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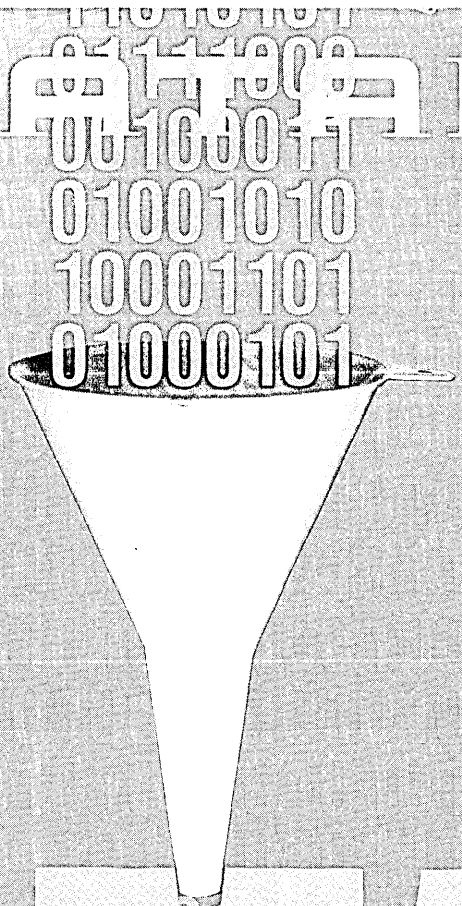

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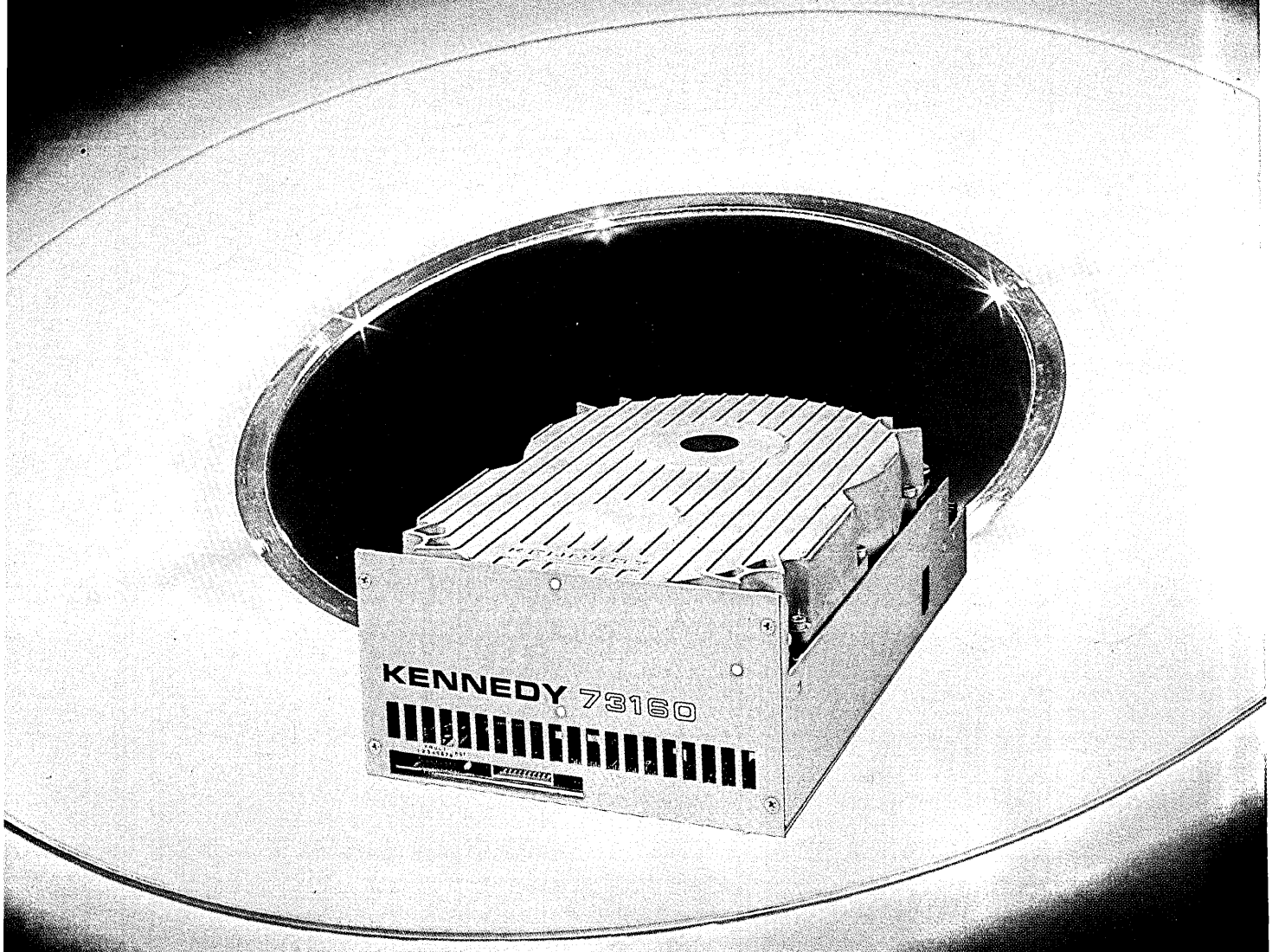

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Functioning as an IBM 3274 Model 51C Cluster Controller using either Bisync or SNA/SDLC protocol, the Micro7400 allows ASCII terminals (or personal computers emulating terminals) to perform as 3270s. Display terminals emulate IBM 3278s, printers emulate IBM 3287s. And special software allows printer terminals to interact with full-screen programs originally developed for crt's.

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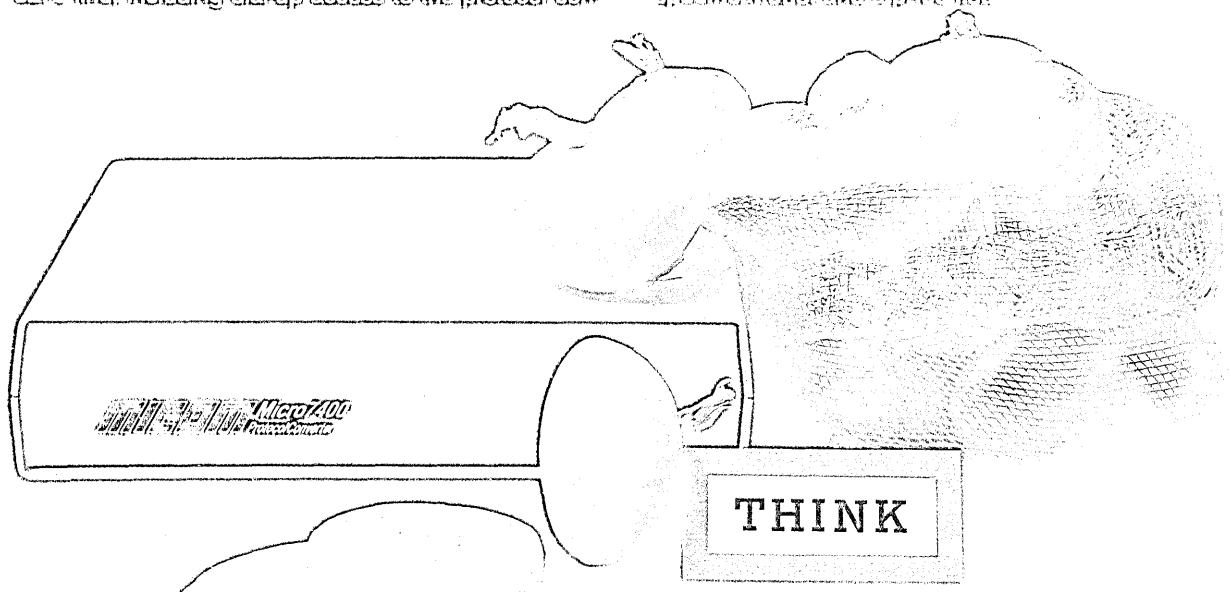

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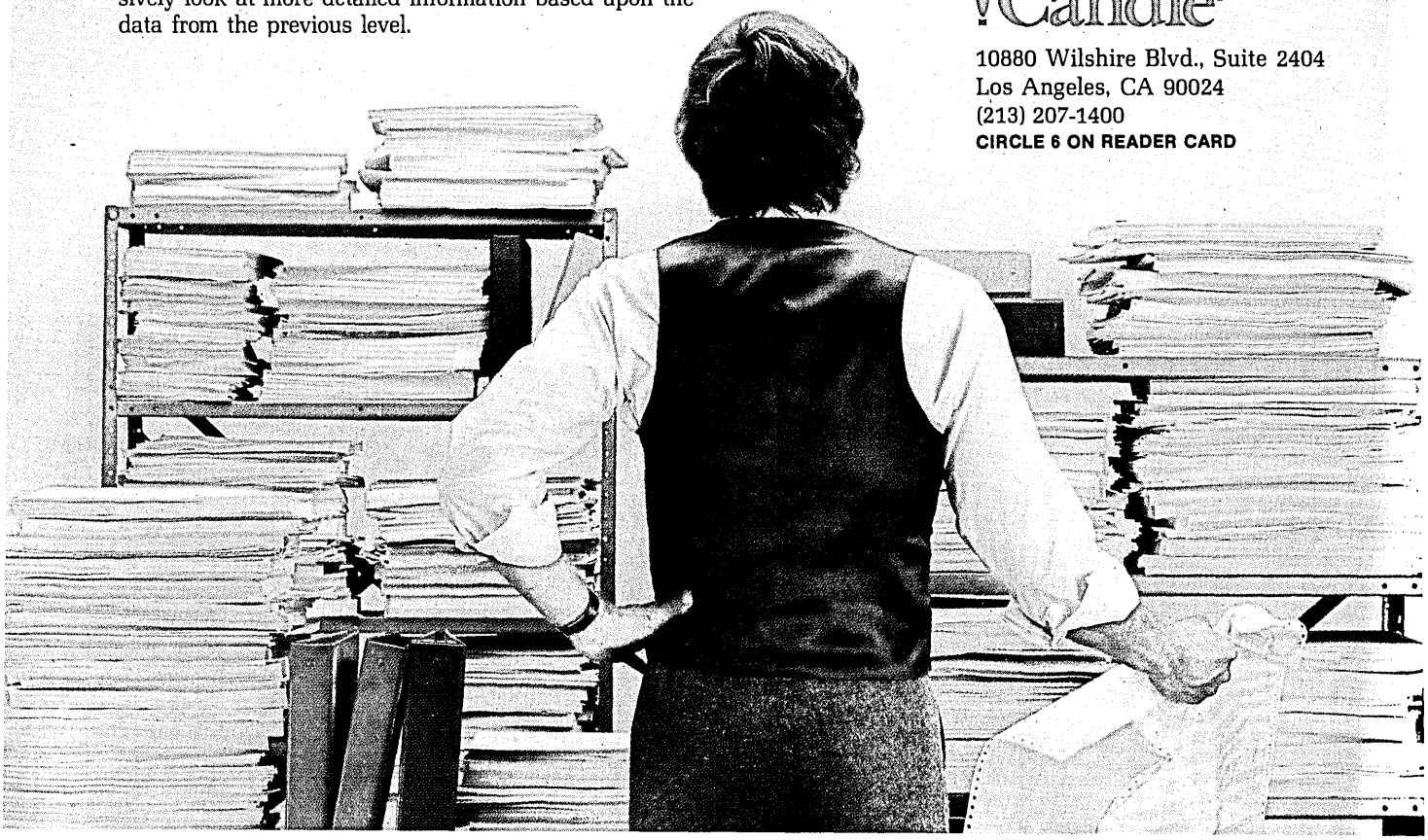

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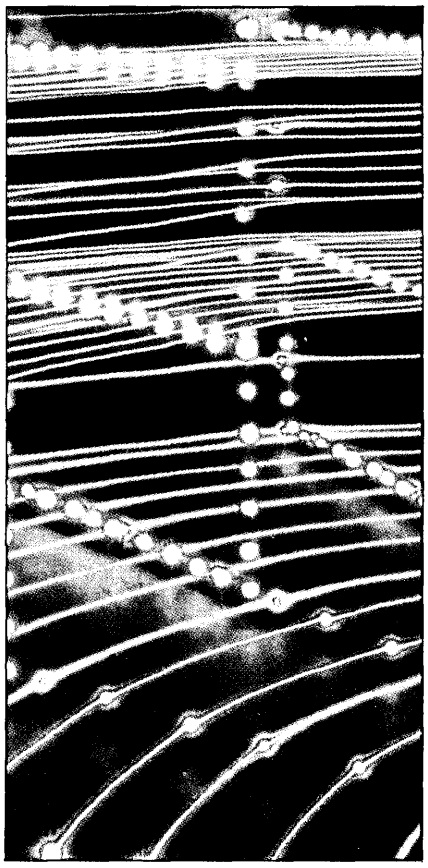

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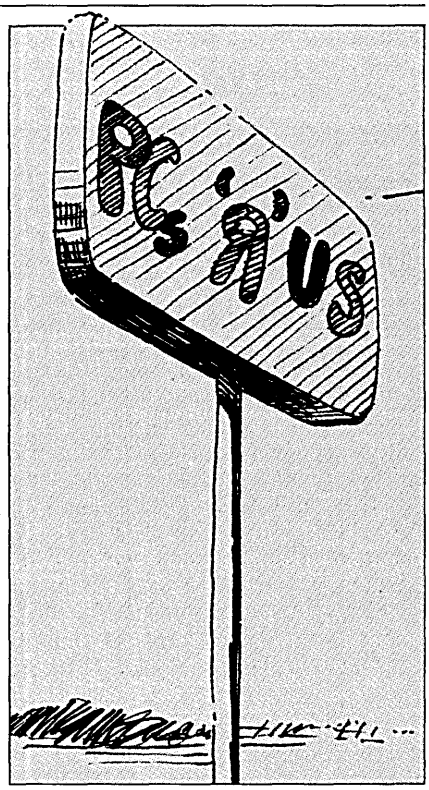

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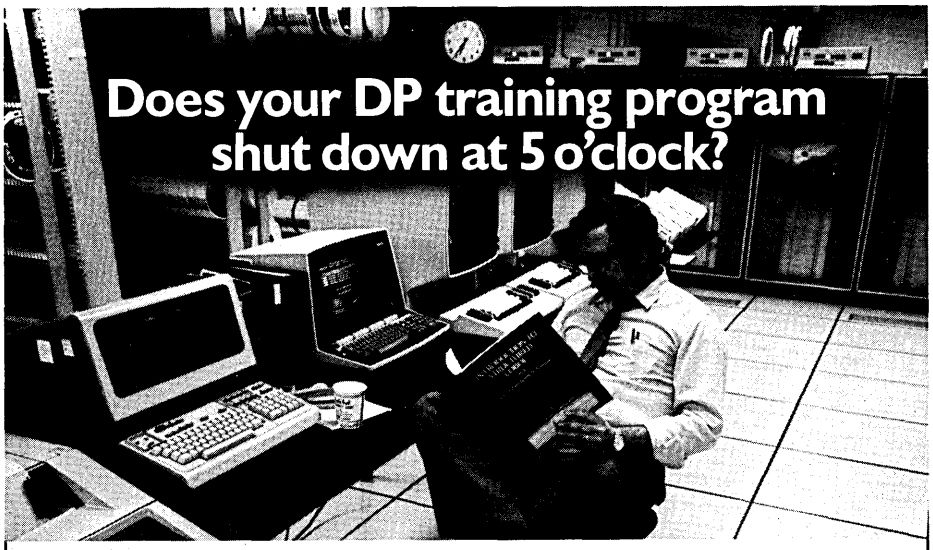

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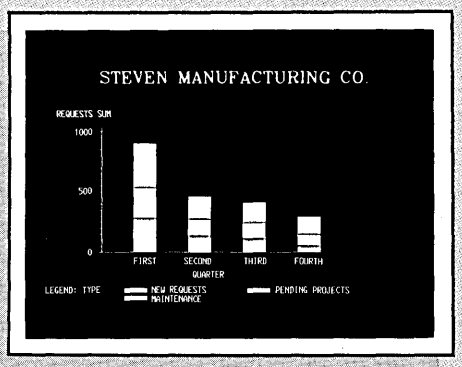

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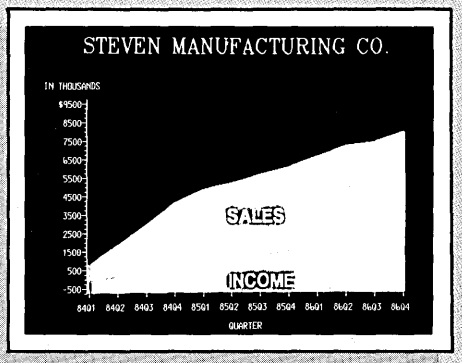

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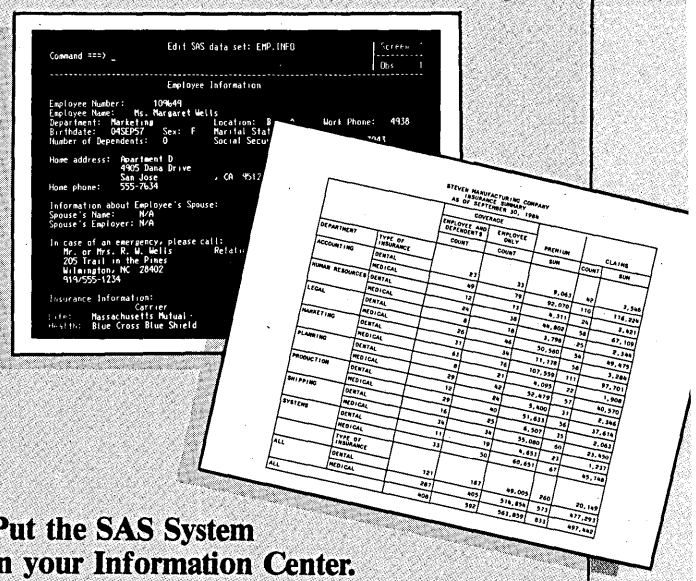

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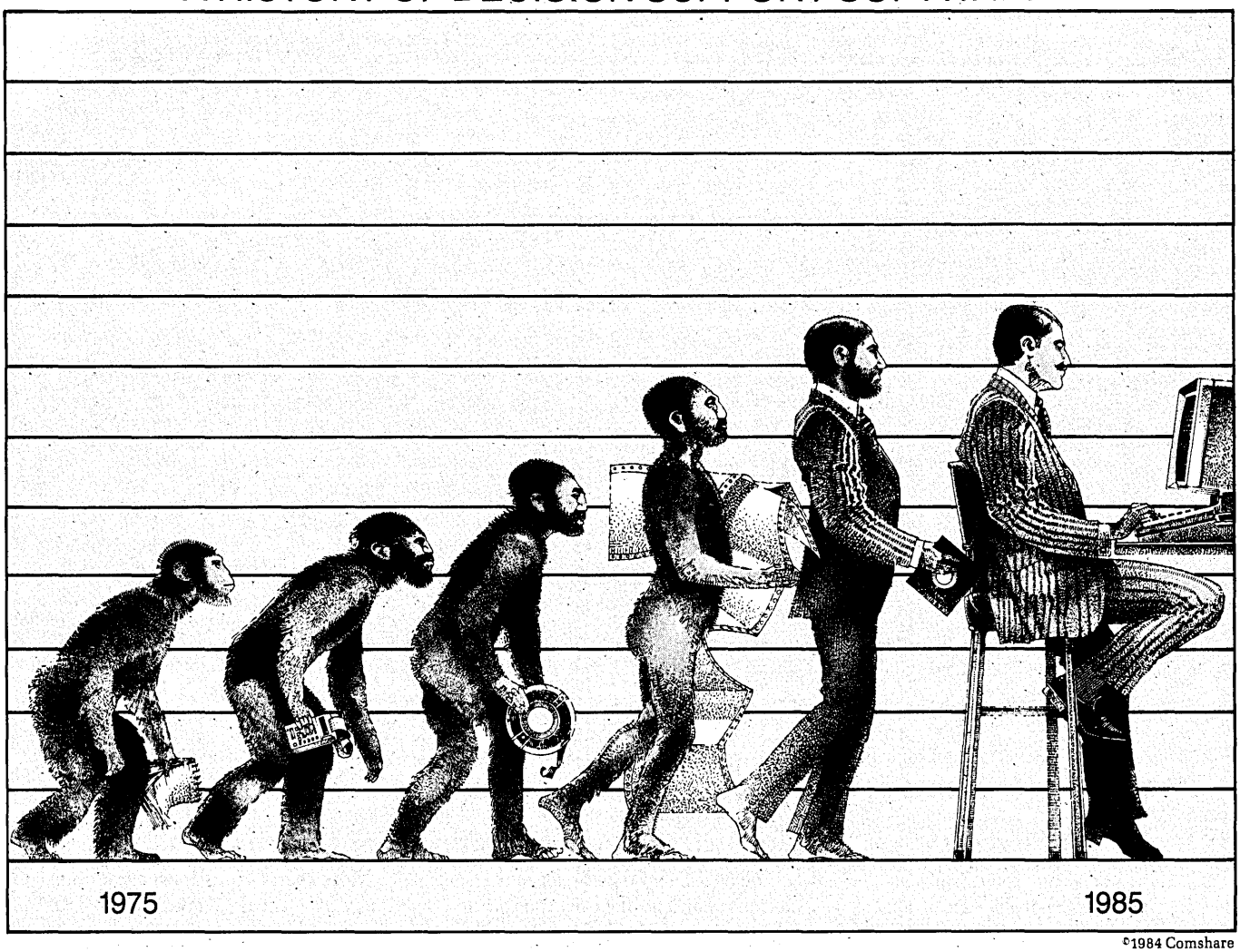

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For decision makers who need to know their options now.

CIRCLE 9 ON READER CARD

LOOK AHEAD

IBM FOLLOWS MAP	IBM pleased the 185 companies attending a recent factory automation conference when it said it would use more of their equipment in its factories. "We need MAP as much as any other user," said Ed Holden, IBM director of advanced engineering, referring to the General Motors-backed factory floor communications protocol. "We are going to get some of our competitors' products on our floor." MAP, which was demonstrated to great acclaim at last July's NCC, promises to help various vendors' equipment interconnect in a meaningful way. Noting that IBM can't always build exactly what it needs in the way of factory automation, Holden said the changes will begin in two to three months' time. Previously the industry leader often front-ended "foreign" equipment with its own Series/1 minicomputer.
FAULT TOLERANCE FALTERING?	The market potential for nonstandard, fault-tolerant computers may be much narrower than some vendors of such machines are claiming. A recent survey based on responses from over 6,000 minicomputer users shows that 40% of them are not interested in nonstop computers that are incompatible with installed machines. Only 11% of the users said they were interested. The survey, taken by Cowen & Co., Boston, in conjunction with DATAMATION, found that only 14% of the users would pay extra even for compatible nonstop systems.
TIME FOR A NEW SERIES/1. . .	The time is ripe for IBM to introduce a new generation of Series/1 minicomputers. The line was first introduced eight years ago and has remained in the 16-bit class ever since. The same Cowen survey shows the machine's popularity slipping drastically compared to such 32-bit machinery as DEC's VAX and even NCR's 68000-based Tower. Not that IBM is doing poorly in the low-end systems area--its System/36 is high on the list of future purchases cited by users--but it would seem likely the company will soon replace the aging Series/1.
. . . AND NEW IBM SUPERMINI?	The industry leader this month may also introduce a new 4381 cpu, which would push into the region the 3083 currently occupies. The expected machine would not need the water cooling a 3083 requires and would therefore be more competitive with the Digital Equipment VAX-11/790, or "Venus" machine, which is expected to be introduced any time now. IBM may also introduce a portable computer soon, perhaps taking some steam out of HP and Data General's recent offerings in that arena.

LOOK AHEAD

MIT BOOK BLASTED

An evidently embarrassed MIT Press is reprinting with many corrections The Computer Comes of Age, a history of early computing development written by Rene Moreau, manager of scientific developments at IBM France. The first in a new MIT series on the history of computing (coedited by MIT prof I. Bernard Cohen, who consults to IBM), the first edition of the book was riddled with factual errors. Gordon Bell, former chief engineer at Digital Equipment and now at Encore Computer Corp., writes in a blistering review appearing in ACM's Annals of the History of Computing that Moreau may have attempted to "rewrite history." Bell finds particularly offensive Moreau's statement that "It is no exaggeration to say that there has been no fundamental development in computer science since 1963."

AUTOMATING FREE SPEECH

The Community Memory Project, an uncensored electronic bulletin board designed by a group of Berkeley, Calif., computerniks, has finally gone on-line after many years of underfunded development work. The system's terminals are to be located in supermarkets, local shops, and libraries as a means of helping people share information, gossip, advertisements, graffiti, and any other bits of free speech. Eventually the nonprofit group hopes to sell its software to similar groups in other communities. Much of Community Memory's funding has come from Lee Felsenstein, the man who engineered the original Osborne computer.

RUMORS AND RAW RANDOM DATA

Paine Webber analyst Stephen K. Smith says Tandem Computers will come out soon with a series of PC-compatible workstations code-named Dynamite, a 16-bit machine called Checkpoint to replace the aging NonStop I and II series, and a new low-end, 32-bit cpu in the TXP line. . . .Apparently not to be outdone by its aggressive competitors, IBM has begun lending computing publications its new PC AT on a trial basis. . . .Lee Data Corp., Minneapolis, has come out with a device that enables 3270-type terminals to communicate over installed twisted-pair telephone lines. . . .A pamphlet on 1984 from the Soviet Novosti Press Agency equates the Pentagon's Ada programming language with George Orwell's Newspeak. . . .A recent item in this column erred in stating that Boeing Computer Services found many faults with an AT&T 3B2/300 computer. Boeing says it indeed has found problems with a new computer, which it declines to identify, but says it has no complaints about what little 3B hardware it has installed.

Man discovered the bar code blues.

A strange thing happened when man asked his printers to handle emerging bar code standards.

Very little emerged.

Some could handle only a few formats. Or print just one bar code per form.

Worse yet, some required costly software and lots of time from the host computer. Incredible as it sounds, some of these wimpy printers had to be protected from dust and temperature.

That's when man discovered the bar code blues.

Fortunately, there was a solution for this dilemma. Man called it the L150 bar code printer. And it could do it all. AIAG, HIBC, LOGMARS, UPC, and EAN.

First in a series of new bar code label printers, the L150 proved to be tough, fast, and perfect for print intensive environments. Man also discovered this printer could turn out high first pass read rates, even in dusty, hot factories.

And with intelligence built in, the L150 could print forms and labels with bar codes, logos, expanded characters, compressed print and reversed print, all in one pass. In effect, man found a way to have custom forms without the expense of custom forms.

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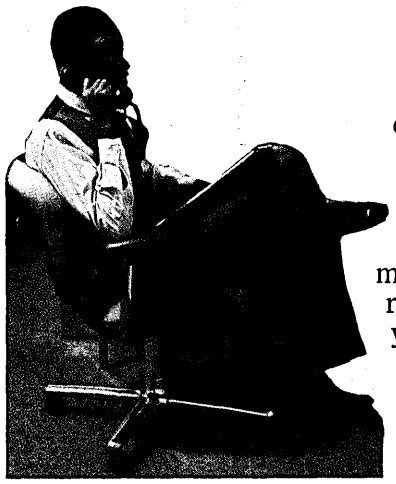
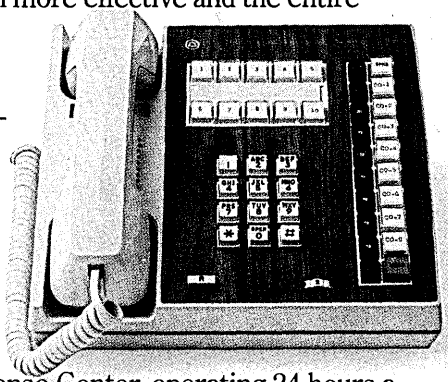
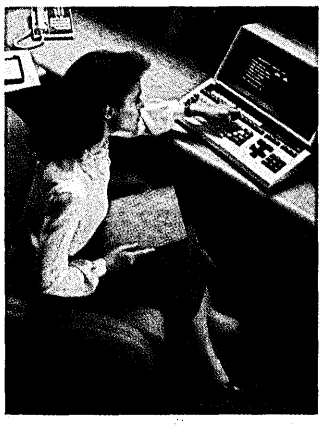


In evaluating a computer system, many users put service at the top of their list. So do we.

We start by making one individual responsible for your system's performance. He's highly trained and knows you and your operation first hand. And he's the focal point of a person-to-person approach that makes communication more effective and the entire program more responsive.



The Honeywell service program includes varied resources to assist your representative in meeting every eventuality. Like our National Response Center, operating 24 hours a day, seven days a week. Your one call here is all it takes to trigger action. All of the historic data on your system is at their fingertips, all resources at their disposal.



