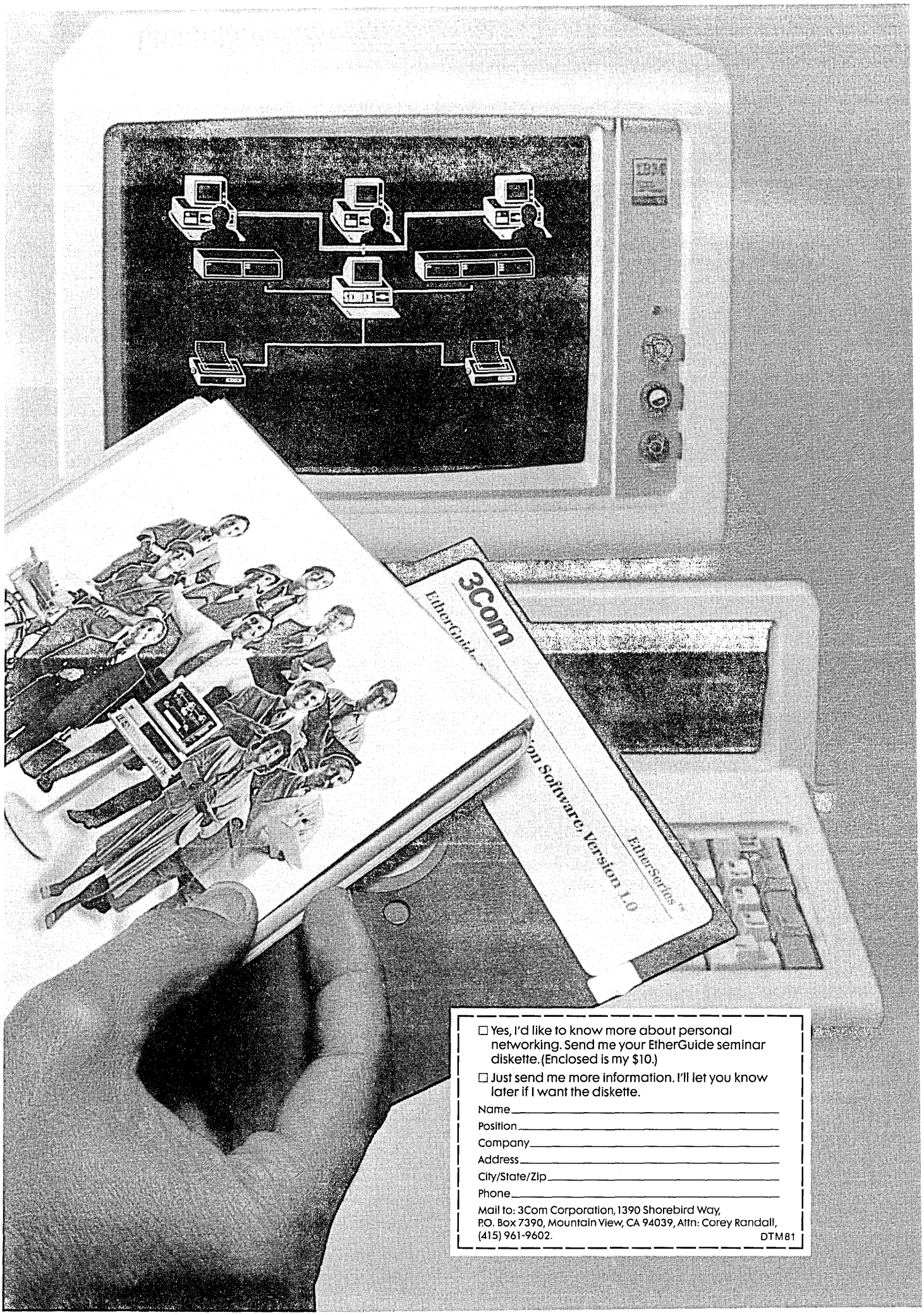

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ish to pull completely out of the timesharing business. "Timesharing used to be *the* application," says Crandall. "But now, along with micro turnkey systems and software packages, it's just one of three ways to deliver applications. So it's still important to a multiple delivery strategy, which is what the RCS industry has to adopt."

Comshare's experiences also have provided possible clues to the evolution of the computer services business. It's significant that IBM chose Comshare's System W decision support software for a joint marketing program over the rival claims of the "legitimate" independent software companies eager to gain access to Big Blue's Fortune 500 customers. After all, in several sectors of the computer industry, Comshare is seen as a fading RCS vendor "posing" as a software company.

"The guys in the glass houses [central dp] don't like IBM talking to their end users, and IBM doesn't want to get stuck with an expensive, after-sales handholding task. So along comes Comshare," says one former IBMer.

Under the comarketing agreement, IBM provides hardware and Comshare software and field support. By contrast, personal computer software companies, like Microsoft and Lotus Development, are typically headquarters-based with few fully staffed field offices.

Comshare clearly thinks it has come from one of the worst positions to one of the best, and expects to eclipse the services industry's decision support software leader, Execucom, next year. The way, though treacherous, would appear to be open for other computer service companies to emulate Comshare and use multiple delivery strategies to take on the software industry. If so, then maybe a few of the old salts won't be falling into their graves prematurely. ◉

GRAPHICS ATTACKS ON IBM

New offerings are existing products with something added.

by Edith Myers

Two California computer graphics companies, one in software and one in hardware, have taken direct aim at IBM markets with offerings tying together existing products with newly announced "missing links."

In the case of Integrated Software Systems Inc. (ISSCO), San Diego, the missing link is what president Peter Preuss calls, "the glue that ties it all together." The total offering is I-VIS for Integrated Visual Information System. The key missing link is the I-VIS manager.

For VG systems (formerly Vector General), Woodland Hills, Calif., the missing link is a computer, which it has integrated with both its vector and raster display stations, with the capability of running CADAM and other high-performance CAD/CAM software.

ISSCO has been selling its DISSPLA and Tell-a-Graf software packages into the IBM world for more than 10 years. The software can extract data through any data management system or data file structure and can output the information in graphic form through some 230 graphics output devices.

An acknowledged leader in the presentation graphics field, ISSCO was pushed toward its decision to offer I-VIS by results of a recent study by the Wharton Business school, which the company feels quantified the value of presentation graphics. "We're where air conditioning was in the '40s," says Preuss. "It wasn't doing too well until studies produced statistics on how much more productive workers are in an air conditioned environment."

The Wharton study involved MBA candidates in role-playing situations and indicated that presenters using graphics made their point 67% of the time, were perceived as more professional than presenters without graphics, and achieved consensus in a 28% shorter meeting time.

Armed with these conclusions, ISSCO set out to develop I-VIS and to tailor it to the IBM user. Anders Vinberg, director of development, says he was surprised at the credit he's been given for recognizing the facts that the IBM market is both bigger than and different from others. To convince his development staff of the latter, he acquired IBM 4300 series computers. The staff had been used to working with Vax machines. "They resisted but they learned," says Vinberg.

"We took a look at what that [IBM] marketplace needs and came up with a whole bunch of things," says Preuss. He says developers took great pains to make it look as if the software belonged in an IBM environment. "We aimed for familiar access. Ease of use is in the eye of the beholder."

IBM was very cooperative, says Mel Gafner, ISSCO's vice president of marketing. "They need us and we tell our customers to buy their low-end graphics software. It makes ours look so much better."

Preuss said ISSCO has been selling VIS components for years but they weren't recognized as such. He says they have 1,900 installations of DISSPLA and Tell-a-Graf and 150,000 users who are using them at least once a week. "That's more than are using VisiCalc." General Motors, he says, has 60 copies. "At one site, use of Tell-a-Graf is the most common computer usage with the second being printing a list."

While most ISSCO products were developed with the producers of graphics in mind, the I-VIS package was primarily designed for the user of graphs. The I-VIS manager is integrated with the IBM menu structures and uses the same kinds of symbols and terminology.

A user of the I-VIS manager has access to all of ISSCO's existing graphics software and some additions as well. One is a graphics production facility. This is for what Preuss calls production graphics, which he thinks will be a major issue in the next three years. He defines production graphics as "the ability to routinely support any major numeric report with a graph."

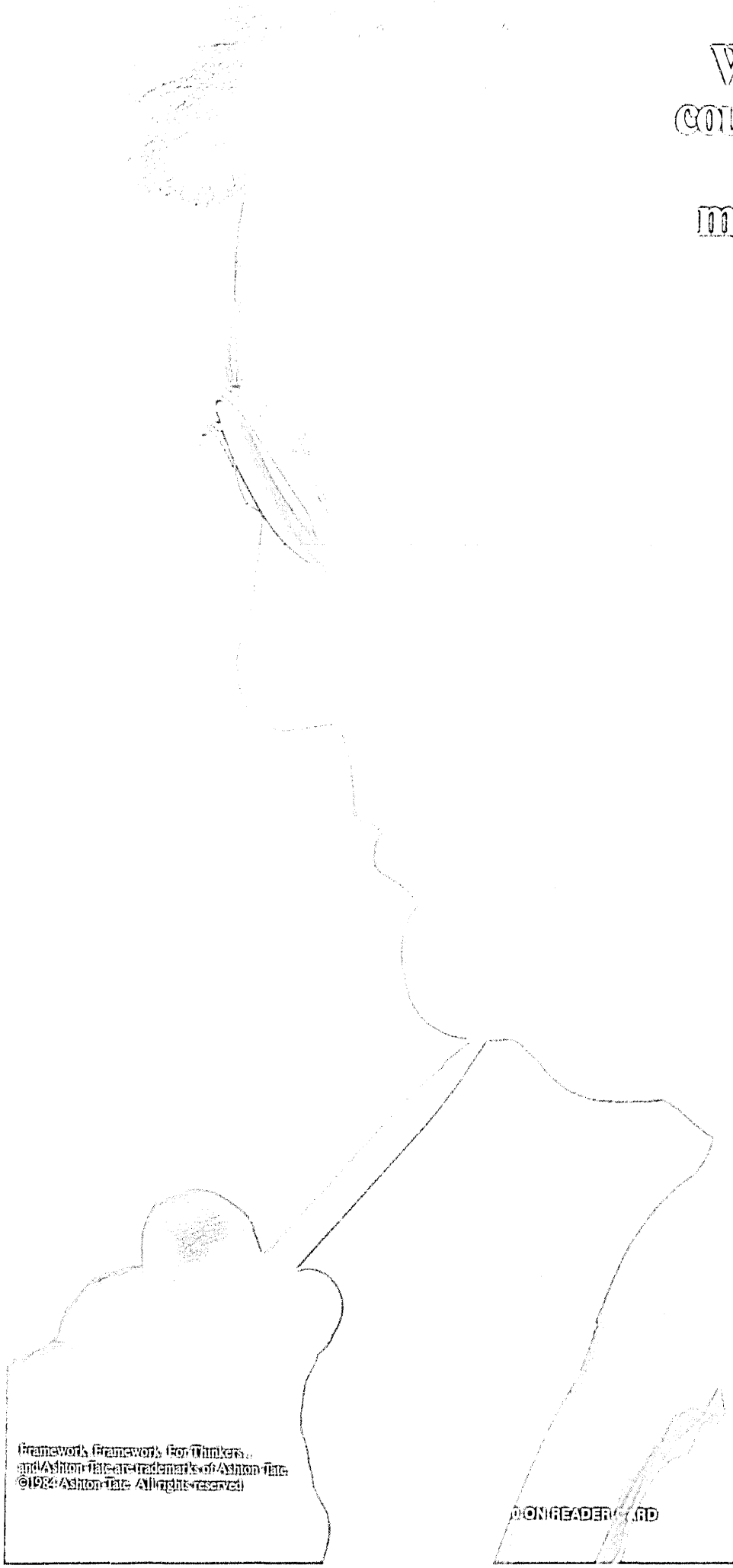
Also new are a screen chart for design of simple graphs and an executive chart book for retrieval of graphs. GKS (the graphical kernel standard) has been added to DISSPLA. "This is for gurus," says Preuss, who doesn't think it adds much value except, perhaps, for programmers. He says DISSPLA has many of the characteristics of GKS built in already. A tabler for creation of numeric tables has been added to Tell-a-Graf.

VG systems went outside the company for its missing link. "We wanted the best 370-compatible computer we could find," says president and chief executive officer John McPherson. The one selected is a 32-bit machine built by Canaan Computer Corp., Trumbull, Conn.

"To survive in the CAD/CAM world, you have to be IBM-compatible in some way," he states. He particularly wanted his company's system to run CADAM, software developed by Lockheed Aircraft Co. and sold by a Lockheed subsidiary, CADAM Inc., which he describes as "the most powerful CAD/CAM software on the market."

VG calls its total system offering the System 9000. It lists at $120,000 with two raster display stations, the cpu, two megabytes of RAM, two 85-megabyte disk drives, an IBM-compatible 9-track tape drive, a control terminal, and a printer. Either one or both of the raster displays can be replaced with a vector display at a slightly higher cost.

McPherson says the system can be expanded with a party line Ethernet. "Ethernet is becoming a standard," he claims. "IBM talks about its own local area network but I'm wondering whether IBM has waited too long." ◉



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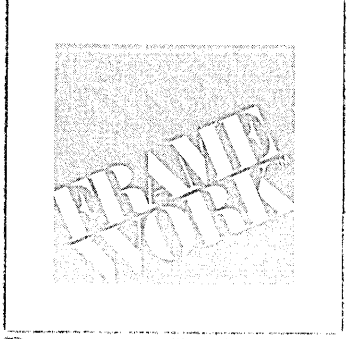

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UCC-11. An automated job management system that provides comprehensive job tracking and makes reruns and restarts a breeze. Ware it with UCC-7 and your data center will almost run itself.

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UCC-3. A comprehensive DASD management system designed to work with UCC-1. Automated facilities promote efficient usage, enforce space allocation standards and provide tools for complete analysis and maintenance of the DASD environment.

UCC-9. A unique software product which can ensure high levels of vendor support, reduce hardware failure and get the most out of each hardware dollar.

UCC-10. A Data Dictionary/Manager which automates the communication and control needed to effectively manage the IMS data base operation.
UCC-8. An online, integrated system designed to manage the complex support activities of today's data centers. Key areas of use are: problem management, change management, customer support, inventory management and TP network control.

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UCC-20. An OS JCL Generator which works in conjunction with UCC-2 to ease the transition to OS.

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NEWS IN PERSPECTIVE

BENCHMARKS

FIRE SALE: Telex Computer Products Inc. agreed in principle to buy the installed base, receivables, and inventory of the Raytheon Data Systems division of Raytheon Corp. for $200 million. Telex vice president and general counsel J.B. Bailey said the sale would include substantially all assets except real estate of the Lexington, Mass., plug-compatible terminals maker. Raytheon closed the RDS division last spring after reporting a $24.3 million loss in 1983 and a $6 million loss in the first quarter of 1984. Raytheon Data Services & Leasing Co., formed after RDS was closed, was also included in the transaction, which was slated to take effect July 1. Telex, with 1983 dp revenues of $221.7 million, is already one of the leading suppliers of IBM plug-compatible terminals and other peripherals. Raytheon's 1983 dp revenues totaled $285 million. The sale would also give the Tulsa, Okla., firm an entry into the airline reservation terminals business.

BIDS FOR INMOS: AT&T Technologies Inc. bid $80.7 million to acquire two Inmos plants from the British government. The Morristown, N.J., company said it would invest $96.6 million in one of the plants in Newport, South Wales, if the sale is consummated. The other plant is in Colorado Springs. As part of the offer, International Computers Ltd. (ICL) would acquire the Inmos design team in Bristol, England, and keep it in the U.K. The British government has insisted that any sale of Inmos to private interests include a promise to keep the semiconductor maker's development facilities in the U.K. Inmos management is split between the AT&T offer and a $13.8 million offer from Thorn/EMI for less than 10% of the company. Inmos has said it needs the $96.6 million for capital investments in its Newport plant. The figure includes a $41.1 million assembly and test facility. The fate of Inmos, which was started under a Labour government, is the focus of hot debate in the House of Commons.

BANKRUPT: Franklin Computer Corp., which had just emerged from under a costly copyright infringement suit with a new product line, filed for protection from its creditors under Chapter 11 of the bankruptcy code. The Pennsauken, N.J., firm, which paid Apple Computer $2.5 million to resolve a legal dispute in which Apple claimed Franklin had illegally used its ROM-based operating system, had cut three quarters of its work force in an effort to stay solvent. It also faced a revolving door in the executive suite, as Morton E. David was named ceo and Joel Shusterman president of the firm in the last month before it went bankrupt. The firm cited slowing sales throughout the personal computer marketplace as its death blow. The privately held company had revenues of $71 million in the fiscal year ending last March.

EXPORT: Fujitsu Ltd. said it was planning to export supercomputers to the U.S. through Amdahl Corp., in which the Japanese company has a 49% stake. The deal would bring Fujitsu into an arena where only a few comanies—Cray Research, Control Data, and Denelcor—are currently active. Fujitsu offers two supercomputers, the 250 megaFLOPS VP-100 and the 500 megaFLOPS VP-200. The company has reportedly shipped only two of the machines so far, however. The Amdahl connection, which is already being used to move Fujitsu disk drives into IBM shops in the U.S., would help the Japanese company penetrate a market that is expected to take off shortly as additional uses for supercomputers are developed. IBM, too, is widely expected to enter the supercomputing race soon.

VENTURED CAPITAL: 1983 was a good year for venture capital, particularly for computer companies. *Venture Capital Journal,* published by Venture Economics Inc., Wellesley Hills, Mass., said venture capital disbursements to portfolio companies jumped 56% in 1983 to an estimated $2.8 billion, representing the largest annual increase since 1979 when there was an increase from $550 million in 1978 to $1 billion. In terms of numbers of companies financed, computer hardware and systems firms accounted for 28% in 1983, and software and services firms for 12%. The West Coast was the geographic winner with 41% in numbers of firms and 52% in dollars invested. Within California, the southern counties—Los Angeles, Orange, and San Diego—received 13% or $364 million of the $2.8 billion invested in '83, up from 10% or$180 million of $1.8 billion in '82. "Southern California is emerging as a new center of venture capital," says Jane Morris, managing editor of the journal.

BIG BUY: Ross Perot's Electronic Data Systems, Dallas, agreed to become a subsidiary of General Motors in a deal worth as much as $3.4 billion in stock, cash, and notes. Early plans call for EDS to eventually handle all of GM's data processing, effectively quadrupling EDS's current business of almost $800 million a year. Most of that business comes from processing health insurance claims and government facilities management contracts. Perot, who with his family controls some 28.5% of the EDS stock, is expected to make about $580 million cash on the deal. He will also gain a seat on the GM board of directors. Perot and EDS president Mort Meyerson plan to stay with the company, which will remain headquartered in Dallas. EDS stockholders were offered a choice between receiving $44 a share immediately and getting promissory notes worth a minimum of $60.20 a share when they come due.

Meanwhile, in an unrelated matter, EDS filed suit in federal court charging IBM will improper conduct in winning a $61.3 million contract with the Immigration and Naturalization Service. Asking for a preliminary injunction against IBM, EDS charged its competitor with secretly meeting with INS officials and then adjusting its bid to come in $2,713 below EDS. "It is simply incredible that two bids, based on substantially different technical solutions, could differ by only five thousandths," the Texas company said in its suit. IBM's contested bid calls for it to supply 64 model 4300 and System/36 computers and more than 8,000 terminals.

LEAVING IBM: B.O. Evans and Francis G. "Buck" Rodgers, two veteran IBM officers, took early retirement from the company effective July 1. Aged 56 and 57, respectively, the two men joined IBM in the early 1950s. Evans left the company as vice president for engineering, programming, and technology on the corporate staff. Rodgers, vice president of marketing since 1974, has been succeeded by Terry Lautenbach, corporate vice president. Evans's responsibilities have been handed over to new development and programming staffs headed by Michael J. Attardo and Earl F. Wheeler, respectively, IBM said.

VICTOR SALE: After several months of bidding, troubled pc maker Victor Technologies agreed to be bought by Beta Systems,. Mannheim, West Germany. The $30 million deal would have to be approved by Victor's creditors because the company is operating under Chapter 11 of the bankruptcy code. It has already been approved by Kidde Inc., Victor's largest shareholder. Reportedly, Beta will acquire all of Victor's stock and form a public company in the U.S. in order to keep Victor stock trading. Others who had bid for Victor, which ran into severe trouble last year shipping 16-bit pcs, include Swedish software house Datatronic and Applied Computer Techniques, Victor's marketing arm in Britain. Victor is understood to have penetrated the European market much further than the U.S.arena, partially because of a less aggressive IBM there. Victor's 150 employees were reported to be shipping about 150 machines a day from the firm's Scotts Valley, Calif., plant. ◉

In 1947, 71 years after Alexander Graham Bell uttered the words "Watson, come here, I want you...," Bell Laboratories invented the transistor...and ushered in the Computer Age.

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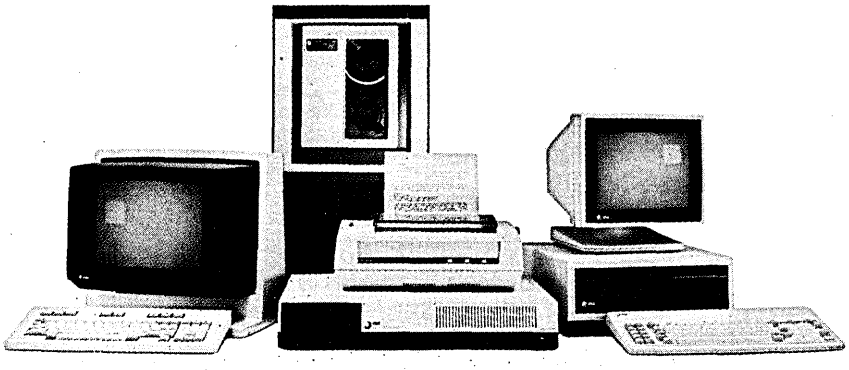

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For over 40 years, AT&T has been in the business of designing and manufacturing computers.

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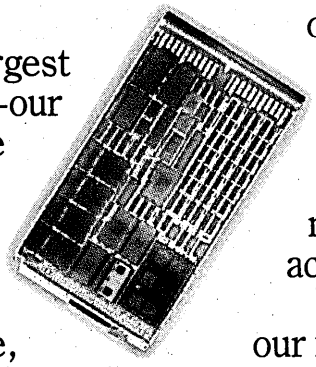

Today, we're proud to introduce a whole new line of flexible, compatible, reliable computers for business ...AT&T Computers.

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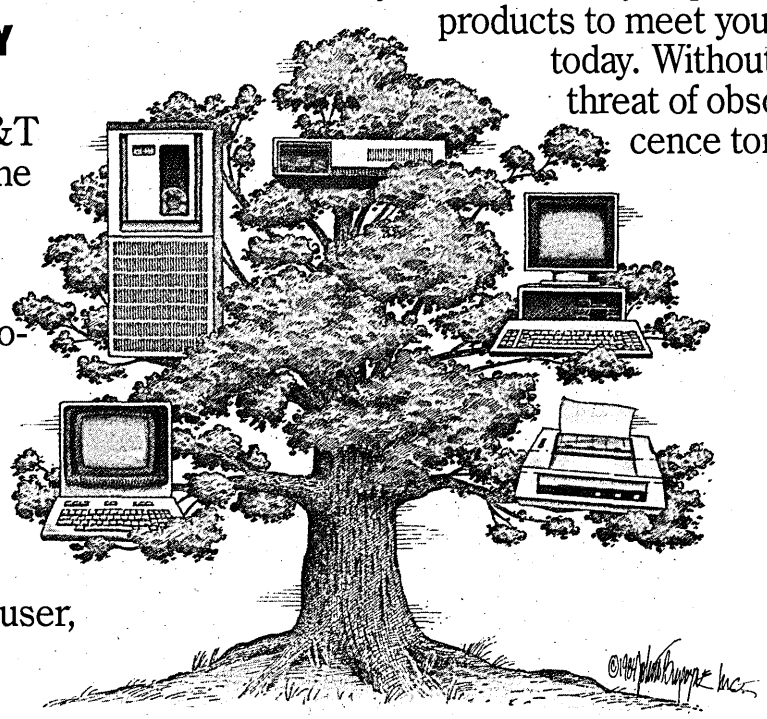
Meet the family.

The 3B2, 3B5 and the AT&T Personal Computer make up the new AT&T family of flexible business computers.

The AT&T 3B2 is one of the most advanced super microcomputers you can buy today. This 32-bit UNIX* System V-based super micro packs all the power of a much larger system in a size small enough to sit on your desk top. Because it's a multi-user, multi-tasking computer that can accommodate up to 18 terminals, it operates at a low cost per work station. That makes it perfect for offices where many people need desk-top computers and there's a need to accommodate growth.

For larger family gatherings, the AT&T 3B5 minicomputers make great hosts, because they can accommodate up to 60 users.

What's especially attractive about our family is that it will grow with you. No matter what size your company, it allows you the flexibility to pick specific products to meet your needs today. Without the threat of obsolescence tomorrow.



E NEW COMPUTERS.

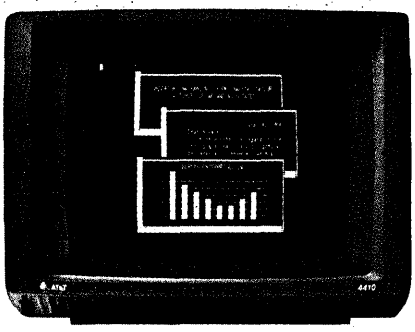
And the family's open architecture means that our computers will be good company for your current hardware and software, thus protecting your investment.

No matter which AT&T Computer you buy, consider yourself part of the family.

ALL THIS AND A PC TOO

AT&T would also like you to meet the new AT&T Personal Computer. This exciting new member of our computer clan is perhaps the most flexible and compatible personal computer on the market today.

What makes the AT&T Personal Computer special is its ability to run most popular business software, including most available MS-DOS** applications. It operates as a stand-alone unit or as an intelligent work station in an integrated computer network.



And it combines high performance with excellent graphics capabilities and a high-resolution screen.

Moreover, costly options on some other PC's are standard features on the AT&T Personal Computer—features such as color graphics; serial and parallel ports; clock/calendar display; monitor pan and tilt, plus multiple expansion slots to add extra printers, memory and other plug-in options. All this is bound to make it your personal favorite.

YES, WE DO WINDOWS

If you have several stacks of work that you'd like to spread out and work on, AT&T has the perfect way out. It's called windowing. It allows you to divide your computer screen into four miniscreens. It enables you to print from one window, edit in another, draw a graph in a third and sort addresses in the fourth. With AT&T's windowing, you'll be able to see to everything at once.

When it comes to compatibility, the new AT&T Computers hit it off with each other...and most everyone else.

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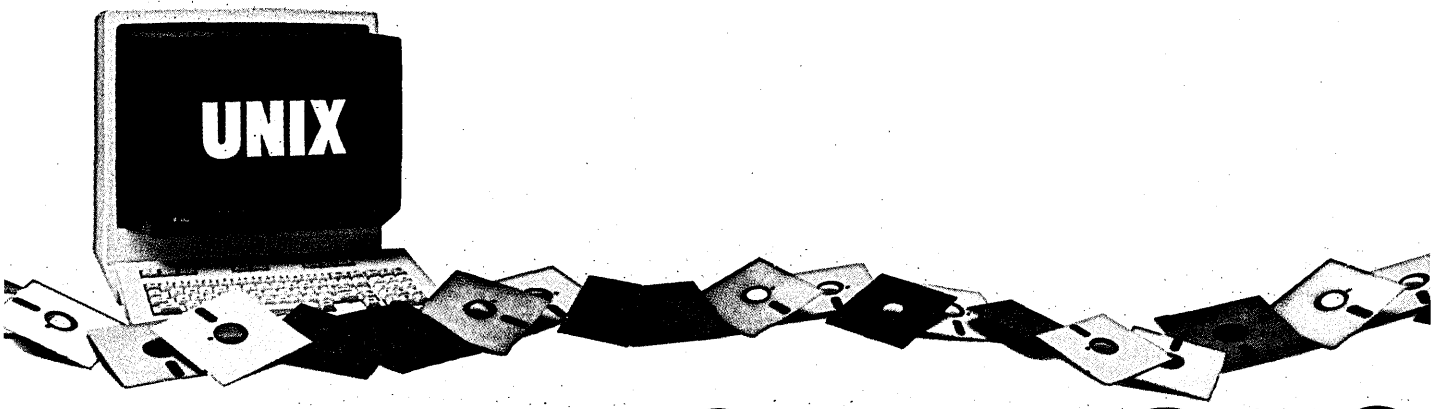
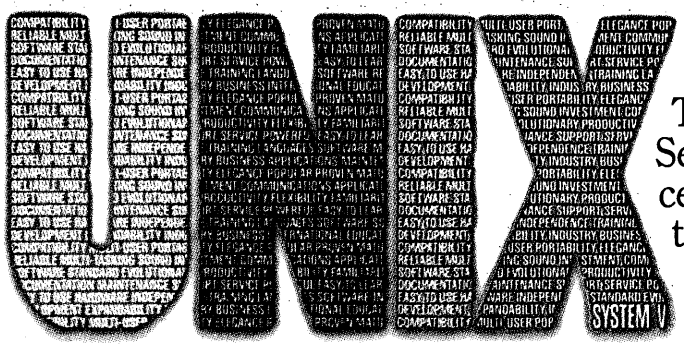


THEY GET ALONG

bridges the MS-DOS and UNIX Operating Systems, allowing you to use your PC as part of a larger 3B network.

All our computers are based on AT&T's Information Systems Architecture, an open, communications-based structure that can accommodate and integrate not only our products, but also those of other manufacturers.



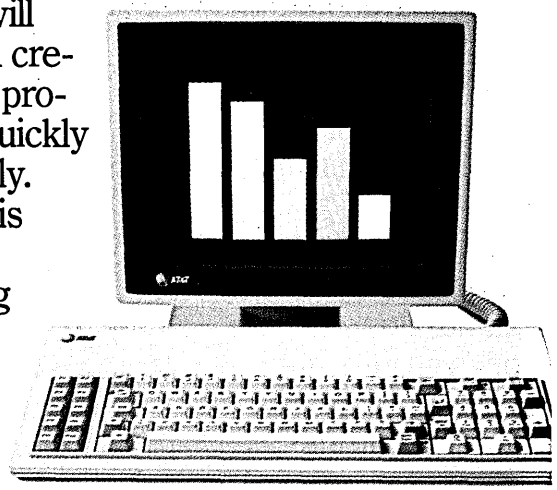
We also have the UNIX System V Operating System, developed by AT&T Bell Laboratories. It's an operating system so flexible, it's rapidly becoming an industry standard. You won't have to discard equipment. Or waste time and money reprogramming every time a new computer comes along.

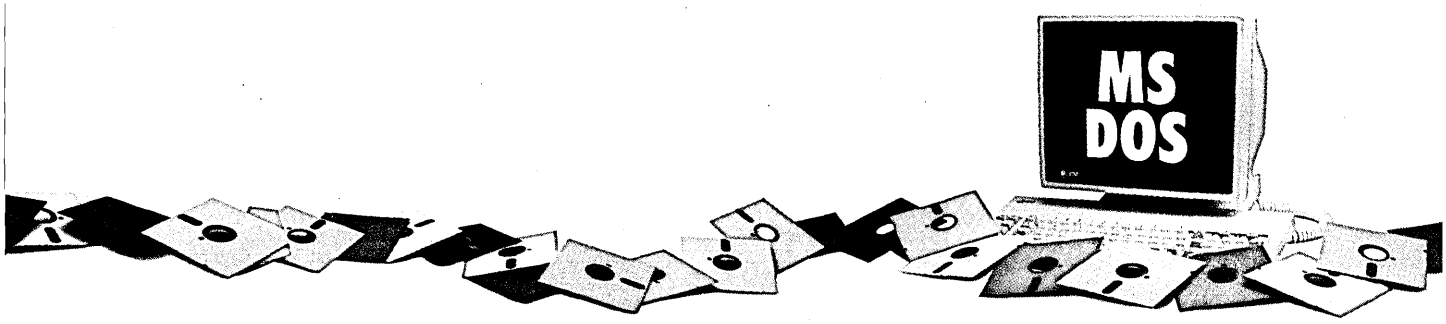
HARDWORKING SOFTWARE

For solutions to all your business problems, the new AT&T software really applies itself, with a wide range of new applications. AT&T software also offers you upward compatibility. Because it's based on the UNIX Operating System, 3B2 software will run on 3B5 computers.

It's your assurance that your software investment is protected as you grow.

We've created a Business Management Series to perform a full range of management functions from financial analysis to sales administration. The Communications Series enables your processors and terminals to talk with each other. There's an Industry Series to zero in on the needs of your particular business. There's also an Office Productivity Series to help you with tasks like word processing, filing, and spreadsheets. And a Systems Programming Series will help you create new programs quickly and easily. Since this is just a sampling of our wares,





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you can see why it makes sense to sign on with AT&T's entire range of software.

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The new AT&T Information Systems Network, featuring star topology, is one of the most flexible, cost-efficient links between terminals, work stations, and computers of all sizes. This local area network allows you to connect departments, whole buildings, industrial parks... or even campuses.

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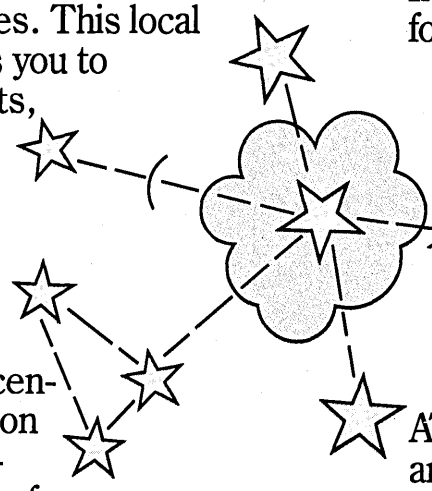

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AT&T INFORMATION SYSTEMS: WHEN YOU'VE GOT TO BE RIGHT.

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In Search of Hot Licks, New Tricks, and Product Mix in Unixland.

THE UNIX UNIVERSE

by Sandy Emerson

Unix: the name of an operating system that's on many people's minds but is now primarily in the hands of students and systems integrators. Unix. Only a few weeks ago, if you mentioned Unix anywhere off-campus, reactions could range from bafflement to a barely suppressed snigger. Many paragraphs of explanation about "eminent, cryptic, and revered Bell Labs' programming environment" might be necessary to restore the conversation to a dull, serious, and hackerly level.

The history of the Unix operating system can be divided into two distinct eras: before its realease and after its release as a commercial product. Before 1981, when AT&T announced a radical change in the licensing structure for Unix along with the first revised standard version (System III), Unix had been the almost exclusive property of universities and research institutions.

When Western Electric (now AT&T Technologies) began licensing Unix at prices end users could afford, 16-bit microcomputer manufacturers leaped at the chance to acquire this powerful, highly versatile operating system that came complete with over 200 utility programs. Better still, Unix could easily be moved to any computer having a compiler for the C programming language (99% of Unix is written in C). The manufacturers might have been left sitting on empty 16-bit boxes had it not been for the simultaneous emergence of energetic, determined Unix porting companies such as Berkeley's UniSoft Systems, which has now installed Unix on more than 50 different machines.

But the enormous wash of cash and enthusiasm around Unix in the past three years still is only the beginning. The sometimes overamplified prognostications by market research firms of Unix sales in the billions of dollars may not materialize on schedule. Although sales in the as-yet-undefined Unix market sector have been quite respectable and are growing at a rapid rate,

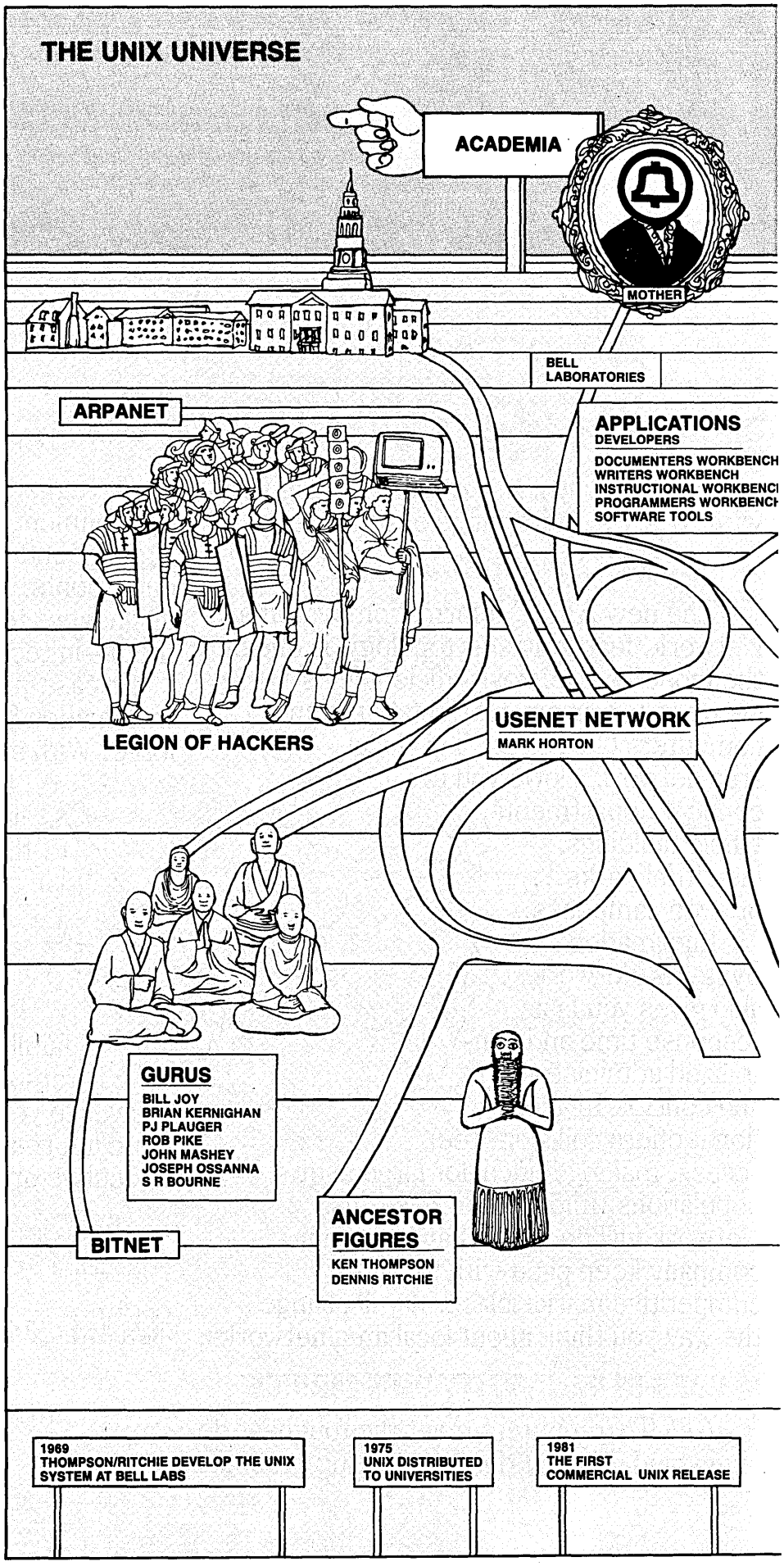
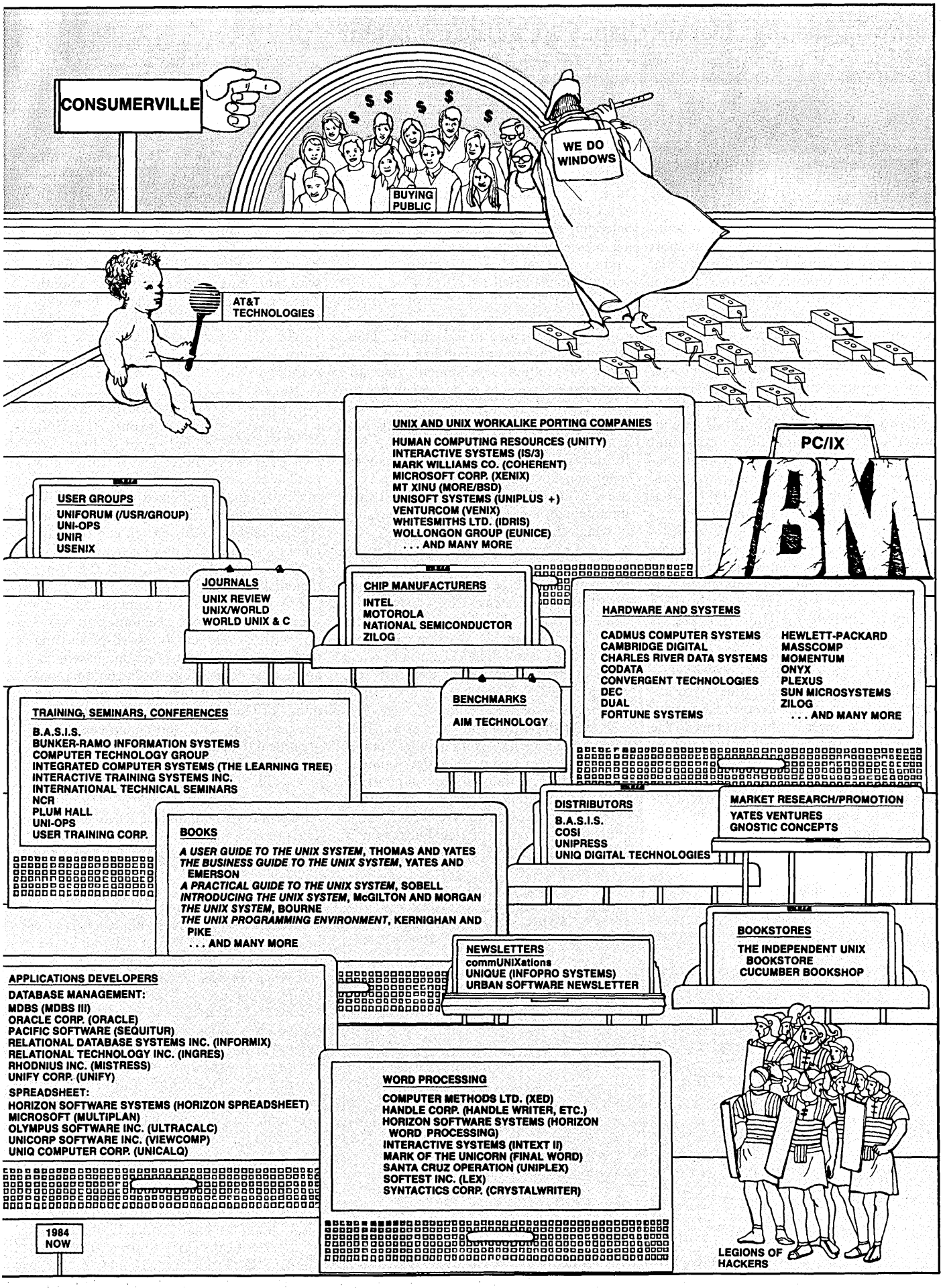


CHART BY CYNTHIA STODDARD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1984 NOW
LEGIONS OF HACKERS

However the Unix market shapes up, at the moment it is a buyers' market.

the majority of the buying public seems to be saying, "Wait and see."

Unix's innate portability may be partly responsible for this reaction. As each new machine comes along, Unix can be installed on it quickly, sometimes in as short a time as as a couple of months from initial port to final shakedown. With the advent of 32-bit supermicros and the recent announcement of Unix for the IBM PC, buyers may still be waiting for the best and cheapest deal.

What are buyers waiting for? Systems integrators and applications houses (some with tightened belts) are breathlessly trying to second-guess what the Unix consumer will most want. Slick individual workstations? Workhorse multi-user machines? Graphics, networking, windows, mice? Spreadsheet/database/word processing/decision support software?

UNIX TOTALLY TAMED?

However the Unix market shapes up, it is certain that, at the moment, it is a buyers' market. This "Graphic Guide to the Unix Universe" is intended to assist prospective buyers by detailing some people and organizations of both historic and current interest. The graphic is meant to be read, roughly speaking, from left to right—from the Ancestor Figures in the lower left-hand corner to the Buying Public somewhere over the rainbow at the upper right.

Readers of any one of a number of recent articles on Unix may by now be familiar with Unix mythology: how, in 1969, Ken Thompson and Dennis Ritchie unearthed an unused PDP-7 at Bell Labs and coded it up with their idea of a more congenial programming environment. By 1972, the Unix operating system had been translated into the C programming language (after a brief incarnation in the B language) and was fast gaining popularity in the various divisions of Bell Labs.

In 1975, with some encouragement from the Justice Department, Unix began to be widely licensed to universities. These educational licenses paid off handsomely in terms of product development: over the next six years, legions of hackers under the direction of Unix wizards (see also "gurus") developed hundreds of utility programs. These tools—for programming and for document preparation, for file management and for communications—give Unix users a huge library of built-in software, unmatched by any other operating system of which this author is aware.

The main regional variation on Unix, developed by Bill Joy and others at the University of California at Berkeley (most recently released as 4.2 BSD), includes a screen editor, job control, and a highly programmable work-management utility, the C-shell. The screen editor and some other "Berkeley enhancements" are now part of Bell Labs' latest Unix release, System V.

At the top of the chart is Ma Bell. The breakup of AT&T into smaller companies means increased product development, and (for the first time) product support for the Unix operating system. AT&T Technologies (the successor to Western Electric and the new master of Bell Labs) is now actively marketing and supporting Unix and Unix applications packages like Documenters Workbench, Writers Workbench, and Instructional Workbench.

Currently, over 100 manufacturers are offering Unix and Unix look-alike systems on 16-bit and 32-bit microcomputers, with more entering the arena every month. The array of possibilities facing the would-be purchaser of a 16-bit Unix machine is so vast that it's fortunate that Unix-specific journals are appearing with plenty of hardware reviews.

JUMPING ON UNIX BANDWAGON

Book publishers are also jumping onto the Unix bandwagon—there are more than 40 titles now available on topics in Unix and C, with more to come. Specialized newsletters like *commUnixations* and *Unique* are surrounded by hundreds of articles in computer-related publications of more general interest, such as *Byte, Infoworld*, and the trade tabloids.

Finally, the Unix applications software market is slowly beginning to warm up, with developers of word-processing packages, spreadsheets, and database management systems (singly or in combination) jockeying for position in the hearts and minds of Unix consumers. Meanwhile, the prospect of System V-on-a-chip could do a great deal to change the price/performance structure on the hardware side.

The people and organizations named in the "Unix Universe" are only a representative sampling of its inhabitants. The presence of names on this chart is not meant as an endorsement, nor should the many omissions be taken to indicate anything other than space considerations. In a world as vast and rapidly changing as the Unix marketplace, any list of players is sure to be outdated well before it is published, but it is hoped that the Graphic Guide will give you a few pointers for further research. Happy shopping. ◉

"Try not to let 'er overheat like that again..."

CARTOON BY LEO COLLUM

Sandy Emerson is a free-lance writer living in Oakland, Calif. She is the coauthor of *The Business Guide to the Unix System* and *Database for the IBM PC* (both Addison-Wesley, 1984), and is currently working on a book on Unix typesetting programs.

Further information about the categories pictured in the Graphic Guide can be obtained from the Unix journals, or from a central source such as the Independent Unix Bookstore, 520 Waller St., San Francisco, CA 94117.

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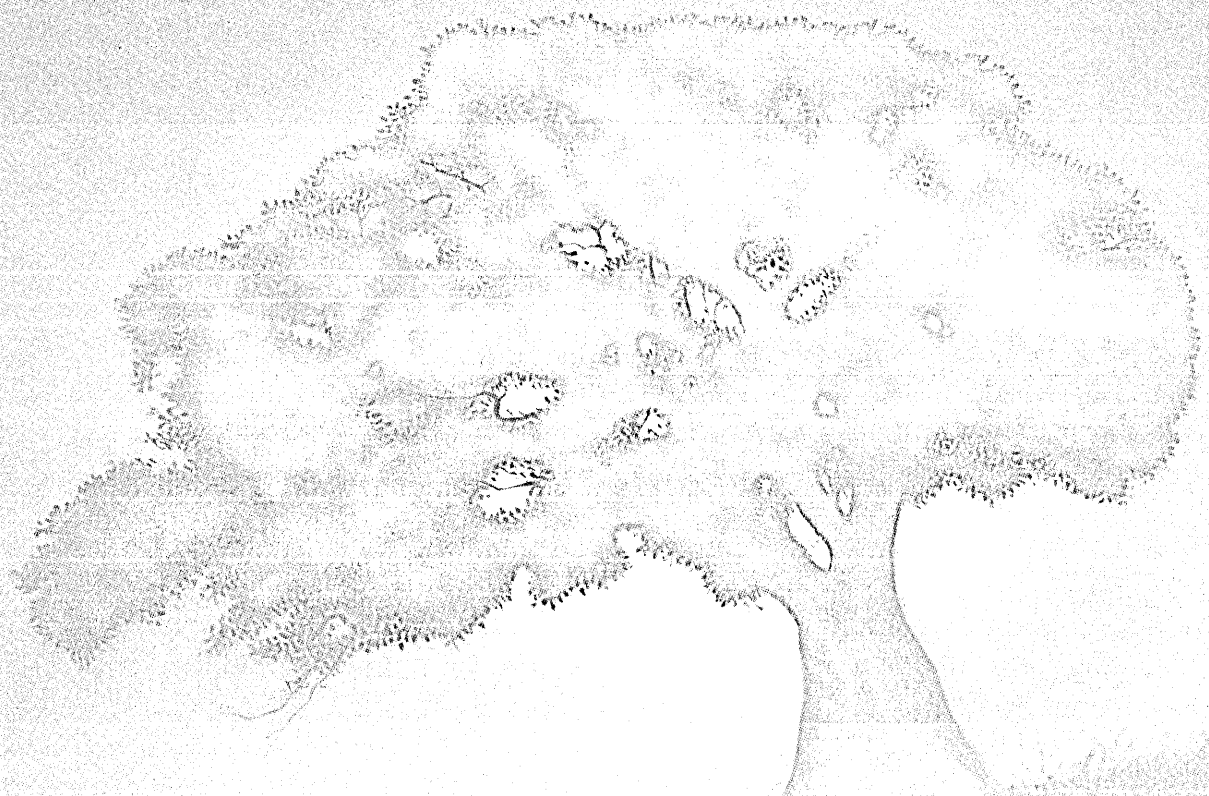

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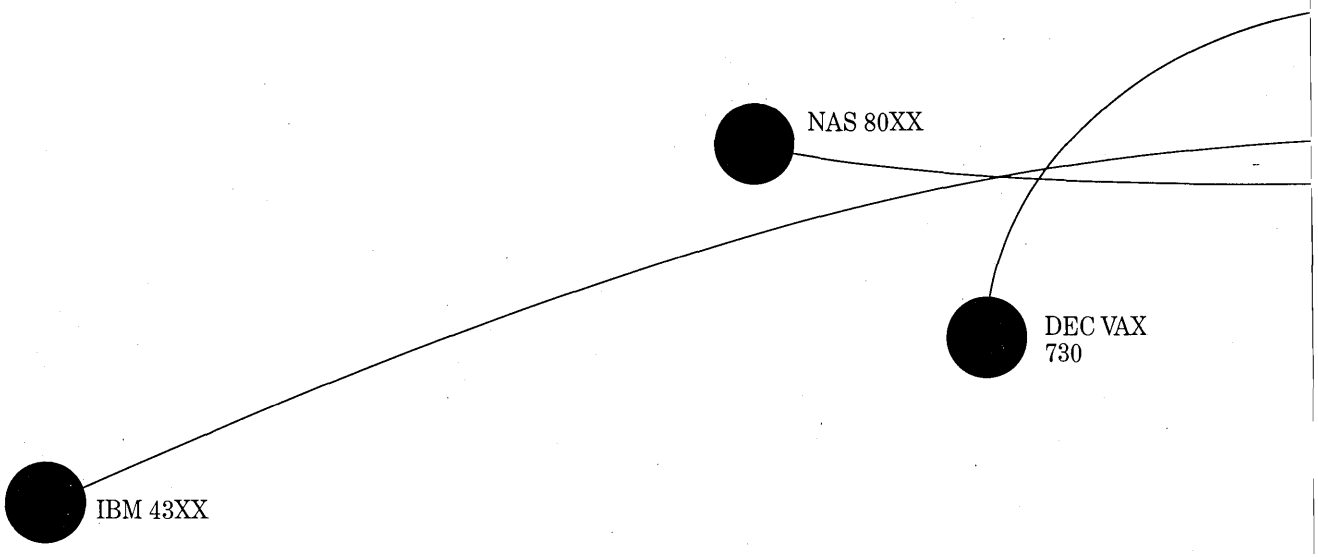

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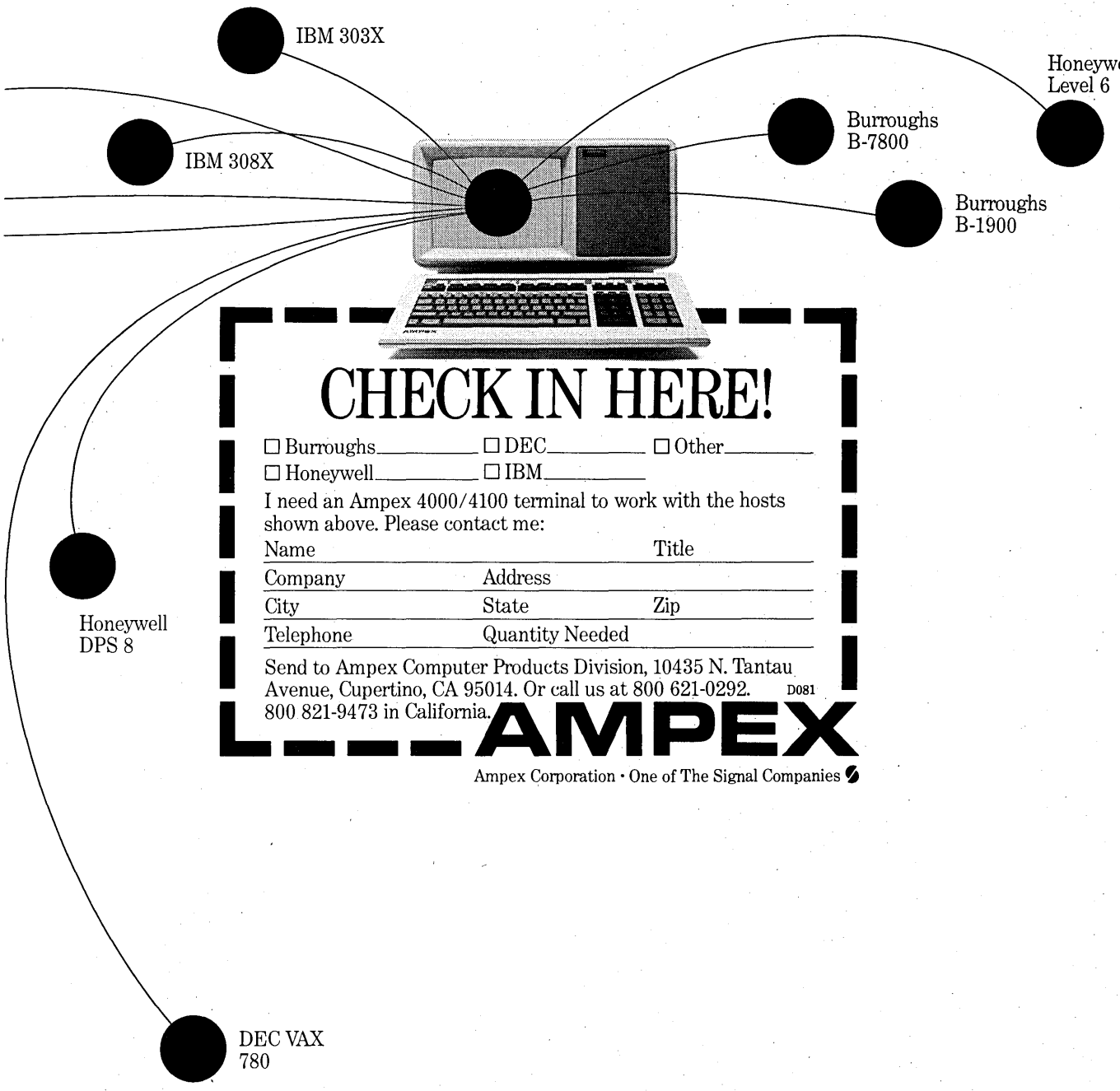

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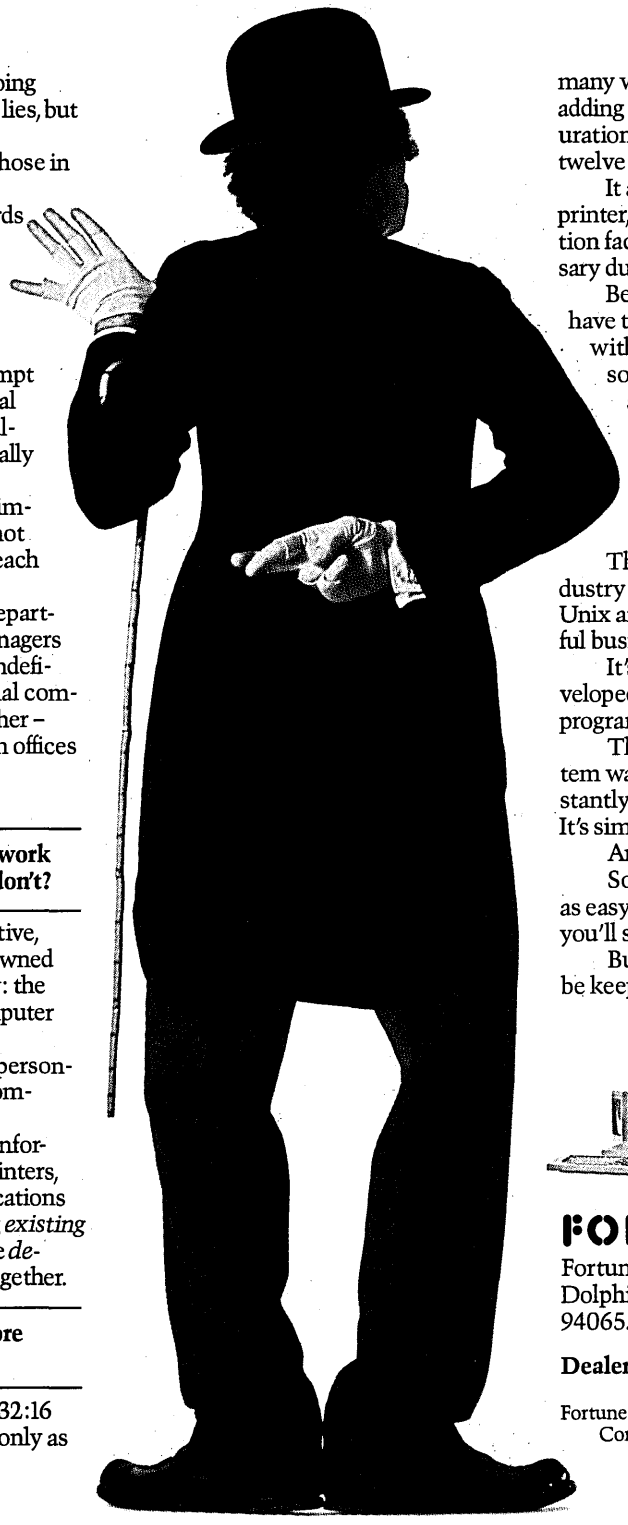

There's a lot of optimistic talk going on about networking today. Not lies, but perhaps wishful thinking.

Talk, in fact, that's making those in the know very nervous.

An alarming lack of standards among manufacturers has stalled the development of software applications packages for networked personal computers.

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CIRCLE 69 ON READER CARD

Micro applications work fine without it, and IBM is understandably indifferent. So what's all the fuss about?

HOW NOT TO WORRY ABOUT UNIX

by David Morris

Dp or MIS managers with professional personal computers have come to depend on desktop access to both personal productivity tools and mainframe databases in the computer room. As good as their computer communications are, however, there is always the nagging hope that a magic potion will make things better. This elixir is Unix. The virtues of AT&T Technologies' operating system are listed across two-page ads in virtually every trade magazine the manager reads.

But does the manager really need Unix? Or, to strike a more realistic chord, what does IBM think about this AT&T cure-all? Though IBM's cards remain close to its corporate chest, it can be said that the company remains essentially unmoved by the lure of Unix. And without IBM's blessing, Unix's claim to be an industry standard is decidedly premature.

Why is this the case? Well, when a mainframe database is queried by a personal computer, it's best that the mainframe and the pc use the same or compatible operating systems. That's the modus operandi of most of the dozen or so micro-to-mainframe software products in the new product pages of the trade magazines. And that's the way IBM will continue to do things. While IBM doesn't miss any bets—it's said to have its own Unix version running under VM—it isn't using Unix on its mainframes, and, even if it decided to, it would take years to get such a system to the market. Similarly, the database management systems that, along with IBM's, dominate the market currently, maintain a cool detachment from Unix. The hard software reality is that a mainframe changeover is many years and many hundreds of millions of dollars away.

So much for a mainframe revolution. The next myth to evaporate is that managers need Unix on their own pcs. Nonsense. The programs they are likely to use as personal productivity tools—word processing and spreadsheet programs, perhaps an integrated package combining these and a couple of others—simply do not need Unix for efficient operation. Likewise, the natural language database interfaces that are appearing know not from Unix. What is more, the capabilities of existing pc operating systems are so sophisticated that they already do everything Unix can do—and often more—in a more user-friendly way.

So if the programs managers use don't need it, and IBM (with billions of dollars tied up in applications programs that depend on its proprietary mainframe operating systems) is not about to change operating horses, why all the fuss about Unix? Well, like any media superstar, Unix hides a dose of talent behind the overdose of hype. There is no doubt that Unix has its satisfied fans and its specific place. Professional programmers love it: they say it was way ahead of its time and that in many ways it remains so. They point out that some of its features are only now being incorporated in newer operating systems.

Unix provides what is known in the software community as an "environment." It furnishes program writers with software tools to help develop highly sophisticated programs. Moreover, Unix is far from having become a creaking antique. The latest available version—System V—is being built into microprocessors under design at Intel, Motorola, National, Zilog, and AT&T Technologies. In the future, these microprocessors will be used in high-end workstations for chores like computer aided design. Additionally, AT&T is both creating improvements for Unix and incorporating changes developed elsewhere. File management additions to Unix developed at the University of California at Berkeley and a real-time version of Unix that is bundled in AT&T's top-of-the-line 3B20D supermini computer, for instance, are no doubt causing DEC and Data General executives some sleepless nights.

POINTS IN UNIX'S FAVOR

There are still other points in Unix's favor. For example, if it were common on microcomputers, minicomputers, and mainframes, only one operating system interface would ever have to be learned. Moreover, in a network of such machines, network server processes would easily be handled by the multitasking Unix, which can run them as background tasks while applications programs run in the foreground. MS/DOS isn't really geared to handle this chore.

While this is all very good, Unix also has a number of drawbacks. Dp and managers usually are not program developers or dedicated hackers, and thus don't give a hoot for ease of software applications design via Unix. They have spent years building up their staffs' ability to construct IBM mainframe operating system-based applications. Nor do managers, who only need to tap database information and write reports, have use for fancy high-end workstations: today's pcs are perfectly fine, thank you. And all the improvements to Unix simply seem to add to the confusion—there are now a bewildering number of Unix versions from AT&T and other vendors, each with its own special features. The resulting menagerie of species makes the possibility of a standard Unix—so that all the Unix flavors can communicate quickly and without intervening bugs—sound about as likely as a fertile mule.

Nevertheless, in the press, Unix has been uncritically hailed as a standard. A standard for what? It is not an 8-bit standard. That honor belongs to CP/M. Nor is it a 16-bit standard. IBM's MS/DOS operating system is the de facto 16-bit standard for single-user microcomputers, and there is not even a close second. Tandy/Radio

UNIX, SCHMOONIX

On the plane going out, I thought about other Unix conferences I had attended over the years.

First there was UUG, the Unix Users Group. UUG wins the trophy for the best user group name of all time. It was always attended by the technical elite. Mainly it was young men in nerdy clothing who went around discussing very intimate details of the shell, the kernel, Bell, and Berkeley. UUG has since become USENIX. I guess USENIX sounds more professional, but UUG was more fun. And now, for managers, marketers, and users, there are UNIFORUM, which is the Unix trade show, and the Unix Market Forum, which attempts to understand the size and type of marketplace out there. The first conference for Unix focusing on the Unix market, it was a three-day seminar in San Francisco that brought together 400 people. It was jointly sponsored by Yates Venture and Boscom. Yates Venture is a market research firm for Unix. Boscom is the Boston Computer Mart, but I never did figure out why they co-sponsored the affair.

The Unix conferences are well attended these days. Maybe the market for Unix is not in operating systems but in conferences. My new marketing motto may become: don't sell Unix, sell shows. Most of the heavy hitters showed up at this one. AT&T and IBM were there. The keynote speaker was Bill Agee, late of Bendix and now a venture capitalist with a Unix company for a protégé. Most of the attendees were fairly conventional looking. Not enough mavericks or long hairs, and too many business suits for my taste. But, I guess that's what happens as operating systems grow up.

Everyone talked about how promising the market is for Unix. (If only the user interfaces and improvements to the shell can be accomplished soon.) AT&T presented a complicated chart that showed what it was going to do—maybe. Jean Yates waved her arms at AT&T and said, "C'mon guys, we need record locking—and soon."

She's right. We've always needed record locking, and a bunch of other improvements from AT&T. When will they do it? Can the world wait? (There's a lot of drama in these Unix sessions, although the plot is beginning to get a bit old.) The world, according to Unix followers, is panting for an elegant, coherent operating system that offers true portability and new networking. And Unix is their candidate.

The real problem for marketing people is that, contrary to what all the techies believe, the users don't care. Just give them an application they can use and afford. Unix, shmoonix. There just aren't that many applications for Unix. The technical sessions (and even at a market forum for Unix there are still technical sessions) underscored the lack of applications software.

There was a lively session on vertical markets, and the presidents of several small-sized software firms talked about the problems related to selling software to CPAs, attorneys, and other vertical market slices. They like Unix because of its portability, but their users don't care about the operating system. (The vendor salesman sitting to my left whispered that his customers still think Unix is several guys without the right parts.)

Wow. Well I thought about that one on my way to lunch. While we ate chicken crepes, Microsoft's Bill Gates spoke. He said that Xenix is Microsoft's third most profitable product. That translates to its having already sold about 30,000 copies, with another 30,000 sales expected.

Bill is good to listen to. He is so intense. Bill's talk, and the presentation by Yates Venture, inspired a whole lot of discussion about the market size for Unix. Will Unix sell in mass quantities—600,000 rather than 100,000? PC IX is selling out—even at 19 diskettes and $900. And publishers can't keep Unix books on the shelves. (Maybe the market for Unix is really in books to buy at the conferences.) The size of the Unix market has important implications for the industry. If it *is* 100,000 it will be like a "boutique." If it is 600,000 it will be a mass-market operation with opportunities for huge profits—and more baby moguls making millions.

Following the afternoon sessions it was—at last—time for cocktails. Everyone was invited to a cocktail party held in the center of the Hyatt. I wanted to get a drink and ask if other people had customers who were confusing Unix with eunuchs. (Can Unix ever be a mass-market product with that name? Maybe middle America just won't buy it.) Nobody knew, because the first four people I met were all brand-new at their companies. Everybody had new jobs. All these little and medium-sized companies expect Unix to be a growth industry and so are staffing up: what better way to keep a new employee busy than to send her off to a conference her first week on the job? They had no idea who their customers would be. So, on to other things. Bill Agee and Mary Cunningham were the celebs, but I was not in a groupie mood. AT&T people were everywhere, but as they rarely talk without waiting for reviews and approvals and clearances, I chatted with guys from Auragen, Sun, Digital Research, Plexus, and Excelen.

The next day's sessions were fun. There was a panel on the retail market for Unix. (Is there any? Nobody seems to know.) And a panel on the scientific market—engineering workstations and all that. Throughout the day, I kept thinking about the mythology and elitism associated with Unix: is Unix popular now because it began as a tool of the technically privileged; will its commercial popularity be its undoing? Or, maybe it really is an operating system that provides solutions to many of the problems created by all the other systems out there.

Enough of the heavy thinking—it finally was time for the next night's cocktail parties. I got a drink and wondered why the venture capitalists are always the best-looking people at these things. (They are as greedy as we suspect—they must have bargained their souls for both money *and* looks. It is the only logical conclusion.) I overheard the IBM man say that IBM got into this because the dp decision-makers (buyers) of the future all used Unix in college. That's so silly and smart it is probably true.

That was it. I went out to dinner with a group of techies. But by this time I was over-amped on Unix and could not talk or think about anything anymore.

Unix reminds me of a soap opera: will AT&T change Unix for the commercial market in time? Will IBM really support Unix? Will applications be written? And, maybe like a soap opera, will it prove not to be worth all the fuss?

I don't know. But I had a good time. Unix conferences are fun.

—Nikky Reno

Shack has collapsed as a contender. Apple has apparently targeted the manager who can ignore rules emanating from the MIS department, who will use the machine for independent work in the office or at home: Apple's new Macintosh is not even remotely compatible with the IBM PC.

With some exceptions, Unix is not being used for applications programs on mainframes—it's really designed for minicomputers, superminicomputers, or multiuser microcomputers. Its presence in personal computers is virtually limited to Microsoft's Xenix. Even its devotees admit that there are only about 50,000 Unix installations nationwide, most on microcomputers, and half of those are Xenix.

In short, the Unix market remains to be defined. Its rising popularity and potential for portability may indeed make it a standard for high-end 32-bit workstations, multiple-user personal computers, minis, and superminis. But even here, there is doubt.

Unix may not even make it as a standard for multiple-user personal computers—the technology has passed such machines by. Processors are so cheap and network technology has advanced so rapidly that there is little reason to tie multiple

IBM has gone the Unix route for reasons as much political as technical.

users to one Unix-based personal computer running what amounts to a timesharing operating system. Users with personal experience using timesharing-based systems know that it is something to avoid if possible—especially when many users try to use files at the same time: the system just bogs down. Unix-based designs are no exception. Multitasking on a single-user system, a conventional local network, or a local network "in a box" (wherein multiple users share resources via a bus and a central resource manager) is far more logical.

In other words, Unix can't overcome the simple reality that a smart, dedicated processor for each user is better than a slow, data-error-prone dumb terminal. High-speed local networks with dedicated, single-user processors have a speed and low error-rate advantage. Dumb or even half-smart terminals hooked to a multi-user microcomputer often use simple RS232 or RS422 links. These get noisy at the high data rates needed to handle multiple users with minimum delay. Local networks can operate an order of magnitude faster and easily incorporate error detection and correction.

ON THE OTHER HAND

Of course, the picture could change. Unix could show up on more mainframes, but it would take years before the critical mass of necessary applications programs are designed, debugged, sold, installed, and understood.

As far as IBM is concerned, it will apparently be a long time before Unix becomes a major part of its high-end microcomputer market for the professional dp manager. The company's unannounced latest and greatest—an Intel 80286-based microcomputer—will implement a subset of the mainframe VM/CMS operating system for the dp user. The Unix-like Xenix operating system, however, is likely to appear on a microcomputer geared to non-dpers, or at least nonmainframe-applications-developing dpers.

Unix is not a particularly great idea on the IBM Personal Computer either, despite the number of times it's been tried. Coherent, Idris, Xenix, Venix, and other Unix-like brand names for the PC provide ample evidence. But what can actually be done with any of these—with IBM's Unix offering in particular? The answer: not much. Designed by Interactive systems of Santa Monica, Calif., IBM Unix for the PC is multitasking, but its multi-user capability can't be used. The reasons for this surprising limitation include IBM/AT&T licensing costs and complications, the lack of gear to hook other users to the PC, the horrible performance that would result because of the limitations of the PC/8088 combination for a single-user (let alone multi-user) Unix, and the lack of applications software.

Don't expect the lack of software to change very quickly. Third-party software designers see no great urgency to write applications for this "noble experiment" of IBM's because IBM has gone the Unix route for reasons as much political as technical. IBM senses that, because of the Unix software cult, the computer community wants it, and wants to be compatible with it. IBM has never argued with marketing reality, and, in complying with market desires, it gains Unix experience, should Unix actually begin to fulfill its promise.

Perhaps the biggest problem in using Unix on an IBM PC is memory. Unix as an operating system environment has lots of utilities—built-in, dedicated programs to do word processing, editing, and other chores for its users. But, unless Unix is the only operating system on a PC, there is just not enough memory or disk space to use these services efficiently—some must be left out.

The IBM PC has a 10-megabyte hard disk. A hard disk is a necessity for Unix unless the user wants to make a hobby of inserting and removing floppies trying to run the AT&T OS. Unix can take up to 8 megabytes on a disk, but the PC IX is said to get by with just 5. So you can expect to dedicate half your hard disk in order to run the IBM version of Unix. That's okay if all you want to do is run the OS. But, if you like VisiOn, or one of the integrated packages that runs on MS/DOS, or a natural language interface to a database, or any of a host of other end-user application products, you are bound to be disappointed, since you won't have room for much more than one.

Matters are made even worse by the fact that the 8088 can address less than a megabyte of random access memory on the PC—far less than what more advanced processors can handle. So swapping information in and out of the PC is further retarded, and there is even less room for multiple programs than there might be with a microprocessor that addresses more memory.

BIGGER DISKS NO HELP

Of course, one can always buy larger disks. But larger disks mean larger expenses and larger problems. For starters, you will need disk drives, special software that allows application programs or operating systems to work with a particular hard disk. Worse, the cost of large disks and multiple terminals for a multi-user system starts approaching the cost of competitive, dedicated multi-user systems.

Moreover, although some networks can do part of the job, there are now few ways to connect PC Unix to Unix on minicomputers or mainframes. You could, therefore, be stuck with a standalone operating system for a standalone PC—this from Unix, the great communicator.

So much for the memory. Now consider the question of speed. Even in its single-user mode, PC IX is slow to execute certain input/output-bound programs. You can forget about speed when there are, for example, a lot of disk accesses (known as reads and writes). This doesn't happen all the time, but often enough you will wait longer than you would with MS/DOS, and again, just for the privilege of saying you have Unix. Worse, PC IX doesn't run the well-known PC applications programs like Lotus 1-2-3, WordStar, or VisiCalc.

Now Unix on both ends of a micro-to-mainframe link would be a coup for AT&T and would give it an entry into the Fortune 500 IBM shops. This, however, is bound not to happen.

For those who will listen, IBM has already indicated the road it will travel. It is porting its proprietary operating system, VMS, onto the XT 370 microcomputer, the machine it has designed specifically for micro-to-mainframe links. So expect a wide variety of link software to run on VMS on both ends of the IBM micro and mainframe link. This software will be sold by IBM through its existing marketing structure and will keep the IBM shops virtually Unix-free. Other vendors like Cullinet that are developing micro-to-mainframe links are also ignoring Unix. Informatics General, in Woodland Hills, Calif., has joined together with VisiCorp in San Jose to come up with Informatics' Answer/DB, a program for accessing an IBM database, which will interact with Visi's PC/DOS-based VisiAnswer for the IBM PC: no Unix here.

Similar capabilities from University Computing of Dallas, Context Management Systems of Torrance, Calif., and McCormack and Dodge of Needham, Mass., in partnership with Lotus Development Corp. of Cambridge, Mass., also ignore Unix. Finally, the just announced micro-to-mainframe link from Software AG Systems Inc. of Reston, Va., depends on MS/DOS.

So the products that can be expected to allow the first micro-to-mainframe links will be based on MS/DOS, not Unix. This is not to say that Unix's strengths will never be realized. Its file handling capabilities and software development tools may well prove indispensable in certain markets. But it will be a while before Unix

Big Blue is moving toward making portions of its VM/CMS operating system the micro-to-mainframe link's common operating system.

makes its appearance on IBM PCs for links. And then, the possibility is that IBM will opt for Xenix, Microsoft's Unix look-alike.

Microsoft has been upgrading MS/DOS to look more and more like Xenix, its command and file structures, for example. In addition, IBM already offers Xenix in certain environments; there is an installed base, it is more user friendly than Unix, its file system is better, and it is popular enough to be the basis for a micro-to-mainframe link for the non-dp professional manager.

Certain of IBM's advanced microcomputers will be based on advanced microprocessors like Intel's 80286. Intel is currently working with AT&T Technologies to port Unix System V on these chips, and future microcomputers that use them will handle that operating system readily.

Technologists can easily show that the 8088 microprocessor is just not up to the Unix-handling job. It cannot, for example, handle the memory management that Unix needs to efficiently serve multiple users. And it cannot efficiently swap large blocks of code and data between RAM and the hard disk to well serve the single user. So it does the job in small chunks and takes its sweet time.

ADVANCED CHIPS NEEDED

More advanced chips, like the Intel 80286, Motorola 68000, or National 16032 are needed. For example, Sritek Inc. of Cleveland, offers the Berkeley 4.2BSD version of Unix on a National 16032—all neatly packaged as a PC add-on board. Extra chips to offload the 8088 from its memory management and input/output chores are another helpful approach and several vendors have taken this tack with their microcomputers.

Successful porting of System V or Xenix to these advanced processors, if it happens, and if it is IBM-backed, and if third-party software vendors perceive it as a real phenomenon—not just a demonstration—will result in the appearance of a wealth of applications programs.

It is these upcoming PCs that will allow Unix to make its mark as an operating system linking all parts of a company. The corporation of the future will tie together its executive suites (personal computers), its engineering labs (professional computers and minicomputers), its factory/production areas (minicomputers), and its data processing areas (mainframes). Unix, because it is so portable, can provide a natural link for all machines in the corporate environment.

No one advocates using Unix as the basis for payroll or inventory control, for example. It is just not set up for those tasks. But it could be the basis for a manager in an office calling up payroll summary information. Or it could accommodate an engineer calling inventory data from his professional computer or division mini.

This kind of corporate communications network is still far in the future. It will require a loose hand with the checkbook and a new way of looking at the computer environment.

Make no mistake, the computer network communications of the future may very well be Unix-based—not only because of Unix's advantages, but because building it on IBM mainframe operating systems or subsets can present problems. Mainframe operating systems, as traditionally written, are notoriously difficult to use for the nonspecialist. It just cannot be expected that the casual manager or engineer-user will be able to deal with them. So a Unix with a user-friendly shell around it will make an attractive package. Such a shell could be designed by many vendors. Will the real IBM micro OS stand up?

Of course, nowhere is it written that mainframe operating systems must be difficult to use. In fact, those dp managers who devotedly believe in Unix and hold faith that IBM will yet opt for their favorite micro-to-mainframe connection will take little comfort in what IBM is up to with one of its mainframe operating systems. In several well-orchestrated steps, Big Blue is moving toward making portions of its VM/CMS operating system the micro-to-mainframe link's common operating system.

For starters, it has introduced this formerly only-for-mainframes OS on an IBM personal computer, the much-heralded (but as yet undelivered) PC XT 370. This machine will offer micro-to-mainframe hookup advantages because its operating system already exists on mainframes—half the OS software battle is over before it starts. Unix, without the crucial mainframe connection, would be left in the dust.

The starry-eyed dp manager still convinced that Unix will sweep the world should also note that several manufacturers of micro-to-mainframe links are porting their software to work under the VM/CMS operating system. This means that once data are downline-loaded from the mainframe to the XT 370, they can be directly transferred from the VM operating system to the application running under the PC/DOS operating system. The XT 370, by design, can look for and read mainframe directories and access files, downloading them to the PC/DOS operating system. The direct load to the applications is a must-do, value-added step by the firms who say they will make micro-to-mainframe links.

Dp managers needn't worry about Unix—not yet. Today's projected micro-to-mainframe links don't use it, personal computers don't need it, and IBM has other plans. ◉

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David Morris is a New York-based writer on technical subjects.

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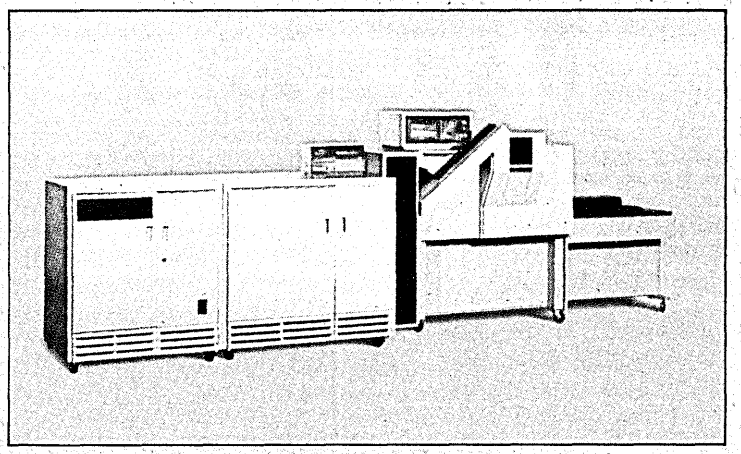

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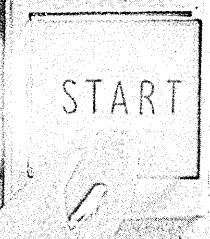

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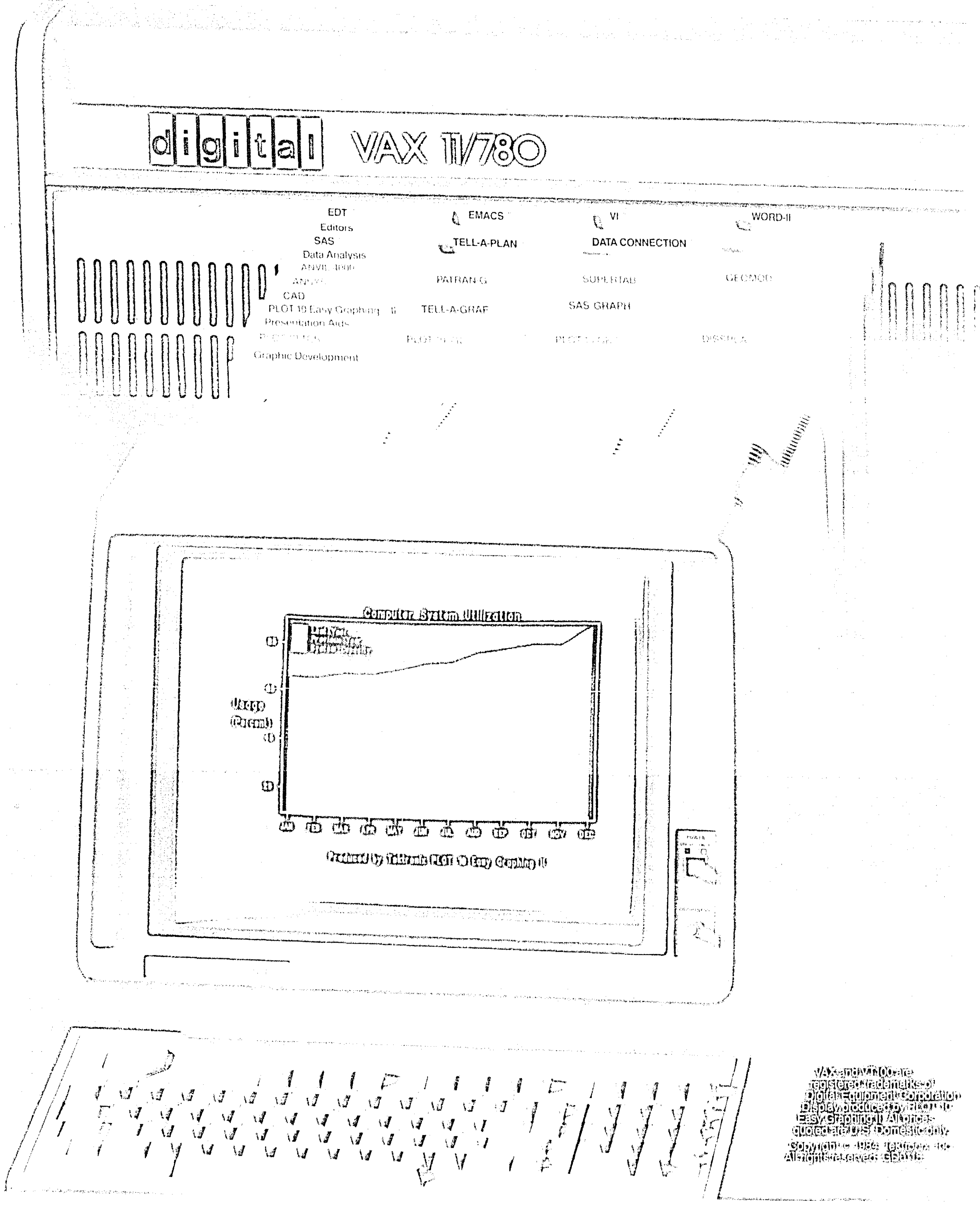

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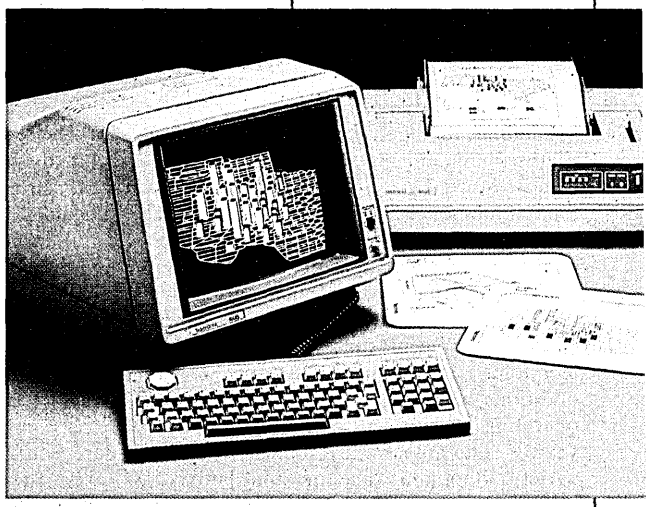

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CIRCLE 39 ON READER CARD

Unix is more than an operating system, and less than a crusade. What's really going on here?

UNIX—HOW IMPORTANT IS IT?

by Dennis F. Barlow and Norman S. Zimbel

Unix has made its mark as a popular operating system for medium-sized, multi-user, timesharing computing environments. Now it is touted by some as the operating system of choice to run the VLSI microcomputers of the future. The Unix-based systems market has been growing at a prodigious 40% per year. But the question that still remains is whether the current trend toward Unix will continue to build momentum or whether it will merely be one of the boom-and-bust phenomena so common in the history of computer systems. Some very big investments are riding on the answer.