Among these are our Technical Assistance Centers. Staffed by hardware and software experts, each TAC is equipped with system documentation libraries and advanced capabilities to quickly diagnose your problem remotely.

If spare parts are required, you'll get them. Fast. Our nationwide on-line inventory tracking system and network of stocking centers allow us to locate and ship any part. Quickly.

Still another element of our customer service is training. In addition to such basics as programming, we conduct classes in advanced areas such as data communications and database design. Using the latest computer-assisted learning techniques, these classes can be conducted at your facilities or ours.

There are no compromises in the quality of our service. But there are varying levels of service available that can be tailored to meet your system availability requirements. Our Customer-Assisted Maintenance Program (CAMP), for example, provides tools for self-diagnosis of difficulties and offers additional economies through parts replacement arrangements that include carry-in, mail-in, or call-in options for expedited delivery.

We call this comprehensive approach to system support TotalCare™ service. It represents all that we've learned in more than 25 years of serving the needs of customers all over the world.

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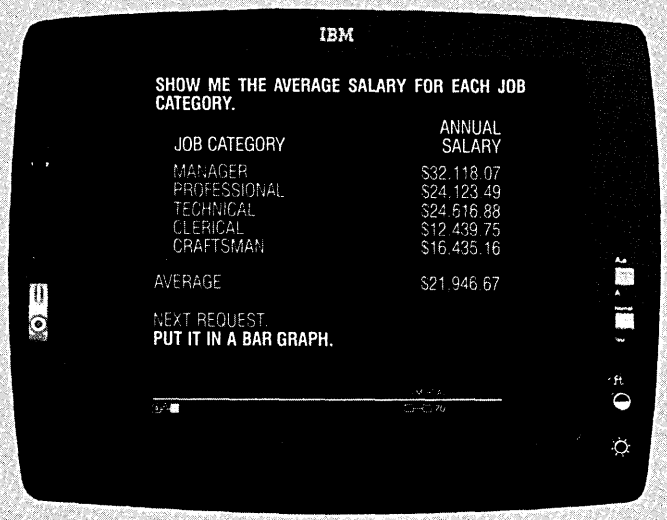

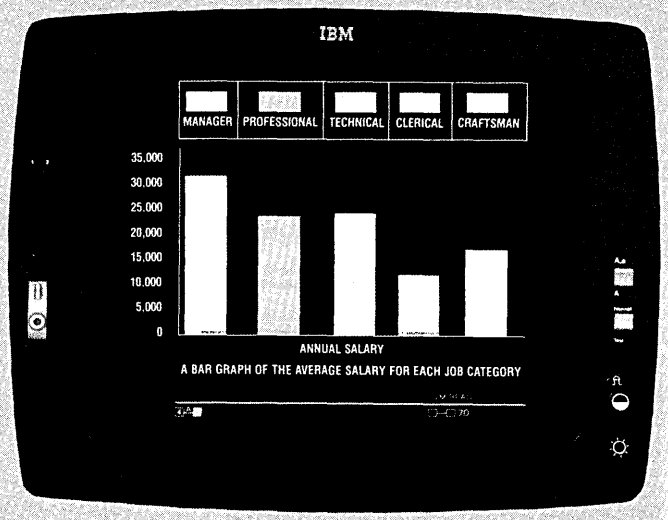

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CIRCLE 12 ON READER CARD

LETTERS

APPLE PIRACY?

As president of Multitech Industrial Corporation and chairman of the Taipei Computer Association, I must state that your recent article, "The Asian Micro Pirates" (May 15, p. 123), presented your readers with a very inaccurate and distorted picture of Taiwan and our local computer industry.

According to recent government statistics, the growth of Taiwan's computer industry was 612% for 1983, with a total export value of $167 million (U.S.). Over 90% of such exports were to renowned U.S. firms like IBM, DEC, Wang, Ampex, ITT, Qume, Honeywell, and more. Terminals, printers, floppy disk drives, and microcomputer systems comprised the lion's share of exports, which shows both the quality of local manufacture and the faith that foreign firms have shown in the capabilities of local firms.

Multitech is perhaps the most reputable computer maker in Taiwan, and we have become so because of our R&D investment and sales success. We have never been involved in the pirate business, and the fact that your article states so is a major blow to our reputation. Multitech does offer computers that are compatible with software on the market for the IBM PC and Apple II machines, but I am afraid that you have lost the distinction between independently developed compatible products and knockoffs.

The issue of copyright protection of computer software is still very ambiguous, even in the United States. In designing around compatibility there are natural hardware constraints and programming conventions that will cause some similarity in software. The issue of how much similarity is legally permissible has never been addressed in U.S. jurisprudence, and is therefore an issue that is still unclear.

Multitech's sister company, Sertek International Inc., is heavily involved in the representation and distribution of products made by American firms. In the component field, Sertek distributes for Advanced Micro Devices, Texas Instruments, National Semiconductor, RCA, Rockwell, Zilog, and more. In instrumentation it represents Genrad, Tymshare, Micom, Gould, Daisy, and others. In the personal computer field Sertek is the authorized dealer for Hewlett-Packard and IBM.

STAN SHIH
Multitech Industrial Corp.
Taiwan

Daniel Burstein replies:
In my article I used the phrase "Multitech . . . reportedly made millions in the fake Apple business. . . ." Apple's claims that Multitech illegally copied the Apple II *have been the subject of frequent reports in the* Asian Computer Monthly *and other regional publications. My article pointed out that Multitech is now a manufacturer of legal, IBM-compatible machines.*

"IMMORTAL SOFTWARE"

Through clever retrofit, it is possible to increase the usefulness—and extend the life—of aging applications. To that extent, the software does seem immortal. For instance, we have been adding simple, standardized menus of control functions to the early vintage TSO applications we maintain for a large federal client. The structure of the underlying software is no better than before, but it is a lot easier to use. The menus use standard conventions modeled after SPF, which makes it easier for users who handle several applications. It also makes the age of a particular application less obtrusive.

Far from being a necessary evil, we have found, thoughtful routine maintenance reduces the need to develop replacements. Users and the client like this.

T.E. COATES
Calculon Corp.
Rockville, Maryland

LET'S GET THIS RIGHT

Rodney Smith's article ("The New Political Machine," June 1, p. 22) on the use of small computers in local elections mentions a firm offering political software packages to Republican candidates "from a one-room office in the Heritage Foundation, Washington, D.C."

Unfortunately, the sentence creates the impression that the Heritage Foundation provides this firm, Campaign Software, with office space (perhaps even that the firm is related to the Heritage Foundation). In fact, the Heritage Foundation is a nonpartisan, tax-emempt public policy research institute and does not get involved in electoral politics. Campaign Software is one of many businesses and associates leasing commercial office space in the Heritage Foundation Building on Capitol Hill, but it is not related in any way to the Heritage Foundation.

This may seem like a minor matter, but the distinction is important because the Internal Revenue Code and our own bylaws prohibit the Heritage Foundation from involvement in partisan political activity. And we adhere to that prohibition steadfastly.

CATHY A. LUDWIG
The Heritage Foundation
Washington, D.C.

CATCHING HACKERS

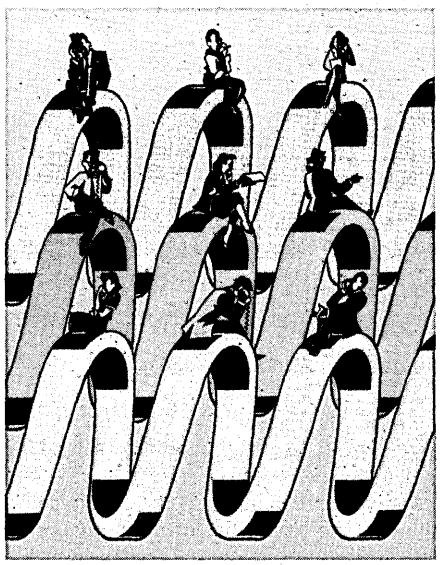
Gene Troy makes some good points in discussing ways of "Thwarting the Hackers" (July 1, p. 116). Here are some more.

People responsible for security should think about ways to catch hackers in the act, not just react after the damage has been done.

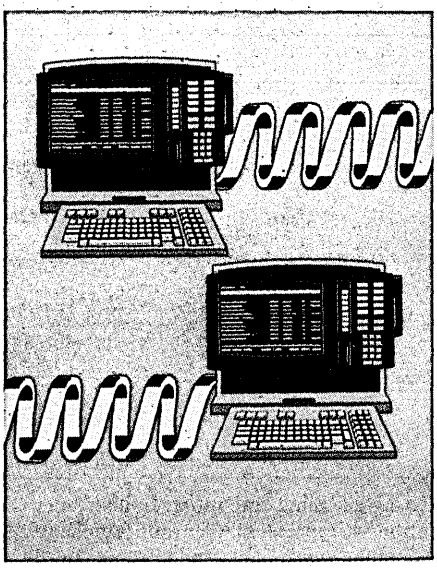
Question: Is the pattern exhibited by a hacker trying to break into your system different from the pattern of an authorized user who has forgotten or miskeyed his password? Answer: Yes, it's entirely different! Does this give you any ideas?

Every well-designed password system tells the user at log-on the time and date of the previous log-on. With this feature in place, and a good ongoing security awareness program, the alert user will learn to verify that there have been no unauthorized accesses since the prior terminal session, and to contact security immediately if someone else has been using his password.

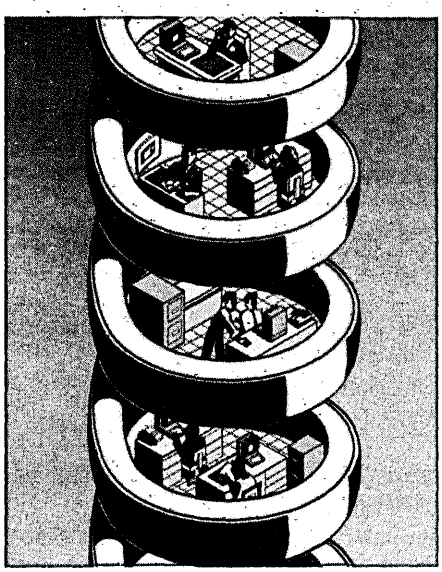
ROBERT V. JACOBSON
President
International Security Technology Inc.
New York



Voice Management



Data Management



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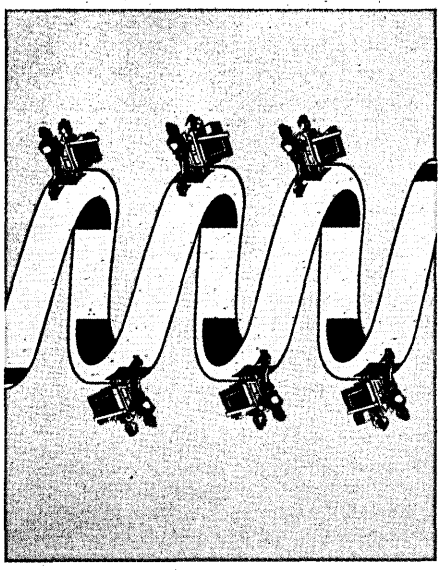
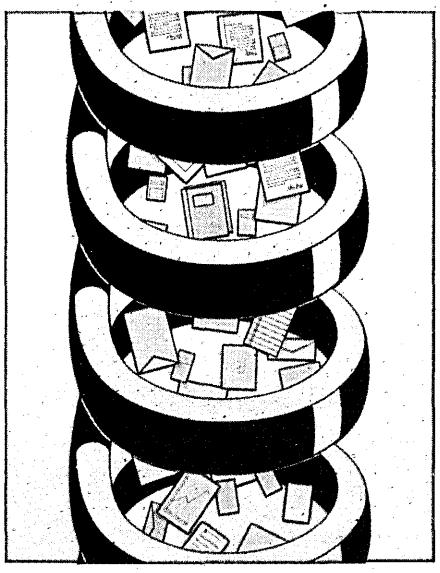
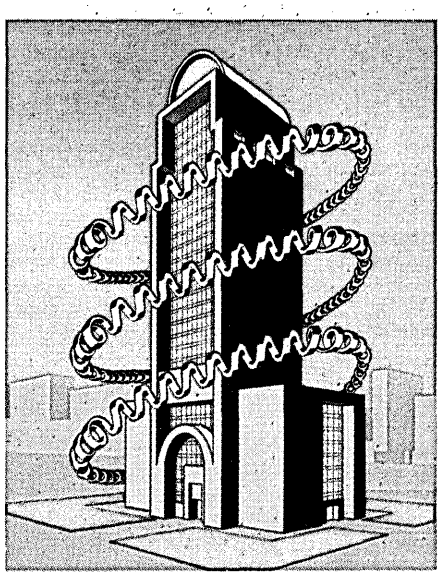


System Management



Office Management



Building Management

ONLY SYSTEM 75 AND SYSTEM 85 FROM AT&T INFORMATION SYSTEMS FULLY INTEGRATE SO MANY VITAL MANAGEMENT FUNCTIONS.

Decisions, decisions, decisions. It wasn't too long ago that if you wanted the most sophisticated office communications equipment in the world, you'd get a telephone.

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Relax. The decision is easy. System 75 and System 85 from AT&T Information Systems offer you more power, flexibility and control than any other system in the world. Because they can grow and change as technology advances, you can be sure your investment is protected. And because they're from AT&T, you know they meet the highest standards of manufacturing quality and reliability.

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Network Management Different businesses need different networks. Our Distributed Communications System and Electronic Tandem Network let you link all your locations, either across the street or across the country.

System Management Adaptability is the key here. You'll have a hands-on ability to monitor and change the entire system day by day, to respond to your changing needs.

Office Management This streamlines your everyday office procedures into one easy-to-use system. By integrating Electronic Document Communication, Message Center, and Directory, you can create, store and send information easier and more productively.

Building Management This function answers the question, "Who's minding the store?" with around-the-clock energy, security and safety control of your building. It's a cost-effective way to keep your business running smoothly.

100 YEARS OF EXPERIENCE

There's another aspect of our system which you can look at as something of an insurance policy. It's called Information Systems Architecture. It is this framework that ensures that anything new we develop for your system will fit right in. System 75 and System 85 are designed according to its guidelines, as our future products will be. That's protection.

We've been the undisputed leader in communications for over 100 years, and we plan to keep it that way. Today, more than 4000 systems designers and others formerly at AT&T Bell Laboratories are working exclusively to develop new business products at Information Systems Laboratories. And they're supported by the largest sales and service staff in the industry to help you along every step of the way.

There are two ways you can distinguish yourself in the business world—either get a little gray at the temples worrying about it, or choose AT&T Information Systems.

To find out more about System 75 and System 85, call AT&T Information Systems at 1-800-247-1212, Ext. 187.

WHEN YOU'VE GOT TO BE RIGHT.

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CIRCLE 13 ON READER CARD

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For all the talk about PC/mainframe issues, you'd think more people would have actually done something.

Well, Infodata has. It's called PC/INQUIRE, and it's just one of several exciting reasons to attend an Infodata MIS Executive Seminar.

Each Infodata seminar offers a range of powerful solutions to the problems facing MIS departments. PC/INQUIRE is one of those solutions: a relational DBMS that offers mainframe system features, yet fits perfectly on an IBM PC. And while satisfying end users, PC/INQUIRE also meets corporate needs for security and data integrity.

Other seminar highlights include on-line demonstration of the following products you'll want to know about: INQUIRE/Information Center with its exceptionally friendly 4GL for the Information Center and the Development Center; INQUIRE/Text, a unique system that transforms free-form text into an active on-line resource; and INQUIRE/DBMS, the relational mainframe model for PC/INQUIRE. And, each seminar attendee qualifies for a free PC/INQUIRE drawing!

Our seminars fill up fast. To be sure of a place, call today and register for the seminar nearest you. (800) 336-4939. In Virginia, call (703) 578-3430.

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INFODATA®

CIRCLE 14 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

MAKING CONVERTS

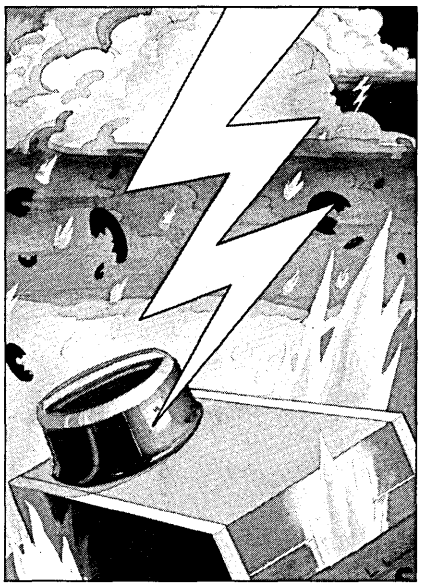


ILLUSTRATION BY DORIS ETTLINGER

When it comes to fire-and-brimstone sermons, reliability management of computer peripherals is hardly in the same class as the seven deadly sins or the Ten Commandments. Yet for every subject there invariably is someone who is sufficiently evangelical of temperament to proselytize the uninitiated.

In managing the reliability of mass storage devices, that preacher is Jim White, a former vice president of Manufacturers Hanover Trust. He developed a software package for IBM cpus that measures hardware failure rates, and makes it possible to compare not only devices within a data center, but also devices across hundreds of data centers. It tracks the failure rates of cpus, channels, memory, disk and tape drives, and media.

That package, marketed by Uccel Corp., is called R+, and it is most often used in tracking mass storage devices. Users frequently report that reliability is the most important factor in choosing new DASD devices, and no wonder. A single overheated circuit can bring down a dozen major jobs. That makes the user community a tantalizing group of potential disciples.

So far, White's preaching plus Uccel's marketing has managed to win over some 700 data centers to R+. Although Uccel manages the marketing end, White himself still goes on the stump to push the product. His speeches, one of which is excerpted on p. 82, are full of vivid analogies, embellished with anecdotes of his own experiences, and laden with exhortations to see the light.

For many users, as Michael Tyler reports in "Hard Facts About Hardware Reliability?" installing R+ is akin to being born again. They swear that the package gives them accurate data so they can keep their most critical data on their most reliable drives, thereby reducing the chances of a hard fail. The users also say the data give them leverage in working with the hardware vendor's field engineers, and they report that these field engineers have in many cases come to dread the reports generated by R+. Indeed, Storage Technology Corp. is said to require its field engineers at R+ sites to phone corporate headquarters daily with R+ ratings.

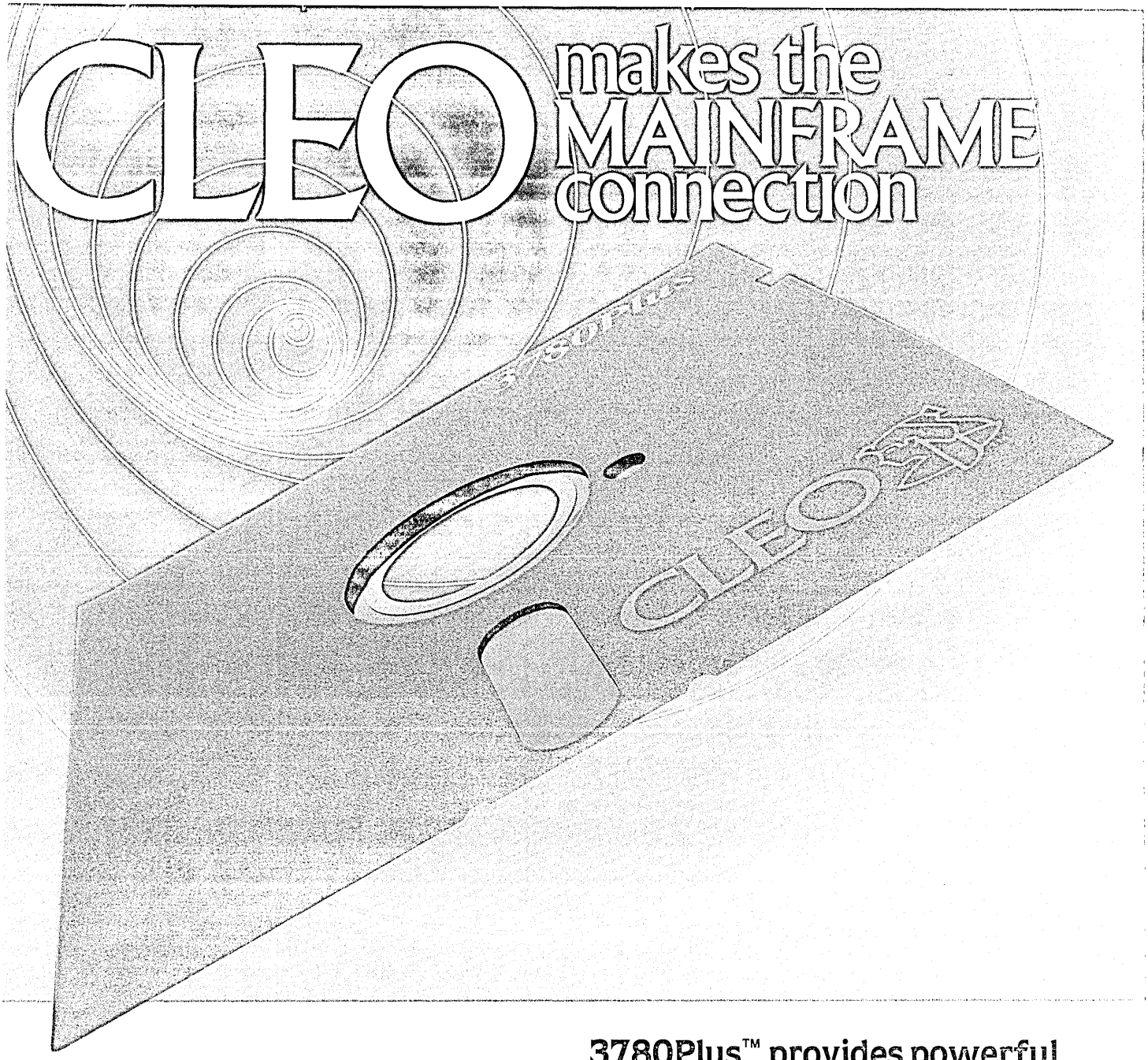
Yet, as with any area where faith and science collide, controversy surrounds R+. Vendors have cried foul because of some of the techniques by which the package gathers its data. Users squabble over how to interpret the data, and whether it is even appropriate to use the data in meetings with the hardware vendors. The controversy, of course, only feeds more interest in the entire subject of reliability management.

Against this backdrop, Uccel has provided DATAMATION with an exclusive peek into its database report comparing the reliability of hardware devices across all 700 data centers using the package. The report, which gives data on average start I/Os per hard fail in the first six months of 1984, offers a fascinating glimpse into the comparative failure rates of DASD devices from IBM, Storage Technology, Memorex, and other IBM plug-compatible vendors.

Despite the controversy, the report lays to rest claims by some vendors that all drives of a similar capacity are equally reliable. In several intriguing cases, some vendors' drives are often vastly more reliable than other vendors' drives. For example, Storage Technology's 8380 drives fail more than six times as often as IBM's competing 3380 drives, despite the smaller burden they carry in most dp shops. Amdahl's midsize drives offer more activity per hard fail than any vendor's drives in any class, while National Advanced Systems' drives are the poorest in the 3330 class and among the best of the high-end 3380 class.

As the article shows, these results may not be as rigorously precise as Uccel paints them, or even as many recipients had hoped. They are nonetheless the only independently generated measures of hardware reliability, and consequently R+ succeeds where screaming and hollering about failures does not: it forces the vendor to take action. ◉

CLEO makes the MAINFRAME connection



CLEO™ makes the 3270 Mainframe Connection

The communications features of the CLEO-3270 Software package allow your computer to emulate a remote cluster of IBM terminal devices.

You'll be up and running fast. No changes are necessary on your mainframe. And CLEO on your computer will install anywhere an IBM 3276 cluster might be used.

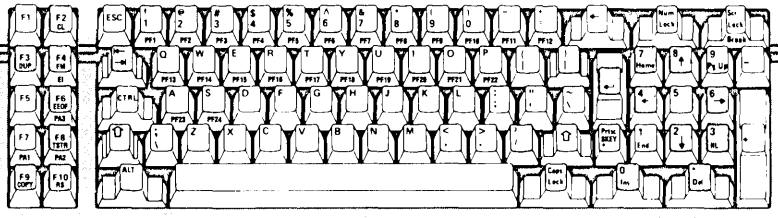
Once CLEO is running, it maintains communications with your host computer, while allowing your computer keyboard operators to run DOS or UNIX tasks in addition to 3278 emulation.

3780Plus™ provides powerful batch communications to your mainframe or other 3780's.

If your IBM mainframe doesn't support remote 3270 clusters, you may need remote batch communications. 3780Plus is your answer for high speed computer-to-computer file transfer.

3780Plus is full featured and supports the IBM 3780 and 2780 BSC protocols. If you need to transmit or receive text or binary files at high speed, 3780Plus has no match. It'll run synchronous modems up to 19.2K baud.

3780Plus maintains a "job file." It'll run "unattended" and keep a log file of all communications activity. Before you buy a 3780 emulator make sure you have the features you'll need: transparent mode, space compression, device selection, printer forms control, spooling, configurable line parameters and line trace for diagnostics. 3780Plus has them all!



Simultaneously use alternate key.

Simultaneously use shift key.

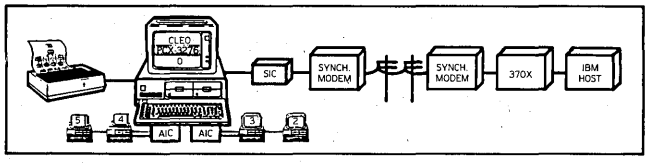
No simultaneous key required.

IBM PC COMPATIBLES

CLEO on the IBM PC Compatibles. The CLEO software program loads from a PC-DOS diskette and contains simultaneous emulation for 3276 line protocol and up to six devices emulating 3278 crts or 3287 printers. When CLEO runs on the PC, six devices are supported (through three interface cards supplied with the CLEO software). The six supported devices include: 3278 support for the PC's console; 3287 support for the PC's printer; and, 3278 support for up to four other PC's which may be serially attached to the PC which is running CLEO.

CLEO is a full 3276 emulator and supports all of the standard features of IBM's 3276; you won't need to make any modifications to your 3270 host computer. Your installation considerations for CLEO on the PC will be identical to those experienced in installing an IBM 3276. In fact, CLEO on your PC will readily install at any site where a 3276 currently operates.

Keyboard decals are supplied with CLEO. These adhere to the front face of the keys on your PC keyboard and serve as a quick reminder of the location of the 3278 keys.



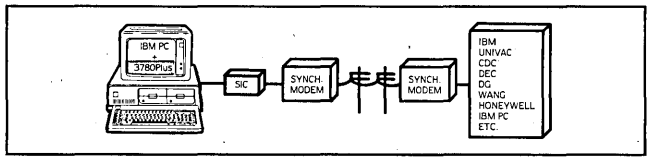
BSC and SNA versions of CLEO are available in two models. The first version is PC2 which provides 3276 emulation and support for two devices, a 3278 CRT and a 3287 printer. PC2 includes one hardware support card (PC-SIC).

The expanded or "clustered" model is called PC6. PC6 requires two additional interface cards (PC-AIC) and four 25' cables for attaching four PC's to a central PC running PC6. Physically these four PC's are attached through their asynchronous serial port (COMM1) using a 25' cable included in the PC6 package.

When you're operating one of the four attached PC's and you want your PC to become a 3278 you execute a software package, PC3278, included with the PC6 package.

For enhanced 3278 display, the IBM color graphics card is recommended for use with CLEO.

3780Plus on the IBM PC Compatibles. 3780Plus Software is self-contained on one floppy disk and menu driven with simple commands so that you need not be an "expert" in 3780 or 2780 communications to use the package. 3780Plus for the PC includes an interface card, SIC, for interfacing to your synchronous modem.



3780Plus supports IBM's 2780 and 3780 BSC protocols for computer-to-host or computer-to-computer high speed communications. Additionally, 3780Plus has special new features for talking to other computers which are running 3780Plus. For example, files are automatically named by the receiving computer to their original name on the transmitting computer.

3780Plus allows maximum flexibility with a "System" command which allows you to execute many PC-DOS commands from within 3780Plus.

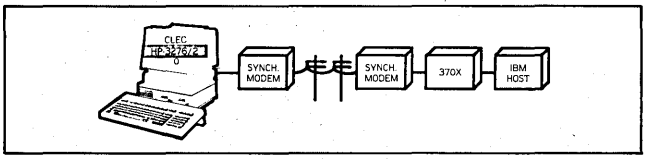
Software/ Hardware Model	Description	3270 Devices Supported	Interface Cards	Retail Price
PC2-3276/2SHM	3276 BSC for the PC	2	1	$ 795.
PC2-3276/12SHM	3276 SNA for the PC	2	1	$ 895.
PC6-3276/2SHM	3276 BSC cluster for PC	6	2	$1,349.
PC6-3276/12SHM	3276 SNA cluster for PC	6	2	$1,499.
PC-3780PlusSHM	3780/2780 emulation for PC		1	$ 795.