In a recent survey by a computer technology forecasting group, one of the questions was, "What personal computer operating system will be popular in five years?" The answers are indicative of the variety of opinions that surround Unix.

- Unix will take 20% to 30% of the market.
- Unix, MS/DOS, and CP/M will merge into a common standard.
- A completely new operating system will appear.
- The user interface (e.g., windows) will make the operating system transparent.

Contradictory answers also greeted the question, "What vendors (all processor classes) will adopt Unix in five years?"

- Most vendors will, but as an option second to each vendor's own proprietary operating system.
- Any computer vendor interested in survival will. Unix, however, will never be a "predominant" operating system.
- All Japanese vendors will.
- IBM will for small businesses.

These widely divergent perceptions provide an appropriate backdrop for an overview of Unix as it stands today and of its prospects.

In 1970, Bell Labs introduced Unix, written in assembly language, as a software research tool on an 8K memory DEC PDP-7. In 1972, Bell recoded Unix for a PDP-11/45 using C, a new compiler developed at the labs. Widespread academic interest led Western Electric in 1973 to agree to distribute it to nonprofit and government organizations for a nominal fee. By 1975, the academic community was a significant user of Unix Version 5 and in 1976, an improved Version 6 was released and offered to commercial users (many are still operating in PDP-11s today). This version included many enhancements resulting from university feedback and experience.

By 1979, when Version 7 was announced, hundreds of person-years of effort had gone into its design and into related software utilities. Equally important, the universities had turned out a significant number of graduates familiar with Unix. From 1981 through 1983, System III and System V added more commercialized packaging, lower end-user license fees, improved portability, communications interfaces, and better performance.

Now, AT&T Information Systems intends its latest version, System V, Release 2, as a competitive weapon and the standard Unix operating system of the future.

In short, the development of Unix in its prehistory (Fig. 1) was a "bottom-up" evolution that took place mainly on DEC equipment. In many ways, what evolved was a collection of program routines from many sources that can be utilized in a common timesharing facility—with particular emphasis on the needs of program developers. Its open-ended and elegantly simple structure has encouraged the development of many different versions of the basic operating system (Fig. 2).

In its formative years, and even today, the Bell System product lacked the full set of features required of a robust operating system designed to cover a broad range of applications and operational environments. Instead, it is structured, with programming tools, to facilitate customization in order to fit the application. Along with the high cost of a commercial license, this has spurred development of a number of Unix-like systems by universities and software firms, most significantly at the University of Wollongong in Australia (the first 32-bit system) and at the University of California, Berkeley. The Berkeley Software Distribution (BSD) version of Unix has become noted for the advantage its added functions and features give it over AT&T's Unix.

In August 1980, Microsoft announced the first commercially supported version for 16-bit microprocessors, the well-known Xenix system. This system was developed in close coordination with Western Electric, the objective being an industry standard for 16-bit systems.

UNIX OFFERED IN C CODE

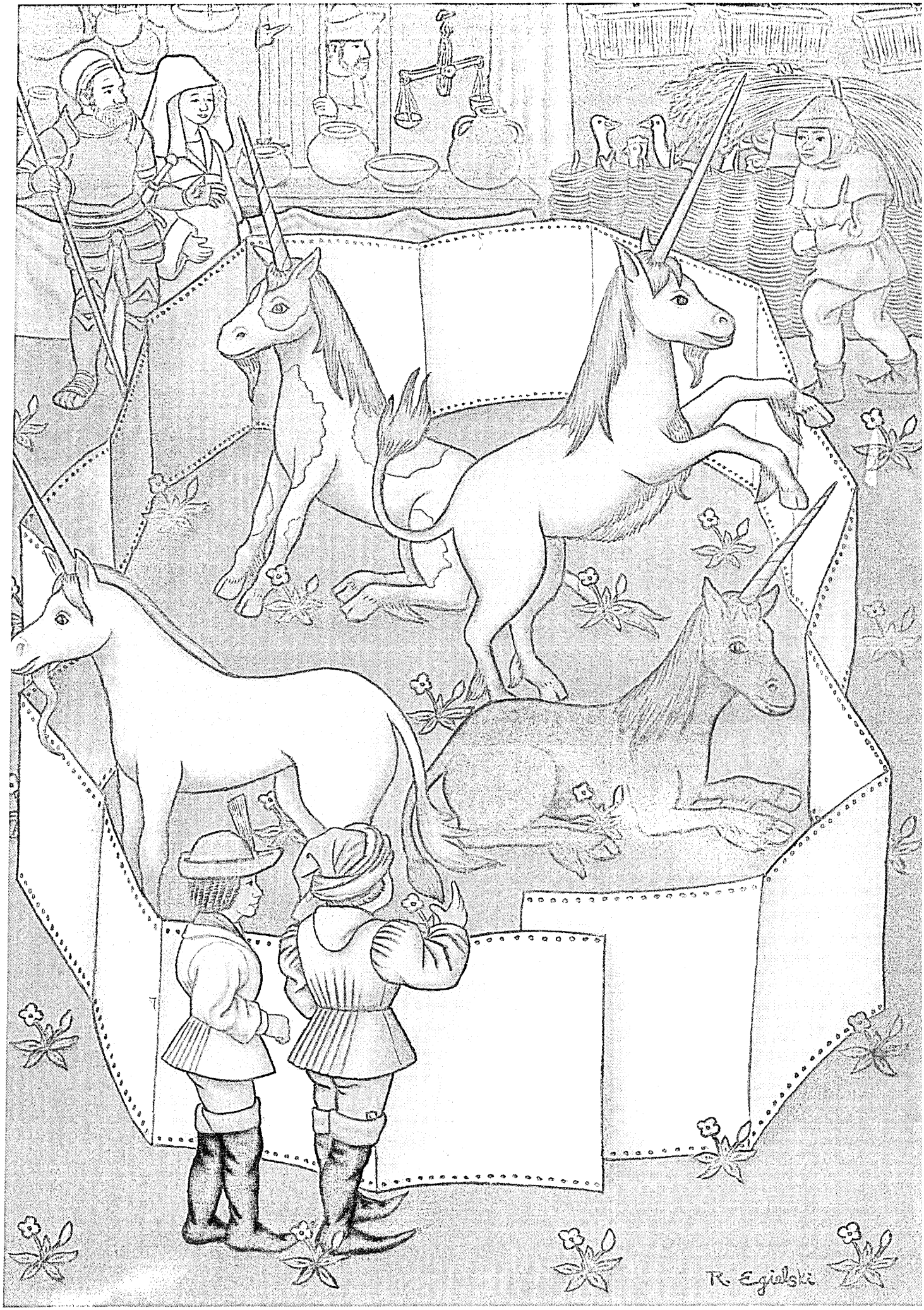
At the time of the Xenix development, the Bell license version offered the Unix operating system in C code and a compiler for PDP, PDP-11, and VAX systems. An important feature of the Xenix product was the inclusion of a C compiler that produced Intel 8086 code. Compilers and device dependent routines for other well-known microprocessors have followed. Other software vendors, value-added resellers, and microprocessor manufacturers have since introduced look-alikes that essentially differ at the shell level, a development made easy because Unix welcomes added user interface functions.

Since 1981, many (mostly small) companies have joined the ranks of Unix vendors to exploit its potential in business and office system markets, so far emphasizing the low-cost systems market. Also contributing to the recent interest in commercial markets were AT&T's recent announcements of its Unix-based minicomputer product line and its agreement with semiconductor manufacturers Intel, Motorola, National Semiconductor, and Zilog to support Version 5 on their 16- and 32-bit microprocessors.

Unix appears to have a competitive advantage over proprietary and other "standard" operating systems for 16- and 32-bit microprocessor systems: it fills this market's need for a customizable, portable, multi-user operating system.

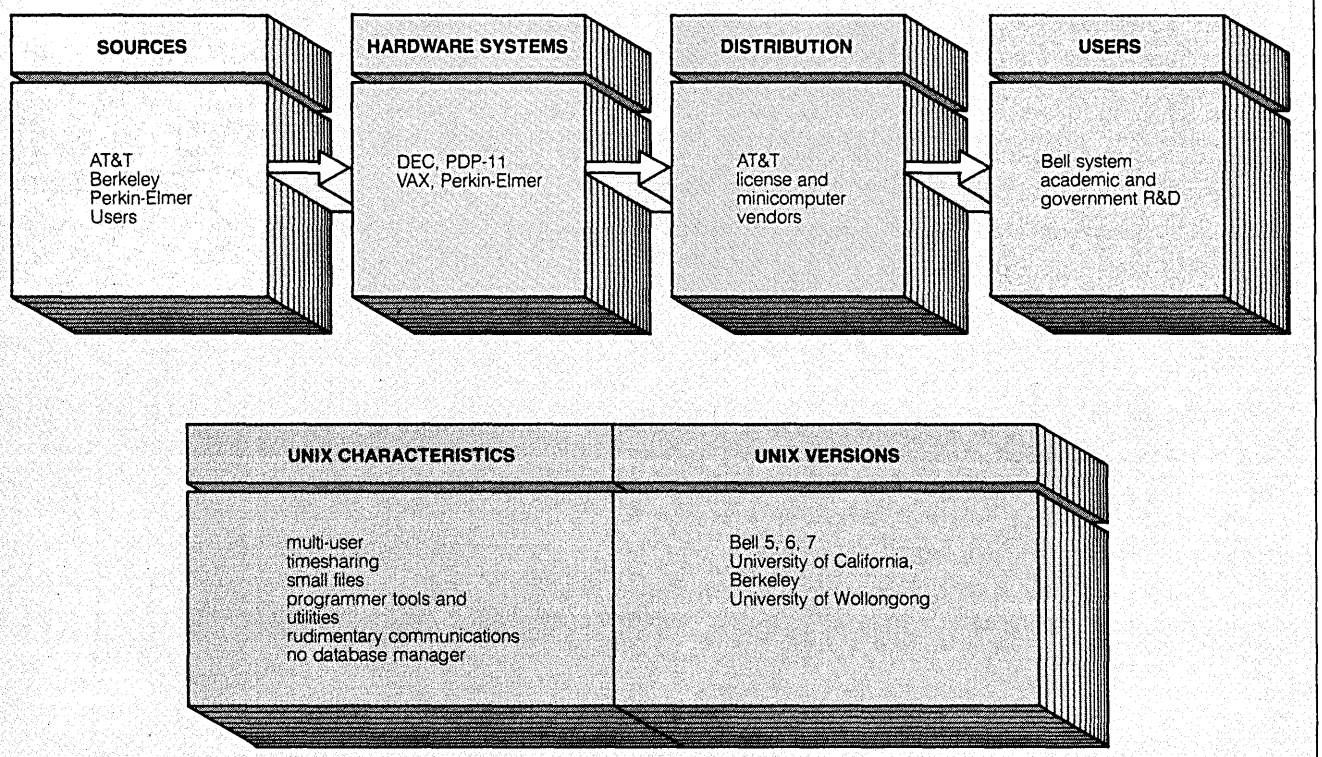
As Unix has evolved and migrated to new applications and hardware environments, limitations in its original design have led to numerous enhancements by AT&T and other suppliers. Initially, one Unix limitation was that it was designed for the 64KB address space of the DEC PDP-11. Unix had difficulty with time-critical system response, such as for process control applications or transaction processing, al-

ILLUSTRATION BY RICHARD EGIELSKI


R. Egielski

Despite its virtues, AT&T Unix was viewed in the academic community as being badly in need of enhancements.

FIG. 1
PREHISTORY (1970s)



though advocates have always maintained Unix is a good system in which to develop real-time applications to be run under another executive. The user interface, with its terse, cryptic style, also remains oriented toward programmers rather than end users.

In predivestiture versions of Unix, there was little architectural change. But Version 6 offered a cleaner implementation than Version 5, with many bug fixes, and with Version 7 Bell introduced larger file sizes (up to 1,000MB), a set of standardized I/O routines, and the "Bourne shell."

With the Bourne shell as the primary user interface, Unix refined its elegant structure (see Fig. 3). The kernel of the operating system supports management of processes, memory, and processor cycles. Unix handles all file input and output in a consistent fashion, whether the data are transferred to logical or physical files, devices, or between processes through a "pipe."

Additional features are a directory-oriented hierarchical file system, redirected I/O, a semistandard systems programming language—C—and a user-interface (the shell) that can create and manage processes. The shell acts like an application program and may be modified by the user or discarded in favor of a different user interface.

As Fred Brooks noted in *The Mythical Man-Month* (Addison-Wesley, 1974), "Conceptual integrity is the most important consideration in system design." Conceptual integrity is something Unix has in abundance.

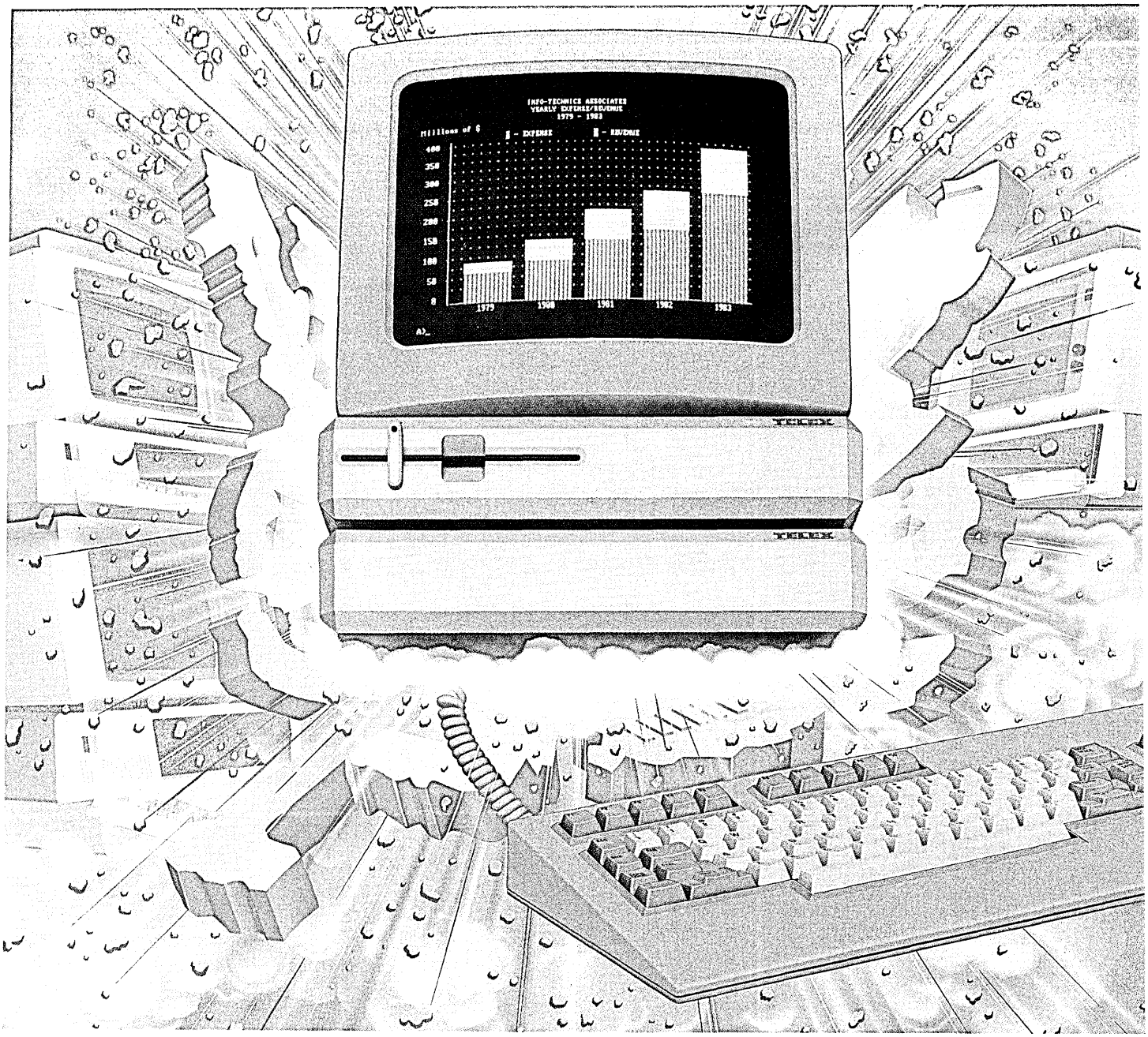
Despite these virtues, AT&T Unix was viewed in the academic community as being badly in need of enhancements. The Berkeley Unix development, now up to Release 4.2 for the VAX implementation, offers support for VAX virtual memory architecture, with superior program editors, performance enhancements such as doubling the file blocking size to 1,024 bytes, a new C shell with programming language-like features, and hardware (especially terminal) configuration utilities. Today, the Berkeley versions tend to be more functional than, but incompatible with, their AT&T counterparts.

VERSION 7 INSPIRED IMITATORS

Unix Version 7 and BSD 4.2 inspired many imitations. Software entrepreneurs saw the high commercial license fees Bell was charging and the lack of product support from both Bell and Berkeley as opportunities and moved quickly to fill the void.

AT&T releases of Unix, namely System III and System V, Releases 1 and 2, have developed it into a supportable software product line and established AT&T as a force for standardization. System III included the Programmer's Workbench, a set of utilities for facilitating and managing large software development projects, and an aggressive price schedule that offered end-user object code licenses for as little as $100. Source code licenses remained at $43,000 each.

System III has had a leveling effect on the Unix marketplace. Most of the independent commercial suppliers of Unix-like systems, such as Microsoft with its Xenix operating system, have moved to become System III-compatible, although retaining proprietary application-level code and



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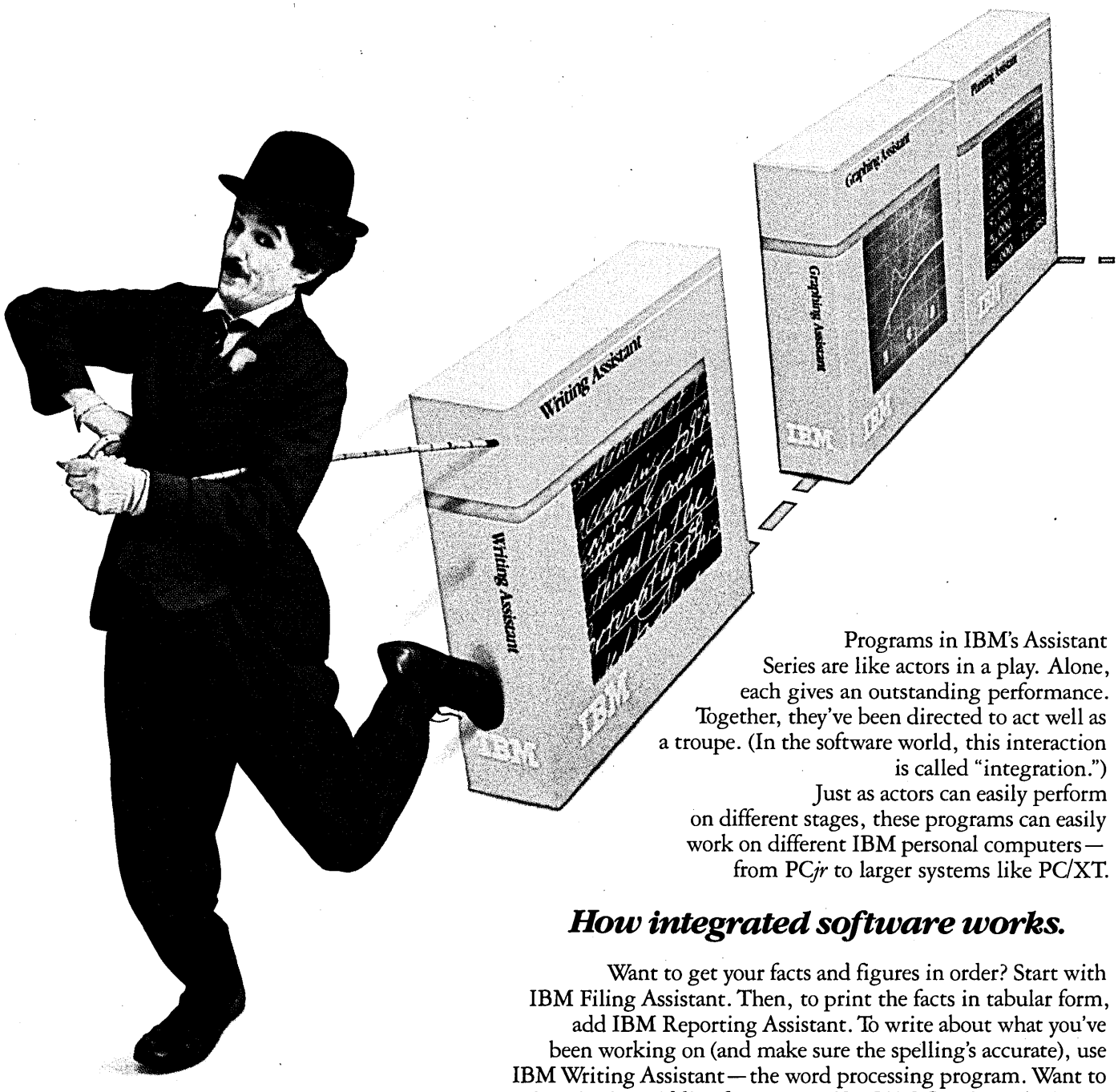

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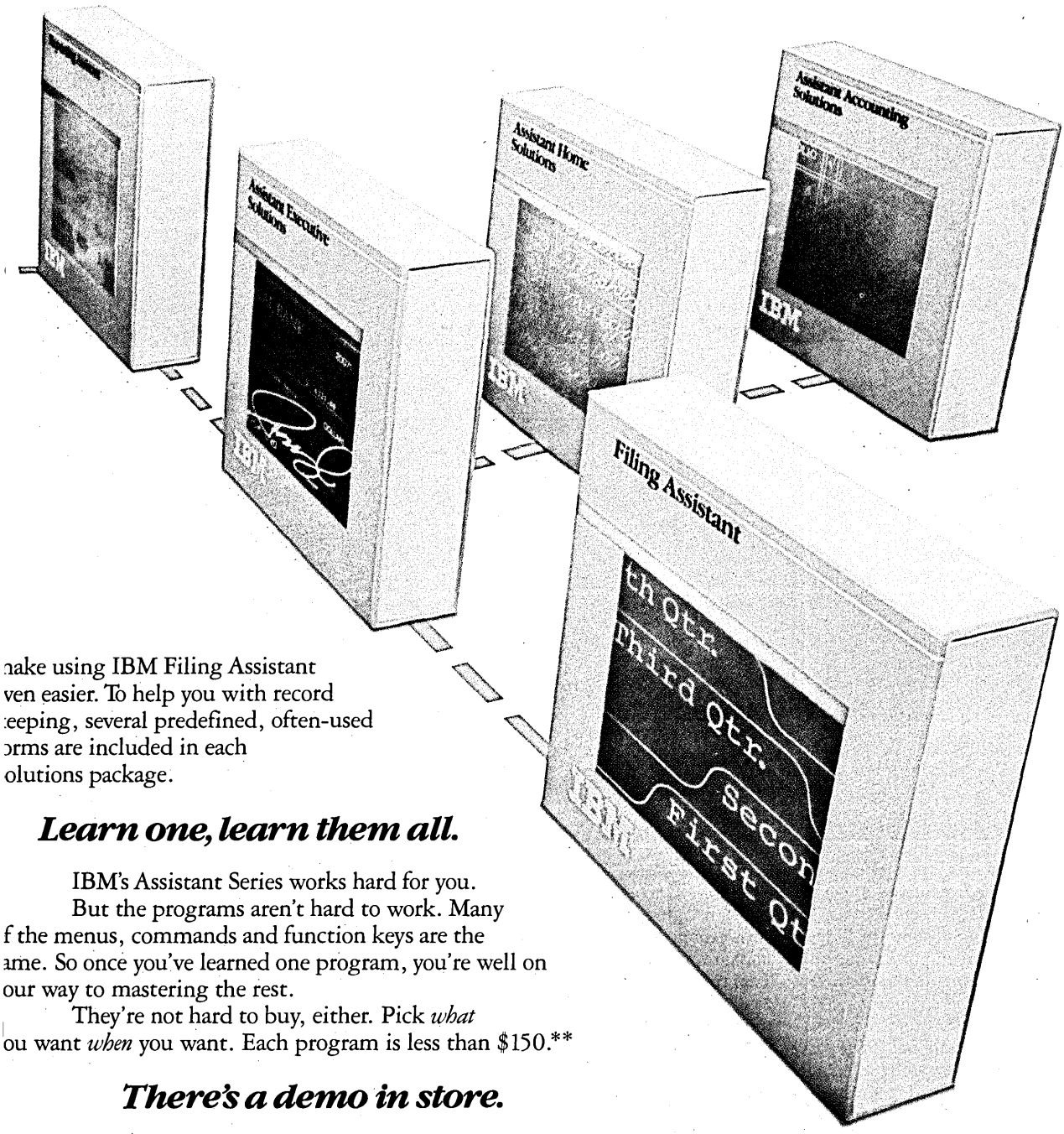

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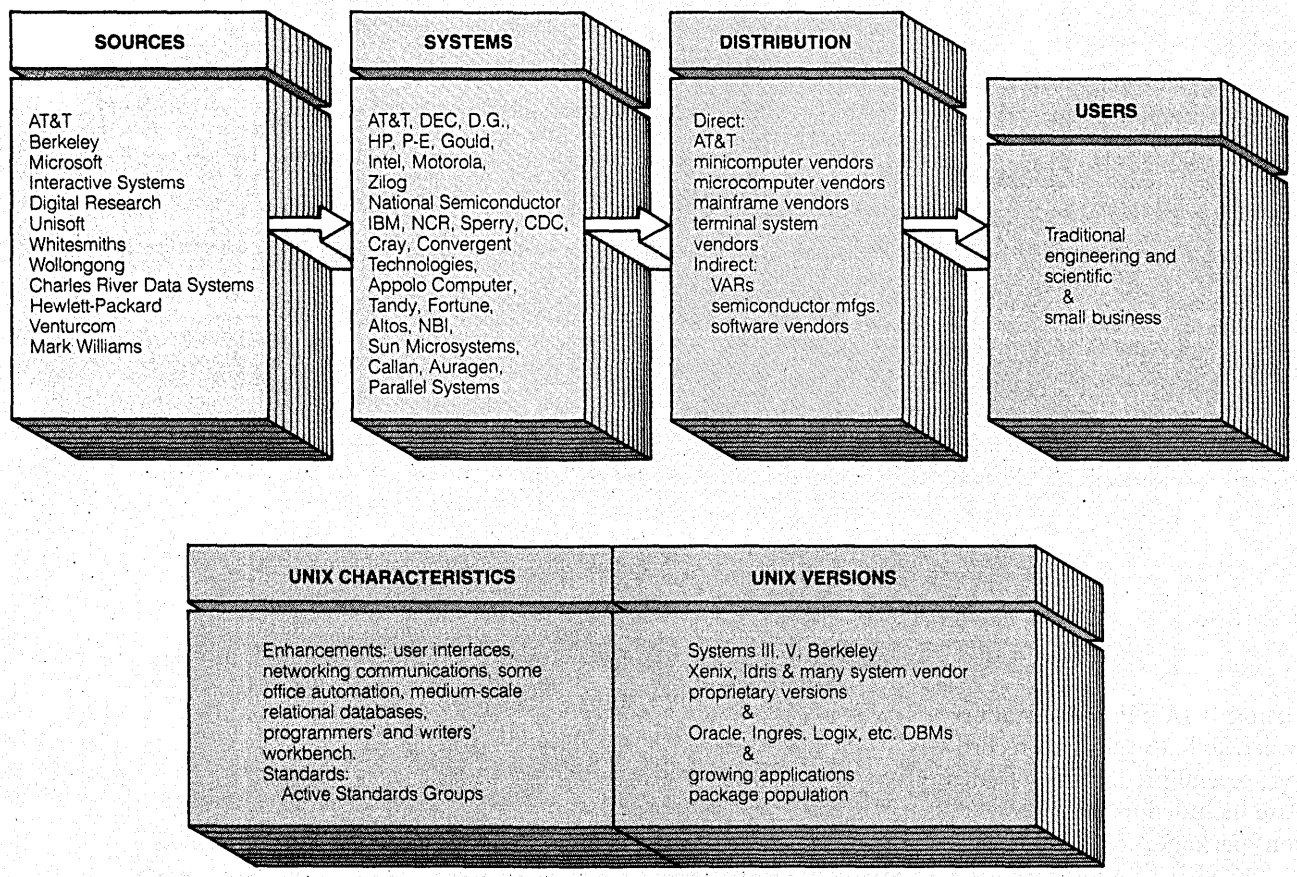
For larger scale processors bigger than superminicomputers, the outlook is cloudy at best.

FIG. 2

PRESENT (1980-1984)



Berkeley enhancements. IBM's Personal Computer Interactive Executive (PC IX), is a single-user System III subset.

System V brought some technical improvements, but more important was the announcement of training and support for source code licenses. This included several major microprocessor product families from Motorola, Intel, National, Semiconductor, and Zilog; and new unbundled applications suites for publishing (Writer's Workbench), statistical applications (S), training (Instructional Workbench), and software development (Documentation Workbench). Because of the newness of System V, its market acceptance is hard to measure. System III implementations, however, are only now reaching customers, and several vendors have indicated they will stay with System III for reasons of product stability. An additional concern is that AT&T may turn Unix into a proprietary system for the 3B computer systems.

In addition to AT&T's efforts to establish the Unix standard, the principal industry-oriented Unix users' organization, /usr/group, has just completed its draft standard of the Unix kernel. The standard, if approved by members, will offer independent vendors of Unix-like systems some short-term stability for their products. Both IBM and AT&T are following the /usr/group effort, but in the long term, we feel these two will dictate their own separate standards and it will be the role of standards groups to bridge the two vendors' approaches and lead the way with enhancements.

/usr/group also has begun to address C language standardization, but this effort lags that for the operating system kernel. This is likely to be an important standard because a standard C is the first line of defense against nontransportable applications. Besides the purely Unix set of vendors, companies such as Microsoft, Digital Research, VisiCorp, and MicroPro use C in their product implementations, opening up the prospect that their product lines might migrate to some future incarnation of Unix.

What is in store for System VI, VII, VIII, etc.? Although we can't say how fast things will happen, likely extensions to AT&T Unix include virtual memory support (finally!), multiprocessor support, networked distributed processing, and a relational DBMS. AT&T will surely move to make Unix applications more generally available. This is indicated by its recent marketing hookup with Digital Research to build an application library.

UNIX MUST ENTER NEW AREAS

What evolutionary steps should Unix be taking, particularly for the real-world, run-time environment? Clearly, Unix has been pushed beyond software program development

into application environments. Indeed if Unix is to become the standard its partisans hope for, it must meet new application requirements. Prospective application areas include office and factory automation, business data processing, and personal computing.

Much work is needed to incorporate compatible standards into Unix: for graphics presentation, for window management, for the user interface communications, and for data interchange, to name a few.

What is the likely impact of Unix on the information industry? Since it is a multi-user, timeshared system with good program development resources (including the Programmer's Workbench and Writer's Workbench) and proven portability, Unix has attracted a plethora of established and new system startups for distributed processing systems (Convergent Technologies), multi-user personal computers (Altos), and multiprocessor mainframes (Parallel Computer and Sequoia). For product developers in startup companies the availability of an operating system that is proven, easy to customize, and standard to the industry is vital in today's short lifecycle environment.

Its traditional markets—scientific, engineering, and professional applications—account for most of AT&T's 200 Unix source licenses on 150,000 computers of 70 types currently in use. System vendors offering Unix or Unix-like software for this market sector include:

- DEC, the vendor of the original system for Bell's Unix software. DEC offers Unix Version 7 (called V7M-11 PLUS) on the PDP-11 and the Berkeley Unix on its VAX (called Ultrix) product lines as well as on its Professional 325/350 personal computer. DEC is incorporating Unix System V features into its VMS operating system for VAX. The recently announced AT&T minicomputer product line now competes with DEC VAX products.
- IBM offers PC IX software (based on Unix Version 7) on the Series 1, a single-user version of System III on the PC XT, and Xenix on System 9000. For its mainframe products, IBM has not yet revealed its strategy concerning Unix, but is rumored to have System III running under VM.
- Perkin-Elmer's Computer Division has continued (most recently with its Everyware system) to develop its Unix environment as a key element of its overall product line.
- Hewlett-Packard offers Unix on its desktop HP 9000 products for 3-D graphics and engineering analysis. Its stated intention is to support Unix on all systems.
- Apollo Computer, selling primarily to technical markets, features an operating system for its Domain environment, a Unix derivative featuring computer aided design and computer assisted engineering.
- Cray and Sperry offer Unix on the Cray-1 and Series 1100, respectively.

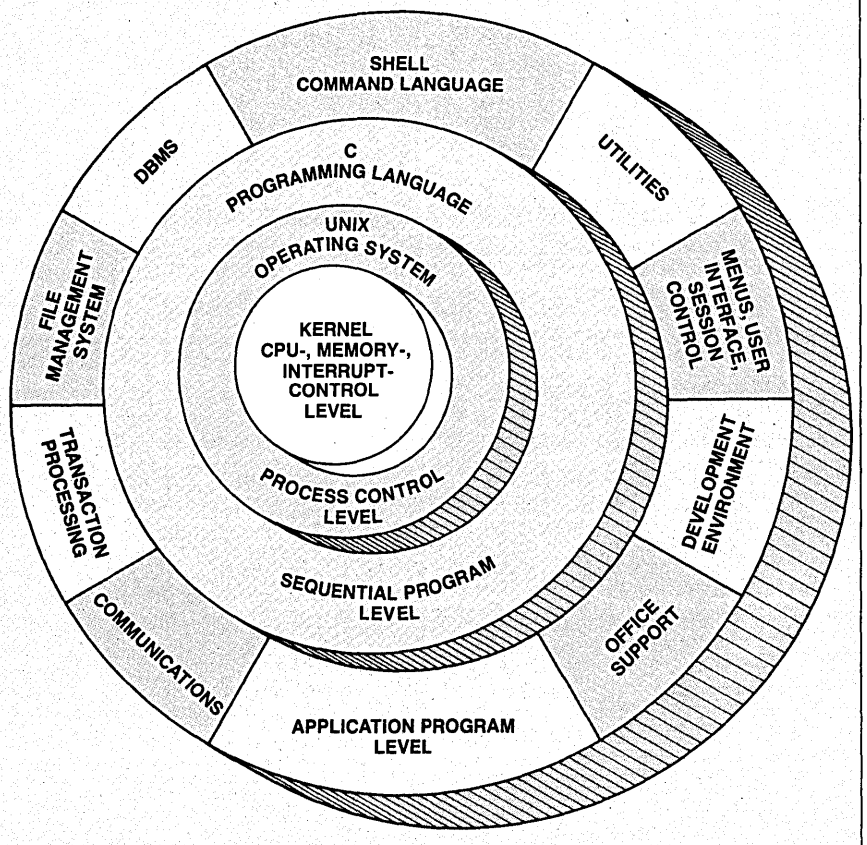
For business data processing and office systems, availability of application software is a key factor in the future success of Unix but, despite a recent flurry of product announcements by system vendors, business related application software remains scarce. One way to beat this problem is to use conversion aids and bridge software and tap the vast array of application packages available on non-Unix-based systems. For example, emulation of CP/M programs is possible under Micronix (Morrow Design), a Unix look-alike. Data General runs Unix/VS, a Unix look-alike, as a guest operating system under its AOS environment just as Amdahl provides Unix under VM. A most promising recent effort in bridge-building is Digital Research's attempt to blend IMS/DOS, CP/M, and Unix System V into a single operating system architecture. DEC users and others also have a vast array of software potentially available through COBOL and FORTRAN languages, available on most Unix versions and look-alikes.

EMPHASIS ON SMALL SYSTEMS

Among business system vendors applying Unix, the current emphasis is on personal computers and minicomputer-based distributed systems. Unix offers substantial office automation and communications features for these markets. Furthermore, 32-bit workstations—which are now proliferating—permit use of the full functionality of Unix for the office, and will be a strong factor in the growth of Unix in this market sector. Since this is a major growth market, prospects are good for the emergence of a substantial population of application software from value-added resellers and application software vendors. But for larger scale processors bigger than superminicomputers, the outlook is cloudy at best.

FIG. 3

UNIX OPERATING SYSTEM ARCHITECTURE



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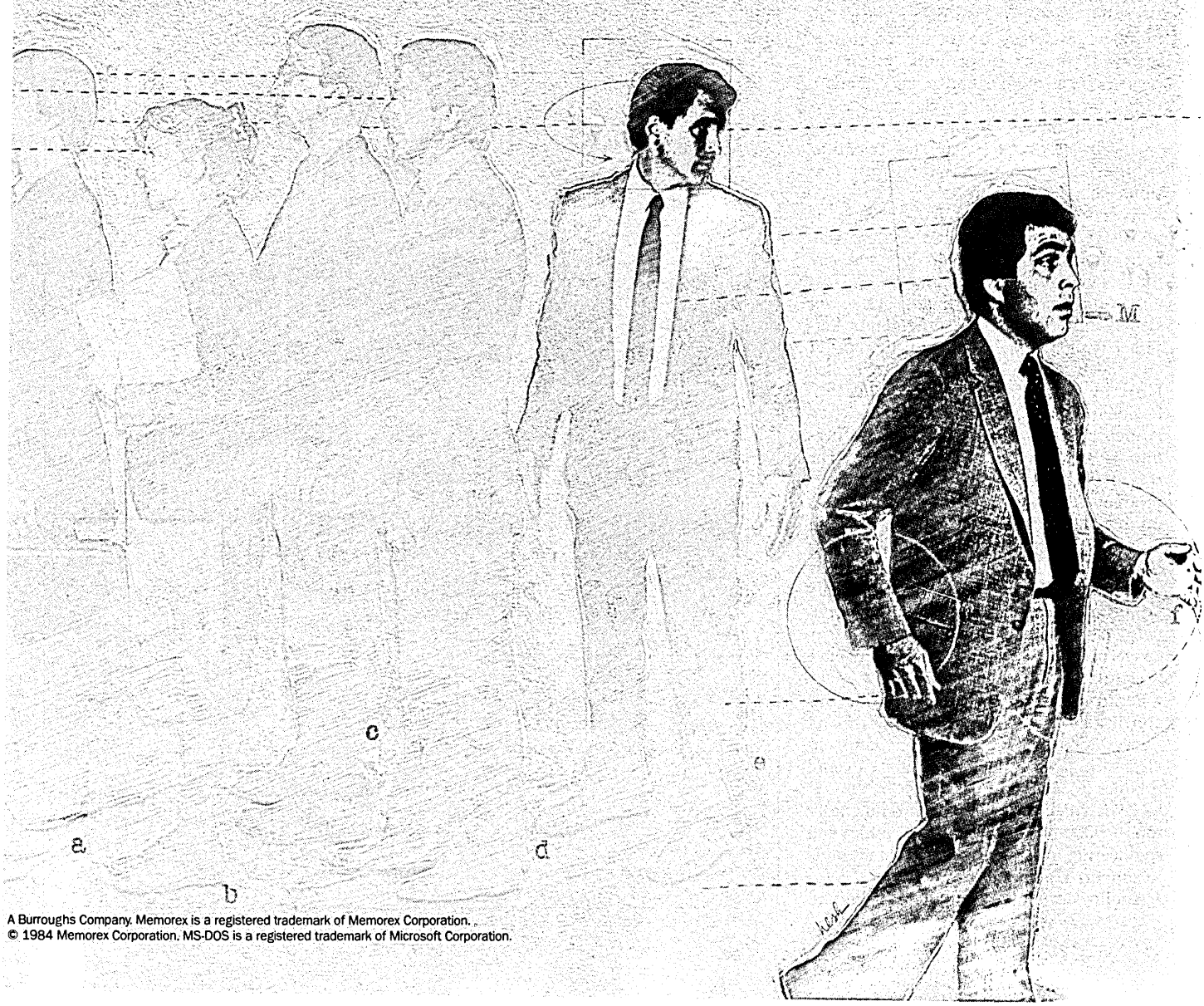

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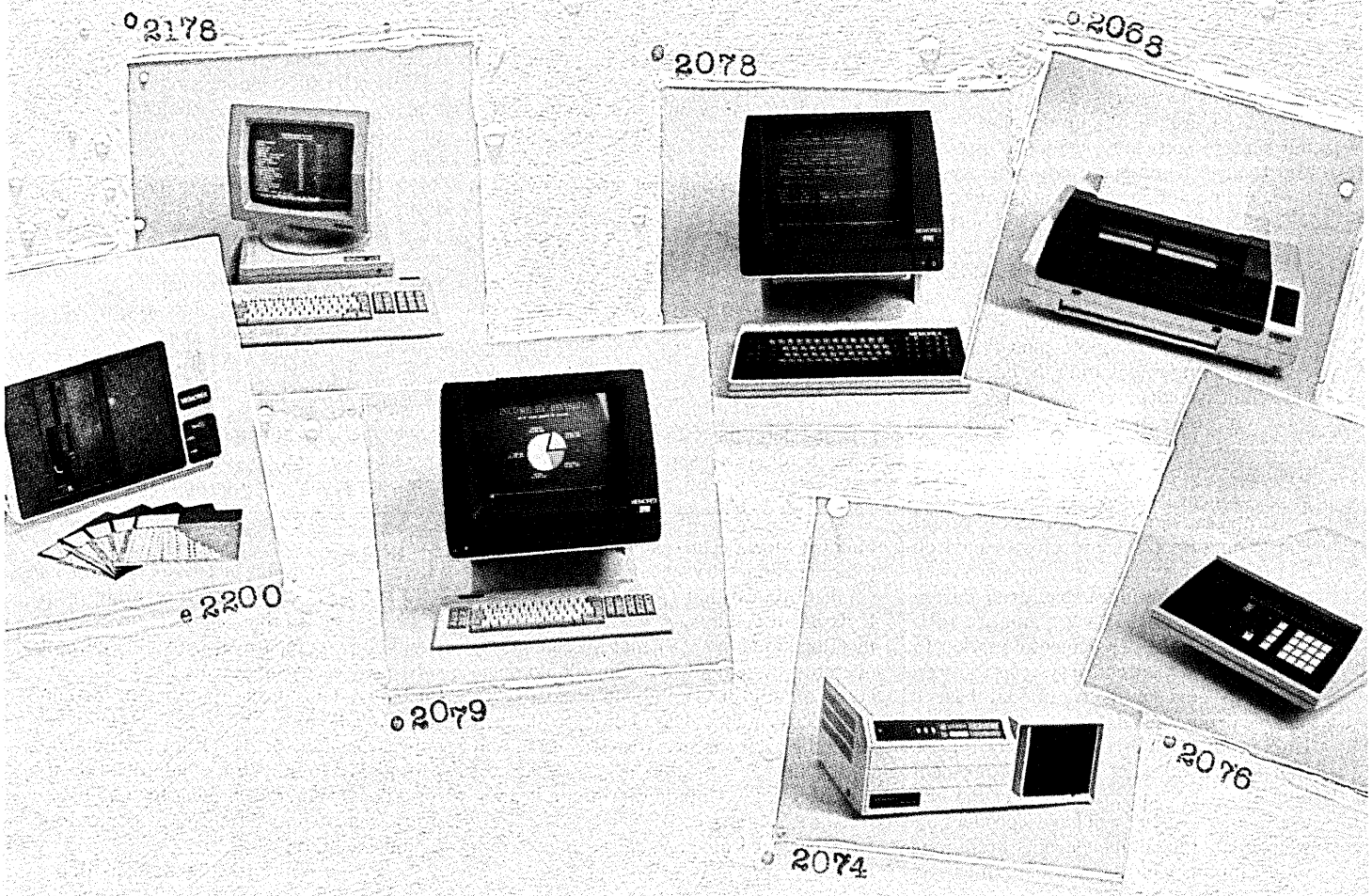

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A popular question these days is, "What does Unix mean to the coming contest between IBM and AT&T?" IBM's proprietary operating systems satisfy a very demanding user group. IBM users enjoy a highly structured operating system that's intertwined with hardware architecture. Users do some tailoring to account for different peripheral configurations, compilers, performance objectives and various security needs. But, with these exceptions, the IBM system is essentially a black box, not tampered with or modified.

AT&T's philosophy to date for operating systems is to provide a system (in Unix) independent of hardware characteristics (from micros through mainframes), thus allowing portability of applications across many hardware vendors, as well as access to many sources of application software. The operating system provides a structure and a library of system functions. Unix's salad bar approach allows the user to select the pieces for his needs, modify them (because it is easy to do so), and add additional functions as necessary.

AT&T is in a unique position. It has marketed a software product, Unix, first, and then its Unix-based computer system product line. Independent of that computer system product line, AT&T has established a market presence through Unix. Its marketing has aimed at oems and value-added resellers, including systems houses and semiconductor manufacturers. Presently, Unix is established in technical markets and is building momentum in the commercial small systems market.

AT&T currently offers a Unix System V-based computer product line ranging from workstations through superminicomputers. The next most likely step is to add a fully integrated, more user-friendly proprietary Unix-based system software environment for its main line of computer system products. Furthermore, based on current competitive position, AT&T appears to be zeroing in on the departmental market for integrated data and office systems as it continues to develop its traditional base in technical markets. If these two classes of Unix product materialize—one for the custom systems market, primarily for oems and vars, and one primarily for the end-user market—AT&T will have a product line well situated to compete against traditional minicomputer and integrated office systems vendors.

What does Unix mean to IBM? IBM's mainline operating systems are here to stay. But IBM is building bridges to the Unix environment and may offer a version of Unix as an option under VM. On smaller systems where IBM uses standard microprocessor building blocks, Unix could provide access to application software, or as a counter to combat competition from AT&T and other Unix-based vendors. A key to Unix in the IBM domain is IBM's Virtual Machine (VM) operating system—where Unix could operate as a guest of VM and can coexist (with little performance degradation) with such IBM proprietary systems as MVS, DOS, and CMS. This way, IBM users get more choices:

- Access to the Unix library of application software;
- the potential for portability, to and from IBM;
- Unix as a competitive alternative to AT&T's emerging products.

In the future IBM could also provide the C compiler in conjunction with its proprietary operating systems to provide another approach to portability and access to C-written application software.

AT&T ASKS FOR A UNIX STANDARD

The Unix operating system, now a sought after product on computers ranging from micros to mainframes, started life as a research project at AT&T Bell Laboratories. Because of its early history, the operating system did not have the kind of support—documentation, training, hot lines, orderly introduction of new features—that a product would.

But in January 1983, when AT&T announced it would actively support Unix System V for the commercial marketplace, this situation changed. Commercial success clearly depended on our working along with the user communities to set standards for the Unix system.

Why does the marketplace need standardization? The rapid growth of the computer and software business has led to a bewildering variety of often incompatible products. Potential computer users who are not enthusiasts but simply people with a particular set of problems to solve are put off when the products of one vendor do not work with those of another.

For the computer business to continue to grow, computer software must be compatible and interchangeable. Customers—business people as well as professionals—need to believe that when they invest in a particular piece of hardware, the software they buy for it will be useful on the new hardware they buy next year, whether or not it's from the same vendor, and that they will continue to find new application programs to suit their needs as the years pass. This user confidence would encourage software developers and vendors to invest money, time, and effort in writing software.

A standard operating system that could be used on many different vendors' hardware would be an important boost to interchangeability. AT&T believes the Unix operating system to be a strong candidate for such a standard for several reasons, including portability, flexibility for diverse projects, versatility from micros to mainframes, and the existence of a large group of experienced users to feed the growing marketplace.

As of early 1984, nearly 1,500 Unix system licenses were held by colleges and universities worldwide. And this year's Uniforum meeting—a gathering of the commercial and academic Unix system users—attracted over 9,000 people.

In May of last year, a major step toward establishing the Unix system as a standard occurred. AT&T and four microprocessor manufacturers—Intel, Motorola, National Semiconductor, and Zilog—agreed to develop versions of Unix System V for computing systems based on their chips. This agreement was a major step toward "horizontal" standardization among micros.

What remains to be done to ensure a standardized operating system? Along with the user communities, we must take a hard look at the Unix system to eliminate those features that reflect its history as a research tool and may not be essential in the commercial marketplace. (In fact, many of these questions of the essence of the Unix system have crystallized as we work with the microprocessor manufacturers to move the system to smaller machines, and we need to weigh trade-offs carefully.)

In doing this "unbundling" to form a basic, standard Unix system, we must be careful to retain the essentials of the system, so that users will find a familiar, comfortable environment, independent of the machine on which the system is running.

As we work with the industry standards groups, the issues we need to consider are varied:

- *The shell* (command line interpreter) takes a user's commands, which are typed into a terminal, and interprets them as re-

AN IBM UNIX IS POSSIBLE

A very real alternative for IBM is to develop its own Unix separate from that of AT&T. IBM's Unix could stay compatible with the current software base by supporting the C language for nonsystems programming. IBM could safely invalidate all the existing kernel-level approaches and deliver a potentially staggering blow to the AT&T standardization effort. The IBM market presence would likely override any short-term disadvantages to a big blue solution.

What is the rest of the pack doing with Unix? For most companies in the information processing business, Unix has a piece of the action—ranging from grudging lip service to a strategic commitment. Most established minicomputer vendors market Unix-based operating environments. Unix has become a necessary offering for this

quests to run specific programs. For example, a user at the shell level would type in the word "who," which orders the shell to run a program that lists all others currently logged onto the user's system. The shell, however, also contains many features that actually make it a programming language. With the shell, the user can write simple programs that take, for example, the contents of a file and, depending on what conditions are met, perform simple operations on the various data (records) within the file. Which features of the shell are necessary? Which could a vendor modify without sacrificing portability of programs?

- *Command options.* What choices does a user need with each command, and what format is the most logical? Computer users expect and should get a regular and predictable grammatical structure for expressing commands and the accompanying options. Deciding what form the commands should take, and how many options are needed are key questions.
- *Utilities.* The Unix system now comes with several hundred utility programs ranging from text editors to system maintenance programs. One maintenance program, for example, checks to see if all disks are in order as the system is brought up. Which of these programs are required, and which could be unbundled for a skinny system that a customer could add on to as desired?
- *C programming environment.* The Unix system is written in the C language, a high-level language not tied to a particular piece of hardware. Several standardization efforts are related to the C programming environment. To help standardize the language itself, we are working toward a formal definition with the American National Standards Institute. A second issue concerns the C compiler which, for a particular processor, translates a C language program into a set of object files in machine language for that processor. Although the data in the files are machine dependent, the format of the data in the file needn't be. If a standard format for the object files were developed, then the effort needed to rewrite the utilities that must deal with them, such as debuggers, would be minimized.
- *System calls.* These are the entry points to the operating system and provide basic services to utility programs. For example, the Unix system editor, upon receiving the "w" command, executes the "write" system call, which copies the contents of the file onto the disk. Which of the approximately 70 system calls are required? The /usr/group has addressed system calls in coming up with proposed application-interface standards to the Unix system. Commercial features such as file locking will be introduced as part of conforming to /usr/goup standards.
- *Libraries.* These are short programs or routines, available to programmers writing software on a Unix system. The libraries give the Unix System its famous modularity and, sometimes, increased speed (for some hardware). Which library routines should be available on the Unix system?
- *Overall file system structure.* The heart of every Unix system is its arrangement of directories and files on the disks. For the system to work properly, a certain structure is mandatory; many utilities must be able to create working files in a temporary directory (/tmp) and must be able to call on data files in other specific directories. The "wwb" utility, for example—a text-analysis program—must be able to store its output in /tmp and must be able to locate a dictionary. We need to define the required directories and identify the locations for the required files.
- *Documentation.* Which types of documentation are required for a Unix system—tutorials, reference manuals? How is this documentation best provided—as printed material? on-line? as cassettes? What about on-line assistance to help the user correct errors?

Once a generic Unix system has been established, its rate of change, its evolution, if you will, must be controlled. We've done this in moving from Unix System V Release 1 to Unix System V Release 2, where we've added increased speed and more user support but have not altered the kernel, the part of the operating system closest to the hardware.

To continue to control the rate of change, we will work with universities and other companies in the industry, directly and through the various standards groups, to incorporate worthwhile advances, an approach that for more than a century has been very successful in integrating new developments into a complex telecommunications network.

The goal of the growing software industry is to provide a base for the common interests of software creators and their customers, who will want to be able to move their applications horizontally from, say, one microprocessor to another, as well as vertically within a hierarchy of computers.

A standardized operating system will meet those needs, and provide a good framework for competition and the natural play of market forces. Hundreds of companies will be able to create and capture market share with unique products to meet customers' needs.

—T.H. Crowley, L.L. Crume, and C.B. Hergenhan

T.H. Crowley is vice president of Software Systems, AT&T Technologies; L.L. Crume is head of the Unix Systems Engineering Department, AT&T Bell Laboratories; C.B. Hergenhan is head of the System Design and Exploratory Development Department, AT&T Bell Laboratories.

vendor segment because users are increasingly demanding standard application software, and new vendors such as Pyramid, Auragen, Synapse, and Sequoia are attacking these companies on their home turf by offering very high performance Unix machines. The trick for the minicomputer vendors is to bridge their existing product line to Unix while maintaining their current strengths and software base.

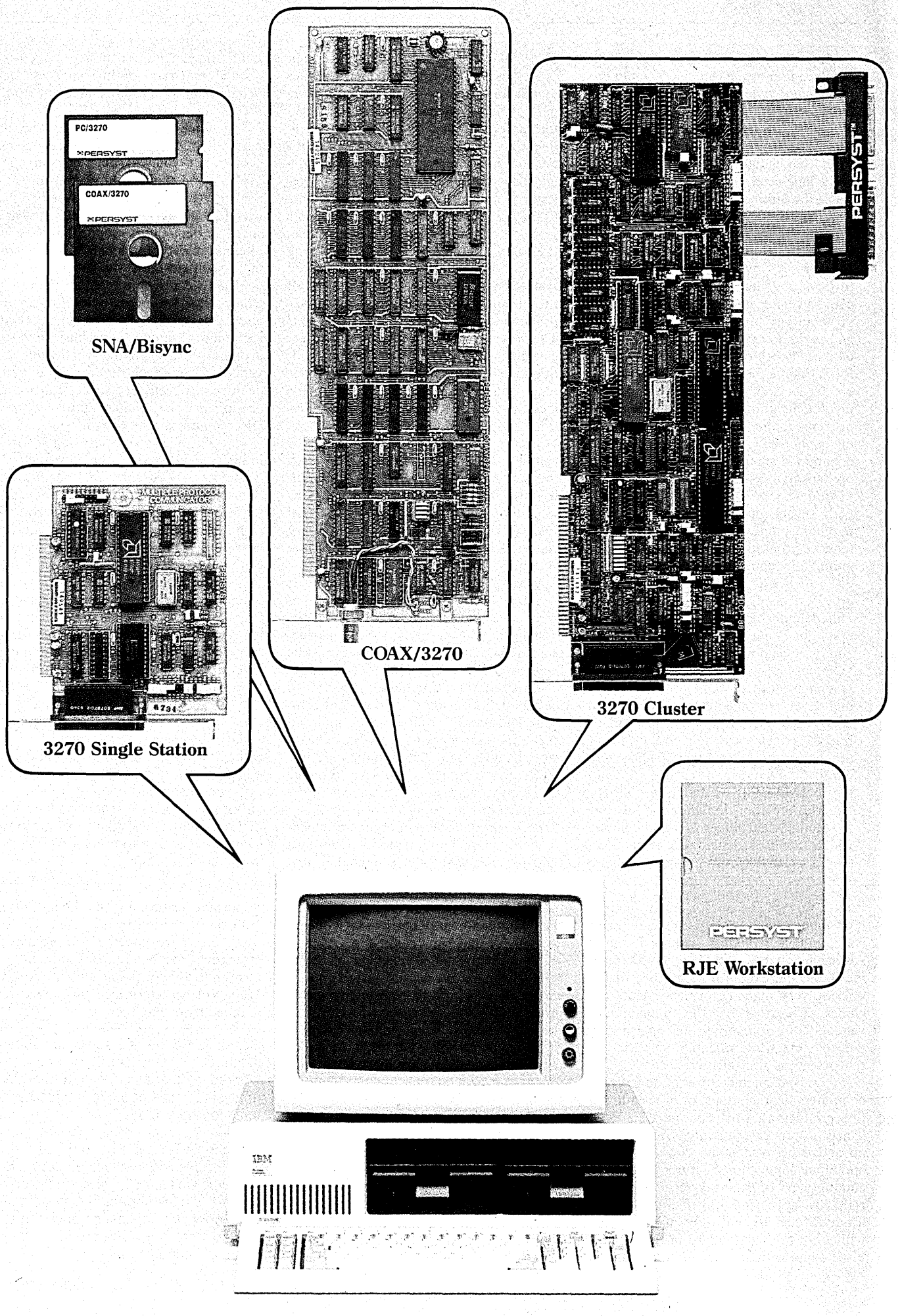
As pc manufacturers add portable computers, workstations, or office automation products that incorporate their established proprietary software, Unix becomes attractive because of its communications and office applications features. Unix is becoming a pc operating system in its own right by appearing on the IBM PC, the Tandy Model 16, and the Apple Lisa, and will compete as a standard in this marketplace along with MS/DOS and CP/M. An interesting wrinkle will be the introduction of the Unix-on-a-board coprocessor, a retrofit adaptor for non-Unix computers.

We have based our view of the future of Unix on the survey answers quoted earlier. We feel it will continue to attract product planners and system developers in the oem market. Its portability based on the C language will continue to be important for the small systems market. As an OS for AT&T's general purpose product line, the original Unix operating system is simply the starting point for a fully functional software system environment—as it is for many Unix oem customers.

It is clear that Unix is not a single operating system, but rather a generic identifier for a clan of operating systems sprung from a common root. At this point, application program portability for Unix-based operating system environments is the most important feature of the Unix universe. Will the transition from System III to future Unix environments compromise this strength? Probably not. But ultimately, the answer to this question and the future of Unix will be determined by the strategies adopted by IBM and AT&T. ◉

Dennis F. Barlow is a senior consultant at Arthur D. Little Inc. (ADL), where he has worked in database design and systems analysis of mini- and micro-based systems for the office.

Norman S. Zimbel is head of the distributed Processing and Office Information Systems Unit at ADL, where he is concerned with the impact of distributed systems upon the application environment, related technology and products, and the information industry.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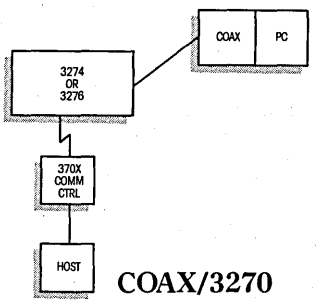

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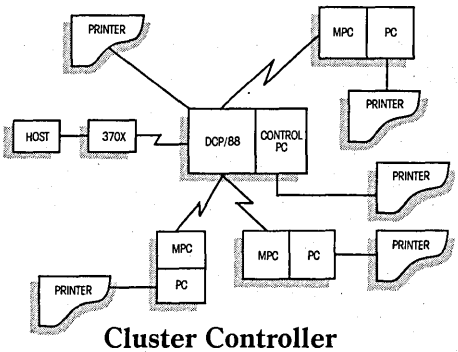

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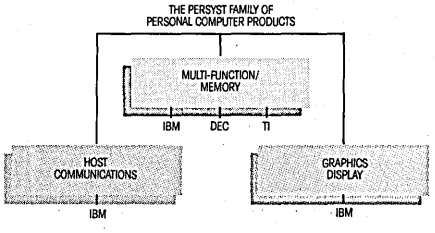

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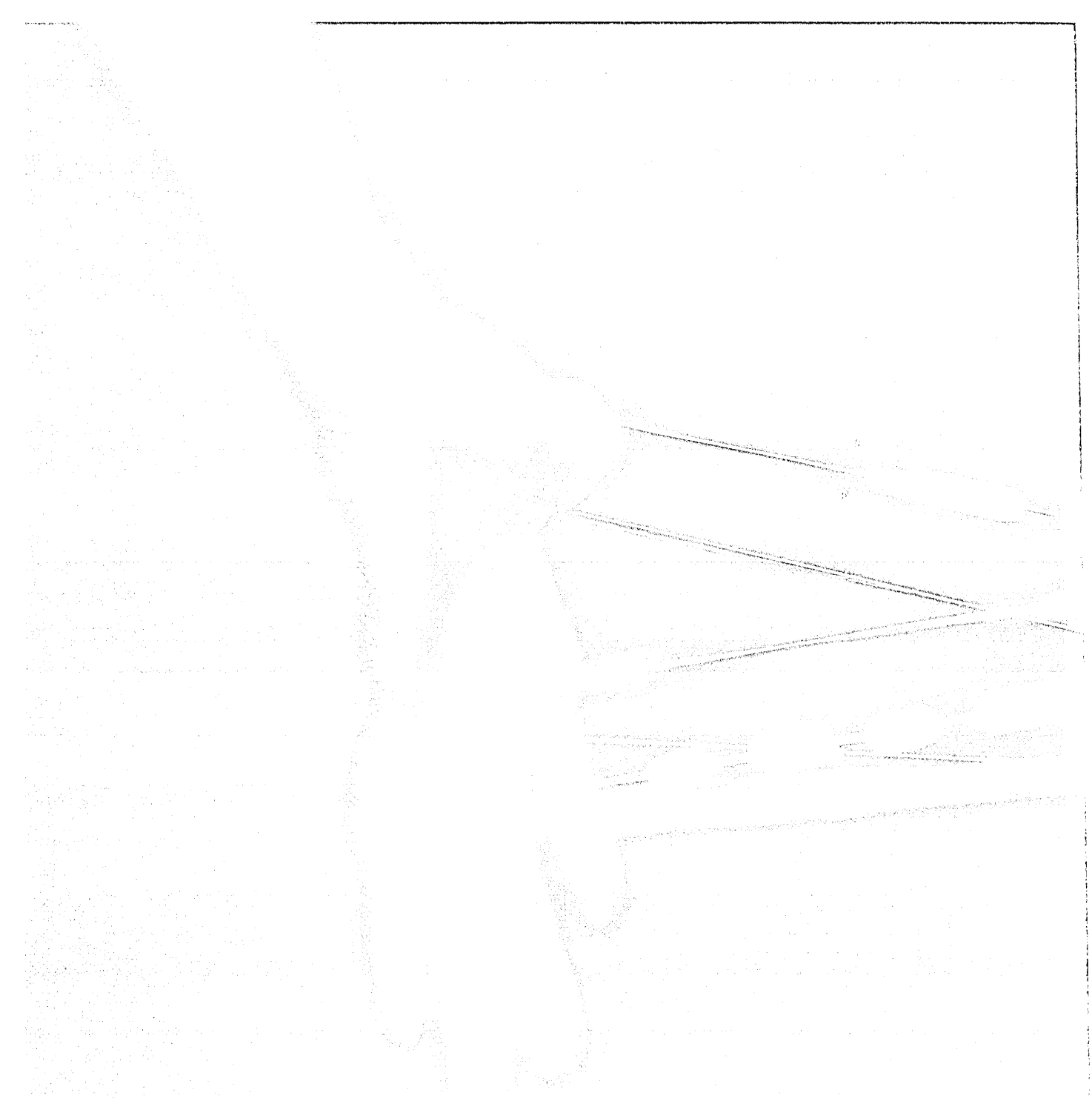


If pc users need to share information and files, a LAN may be the solution. But beware: the technology's still young.

LOCAL NETS FOR MICROS

by David Ferris and John Cunningham

Proper installation of a local area network for personal computers is the most straightforward in use, but still has more in common with minicomputer systems integration than with the [illegible]

experience started in early 1984, and our personal computer support firm has now installed them in four different companies. A pattern has begun to emerge, and our purpose here is to describe what we have found to be the major steps in installing a personal computer LAN.

The reasons why personal computer users buy LAN systems simultaneously [illegible] in order to share databases, programs, and word processing documents. Eventually the proliferation of redundant copies causes confusion, and it becomes apparent that the pcs need to be tied together so they can share resources. Using a LAN, a single master copy of a critical file can be faithfully maintained, and a host of difficulties can be avoided. While that simultaneous updating of shared data (such as customer or inventory files) remains [illegible] most of today's LANs because they lack applicable record-level lockout and recovery facilities.

The need to share information and files is usually the strongest motivation for LAN installation today. Following this is the desire to share local printers of varying quality and speed. LAN vendors make much of the resulting savings because fewer printers will probably be needed. Again, a word of warning: this can turn out to be a false economy when you figure in the costs of LAN boards, file servers, and system

installation and maintenance. There are additional reasons to install a LAN—the need to share communications lines connecting with a minicomputer or mainframe, for example—but the two we stress here are currently the most compelling.

Choosing which LAN to use is in itself a challenging task. There are between 10 and 50 reasonable candidates, depending on how generous you're prepared to be in assessing functionality. The unfortunate fact is that most current LANs amount to barely more than a network interface board or box, some sort of wiring, and a bit of utility software on a diskette. This just isn't enough: a vendor must put a great deal of effort into systems software to make a LAN useful, and when you add this requirement, the list of candidates gets shorter.

Some of the more popular products for pcs include those offered by 3Com, Mountain View, Calif.; Corvus, San Jose, Calif.; Nestar, Palo Alto, Calif.; Novell, Orem, Utah; Orchid Technology, Fremont, Calif.; Sytek, Mountain View, Calif.; and Ungerman-Bass, Santa Clara, Calif. The offerings vary. Some vendors, such as Nestar, Sytek, and Ungerman-Bass, offer better facilities for communications with existing corporate computing resources; others, such as 3Com, Corvus, Novell, and Orchid, sell products with relatively low entry costs (although the real expenses are generally quite different from the apparent ones). Today's personal computer user is generally very sensitive to price, and perhaps for this reason is particularly drawn to products from the latter group.

LAN installation can be divided into a series of separate tasks, the major ones being:

- Physical plant layout
- Hardware installation and configuration
- System definition
- Software installation, conversion, and testing
- Tuning the user interface
- Staff training

In the less expensive category of LANs, we found 3Com's EtherSeries to be one of the better offerings, and we'll use these products to illustrate many of the practical issues of systems planning, integration, and administration.

SHOULD YOU INSTALL A LAN?

You should probably think about networking your personal computers if:

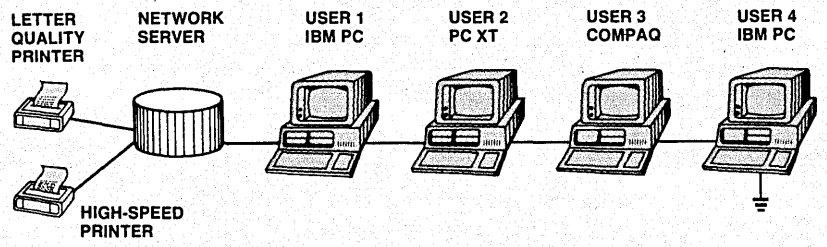
- You have an important business requirement to concurrently update the same data file, and can't develop effective procedures that will allow standalone pcs to do the job.
- You are running into major problems with redundant copies of data, text, or program files that are being exchanged on diskettes, and it's difficult for users to ensure that their versions are synchronized with the master copies.
- You are building a shared pc environment that will be installed at many departments within your company.
- You are an oem and need to develop a shared pc environment that will be installed at many sites.
- You are a large corporation and need to assess the technology.

It's probably *not* worth your while to install a LAN today if:

- You just want to share several printers.
- You just need to allow shared read-only access to data files.
- You have a tight budget and need a fast and easy installation.
- System security is a major concern.

FIG. 1

A TYPICAL 3COM BUSINESS INSTALLATION



What can a LAN really do today? Expectations are often too high. For example, as a 3Com user in the above illustration:

YOU CAN

1. Dynamically link to volumes on the network-server hard disk.
2. Print documents on either of two printers.
3. Send mail to other users or pick up your mail from the network server.
4. Telephone in for program files from home.
5. Create and destroy new user names.
6. Create and destroy volumes on the server hard disk, if you are the owner.

YOU CAN'T

1. Access user 2's hard disk files over the LAN if you are user 1, 3, or 4.
2. Use the backup utilities of the server on your local floppy or hard disk. Files resident on local storage must be backed up separately or copied to the file server.
3. Be sure you can read the server backup disks (which are quad density) on your user PC. If the server breaks down, you could be out of business for up to five days.
4. Access the server hard disk volumes when you phone in.
5. Despool a long document you have submitted to the printer, unless you are the system administrator and are sitting at the server console.

PLACING PC WORKSTATIONS

Physical plant layout. Thought must first be given to the location and arrangement of the pc workstations, particularly if new ones are being installed. For some people, a desktop arrangement with a single pc dedicated to their use makes sense. For others, a terminal room where computers are available for common use may be better. Sometimes, it is a good idea to keep various computers on wheels, so they can be moved when necessary. The location of peripherals also needs thought: noisy printers, for example, should be kept behind closed doors.

With the 3Com system, various open connectors are arranged around the site so that users can connect their computers to the network as needed. The cable itself can usually be run through the ceiling, along baseboards, or through runways under the floor. Some vendors limit themselves to simple twisted pair wire, which is relatively unobtrusive. 3Com uses a thin and flexible coaxial cable because of its better data transmission characteristics.

Depending on the geographical spread of the LAN, other types of cabling may also be needed. We find that most of

It is a good idea to keep various computers on wheels, so they can be moved when necessary.

today's LANs are installed in physically adjacent workplaces. Since 3Com's thin cabling will support short-haul layouts in which the total length of the network is up to 1,000 feet, this is usually sufficient. When workstations are separated by greater distances, one has to turn to thicker coaxial cabling and external transceivers, or to repeaters between sections of the thinner cabling. Use of the thicker cable expands the total length of the network to a maxixum of about 3,300 feet.

Hardware installation and configuration. First of all, the type of network server must be selected and installed. In 3Com's case, the main options are:

- An IBM PC XT with 10MB of hard disk storage, which will support from two to eight micros, depending on the mix of applications. The main determinant is the I/O traffic generated across the network, and the disk access requirements of the various pc applications.
- An IBM PC used in combination with a third-party hard disk system like the Tallgrass 20MB system with tape cartridge backup. Again, this is suitable for two to eight PCs.
- A 3Com AP Server with 30MB of hard disk storage, to which may be added a further 30MB expansion unit. This unit supports between six and 30 micros. Generally it seems a better alternative than the XT server; the storage is less restricting, and fewer systems integration problems occur.
- A VAX 11/750, which will provide for cases in which larger amounts of storage are necessary, and which can support about 100 pcs.

Next, the LAN interface cards must be installed in each pc. Third, some of the pcs may need extra memory boards because they may have to run applications that are new to them.

PRINTERS MAY NEED FIDDLING

Finally, the selected printers must be installed. Printers frequently require some advanced technical fiddling, particularly in a LAN environment, because there is now a specialized piece of software—a print spooler—lying between the pc and its printer. For example, attaching a parallel printer to the 3Com print server requires insertion of a protocol converter because the server expects to talk to a serial printer.

In ideal circumstances, installing and configuring all this hardware proceeds smoothly. One opens up the pcs, inserts the 3Com boards, and hooks up the cables. The printers are attached to the server with a bit of tweaking, and that's it. Life is not usually that easy, however, and hardware installation and configuration is the first point at which one is likely to run into problems that are difficult to diagnose and resolve.

If an IBM PC XT is being used as server, and a common multipurpose memory/communications/clock board such as the AST or the Quadboard has been installed in it, there can be contention for interrupt channels and direct memory access lines on the XT's bus. To fix this, it may be necessary to move jumpers on the multipurpose board or the LAN interface card, and/or apply patches to the networking software.

If an IBM PC acts as server by being equipped with a third-party hard disk like the Tallgrass, great care must be taken during system software installation. The hard-disk device driver must be installed in memory so that it does not interfere with the LAN interface card. Certain hard disks won't work with the 3Com network server at all.

If an XT is used as a file server, and you attempt to expand its disk capacity by adding a third-party expansion disk, you may suddenly find that the XT's 10MB of hard disk cannot be used by the network.

Related problems are likely to occur at various user pcs, as well. For example, if a pc has a full complement of peripherals, such as a local hard disk or a built-in modem, similar bus contention can occur. The moral here is clear: to reduce the problems, try to keep things as simple and standard as possible when configuring your server and workstations.

System Definition. Now the more conceptual work of defining users, file structures, and access rights must be done. Don't expect this to be easy. It is important to give thought to the design of the central LAN files because they will be shared by many users. The system will become unwieldy unless a good design is chosen at the outset.

A central 3Com file storage notion is that of a volume. Because volumes can rapidly become filled with hundreds of different files, it is natural to organize them into hierarchical directories and subdirectories using DOS 2.0 or 2.1. It is then much easier for users and the system manager to locate and maintain files.

On the other hand, 3Com's file security access scheme is tied to user names,

FIG. 2

THE TRUE COSTS OF LAN INSTALLATION

As with any system, hardware is only part of the expenditure. The following illustrates the overall costs of a typical six-user 3Com installation:

DIRECT COSTS

Hardware	
30MB AP server	$12,500
Six LAN interface cards	4,770
Cabling and terminators	200
Software	
Network software	795
Print spooler	750
Electronic mail	1,500
	$20,515

OTHER COSTS

Labor for cabling installation	$50 -	$500	(2-20 hrs)
Configuration planning	300 -	1,500	(6-30 hrs)
Installation and debugging	500 -	5,000	(10-100 hrs)
Program conversion	0 -	10,000	(0-200 hrs)
Staff training	1,000 -	3,000	(40-120 hrs)
	$1,850 -	$25,000	

Labor costs are conservatively calculated at $25 per hour for staff time and cabling and $50 per hour for the other items. Actual hourly cost may be substantially higher if support from a third party is necessary. Thus, depending on the complexity of the system, labor costs associated with making the LAN operational can be greater than the direct costs of hardware and software. The $1,850 cited is an absolute best case; rarely will these soft costs be less than $15,000.

With limited experience and documentation, it's easy to see why diagnosis is difficult.

passwords, and volumes. Each volume can have one of three levels of security associated with it: private, public, or shared. One of the reasons it takes time to determine the organization of files into volumes is that an individual file cannot have a security clearance attached directly to it; rather, it adopts the security status of the volume in which it is resident. One is therefore usually obliged to define many small and unrelated volumes, each containing a relatively small number of files with the same security status.

Some sort of file organization must also take place at the pc nodes. If these contain only floppy disk drives, this amounts to defining a suitable LAN boot disk, which the user must insert to log-on to the network. If the pc contains a hard disk, various networking utility programs must be installed, possibly stored within a subdirectory. This is easy to do, but again, it is worth taking the time to get the design right, and implement the same approach on all pc workstations.

User definition also requires attention. If limited groups of people will need to access particular volumes, passwords must be assigned to the volumes in question. This in turn affects how volumes are organized.

A number of the efforts required in this phase are due to the fact that security facilities are still in their infancy on most LANs. Thus with the 3Com system, one would like to be able to define security at the file level, or organize users into security rings or levels. Even if all the desirable utilities were available, the system definition step would still require careful attention.

Software installation, conversion, and testing. With users and volumes defined it is possible to install and test the various applications programs. These fall in two main categories: standard packages, like spreadsheets, word processing, and data management software; and customized software, like programs written in BASIC or dBase II.

VARIOUS PROBLEMS TURN UP

One runs into a variety of problems at this juncture. Many of these are solvable, but they do need the attention of a computer professional. Typical difficulties at this stage in a 3Com installation include:

- The instructions to install the Volkswriter word processing package on a hard disk will not work for the AP Server. Since neither Lifetree (Volkswriter's vendor) nor 3Com support staff know how to resolve this, users have no choice but to boot Volkswriter from a floppy disk until a solution can be found.
- Some programs that work well on a single user pc (e.g., EasyWriter 1.0 and RBase 4000) won't work in a LAN environment because they are unprepared to allow LAN interface software to reside in a portion of memory.
- BASIC and dBaseII programs often explicitly refer to the A:, B:, or C: disk drives. The files they need to access may now be on the LAN server, so the program instructions themselves may require rewriting. Documentation may have to be correspondingly rewritten.

"Is this your decision, Griffin?"

- Applications that were previously single-user may now have to be altered so that concurrent users do not interfere with each other. One example is where multiple users wish to enter customer order information concurrently and update the same data file at the same time. At best, major program rewrites will be required to provide the necessary record lockout and recovery facilities.

Program testing is complicated by the fact that hardware-level problems, like bus interrupt contention, will still tend to arise at this time. Given the many possible causes of the bugs, limited documentation, and the limited experience of the marketplace, it's easy to see why diagnosis is difficult. Close collaboration between local area network and software vendors can result in far fewer installation problems. 3Com has been particularly active in this respect. The company has worked with package manufacturers to produce networked versions of various products, including VisiCalc and dBase II.

Once installation of the various applications has taken place, backup and recovery procedures can be implemented. Various tools are available. For example, 3Com offers a utility for its AP Server with the tape cartridge option, which will automatically perform full or incremental dumps at specified times. And Tallgrass provides a utility that can be used when its hard disk is attached to a pc.

Tuning the user interface. Users who understand the fundamentals of PC/DOS have little trouble adjusting to the 3Com LAN environment. The network commands are DOS-like in format, and most of them are easy to grasp. Nevertheless, a new set of concepts and commands places an additional burden on users, especially if they're not familiar with DOS. For these reasons, it is usually a good idea to implement a simple menu environment using DOS batch files, BASIC, or menu generators. These can shield users from having to understand how to navigate through volumes, connect to suitable directories, set up default file retrieval paths, select printers, and so on. The same menus should appear on many of the different pcs attached to the network. Consistency is important because users will often log-on to different pcs at different times.

Staff training. The amount of training required depends on how much you use front-end menus, the users' backgrounds, and the complexity of the applications in use. Although in principle it is possible to shield users from all LAN commands, in practice this is not usually desirable. Three types of training may be required.

NEW USERS LEARN THE BASICS New pc users will need to learn the basics: use of the keyboard; what the cursor does; types of files and their storage on diskette; running a program; and how to copy files, format diskettes, list a directory, and so on. We find this generally takes about two days of hands-on instruction.

Users familiar with the basics of personal computers will need to learn the fundamental EtherSeries commands. They will need to know how to log-on, link to volumes, list available volumes, and link to printers. This usually takes about half a day of training and practice.

The system administrator will need to learn general management functions, such as how to define new users, change passwords, create new volumes and perform backups. Mastering these facilities takes between one and two days of the administrator's time. Overall, we find it generally takes the user community about a month to become proficient.

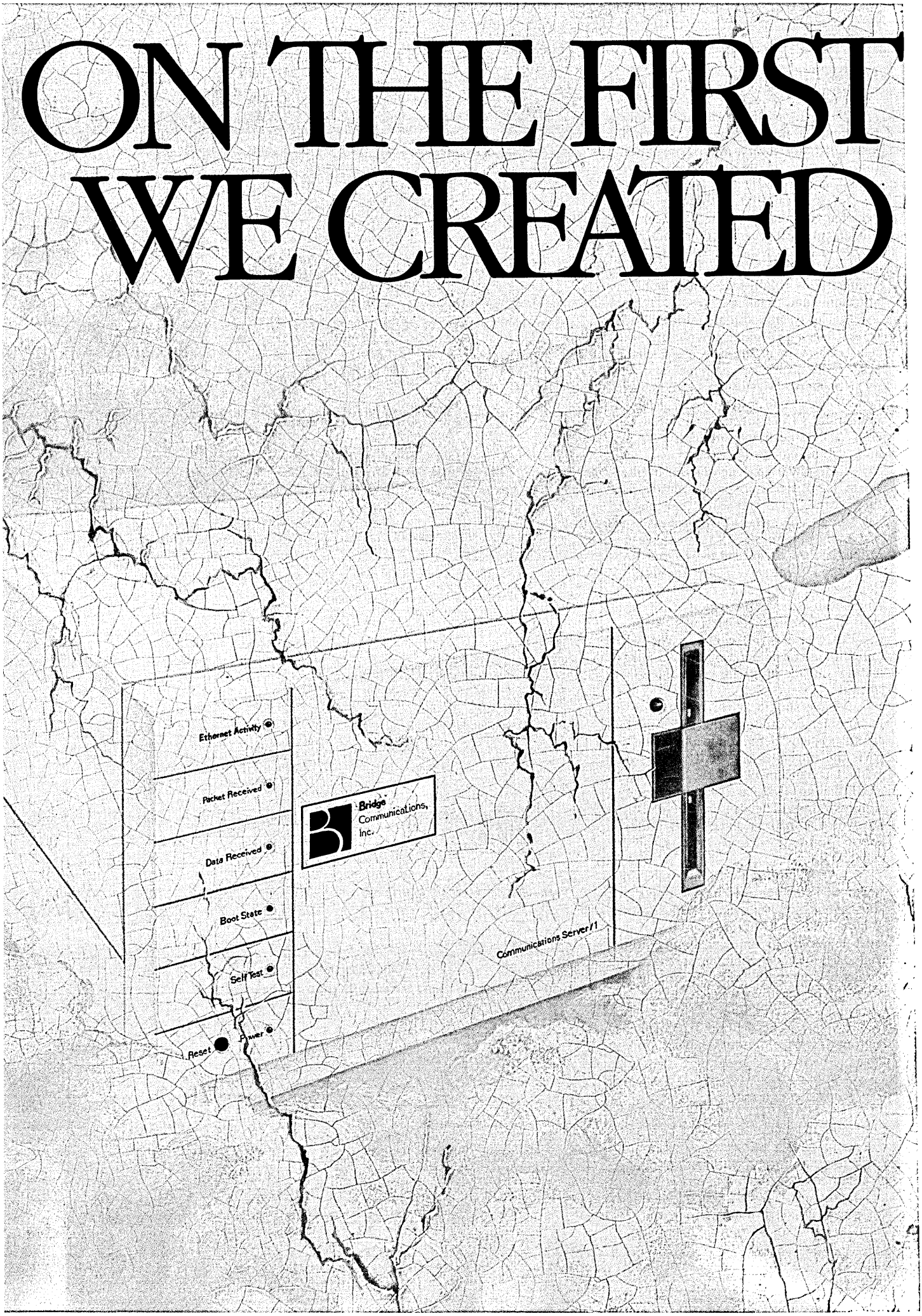
Despite a growing amount of interest in local area networks over the last three years, it is only recently that they are beginning to be installed by business users of personal computers. As we have described, unless you intend to use your LAN as a simple print server only, the installation process will require careful thought. And because the technology is still young, even the more reliable products—such as the EtherSeries—will confront you with difficult systems integration bugs and frustrating shortcomings in available utility software.

Time should help resolve many of the problems, although the necessity for careful systems definition will remain. In part, the improvements will result from gradual enhancements of the utility programs that are supplied to users and system administrators. The ironing out of basic hardware conflicts between standard boards, hard disks, and printers should help as well.

We believe that the single most important development will be the support of independent software vendors like Lotus, Ashton-Tate, and MicroSoft. Many of the most esoteric and time-consuming problems arise because common spreadsheet, database, and word processing packages were not designed to work with a LAN. Over the long term, the most successful LAN is likely to be the one for which the leading software vendors have tailored their products. ◉

David Ferris is chairman of San Francisco-based Ferrin Corp., and John Cunningham is a member of the company's technical staff. Ferrin is a personal computer support firm whose offerings include needs assessment, product selection and installation, applications development, training, maintenance, and hardware and software troubleshooting.

ON THE FIRST WE CREATED



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The Multiple Area Network

CIRCLE 45 ON READER CARD

In the eight months since the apron strings were cut, the regional holding companies have done surprisingly well. But they don't call home much.

MA BELL'S CAPABLE KIDS

by William W. Ambrose

The Bell operating companies lost their installed base—a major competitive advantage in the PBX industry—on Jan. 1, 1984 when AT&T stripped them of $5 billion in assets and 60,000 in personnel. It was going to be a long year for the newly organized regional Bell holding companies (RHCs).

But halfway through Year One A.D. (After Divestiture), the regionals are surprising everyone. PBX sales have been brisk. Their snowballing strength promises to rewrite the rules of PBX distribution, and perhaps accelerate the pace of office integration.

The RHCs are roaring back, and no one is more surprised than they. "We didn't anticipate demand as high as it was—we underestimated grossly," says John Ahern, PBX product manager for BellSouth Services Co., which coordinates PBX marketing at BellSouth's two operating companies. According to Ahern, the number of requests for proposal received "have exceeded our expectations by a large margin."

Similarly, Rick Cade, PBX sales manager at US West's FirsTel Informations Systems Inc., states, "In terms of dollar sales, we are doing everything twice as fast as our business plan." The regionals are also surprising their customers. Commenting on a recent PBX contract awarded PacTel Communication Systems, the equipment marketing subsidiary of Pacific Telesis Group, Bob Heinz, director of Telecommunications for the *Los Angeles Times*, says he was "surprised by PacTel's presentation, given the short amount of time they were in business."

In contrast, Heinz notes, " AT&T Information Systems had a hard time getting its act together. Our account exec had a terrible time." The account executive was formerly with Pacific Telephone, says Heinz, and therefore "he knows our operations. We gave them extra time. We bent over backwards for them, but AT&T couldn't get it together."

PBXs are just the start. Within regulatory restrictions set by the FCC and Judge Harold Green's Modified Final Judgment (MFJ), the RHCs are building integrated voice and data product lines around the PBX.

For example, PacTel sells Data General executive workstations, Codex modems, and Timeplex multiplexors along with Northern Telecom PBXs. US West's FirsTel Information Systems Inc. sells IBM personal computers. And Bell Atlantic's equipment marketing subsidiary recently became an authorized distributor for Digital Equipment Corp. products.

What's driving the regionals to expand office automation offerings at such a dramatic rate is pressure from their customers. The new holding companies, reflecting their Bell heritage, place customer service first. "We have become a lot more flexible," says BellSouth's Ahern. "We want to do business so we are looking at the needs of our customers."

What their customers demand are state-of-the-art products from a single source. By integrating different manufacturers' equipment the RHCs hope to provide what traditional PBX companies and data processing suppliers have failed to offer: integrated office automation systems.

The RHCs hope to establish a new distribution channel. Many of these Bell offspring have much more in mind than operating as large interconnects. They also see themselves as value-added remarketers. Right now, RHCs depend on the PBX manufacturers for software packages, but, says Ahern, BellSouth is "currently studying what kinds of unique packages we may be able to develop and provide down the road."

VOICE AND DATA IN A PACKAGE

The RHCs are planning to provide state-of-the-art voice and data capabilities tied together with sophisticated communications networks in a single "engineer, furnish, and install" (EFI) package. Fig. 1 will help explain the strategy.