HP-150

CLEO on the HP-150. The CLEO software program loads from a MsDos diskette and contains simultaneous emulation for 3276/2 BSC line protocol and support for two devices, a 3278 crt and 3287 printer.

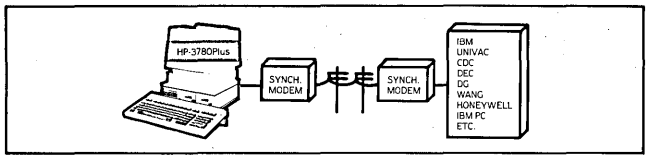
CLEO is a full 3276/2 emulator and supports all of the standard features of IBM's 3276/2; you won't need to make any modifications to your 3270 host computer. Your installation considerations for CLEO on the HP-150 will be identical to those experienced in installing an IBM 3276/2. In fact, CLEO on your 150 will readily install at any site where a 3276/2 currently operates.

Unlike a 3270 coax product, CLEO needs no additional hardware on the HP-150 and an IBM cluster controller to support a coax connection is not required. CLEO is a 3276/2 cluster controller and hooks to a synchronous modem in the same fashion as an IBM 3276/2. The HP-150's port 1 is used for the modem connection.



Keyboard decals are supplied with CLEO. These adhere to the front face of the keys on your 150 keyboard and serve as a quick reminder of the location of the 3278 keys.

3780Plus on the HP-150. 3780Plus Software is self-contained on one floppy disk and menu driven with simple commands so that you need not be an "expert" in 3780 or 2780 communications to use the package.



3780Plus supports IBM's 2780 and 3780 BSC protocols for computer-to-host or computer-to-computer high speed communications. Additionally, 3780Plus has special new features for talking to other computers which are running 3780Plus. For example, files are automatically named by the receiving computer to their original name on the transmitting computer.

3780Plus allows maximum flexibility with a "System" command which allows you to execute many MsDos commands from within 3780Plus.

The HP-150's port 1 is used to connect to the synchronous modem.

Software Model	Description	Retail Price
HP-3276/2SM	3270 BSC for HP-150	$500.
HP-3780PlusSM	3780/2780 emulation for HP-150	$500.

CLEO is ported for many more computers. Contact Altos, Honeywell, IMS, Micromation, Molecular, Nohalt, Olivetti, Tandy, or Zenith Data Systems for CLEO on their machines.

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Unix is a Trademark of Bell Labs

- Color coding on configuration diagrams identifies components supplied in software packages.

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IN FOCUS

MICROS HIT THE ROAD

Fins are out. Digital dashboards are in.

by David Whiteside

When General Motors Corp. introduced its all-new, downsized, front-wheel drive family of luxury cars to the automotive press last summer, more than one veteran auto writer wondered how the public would tell the difference between these high-priced cars and GM's less expensive but similarly styled intermediate front-drive cars already on the market. This fall, yet another new line of GM cars—this time it's the new front-drive compact for the Oldsmobile, Pontiac, and Cadillac division—evokes a similar response: more and more, all GM cars look alike. Such humdrum model introductions are leading many of Detroit's friends and critics alike to wonder, "Where's the beef?"

The answer is surprisingly simple: in the bun, or in more common automotive language, under the skin. In an odd turn of history, an industry universally dedicated a few short years back to fins, chrome, and other highly visible glitter for product differentiation is turning increasingly to invisible electronic devices, especially to microprocessors, for the features they need to distinguish a GM car from a Ford, or even a Chevrolet from a Buick.

In 1985, for example, only the well-heeled buyer of a Buick Riviera or Lincoln Continental Mark VII will be able to order a microprocessor-driven cathode ray tube dashboard display. Complete with touch-sensitive screen, the chips control such functions as the radio and the climate-control system. A stripped-down Ford Escort doesn't have even one microprocessor, something America's middle and upper classes are increasingly unwilling to do without, no matter what the cost.

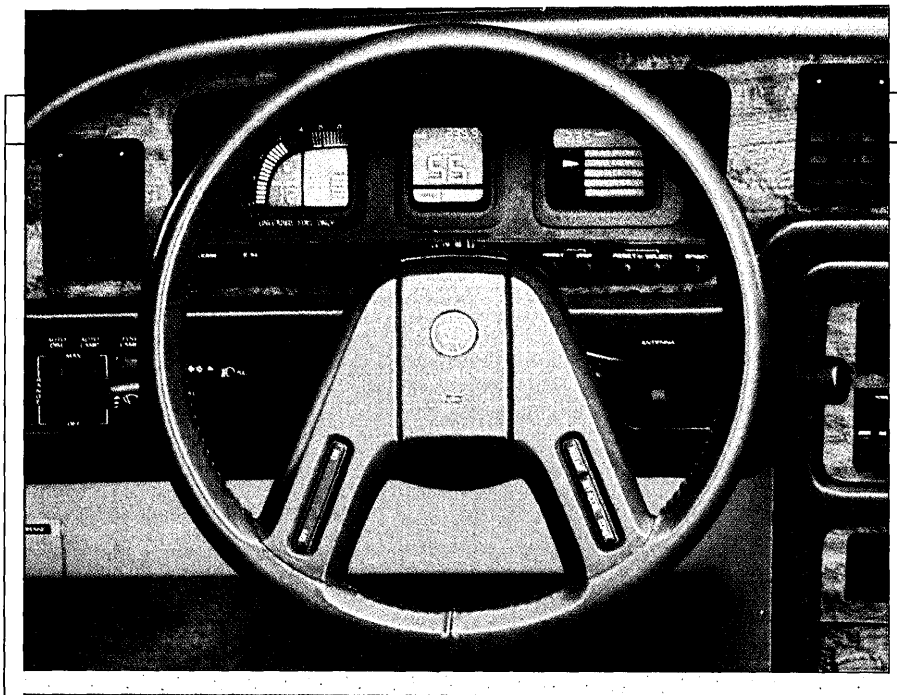
At the other end of the scale, some Ford luxury cars have more than 10 micros, an orgy of electronic elegance that only the wealthy can afford. Middle-class car buyers can choose from a plethora of microprocessor-controlled instrument panels offering everything from simple digital speedometers to dazzling multicolor graphics.

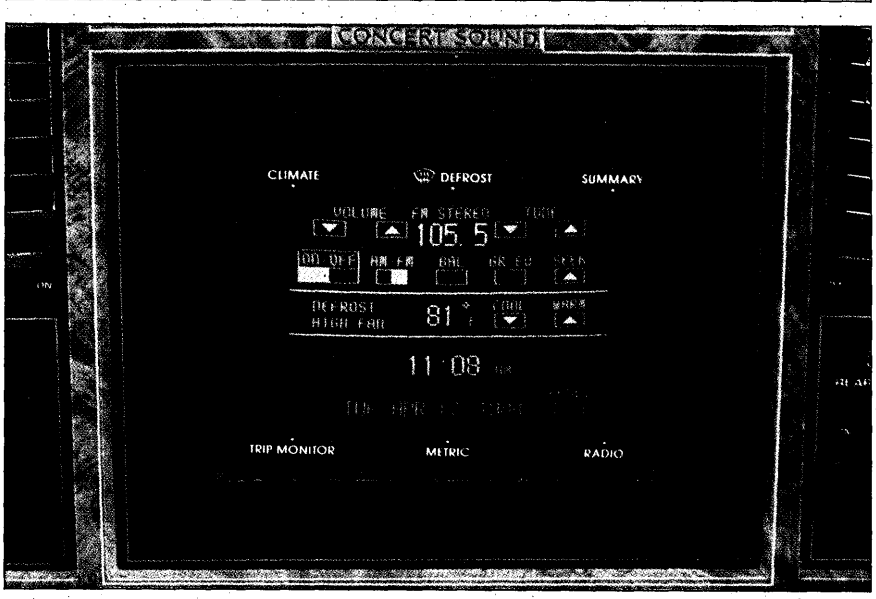
Indeed, with the exception of very basic cars, the microprocessor has become ubiquitous in U.S. automobiles. Even the unhappy buyer of an Escort with the base engine and manual transmission—one of the few cars today that does not have at least micro-based carburetor controls—can quickly remove the no-micro stigma by simply adding an upscale radio. Within three years, according to one major study, electronic componentry will account for 10% of total vehicle costs, or about $1,350 per car. The same study, sponsored by the University of Michigan, predicts that by the early 1990s, as much as 15% of the cost of passenger car engine, transmission, and safety systems will be in the electronics. About 90% of the cars built in the U.S. in 1992 are expected to have electronically controlled AM/FM radios, and 40% of the cost of comfort and convenience items like radios and trip computers will be in their electronic components.

The automobile electronics phenomenon is not limited to this side of the Atlantic and Pacific oceans. Some of the gadgets now being tested by the Japanese and Europeans are raising eyebrows stateside. There is a system to switch on windshield wipers as the first raindrops touch the hood, and radar and sonar to avoid collisions. And those talking cars, warning of open doors or inadequate fuel, are only the beginning—Japanese and American carmakers are working on voice recognition systems too, so drivers can change radio stations by talking back to the radio.

Just 10 years ago, Detroit's auto makers were at most mildly interested in electronics technology. Except for car radios, which were revolutionized by the advent of the transistor in the late 1950s, two decades of consistent courting by the semiconductor industry seemed nearly futile until the mid-1970s. At that point, nearly the only nonentertainment electronic applications on cars were in the alternator and voltage regulator. Today, incited by the increasingly intense competition to be the first to bring the latest in electronic wizardry to market, Big Three engineers, marketing managers, and public relations staffers alike often forget their recent indifference and argue heatedly over who introduced the first electronic components.

One venerable auto industry observer believes the honors should go to the company that offered a solid state headlight dimmer in the late 1950s—but he's not sure who that was. Stepping into the void, Chrysler Corp. claims the honor based on its 1969 introduction of a solid-state voltage regulator. Upstaging its across-town rival, Ford Motor Co. points out it had a transistor-assisted ignition system in 1964. Some argue, however, that the one that really counts is the first microprocessor-based automotive device.





Polychromatic LCD display in new Fords indicates speed and distance. Buick crt has a touch screen and animation for temperature controls. Navigation by satellite with a new Chrysler system now being tested.

That was an ignition control device called Misar (for microprocessed sensing and automatic regulation) on the 1977 Oldsmobile Toronado. Based on a custom 10-bit PMOS Rockwell chip, Misar ushered in a new era in automotive electronics.

What made the difference is a now familiar story. Early in the 1970s, the federal government started insisting that cars produce less air pollution. Then war erupted in the Mideast, and the Arab oil producers cut off the supply of crude to certain unfriendly nations, including the U.S. That led to a fivefold increase in retail gasoline prices, energy shortages, and ultimately to a new set of federal regulations designed to force increased fuel economy from a domestic auto industry generally perceived to be perversely reluctant to give up its gas-guzzling dinosaurs.

Detroit turned to a number of strategies to meet the crisis. First, it downsized its cars and substituted lightweight materials to gain fuel economy. Second, it turned to solid state electronics to squeeze the last drop of fuel efficiency from engines straining to meet emissions standards. And then it discovered aerodynamic styling to further boost efficiency. Ironically, it is downsizing and uniformly aerodynamic styling that make GM's cars look alike, a problem increasingly shared by Ford and Chrysler.

It was in this process that Detroit's engineers realized that having put

In 1985 the well-heeled buyer of a Buick Riviera or Lincoln Continental Mark VII will be able to order a microprocessor-driven cathode ray tube dashboard display, complete with touch-sensitive screen.

one microprocessor on their cars to control their engines' fuel and emission systems, they might as well have the same microcomputer do a few additional tasks. Then they realized they could add another micro or two to make their cars appear more luxurious, increase consumer appeal, and thus shore up sagging profits. First they had to master the tricky art of putting environment-sensitive electronics in cars that are expected to perform as well in the scorched California desert as in the snowy Rocky Mountains.

The automakers started with under-the-hood functions, using chips to reduce fuel consumption. Tackling engine

controls made the environmental problem an immediate hurdle because putting the chips close to the engine exposed them to both the weather and to the wide range in engine-compartment temperatures. Indeed, early efforts to locate engine-control chips under the hood often led to disaster: some cars' engines would simply cease running in the midst of traffic due to excess moisture in the black box. To this day, most of Detroit's engine control computers are concealed under the dash inside the passenger compartment, shielded from the weather.

Despite these problems, Chrysler had a discrete analog spark advance control system on some 1976 cars. It was based on CMOS integrated circuits mounted on two printed circuit boards with 200

Some Japanese gadgets are raising eyebrows stateside: a system to start windshield wipers as the first raindrops touch the hood, radar and sonar to avoid collisions.

components. A second generation of this "lean burn" system was based on an RCA 1802 microcomputer.

While Chrysler was working on its digital lean burn system, GM introduced the Misar, and Ford came up with the first generation of its microprocessor-driven electronic engine control, EEC I. Unlike GM and Chrysler, Ford from the start used one microcomputer to coordinate several engine functions: a nine-chip set that included a 12-bit Toshiba microprocessor (assembled by Essex International, now part of United Technologies Corp.'s Dearborn, Mich.-based Automotive Group subsidiary), which handled spark timing and exhaust gas recirculation on 1978 Versailles luxury cars.

Today, all Ford-built passenger cars, except for the base Escort and diesel-engine models, come equipped with a fourth generation EEC module. Designated EEC IV, it is based on an Intel chip developed in cooperation with Ford. The 8061 Intel NMOS chip is a 16-bitter with some 40 I/O channels. An Intel 8361 memory chip provides 16K of ROM, which in the future may be expanded to a 64K version. Intel supplies about two thirds of the chips while Japanese suppliers, primarily Toshiba, supply the other third; Ford assembles two thirds of the modules while Motorola supplies the rest. EEC IV itself is expected to go through several generations.

In addition to some half-dozen engine functions routinely controlled by the first generation, EEC IV already controls the shift point between third and fourth gear on some automatic overdrive transmissions in certain small trucks. Ultimately, electronic controls will allow drivers to select different engine/transmission schedules from the on-board computer's programs. For instance, a performance program might call for shifting from first to second gear at a higher engine speed, thus providing more power to the wheels than a fuel economy schedule. An engine/transmission program for maximum miles per gallon, of course, would call for shifts from one gear to the next at lower engine speeds. "In the late 1980s," says Leonard J. Groszek, manager of technical planning at Ford's electrical and electronics division, "EEC IV will include shift scheduling and variable shift schedules—and continuously variable transmissions."

Other hidden functions gradually being taken on by microprocessors include antiskid braking systems. Some 1985 Mark VIIs will have an ITT-supplied electronic antilock braking system designed in Europe, which senses when one wheel has started to skid on a slippery road surface and automatically pumps the brake on that wheel. Twin microprocessors and a self-checking program return the brake system to conventional operation if the two computers fail to agree, a sign of a malfunction.

Full-sized Ford passenger cars can be ordered with an automatic rear-load leveling suspension. An 8-bit Intel 8049 microprocessor is programmed to feed compressed air into the system's rear air springs when a heavy load is thrown in the trunk. The computer releases air from the springs when the load is removed, thus keeping the car level.

On the Ford Thunderbird and the Mercury Cougar, two different electronic instrument panels are available. The standard panel features a digital readout speedometer and combination trip odometer/odometer with a service interval reminder and high-speed warning. Driven by an 8-bit Motorola 6805 cpu, this instrument cluster has liquid crystal displays supplied by two Japanese firms, Optrex and Alps. Ford has designed its new electronic instrument panels in modular form, and this cluster forms the base module.

The other Thunderbird/Cougar panel available includes this base cluster plus two others, each driven by its own Motorola 6805. One module is highlighted by a green, yellow, and red LCD graphic readout tachometer. It also includes gauges for fuel quantity in gallons, analog bar graphs for fuel, engine temperature, oil pressure, and volts. In addition, the computer behind this module is programmed to detect operating conditions outside the normal ranges and signal the driver visually and audibly. Finally, the third module includes a five-function electronic LCD trip computer plus conventional warning lights for "check oil," "low washer fluid," "rear lamp out," "front lamp out," "door ajar" and others. The third module also has a digital time and day/date clock.

Although in '85 cars only two versions of this instrument panel are available, Ford figures the three-microprocessor approach will allow it to offer one-, two- and three-module dashes in the future. The added cost of three micros on top-of-the-line models is less of a problem than the cost penalty of a single, more powerful, but underused micro on lower-level models had a single-cpu approach been taken.

Finally, Ford is fielding a 50-unit test fleet of what it calls Mark VII Comtech cars. Essentially special versions of the conventional luxury cars, these units have four electronic systems that Ford wants to test before offering them to the general public.

One system is a system control pod arranged around the steering wheel hub. Another is a new electronic radio. The third is an electronic instrument panel; although its electronic controls are similar to those of the Thunderbird/Cougar modules, its layout is different. And most significant, the fourth component in Comtech is a touch-sensitive 7-inch (diagonally), blue/green monochrome crt from Zenith Electronics Corp., Glenview, Ill.

An infrared beam touch screen turns this into a combination display and control panel (see "Touch Screens: Big Deal or No Deal," January, p. 146). Moreover, a 10-button hard key panel below the screen serves double duty: it calls different functions to the screen, and it is used for numeric data entry. For example, pushing one hard button calls up the trip information screen. In that mode, the driver can use the hard keys to indicate

Micros started as a defensive tool, to improve gas mileage. Now they're considered a fashion item.

how many miles he plans to drive to his destination. Should the driver forget, and later ask the computer how many miles are left to the destination, a message on the screen offers a reminder of the omission and asks for the miles-to-destination number. If the driver touches the "yes" area on the touch-sensitive screen (the infrared beams, of course, are broken by the finger, signaling the computer which button has been pressed), he can then enter the miles via the hard keys below the screen. Other trip information available includes average speed since the engine

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was started and distance traveled.

A hard key labeled "fuel economy" also interacts with the screen. Pushing it calls the fuel economy data function up, then touching the designated spot on the infrared beam screen selects a choice of graphs displaying average fuel economy, instantaneous fuel economy, or miles to empty. Another hard key calls up monthly calendars that can be scanned forward and backward by touching the screen. Yet other buttons call up time

Some 1985 Mark VIIs will have an electronic antilock braking system that senses when one wheel has started to skid on a slippery road surface, and automatically pumps the brake on that wheel.

functions, including an alarm clock; speed alarm and service reminders; operating and service information; diagnostic checks; temperature controls; and a standby mode that simply displays the word "Comtech" on an otherwise blank screen. The tenth hard key switches all the data from English measures to metric and back again.

The most sophisticated use of the crt, however, is in the climate-control function. Here, the touch screen is actually used to control the heating, air conditioning, and ventilation. To operate the vehicle's climate control system, the driver first calls up the climate-control screen with the appropriate hard key. An image of a temperature control panel, complete with choices between recirculating interior air and opening the fresh-air vent, fan speed, temperature, defrost, and so on, then appears on the screen. By touching an area of the screen designated "hi," "lo," "auto," or "vent," the driver then selects the system mode and adjusts the blower speed. Touching the word "warmer" will raise the inside temperature, while touching "cooler" will reduce it.

Although currently classified as an experimental vehicle, Comtech may go into limited production before the end of the '85 model year. "If [the test] works out," says Groszek, "then about 1,000 units will be built toward the end of the model year."

Like Ford, GM's Buick division is using the same size Zenith crt. About 80 of the crt-equipped Rivieras are being placed in dealerships in the fall, although initially they will not be allowed to sell these units. The idea is for the special Rivieras to be used as demonstrators, as loaners to customers and their own staff. More will be built later in the model year, possibly for sale to the general public.

Unlike Ford, Buick opted for a transparent Mylar membrane switch on its crt. It has arranged touch-sensitive hard keys around the crt. These call up various menu-like functions to the screen. Then soft buttons on the screen are used much like the Ford climate-control screen. Buick's hard keys call up a summary screen, a trip monitor, a radio controller, climate controls, and a defroster. A sixth hard key handles English/metric conversions.

Some of the screens have additional submenus. The summary screen, for example, includes the basic radio controls—on/off, volume, station selection. The radio screen includes these controls plus others like bass/treble and search/scan. This screen can go to yet another screen for setting the station memory. Consider it a mobile decision tree.

Other details distinguish the Buick crt from Ford's. The GM division added elementary animation to its climate-control screen, depicting a fan moving at different rates as the driver changes blower speeds. Buick's data communication approach is more sophisticated than Ford's. Whereas a relatively crude system of dedicated wires link the Ford crt systems to climate controls and instrument panel micros, one cpu drives Buick's crt, another handles the climate controls, and a third handles other car body function; these three are linked via a serial multiplexor. A fourth micro controls Buick's radio, but is linked separately to the screen.

For its part, Chrysler offers a variety of electronic instrument panels, including one that combines digital readouts and analog displays for the 1985 Chrysler LeBaron and Dodge Lancer. By the late 1980s, the company plans to offer electronic instrument panels as standard or optional equipment on all its cars. "All of our cars today have at least one computer, the fancy models have seven, plus 59 other integrated circuits," notes R.M. Sinclair, Chrysler's vice president for engineering. "We'll be adding another 46 ICs and seven more micros within the next five years, plus another micro for an electronic transaxle. The future seems limitless. Every moving part could be under the control of computers. We may do away with engine idling—engines will shut down and start up at the touch of the accelerator."

Other Chrysler plans include a memory capability for power mirrors and seats—just program a push button once and it will automatically return the mirrors and driver's seat to the desired position. Targeted introduction date is the '86 model year, a bit behind GM's Cadillac division, which has a power seat memory on some '85 models. Chrysler already offers a voice reminder system with over 20 messages in it, and company engineers dream of voice-activation systems for such functions as door locks, windshield wipers, and even seats by the late 1980s. While Chrysler is not quite as close to putting a crt in its cars as Ford and GM, it has been showing a crt display as part of a satellite navigation system it may have ready for market by late in the decade. It uses a videodisk system to display prerecorded road maps and a Navy satellite tracking system for determining location. Perhaps as a first step toward the dead-reckoning portion of such a guidance system, Chrysler has an electronic compass in the works for 1986.

Although details of Chrysler's electronic compass are not available, its interest in satellite-based navigation systems is shared by the other automakers. GM, for example, has its own electronics show car called the "Concept 100." Its conceptual navigation system combines satellite position signals with an electronic compass for dead reckoning of position, with maps displayed on a crt. The Concept 100 also has a sonar system to warn of approaching vehicles from behind or in front. A keyless entry system opens both doors of the two-door coupe by punching a code into a five-key pad, while another keypad on the console between the front seats is used to enter an engine-starting code. A second, smaller (5-inch) crt in the back seat allows passengers to while away long trips with the tv shows or electronic video games of their choice—with the help of built-in joysticks.

"The microprocessor was developed far from the auto industry," notes a recently released MIT study, "The Future of the Automobile." Nonetheless, the report continues, "The new technology

Chrysler will soon introduce an electronic compass.

raised such attractive possibilities for new automotive functions and for easier ways to perform old functions that experimentation with it by auto designers was certain." The evidence under the surface of Detroit's otherwise lackluster fall season is that the industry has come a long way in applying microcomputers in new and exciting ways.

"No other area of our business is changing as fast as electronics," notes Ford president Donald E. Petersen. "Nor will any other area play a greater role in the way we design, develop, and manufacture our cars and trucks." ◉

David Whiteside has covered the auto industry for more than a decade, and currently is Detroit bureau chief for *McGraw Hill World News.*

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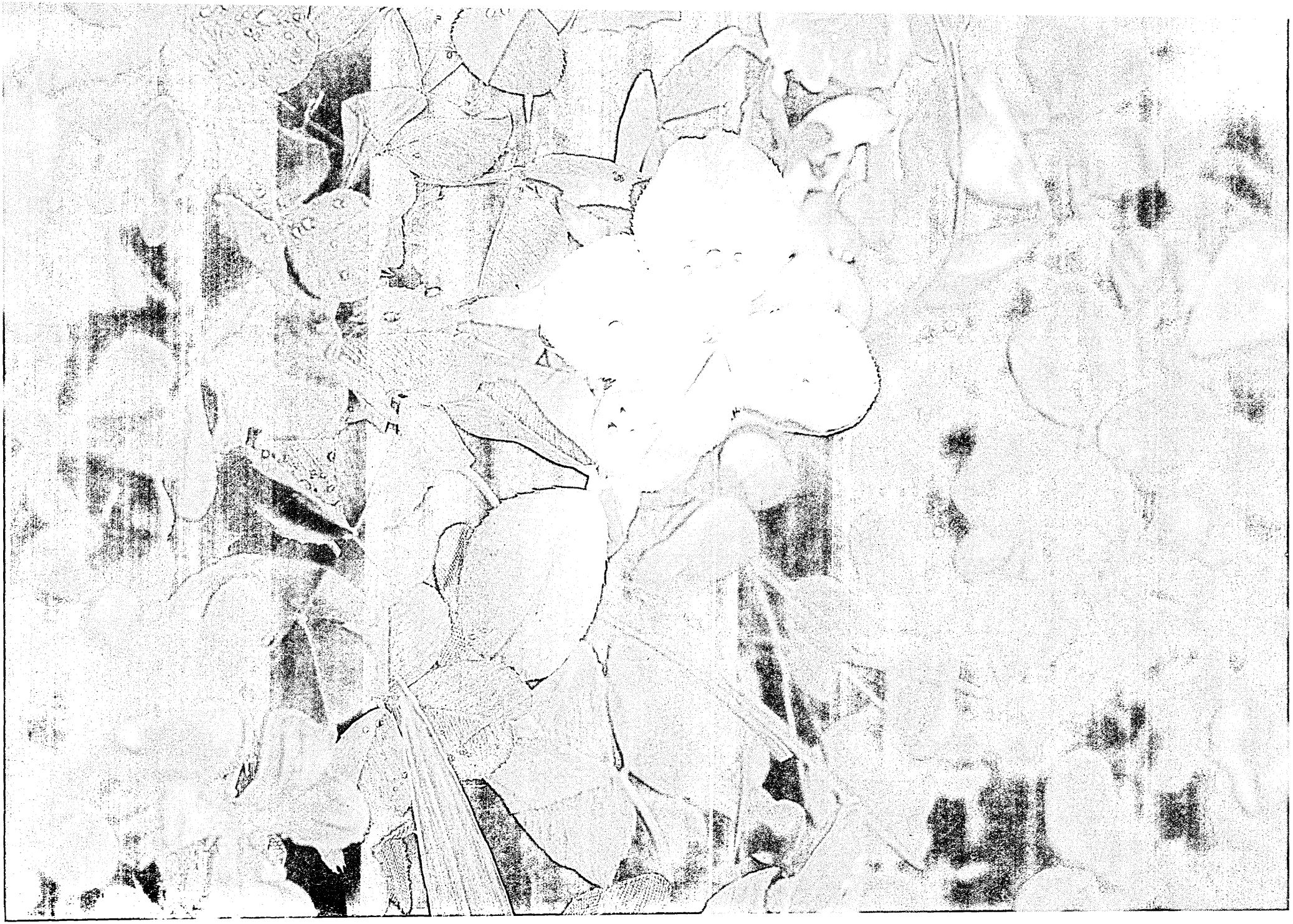

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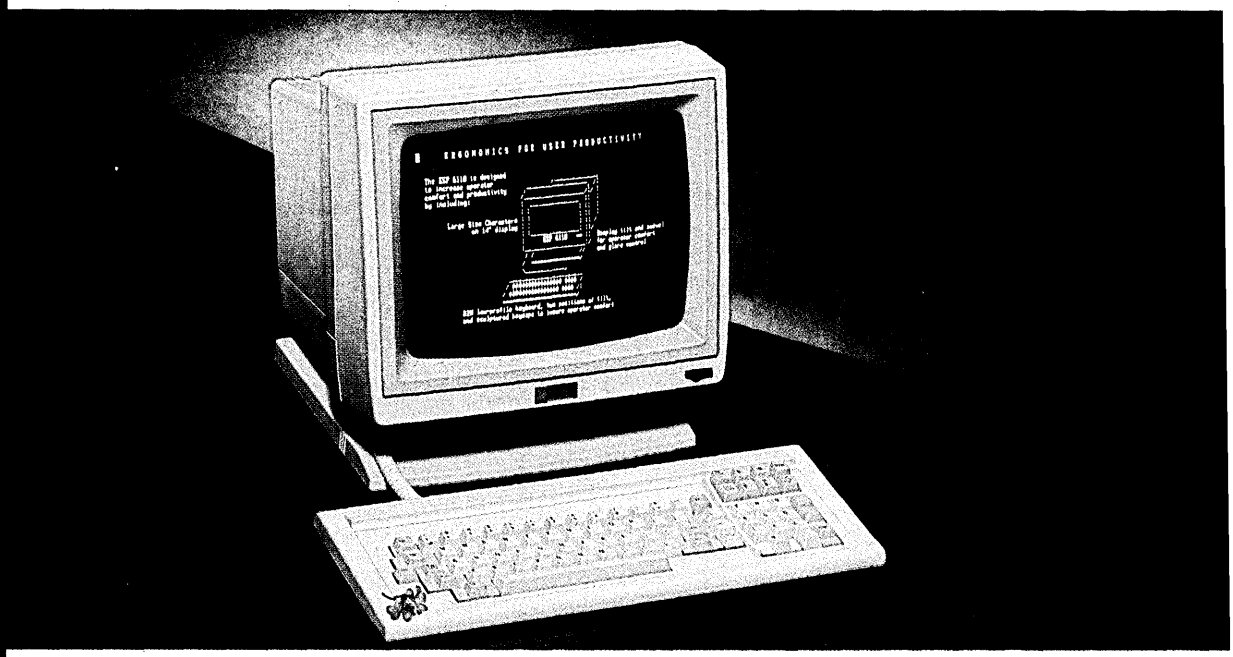

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CIRCLE 18 ON READER CARD

NEWS IN PERSPECTIVE

PERSONAL COMPUTING

PC AT: A CHANGE OF RULES

IBM's new desktop has rocked the micro industry, but dealers may get left high and dry.

by Michael Tyler

IBM's introduction of the multi-user Personal Computer AT and the PC Network may indeed change the nature of the microcomputer industry, but not necessarily in the way most industry watchers had expected. While the machine's speed, multi-user support, and communications capabilities are viewed as impressive technological leaps forward, the machine's most profound impact may be on the structure of the retail distribution channel that has been so central to the success of IBM's PC family and the growth of the micro industry.