The chart juxtaposes various groups of suppliers along two axes: the vertical axis represents the convergence of communications and dp; the horizontal axis represents the general areas of competition along the business system, or value-added chain, which link raw materials suppliers with ultimate customers.(The strategic groups of competitors shown are general categories, and do not accurately reflect the differentiation between rivals within groups. Also, many groups are missing [e.g., semiconductor manufacturers], and many companies shown have operations which extend to other groups.)

When the major strategic groups are positioned along the two axes, a number of observations can be made. First, the drive to integrate dp and telecom is further along at the component and manufacturing level than it is at the marketing level. In other words, the technology exists to create whole integrated systems but the market may not be ready.

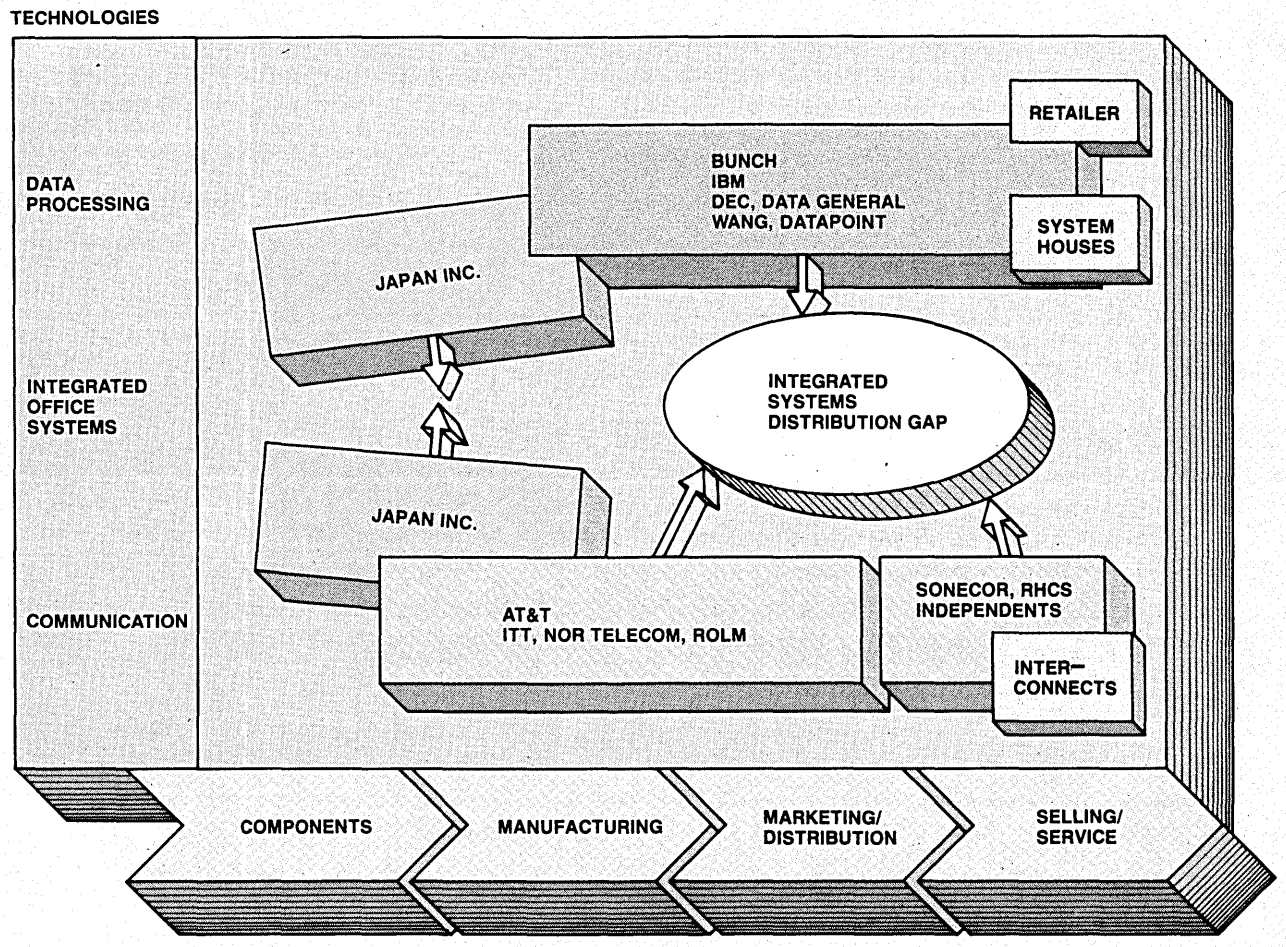
A second observation is that those

ILLUSTRATION BY MICHAEL GARLAND

What's driving the regionals to expand office automation offerings at such a dramatic rate is pressure from their customers.

FIG. 1

SPHERES OF BUSINESS COMPETITION



suppliers closest to developing a fully integrated information product line, based on decades of experience in both telecom and dp, are the Japanese. But because they have only small distribution operations in the U.S., Japanese suppliers must split their product lines to reach the market—telecom equipment through interconnects and telephone companies; data processing equipment through retailers, system houses, and original equipment manufacturers (oems).

Unburdened by established product lines, the RHCs hope to step into that integrated systems distribution gap. Most office automation suppliers sell integrated systems based on the equipment they manufacture. Wang, for instance, has a vested interest in selling a networking system that takes advantage of its huge installed base of word processing systems and has the capacity to transmit large amounts of interactive data—i.e., a broadband LAN.

Rolm's office automation solution, not surprisingly, deems the PBX the networking hub, a strategy designed to sell PBXs and PBX aftermarket products. By virtue of their strengths, Wang and Rolm are squeezed into different segments of the office automation market, and squeezed out of many others. For Wang to develop a PBX or Rolm a complete office automation line would involve spending tens or hundreds of millions of dollars and could take years. Both have had to go outside for help: Rolm to IBM and Wang to InteCom.

By contrast, the RHCs are able to assemble a wide range of networking and peripheral products virtually overnight.

Offering a wide variety of office equipment, from PBXs to word processors to voice/data terminals, the regionals have the flexibility to compete in those segments it chooses. And they have a huge inventory of equipment, including Japanese gear, from which to choose.

True to their roots, all the regionals are emphasizing customer service as the core of their strategies. It is not surprising, therefore, that some RHCs have two and sometimes three PBXs on hand covering the same line ranges.

BellSouth, for example, offers both the InteCom IBX, which covers up to 16,000 ports in dual configuration, and the Northern Telecom SL-1 and SL-100, which between them cover from less than 100 lines up to about 30,000 lines. The IBX was chosen for its ability to "handle heavy data requirements," says Ahern. He also adds that a number of customers specifically re-

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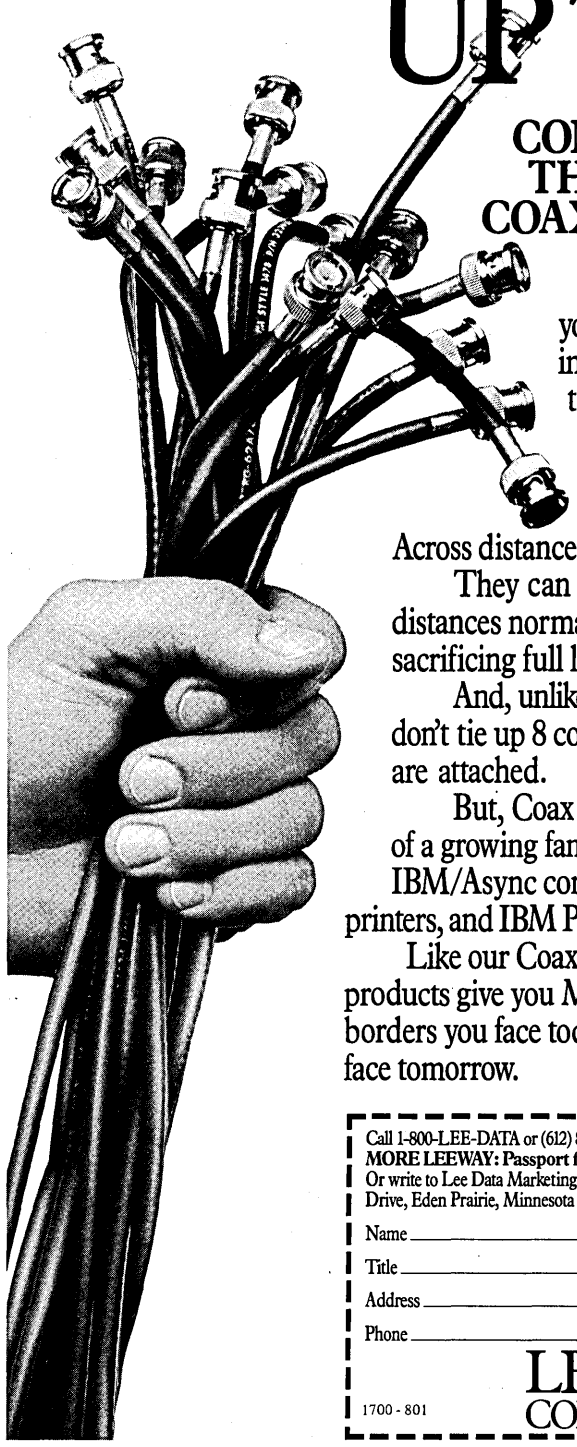

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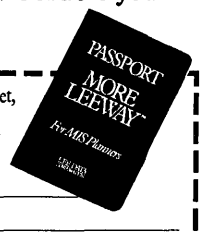

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LEE DATA CORPORATION

CIRCLE 46 ON READER CARD

Unburdened by established product lines, the RHCs hope to step into the integrated systems distribution gap.

FIG. 2

REGIONAL BELL HOLDING COMPANY PBX AND OA OFFERINGS, 6/84

REGIONAL BELL HOLDING CO.	CUSTOMER PREMISES EQUIPMENT MARKETING UNIT	PBX OFFERINGS	OFFICE AUTOMATION OFFERINGS
Ameritech	Ohio Bell Communications Michigan Bell Communications Indiana Bell Communications Illinois Bell Communications Wisconsin Bell Communications	Ericsson Prodigy Northern Telecom SL-1, SL-100	none
Bell Atlantic	Bell Atlanticom Systems Inc.	TIE Data Star NEC NEAX 2400 InteCom IBX	DEC teleprinters AT&T DATAKIT Esprit Workstations Proteon Pronet
BellSouth	BellSouth Services Co. Southern Bell Advanced Systems South Central Bell Advanced Systems	American TeleCom FOCUS ITT 3100 Northern Telecom SL-1, SL-100 InteCom IBX	Northern Telecom workstation
NYNEX	Business Information Systems Inc.	TIE Data Star GTE Omni InteCom IBX	General Datacomm modems and multiplexors
Pacific Telesis Group	PacTel Communications Systems	TIE Data Star American Telecom FOCUS 50, FOCUS 100 Northern Telecom SL-1, SL-100	Data General workstations Codex modems Timeplex multiplexors
Southwestern Bell Corp.	Southwestern Bell Telecommunications Inc.	American Telecom FOCUS 50, FOCUS 100, FOCUS Elite Northern Telecom SL-1, SL-100 InteCom IBX	IBM modems Northern Telecom workstations
US West	FirsTel Information Systems Inc.	TIE Data Star NEC NEAX 2400 Ztel PNX InteCom IBX	IBM PC GRiD Systems, personal computer NED AstraPhacs

quested the InteCom switch. The Northern products, on the other hand, are available for customers with fewer data requirements. These were chosen because of their "good track record and good support from Northern."

CADILLAC TO CHEVROLET

Ameritech's Ameritech Communications Inc. also offers two large switches in its "Cadillac to Chevrolet" approach. During its initial PBX selection process, Ameritech chose the NEC 2400, a modular switch that can be expanded to 23,184 ports from 184 ports. The company recently added Northern Telecom's SL PBXs; according to Lana Porter, director of Advertising and Public Relations, because it was a proven product, while the 2400 is not fully featured at this point. Porter was quick to add that NEC is not behind schedule.

FirsTel's roster has three products that will cover the same line range. InteCom's IBX was recently added to the NEC 2400 and the Ztel PNX. The first release of the PNX, scheduled for delivery later this year, will support 2,000 lines; the second release, expected in early 1985, is supposed to handle 20,000 lines.

By offering more than one PBX, the RHCs can "provide a wider range of features to satisfy client needs," says John Flower, manager of Strategic Planning at Southwestern Bell Telecommunications Inc., the equipment subsidiary of Southwestern Bell Corporation. Southwestern sells InteCom and Northern Telecom PBXs.

But RHCs are carrying the concept

of customer service far beyond the PBX. Because Southwestern is not tied to a network or equipment supplier, says Flower, "we have a unique opportunity to fill the role of office integrator." To enhance the PBX's capabilities, Southwestern offers IBM modems, Northern Telecom SL-1 executive and DP 1000 standalone workstations, and expects to add a full line of modems, and an InteCom executive workstation. In addition, says Flower, the company is evaluating suppliers of applications processors including AT&T, DEC, Wang, and IBM.

FirsTel's product strategy is typical. Describing the company's "unified systems architecture," Ken Garrett, director of product marketing, identifies four levels based on customer function: the core is the "information controller management system," a fancy name for third generation PBX; second comes the "applications layer," including voice mail, electronic mail, and other messaging systems; third is the "transport layer," covering modems, call accounting, and the like; last is the "access layer," including personal computers, executive workstations, and eventually word processing terminals. FirsTel is distributing IBM PCs and XTs, personal computers from GRiD Systems Inc., and a host of data communications products.

NYNEX's Business Information Systems Inc. (NBIS) is following suit. Vince Gerosa, assistant vice president of marketing for NBIS' Business Systems Division, says that NYNEX "will be announcing a complete office automation product line within the next few months that is fully integrated with our PBXs over twisted pair cable." The line will include "word processors, small business systems, and management workstations." Bell Atlanticom has taken a bolder step to differentiate itself by becoming an authorized dealer for DEC teleprinters. Bell Atlanticom also distributes local area networking equipment made by AT&T Technologies and Proteon Inc.

Fig. 2 lists the PBX and office automation supply contracts established by midyear.

While all the regionals seem to have collected the latest in technology, each seems to be deploying its resources differently.

Some of the RHCs have already taken steps to cover the national market. Ameritech has been most aggressive moving outside its region. The company signed a $130 million contract to supply and maintain equipment for SBS Real Estate Communications Corp., a Satellite Business Systems subsidiary which is building and marketing multitenant services in major metropolitan areas throughout the nation. The first cutover by Ameritech, a NEC 2400 PBX, occurred June 1 at the National Press Building in Washington, D.C.

US West's FirsTel is also pursuing opportunities outside its region. "FirsTel has sold in 48 states," notes Cade.

CONTENT TO STAY IN REGION

Others have been content to stay primarily inside regional boundaries. PacTel is focusing on its own region initially for two reasons, according to a PacTel spokesperson: first, to get established, and second, "to close out opportunities for other RHCs."

In all cases, the regionals' primary emphasis is at home. That's because it would be hard to provide a high level of customer service outside the region. "We come from a regional heritage," explains Jack Zaloudek, vice president of marketing at Southwestern Bell Telecom. "Our focus is to go with our regional clients, and go where they want us to go." Only after they build up service capability to support regionally based national accounts will they seek business outside the region.

The heavy emphasis on customer service is paying off so far for the regionals.

All the RHCs seem to have reached or far surpassed their startup goals. According to Zaloudek, SW Bell's results are "far better than we expected. Each month we update our forecasts, and we are turning business a lot faster than we anticipated."

FirsTel's Cade estimates his company had sold over 1,500 PBXs by midyear. SW Bell's Flower also estimates sales in the thousands.

One challenge facing the RHCs has been building up staff to handle all the business. Manpower has been a concern for BellSouth. Because of the unexpected high level of activity, says Ahern, "it's hard to keep up with special requests, product delivery, responding to RFPs, etc." So far they are managing.

Price has been a major factor contributing to the regionals' success and some competitors are crying foul.

"Because of the large volume [of our supply contracts]," notes FirsTel's Cade, "we are very competitive pricewise." But, he adds, "we are not giving them away. We don't have to."

NYNEX's Gerosa agrees: "We are being price competitive, but we don't belive in gaining market share by losing profitability."

Richard Moley, vice president and general manager of the Marketing Group for Rolm Corp., which competes head on with the regionals for PBX business, sees things differently. The RHCs on occasion are "using pricing strategies to enter the market," says Moley. "They clearly are all losing money" in medium and large PBXs, he adds.

The regionals face a number of other obstacles as well. Regulatory issues are a major inhibitor.

Ameritech and BellSouth both sell PBXs through divisions of the operating companies in the region. The FCC's Computer Inquiry II decision, however, requires that telcos set up separate subsidiaries for equipment marketing. Another gray area is whether the RHCs can sell processing equipment. "Our biggest obstacle is the uncertainty of the regulatory environment," states NYNEX's Gerosa. In particular, he adds, "we are waiting on a final decision on our ability to sell data and software with one sales force."

The regionals must blow away the clouds of confusion surrounding divestiture. This is Bell Atlanticom's biggest obstacle, according to Peggy Kingsland, the company's manager of communications. "People are confused about divestiture; they are not sure who we are," says Kingsland. "We have to build our own recognition factor."

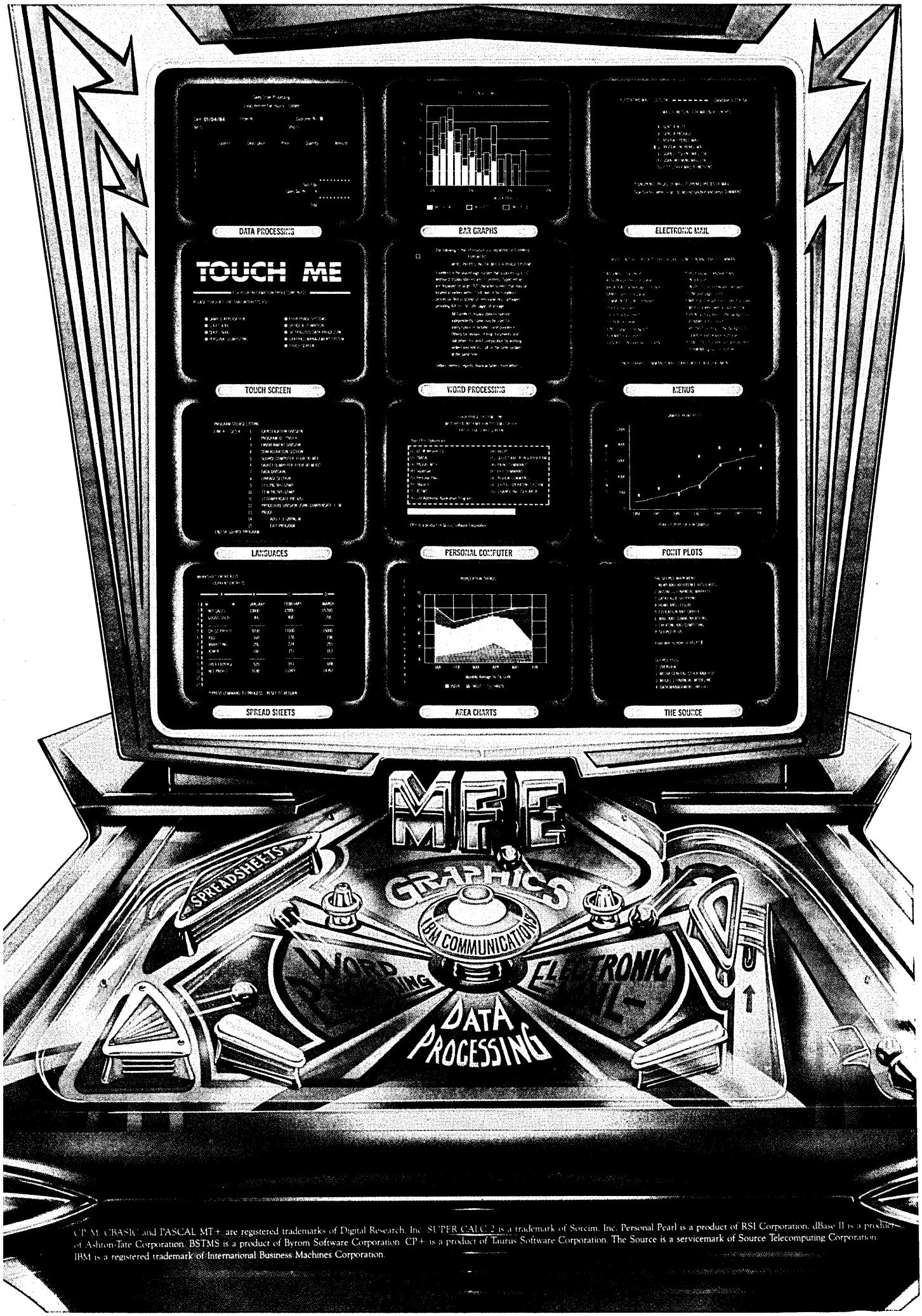
Despite these obstacles, Rolm, AT&T Information Systems (AT&T-IS), and smaller interconnects must be worried about the building momentum of the regionals.

Rolm and AT&T-IS are both relying on their direct sales forces to distribute their PBXs and office automation lines. They are likely to feel greater pricing pressure across the board. Moreover, it may be difficult for them to keep up with RHCs armed with a broad range of state-of-the-art telecom and office automation products.

The entry of the regionals into the PBX and office automation markets is sure to generate some winners. One winner is likely to be the customer. The new competition will bring the latest technology to the fore. The RHCs have already proven to be big boosts for third generation PBX suppliers InteCom and NEC.

The door is wide open for newer PBXs, like Ztel's PNX, and new developments in networking and automation. And the RHCs may emerge as the few companies capable of playing the role of office integrator. ◉

William W. Ambrose is chief industry analyst for Northern Business Information Inc. and editor of *The Telecom Strategy Letter*, which analyzes competitive strategy in the telecommunications industry.



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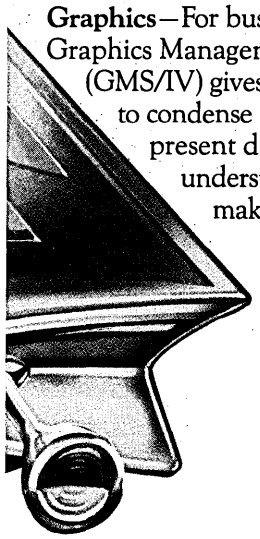

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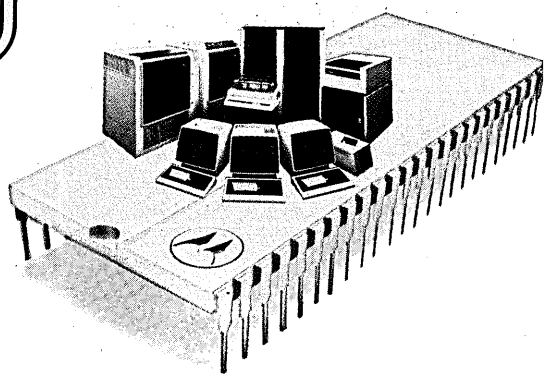

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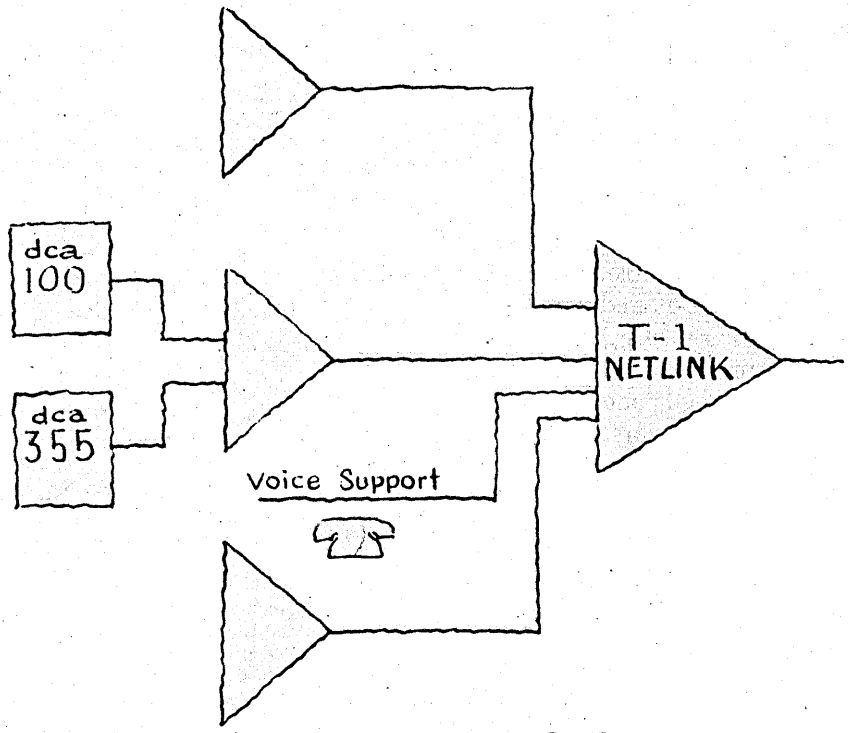

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CIRCLE 48 ON READER CARD

The market is crowded, and buzzwords are flying fast and thick. Here are some tips on how to make sense of it all.

THE PBX: WHAT MATTERS, WHAT DOESN'T

by George M. Pfister

The PBX business is confused. As the distinction between communications and data processing has blurred, so also has the ability of vendors and users to understand the real issues concerning PBXs. Some of this confusion is unavoidable, but a lot of it seems to have been manufactured for marketing purposes.

Many veterans of the voice business, both users and vendors, are not yet accustomed to the underlying digital technology of the modern PBX. I have dealt with PBX product managers who couldn't present a system architecture in which the numbers of time slots or bus speeds added up in a consistent fashion.

Dp personnel, on the other hand, may hear the terms "cycle time," "bus," and "digital," and jump to the conclusion that a PBX is a computer, and that they are well equipped to handle a purchase decision.

The classic case of PBX-based confusion was the "analog vs. digital" argument. In the mid-1970s, when phones and transmission facilities were hopelessly analog and there was no technological or manufacturing reason to go digital, many users purchased systems touted as digital even when an analog system had superior capacity. In fact, AT&T's Dimension 2000 had better capacity than its competitors precisely because it was analog.

The once-sedate PBX business is today the domain of buzzword mongers whose claims of "integrated voice and data" and "broadband compatible" fill the air and the pages of the trade press. The industry may be immature, but it's already making full use of the sophisticated promotional machinery of computer marketing. The time seems right for a back-to-basics—or more aptly, back to business—view of the market. A good place to start is with one of today's most frequently discussed (and widely misunderstood) concepts—the PBX generations.

First generation (or manual) PBX systems entered the business world in the late 1800s. Second generation systems appeared on the scene in 1929, with Bell's 701 family of equipment. The major difference between the two generations was that an operator was not required to handle outgoing or intra-office calls.

In the mid-1970s there appeared a subcategory of systems that we term late second generation. These systems used a computer to control the switch and offer enhanced functions such as programmable instrument moves and changes and least-cost routing. By doing away with the operator, earlier second generation systems had lost the intelligence necessary to call an executive back when a line was free, or reference a route list for long distance communications. The stored program control inherent in the late second generation systems restored these functions.

The first third generation system was the Intecom IBX, which was announced in 1979. Since then, major vendors have announced their own third generation products: the ATTIS System 85 Release II, the NEC NEAX 2400 IMS, the Rolm CBX II, and others. The third generation PBX has three main characteristics: distributed architecture, nonblocking operation, and integrated voice and data. These characteristics have generated considerable promotion and controversy.

Nonblocking operation will never be required for voice communications where a large number of telephones can be adequately serviced by a lesser number of communications channels. When long holding time data communications are added, high-capacity, nonblocking operation may prove more useful than lower-capacity, voice-only PBX systems.

Older systems in the second generation class were designed to support voice, not data. A voice system designed to support random calls that last two to five minutes may be severely overloaded when confronted with a large number of time-sharing users who stay on the line for hours. But functions such as electronic messaging, which has voice-like traffic requirements (short session/random arrival), can be supported, at least until the time-sharing monsters arrive. The third generation systems have substantially more channel capacity since they were designed with data in mind.

SYSTEMS CALLED NONBLOCK

Many of these third-generation systems are described as "virtually" or "essentially" nonblocking. The vendors are referring to the fact that completely nonblocking architecture is practically impossible, owing to network, common equipment, or processor real-time limitations. If a vendor claims that a large system (2,000 to 4,000 lines) is completely nonblocking, be sure to ask where you should put the Cray processor required to control the switch.

Distributed architecture, in terms of topology and control, is another characteristic of third generation systems. In regard to topology, switching modules are distributed over coax or fiber media. This can produce occasional benefits in situations where cable distribution channels are loaded, but is most useful in a campus situation, or when you want to simplify cable management.

There are two control distribution strategies: hierarchical and fully distributed. Hierarchical systems such as the Intecom IBX and ATTIS System 85 distribute routine functions to the switching module, with the real control residing in a central processor. In fully distributed systems, the switch module processes its calls independent of any other system component. It is argued that fully distributed systems are inherently more reliable since failure of a single central node, no matter how catastrophic, does not produce overall system outage. The hierarchical camp counters that fully distributed PBXs cannot perform under high-load conditions because of internode control and synchronization problems. While the hierarchical approach will be viable for almost all users,

the increasing power and diminishing cost of processors probably favors the distributed approach in the long term.

Several vendors are currently offering switches they describe as "fourth generation." The features that supposedly justify the christening of this new generation are things like "inherent broadband architecture" and "integrated packet switching." We have seen no new products, however, that merit classification as a new generation.

Having observed the PBX business for a number of years, Perspective Telecommunications Group has developed a view of what vendors will need to succeed in the market. The characteristics include:

- an applications orientation
- terminal products
- dedicated distribution
- installed base
- service and support
- R&D track record
- vertical integration

Let's consider these attributes one at a time.

Applications orientation. Someone at Rolm said it best: "The good news is that everyone needs a PBX. The bad news is they only need one." A vendor that cannot grow or receive an ongoing revenue stream has a poor prognosis for success. Once you have sold someone a third generation PBX with almost unlimited capacity, you're going to have to wait quite a while before you can send another.

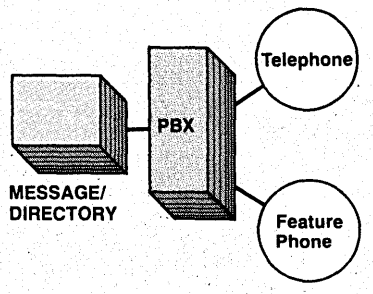
Fig. 1 depicts a simple message/directory processor commonly associated with most of the systems shipped today. An additional feature of this processor complex might be station message detail reporting (SMDR) processing. The user devices connected include basic analog telephones or more sophisticated feature phones with discrete feature buttons and displays.

LEAD-UP TO SMART PHONES

In Fig. 2 we have added voice processing (voice store and forward and voice recognition) equipment, and text and data processing. In addition to generating direct revenue streams, the applications processors also bring about the purchase of more feature phones, and ultimately lead customers to "smart phones"—sophisticated devices that provide an effective interface for electronic mail and data processing. Feature phones cost between $100 and $300, and smart phones cost from $1,500 to $2,000. Together, they can provide a PBX vendor with considerable revenues. Note also that the processors, switch, and terminals operate with sophisticated, proprietary protocols.

FIG. 1

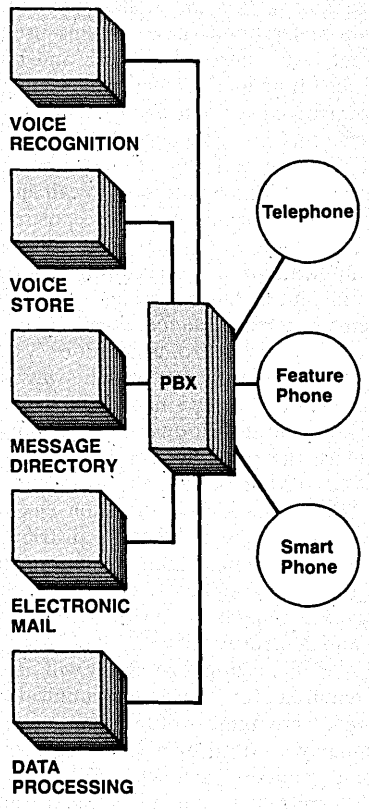
PBX MIGRATION PATH: PRESENT VIEW



MARKET PENETRATION	DEPENDENCE ON PROPRIETARY PROTOCOL	COMPLEXITY OF HUMAN INTERFACE
90%	None	None
10%	Medium	Low

FIG. 2

PBX MIGRATION PATH: FIVE- TO SEVEN-YEAR VIEW (1987-?)

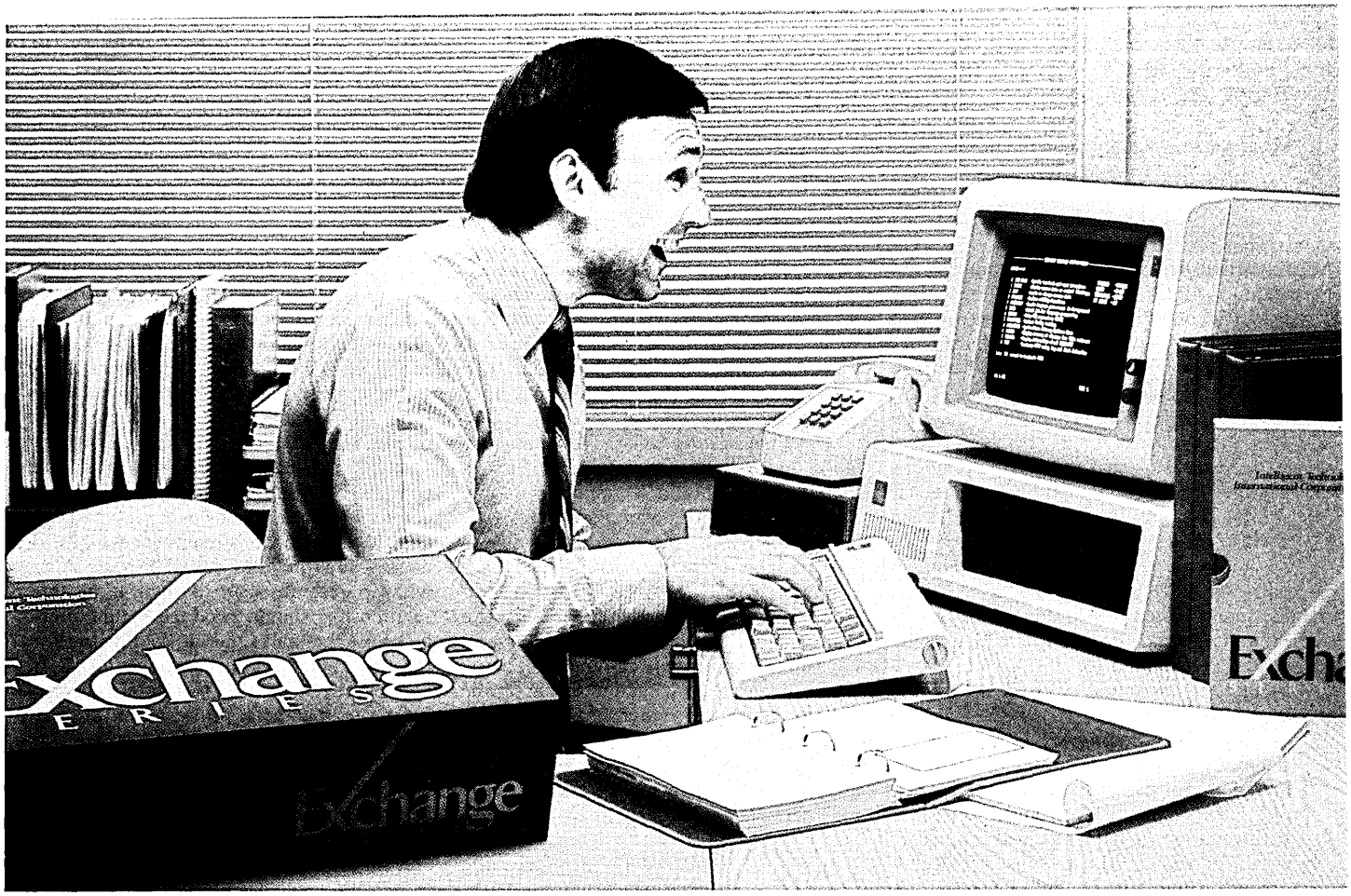


MARKET PENETRATION	DEPENDENCE ON PROPRIETARY PROTOCOL	COMPLEXITY OF HUMAN INTERFACE
0%	None	None
50%	High	Medium
50%	High	High

The bottom line is that vendors whose product lines don't reflect an applications orientation may not be able to maintain high enough margins to provide anything more than basic support.

Terminal Products. A vendor who sells the PBX and the applications processor but does not have a terminal product line will be less profitable and stable than a vendor who sells all system components.

Dedicated Distribution. As should be apparent from the migration scenario described in Figs. 1 and 2, we are no longer dealing with a POTS (Plain Old Telephone Service) environment. The demands placed on a sales and service organization by this new environment will transcend the capabilities of today's interconnect distributors. Installation of mainframe communications links and local area network gateways will



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Feature phones and smart phones together can provide a PBX vendor with considerable revenues.

require dedicated support from an account team of highly trained specialists. Any reader who has ever implemented (or tried to implement) an interface for a third party device beyond SNA Physical Unit 1 will appreciate the complexity of this task.

Installed Base. In any systems business, the quality and size of a vendor's installed base is critical because it provides a habitual (and possibly captive) market for add-on products and services. For the end user, a vendor with a large installed base has a larger customer community to potentially subsidize research and development for sophisticated new products. ATTIS, for example, has an installed base that could potentially be used to subsidize the development of switches tailored to specific industries.

Service and Support. For some years Perspective has been recommending (albeit half humorously) that our clients include one question in all RFPs and discussions with vendors: "What is the instruction processing speed of the proposed switch/-processor in microseconds?" Because some vendors can't answer very convincingly, it helps a user identify those manufacturers who understand and can support a sophisticated real-time system. As the PBX market environment changes, service and support will require more sophisticated people and greater vendor commitment.

Even so, users should assume that they'll have to be autonomous when it comes to routine system operation and maintenance. Thus, switches that offer easy operation and maintenance—i.e., moves and changes and board swapping—are preferable. After all, your computer vendor doesn't operate your computers.

Research and development track record. All the PBX system components may be available, but unless the vendor can provide accessible internal interfaces, people will not use them. Unless a consistent and well-thought-out product line exists, expensive subsystems (processors, switch, terminals) may have to be replaced prematurely. Some vendors may cite superiority in research on underlying technologies such as fiber optics and VLSI. However, these credentials are less significant than the vendor's ability to deliver cost-effective, user-friendly functionality.

Vertical integration. This characteristic is important in two respects: First, a manufacturer should be more profitable than a distributor in a market of this size. Theoretically, the distributor will always have a higher price than a well-tuned manufacturer/distributor since there is an additional price component to cover the manufacturer's margin. Second, and perhaps more important to the end user, a vertically integrated manufacturer should be better equipped to design PBX subsystems in concert with a systematic world view. This sytematic world view guarantees that all system components will work efficiently together.

AT&T, ROLM ARE FAVORITES

Based on the foregoing criteria, two favorites emerge: AT&T Information Systems and Rolm. While both companies qualify positively against every one of our success criteria, they have come from different market positions. The pivotal point in comparing the two vendors is their research and development track records. Though ATTIS possesses the awesome R&D capabilities of Bell Labs, it has been lackluster for the last few years in the introduction of new products. This situation is changing, as evidenced by introductions such as System 85 Release II, System 75 and the well-packaged 3B family of processors. In any case, it is unlikely that ATTIS is interested in being a technology leader. With its strong distribution and market share, ATTIS is likely to maintain its position as the industry war-horse.

Rolm had an uncanny level of responsiveness to the market in terms of product development. Rolm's Phonemail voice messaging system was the first truly integrated system. Data communications was brilliantly addressed with submultiplexing and X.25/TI interfaces. The CBX II effectively quadruples the capacity of all installed systems, and the digital Rolmphone terminal products could make analog telephones virtually obsolete.

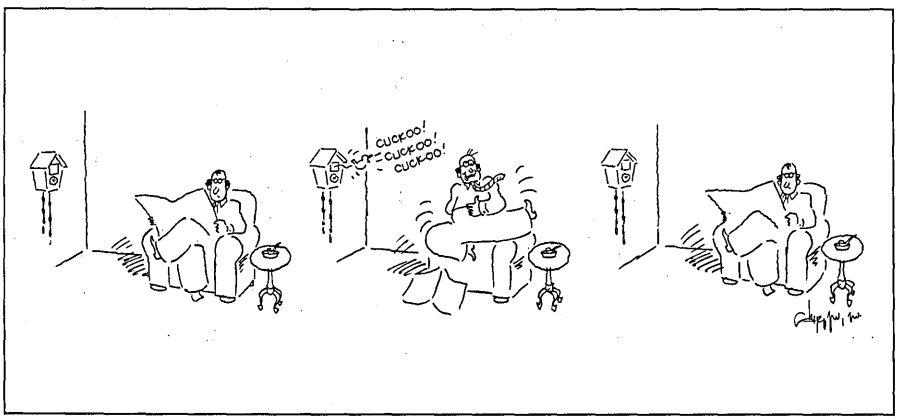
No discussion of Rolm would be complete without some analysis of the IBM connection. IBM now owns 20% of Rolm, and the relationship strengthens Rolm's finances and provides superior positioning with dp executives. In the long term, this relationship should produce better interface packages and superior field liaison for the two companies for implementation of PBX/processor links. If high-level IBM-processor-to-PBX interconnections are required, Rolm may be the best bet.

In the future, look for ATTIS and Rolm to become more similar, with ATTIS becoming more responsive with products, and Rolm approximating the sales, service, and support clout of ATTIS.

While we have flagged two vendors as favorites, this is not to imply that other vendors won't be in business next week or next year. Readers should assess how the PBX will fit into their corporations' plans. If the migration scenario presented earlier seems a likely one for your company, what you should be most concerned about is the long-term health of a prospective supplier. Will the vendor be able to protect your large investment in processors and terminals, and prevent disruptions if a system has to be replaced? On the other hand, if the PBX is not central to your office automation plans, your commitment is less and many suppliers may be adequate.

In the future, other vendors may meet our success criteria. The Regional Holding Companies (former Bell Operating Companies) may prove to be durable competitors despite restrictions on their ability to manufacture. Their success could shore up equipment suppliers such as NEC, Intecom, Northern Telecom, and others. Ericsson bears some scrutiny because it has committed to most of the investments necessary to meet our criteria.

One final note: the purchase of a PBX may not be quite as simple as many dp professionals might wish. A business rather than a technological perspective can make the choice easier. ◉



George M. Pfister is president of Perspective Telecommunications Group, Paramus, N.J. He has over 14 years' experience in the design of sophisticated voice/data communications systems as a user, vendor, and consultant.