The AT, along with recent pricing and product moves by IBM, may signal IBM's intention to curtail independent retail outlets in favor of company-owned IBM Product Centers and the firm's direct sales force. Some retailers are concerned that they may no longer be able to sell IBM products profitably, and that without IBM products they may be hard pressed to sell anything.

Dealers say IBM's pricing of the AT is the major problem. The basic AT, with Intel 80286 microprocessor, 256KB of RAM, and a 1.2MB floppy disk drive, sells for $3,995. An enhanced version with an additional 256KB of RAM and a 20MB fixed disk drive goes for $5,795. By comparison, a PC XT, based on the slower 8088 chip and equipped with 256KB of RAM, a 360KB floppy disk drive, and 10MB hard disk drive, lists for $4,395. The basic PC, with 256KB of RAM and a single 360KB floppy drive, is tagged at $1,995.

"They've priced the AT very aggressively," says Anthony P. Morris, head of Morris Decision Systems, a New York retailer.

"IBM could have charged $1,500 more for the machine and not lost a sale," says Seymour Merrin, who runs the Computerworks chain in Connecticut. "This is a much more complex computer [than the original PC] that is going to require more support and sales time, and we are receiving no more money for it."

Retailers complained that the AT's price tag, coming on the heels of a 23% across-the-board price cut on older PC models in June, leaves them little room to maneuver around the computer giant's own sales channels. "The AT price gives us practically no margin," says Carl Collander, president of Collander Data Products in Philadelphia. "We have one on order, which we're getting mostly out of curiosity, but I don't think we're going to carry it. The PC also has practically no margins now, and contrary to what some people are saying it's not going out the door lickety-split" as it did in the past.

"Dealers feel squeezed in two ways," explains Franklynn Peterson, editor of the *Computer Insider* newsletter in Madison, Wis. "First, their sales are flattening, and with thin margins it's hard to support the overhead. Second, they're married to IBM for the rest of their lives. Once, they thought they were lucky to get an IBM dealership. Now they're finding it's not an ideal marriage, but the only one they can have."

As one dealer told the *New York Times,* "I think there is a feeling that [IBM] has become arrogant and uncaring. One of the IBMers just said to me, 'We know you have to take our products because we are the only player in town.' "

An IBM spokesman in Boca Raton, Fla., says the company is "very concerned about protecting [its] dealers," whom he calls "valuable business partners." The company declines to discusss margins and says the AT was priced "with the consumer in mind."

The changing relationship between the dealers and IBM began to take place early this year, when IBM announced it would sell the 3270 PC only through its direct sales force, even though large retailers like New York's Morris also called on MIS managers who run 3270 networks. Since then, IBM has participated in drastic industry price cutting while simultaneously narrowing the performance gaps among its models. Dealers could comfort themselves that, while selling PCs was becoming more difficult and less profitable, they could still pull in lucrative postsale service and maintenance revenues. IBM may have pulled that from the dealers as well when it announced it would provide a one-year service warranty with every AT.

Retailers complain the AT's price tag and price cuts on older models in June leave them little room to maneuver around the computer giant's direct sales force.

Some dealers, such as Juan Espada, president of Omnitech Systems Corp. in New York, have complained all year that IBM's policy has been to use the dealer channel to build up PC sales and

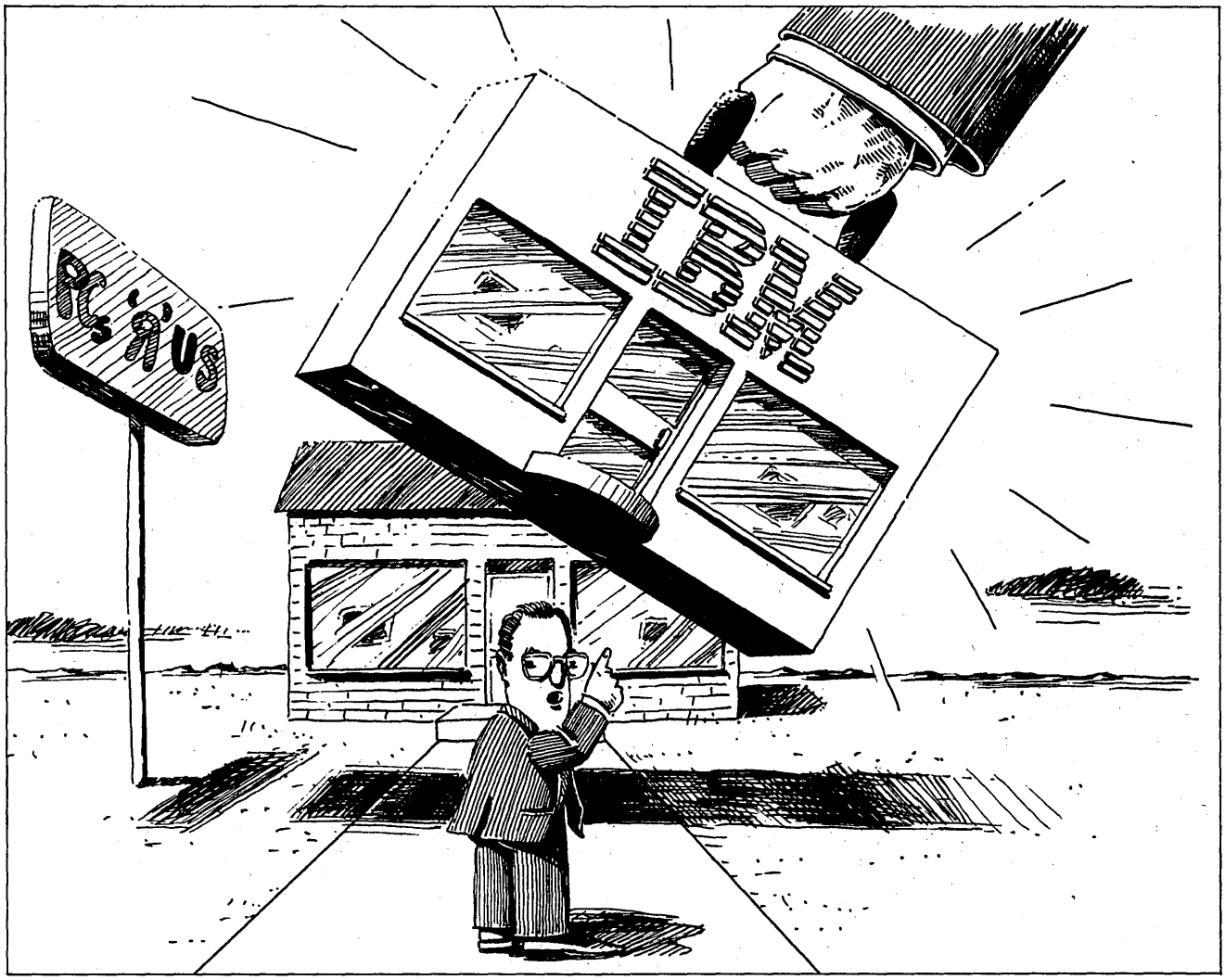


ILLUSTRATION BY JAMES R. JONES

then to drop it when the corporation felt it could capture the market alone.

Another view holds that IBM puts its own interests ahead of the dealers' when the two conflict. Thus, says Peterson, IBM's moves can be explained as a selfish reaction to slowing PC sales and growing inventories of PCs—the industry expects IBM to make 2 million of them this year.

Morris argues that dealers need not be crippled by IBM's moves if they can modify the way they do business. "The price of the AT limits the margins on our workstation business, but it identifies an opportunity for us to integrate systems. Since our clients want a solution to a problem rather than a commodity product—which is what PCs are becoming—we can capitalize on the open architecture of the systems and integrate third-party products. IBM's Product Centers will have a hard time being able to do that."

Similarly, he says, IBM's new warranty does nothing for customers who want what he calls "single-point accountability." Those customers want to have only one source service their entire PC systems, rather than have IBM service its hardware, another firm service other hardware, and a third firm maintain the software.

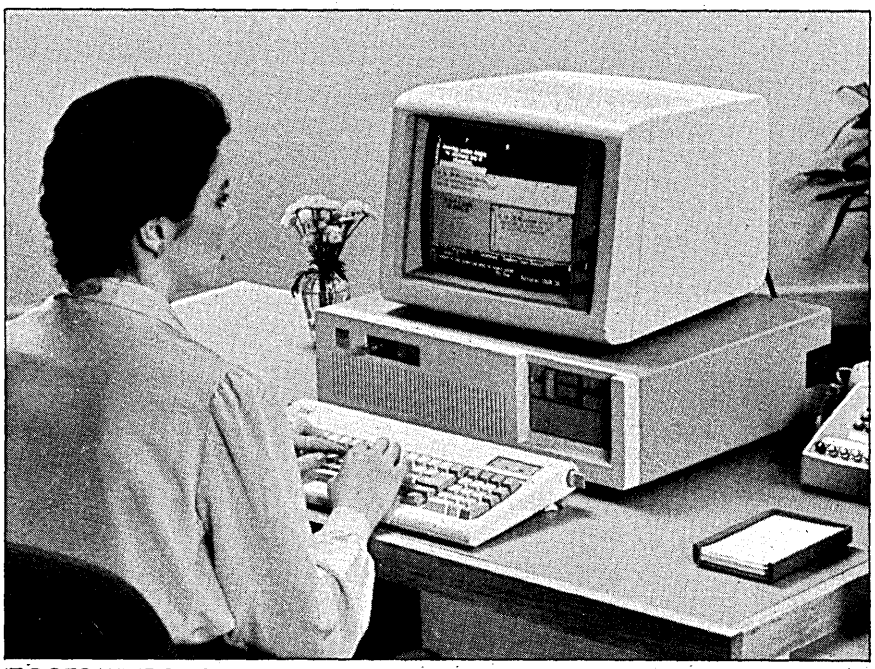
"People are in for a surprise," says David Wagman, chairman of the Softsel distributorship in Inglewood, Calif. "Once the user deals with the retailer and acquires some understanding of the PC, he'll go back to that source and pay a higher price there rather than go somewhere else to get his upgrade. It's the application that will determine whether the dealers will be successful, and the AT doesn't change applications that much. The hardware vendor can always skim the cream of the crop more cheaply with direct sales than through retailers, but after that customers are cheaper to reach through retailers than direct or through company-owned stores."

"There is still some question as to how the XT will fit relative to the AT, since their prices overlap."

Even so, IBM's aggressive pricing is changing the nature of the independent retail channel, and, as a result, that of IBM's direct and retail channels. Those changes ultimately may be more important than any technological innovations the AT has brought to the market.

Primary among the new PC's technical innovations are the Topview window management program, multi-user programming, and the PC Network. Yet IBM did not announce a terminal to go with the AT, and some software developers are unsure whether any asynchronous terminal could be used. Moreover, the firm did not include any multi-user applications with the software announced. Some suggest that multi-user capabilities only make sense in a small set of applications, such as relational database management and electronic mail. Consequently, they are less than thrilled about writing multi-user versions of their current products.

Similarly, the Topview program has received a lukewarm reception, primarily because it may impede users rather than aid them. "I'm not a big windows fan," says Wagman. "Most applications



IT DOES WINDOWS: IBM's PC AT machine runs a windowing package called TopView that supports concurrent execution of several programs. IBM says the program, which supports mouse pointing devices, is a "key foundation for future applications," and has introduced the program for the 3270 PC as well. Priced at $149, the package supports many IBM packages for the PC. A $395 "toolkit" will be available to help independent programmers write applications that can take full advantage of the software's facilities. Deliveries for both packages are to begin early next year.

are designed to take up the whole screen, and if you carve up the screen the efficiency of the programs goes down tremendously. Besides, most people can't multitask even if the computer can."

Topview also drew low marks because it requires that applications conform closely to PC/DOS 3.0, the AT's primary operating system. Yet most of the popular applications packages, like Lotus Development Corp.'s 1-2-3, frequently bypass the operating system in order to achieve faster speeds. "If you had to give up performance to fit in with windows, I'm not sure you'd want to do it," Wagman says.

The issue may become moot when IBM announces a virtual device interface (VDI), says Lance Hansche, executive vice president of Phoenix Software Associates in Norwood, Mass. He notes that applications bypass PC/DOS almost exclusively in order to write to the screen faster, and that a VDI would eliminate the need for bypassing. IBM will unveil a VDI for the entire PC line in the first quarter of 1985, Hansche says.

Consequently, the most practical differences between the AT and the XT are the AT's speed, which IBM says yields system performance two to three times that of the XT, and its larger main memory, which facilitates applications that wouldn't have fit on older models. "The AT is a product of natural evolution," says Wayne Erickson, ceo of Microrim Inc. of Bellevue, Wash. "When other 16-bit micros came out after IBM, they had higher clock speeds or larger and faster disks and controllers, or other enhancements. The AT so far is in the same line, not a radical leap like from 8-bit to 16-bit."

Yet the $1,400 separating the XT from the fixed-disk AT will discourage users from buying the AT as nothing more than a PC upgrade, Collander says. "As aggressive as the price is, only a very serious guy is going to part with that kind of money just for an upgrade."

Multiuser capabilities may only make sense in a small set of applications, like relational database management and electronic mail.

Because the AT's most innovative features may not be useful for several months, observers say, the AT may suffer in the marketplace. "Despite the important differences in performance characteristics, there is still some question as to how the XT will fit relative to the AT, since their prices overlap," Morris says. "There should be room for both."

Collander agrees, noting that the AT ultimately will compete in a more vibrant multi-user network, one in which the best-positioned companies will continue to succeed. "You really will see a separate multi-user market. And in that market, I think North Star's Dimension, which supports 12 users, and Microcraft's Dimension 68000, which supports 16, are better values because the IBM only supports three users. But the 8-bit guys must be quaking in their shoes right now."

As with the AT, the technological innovations of the PC network may not be felt for some time. When they are felt, however, they may be significant. "I think the network is more important than the multi-user capability by a factor of about 10 to 1," Wagman says. "Networks are the wave of the future in our industry, with single-user workstations with local processing power connected by networks and gateways to higher-order processors. The AT can be primarily a network file server or an ultrahigh-powered workstation. There's a set of opportunities arising for the systems software vendors to make the networks as transparent as possible to the users."

Microrim's Erickson says, "As LANs become more common, software vendors from the start have to think about how their products will operate in that environment. You have to decide how much burden you want to put on the end user and how much the software will handle. Some software asks the user when and how he wants to lock records or files, and if he doesn't do it right, that's too bad. The logic for network environments is pretty complex and there's a good chance the end user would goof it up."

Software vendors who already have network versions of their products available are at a distinct advantage, Erickson says. "The level of effort needed to switch from a Nestar to an IBM network is pretty low. It's little more involved than porting from an IBM PC clone to the HP 150 or the Texas Instruments Professional."

Large dealers, like Morris in New York and Collander in Philadelphia, already do a substantial business in packaging networks for corporate customers, and are not worried by IBM's PC Network. "I don't think it will have much effect on our business," Collander says.

The local network vendors themselves also profess little concern, with most taking the tack that IBM's entry can legitimize the market and help it grow and stabilize. Yet Softsel's Wagman says, "I'm not a big believer in that aspect. If IBM said it was going to be entering my business, I'd be horrified. Maybe in the short term they can profit from IBM's announcement, until IBM starts shipping in October. But when IBM goes after a market it takes it seriously, and it will take more than it builds for others." ◉

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CIRCLE 19 ON READER CARD

WORKING WITH THE PC AT

With a local network in tow, the new IBM PC offers significant opportunities for software writers.

by R. Emmett Carlyle

When it comes to IBM's new personal computer, the PC AT, everything, it seems, is as clear as mud. The machine's introduction was hoped to have cleared the air after months of speculation as to when Popcorn would pop, and what it would look like. Instead, it's almost as if the machine never left the closet and a phantom is stalking the industry in its place. Nobody seems to have been able to get a handle on the AT.

The more romantic observers view it as the dawning of a new age of multitasking personal computers, single machines that can run several applications concurrently. If we view it in a harsher light, we could be witnessing a machine overshooting its market, a case of technological overkill.

For some, the AT's powerful processor is impressive news and will be snapped up quickly; others say users will have to spend $10,000 for a useful configuration, and at $10,000 it will just sit at retailers gathering dust. The machine's Intel 80286 microprocessor is as powerful as a low-end IBM 4300, experts say. What's equally certain is that IBM neglected to provide it with a minicomputer-class operating system to take advantage of such power.

"What we have here," says Peter Labe, analyst at Smith Barney Harris Upham & Co., New York, "is a full-bodied workstation capable of operating in higher-end, multi-user markets. But where's the multi-user DOS operating system compatible with the existing PC applications base?" IBM's offering is a three-user version of Xenix—Microsoft's implementation of Unix—which experts describe as a "sideshow" with virtually no applications to its name. "The question seems to be, 'Why bother?' " says Labe.

"And though the machine comes complete with PC Network to enable users to share files and peripherals," he adds, "there's no multi-user software for them to share applications and no graphics environment."

Labe claims that "self-impact" is the likeliest reason for the omissions. IBM seems to be saying that multitask PCs are fine, but if one must do multi-user work, do it on mainframes. "PCs sell mainframes," was the word from a buoyant IBM president, John Akers, at the NCC last July. He might have qualified that with "unless they do what mainframes do."

"I don't see IBM's corporate customers rushing to embrace PCs, whether they share LANs or not," Ken Bosomworth, president of International Resource Development Corp. (IRD), in Norwalk, Conn., reflects on the IBM machine. "Their most likely course is to build on their 3270 terminal networks, adding chips and peripherals to low-cost terminals when the need arises." Bosomworth adds that he sees a more "leisurely" move to PC LANs by IBM's customers—"and then only when there is a heavy electronic mail and graphics requirement."

Darrell Miller, marketing manager for operating systems at Digital Research Inc., Pacific Grove, Calif., disagrees and thinks the market will be eager to embrace the new technology.

"People have a definite need to share information, whether through a network or just one processor. They'll find a way to use the power if it's offered to them," he comments.

"Now it's up to the independent software vendors [ISVs] to come up with the multi-user applications," notes Greg Ennis, director of systems engineering at the Personal Communications Division of Sytek Inc., Mountain View, Calif. Sytek licenses protocols and broadband networking technology to IBM for its PC Network. "In a sense we're throwing down the gauntlet to the leaders who have provided us with the single PC user software and are saying 'Adapt or die.' If they don't supply [new, multi-user software] somebody else surely will."

"I don't see IBM's corporate customers rushing to embrace multi-user PCs, whether they share LANs or not," says IRT's Bosomworth.

Ennis says the tools, protocols, and network software will soon be available for ISVs to begin planning distributed software strategies. "There's no question they'll have to undergo an educational process," he says. "So far, nobody has been able to write multi-user software of this kind because no standard access protocols to communication functionality existed."

Now those protocols have been established by IBM, etched in ROM chips aboard the network adaptor card it will sell users for $695 a shot. "The card and IBM protocols [known as Net BIOS] should be available in October for ISVs," says Ennis, emphasizing that the protocols are totally independent of the PC's operating system. That is no small detail considering that IBM has announced support for no less than five operating system versions for the AT: Xenix, PC/DOS 2.1, 3.0, and 3.1, and PC IX, which will be upgraded from single- to multi-user capability.

"Deciding which operating system and applications environment to write to is not a simple issue at all," says Jim Kinlan, manager of oem marketing at Lotus Development Corp., Cambridge, Mass., addressing the introduction of the AT. Lotus, whose best-selling 1-2-3 package has made it the top independent software vendor, seemingly has the most to lose and no clear way yet to capitalize on its market edge. "We're hedging our bets," Kinlan comments. "We're pretty sure that the single-user application will be the driving force for the next two years or so. Nobody is sure how fast corporations will move to multi-user PCs."

"The PC Net is fully independent of any operating system," says Greg Ennis of Sytek.

In fact, like other companies, Lotus is asking, "Where's the multi-user operating system?" Most observers seem to be agreed that Xenix will enable file copying and exchanges with DOS-based PCs, but it can't run DOS applications. "We have no plans to write to Xenix at this time," Kinlan revealed.

The company can—and will, one supposes—continue to write to the single-user PC/DOS 2.1 and hunt the new best-seller. "Only 15% to 20% of the current white-collar work force has been reached by spreadsheet programs, and probably the same again by word processing," claims IRD's Bosomworth. "That leaves an enormous number out there with no obvious use for a single-task PC. This will be where the next bunch of software millionaires will come from. Finding this multi-user application is the key."

Sytek's Ennis, however, suggests that much can be done now by Lotus and the others to optimize their current programs for use on the PC Net. "By adding file and record-locking software to 1-2-3, for example, it can be mounted on a PC AT file server and used concurrently by other PC users on the PC Net."

Lotus agrees the changes could be made, but is understandably concerned about unauthorized use of its software. "There's no answer in the hardware industry that guarantees that our application software has been paid for by the PC using it," says Kinlan. One approach to the problem, he notes, is to add a low-cost serial ID device to each authorized user of

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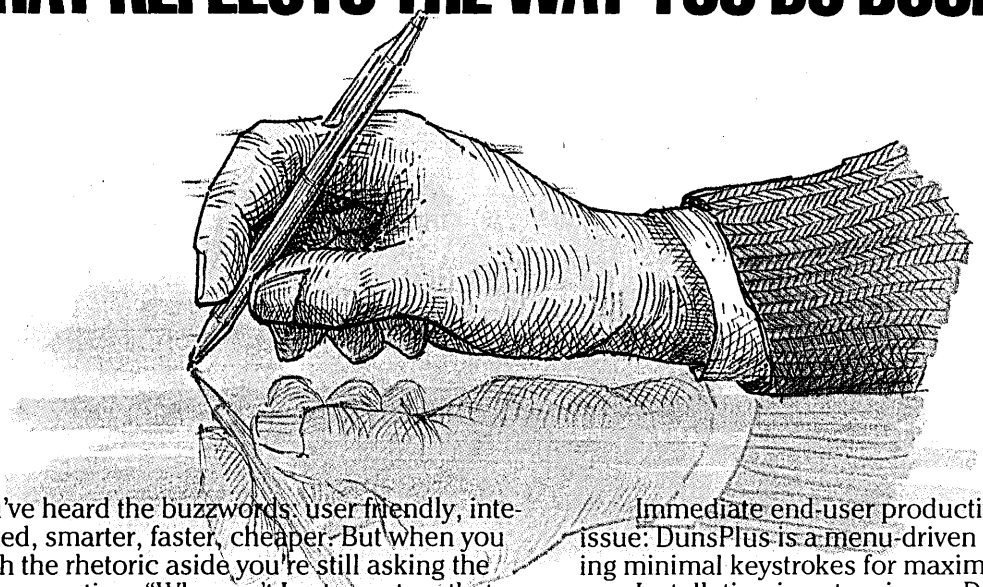

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the file server's application. Another approach is to tell the file server operating system that only three users, say, are allowed to use the application package, so it can deny access to a fourth. Yet another approach is for the software vendor to design and sell software priced by the number of users, with prices increasing on a sliding scale when users are added. Or, conceivably, the file server could clock the number of accesses to an application in any one session and the vendor would be paid accordingly.

Though PC/DOS 3.1 has been created to facilitate the use of the nonproprietary PC Net, the software itself has turned into a closed IBM domain for application writers.

"In fact, not too many people yet realize just how IBM-proprietary PC/DOS 3.1 is," claims Miller at Digital Research, which has been working with the new system. "If you look at the actual code that lies between application program and PC hardware, only one module is still recognizably Microsoft's: the BDOS hierarchical file handler. The rest," Miller claims, "is IBM-proprietary."

The most notable change, according to Miller, is to the main module that the end user sees and types into. "The old Microsoft code," Miller says, "has been replaced by a program announced as TopView [code-named Glass within IBM] which now acts as the dispatcher and scheduler of shared resources and tasks. If you want to write any I/O that requires sharing, as on the PC Net, you have to go through TopView." To Miller's way of thinking, TopView is more than just a windowing scheme, "it's the heart of the operating system, almost an OS in its own right."

If an applications programmer chooses to write programs without shared I/O for single-task PCs as before, he can continue to use PC/DOS 2.1 and maintain what one ISV called "the old Microsoft order." Many will do this for the short term, observers believe, but the shared-PC world of DOS 3.1 and TopView is surely on the way.

"In fact, not too many people yet realize just how IBM-proprietary PC/DOS 3.1 is," says Darrell Miller of Digital Research.

Both Microsoft and Digital Research have proposed alternative windowing schemes and applications managers—MS-Windows and Concurrent DOS, respectively. Both products were rejected by IBM in favor of TopView. That software's proprietary nature—IBM is unlikely to license it to other system vendors—is likely to create competitive opportunities for Windows and Concurrent DOS. AT&T, in fact, is seen as a likely oem purchaser of one of the products.

While Microsoft won't speculate on why IBM rejected Windows, Miller at Digital Research confirms oem interest in Concurrent DOS but concedes the retail arena to IBM. "There's no doubt in our mind that TopView will become the standard," he states without rancor.

Still, if industry reports are correct, Digital Research has some big cards to play this fall. Following a two-year development effort aimed at lessening its dependence on the aging CP/M operating system, the company has created a multiuser PC operating system that runs not only on the Intel 286 chip but also on the Motorola 68000 family.

The new software is said to preserve compatibility with the retail base of PC/DOS applications. A basic three-user package will be sold, it is believed, with an option for eight users. Some say the software will be compatible with IBM's TopView as well.

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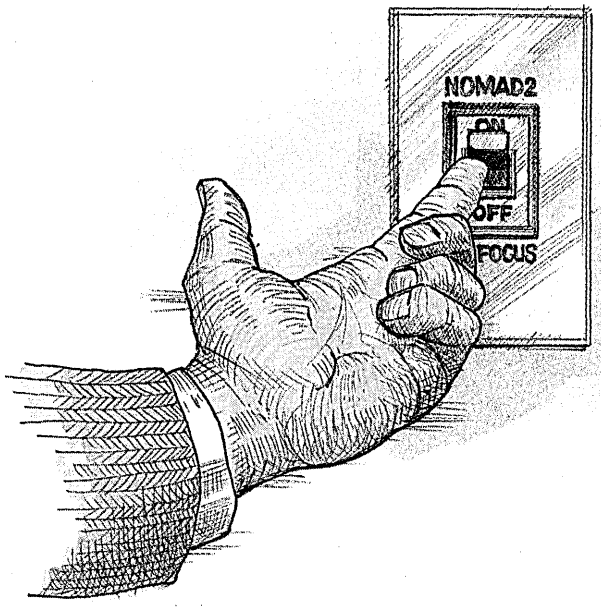
LOCKED INTO FOCUS? NOMAD2'S LIBERATOR MAKES FOR AN EASY SWITCH



The best time to choose NOMAD®2 is before you develop FOCUS applications. But if you're currently using FOCUS, you're not locked in. And the reason is a new NOMAD2 facility called LIBERATOR.

LIBERATOR automates virtually all the work involved in FOCUS to NOMAD2 application conversions. It reads FOCUS MASTERS, creates a corresponding NOMAD2 Schema and generates the procedures for data transfer.

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Your FOCUS applications are an investment, NOMAD2's LIBERATOR helps you leverage that investment. NOMAD, and now NOMAD2 — the premier 4th-Generation-Language/DBMS from D&B Computing Services, has made us a leader in the field of information management services. And as your needs evolve, so do we. NOMAD2's LIBERATOR is just the latest step in providing usable business tools to help you get more leverage from the way you do business.