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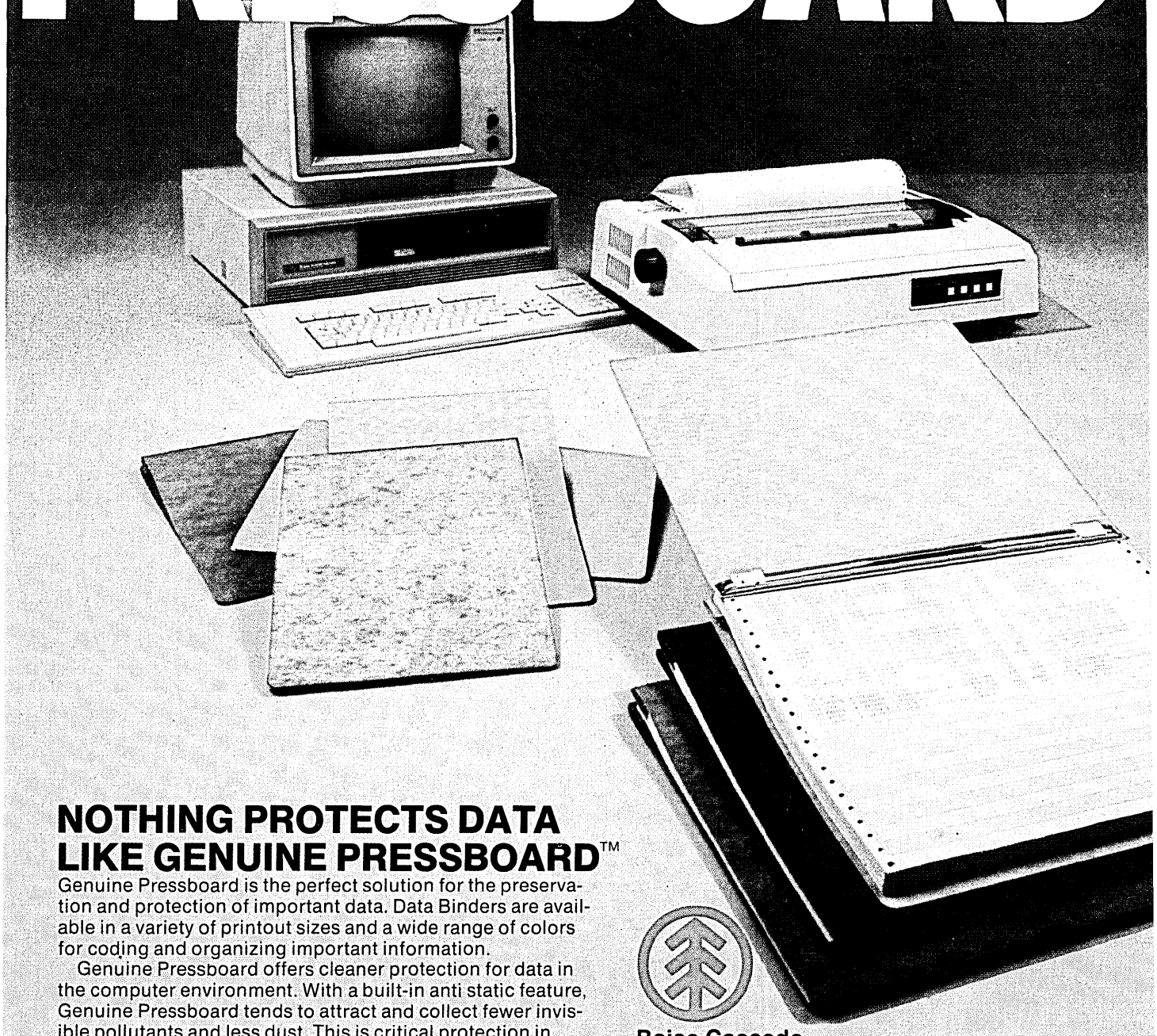

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INFORMATION SERVICES

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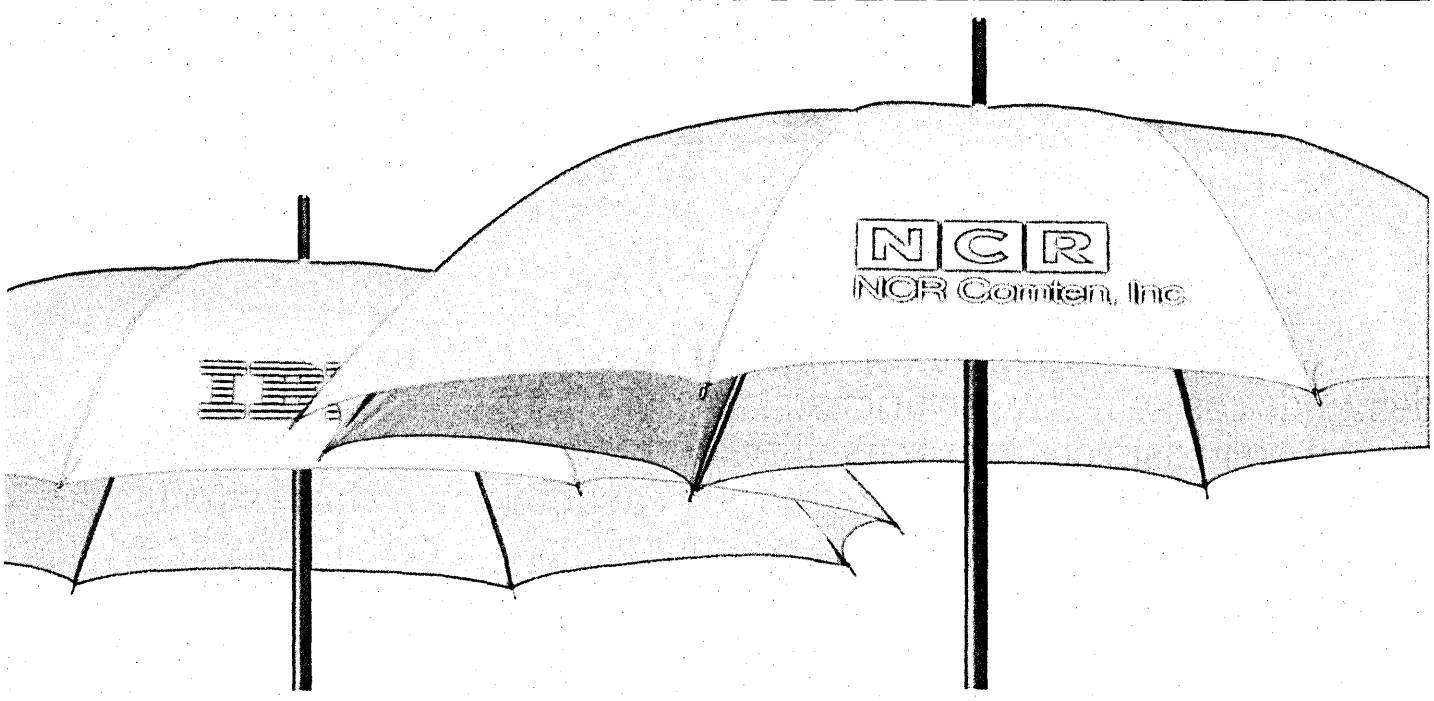

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CIRCLE 52 ON READER CARD

HARDWARE

OFF-LINE

With all the commotion about the influx of Japanese computer equipment into the U.S., very little has been said about U.S. products that find their way into Japan. Nevertheless, some U.S. vendors have found Japan a hospitable environment. VMX Inc., for example, recently became the first company, American or Japanese, to win approval for a voice store and forward system to be sold in Japan. When the Nippon Telegraph and Telephone Public Corp. (NTT) approved the Richardson, Texas, firm's Voice Message Exchange, Japan became the seventh foreign country to endorse the product. The VMX system will be marketed in Japan by Marubeni Corp., a Tokyo-based international trading company, rather than by VMX.

In several countries, such as Japan, England, and West Germany, VMX has had to overcome nationalistic trade barriers before being allowed to sell its product. Its success in entering and profiting from foreign markets can to a large degree be explained by the nature of its product. Voice mail systems are computers that interface to PBXs to allow users to leave voice messages for each other. The major vendors worldwide today are Rolm, AT&T, VMX, and Wang, all U.S. firms. The systems are, however, in significant demand by some of the largest multinational companies for both domestic and foreign facilities. Using voice mail, employees in America can talk to their counterparts anywhere in the world without regard for time zones, and in whatever language they choose. (Of course, the machines don't translate; both parties must speak the same language.) The systems provide advantages of both telex and telephone. Thus, the combination of demand by large multinational firms and the limited number of suppliers makes it easier for the American suppliers to enter foreign markets. Japan has no alternative if it wants voice mail.

Robots, as we all know, specialize in tasks we humans consider drudgery or menial work. Of course, one definition of menial may differ significantly from another. Cooking, for example, is a task that many people consider drudgery but that, according to Professor Brian Reid of the electrical engineering department at Stanford, is not well-suited to a robot. He tried to program one to prepare a Beef Wellington, following Julia Child's recipe that involves 26 ingredients, hundreds of steps, and piles of dirty dishes. All that was needed, he thought, was a computer program for the robot that would give specific step-by-step instructions. That turned into quite an undertaking. Take one task for instance—that of preparing the mushrooms. The robot has to go to the refrigerator to get the mushrooms and then bring them back to the sink to wash them. Once the mushrooms are washed under the faucet, they have to be chopped. The robot must be told to remove the stems, throw away the ends, cut the stems, then cut the crowns perpendicular to the base. In the meantime, the robot must check the melting butter every 10 seconds, which barely gives it enough time to chop another stem.

Another major problem for Reid was to translate terms like "until done" into terms the computer would understand. Needless to say, the meal never got done. In fact, Reid spent 13 hours attempting to program the robot and only got 5% of the recipe. He thinks it will take him five years to develop the notations for the operations. So much for using computers to solve important world problems.

NETWORK OPERATIONS SYSTEM

This computer-based system is designed to cut the cost of running a telephone switching network by streamlining its operations. The Multifunction Operations System enables users to centralize the operations, administration, and maintenance of a switching network. In turn, according to the vendor, this will reduce operating expenses and improve service to customers.

The system is design to allow users to gradually centralize their telephone network operations at low, incremental costs. The system's modular architecture allows users to select the functions and features they require for the present, while providing expansion for future needs.

The unit can interact with a user's existing operations system and support different switching system protocols. Programming features allow users to "fine-tune" the system to their own needs. The vendor is offering the Multifunctions Operations System to independent, international, and privately owned telephone networks such as Fortune 500 companies, government locations, and university campuses.

The architecture is centered around the vendor's Datakit Virtual Circuit Switch (VCS), a local area network product that establishes communications between the network systems, 3B computer-based functional modules, and user workstations. The modules provide the specific features selected by users, who can communicate with the system through a keyboard/display terminal. An optional color monitor and audible alarm equipment with a voice synthesizer are available. The system's software is written in C and uses the Unix operation system.

A basic startup Multifunction Operations System contains three core modules that perform the following functions: maintain and administer the switch; mon-

itor the switching system, and environmental and other user-defined alarms; and update and verify the exchange database information. The price of a basic configuration, including hardware and software, is between $250,000 and $350,000. AT&T TECHNOLOGIES, New York City.

FOR DATA CIRCLE 301 ON READER CARD

TURNKEY FORECASTING WORKSTATION

The Horizon/370 is a turnkey forecasting system combining mainframe statistical, modeling, and forecasting software on the IBM PC XT/370. The system uses an optimized version of this machine featuring increased hard disk storage and response time, which is three times faster than the normal configuration, according to the vendor.

As a dedicated forecasting workstation, the system provides users with the equivalent of a 370 mainframe running VM/SP Release 2.0 using CMS, a 30MB storage capacity, and up to 4MB of virtual memory. Among the forecasting techniques are regression analysis including nonlinear, two stage, and pooled regression; and time series analysis including automated Box-Jenkins and automated State Space.

Intended for the professional forecaster, the system provides a standalone analysis environment with mainframe computer links. It contains XSIM, the vendor's proprietary applications software, the Lotus 1-2-3 reporting and graphics package, and IBM's DOS 2.0 Operating System. Users can access corporate data from the mainframe as well as information from third-party data suppliers.

Combining the vendor's and users software and data sources, the system is used to evaluate and validate statistical models, develop forecasts, create custom reports and graphics, and create routines to automate repetitive forecasting tasks for automatic updating of private databases. The Horizon/370 costs $50,000. CHASE DECISION SYSTEMS, Cambridge, Mass.

FOR DATA CIRCLE 302 ON READER CARD

LASER PRINTER

The LaserJet printer is designed to operate with personal computers. It is targeted for small businesses and offices. According to the vendor, the printer is so quiet, personal computer users can carry on phone conversations sitting next to it while it is printing. The unit registers a noise level of less than 55 decibels when printing documents.

Compatible with major existing software packages, the unit can print either horizontally for business correspondence or vertically to create spreadsheets using a compressed character font.

Eight pages can be printed per minute while maintaining print quality nearly indistinguishable from copy produced on electric typewriters. The printer has a 300 by 300 dots-per-inch resolution. In addition to the Courier 10 font, the printer offers up to four fonts in plug-in cartridges. The unit also has built-in raster graphics capabilities.

The printer uses standard cut-sheet paper plus legal-sized paper and European sizes A4 and B5. Bond paper with preprinted letterhead, envelopes, labels, and transparencies designed for copies are among the materials users can process on the printer.

It comes with a built-in sheet-feeder, which can handle 100 sheets of paper at a time. The unit can also be fed odd-sized paper one sheet at a time. Two-sided printing is possible using manual feed. The unit also has a disposable cartridge. The LaserJet personal printer (HP2686A), with Courier 10 font, multiple typefaces, disposable printing cartridge, built-in sheetfeeder, and RS232C interface is priced at $3,500. Additional disposable printing cartridges are $100 for one and $90 for eight or more. Plug-in font cartridges containing three fonts sell for $225 each. HEWLETT-PACKARD CO., Palo Alto, Calif.

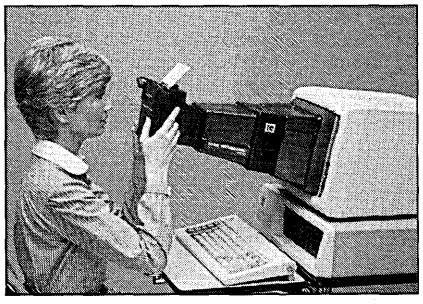
FOR DATA CIRCLE 303 ON READER CARD

CAPTURES COMPUTER GRAPHICS

The Instagraphic crt print imager enables users to make color prints of images displayed on a 9-, 12-, 13-, or 19-inch screen. It is a modular system that provides users flexibility in documentation of still images displayed on a video or computer screen.

In addition to its instant print-making capabilities, the outfit can be used to produce conventional color slides and prints of the crt image by using a 35mm single lens reflex camera, not provided with the outfit.

The system offers users a wide variety of cone adapters to match just about any available screen size. To create an instant print, the user snaps the appropriate adapter, places the base of the unit on the crt, and pushes the camera exposure button. One or two test exposures may be required to arrive at the best exposure time for the brightness level on the display.

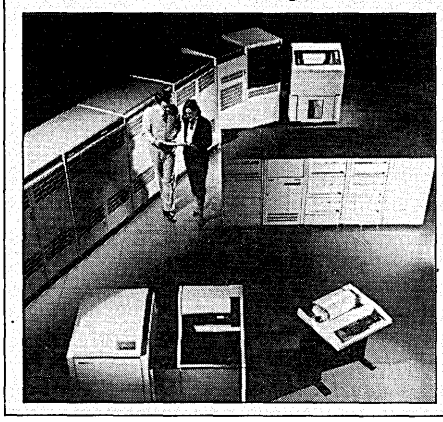


HARDWARE SPOTLIGHT

MAINFRAMES

The DECsystem-1095 and DECSYSTEM-2065 boast up to 20% greater performance than the vendor's current model 10 and 20. Performace increases are made possible by a new cache and main memories.

Both computers are targeted for the vendor's existing mainframe customer base in research, industry, commerce, and universities. Typical applications include performing complex mathematical modeling in scientific and engineering research, managing large databases in financial and executive operations, and handling both edp and large timesharing functions in colleges and universities.

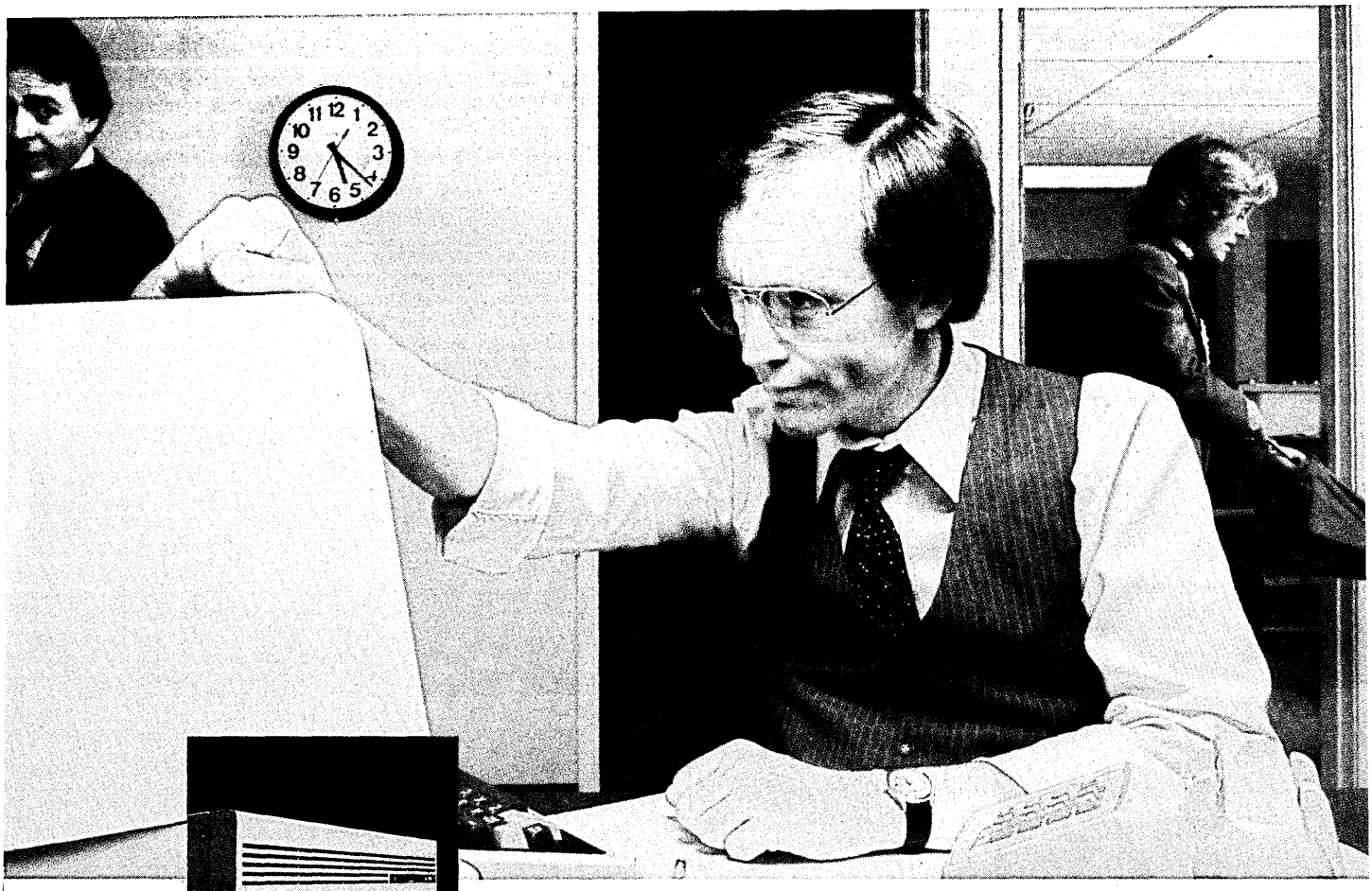


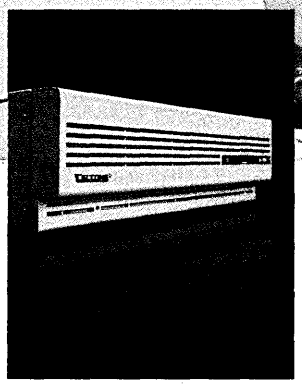
Both the 1095 and 2065 basic configurations feature a 36-bit central processor, a new cache/pager unit, an minimum 2 Mwords (9MB) of memory, 176MB disk drive, DECwriter III hardcopy console terminal, and a 16 asynchronous line front end.

Memory for the computer systems utilizes 64KB MOS chips, enabling more primary storage capacity in the same floorspace. The memory can be used in DECsystems-1091 and earlier DECsystem-20 configurations, and the vendor is implementing a trade-up program for the lower-density memories on these systems with credits toward the new memory.

The cache/pager has 4 Kwords (18KB) memory, and brings the cache hit ratio to approximately 95%. The hardware page table upgrade increased the page table entries to 1,024 from 512 and the number of directory entries from 128 to 512. System prices for the mainframes start at $395,000 for the DECsystem-1095 and $355,000 for the DECsystem-2065. The upgrade kit costs $40,000. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 300 ON READER CARD





"What good is 9600 baud if your stat mux slows you down?"

Speed can be addictive, that's a fact. Once users get accustomed to fast feedback they just don't want to hear that your lines are overloaded or your mux just can't keep pace. They want their data and they want it now.

To help you avoid these baud rate bottlenecks, Teltone is happy to introduce our new M-860 Statistical Multiplexer.

You want speed? It's a thoroughbred at up to 78,600 bps, so you can take full advantage of 56K bps DDS circuits. You need flexibility? It's a chameleon that offers six different data link interfaces—two with integral modems.

Efficiency? It's an unparalleled performer that delivers multiplexing efficiencies of 800% and more. Friendliness? This is your mux—fully programmable from the local or remote end with an interactive menu system that also provides access to diagnostics and statistics. You'll never deal with DIP switches again. The M-860 is compatible with our own DCS-2 Data Carrier system and voice-grade lines, but it works equally well over microwave, coaxial cable and fiber-optic hookups.

Want more? How about local or remote echoplex, full field expansion, CRC error detection and ARQ retransmission, speed conversion—plus the same dependable service we've been giving the telecommunications industry for more than 15 years.

It's a combination that's really hard to beat, in a mux for people who'd rather be working than waiting. Call 1-800-227-3800 Ext. 1122 or write Teltone Corp., PO Box 657, Kirkland, WA 98033. In Canada call (406) 475-0837 or write 183 Amber St., Markham, Ontario L3R 3B4.

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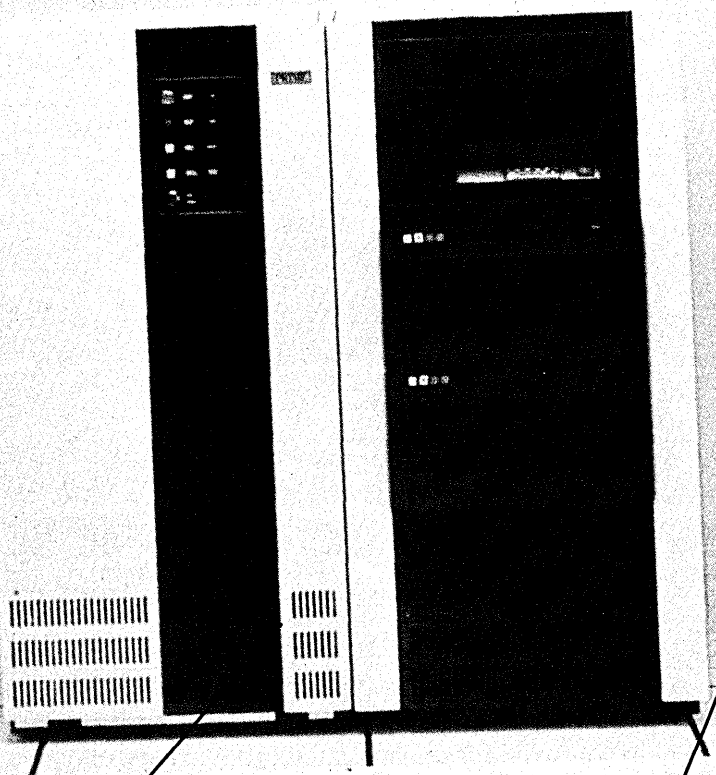

More power. Introducing the Prime 9650,™ a technological advance in 32-bit systems. Up to 96 users. Up to 8Mb MOS memory. Gate array technology. Performs multiple applications simultaneously with fast response times.

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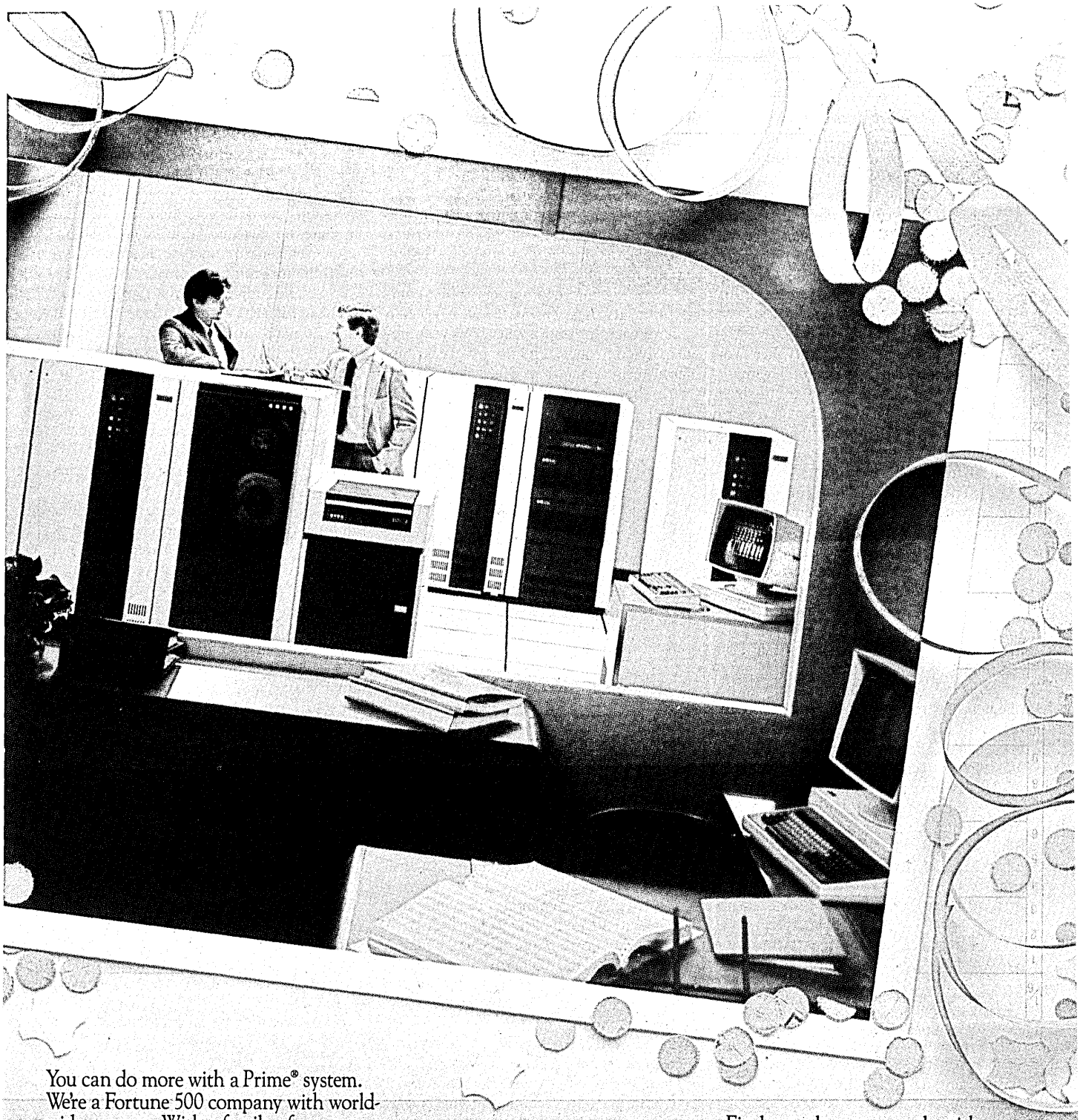
Less money! Our new state-of-the-art systems can cost as little as $4,000 per user. They're also more reliable, easier to maintain, and easier to service.



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CIRCLE 54 ON READER CARD

The system comes with a Kodak Instagraphic camera back that holds a 10-exposure pack of film, a print module including shutter and optical elements with variable focus lens, a crt cone, and cone adapters. The Instagraphic crt print imager sells for $300. Individual cone adapters can be ordered for $40 each. EASTMAN KODAK CO., Rochester, N.Y.

FOR DATA CIRCLE 304 ON READER CARD

NETWORK CONTROLLER

The Analysis 550 network controller provides automated network management capabilities for small- to medium-sized network applications. It manages from one to 10 lines while automatically monitoring line, terminal, and modem problems at up to 512 locations.

The unit tracks line impairments and expands the range of conventional parameter reporting. It analyzes data from every network location automatically and on a continuous, noninterfering basis. Modem diagnostic microprocessors extract information on the actual condition of the phone lines. The controller allows software-generated configuration strapping options of the vendor's MPX modems to be downline loaded. Users can display the strapping configuration of any modem in the network.

The operator commands the network from a terminal controller and keyboard. Polling and status reporting is completed over a noninterfering diagnostic channel and does not affect primary data transmissions. The Analysis 550 costs $12,500. PARADYNE CORP., Largo, Fla.

FOR DATA CIRCLE 305 ON READER CARD

CONTINUOUS FORMS PRINTER

The 4715 Continuous Forms Printer, Model 1 is a tabletop, serial, bidirectional, matrix, impact printer. It accepts either continuous-form or cut-sheet paper.

Designed for flexibility, the printer can operate at five different print speeds ranging from 90 to 216 characters per second. It attaches to the IBM 4701 controller via a loop, which operates at speeds of 1,200, 2,400, or 4,800 bps.

The 18.5 by 16 by 6-inch printer supports both regular and quality print. The unit has an eight-inch print line capable of printing up to 136 characters on a line at 17 characters per inch and provides line spacing at five or six lines per inch, program selectable. The printer also has a "clean hands" ribbon replacement.

This printer is part of the vendor's 4700 Finance Communications System. The IBM 4715 Continuous Forms Printer costs $3,600. Both volume discounts and monthly rentals are available. IBM CORP., Rye Brook, N.Y.

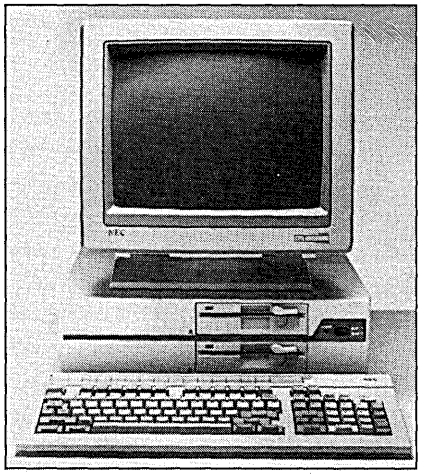
FOR DATA CIRCLE 306 ON READER CARD

DUAL OPERATING SYSTEMS

The Advanced Personal Computer III runs both MS/DOS and Unix. It is intended for both business and at-home applications. Business users can take advantage of the system with a hard disk, while home users can use a television interface and joystick for educational and entertainment applications.

This microcomputer is IBM-compatible. It uses an 8MHz NEC PD8086 microprocessor and a NEC 7220 graphics display controller. The floppy disk transfer rate is faster than 30KB per second; with the hard disk the transfer rate is 625KB per second.

The base model includes 128KB of RAM memory, keyboard, and a single,



5¼- inch, 320KB floppy disk drive. Memory can be upgraded to 640KB with expansion boards. An additional 320KB disk drive is also available.

The system can also be configured with a 10MB Winchester hard disk. A Centronics printer interface is standard, as are RS232 and color or monochrome monitor interfaces. Optional interfaces include an additional RS232 and IEEE-488.

Monochrome graphics, standard with all APC III models, include 64KB of graphics memory. The graphics resolution is 640 by 400 pixels. Full eight-color capability and color monitor are available.

The basic Advanced Personal Computer III sells for $2,000 and includes a single floppy disk drive and monochrome graphics with 128KB of memory. An APC III monochrome system with floppy disk drive and 10MB Winchester hard disk retails for $4,000. NEC INFORMATION SYSTEMS INC., Boxborough, Mass.

FOR DATA CIRCLE 307 ON READER CARD

GRAPHICS COPIER

The 4692 Color Graphics Copier is designed for applications ranging from computer aided design to business presentation graphics.

The product is compatible with the vendor's 4107, 4109, 4113B (option 9), and 4115B (option 9) color display terminals. Field-retrofittable terminal firmware upgrades for these products will be available this fall. The 4692 can accommodate up to four simultaneous signal sources when equipped with an optional four-channel multiplexor.

The unit supports two printing modes. Fixed-resolution mode prints at the copier's full 154 dots per inch addressability, producing up to 1,536 by 1,152 dots in an 8.5 by 11-inch image during a two minute printing period. Variable resolution mode copies take approximately one minute. This mode is selectable under software control.

The printer utilizes the vendor's "Ink Transient Suppressor" technology—a five-micron screen mesh filter that traps bubbles and particles that work their way into the ink system. When not in use, the ink head is parked against a capping station. Heads are automatically purged and washed each time the copier is turned on and after every 50 copies. The head can also be purged manually.

Ink is supplied from three separate ink cartridges to mix colors. Black is supplied from a fourth separate cartridge. Additional shades can be created using half-tone dot patterns provided either by the signal source or generated by the onboard 216 pattern "look-up" table.

The graphics copier can connect directly to host mainframes or non-Tektronix terminals that support a Centronics-type parallel interface modified to accommodate color data, four-channel copier multiplexing, and the the higher data rates required by color. The 4692 Color Graphics Copier costs $6,000. The optional four-channel multiplexor is priced at $900. TEKTRONIX INC., Beaverton, Ore.

FOR DATA CIRCLE 308 ON READER CARD

COLOR WORKSTATION

The D-90C is a color raster workstation for use with the Unigraphics system for computer aided design, manufacturing, and engineering. It is designed specifically to meet the needs of engineers and designers working in the CAD/CAM/CAE environment.

The workstation consists of a graphics display terminal with a 19-inch screen and a 12-inch screen message monitor. The unit has an alphanumeric keyboard, which includes a joystick, 12-key numeric keypad, system control keys, and a 32-button keypad for selecting Unigraphics functions and menus.

The screen can be used in normal room light. According to the vendor, the use of two crts, each dedicated to its specific task, means messages and menus

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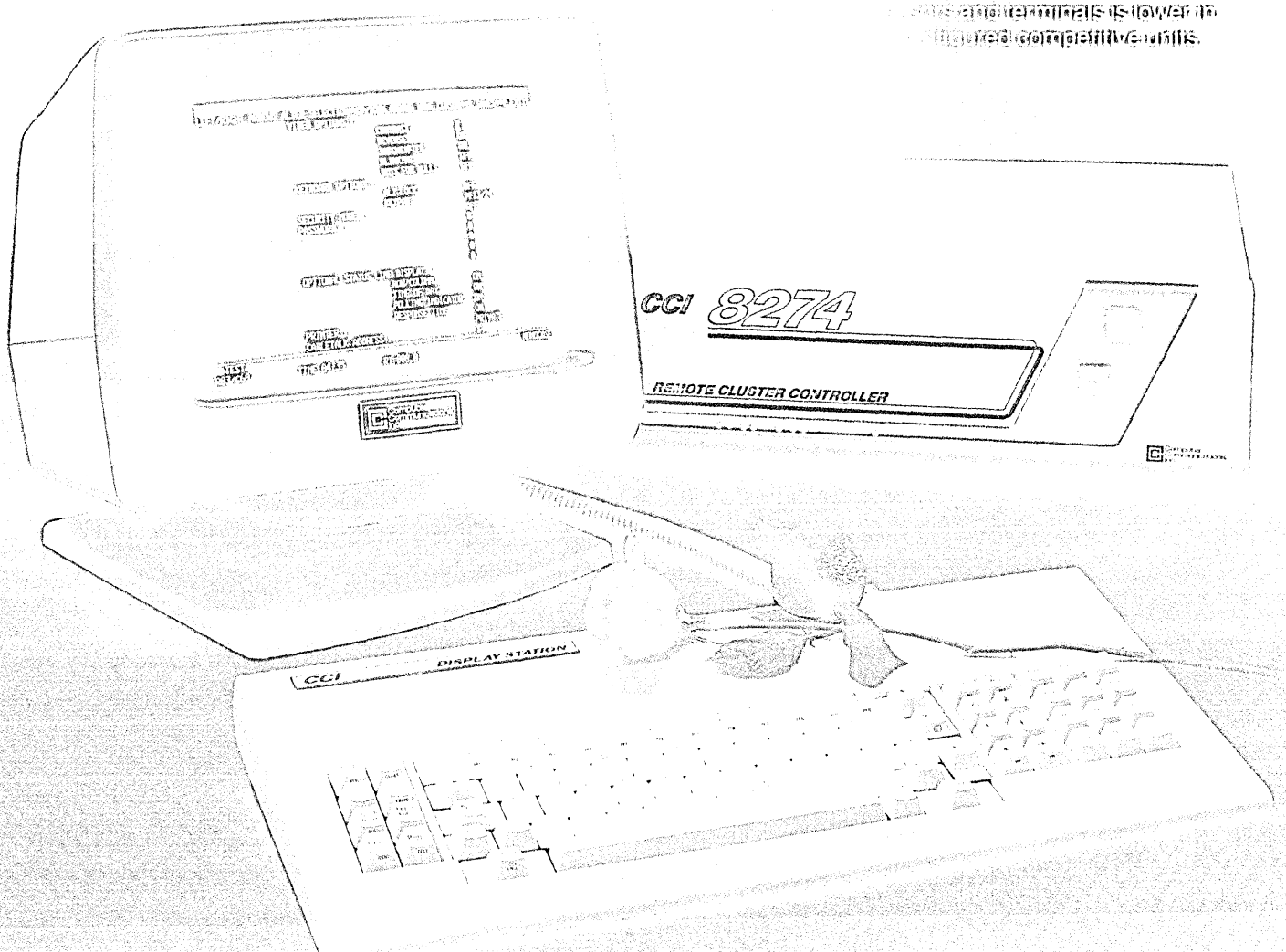
- [illegible] as an exclusive "private" printer
- [illegible] to the CCI family of [illegible] and terminals is lower in [illegible] competitive units.



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CIRCLE 4 ON READER CARD

don't waste space on the graphics display.

The terminal has a bit-mapped raster scan device with 1,024 by 792 pixels. The unit will display up to 15 user-defined colors at the same time from a palette of 4,096 hues. The unit can emulate the DEC VT100 and the Tektronix 4014. It is fully compatible with standard plotters and printers. An optional four-channel multiplexor allows up to four D-90Cs to share a single hardcopy device. The D-90C costs $28,000. MCDONNELL DOUGLAS AUTOMATION COMPANY, St. Louis.

FOR DATA CIRCLE 309 ON READER CARD

DUAL HOST CONTROLLER

The Model 411 dual host controller enables terminal users to interconnect concurrently with two remote IBM or IBM-compatible mainframes and up to 16 asynchronous hosts.

The unit interconnects simultaneously with the mainframes and asynchronous hosts through remote communication interfaces, and a terminal user can switch freely from one system to another through simple keyboard commands.

The product can accommodate up to 32 terminals via BSC or SNA/SDLC protocols in the 3270 mode. Different terminal users can simultaneously interconnect with different hosts. The controller also serves as a line, modem, and port-sharing device for the asynchronous communications. The Model 411 is priced at $17,400. Leases are also available. LEE DATA CORP., Minneapolis.

FOR DATA CIRCLE 310 ON READER CARD

STREAMING CARTRIDGE

The Series 6500 is a 5¼-inch streaming transport that includes up to 16KB of buffer storage for higher burst data transfer rates and longer operation before repositioning. It is designed for Winchester backup and data storage.

The transport ramps up to and down from its 90 ips operating speed in 150 msec. The nine-track transport, with two-track stepping heads, has a formatted capacity of 60MB with a 600-foot cartridge and 45MB with a 450-foot cartridge. Time to backup 60MB is 12 minutes.

The unit is available in a full-height configuration with a formatter card installed, and in a half-height configuration without formatter. The formatter adopts the QIC-02 (quarter-inch compatibility) drive interface standard and is also compatible with the ANSC X3T9.6/83-20 interface definition along with the QIC-11 and QIC-24 tape format, which allows media interchangeability among transports.

The drive employs self-clocking, group code recording with an 8Kbpi recording density. The Series 6500 with formatter costs $1,275 each. Without the formatter, the Series 6500 is priced at $875. KENNEDY CO., Monrovia, Calif.

FOR DATA CIRCLE 312 ON READER CARD

DISPLAY TERMINALS

The 9230 and 9236 display terminals are IBM-equivalent 3180 and 3279 monochrome and seven-color units.

The 9230 has a monitor with user-selectable screen sizes, a logic base, and a choice of keyboards. Features include dual logic units that integrate into the system to meet diverse application requirements.

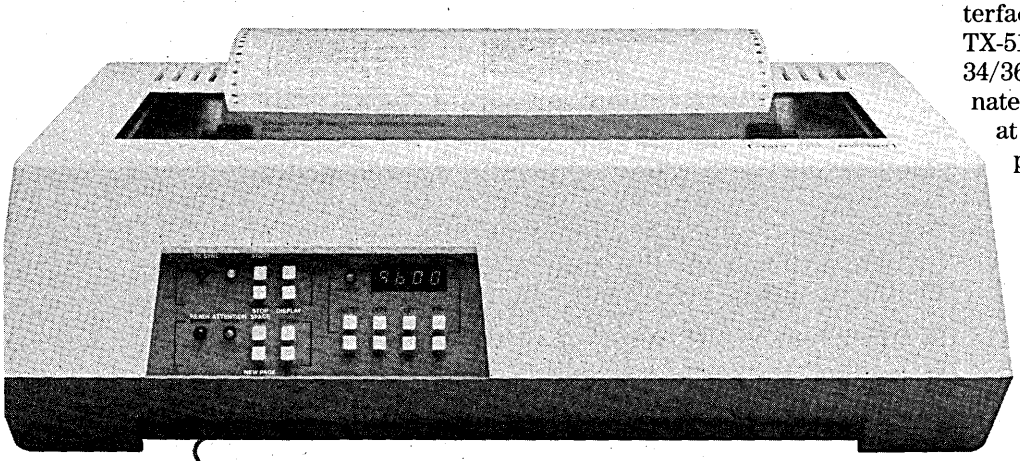
The 9236 display is a seven-color terminal that offers graphics support. The extended function color is comprised of three elements: a monitor, a keyboard, and a logic base. Optional features include programmed and symbol sets and dual logic units.

The 9230 costs $2,300 and the 9236 costs $4,050. ITT COURIER TERMINAL SYSTEMS INC., Tempe, Ariz.

FOR DATA CIRCLE 311 ON READER CARD

—Robert J. Crutchfield

Your IBM 34/36/38 Will Think This Is A $17,000 Printer.



For all your IBM 34, 36 or 38 knows, your new Datasouth TX-5180 is an IBM 5225—an overpriced, underfeatured copy cruncher the size of a washing machine. It might even think your Datasouth is an IBM 5224 or a 5256, both of which are just as clunky and cost upwards of $4500.