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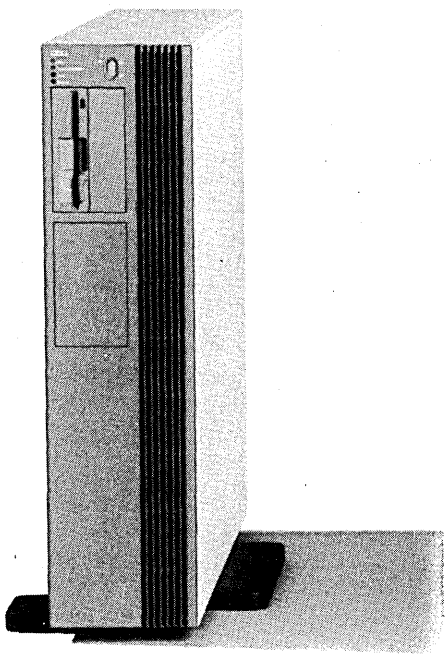

Nobody has to tell you that UNIX * is one terrific operating system.

But to get the most out of it, you need one terrific box.

That's the NCR Tower.

A LOT OF COMPUTER FOR A LOT OF PEOPLE.

The NCR Tower and Unix were made for each other. Just like Unix, the Tower is at its best in a multi-user environment.

Compare the Tower to the three-user IBM AT, for instance, and you'll find there's no comparison.

The Tower can handle up to twelve users simultaneously. And each user gets a lot more memory, a lot more storage and a lot more versatility. In short, a lot more computer. For a lot less money.

The Tower can even stand as part of a nationwide distributed data processing network via SNA and other industry standard protocols.

Why does the Tower perform so well? Because it's built so well.

It is powered by the Motorola 68000, one of the most powerful 16-bit microprocessors around. To boost power even further, it has separate processors for disk, CRT and I/O controllers. And it comes with other guarantees of high performance like a Winchester hard disk and the Intel Multibus.* As well as a unique power failure recovery system and battery back-up that enables it to survive power outages.

Put it all together and you've got a system with a storage capacity that expands from 40 million characters to 214 million. One that can handle everything from color graphics, electronic mail and word processing to data base management and electronic spreadsheets. And one for which programs can be written in COBOL, BASIC, Pascal, FORTRAN and "C."

UNIX FOR BEGINNERS, INTERMEDIATES AND OLD PROS.

Along with this impressive piece of hardware comes an equally impressive piece of operating software: the NCR-enhanced version of UNIX.

It's a more powerful and, at the same time, altogether more "friendly" operating system. It lets neophytes write their own programs while allowing highly experienced people the freedom to tap such resources as a cryptic command set structure.

What makes this possible is a design which features five different user interface

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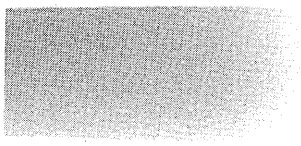
RFUL CASE FOR UNIX: TOWER.



levels. Called "shells," they keep users within the boundaries of their own abilities. One "shell" is for professional programmers who develop operating software; another is for EDP people who write complex application programs; a third is for system administrators; the fourth is for office procedures analysts and the fifth is for casual users (it's so simple, even a vice-president can use it).

Put simply, UNIX is a lot more valuable to a lot more people on the Tower.

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CIRCLE 24 ON READER CARD

piece of software that should bring Apple Lisa and Macintosh-like graphics capability to the PC family. It may even, according to some sources, enable applications to be written for both the Macintosh and PC AT machines. In any case, the new software would help make a bridge between what most observers think will be the two mainstream pc designs for some time to come. While IBM declines to "speculate," Digital Research's most specific public comment was uttered cryptically at an NCC press conference: "Crystal is the best form of glass."

That company's new operating system is also a natural lead-in to the Unix world of AT&T. Digital Research has just completed the Intel 286 port for AT&T's Unix System 5, and has also been responsible for sifting through independents' applications submitted for the operating system. Further collaboration between AT&T and Digital Research is expected as the two strive to make connections between multi-user PC/DOS and Unix.

But don't think Digital Research is simply working with AT&T against IBM, says Darrell Miller. "We're working with everybody trying to preserve a generic industry. We think of ourselves as Switzerland: neutral." ◉

METAPHOR UNVEILS NETWORK

A startup's new workstations offer some intriguing approaches to programming and the "user interface."

by John Verity

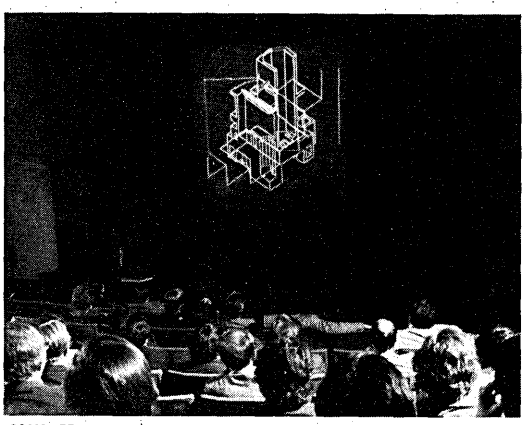
Making sense of the "raw seething bits" that spew forth from corporate mainframes and commercial databases requires more than a pc spreadsheet or fourth generation language. Financial and marketing analysts need "push-button" access to high-powered inquiry and analysis software.

So says David E. Liddle, president and chief operating officer of Metaphor Computer Systems, a Mountain View, Calif., company that has brought out a remarkable workstation designed to extract and analyze mainframe data in a way that's never been done before. In a bold challenge to IBM and other pc suppliers, Liddle and partner Don Massaro, chairman and chief executive, are selling a machine whose network structure may be the shape of things to come.

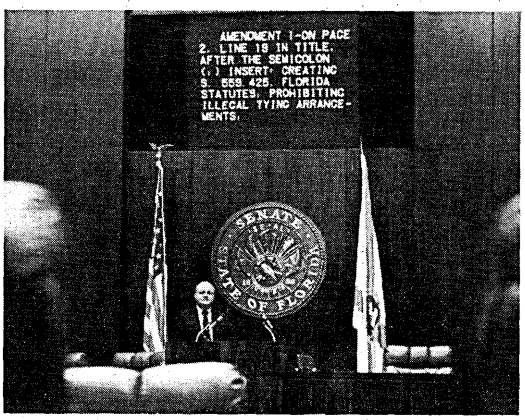
"Our system is designed for the kind of people who can't find a personal computer powerful enough to handle the large databases they work with but who don't have the patience to learn the intricacies of a mainframe," says Liddle. "Moreover, they need to merge and analyze data from several different sources at once."

To that end, Metaphor has come out with a workstation and network quite similar in concept to Xerox's Ethernet-Star office system but programmed to aid key managerial jobs in specific industries. The company says it's initially selling its network only to selected analysts at financial institutions and large packaged consumer goods suppliers; those and other professionals at manufacturing and distribution companies will be taken on next.

Like Xerox's office systems, the Metaphor system comes as a network of workstations and file servers that work intimately together. Such networking is seen becoming commonplace in future office systems—IBM, for instance, recently laid the foundations for networked combinations of its PCs (see story this issue)—



COMPUTER-AIDED DESIGN displayed by General Electric projector is viewed by Engineering Society of Detroit.



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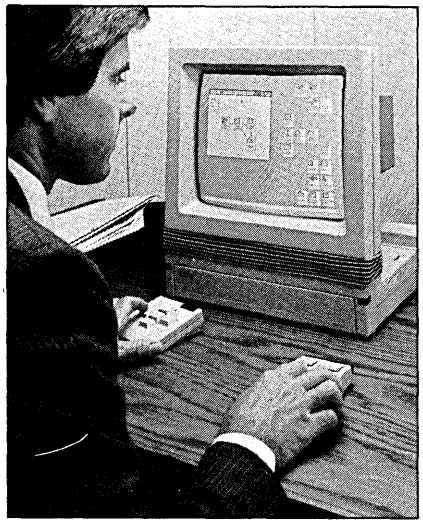

ICONIC VIEW: The Metaphor workstation employs a mouse and five-key keypad to build applications from icons.

because it enables relatively inexpensive workstations to share files, programs, and expensive peripherals.

The Metaphor machine also resembles Star in the way it interacts with users. Much of the power of Star, and that of derivative machines like Apple's Lisa and Macintosh, comes from the mouse-icon user interface pioneered by Xerox at its legendary Palo Alto Research Center (PARC). It is a technique even IBM has been forced to acknowledge in recent PC offerings. Instead of having to learn arcane system command languages, the user merely selects function and file icons with the mouse, and the system accordingly opens and closes windows on a bit-mapped display. The idea behind Star is to make images on its high-resolution screen simulate pieces of paper and file folders resting on a desktop. Except for entering text through a standard keyboard, the user controls virtually all the system's functions through the mouse.

Metaphor's system, now launched just short of two years after Liddle and Massaro left top slots at Xerox to form the company, takes the Star ideas several steps further. Perhaps most significantly, Liddle and Charles Irby, chief designer of the original Star interface, have made it possible for icons to be joined in flowchart-like diagrams that define entire analytic applications programs. In other words, complex procedures involving multiple database queries, spreadsheet calculations, plotting and printing, and even lengthy data reduction programs written in BASIC can be designed graphically as sequences of generic icons.

When "opened," each icon offers a series of windows and interactive "option sheets" that help customize the icon's function to user needs. The spreadsheet icon, for instance, opens to reveal a standard spreadsheet display. Many of the sheet's elements, however, are "active" in that when pointed to with the mouse, menus and help screens appear in order to guide the user. Once defined through such menus, applications can be "encapsulated" and from then on called into action by invoking a single application icon.

Liddle says he first toyed with the idea of graphical programming in the early '70s while working at PARC with Alan Kay, a noted programming theorist. But, he says, he has seen no implementations of the idea comparable to what Metaphor has brought to market.

Metaphor says it has spent much of its startup period interviewing potential customers to determine what types of analytic tools they would like to have. Massaro claims that in addition to pushing ahead with engineering, the company spent its first six months talking to some 250 dp managers and end users; only then was a complete business plan written and major venture capital sought. So far, the company has written some 89 application capsules, 20 for financial analysts and 69 for consumer goods analysts, each of which the user can customize to use specific sources of data and analytic methods. The capsule programs vary in price but generally sell for less than $1,000 apiece, says Liddle.

To further avoid the necessity of a full keyboard, the Metaphor workstation comes with a five-button keypad that per-

The system takes many of its concepts from Xerox's Star-Ethernet products.

forms such operations as open, close, and copy on icons selected by the mouse. Because the keypad and mouse (and a standard keyboard) are not hard-wired to the display casing (all three communicate via infrared light beams), the user may use whichever hand is more comfortable to operate a device. When not in use, all three devices tuck away into the terminal to save desk space and to recharge their batteries.

The workstation's electronics, which consist mainly of a 68000 microprocessor backed by a megabyte of RAM, control the bit-mapped screen, communicate with file servers over the local network, and handle processing tasks delivered to it over the network. Eliminating local mass storage helps keep the workstation cost down without sacrificing performance because the network, which operates at 10Mbps, can move software and files quickly from server to workstation. The network meets the IEEE 802.3 standard, which is essentially the

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Xerox Ethernet spec.

Two types of file servers are offered, the larger one, designated DS200, incorporating the relational database machinery of Britton-Lee Corp. to organize and retrieve large files of data downloaded from mainframes outside the network. It runs 10 times faster than the smaller DS 100 server, which uses a Metaphor-designed controller to handle strictly network and workstation software, according to Liddle. The large server can handle several gigabytes of on-line storage, depending on how many 8-inch hard disk drives are installed. Metaphor supplies 370 mainframe software to perform the extraction of data from IMS, VSAM, and other files for use in the server.

Data may also be extracted from remote commercial databases to aid, for example, a consumer goods brand manager in comparing the performance of her company's products against those of a product category in general. The Metaphor system can be programmed to tap into such remote databases each time an analysis is run or on a periodic basis, Liddle explains. Moreover, the corporate and commercial databases may be reformatted easily to enable direct comparisons.

Also on the network are communication servers, to attach the network to mainframes, dial-up lines or other links, and printers, both electronic and dot matrix. Liddle says the workstations may also emulate 3270-type terminals, with several active sessions in progress at one time.

Prices for the network of workstations start at about $7,800 per terminal. In other words, a 16-workstation network with a 144MB file server is priced at $126,000, not including applications software or printer. A 32-station system with 288MB of file server storage and a 504MB database server, comes in at $332,000, or $10,400 per workstation, according to Massaro.

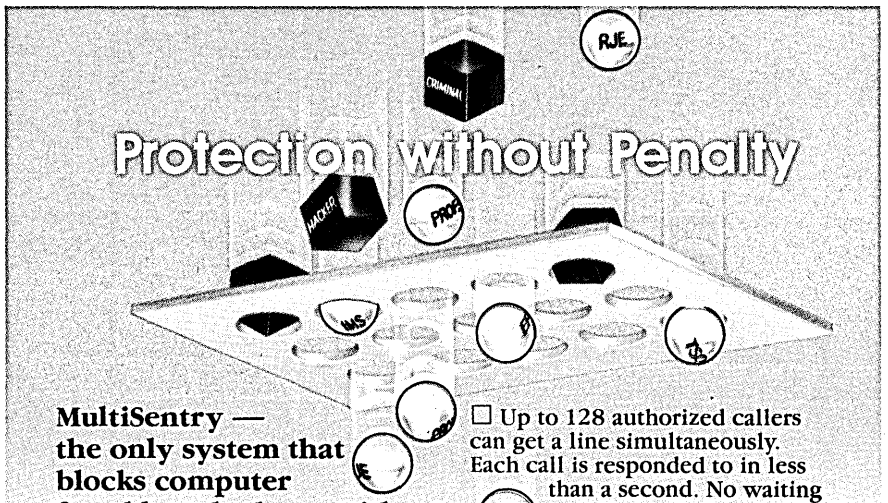
The keyboard, keypad, and mouse communicate via infrared light beams.

Liddle and Massaro claim the idea for the Metaphor system came to them while they were still at Xerox but that the company was not interested in developing the product primarily because it would require a specialized marketing force. Consequently, the two left Xerox in October 1982, and until last August said virtually nothing publicly about their plans.

Now, however, they say they've raised $15 million in venture capital, begun hard-tooled production, and as of August had installed purchased systems at Beatrice Foods in Chicago and Bank of America in San Francisco. Additional orders were said to be on the books from Household International and Pepsico. Sales offices have been opened in New York, San Francisco, and Chicago, according to Massaro, who says the company is currently shipping products 30 days ARO.

He notes that the company doesn't expect to be profitable for several years while it boosts field staff and production. As its business progresses, Metaphor plans to expand its sales efforts to include additional job categories and more vertical industries. Marketing is being led by vice president Katharine C. Branscomb, 29, who most recently was Tandem Computer's marketing manager for market development. Previously she was with the Boston Consulting Group.

The company's sales tactics call for initially dealing directly with potential end users, followed by a visit to the user's dp management. As Massaro points out, only with the cooperation of a dp manager can Metaphor's machine work effectively. It must be given timely access to



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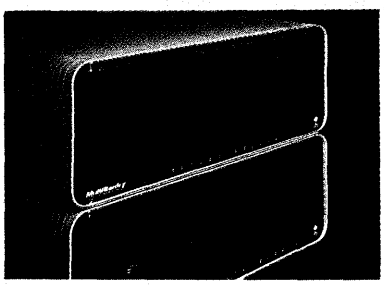

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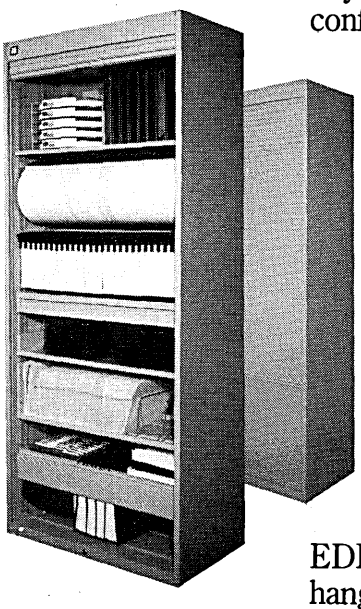

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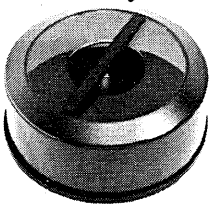

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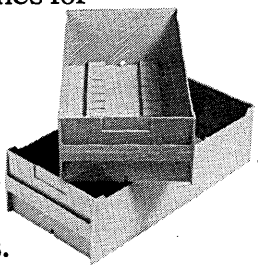

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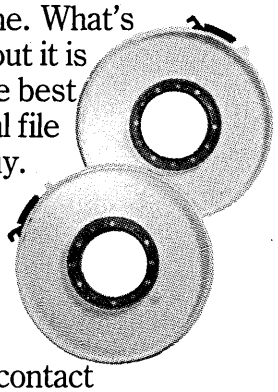

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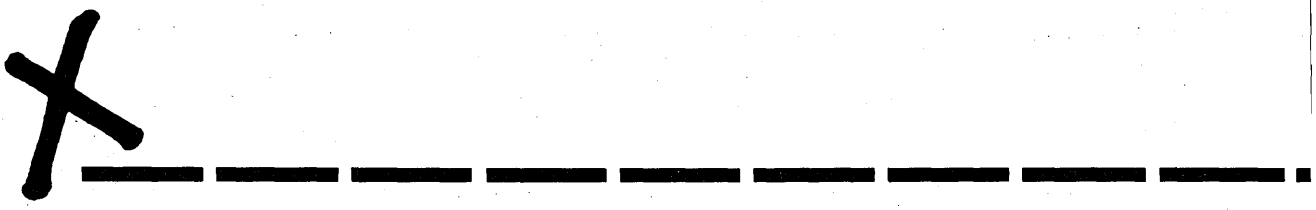

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CIRCLE 30 ON READER CARD

the necessary corporate information stored on mainframes.

Marketing will be helped by a "preferred consultant" arrangement with Arthur Andersen & Co. of Chicago, which calls for the public accounting firm's dp consultants to be trained in use of the Metaphor system and to assist clients with installing it. The agreement is nonexclusive, however, allowing Arthur Andersen to help clients with other vendors' systems as well. ◉

DG MAKES PORTABLE CPU

The minicomputer maker is hoping a portable pc will help sell office automation systems.

by R. Emmett Carlyle

"Since our next two largest competitors, DEC and IBM, are five times and 40 times our size, respectively, I believe it entirely appropriate to take market share when we can. We certainly can today, and are doing so with great relish."

Since these words were uttered last April, Data General's president Edson De Castro has had a great deal of relish. His Westboro, Mass., mini maker continues to gain market share—equipment sales and orders were up some 57% in the latest fiscal quarter—and its R&D organization continues to be enormously productive.

Data General's development labs have been under intense scrutiny since they wrested the price/performance lead from DEC in the 32-bit commercial supermini market two years ago and followed with a pacesetting suite of office automation software. In recent months, the company has sustained a rapid pace of new product introductions in the industrial and personal computing markets.

The latest and smallest challenger from the Data General stable is the DG/1, a 10 lb. portable computer that has been greeted with controversy and two questions—what Robert Miller, senior vice-president and number two executive, calls the "wrong questions."

The first concerns the possibility that the portable could soon be matched or bettered by IBM, or some other manufacturer, because its window of opportunity may be a matter of only a few months. The second question concerns the impact of the portable on Data General's profits.

The portable machine—code-named Book One because it was original-

Analysts say IBM has its own portable, the Clamshell, under development for introduction shortly.

ly conceived as a book-sized product before marketing considerations swelled it to briefcase size—is a pure CMOS machine using the Intel 8088 microprocessor. It uses a 25-line, liquid-crystal display, apparently an eye-catcher in itself.

Like HP's model 110 portable, considered a leader in packing IBM PC compatibility and popular software into a small package, the DG/1 uses the Sony 3½-inch floppy disk drive. If an optional extension is employed, the DG/1 can also be used with 5¼-inch floppies as used on most popular pcs. DG claims its pc offers a high degree of software compatability with IBM's PC line.

But analysts are quick to point out that IBM has a 25-line LCD portable, code-named Clamshell, under development.

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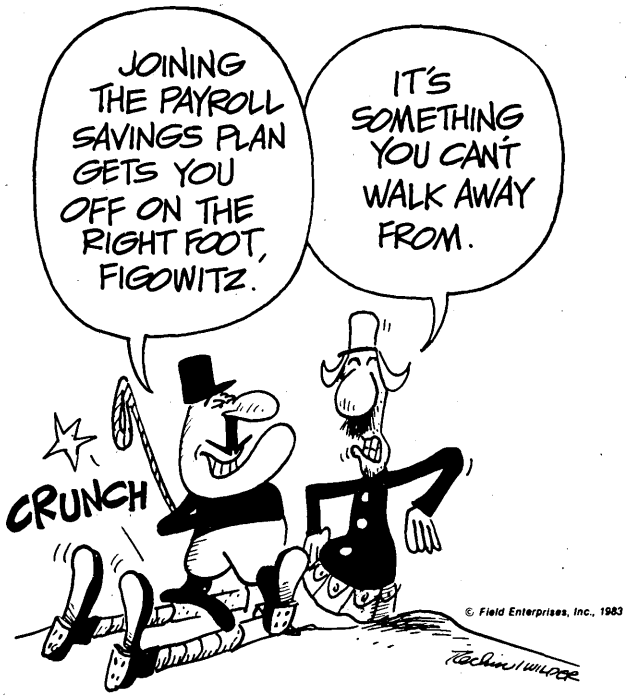

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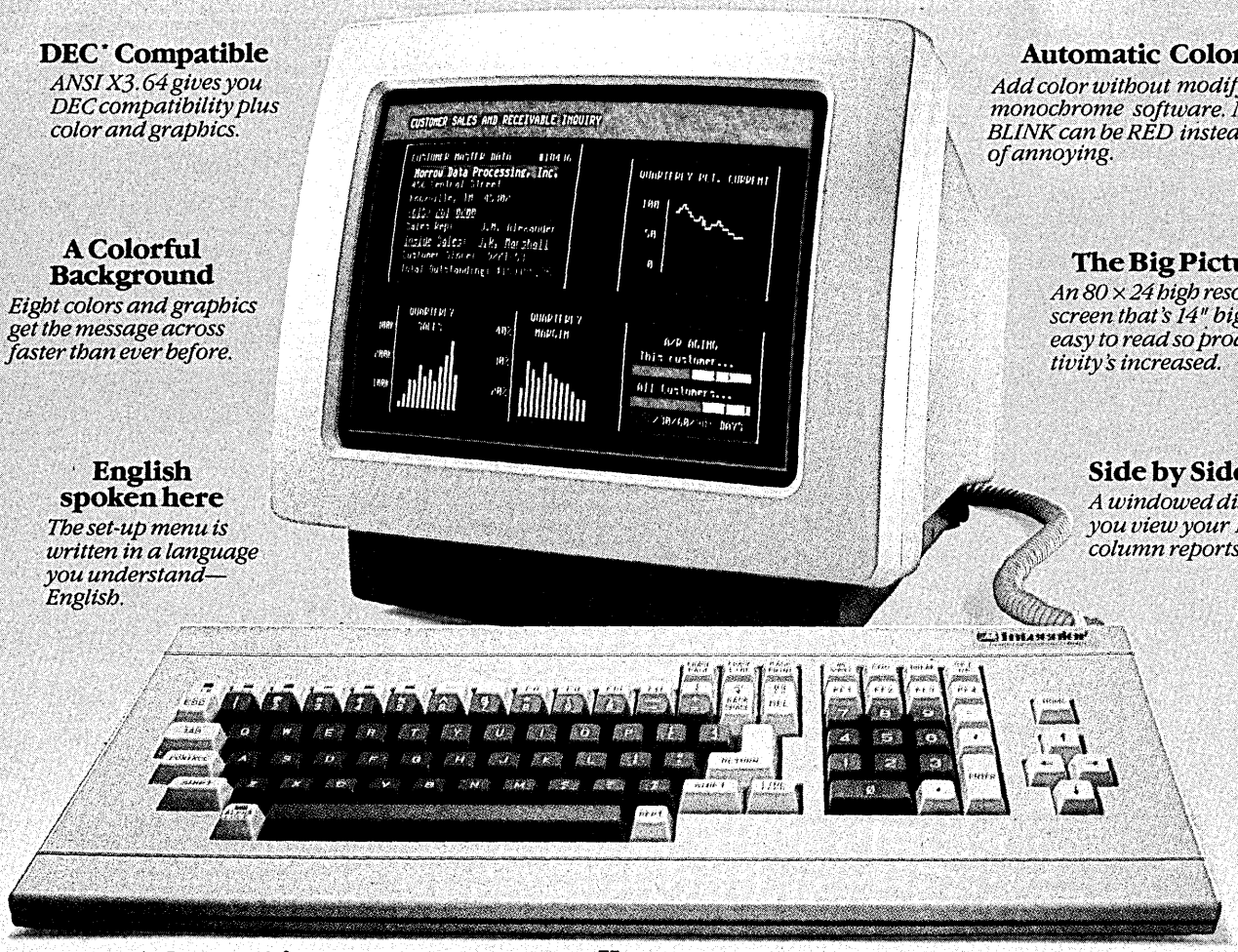

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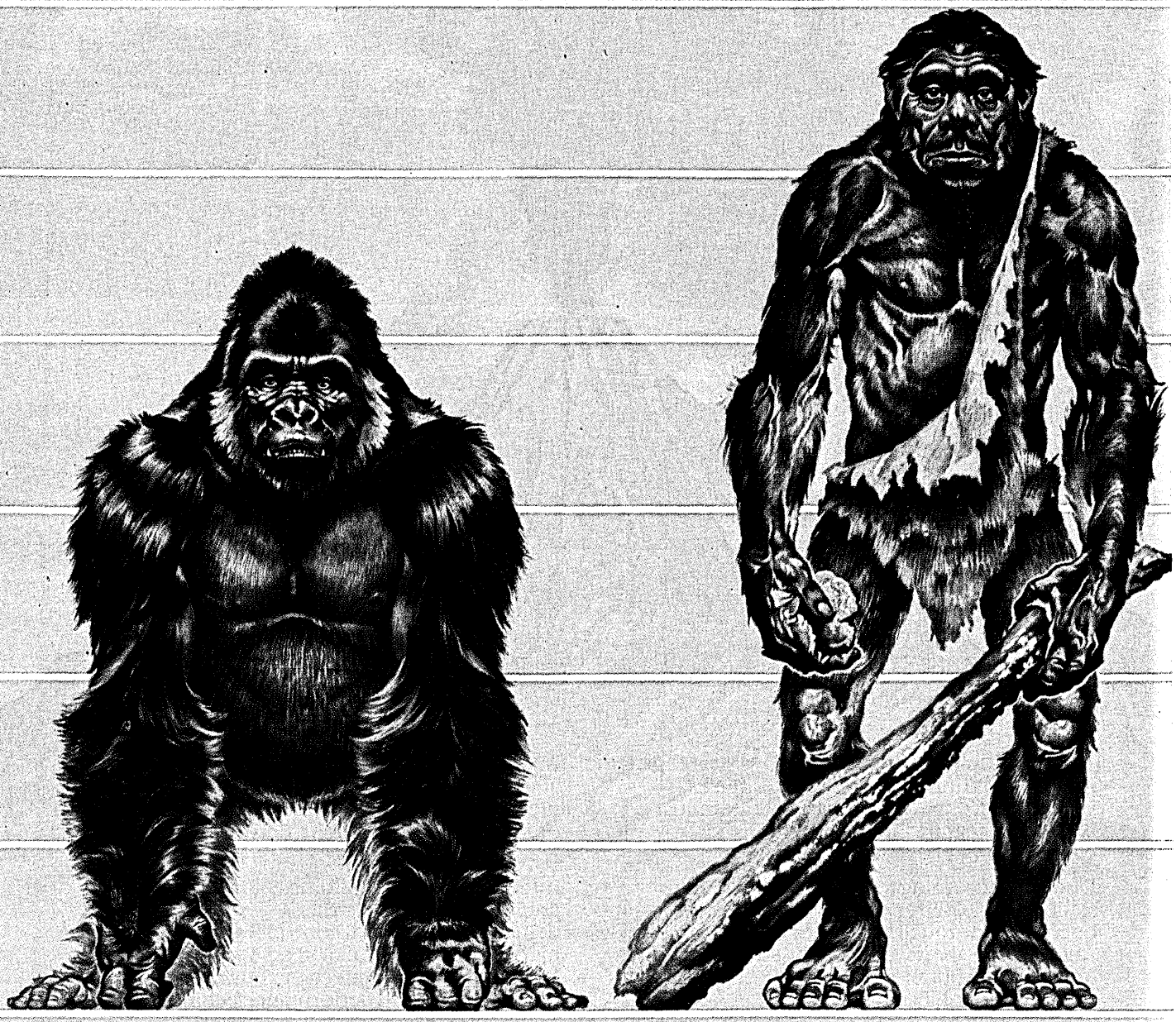
THE EVOLUTION



PBX
(Switchus interruptus)

LAN
(Linkus limitus)

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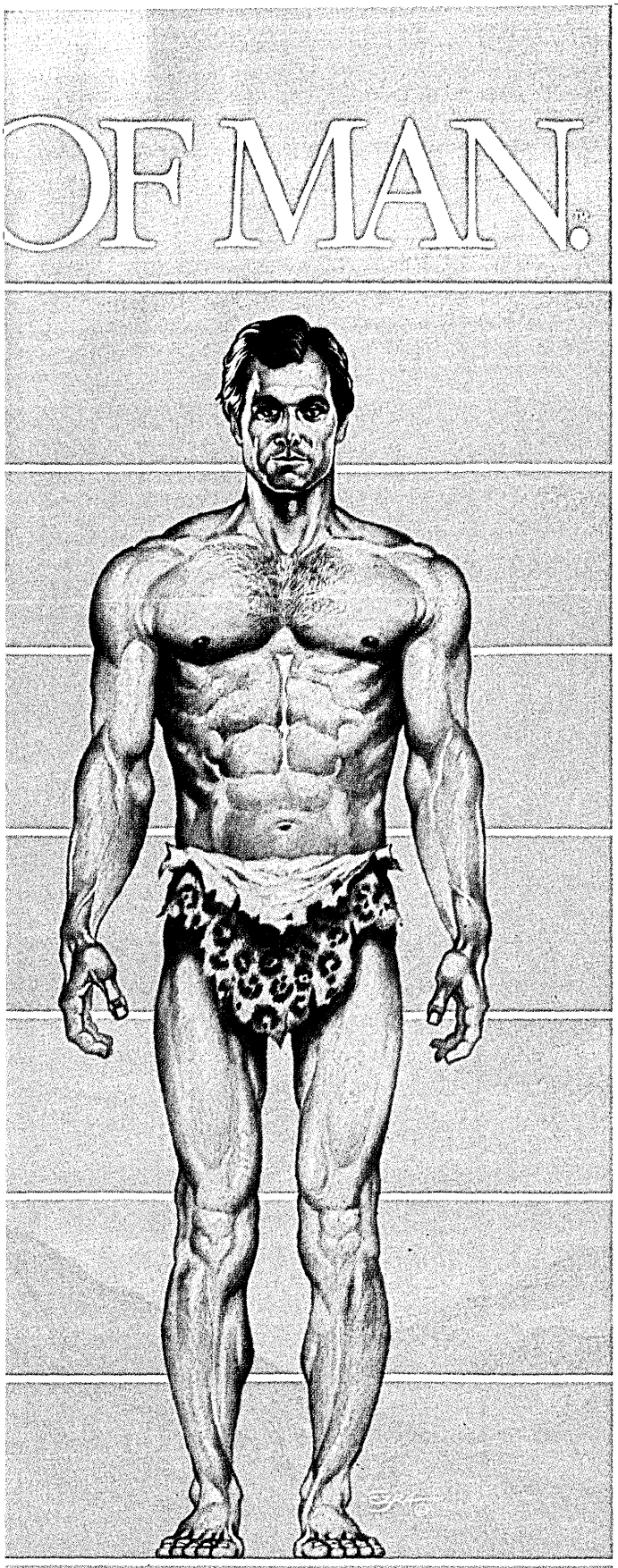

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The Multiple Area Network

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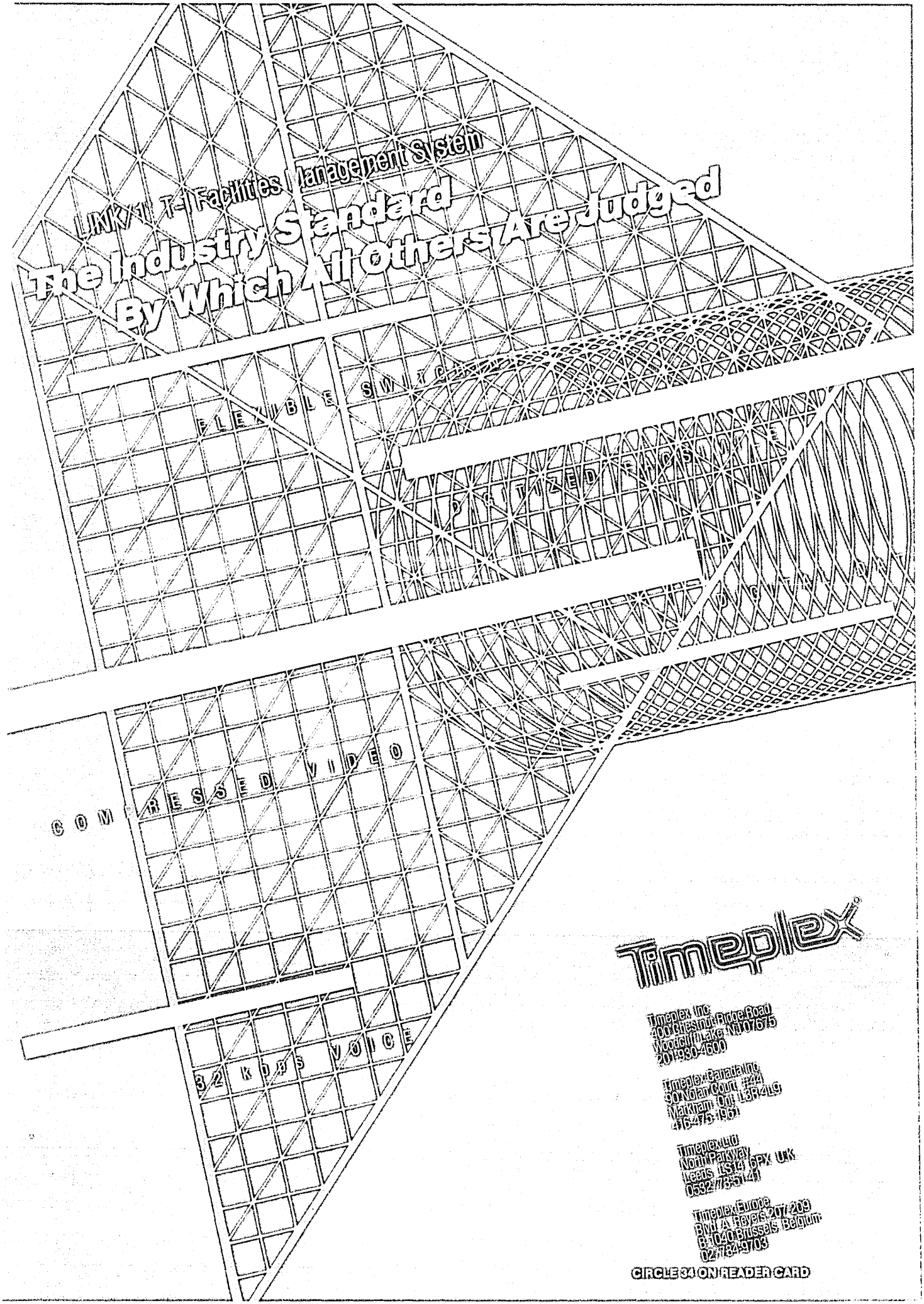
LINK/1 T-1 Facilities Management System
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And, like Data General, IBM has a Japanese affiliate that could bring such a machine to market at low cost. "Though the base price of the DG/1 is under $3,000, IBM may be able to put a similar configuration on the market for less," says George Colony, an analyst at Forrester Research, Cambridge, Mass.

Ironically, the other fear—this time voiced by institutional research companies—is that Data General's portable could become *too* successful. Marc G. Shulman, an analyst at Hambrecht & Quist Inc., San Francisco, says he's concerned that outright sales of Data General's Desktop Generation computer line, introduced last spring, may rise to 20% of the company's total revenues during its fourth quarter, which ends in December. He points out that pcs and desktop machines carry lower than average gross margins: the average discount of a pc sale is 30%, compared to an average of 20% for other hardware products. Schulman says he also fears that an "uncontrolled growth in their revenue contribution could hurt Data General's operating profit margins" and result in the lower-end products driving the business.

On the question of the potential for strong IBM competition, senior vice president Miller says, "We believe we know enough to stay ahead. There are answers to that question but they must remain proprietary."

The issue of margins would be valid, he says, "if the product had been developed in isolation or in a vacuum, but that's not the case." Miller says the DG/1 is part of a coherent marketing strategy and fully complementary with the MV line of superminis and CEO, the MV-based office automation system. "Ninety percent of our major bids include a combination of MVs and desktops. Now the portable will begin to appear in our bids and will leverage sales of higher-margin items," Miller states.

He points out that when the company's MV/4000 was introduced in 1981, it was a "breakthrough" in that with CEO it could deliver office automation at less than $10,000 a workstation. "With the arrival of the MV/10000, the price per workstation dropped to $6,000." Miller adds that the new portable, through a piece of software known as CEO Connection, takes leading IBM PC programs and converts them for use in the CEO environment. "So once more we drop the entry price for office automation and departmental-level computing, at the same time adding a whole new dimension for those professionals on the go who are highly sensitive to issues of portability, convenience, and ease of use."

Data General has very carefully tied the portable into CEO and the MV superminis, and just as carefully created the software for the whole ensemble to coexist with the IBM mainframes so popular at large corporations. "Data General is the first company to achieve such cohesion and integration, and is showing the way for other minicomputer companies," says Colony.

Rather than adopt an IBM-compatible approach from the outset, DEC, Wang, and HP attempted to maximize sales of their own particular pcs, and were, as Schulman puts it, "sucked into a volume manufacturing and application software availability game with IBM that they must surely lose." Now these companies seem to be pulling back from such a strategy and seeking a way to drive their business from the high end rather than the low, as Data General has done. "Wang, for example," says Schulman, "is avoiding the trap of competing in an area where IBM can price very aggressively, and instead is focusing its efforts at the supermini level, where IBM's pricing flexibility is reined in by self-impact constraints.

Minicomputer makers are pushing sales of superminis in markets where IBM is most vulnerable.

Wang has announced connectivity between its VS computers and IBM mainframes, and support of IBM's document exchange standards. What remains is for Wang to announce connectivity between its superminis and IBM PCs as Data General has done.

"When that happens, Wang can [follow Data General's lead and] play the PC cluster controller game—a game played with high-end machines having high margins," says Schulman.

IBM can't easily respond to such a strategy in the short term, according to Schulman. "Its 4361 and 4381 superminis have just moved into volume production at the same time that IBM is experiencing a rapid mix shift toward lower gross-margined PCs and away from higher margin 308X mainframes."

This fact leads Schulman to conclude that IBM's 43XX prices are unlikely to be cut more than 15% to 20% over the next year. "If I'm right, the price per MIPS of high-end 43XXs will stay above $135,000—at a level almost twice that of Data General's market-leading $70,000 per MIPS, and still above DEC and the other mini vendors' more gentlemanly pricing."

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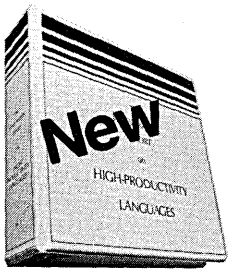

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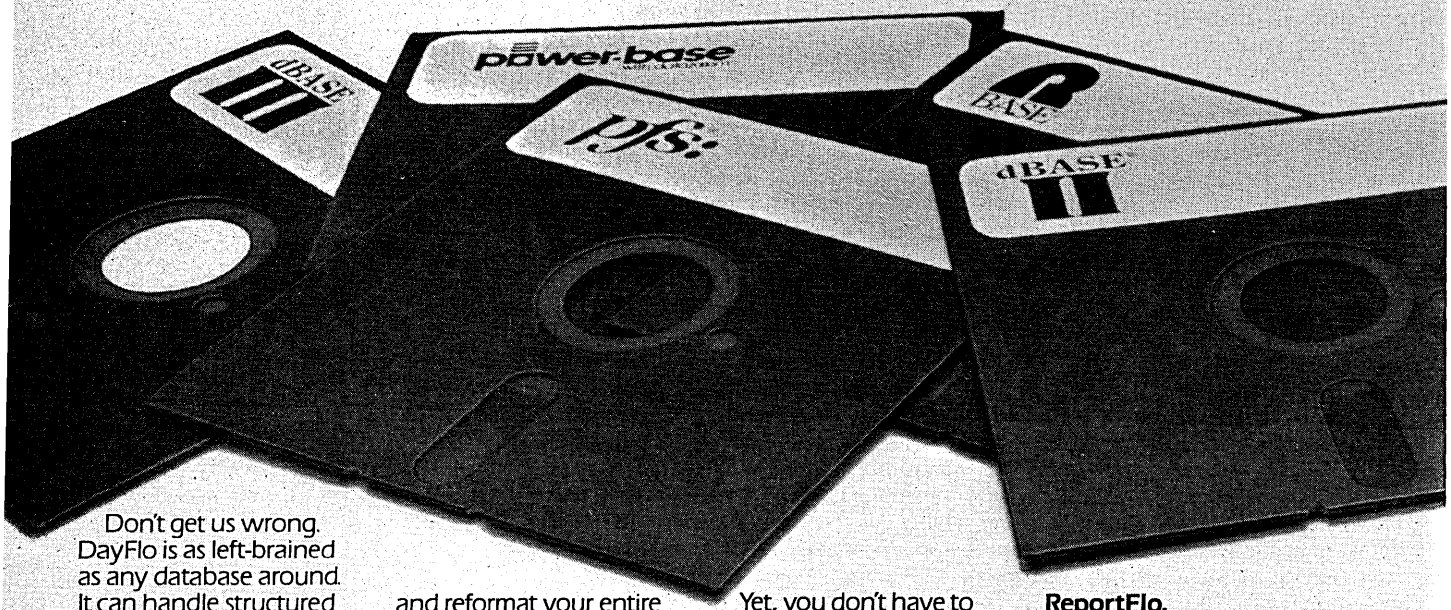
CIRCLE 35 ON READER CARD

Traditionally, databases have been left-brained.



Don't get us wrong. DayFlo is as left-brained as any database around. It can handle structured information such as customer lists and personnel records. Keywords and field names are used to gain access to records.

Just like traditional databases.

However, solving traditional problems in traditional ways is just one side of DayFlo. It's also flexible enough to handle today's new challenges in exciting new ways.

And that's where strictly left-brained databases get left behind.

The First Free-Form Database.

In the real world, there's always an exception to the rule.

Which wreaks havoc on traditional databases. For example, because of fixed formats, entering a new field such as a Telex number into a single customer record is next to impossible. Unless you're prepared to reprogram and reformat your entire database.

DayFlo, on the other hand, eliminates these tedious operations.

Word-Oriented Database.

Unlike traditional databases, DayFlo has integral word processing. For instance, you can store letters and memos along with customer lists in the same database.

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Every fact you need, from key client lists to spontaneously entered notes and ideas, is just a few keystrokes away.

Power, Yes. Programming, No.

DayFlo is a powerful package that runs on an IBM PC with hard disk, Compaq Plus, or compatibles.

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COMPARING DAYFLO TO TRADITIONAL DATABASES

TRADITIONAL DBMS	THE BENEFITS OF DAYFLO
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• No word processing capabilities.	• Integral word processing. Create and store letters, memos, notes, ideas, etc.
• Fixed field length.	• Variable field length. No counting character spaces.
• Adding new fields requires remapping or reformatting of database.	• Instantly add new fields to existing records without reformatting the entire database.
• One value per field.	• Multiple values per field. Information where you want it.
• Retrieves data based on pre-planned criteria only.	• Retrieves information based on content or key words.

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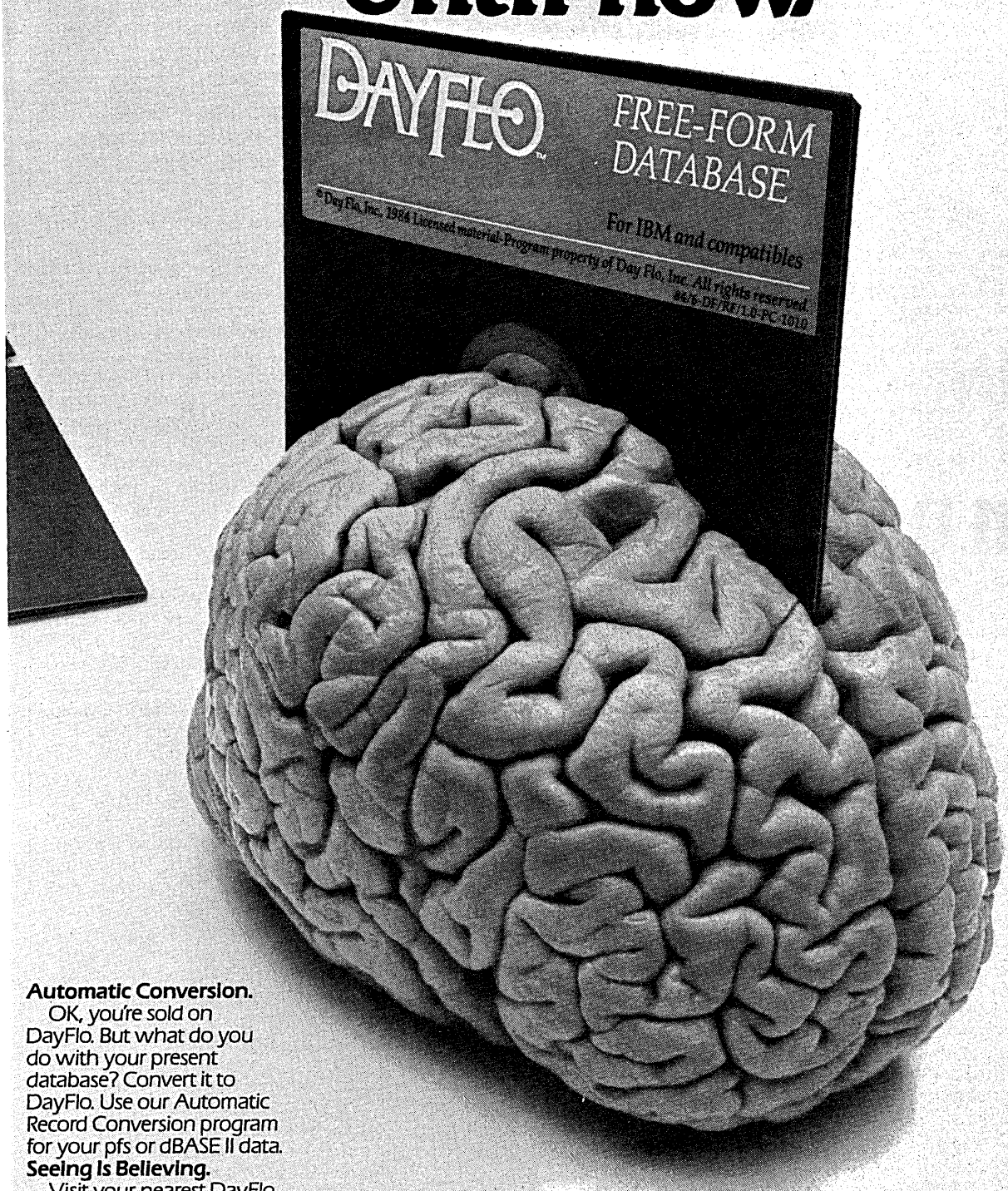

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CIRCLE 36 ON READER CARD

emerging market for office automation systems within the large corporate environment, Miller explains in Westboro. "It is believed that 85% of Fortune 500 companies are in the early stages of installing multimillion dollar systems that will serve as a trial for significantly larger systems over the next few years." He adds that the race to be the selected vendor for these initial trial systems is heating up, and bidding has been very intense. "But IBM not only has no low-cost distributed 370 architecture to offer," Miller charges, "it has no distributed office automation software to bid either."

TELECOMMUNICATIONS

WIRING THE WORLD

The nation's second largest bank is building a globe-encompassing data network.

by Charlie Howe

When the earth trembled at 5:13 a.m. on April 18, this thought may have crossed the mind of the founder of the Bank of America: time is money. As the great San Francisco earthquake and fire of 1906 began, Amadeo Peter Giannini borrowed a wagon and two horses named Babe and Chubb. Hastening to the Bank of Italy, as it was then called, Giannini gathered up total deposits of $80,000 and hauled them to safety, while less prescient money changers watched their funds go up in smoke or fall prey to looters.

The nation's second largest bank is still thinking in terms of time and money, but now on a global scale. With an initial data center operating in London, the Bank of America is in the process of building an international network of common databases linking some 100 locations. The project, called the International Banking System (IBS), may cost $500 million over the next seven years. Within four years it will automate all of the bank's foreign exchange and money trading, funds movement, correspondent banking services, and general ledger and accounting functions. Though the bank will not reveal marketing details, some suspect that financial intelligence gleaned from these transactions could, in a manner that would not violate customer confidentiality, be bundled into one or more additional databases and massaged to provide substantial sources of revenue.

The magnitude of IBS still has competitors and analysts mulling and speculating. At least 150 separate data processing programs representing some 5 million lines of code have been written in-house for the London operation, which covers the bank's operations in Europe, the Middle East, and Africa. The entire project is scheduled for completion in 1988, with additional data centers in Hong Kong, Singapore, San Francisco, probably New York, and in other undisclosed locations. Up to 80% of the services being provided in London will be replicated in these other locations, giving the bank a standardized dp system that will enable customers and B of A branches worldwide to patch into a variety of financial services.

Overseeing the IBS project is Jay Cook, senior vice president of the bank's Global Systems Services at bank headquarters in San Francisco. "Believe it or not, we still use a lot of mail worldwide," he says by way of explaining IBS. "We are doing this partly to keep competitive and also to meet the demands of the marketplace. Multinational corporations want information. They want to be able to execute quickly, and once they execute they want to know what has been done. International banking has been a [communications] maze in the past, and there is a need to better understand your business on the MIS side. We hope to be able to sell this network and these services to other banks, rather than have them build something comparable."

The London data center and those that will follow have a strong IBM flavor. "We are not in a total SNA environment at present," explains Mike Flinders, a bank vice president and manager of the London operation. "We will likely be moving towards VTAM and NCP in the next year or two, however." IBM hardware in London includes 3081s, 3083s, some 3033s, and an Amdahl V/8. "For our interface to the outside world we use a message switching environment with DEC 11/70 minicomputers directly connected to the mainframes," says Flinders.

"We are doing this partly to keep competitive and also to meet the demands of the marketplace."

IBM 3083 mainframes will manage two major databases. Using the MVS/IMS operating system, one machine will run an operational database in an on-line environment. A second 3083 running under VM will provide reporting on an end-of-day basis from all branches in Europe. In an MIS pie filled with plums, the operational database appears to be the bank's potential big money-maker.

"The operational database functional areas include the Astra and Comet systems," says Gerry Curtis, another London branch vice president. "Comet deals with credit and marketing, and Astra deals with liability management: acquiring money in the marketplace, foreign exchange trading, money market activities, taking in deposits from other corporations, and making money by dealing in the difference in exchange rates."

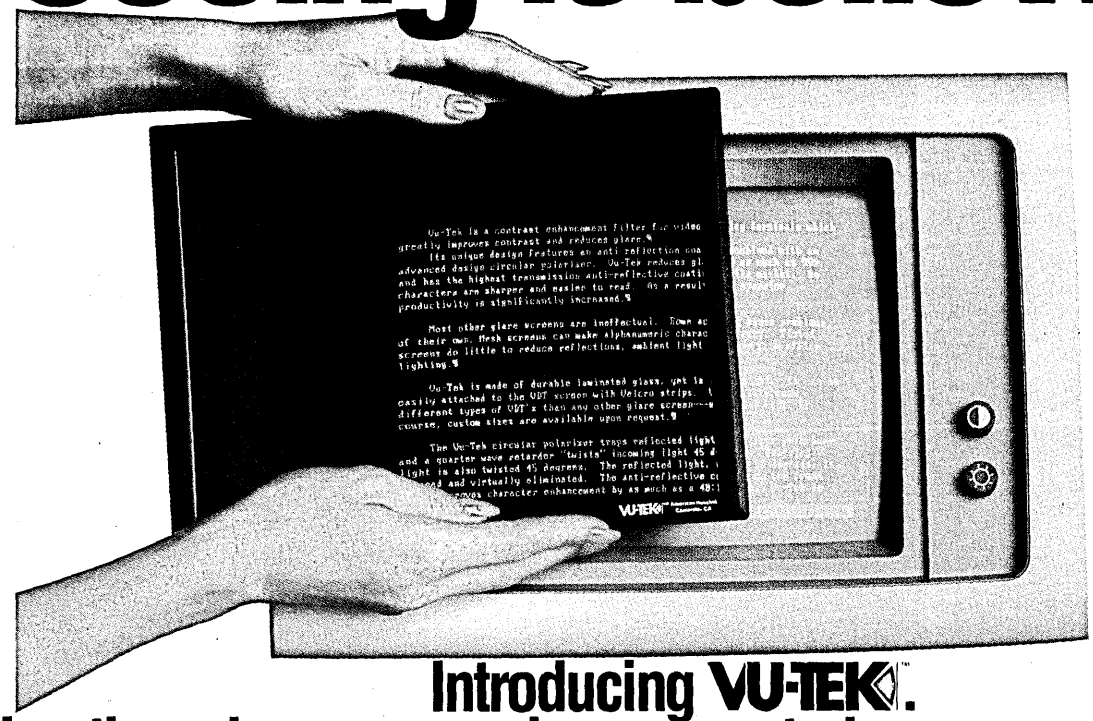
Tymshare was one of the first companies to offer international computing services to banks.

A third system is called Aries. "This handles payments and it operates two ways," says Curtis. "If a customer telephoners us and asks us to pay money out of his account, with the money to be delivered, say, to an account in Hong Kong, then the payment is made automatically in real time after keying it into Aries. Aries not only deals with sending money out, but also with electronic payments coming in. If a bank payment comes in over the wires, Aries automatically traps it. If it is a repayment of a loan, say, Aries will direct it to the proper application." Aries uses a common message processor, says Curtis, that formats messages from the internal banking format to those required by Swift, Telex, Fed wires, and other money-oriented nets. A fourth system is called Gemini, and it handles accounting aspects that include maintenance of customer accounts and maintenance of the bank's own general ledger, as well as risk control. "If a customer wishes a payment to be made," says Curtis, "the clerk will enter a payment into the system. The accounting transaction resulting from that payment—debiting and then sending the payment out over the wires—will immediately ask Gemini to ensure that the customer has adequate funds to allow the transaction before the payment actually goes out.

"Gemini also has an interesting feature that allows us to put limits on currency," continues Curtis. "For example, if we hear that the Argentine peso is going to collapse tomorrow, we can put a lock on the system that will say that no Argentine pesos can go through the system without approval from on high."

Sending and receiving all these data to and from the outside world involves using everything from dedicated telephone lines to leased satellite transponders. "From what we know right now, we will probably end up with a combined SNA and X.25 packet-switching capability," says Lance Myers, the bank's systems designer. "We will probably use one [protocol] in one place and one in another, and both in some places." In this

Seeing is believing.



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More than 90% of all employees who regularly use VDT's may suffer from eyestrain.* And that can make your business suffer, too.

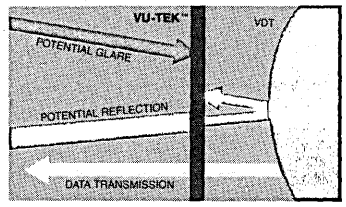
The cause of eyestrain? Glare. Reflection from office lights. And hard to read characters.

The result. Impaired vision. Headaches. Fatigue. More work breaks and absenteeism.

And reduced office productivity.

VU-TEK™ reduces glare up to 99%.

VU-TEK contrast enhancement filters help increase operator productivity by eliminating up to 99% of reflected VDT glare while also improving character clarity. VDT operators can now work more efficiently and comfortably.



VU-TEK's dramatic effectiveness is due to an advanced circular polarizer that traps glare preventing it from reaching the VDT operator's eyes.

No other glare screen is more effective than VU-TEK.

VU-TEK increases character legibility.

VU-TEK uses a special distortion-free anti-reflective coating on the front glass surface to improve character contrast and clarity.

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Fits leading VDT's. Easy to install.