But you know better. You know your TX-5180 is a perfect 34/36/38 dot matrix printer that costs a fraction of what IBM wants you to pay for one of their printers. You also know your TX-5180 even beats its third-party black box competitors. Because it doesn't come with a black box. Or dipswitches. Or any of the other old-fashioned inconveniences that clutter most of the printers in the 34/36/38 market. Instead it comes with a list of features that make you as happy as your accountant.

Like parallel *and* IBM twin-ax interfaces (so you can hook up your TX-5180 to a PC as well as your IBM 34/36/38). Cable-through and terminate capability. Bidirectional printing at 180 cps. Six different character pitch settings. The most complete, friendly and ergonomic front panel controls in its class. And legendary Datasouth reliability.

So treat your computer and your accountant to the best printer a little money can buy: your new Datasouth TX-5180. It's only a toll-free call away. Make that call today.

Your Accountant Will Think It's A Miracle.

AUDITOR'S REPORT

We have examined the Datasouth TX-5180 and found its features and characteristics exceed accepted expectations for IBM 34/36/38 printers. A partial list follows.

- ☐ Tabletop, impact matrix serial printer
- ☐ 180 cps bidirectional printing
- ☐ Tractor feed forms: 3"-15"
- ☐ Cartridge ribbon
- ☐ Cable-thru and terminate
- ☐ Push button programming
- ☐ Twin-ax and parallel (ASCII) interfaces

The TX-5180's ratio of value to price is exceptional. Purchase of the device is highly recommended.

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CIRCLE 56 ON READER CARD

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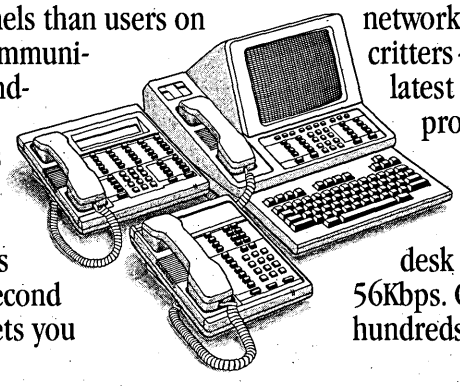
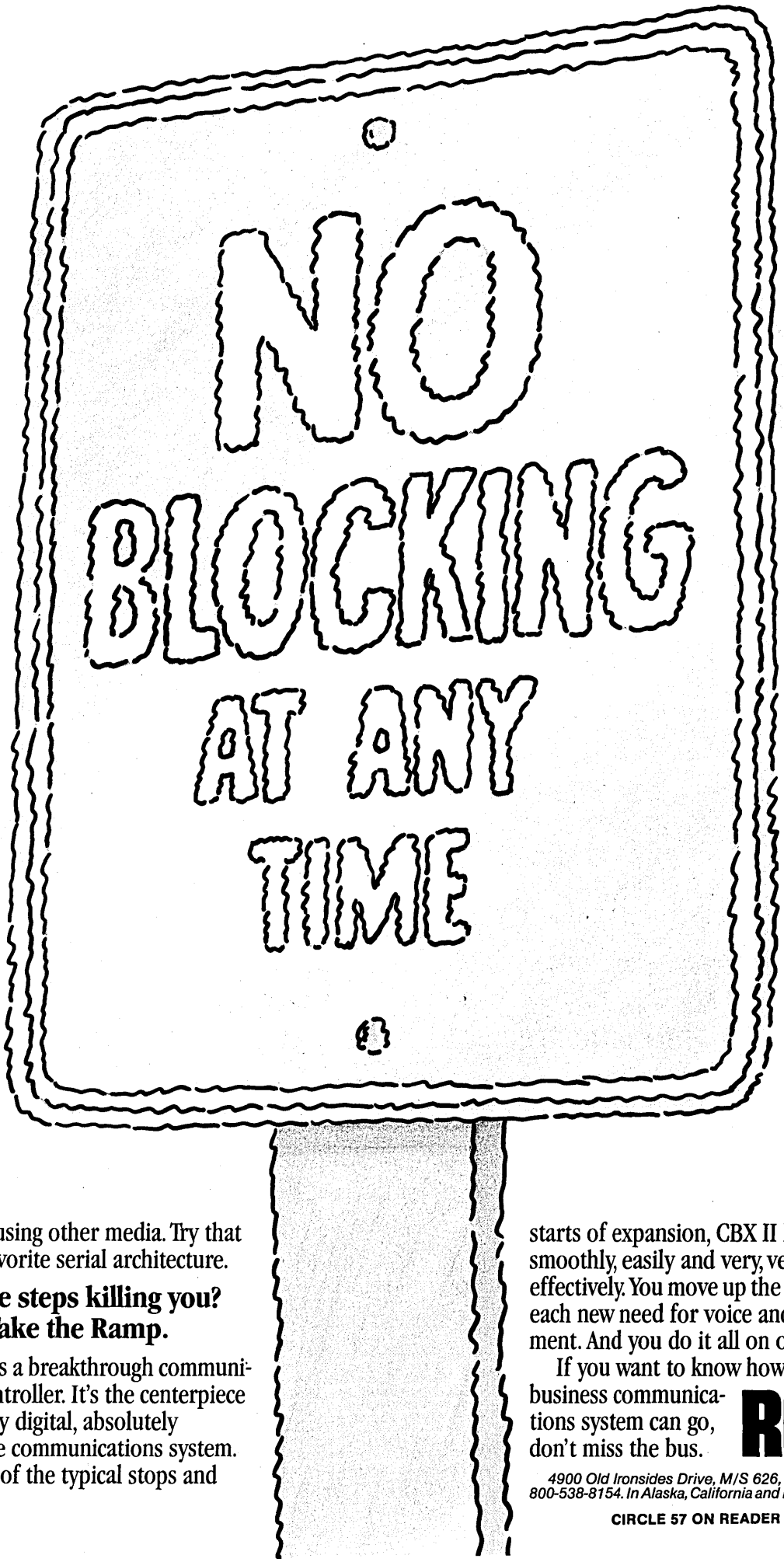
There are always more channels than users on your ROLM® CBX II business communication system. (Our ten-thousand-user system has more than twenty-three thousand channels to handle voice and data.) No blocking at any time. Ever.



And, thanks to its parallel bus and about 4½ billion bits per second system bandwidth, the CBX II lets you network a whole company full of common digital critters — telephones and terminals — plus all the latest high-performance devices: PCs, word processors, graphics terminals and computers. You can even network networks. On one system.

ROLM can deliver voice and data to the desk at speeds well beyond the much-discussed 56Kbps. CBX II's advanced architecture gives you hundreds of kilobits, using existing telephone wire;



megabits, using other media. Try that on your favorite serial architecture.

Are the steps killing you? Take the Ramp.

CBX II is a breakthrough communications controller. It's the centerpiece for a totally digital, absolutely expandable communications system.

Instead of the typical stops and starts of expansion, CBX II lets you grow smoothly, easily and very, very cost-effectively. You move up the ROLM Ramp with each new need for voice and data management. And you do it all on one system.

If you want to know how fast, how far a business communications system can go, don't miss the bus.

ROLM

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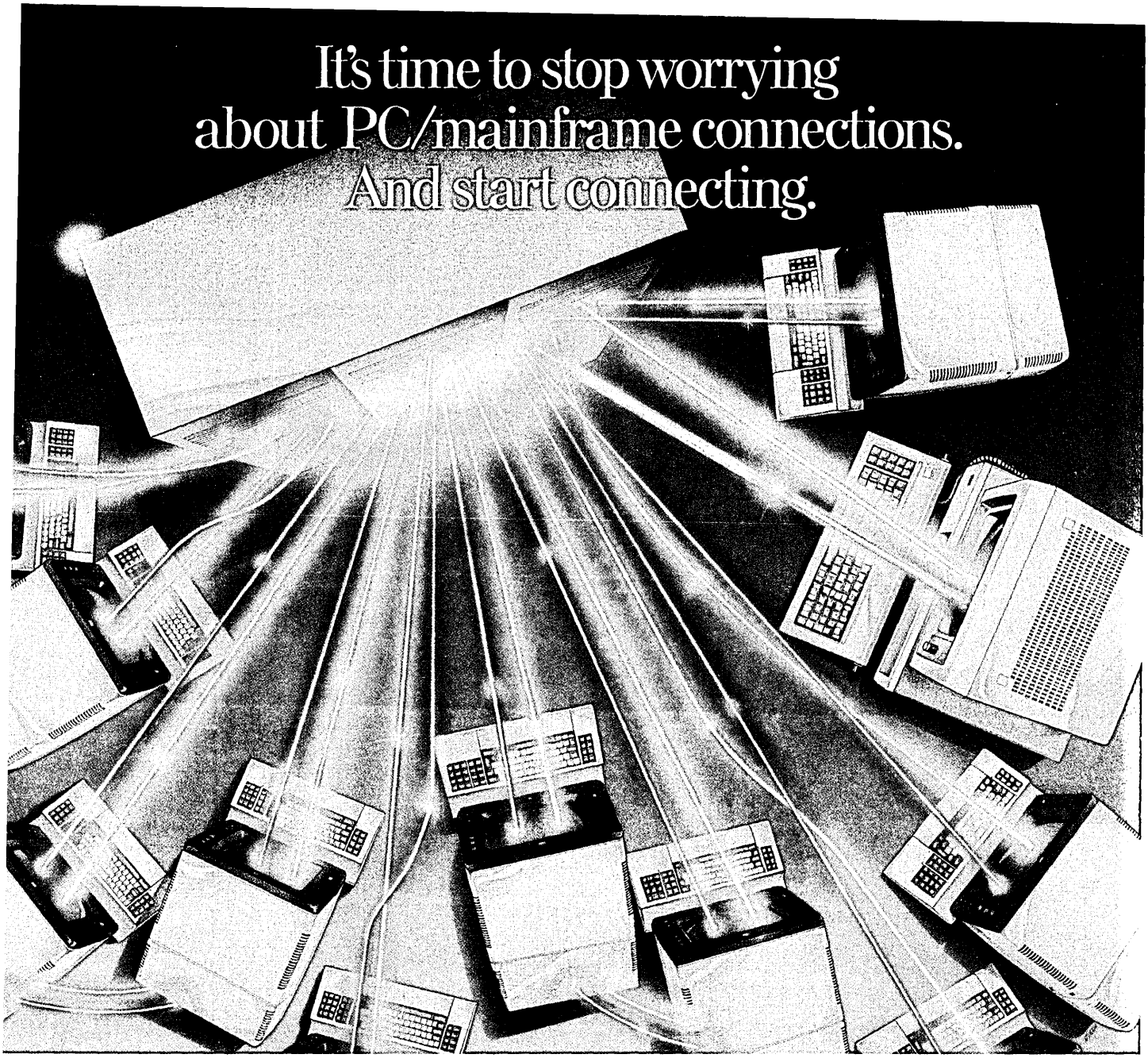
CIRCLE 57 ON READER CARD

It's time to stop worrying about PC/mainframe connections. And start connecting.



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For all the talk about PC/mainframe issues, you'd think more people would have actually done something.

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Cleveland	Sept. 6	Rochester	Nov. 1
Dallas	Oct. 17	San Antonio	Oct. 10
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CIRCLE 58 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

"Hardware advances continue to outstrip software today as computer users demand more powerful, easier to use systems, and software developers will face greater innovation challenges," said James R. Porter, vice president of corporate marketing and development at Informatics General Corp. in Woodland Hills, Calif., during a speech to the Finnish Data Processing Association. He went on to say that end users now control as much as 40% of the world's computing power, and they, not traditional dp professionals, will control the majority of computing power in the next few years. Indeed, that figure could go as high as 80% by 1990, he said. Porter attributed the growth to the "quick acceptance of personal computers and the growing use of information centers" in large firms. There is a need, he said, to develop software designed specifically to appeal to these end users, who represent a new political force on the dp scene. Porter sees the micro-to-mainframe link and similar packages as part of this breed of "new software" -- similar, one supposes, to the New Math launched in public schools a generation ago to make arith-metic more user friendly to grade-schoolers. It's little wonder Porter should place so much emphasis on such links, of course, considering Informatics's joint ventures with VisiCorp and Ashton-Tate, which give micro users access to an Informatics mainframe database using Informatics's Answer/DB and VisiAnswer or dBase/Answer.

Porter is accurate in one regard: software vendors do need to market products to the users in accounting, sales, distribution, and other departments of the company as well as to the MIS department. The key question, as yet unanswered, is whether it will still be the MIS department that decides what to buy or whether the end-user departments will soon be able to demand that MIS buy -- or not buy -- certain packages. While the end users may indeed control 80% of the computing power by the end of this decade, that does not necessarily mean they will have the clout needed to control the purchasing of computers or software packages.

Industry observers often remark that in order for mainframe makers outside the IBM world to remain competitive, more independent software will have to be made available to them. No one doubts the dearth of independent software: one estimate is that IBM dp shops buy 80% of their software for IBM systems while non-IBM dp shops purchase less than 30% of their mainframe software. Some software vendors argue that there is not enough business to make it profitable to stray from the IBM fold, while others are making an effort, citing the number of non-IBM systems in use today. (Is the glass half full or half empty?)

The issue is not as pressing in the minicomputer world, but more vendors there are moving to encourage third-party development nonetheless. Prime Computer Inc. has initiated its Cold Start Program, which is designed to encourage software developers to adapt their programs to run on the Primos operating system. The Natick, Mass., firm says the program has met with initial success. Even Hewlett-Packard, recognizing the sheer number of IBM System/38s in use, now has a value-added software package to bring S/38 RPG over to the HP 3000. That's a strong statement to third-party vendors, since the HP 3000 is the top seller in its class after the System/38. Mainframers will soon need to follow the mini makers' lead and encourage third-party software development.

AIRLINE PAIRING AND PLANNING SYSTEM

The Airline Pairing and Planning System (ALPPS) is an application especially designed and programmed to solve one of the most complex problems in the airline industry—juggling flight schedules, routing of aircraft, contractual limits, and Federal Air Regulations, to produce cost-effective crew schedules in a timely manner. Using the flight schedule, aircraft routing, and station files as input, ALPPS allows the airline to construct a unique profile that accommodates its contractual and scheduling rules. In its interactive mode it assists schedule analysts in assembling various aspects of the trip pairing puzzle. The schedule analyst has flexibility in listing flight legs, breaking flight legs apart by station or flight, correcting legs by station or flight, editing any data files, and requesting a listing of all flights into and out of a station.

All these functions are interactive. With these functions a schedule analyst can observe the effects of changes on the solution to the problem. Schedule analysts may also initiate the batch version of the program from the terminal and continue working on the problem in an interactive mode. The program is designed to run on large-scale Sperry computers. The ALPPS costs $500,000. SPERRY CORP., Blue Bell, Pa.

FOR DATA CIRCLE 326 ON READER CARD

HUMAN RESOURCE SYSTEM

Payroll/Personnel is written for the System/38 in native RPG language and enables operators to use on-line query and report writing. The computer is accessed via logical rather than real file structures. In turn, data files are externally defined in the data description specification that can be field referenced via a master dictionary.

To define each file, users need build a specification only once; the system will automatically reference it thereafter. The on-line system is menu driven with operator prompts.

This package is part of the vendor's other human resource software. Modules are usable on a standalone or fully integrated basis. An optional report writer is available that gives both on-line query and hardcopy output capabilities, linking up to eight files. In addition, data files may be built at the detail or summary level. The report writer is completely menu driven, and requires no new language for operators to learn. Payroll/Personnel and other human resources software for the System/38 will start at $40,000 for each module. INTEGRAL SYSTEMS INC., Walnut Creek, Calif.

FOR DATA CIRCLE 327 ON READER CARD

MICRO-TO-MAINFRAME LINK

This micro-to-mainframe link is called pcMainframe. The package connects IBM PCs and PC-compatibles to mainframe computers running CICS. The data transfer system allows micro users to download and upload files in a real-time environment between personal computers and the mainframe.

The system requires no special programming, and provides the capabilities to selectively extract, average, summarize, reformat, and transmit records and fields from mainframe files for use on the PC. The software directly downloads selected records and files from mainframe files to the micro. This data is immediately available and automatically reformatted for end users to use in all the popular spreadsheet programs. Data created or modified on the PC can also be uploaded to mainframe data files or special user libraries under the control of the system administrator and the product's security. This uploading feature allows users to share data between PCs, store PC-created data for future retrieval, and input data to the mainframe without extensive rekeying, the vendor says. The pcMainframe package costs $9,000 for eight PCs under DOS, and $12,000 for eight PCs under OS. Each additional micro connection is $300. Quantity discounts are available. OXFORD SOFTWARE CORP., Hasbrouck Heights, N.J.

FOR DATA CIRCLE 328 ON READER CARD

POLICE ENFORCEMENT MANAGEMENT

Crimestat provides automated generation of police reports, crime analysis and forecasting, and improved dispatch assistance. The system replaces card files with four mandatory preformatted files: master name index, incident reports, property reports, and arrest reports. Using these files, the software generates monthly Uniform Crime Reports (UCRs), crime forecasting reports, special date reports of past occurences, crime watch reports, and current lists of wanted persons and vehicles.

According to the vendor, this product can offer police departments better resource allocation, improved responsiveness, better file management, and increased overall efficiency.

This dedicated application software program is designed for the vendor's Micrapoint II hard disk micrographic filing system. With Crimestat, Micrapoint II has the ability to automatically print UCRs directly onto FBI forms, which, according to the vendor, saves approximately 60 man-hours of manual labor per month. Any Micrapoint terminal can perform an inquiry at any time. Crimestat costs $4,800. 3M, St. Paul.

FOR DATA CIRCLE 329 ON READER CARD

RELATIONAL DATABASE

Magnum is a fourth generation relational data management system designed for use on DEC VAX computers under VMS. This software is designed to bridge the productivity gap between the dp professional and the ad hoc or occassional user. According to the vendor, the system is sophisticated enough to satisfy the requirements of high-level software engineers, yet simple enough to be run by users. Originally designed for professional programmers and systems analysts to develop complex, high-volume transaction-based applications, the product also employs a simple query language that enables those with minimal computer experience to use the system for such applications as order entry, inventory and project control, personnel reporting and tracking, and financial reporting.

In dp departments, this query language plus a high-level procedure language helps increase programmer productivity by speeding application development and reducing the mechanics of system maintenance, the vendor says.

The simplified relational data model provides data independence and flexibility in manipulation of data, allowing expansion of the system or development of a specific program. The product also has a data dictionary that provides central control of information. The software can be used to generate timely and accurate standard or ad hoc reports. Concurrent updating capability allows several users to access and modify data simultaneously. A screen generator is used for formatting. Magnum systems range in price from $20,000 for use on the VAX 11/730/725 to $45,000 for the VAX 11/780. TYMSHARE, Cupertino, Calif.

FOR DATA CIRCLE 330 ON READER CARD

INTERFACE DESIGN PPODUCTIVITY

Functional Language Articulated Interactive Resource (FLAIR) is a new method of rapid prototyping user interface that allows users to generate a dialog with a

SOFTWARE AND SERVICES

PROJECT MANAGEMENT SYSTEM

The Capital Project Management System (CPMS) is for use on mainframe computers and is designed to monitor the progress of construction projects and other large expenditure programs to ensure that allocated funds are being properly expended within the budgeted framework.

According to the vendor, when a project or phase of a project is completed, the system will automatically translate espenditure data into a fixed asset in accordance with specific user instructions. CPMS will also integrate with the vendor's other financial systems software as well as products from third-party companies. It will also operate in a standalone system, as well as in a real-time, on-line mode, and in a batch mode.

Included in the system are a series of comprehensive reports that can inform users of the amount that each phase of a project is overbudget. Customized reports will also be available. CPMS has the ability to do trial transactions of expenditure data to fixed assets, thus enabling users to experiment with different cost combinations in establishing fixed asset values for depreciation purposes. The system can take single expenditure, parts of an expenditure, or groups of expenditures and combine them to make one asset.

The software has the ability to simultaneously keep track of sums that have been budgeted, approved, committed, or expended for components and subcomponents within a multiphase project. CPMS can perform capitalization of interest with standard Financial Accounting Standards Board statement 34. It also will calculate progress payment investment tax credits in accordance with IRS regulations. CPMS is suitable for a broad range of applications by industry, real estate companies, and large financial institutions. It can track the financial aspects of construction projects, renovations, leasehold improvements, and large R&D projects, the vendor says.

The package will function in an on-line, real-time mode on IBM systems 43XX and 30XX and up and on HP-3000 computers. It will work in batch mode on large-scale computers made by Burroughs, Honeywell, DEC, Data General, and Sperry (including Univac). Prices for the CPMS start at $15,000. DATA DESIGN ASSOCIATES, Sunnyvale, Calif.

FOR DATA CIRCLE 325 ON READER CARD

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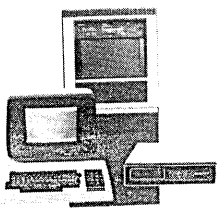

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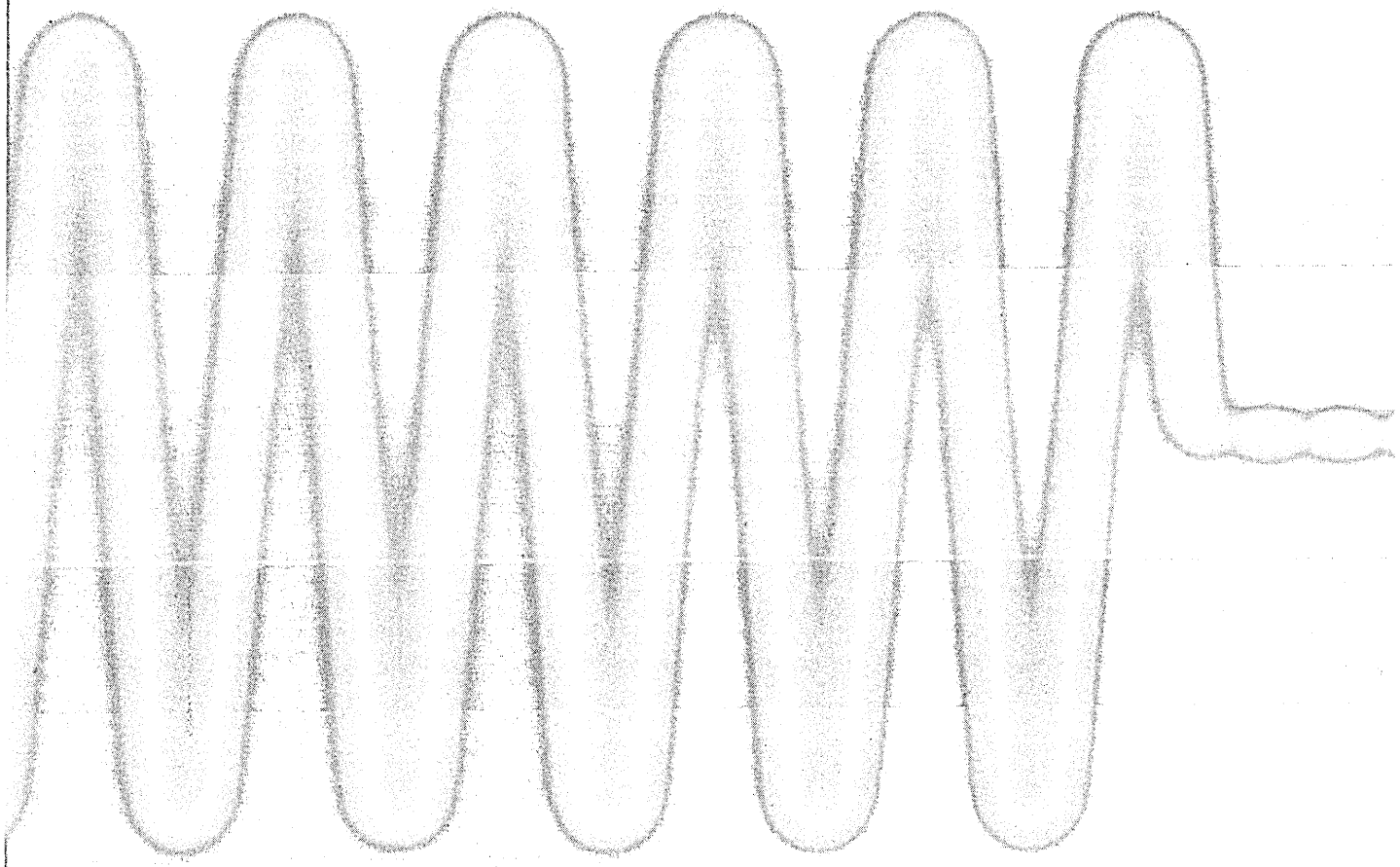

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color graphics system. FLAIR enables system designers to express operator/computer interactions instantly. In addition, users can use all the hardware available in a computer facility without first mastering the host system. With this product, the system designer can demonstrate various man-machine interface (MMI) systems to a client before a proven MMI system is actually chosen and implemented. Through interaction with the system, a client can consider various formats, device choices, content, and sequences.

According to the vendor, in-house experience with FLAIR has shown productivity improvements in the MMI process. Display formats and scenarios which have previously taken weeks to produce by conventional hand coding methods take only a few days with this software.

The product is compatible with a variety of hardware I/O devices. FLAIR is written in FORTRAN 77 and is available for licensing to any U.S. Government agency or subcontracting to the private sector. Prices for FLAIR start at $40,000. TRW INC., Redondo Beach, Calif.

FOR DATA CIRCLE 331 ON READER CARD

SPREADSHEET COURSEWARE

The Scholar/Teach 3 Computer Based Instruction Course examines various aspects of spreadsheet terminology, including products currently available on the market, their standard features, and their basic functions. The course also looks at some common applications of spreadsheet programs and how users might find a spreadsheet useful for a particular application. The spreadsheet and database courses are one hour in length and are available for $60 each. Multiple copy discounts are available.

FOR DATA CIRCLE 332 ON READER CARD

ARTIFICIAL INTELLIGENCE APPLICATIONS

Domain Lisp allows artificial intelligence applications to run on this vendor's workstations. According to the vendor, the language increases the application capabilities of the Domain system, helping to improve the productivity of technical professionals working in AI research.

This language features a high level of integration with the vendor's entire line, providing the flexibility to use multiple languages, including Lisp, and apply the language best suited for a given task.

The Domain Lisp environment contains both an interpreter for checkout and prototyping and an optimizing compiler for the creation of production applications. The software is part of the Domain language system, an environment that includes C, Pascal, and FORTRAN 77 languages.

Applications include building expert systems, special purpose graphics, and robot vision software. Communications support includes IBM 3270 emulation, HASP, X.25, and Ethernet. Domain Lisp is priced at $1,800 per node, and $15,500 per site (up to 100 nodes). APOLLO COMPUTER INC., Chelmsford, Mass.

FOR DATA CIRCLE 333 ON READER CARD

FORTRAN TO C

Fortrix-C is a program that converts FORTRAN programs and files to C code. The complete package is designed to meet the requirements of various Unix environments. Included are integer-character string converters, space allocators, string parsers, and other manipulators not included in standard C libraries.

The software is designed to make as few run-time assumptions as possible. During execution it solicits the information required to run the program from the user. Usually, responses are either yes or no and references to user manuals are not necessary, according to the vendor. In operation, the software converts FORTRAN flow control statements to functionally equivalent sets of C instructions. The system has been designed to produce C code that retains the essence of the original FORTRAN source code. Fortrix-C costs $2,500. RAPITECH SYSTEMS INC., New York.

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BUSINESS GRAPHICS

VideoShow and PictureIt make up a business presentation system that produces high-quality graphic images in up to 1,000 colors, and can be displayed on any color tv, color monitor, or video projector.

To give a presentation, the user inserts the diskette into VideoShow, a portable unit that can be connected to a display. VideoShow's wide color range and clarity is due to a display technology that uses microdots instead of pixels. This enables the graphics display to have up to 1,000 colors and a 1/2000 horizontal position accuracy.

Using PictureIt software on an IBM PC or PC compatible, the businessperson can prepare a presentation on a diskette. A novice can master the process in 30 minutes, the vendor says. It is capable of producing 25 different charts that can be combined and modified with text.

VideoShow is priced at $3,300 and PictureIt sells for $600. GENERAL PARAMETRICS CORP., Berkeley, Calif.

FOR DATA CIRCLE 335 ON READER CARD

EASTERN BLOC DATABASE

The Eastern Bloc Countries Economic Database provides comprehensive economic and demographic information provided by the Vienna Institute for Comparative Economic Studies, an authority on Eastern Bloc data. The database includes information on Yugoslavia and all the COMECON countries—Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the USSR. Most of the data is annual, and some of it is continuous back to 1950. It is updated quarterly. The statistics in the database include a wide range of demographic and economic information, including production figures by industry, government income by source, consumption of agricultural products, imports by commodities and products, terms of trade, population by age groups, and employment figures. Government economists specializing in trade, corporate economists, and banks in business relationships with Eastern Bloc countries can use this database for research and analysis.

There is no initiation fee, surcharge, or minimum monthly charge for use of the Eastern Bloc Countries Data Base on the I.P. Sharp system. Charges are based on timesharing rates of $1 per hour connect time, 25 cents to 45 cents per cpu used, and 70 cents per thousand characters transmitted or received. The data can be accessed using any ASCII terminal or Telex terminal, or a variety of microcomputers. I.P. SHARP ASSOCIATES INC., Rochester, N.Y.

FOR DATA CIRCLE 336 ON READER CARD

CORPORATE COMPUTER TRAINING

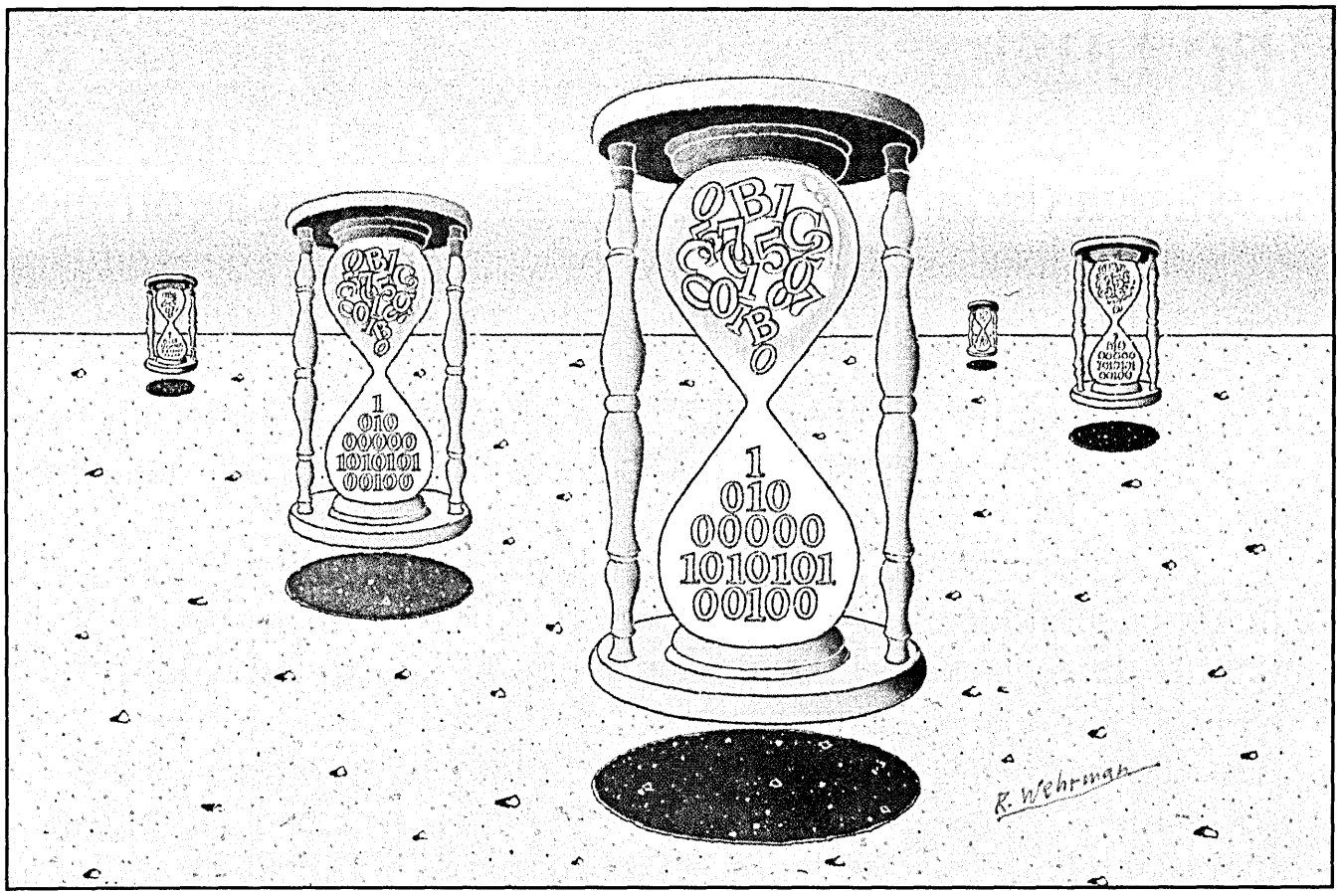
According to the vendor, a major and growing market exists in serving corporations who want to encourage their employees to become more productive through effective use of personal computers. So the vendor has formed a new division called Knoware Learning Systems, which will provide personal computer programs directed initially at the corporate market. As a training resource, this division will provide a full curriculum of computer assisted instruction starting with computer literacy up to and including decision support for solving business problems.

The curriculum will use educational software products to help beginners overcome the initial fear and anxiety often experienced by first time computer users, the vendor says. The program will focus on basic business education such as accounting, finance, sales, management, and educational support for the most widely used application programs. The course will also feature a help mode in print pieces and audio visual materials like audio- and videotapes, slides, and existing simulations from outside sources. KNOWARE INC., Cambridge, Mass.

FOR DATA CIRCLE 337 ON READER CARD

—Robert J. Crutchfield

Without complete understanding of user needs, software development can take forever.



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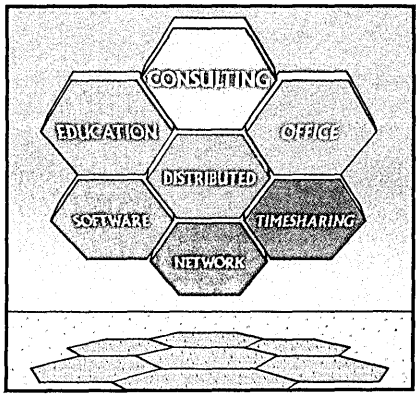

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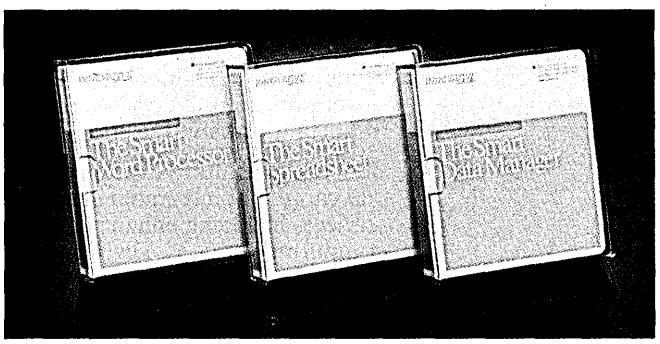

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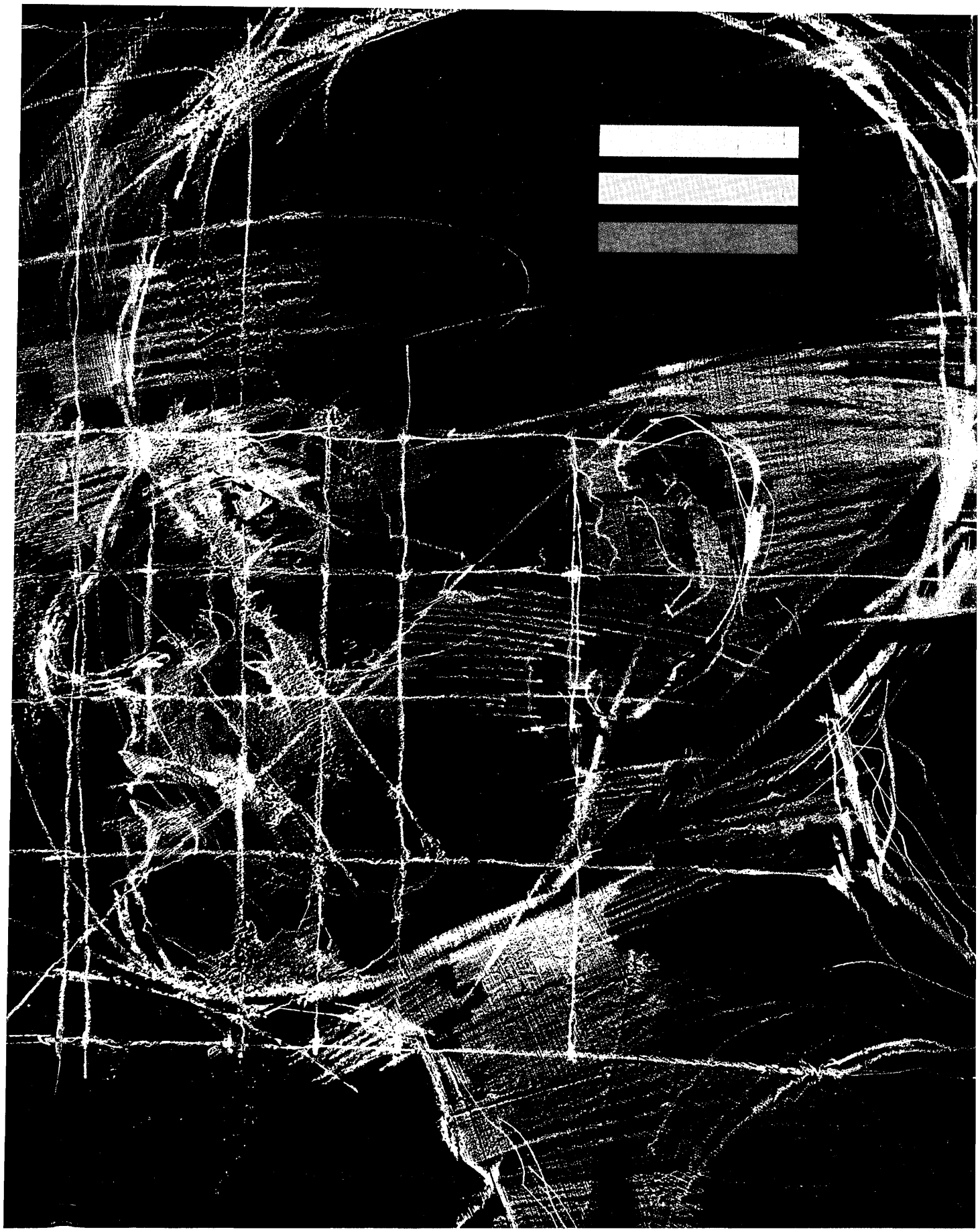

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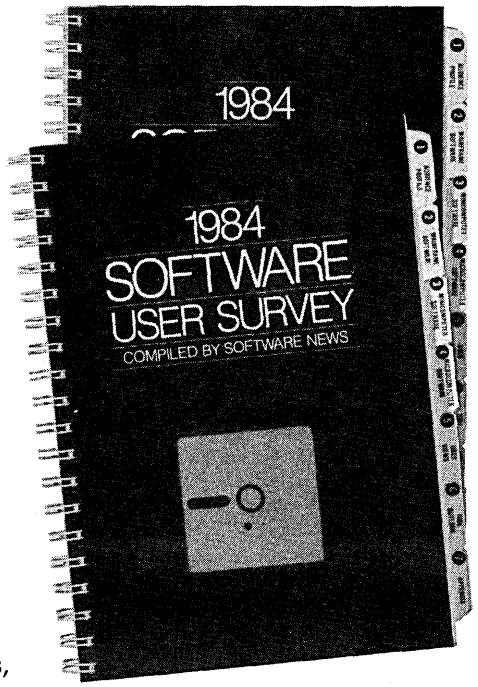
The 200-page report of the survey results ranks the leading software vendors by their relative market shares. The expected increases in 1984 software expenditures are analyzed separately for mainframes, minis and micros. Twenty-seven specific categories of applications and systems software were studied to identify the fastest growing segments. Examine the Table of Contents for more details.



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APPLICATION PROTOTYPING

by Bernard H. Boar

Perhaps the most active debate about prototyping methodologies involves the answer to the question, "Is prototyping a systems development methodology in its own right, or is it part of a systems development methodology?" Sometimes this question is shortened to "Do you throw prototypes away, or can you implement them?" Bernard Boar, in his new book, *Application Prototyping*, takes this question head on, and says, "Prototypes are not to be implemented."

The author presents prototyping strictly as "an alternative approach to requirements definition," which seeks to define systems requirements through "gradual and evolutionary discovery as opposed to omniscient foresight."

Boar contends prototyping is a concept that should be used more often on large engineering problems than on small ones. It is with the large problems that requirements are most elusive. Without prototyping, according to Boar, it is extremely difficult on large projects to define a set of requirements that are complete, consistent, nonredundant, understandable, testable, maintainable, correct, and necessary. Boar posits that prototyping is the only approach that achieves these goals of requirements definition. It does so through a heuristic (trial and error) process rather than a deterministic (decomposition) process, which is the traditional approach.

Boar specifically identifies the underlying assumptions of prototyping by saying the following. 1. All requirements cannot be prespecified (deterministically). 2. Quick build tools are available. 3. An inherent communication gap exists between project participants. 4. An "active system model" (i.e., the prototype itself) is required. 5. A rigorous approach is correct once requirements are known. 6. Extensive iteration is necessary, inevitable, desirable, and to be encouraged.

Most of Boar's observations about current systems development problems are right on the money. His argument that application prototyping deals with these problems is also well made. But he does not answer definitively the three critical questions that seem to prevent project managers from fully embracing prototyping concepts: 1. How do I control an iterative project? 2. How do I allocate resources in an iterative environment? 3. How do I know when to stop?

Application Prototyping casts prototyping as an activity or set of activities to be performed within the context of the overall systems development life cycle. In Boar's approach, it is a self-contained, 10-step life cycle within a greater systems development life cycle. The prototyping life cycle seeks to define requirements by using an active modeling concept (rather than a passive modeling concept like data flow diagrams or entity relationship diagrams). His approach then turns the requirements statement—which is now in the form of a prototype model—over to other activities within the systems development life cycle that transform it into a production system.

Part of the book's problem is that it is not very specific about the things that must be learned in prototyping and then passed on to the rest of the development activities. Exactly what are the "new" requirements specifications? The book could have used a prototyping example to illustrate the interface between the application prototype and the rest of the life cycle.

Boar's underlying assumption is that requirements can, in fact, be identified, specified, and held constant so that the rest of the life cycle can produce a product. Given this assumption, Boar excludes decision support systems from the list of good candidates for prototyping. He claims the only appropriate systems for prototyping are those with good logic structure that can be prespecified. The problem is these types of systems are becoming a smaller percentage of the application backlog—which implies that application prototyping will never be an accepted norm.

In addition, Boar indicates that prototyping is not a good concept for crash projects. Prototyping requires time and patience. Unfortunately, most people view it as a shorter, faster system development methodology, not a longer one. This can impose serious limitations on application prototyping as Boar defines it.

The question, then, is what is the return for application prototyping? Is the quality of the requirements statement from the prototyping activity orders of magnitude better than what would have been obtained using a deterministic approach? It would have to demonstrably increase the life expectancy of an application, and to do that Boar would have to show that the life expectancy of today's short systems (seven to 10 years) is more related to poor definition of inherently stable requirements than to the fact that requirements actually do change. Changing requirements implies shorter development cycles, not longer, more vigorous ones.

Under the assumption that throw-away prototypes are one concept of prototype development, this book (grudgingly) identifies several possible alternatives called "hybrids." These hybrid approaches are techniques like screen prototyping, using purchased applica-

tions as initial models, prototyping during feasibility, subsystem prototyping, prototyping as part of a request for proposal, and end-user prototyping.

Boar also reluctantly addresses the notion of a new life cycle concept that provides for implementation of a prototype. In his view, this life cycle concept would identify prototyping as a step between feasibility and production/maintenance. The problem with this approach, says Boar, is that in some cases the software used to support building prototypes would not include such features as preprinted forms, operation run books, conversion procedures, user documentation, production recovery/restart procedures, quality control review, database sizing, user/machine error procedures, test plans, and so on. This argument against implementing prototypes appears to be based more on available technology than on logic, or, for that matter, conventional wisdom.

Application Prototyping introduces the notion of a prototyping center. This center, according to Boar, is to be distinguished from an application development center, an information center, or a production center. It is an environment where application prototypes can be constructed as the requirements part of the life cycle and then handed off to application development centers, which would transform them into software that could subsequently be moved into production centers. The book goes into a great deal of detail on the software structure of a prototyping center.

The basic software structure includes a data dictionary, a high-function database management system, a very high level procedural language for generating both batch and on-line programs, a teleprocessing monitor, an ad hoc query language for both batch and on-line queries, a nonprocedural report generator, a documentation generator, and a text editor. This software should be fully integrated, complete, and self-contained—all components must be under the data dictionary's control. The software should be both menu and command driven, and should be a prototype-workbench concept. (It is assumed that basic components of the prototyping center could subsequently be folded back into the information center, or the application development center, or both.)

In my opinion, *Application Development* is a "must read." Whether you agree with Boar or not, he is an articulate writer, and his concepts are extremely valuable to anyone trying to use prototyping as a serious approach to system and database engineering. John Wiley & Sons, New York (1984, 210 pp., $30).

—Daniel S. Appleton

THE CHANGE MASTERS, Innovation for Productivity in the American Corporation

by Rosabeth Moss Kanter

The state of American industry has gotten so bad that there are good intentioned people in the country who seriously believe the government (yes, our government, the American, red, white, and blue one) might be able to improve things.

Rosabeth Moss Kanter isn't one of them. She doesn't think the government is needed to solve our productivity problems; she doesn't even list the phrase "industrial policy" in her thorough index. Neither does she spend much time talking about Japanese-style management, or technical revolutions, or shifts to a service economy, or even about capital formation. Nonetheless, her book is all about how we who work in American corporations can shift our companies into high gear.

In the parlance of the book, Change Masters are "those people and organizations adept at the art of anticipating the need for, and of leading, productive change." We get the feeling this definition was one of those phrases that was labored over and honed to a level of precision in which each word has a pointed, shining significance of its own. Throughout the book we sense the effort and consideration Moss Kanter has put into precise wording. It is not an easy book to read, but the obvious labor that has been invested in it and the frequent useful insights that arise from struggling with it make the reader keep coming back—perhaps as a matter of conscience. No matter the motivation, the persistent reader will be rewarded with an engaging and persuasive argument about how productivity in American corporations can be nutured by freeing the Change Masters we already have inside each of our firms.

The argument starts by drawing distinctions between two classes of corporate cultures, "progressive" and "nonprogressive." Progressive organizations have or are perceived to have a set of what we usually think of as modern, people-oriented personnel policies and practices. Nonprogressive organizations were companies similar in size, industry, and history to the progressive companies, but they had none of the progressive human-resource practices. A 20-year comparison of financial performance was made and the firm conclusion emerged that "the companies with reputations for progressive human-resource practices were significantly higher in long-term profitibility and financial growth than their counterparts." Warm and fuzzy works! The book suggests that environments that give rise to innovation in human-resource practices are also fertile ground for innovations of other kinds and, in turn, the innovative human-resource factors will enrich the environment and make it better for innovation.

This book's most important contribution is a complete description of the kind of environment that produces innovation and a model of how innovation arises.

The book is structured into five parts. The first two present the sad facts about negative and oppressive changes in the American corporate environment that have sapped its vitality. Moss Kanter then gives us the specifics of how innovation is crushed in many of our companies today. There is a powerful section called "Ten Rules for Stifling Innovation," which includes items like "Insist that people who need your approval to act first go through several other levels of management to get their signatures" and "Make sure that requests for information are fully justified, and make sure that it is not given out to managers freely. (You don't want data to fall into the wrong hands.)" These chapters are full of real-life examples of good ideas that were snuffed out before they took off and others that were allowed to bud but never flower because of neglect. If you work in what Moss Kanter calls a segmentalist company (the "bad kind"), these stories will be painfully familiar.

The third section of the book, called "Places Where Innovation Flourishes—and Why," contains three very upbeat chapters. It includes descriptions of companies that are successful at innovating and at their businesses. Most of these stories will be familiar to us in the information systems business because our industry seems to have more than its share of this kind of company. Key phrases from this section are "culture of pride," "climate of success," "risk taking," "investment in people," "boundary crossing," "consensus," "team building," and "corporate entrepreneurship." Much of the book's meat is in this section since it goes beyond simply describing these corporate environments; it analyzes the process by which innovation is encouraged and how it works. Because a vocabulary is introduced with the model—a valuable addition—coherent discussion of the the author's concepts is possible.

The fourth part of the book, called "Corporate Entrepreneurs in Action," is a mix of down-to-earth, how-to-do-it material and a high-level hypothesis of how change actually occurs in a corporate culture. In this transitional section, the focus shifts from the mechanics of innovation in a company to an argument on how corporate America could be oriented in a new, more innovative direction.

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The final part of the book, called "Can America Do It?" says "You betcha!" This section begins with an interesting but ambiguous description of a major corporate culture shift that has been underway at General Motors for the last seven years or so. It's interesting because the idea of a major cultural change in one of the world's largest and most successful corporations inherently attracts attention, ambiguous because it isn't clear at the end of the telling if the changes will stick and, if they do, whether they will really make any difference to the bottom line. The exciting thing about this final section is the assertion that America's cultural bias toward individual enterprise may be the magic ingredient that will put us back on the track of corporate productivity, innovation, and excellence. We just have to follow the recipe that will set that spirit of individual enterprise free in our corporations.

The book concludes with some blue sky thoughts about how we might change tax and securities laws to promote certain of these desirable changes. These items can be ignored with impunity or they can be digested by the reader without serious damage to the book's credibility.

This book is hard to read but worth it. If you are a dp manager, read the book and then send it to the highest ranking member of your management that you can reach. If you live in a corporate culture that would make it uncomfortable for you give a copy to anybody higher than your immediate boss, your company probably really needs the kind of change the book encourages—smuggle a copy to the chairman! Simon and Schuster, New York (1983, 432 pp., $19.95).

—Bruce W. Hasenyager

REPORTS & REFERENCES

SUPERCALC PRIMER

The SuperCalc Primer, by Mitchell Waite, Sharyn Venit, and Diane Burns, is now available through Howard W. Sams & Co. for $16.95. The 218-page book teaches novice users to master SuperCalc's power, while helping all users to work many kinds of "what if" problems, make investment predictions, and do financial modeling. Also shown are the everyday uses of SuperCalc, like using a check register to track expenses and reconcile bank statements. Readers learn how to create and format worksheets; define formulas; enter data; save, re-create, and modify spreadsheets for new applications; and much more. The authors demonstrate how to change a check register into a general ledger, or generate a report to analyze cash flow. The book also covers SuperCalc 2. For more information, contact Howard W. Sams & Co. Inc., 4300 W. 62nd St., Indianapolis, IN 46268, (317) 298-5400.

INSECURE?

Adrian R.D. Norman, a computer specialist with Arthur D. Little Ltd. (the British affiliate of the Mass.-based management and technology consulting firm), has written a book entitled *Computer Insecurity.* The book is a compendium of past computer horrors, ranging from larceny perpetrated by programmers, "hackers," "phone phreaks," and "fiddlers" to cases (tragic and comic) of people victimized by computers run amok. Norman wrote the book in hopes of providing today's information systems users and managers with a guide to avoiding misuses of their own increasingly valuable time and facilities. He cites more than 100 examples of "computer insecurity," which date as far back as 1948. Norman covers computer fiascos caused by natural disasters, fires, electrical power failures, professional incompetence, intentional sabotage, vandalism, employee mischief, telecommunications and interception, labor strikes, organized crime, hardware and software theft, fraud, as well as flaws in system design brought on by undue haste during the development stages. The author also offers some guidelines for preventing security failure. The 360-page book costs $24 and is sold by Methuen Inc., 733 Third Ave., New York, NY 10017, (212) 922-3550.

IEEE DIRECTORY

The 1984 IEEE Membership Directory has been published by the Institute of Electrical and Electronics Engineers Inc. Celebrating its centennial anniversary, the society now boasts over 250,000 members in over 124 countries. The 1,500-page, paperbound guide provides readers with access to the names, addresses, current locations, and titles of its numerous members and affiliates. Telephone numbers are included wherever possible. The directory also contains listings of over 3,500 IEEE fellows, along with their citations and other awards; winners of 24 major IEEE awards for outstanding achievement in science and technology; and IEEE past presidents and directors. There is a section on the purposes, organization, and history of the society, and the requirements necessary for the various membership grades. The directory costs $35 for members and $85 for nonmembers. To order, contact IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854, (201) 981-0060.

OA REVOLUTION

A new report entitled *The Office Revolution: Strategies for Managing Tomorrow's Workforce* has been published by the International Information Management Congress. The 132-page report is the result of one year's in-depth research by the Administrative Management Society Foundation. It conducted interviews with human resources and OA authorities, and did surveys of over 4,000 managers and employees from all kinds of businesses. The publishers claim the report targets the major changes in human resources that will affect careers, identifies the problems that can result from such upheavals, and provides methods and guidelines for solving or averting dilemmas. For more information contact International Information Management Congress, P.O. Box 34404, Bethesda, MD 20817, (301) 983-0604.

PERIODICALS

IT'S ONLY LOGICAL

Elsevier Science Publishing Co. has announced publication of *The Journal of Logic Programming,* a quarterly periodical dedicated to the international logic programming community. The journal will print original research papers, survey and review articles, dates of tutorial expositions, and historical studies in the area of logic programming. The publishers expect the journal to help readers learn about rapid developments in the field by offering "expository articles useful in teaching and self-study, and by serving as an intellectual force for active research and scholarship." A one-year subscription (four issues) costs $85 for institutions and $49 for individuals. Contact Elsevier Science Publishing Co. Inc., P.O. Box 1663, Grand Central Station, New York, NY 10163.

SEMINARS

DATA COMMUNICATIONS

The Center for Advanced Professional Education is holding its seminar,"Data Communications: A User's Guide" at various locations during August and September. Attendees who might benefit from this course are analysts, designers, programmers, project/program auditors, supervisors, managers, directors, and anyone else who needs to be brought up to date on data communications. The three-day course costs $645, and includes a course workbook and all other necessary materials. It will be held at the following locations: Atlanta, Aug. 8-10; Chicago, Aug. 15-17; Newport Beach, Aug. 22-24; Detroit, Aug. 27-29; Buffalo, Sept. 5-7; Providence, Sept. 12-14. For more information contact the Center for Advanced Professional Education, 1820 E. Garry St., Suite 110, Santa Ana, CA 92705, (714)261-0240.

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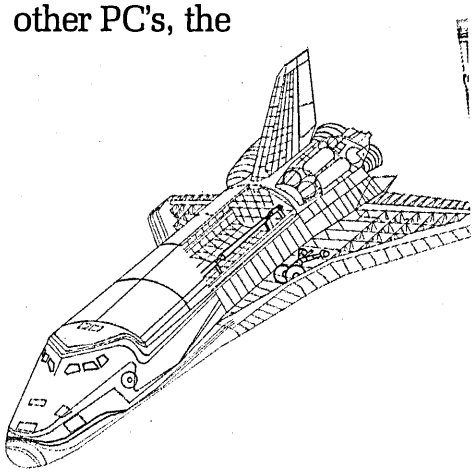

Graphics are being used more and more by businesses every day. They give companies a clearer picture of their place in the market. They make for more effective presentations. And with slides and color transparencies, they can let a room full of people see the same thing at once. Although most people see the value of graphics, very few are aware of the personal computer that lets them create the best color graphics.

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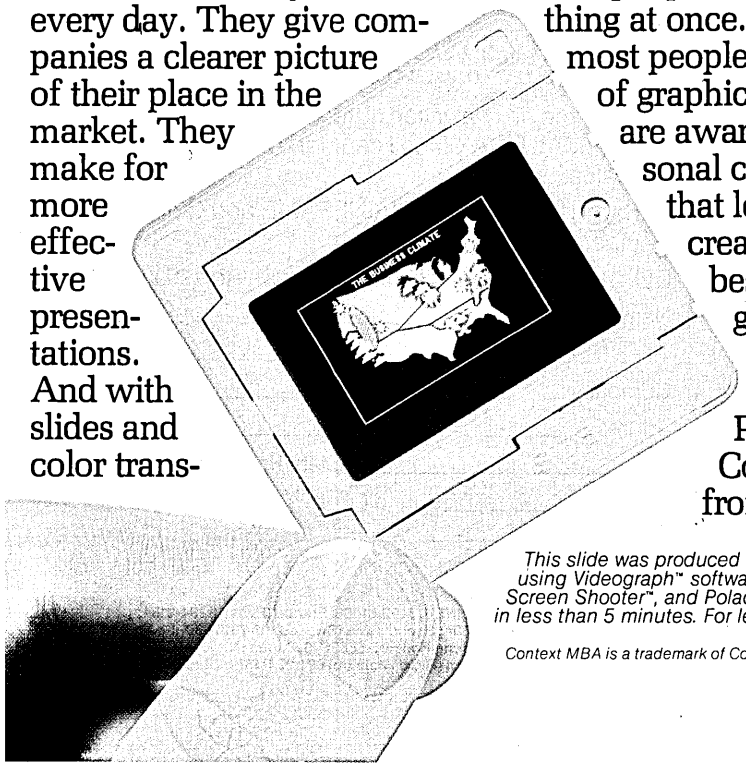

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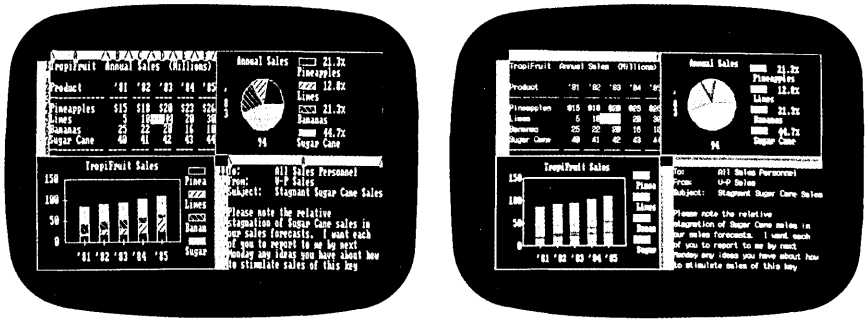

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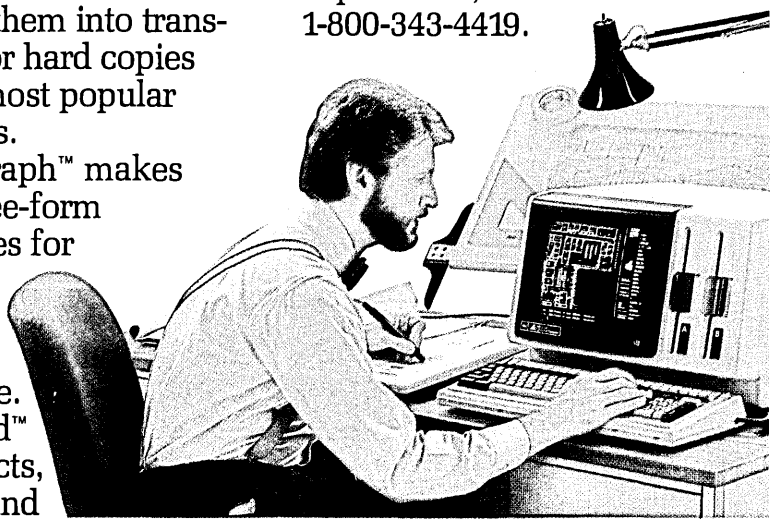

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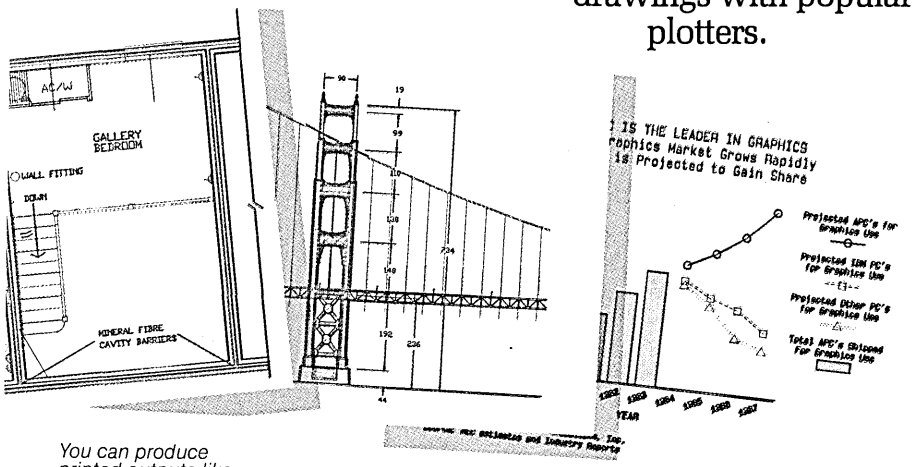

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ON THE JOB

LITERACY ABOUNDS

A new report on "Visual Literacy," contains the statement, "We are not necessarily less literate but literate in different directions."

The report was released by the board of advisors of the Center for Effective Communication, Compugraphic Corp., Wilmington, Mass. The board consisted of faculty and researchers from Boston and Harvard Universities, the University of Pennsylvania, Rhode Island School of Design, and Stanford University. The center was founded to investigate business communication problems in the face of computer technology.

The report points out that visuals are often used to teach more rapidly and effectively, and that "if business documents combine visuals with good writing, internal and external communication will be more productive." The Compugraphic report also states that most business communication is "bad in terms of clarity, understanding, vigor, and brevity."

Misuse of electronic technology inhibits the communications productivity systems are designed to enhance. According to the report, this is caused by one of two conditions: overuse of OA systems by overzealous employees, and lack of use of such systems by people intimidated by the technology. "In some corporations," the report says, "people become so entranced with office automation technology that they clog its memory, and their colleagues' in-baskets, with vast amounts of unimportant information."

The report also claims that people

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inundated with information become "lackadaisical, poorly motivated, and make serious mistakes."

MIS ME WHEN I'M GONE

More and more MIS/dp executives are moving up the corporate ladder, says Edward L. Unterberg, executive director of Russell Reynolds Associates Inc. (a New York-based executive search firm). He feels that management's attitudes toward these executives have changed now that information systems are playing bigger roles in companies' successes.

Unterberg also says the new MIS/dp exec must have management experience in addition to technical skills. The exec often reports directly to the president or ceo and is involved in strategic decision-making. Not surprisingly, compensation—up 40% in three years—reflects the MIS/dp exec's growing importance within the corporate structure.

As MIS branches out into all parts of an organization's operation, company executives want to move their MIS directors to other jobs outside the dp department. Unterberg comments that it is not unusual for his company to receive an assignment to recruit a vp of MIS who's got the qualifications to eventually run a division of that company.

A recent survey by Russell Reynolds Associates claims that 59% of the ceos at 500 of the largest U.S. industrial companies and 500 of the largest U.S. service companies feel there will be a great demand for these executives over the next five years. Only 7% of the group thought there would be a decline.

One final note from Unterberg: "To succeed in today's high-technology environment, companies must not only be cognizant of the latest technological advances, they must have the managers who know how to apply them effectively to further their business interests."

INFO CENTER SURVEY

Crwth Computer Coursewares has released a comprehensive report on the information center. The company polled over 150 major corporations to assess the growth, benefits, problems, and structure of information centers. A majority of the respondents felt that the institution of the information center resulted in increased job productivity, improved use of information resources, and better relations between dp and end users.

The report also indicates that the severe shortage of dp trainers jeopardizes the goal of the information center, which is "to train end users to be self-sufficient in computing powers." Many info centers, says the report, are using computer-based training to combat this problem.

The report is free to dp trainers and information center management. If you're interested in receiving a copy, send a business card to Bibi Garcia, Crwth Computer Coursewares, 613 Wilshire Blvd., Suite 200, Santa Monica, CA 90401, or call (800) 282-2372 or (213) 391-6788.

GRIPES AND HOSANNAS

DATAMATION has published results from all kinds of surveys on dp professionals: How much do they make? What software packages do they like? What kind of turnover rate do they have? How big (or small) are their budgets? The list goes on. What we want to know now is what do you really *hate* about your job? If you've got no complaints, maybe you'd like to tell us what you *love* about your job, and if you're not so sure, how would you change the way things are run in your organization? Names are not necessary, but job titles are. Send all replies to Lauren D'Attilo, Assistant Editor, DATAMATION Magazine, 875 Third Ave., 12th floor, New York, NY 10022.

—Lauren D'Attilo

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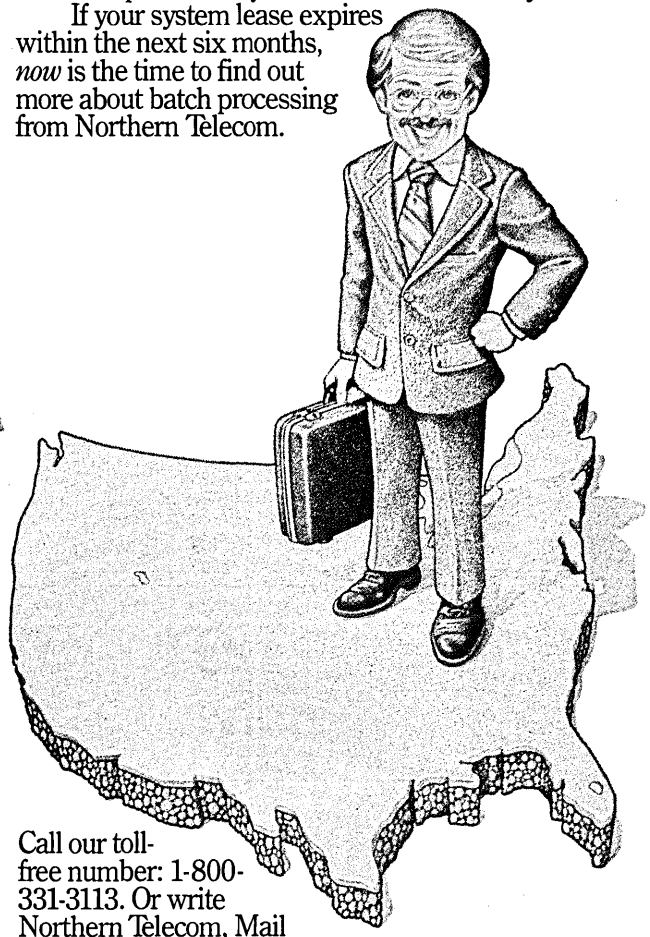

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

QUALITY AND COMPUTER EDUCATION

What exactly are students of computer science learning? By now, everyone knows our educational system has been deteriorating, and, in particular, that training in key areas such as mathematics and sciences is woefully inadequate. A couple of my own experiences come to mind.

The first one involves a young (less than three years out of college) software engineer working at my firm. His assignment was to create a magnetic tape containing some database values from one of our computer systems in such a way that it could be transmitted using remote job entry (RJE) to a customer's computer located in a distant metropolis. Once written, our magnetic tape could be delivered to the customer's RJE workstation in our city and, with the preparation of a few punched control cards, transmitted to the distant computer.

Aside from the usual agonies associated with using magnetic tapes on differing computers, a more unusual problem arose: the young software engineer was unable to prepare the punched control cards. It wasn't that he couldn't determine what the cards were supposed to contain; he couldn't figure out how to punch them! His entire college computer education had been spent using interactive terminals.

The second experience involves my high school and college-aged children. For my birthday last year, my son gave me a binary clock kit. You may have seen them: neon lamps are arranged such that the time is determined by the number of bulbs lit in each of six columns (two for hours, two for minutes, and two for seconds). Each column is a binary representation of the decimal value for the appropriate time digit. It is a classic case of what we old-timers call binary coded decimal.

When I finished building it, I showed it to my daughter, a high school senior who had just completed her school's computer science class. I thought she would get a kick out of applying some of her computer theory to the clock. Surprise number one: she couldn't even understand the principles of the device. Her training did not include any number system theory; binary numbers were not even mentioned during the course. Turns out her entire computer science semester had been spent using a personal computer in BASIC without any discussions of the fundamentals that make computers function.

Ah well, I thought, I'll ask my son, a college sophomore with at least one university-level computer course under his belt. Surprise number two: he couldn't read the clock either. Seems he had spent his first computer science class programming card games (and other class problems) in Pascal.

None of the three individuals I've discussed is uneducated. One is a college graduate, one is in college, and one will be starting college. The moral, if there is one, is that the training being provided to new practitioners of computing appears to be bypassing the earlier techniques and fundamentals on which the business is based. Using a keypunch may not be a critical skill, but it does tend to clearly demonstrate the methodology for coding binary values into letters, digits, and symbols. Even more unnerving, however, is the apparent lack of training in binary numbers at all. Though we hardly ever use "straight" binary in computing these days, it still represents the foundation on which all successful computing rests.

If this level of computer education continues, we mayend up with a generation of software technicians who can work a computer, but don't know how a computer works.

Additionally, the education quality (or lack of it) implied by my illustrations does not bode well for the changes so clearly needed by the software engineering industry. Without an understanding of fundamentals, it is quite possible that individuals employed in this business will be unable to conceive and implement rational, effective software and hardware development improvements. Another consequence will be an ever-increasing schism between a relatively static business computing community and the advancing computer sciences. The ability to transfer research computing to production technologies will be restricted because of a lack of understanding of both theory and practice.

I certainly hope these recent experiences are not typical. If they are, we'd better let the academic community at all levels know of our concerns. The future of computing is at stake.

—David A. Feinberg
Seattle, Washington

THE QUARK, OF COURSE

The history of the integrated circuit has been an unswerving path to smaller, faster, and denser devices. While the trend shows no current signs of slowing down, it is clear that there are lower limits to component size. Those limits, in turn, enforce maximum speed. At current rates of improvement we can expect to see ICs reach those limits relatively early in the next century. Even with such improvements as unlimited layering and superconducting, an absolute maximum of information density will be reached. Further improvements will require new directions in storage devices, storage schemas, or both.

Memory density can be radically improved by departing from the binary system. This can be done by breaking away from the existing system—left-right, on-off, presence-absence—and making use of a quantized multivalue system where a variety of different states can be expressed by a single, irreducible unit. We

refer, of course, to the quark.

At BNR (Binary's Not Required), we are working on the Quark Universal Information Transfer System, usually called QUITS. The idea is to demonstrate the feasibility of a multivalue system where a single unit may express a range of values with no ambiguity possible. We selected the quark because of its wide variety of attributes and range within those attributes.

We have developed a proprietary method of quark manipulation, Systematized Quark Unitary Emission, Location, Control, and Holding (SQUELCH). Since SQUELCH is a trade secret rather than a patented system, the internals of its functioning will not be discussed here. Fortunately, many of the implications of such a system can be discussed without compromising the actual implementation details.

Full quark implementation should yield a system where a single particle may express any of the values of charge, spin, truth, beauty, and charm—many more values than are available with standard binary. For our test purposes, we are going to focus on charge only. This will simplify things considerably, as most existing computing equipment is designed for charge-based systems.

To further simplify, we are going to use only the +2/3, −2/3, and 0 charge states. This trinary system should be sufficient to demonstrate the feasibility of production of such machines.

Our first impulse was to simply map binary processing into a trinary machine. After some consideration, however, we decided to opt for true trivalue logic, which includes binary as a subset. If two-value logic systems have only TRUE and FALSE, a trinary system should have a third value between the two. Our first impulse was to use MU, from the undefinable Zen, but confusion with such things as mu-mesons quickly became apparent. A number of our initial contacts at venture capital firms suspected us of fraud, since it seemed we didn't know a quark from a meson. We finally settled on DUH. Other candidates included EH?, SAY WHAT?, and HMMM . . . , but these were rejected because of their use of punctuation.

For the single trinary digit, we have selected the word TRIT as in TRinary digIT. Following a standard pattern, we established a naming convention for the other operating units in the machine. The basic working word, loosely equivalent to a byte, is the tryte. A tryte consists of nine trits (we want to maintain powers of three here), and can be broken up into three three-trit sections called tribbles. There is no six-bit section, as the presence of two tribbles always implies the existence of a third. Two ASCII characters fit neatly into a tryte, and we are providing special machine instructions for fetching and depositing characters. Addressing and arithmetic operations use a three-tryte quantity (27 trits), the trilobyte. This value, roughly equivalent to a 40-bit binary quantity, has proven sufficient for all addressing and most arithmetic processes. Ultrahigh precision arithmetic is handled in three-trilobyte quantities, the nynobyte.

String processing will be provided in hardware instructions as well. With the extremely large number of character values that can fit into a tryte, both EBCDIC and ASCII can be encoded, with the ninth bit used as a tag for indicating type. A null-terminated string of trytes is referred to as a cliché.

The use of such factors as charm, truth, and beauty as data elements leads to a wealth of new functional capabilities in the systems that use them. System interactions with an operator might vary, depending on the appearance and integrity of the operator. Such features could, using modern psychological techniques, radically change the behavior of users. When systems can inherently recognize a lie (or, more correctly, negative truth values), system and data integrity improve by orders of magnitude.

Charm would not only be recognized by the system, but could be generated as well. This should greatly ease "computer paranoia," and give much greater user satisfaction.

The proper use of beauty should be a tremendous aid, not just in commercial installation, but in the fickle, consumer-oriented pc market. Imagine being able to tell a home user that the system will not only look good in his living room but will, over the course of time, improve the appearance of the entire house by selective beauty radiation. Naturally, systems for military use could also be configured with negative beauty quotients.

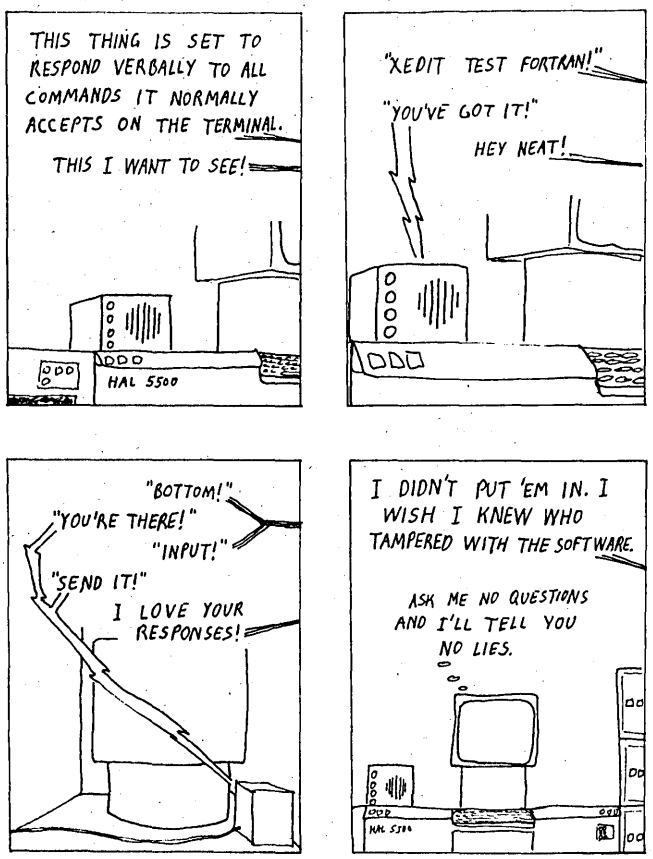
Logic systems based on trinary and n-ary systems will also break new ground. The multiple values possible for a single quark could be used, as in present systems, to simply express a degree of confidence. With their inherent quantized values, it is also possible to assign a specific meaning to each distinct state. We have done this in a very simple form with the TRUE-DUH-FALSE system. With more values, such distinct states as "I don't know if I know or not," "I used to know but I forgot," and "Your mama" are well within reach. Logic systems can be customized for a specific type of inquiry, with specific quark values representing a user-selected set of truths.

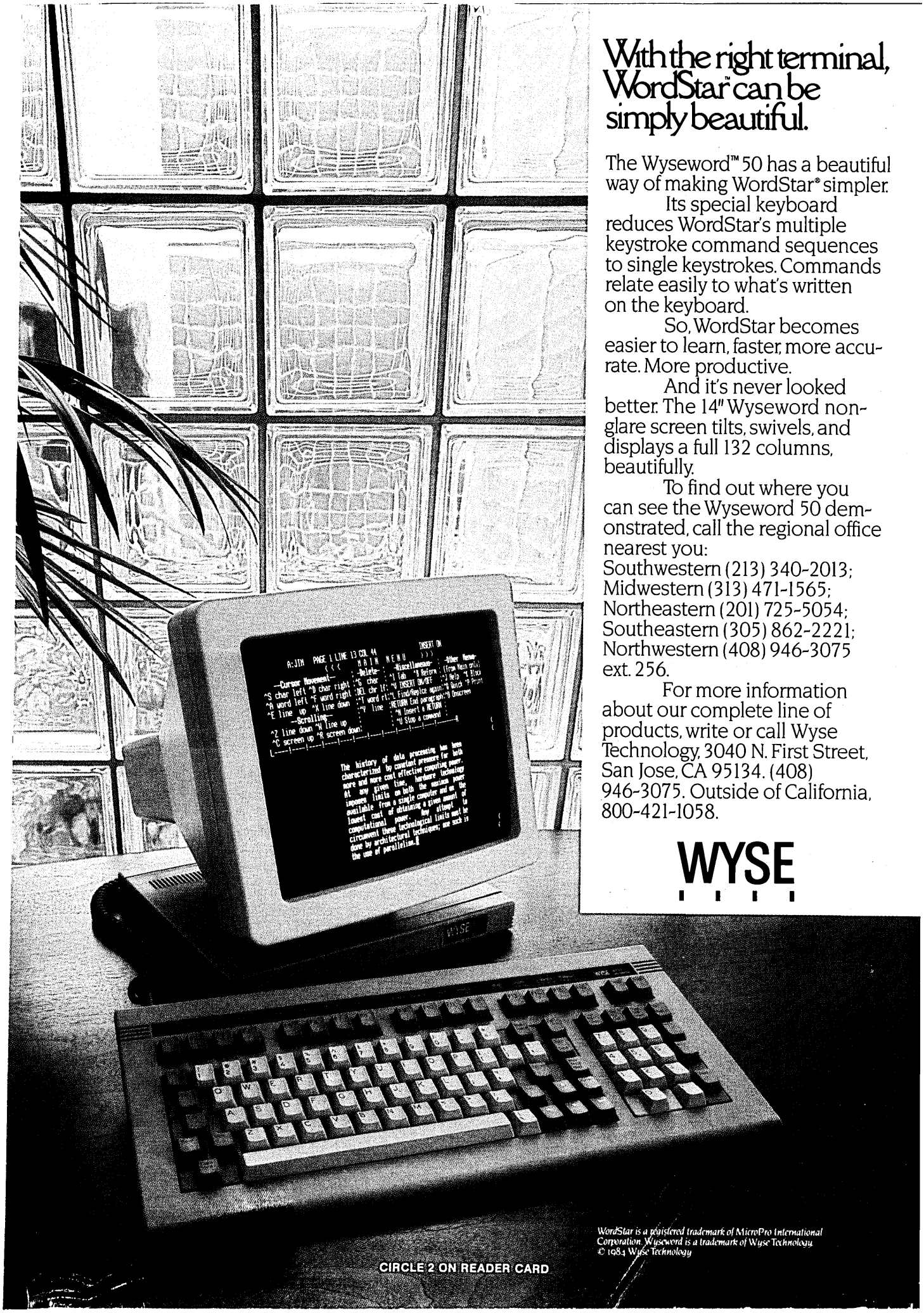
The combination of truth, beauty, charm, etc., with a multivalue logic system opens up yet another field of potential applications. Possible states in such a system could be "Nice try but no cigar" (high beauty, low truth), "You must be kidding" (low truth value, low charm), or "Not on your best day" (low charm, low beauty, low truth). The possiblities in higher level combinations are staggering.

We have only scratched the surface of the logic and arithmetic that can possibly be developed on quark systems. Imagine the greater realism when a spreadsheet can honestly report to a business manager that, although it has all the information, it still doesn't have an answer!

—Steve Simmons
Ann Arbor, Michigan

DIGITS BY ROY MENGOT





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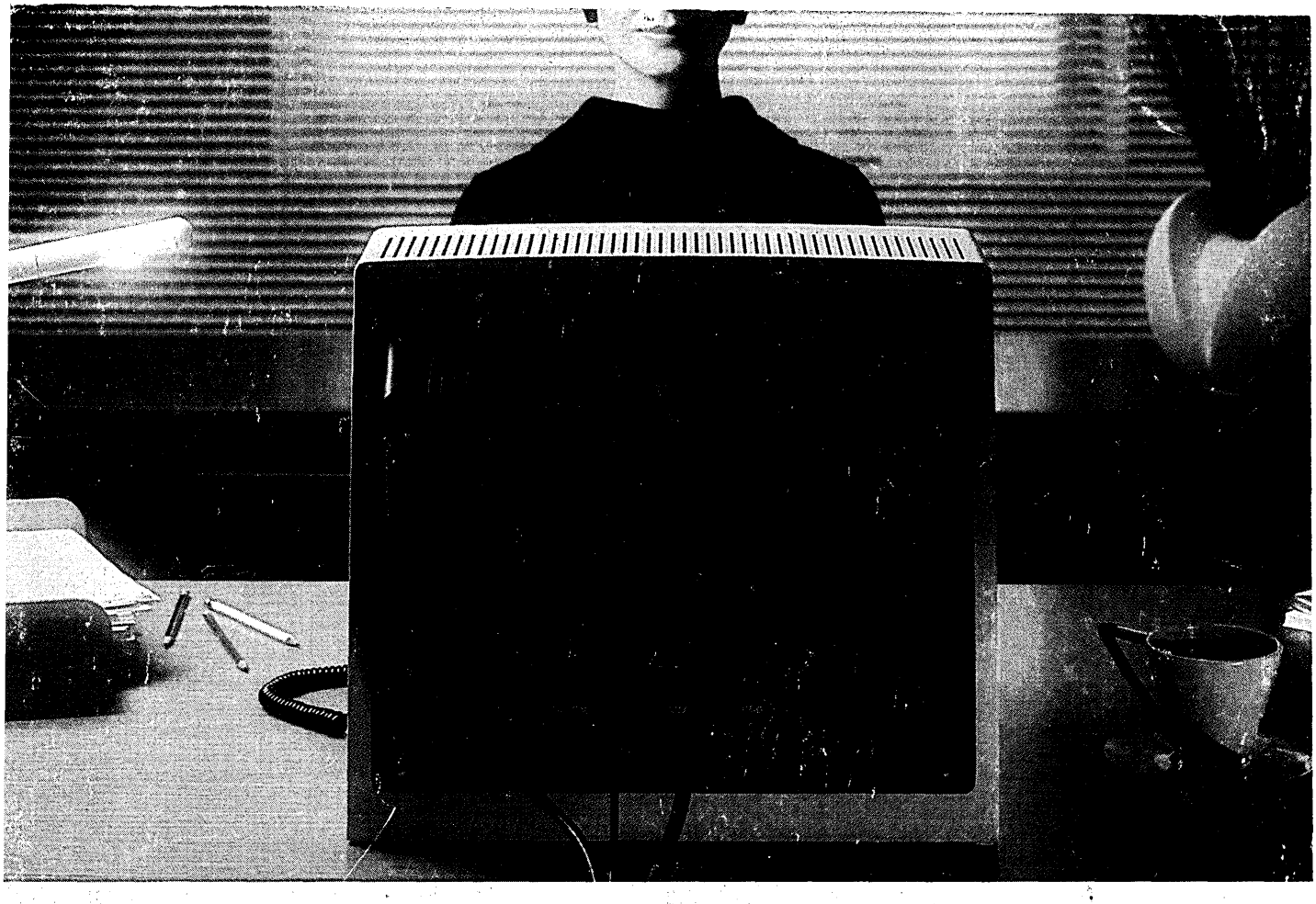
CIRCLE 2 ON READER CARD



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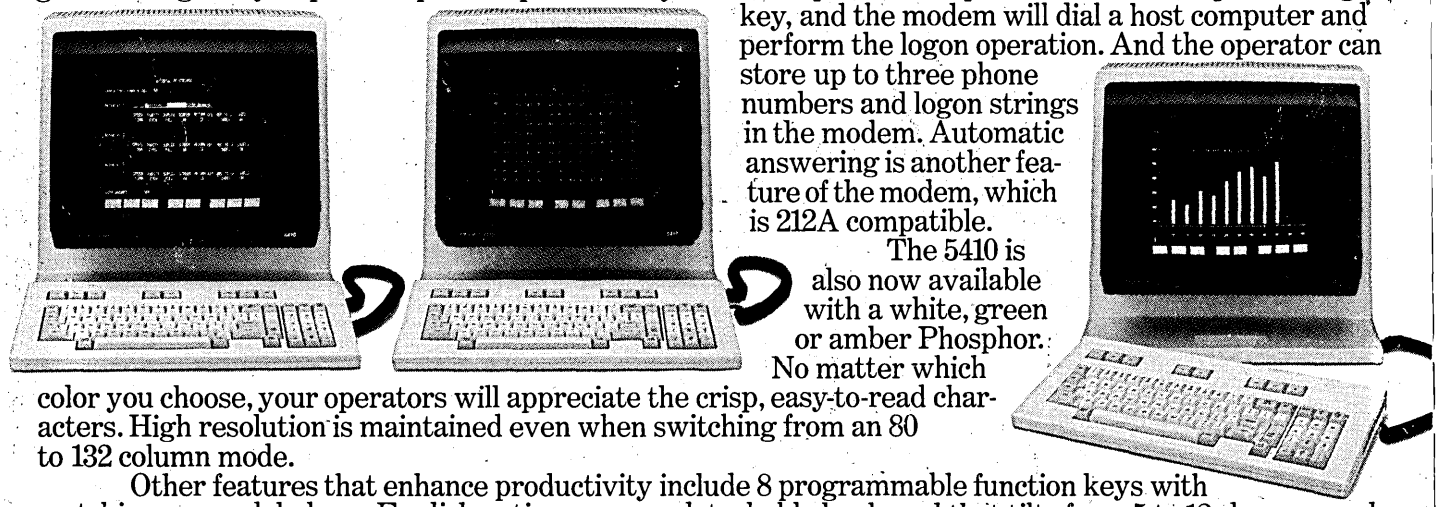

The 5410 is also now available with a white, green or amber Phosphor. No matter which color you choose, your operators will appreciate the crisp, easy-to-read characters. High resolution is maintained even when switching from an 80 to 132 column mode.

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CIRCLE 3 ON READER CARD