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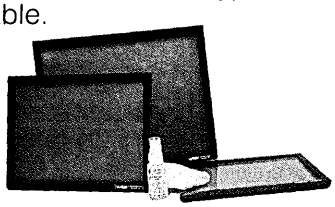

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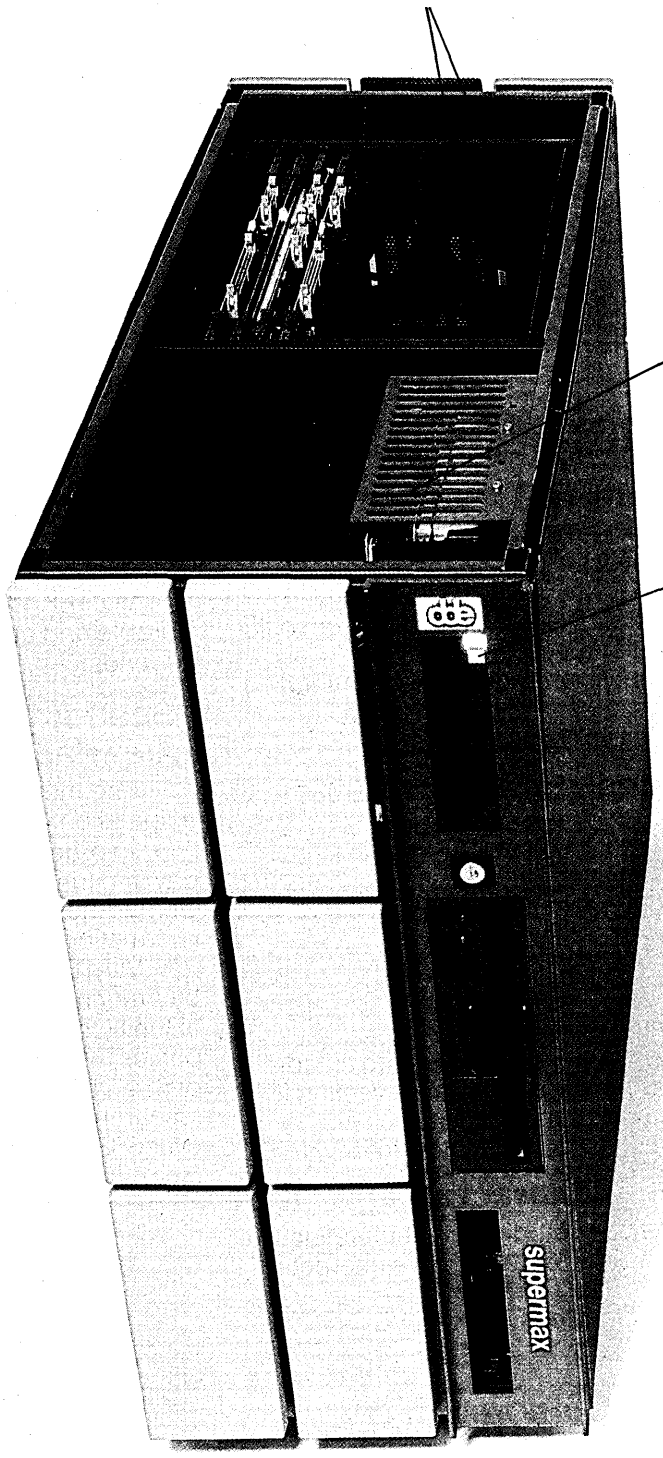

SUPERMAX Vertical
1 CPU, 8 users
1 MB Memory
36 MB Disk

OEMs/Distributors
Come to COMDEX and see Dansk Data Elektronik demonstrate its SUPERMAX, closely-coupled, multi-cpu Super Micro family.

A unique design, with 32 bit architecture, gives easy expansion in the UNIX* environment. Of course there are limits to growth, but these limits are distant with SUPERMAX. SUPERMAX grows from:

- 1-8 MC68000 CPUs
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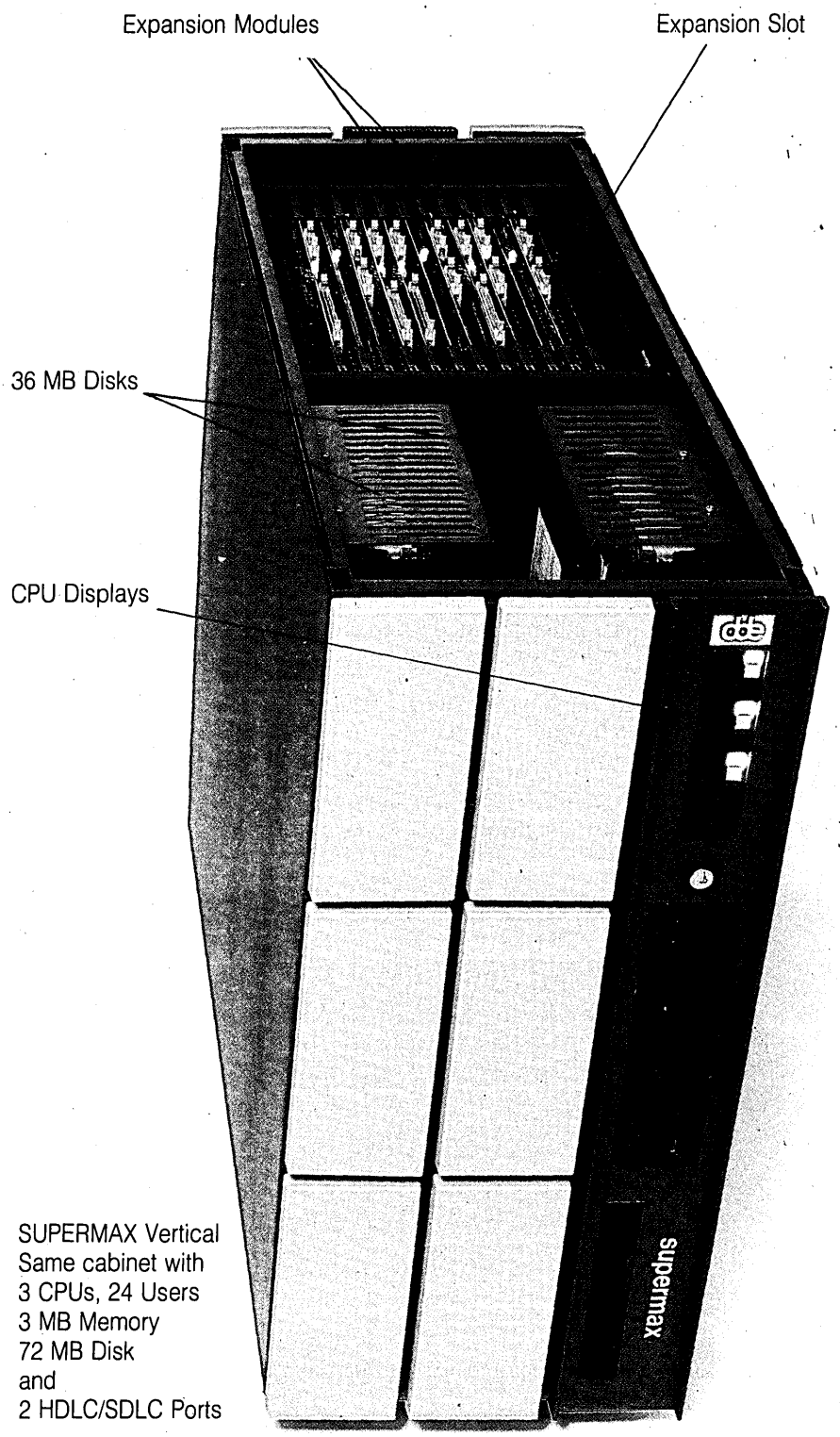

SUPERMAX Vertical
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3 MB Memory
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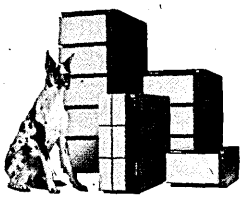

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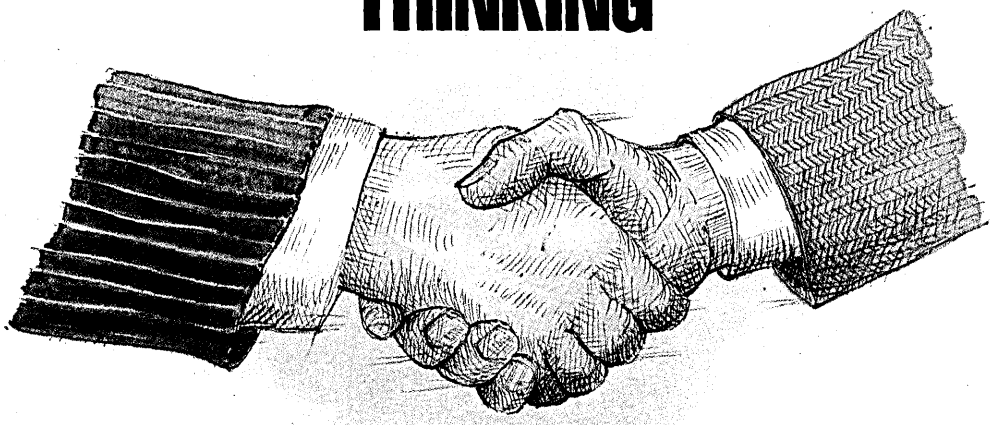
PREVENT "DP VS. END-USER" THINKING



Face it. End-users are no longer strangers to the world of computing. They have mainframes and PCs, software and data. Now, more than ever before, end-users need the support of their company's data processing professionals.

Help in using technology to satisfy end-users' individual information needs is not enough. To succeed in supporting end-user computing, you've got to manage your company's information resource. And you've got to prevent "Us versus Them" thinking. That takes teamwork—and software from TSI International.

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connection the bank is studying IBM's NPSI communications package, a packet-switching interface that enables SNA to run on top of X.25, the latter being the international standard for data sharing and file transfers between the gear of different vendors.

The bank is also using the IBM logical unit 6 (LU6) feature, which enables one IMS system to send data back and forth with another during IBM transactions. Like most banks, B of A is a major user of data communications—last year's bill was some $60 million.

Analysts and the competition are still waiting for the other shoe to drop. "You are talking about a rollout in four years," says Irving Levin, a senior analyst with consulting firm Arthur D. Little, "which makes it too soon to have all the answers. From what I hear, however, this definitely puts them into the big league category with banks like Citibank. They are sending a message that they plan to be at the top of the heap."

"I just don't have enough details to comment yet," says Randy Snodgrass, a vice president and systems architect at Citibank in New York. With assets of $143 billion, by the way, Citibank is the largest bank holding company in the nation. Bank of America is second with $121 billion, says *American Banker,* a New York-based newspaper.

"We are also moving toward customer-initiated transactions," says Snodgrass, "and my belief is that we are head and shoulders above most other financial institutions—not in everything, of course, but across the board."

Snodgrass agrees that IBS represents direct competition for servicing other banks and financial institutions. "If they are going to sell an informational by-product resulting from these databases, we also see that as competition," says Snodgrass, whose company last year spent some $80 million on communications. Unlike B of A, which leases transponders, Citibank owns two transponders, with a third held for backup.

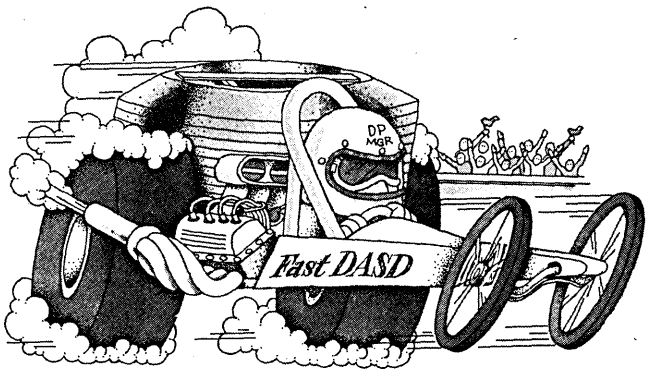
Perhaps the granddaddy of the value-added international banking database management business is Tymshare, with its International Banking and Investment Systems (IBIS) division, launched in 1972. Tymshare, based in Cupertino, Calif., and recently acquired by McDonnell Douglas Corp., St. Louis, describes IBIS as "a modular software product designed to meet a variety of trading requirements of the international banking and investment community." IBIS programs run on DEC VAX computers, and also allow banks to patch into the Tymnet X.25 public packet switching network, which is one of the largest of its kind in the world. Tymshare has more than 20 major banking clients worldwide, and has just landed customers—including France's Credit Agricole, First American Bank of Washington in Washington, D.C., and the Bank of Bermuda—in contracts with a collective worth of more than $2 million.

"The extensive risks involved in international banking and foreign exchange trading have been downplayed, to the chagrin of many responsible banks and concerned authorities," says John Petallides, director of marketing for IBIS. "We are pleased and encouraged that big banks like Bank of America . . . are recognizing the need and developing systems like IBIS to help them avoid crisis and possible financial disaster, not only to their own institutions but to the world [banking] system."

Bank of America's Cook says that IBS, with some 5 million lines of code, is among the biggest systems in the world. How big is Tymshare's IBIS? "It is an extraordinarily large system," Petallides says, "as all of these systems need to be."

OS/MVS Users

. . . over 500 users are using FastDASD to improve system performance.



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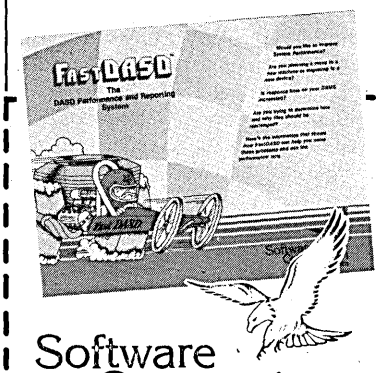

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NEWS IN PERSPECTIVE

BENCHMARKS

FINES DEC: The Commerce Department levied the heaviest fine ever imposed for export violations against Digital Equipment Corp., Maynard, Mass., charging that the leading mini maker had allowed one or two of its most powerful machines to reach the Soviet Union. The $1.5 million fine may be reduced to $1.1 million if DEC does not violate any export laws in the next three years. Specifically, the department charged that between August 1981 and January 1983 DEC sold to a Richard Mueller and his company, Deutsch Integrated Time, VAX-11/780 superminis, which were said to be useful for military purposes. The sales were in violation of laws restraining U.S. companies from doing business with firms known to sell militarily sensitive equipment to the Eastern Bloc. Mueller had been indicted in 1979 by a Federal grand jury for shipping semiconductor manufacturing equipment to Warsaw Pact nations. DEC denied any wrongdoing and said it was complying with the fine to avoid more costly litigation. As reported, observers say Commerce has made a well-publicized example of DEC in order to encourage vigilance by other manufacturers.

MONCHIK-WEBER MEETS McGRAW-HILL: Monchik-Weber Corp., a New York vendor of financial systems, agreed to be acquired by McGraw-Hill, also of New York, for $55 million. The publishing company, which is understood to have done the deal to bolster its financial services offerings, will pay $15 cash per share for the 3.6 million outstanding shares of Monchik-Weber. The latter says it was approached by several suitors before settling with McGraw-Hill, which indicated it may soon acquire a hardware manufacturer.

JAPAN DEALS IN AT&T: Japan's Ministry of International Trade and Industry (MITI) said it is planning a five-year joint effort with AT&T to foster native software development in that country. Although a final decision on the project, which is expected to cost some $125 million, is not due until late this year, the plan calls for AT&T to work with several Japanese computer companies in furthering the development of the Unix operating system. Japan's interest in AT&T is understood to be as an alternative to IBM, which successfully "stung" Hitachi and other Japanese manufacturers in 1982. MITI is concerned about the future of Japanese computer efforts given the relatively unproductive Japanese software industry. Few details of the proposed MITI-AT&T plan were available, but it reportedly centered on modifying Unix for use on large computers and making it more easily accessible to Japanese programmers.

AMDAHL XA EARLY: Amdahl Corp. said a previous decision to redirect engineering resources has enabled it to provide support for IBM's MVS/XA operating system two quarters earlier than previously planned. The XA support, which enables 31-bit addressing within the large-scale 5870 and 5867 mainframes, will be available in the fourth quarter of this year instead of in the originally planned second quarter of next year. The Sunnyvale, Calif., manufacturer had delayed by two quarters shipments of the 5880 and 5868 multiprocessor machines so that more time could be spent reworking the 5870 and 5867 to support XA. That change, and an unexpectedly small number of engineering changes for the XA support, helped accelerate the delivery schedule, a spokesman said. In an unrelated development, Amdahl fired between 250 and 300 employees in order to cut expenses and "streamline" operations. The layoffs were said to be worldwide and "across the board."

DUMPING DROSS?: A Silicon Valley company that is a major supplier of disk controllers for the IBM PC has been fingered as a brazen polluter. Donna Scott, assistant city attorney for the city of Sunnyvale, Calif., says that three employees of Xebec Corp. were recently spotted in her town during daylight hours, dumping more than 300 gallons of yellow gunk down a storm drain. Analysis identified the goo as toxic waste containing toluene, ethyl benzine, and the solvent TCE. In a joint lawsuit filed in late August, Sunnyvale and the state of California seek a permanent injunction against the practice, plus some $67,000 in penalties. If convicted, Xebec could also be fined $25,000 per act of pollution. At press time a Xebec spokesman in nearby San Jose said that he had not seen the court papers and couldn't comment. The facility named in the suit, he adds, was acquired last April by Xebec from San Antonio, Texas-based Datapoint Corp., which had been using it for some 10 years as a tape and disk drive facility. "We really don't know what's been going on out there," he says, "but we intend to find out." Is Xebec the sole source for PC XT controllers? "We won't say that we are, and we won't say that we aren't," the spokesman says. And neither will IBM.

COMSERV'S RED INK: Prompted by what they charge were deliberately misleading statements by management, two investors in Comserv Corp., St. Paul, have filed class action lawsuits against the company. The suits claim Comserv misled investors with false financial figures from April 1982 through April 1984, which artificially inflated the prices of the company's common stock and convertible debentures. Despite predictions by president Richard Daly to the contrary, Comserv disclosed losses of $15.2 million during the 18 months ended June 30, 1984. The financial figures were the first the troubled software company has released since November last year. It has also restated previous financial figures downward for the second time. Reportedly claiming it was "misled," Peat, Marwick, Mitchell & Co. has dropped Comserv as an auditing client, and the SEC has begun an investigation of Comserv's auditing practices. Daly said the company's problems are continuing: no profit is expected for fiscal 1984 due to lower-than-expected revenues and several unexpected costs. Comserv develops and sells software for manufacturing customers.

DOD SOFTWARE FACTORY: The Department of Defense wants to establish a Software Engineering Institute (SEI), which, if all goes according to plan, will employ 250 people by 1988. Approximately 70% of those employees will be professional technical personnel designated as members of the technical staff. Their mission will be to "accelerate the transition of emerging or advanced computer software technology into use in the development and maintenance of DOD weapons systems," according to a preliminary bid for sources. This will be accomplished by establishing a showcase software "factory" that will represent the standard of excellence for software engineering practice. The SEI's ultimate objective is to reduce the "labor intensiveness of developing and evolving military applications software." Major functions will be identifying opportunities for technology transition; evaluating prototype software tools and methods; integrating new and improved tools and methods into life-cycle automated software development and support environments; and encouraging the use of advanced software environments in developing computer-intensive weaponry. DOD says "the SEI will endeavor to bring together the best professional minds in the area of software systems engineering and technology." Industry sources say many state governments eager to foster local growth of high-tech industry, are lobbying to have the SEI located in their locales. The budget for the first year is $8 million but it will grow to $20 million by the fourth year. A decision on the SEI location may come as soon as next month. ◉

Bolstering the defenses of the kingdoms of LAN.

Each personal computer in a Local Area Network is a kingdom unto itself. Messengers from different kingdoms must pass through each other's kingdom to get information. It's the law of the LAN that they be permitted to do so. Confidential documents, therefore, are highly accessible to all. Which is why no realm is truly secure.

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Conventional defenses are vulnerable.

Password schemes, for example, tend to be too easy for devout hackers to tear asunder. And if elite passwords are discovered, dedicated file servers are of little help.

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You'll never achieve total invulnerability. If you could, you'd have utter anarchy. Because no one could access your node on the LAN. Which is why your best defense is to implement a security program that'll ensure the most efficient use of your resources—with a minimum of surprises. While also being a cost-effective deterrent.

That's why hardware alone isn't the solution. It's just too easy to copy. While software alone is simply too easy to break. And since neither one alone can give you the protection you need, your solution lies in the interlocking of both.

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Simply put, Codercard is a tamper-proof device, slightly thicker than a credit card, that contains a self-powered microprocessor. Encoded on this is a unique ID number. And a new, complex series of algorithms that are key to the authentication process.

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The MAPPER System can be scaled for a major corporation, for a single department, or for a growing business. You can even timeshare through a Sperry service bureau.

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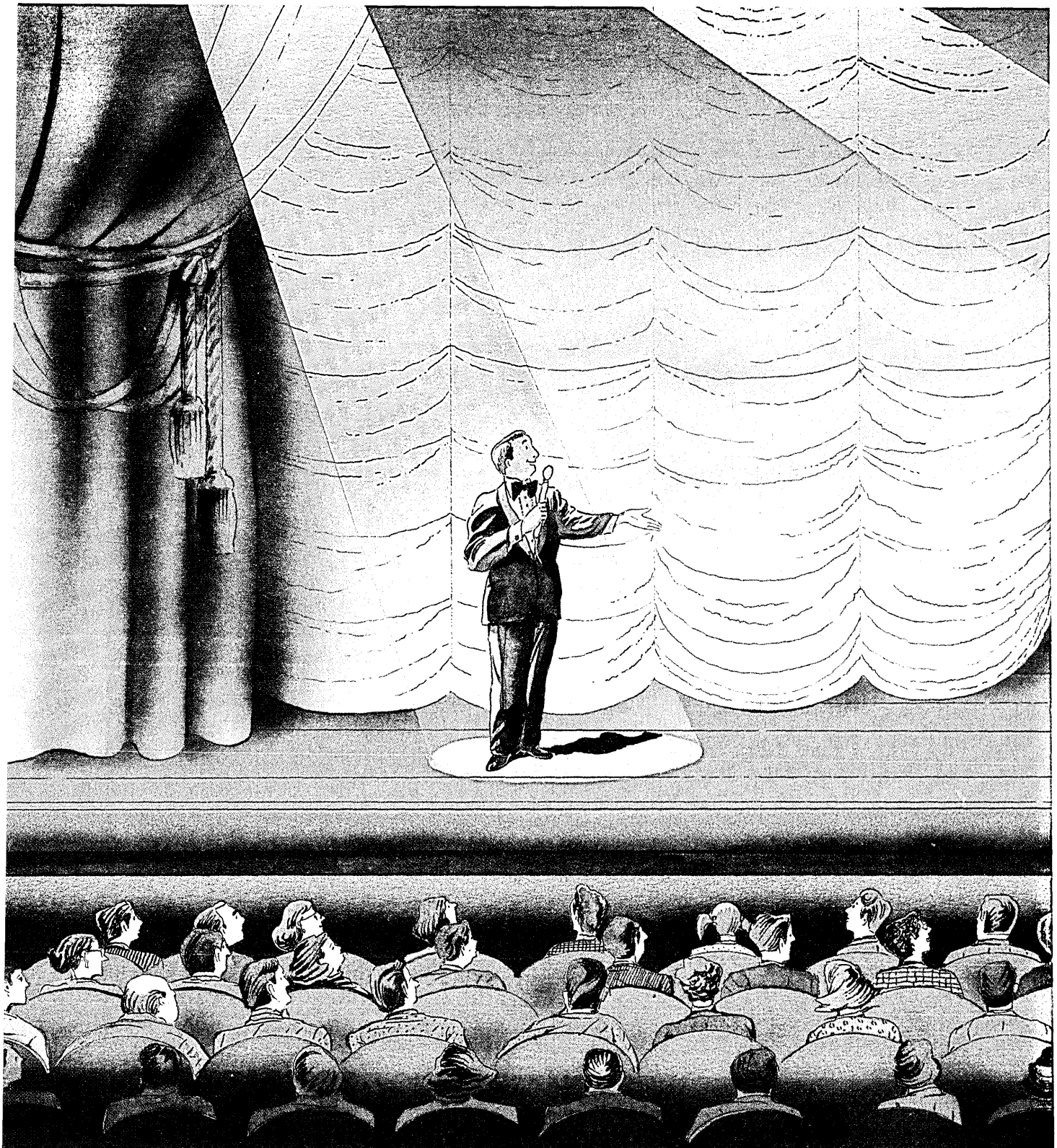


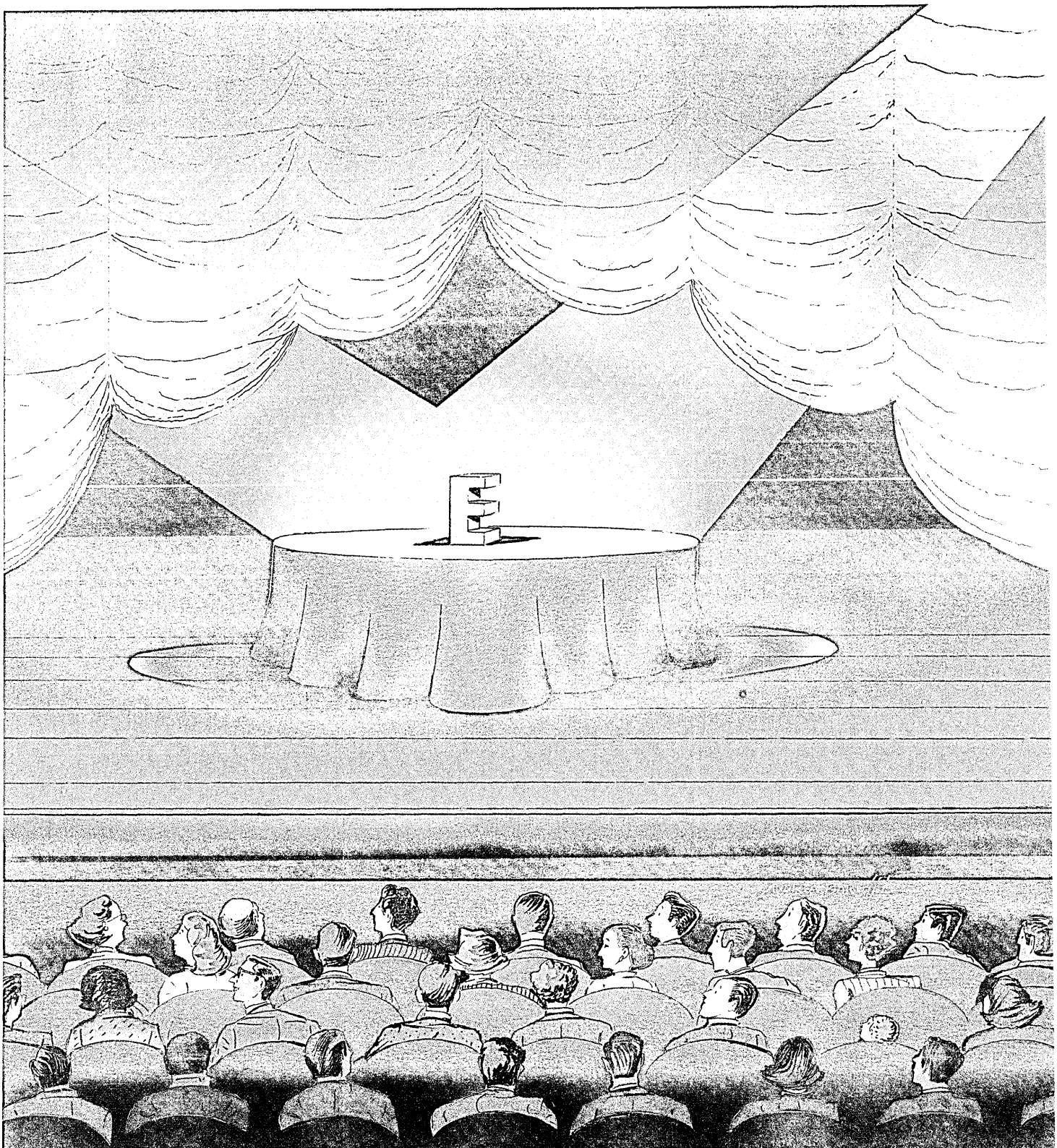
Relief is on the way as new technologies give us the means to store more in less.

THE MASS STORAGE SQUEEZE

by Steve Moore

The ultimate information system will provide geographically dispersed users with instant access to any kind of information at any time.

When a user request reaches such a system, it will automatically be handled by appropriate subsystems, depending on the response time desired, the type and amount of information required, and the relative locations of the user and the storage



device containing the needed data.

Today's most advanced information technologies are a glimmering of that future, but many information systems managers rightly ignore premature product announcements and blue-sky speculation. They prefer to focus on staying abreast of the mind-boggling array of currently available technology they must evaluate, select, and manage.

If today's dp manager has an Achilles' heel, it's knowledge of information storage options, says Gene DeKoster, vice president of planning and requirements at Storage Technology Corp. "People know VTAM and SNA and IMS and 3270 and all the buzzwords, but I bet I could ask them 40 questions on storage and they couldn't answer 40% or more."

The information explosion is driving the computer industry to provide faster, higher-capacity, cheaper, more compact, and more versatile storage solutions. Until recently, options in mass storage were variations on the magnetic media theme, and the technologies remained largely transparent to the dp manager, who relied on the vendor to select and package the storage device.

Now intelligence is migrating from the cpu to the disk storage unit, which is beginning to be transformed from an isolated device into an intelligent, more modular subsystem. Optical disks have only begun to challenge magnetic media. Emerging electronic

ILLUSTRATION BY ANDREA BARUFFI

Optical disk technology has already opened up a wide range of new capabilities and novel applications.

storage technologies are already capable of replacing disks in some applications.

In the midst of these developments, "what dp managers have to have is a living, breathing plan that has a two- or three-year window on it and is constantly being updated as technology is introduced, and as storage management is enhanced, so that they are in a position to tell whether or not a new capability will be useful to them," advises Paul Wolfstaetter, storage systems consultant for IBM.

An information system exists for its users, and a good management plan will depend on regular communication between users and management so that system capabilities stay in step with user demands. Interdepartmental rivalry and parochialism can easily distort the manager's perception of overall system needs.

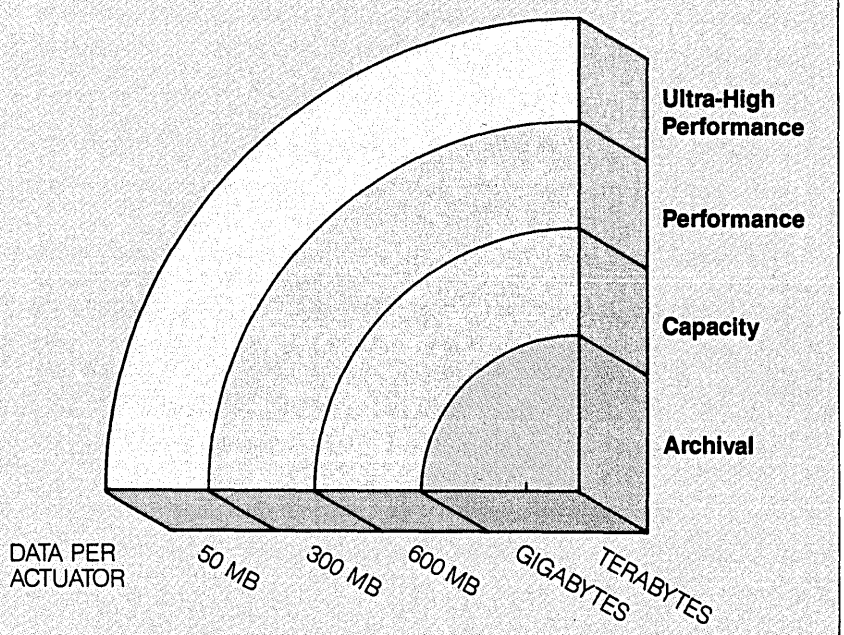
Who are the users and where are they located? How much of how many kinds of information do they require, and at what rate are their demands increasing? What formats do they want their information in? How quickly do they need it? What information is disposable and what should be kept? Once current and anticipated user demands are understood, what are the cost-performance trade-offs of existing and soon-to-come storage technologies that can help meet those demands? What allocation of data among how many actuators controlled by what types of software will be optimum?

Dp managers who can answer these questions will be in control of both their systems and their vendors. Those who can't may end up trapped in a cycle of user-demand crises patched up with barely adequate storage choices.

A useful tool in analyzing storage options for larger systems is a chart developed by StorageTek's DeKoster, which divides storage needs into four general categories: archival, capacity, performance, and ultra-high performance (see Fig. 1). Each category is related to a range of data capacity per storage device actuator.

FIG. 1

RANGE OF CAPACITY PER STORAGE DEVICE RELATED TO TYPES OF STORAGE



BOUNDARY HARD TO DEFINE

The capacity and performance zones have no easily definable boundaries; they represent the shifting interplay of machine room capacity with user demands for higher performance. At one extreme are archival storage applications requiring mammoth storage but relatively infrequent access to the stored data (such as NASA photographic data or oil company geophysical exploration data); at the other are ultra-high performance random access multi-user applications demanding subsecond response times (like airline reservation and bank transaction systems).

While the majority of corporate systems fall between the two extremes, DeKoster believes that the archival and high performance areas will drive storage technology over the next decade. "The archival zone is the information explosion; the ultra-high performance zone is the explosion in electronic delivery customer service. People say it can't happen, but if you have 20 million accounts and only 5% want electronic servicing in the home, that's a million terminals, and it's going to happen."

When system needs in each of the four areas are known, equipment choices can be made with capacity, performance, and price trade-offs in mind. Much of the difficulty in making choices among storage solutions lies in simply finding out what's available. Storage devices fall into three broad (and to some degree, overlapping) categories: magnetic, optical, and electronic. To these, we can add a related fourth category: software and hardware that supercharge storage devices by connecting them to the system in a way that allows efficient staging and retrieval of data. Examples are caching systems, database machines, networking products, and system resource control software.

Choices among storage media have traditionally been made on the basis of physical size, capacity, access time, throughput, and cost per MB stored. Those trade-offs are further complicated by the emergence of two new options: fixed and removable rigid media, and read-only, write-once, and erasable media.

Early removable Winchester disks fell out of favor because of reliability problems, but they are on the way back with the introduction of new cartridge technology by such companies as Amcodyne of Longmont, Colo. So far, all announced optical disk products have been removable. Removable rigid media increase the cost per drive but, depending on the application, can introduce savings by eliminating secondary backup and archival systems as well as storing large amounts of information on random access, identical, and portable media.

At first glance, read-only and write-once optical media look like throwbacks in a market dominated by erasable media. Read-only media are recorded on by the manufacturer, and can be read from but not written to by the user. Write-once media may only be written to once by the user. Once filled up, they become read-only me-

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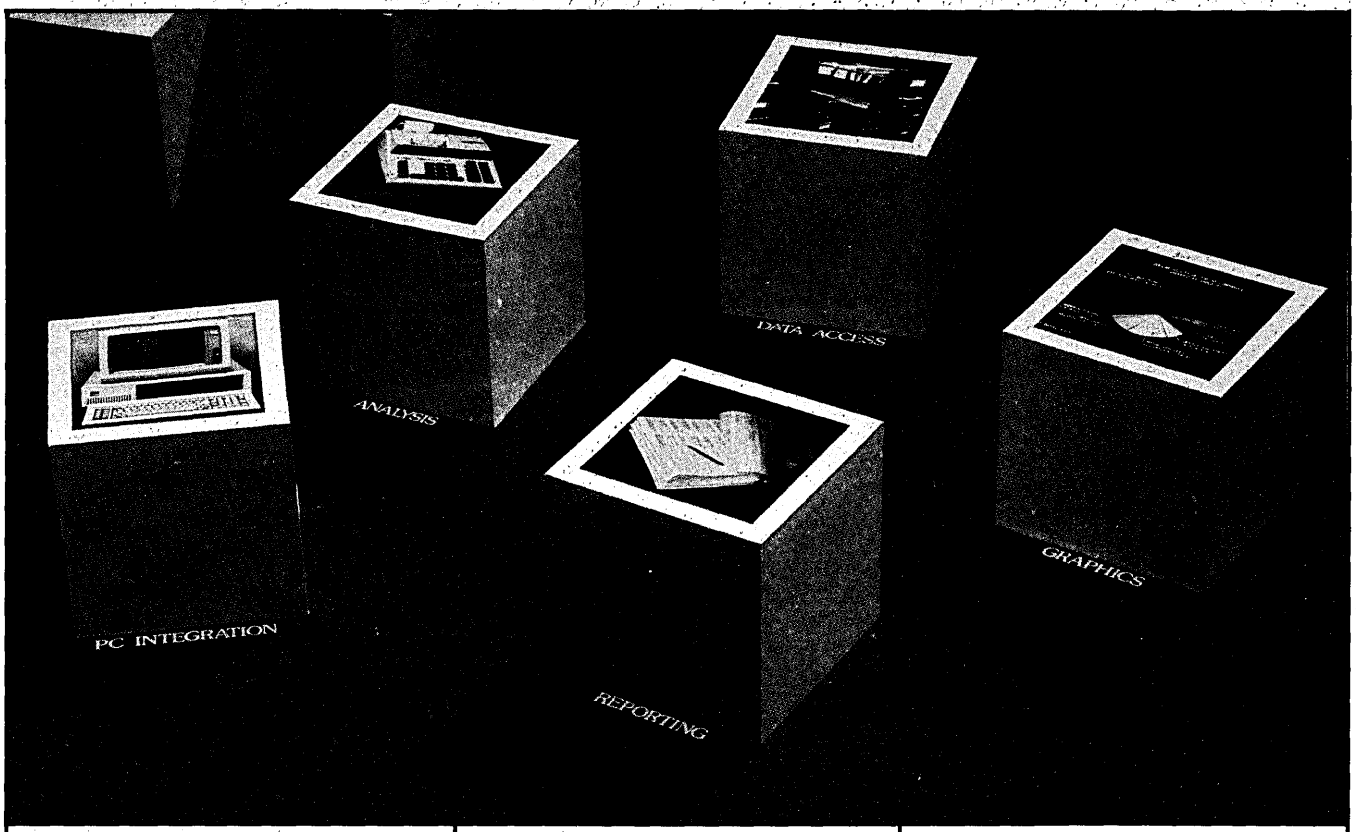

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CIRCLE 43 ON READER CARD

Easily replicable, inexpensive, read-only optical disk libraries may emerge as an alternative to on-line database services.

dia. Both are nonerasable. For applications demanding secure storage of original versions of valuable documents, images, or data streams, the primary advantage of nonerasability is evident: once the data are recorded, no one can modify or erase them short of physically destroying the media.

Write-once optical media can provide a secure audit trail of changes to original data—an invaluable function for medical, financial, or geophysical applications in which a difference of a few bits can define the presence of a tumor, a fortune, or oil. All versions of engineering drawings or of documents prepared in conference can be stored and later compared to the final product.

Although optical disk technology has barely reached the market, it has already opened up a wide range of new capabilities and novel applications. Optical disk vendors point to high capacity, removability, the ability to store images, longevity, and sturdiness as advantages of optical over magnetic media. Proponents of magnetic media point out that:

- A given digital image represents virtually the same number of bytes on both types of media.
- Optical drives are slower than the currently available 2.6GB magnetic drives that already have so much data under each actuator that they are too slow for high-performance applications.
- The longevity and reliability of optical media have yet to be proved.

OPTICAL PRODUCTS AVAILABLE

Recently announced optical products range from multigigabyte write-once disks intended for archival purposes to smaller, easily replicable read-only disks based on videodisk and audiodisk technologies. Read-only and write-once optical disks are unlikely to reach end users in quantity before the first quarter of 1985. Relatively low-density 5¼-inch erasable optical products are expected to follow by the end of the same year.

On the high end, StorageTek's $130,000 removable write-once 14-inch disk holds 4GB of digitally recorded user data and is intended for customers like oil companies, whose seismic exploration crews may generate thousands of reels of magnetic tape every month, and who may have millions of reels of tape in storage that must be refreshed every seven years. Data are stored on 16-inch square 4GB platters ranging in price from $150 to $225, depending on quantity. StorageTek's drive occupies a middle ground between faster magnetic disks and slower magnetic tape systems.

The combination of extremely high density and the ability to store images in either analog or digital form (depending on the specific optical disk technology employed) may make optical disks competitors not only of magnetic media but of photocopiers, microfilm, and microfiche as well. Information industry futurists speculate that optical media will someday virtually eliminate paper, magnetic tape, and microfilm. For now, technologies are needed to bridge the gaps between new and existing storage media.

Several companies, including Eastman Kodak (Rochester, N.Y.), Filenet (Costa Mesa, Calif.), and Matsushita (Secaucus, N.J.), have developed optical document and microimage file systems intended to interconnect three basic information-handling functions: microfilm and paper storage, magnetic and optical media storage, and on-line display and modification at workstations. Such systems employ scanners that digitize images of paper documents or microfilm and store them on high-density optical disks. Broadband networks can then be used to interactively connect imaging systems, optical disks, high-resolution workstations, and printers.

Yet another new optical application involves read-only optical disks, which are most useful for storing information that is updated relatively infrequently (perhaps once a month or less) and is intended to be distributed to many users in different locations. Two companies who hope to create a big new market in electronic publishing on read-only laser video- and audiodisks say they will release products this year.

Hitachi plans to introduce a standard-sized 5¼-inch drive using 550MB audiodisks. A larger drive by Reference Technology of Boulder, Colo., will use 12-inch videodisks with a capacity of 1GB. Both units are touted as capable of boosting the storage and response time capabilities of small computers to the mainframe level.

Reference Technology, and perhaps Hitachi as well, will supply 3M Corp., Menomonie, Wis., with tapes of customer data, premastered in-house using proprietary data compression and error-correction techniques for mastering and stamping out optical disks in quantity. Customers of both companies will buy the disk drive, then pay for production of master disks and for desired quantities of duplicate disks. In large quantities, average cost per disk including the drive and mastering could drop as low as $20 to $25.

Easily replicable, inexpensive, read-only optical disk libraries may emerge as an alternative to on-line database services because "many information professionals don't like to be intimidated by the taxi meter," says Reference Technology president Steve Smith. Rather than rent both the information and the phone line, people could own the information and browse through it at length and at leisure.

Erasable optical disks are more troublesome. There are currently three active technologies for making optical media erasable—magneto-optic, phase-change, and polymer dye. "Everybody except Matsushita seems to believe that magneto-optics has a better shot at it," says Jim Porter, president of Disk/Trend in Los Altos, Calif. Matsushita's drive, which will use 8-inch 700MB disks and phase-change technology, was introduced in April 1984 but industry observers don't expect it to reach end users for at least another two years.

ERASABLE DISKS IN 1985

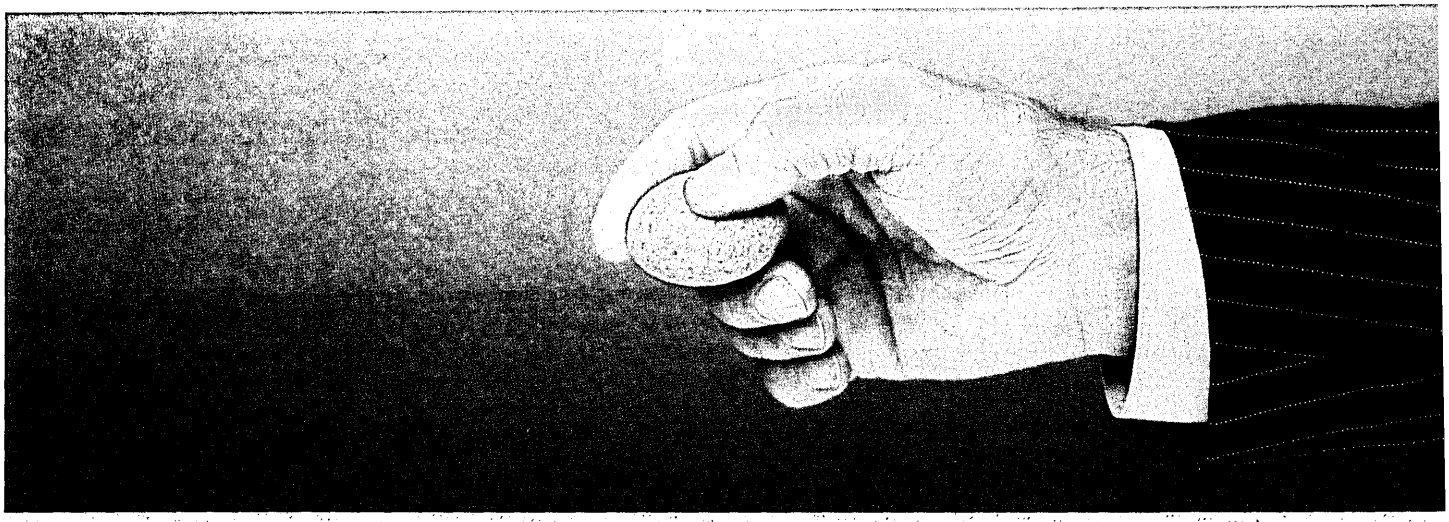
The first erasable optical disks will be 5¼-inch, use magneto-optics, and will be available in 1985, according to San Francisco-based optical memory consultant Ed Rothchild, who publishes *Optical Memory News* and *The Optical Memory Report.*

"There really have been questions about how long information written on an optical disk will remain," says Rothchild, adding that "degradation of magneto-optic media does not come from the number of times you write on it or erase it. . . . The enemy of optical media is moisture getting into contact with the information-bearing surface."

There are questions about degradation or fatigue in optical media employing phase-change technology, but Matsushita claims its disk can be erased and reused a million times.

Most optical disks are made of PMMA plastics, which are being alloyed with various minerals in an attempt to reduce their sensitivity to moisture. Recently, says Rothchild, several Japanese companies have experimented with polycarbonate substrates and have found that "the medium is so promising that Sony is now willing to guarantee that you could read back information from one of their polycarbonate [write-once] disks for 20 years, and expect that it will last for 30 years. You can write on it for five years, but recover the information for about 20—twice the length of time anybody else has claimed to date."

And finally, after 15 years of failed attempts to apply it to information storage, holographic technology is expected to make an appearance within two years—but as a focusing element in optical drive heads rather than as an actual storage element, says Rothchild.



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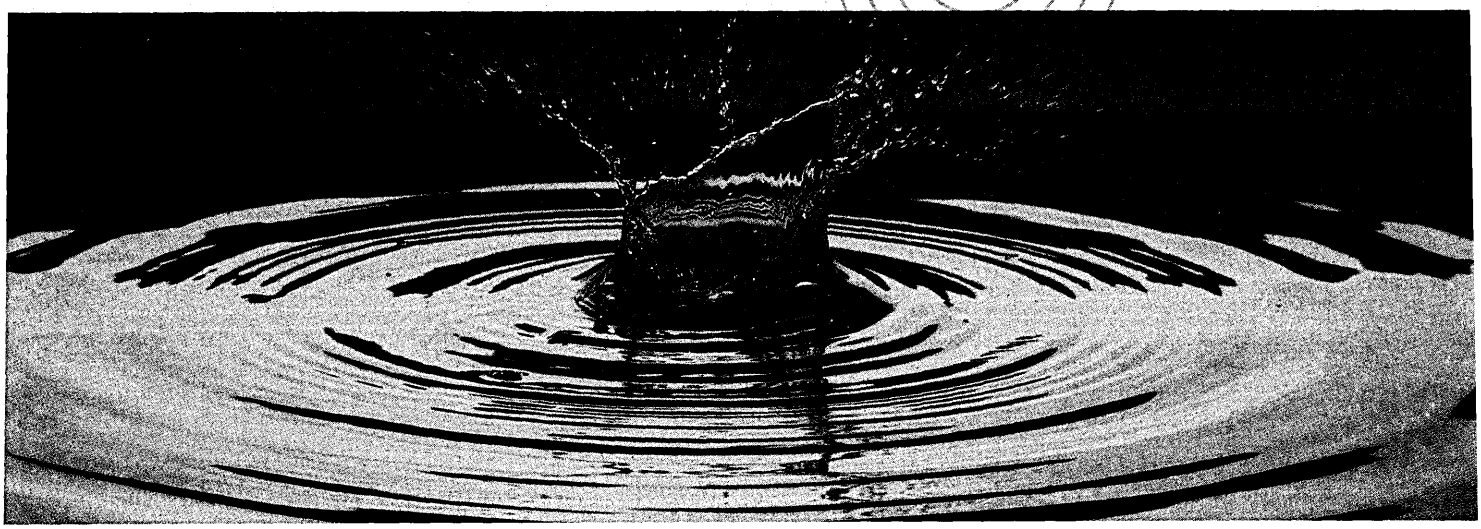


Magnetic media densities have quadrupled approximately every five years.

Regardless of its promise, optical technology has a long way to go before it will significantly erode other information storage markets. "The verdict is still out as to whether optical disks become a viable competitor in the overall disk market," insists IBM consultant Wolfstaetter, although his employer is known to be actively investigating optical technologies.

Magnetic media dominate the storage market in terms of diversity, economy, and proven reliability, and will likely continue to do so until at least 1990. Companies in any segmented market risk embarrassment, not to mention failure, if they assume competing technologies will stand still while they move forward—and magnetic media still have plenty of momentum relative to their competition.

As the demand for increased magnetic disk recording densities escalates, most of the industry is sticking with proven longitudinal recording techniques rather than rushing to adopt promising but controversial vertical recording methods. Longitudinal recording orients the magnetized areas that define each bit end-to-end; vertical recording increases surface densities by standing them up side by side.

EXPENSIVE AND HARD TO PRODUCE

Unfortunately, high-density vertical recording works best with associated technologies that are both expensive and difficult to produce in volume: thin-film media (oxide, plated, or sputtered), low-flying thin-film heads, or both.

"Many people in the magnetic industry feel that vertical magnetic recording is most appropriate for in-contact flexible media," says Rothchild. "There are so many problems getting the rigid media to work that a lot of people in that industry are saying the concept of rigid disk vertical magnetic media is dead, it's not going anywhere, let's go to magneto-optics, which does work .... One indication of the relative merit of disk technologies is that there are only three companies in the world developing rigid vertical magnetic media. There are eight developing flexible vertical magnetic media and 77 developing optical media; that should tell you something right there.

"The problem with rigid vertical magnetic recording is that when you get to the densities they're talking about (100,000 flux changes per inch and more, and 300,000 have been done in laboratories) you have to fly the head so close to the surface of the media, down to 4 microinches (currently the closest head is at 11 microinches) that you are below the mean free path of air molecules, and there's a vacuum under the head, and it may be impossible to keep the head from crashing."

Porter is more optimistic: "Heads have been flown on a demonstration basis by Ampex [Cupertino, Calif.] on plated disks at 4 microinches, and reports within the industry indicate that those flying heights are required only for extremely high densities. If you go to 100,000 bpi, you'll have to fly pretty close to the disk, but if you operate at 20,000 to 30,000 bpi then the combination of thin-film heads and vertically recorded disks is expected to be viable."

No vertically recorded Winchesters have been shipped yet. The leading company in vertically recorded rigid media, according to Porter, is Lanx of San Jose, Calif. Lanx disks and heads are being evaluated by Control Data, but are unlikely to reach the market soon.

Today's best vertical technology can handle only about half the density obtainable on optical disks, and DeKoster projects that optical media will put 16GB onto one surface in the not-too-distant future. Still, according to Dave Liddell, IBM's manager of product marketing for storage systems, vertical technology can't be ruled out yet, especially in view of the computer industry's history of premature pronouncements on the death of technologies.

The current hard disk market is shared by longitudinally recorded Winchesters in 3½-inch, 5¼-inch, 8-inch, and 14-inch sizes. The bigger drives typically have slightly faster access times and data rates, as well as higher capacities. Thin-film heads and media and half-height configurations are among the advances trickling up into large drives from the more competitive small Winchester market.

Magnetic media densities have quadrupled approximately every five years—but semiconductor chip densities have done the same about every four years, and electronic data storage is available now to those who can afford it.

The possibility of replacing spinning media with an electronic disk moves closer to reality as microprocessor chip technology improves. Production of 256K chips is revving up this year, and the 512K chip is already a stepchild of the much-heralded megabit chip. "With people first starting to talk about the megabit chip this year, in 1986 we may see some real product, and in 1987 we may see volume production start," predicts Bill Woodruff, SRAM product manager for Mostek in Dallas.

With such powerful chips, speculates DeKoster, "I can get rid of that spinning media and have an electronic disk drive. In the morning I can format it as a 3380 and in the afternoon as a 3350 and that night something else, and now I have no conversion for the rest of my life. I can change to fixed-block architecture and it's a microcode load. I can map that piece of block any way I want."

DISKS RELEGATED TO BACKUP

In that scenario, disks will be relegated to backup and archival applications. CMOS-based RAM disks that consume little power will be protected from external power supply problems with small batteries or uninterruptible power supplies, and shadow backup systems will automatically and instantaneously record every new transaction onto high-capacity disks handled by automatic jukeboxes.

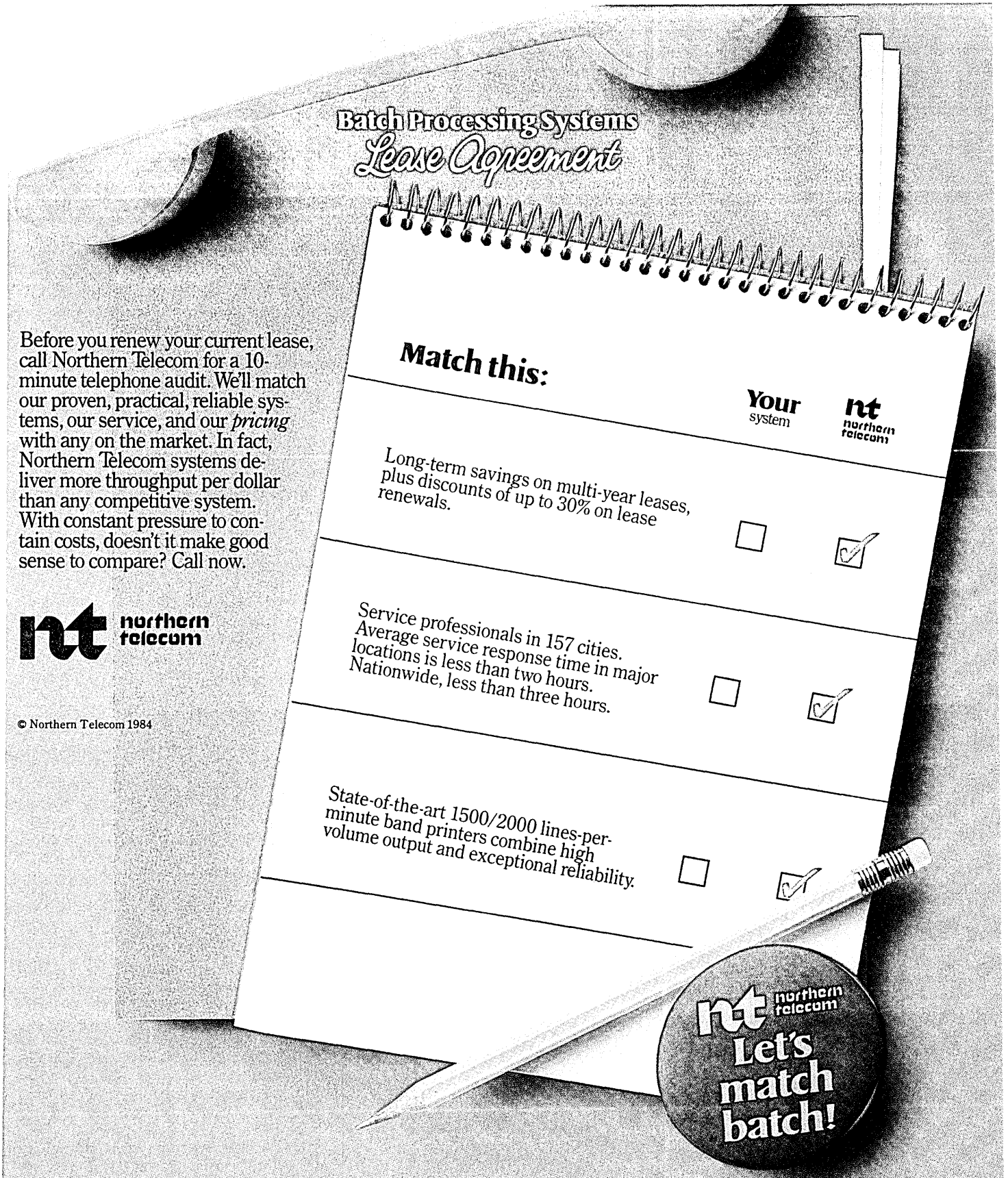
"You don't need backup with electronic memories nearly as much as you do with a low-reliability medium like rotating magnetic media," notes Woodruff. "CMOS dynamic RAMs will be the kind of a part that by the end of the decade you'll be able to put 40 to 100 of them in a box and hold them up over a period of a few weeks or a month on a couple of nickel-cadmium D-cells. The hell with uninterruptible power supplies when the computer goes dead—you don't need to cycle the thing and that's what uses power in CMOS parts.

"With large battery-supported electronic memories, you could have a modem hookup and basically only have to fall back on it to reload your system in the event of a battery failure or system teardown." The reload would be from whatever is on the other end of the line—perhaps another electronic memory.

Right now, although large semiconductor electronic memories are available, they are prohibitively expensive, except for specialized applications that depend on processing large amounts of data rapidly. Intel's FAST 3825, a 12MB to 144MB solid state disk replacement system made up of 64K chips, is priced in the $100,000 range.

Disk industry trend watcher Porter keeps an eye on electronic memories "to satisfy myself they're not going to run disk drives off the road.... With electronic memories, you're not going to get close in the foreseeable future to the cost per megabyte offered by conventional rigid disk drives." Dick Brunner, marketing and development manager for memories at Motorola, agrees. "Right now the highest density available in electronic memory is 256K, and at that density I don't believe you'll see it replacing disks on a cost/density basis."

Woofruff explains: "To put together



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The capability to define specific response-time parameters for each user is still a wish-list item.

a 10MB memory with 256K RAMs—which will eventually get down to $5—you're talking about 320 chips. Your system would easily cost two times the price of just the memory, so you've got $1,600 for the chips and another $1,000 to tie it together [at the oem level]." For comparison, Porter pegs the oem price of a 10MB Winchester at between $350 and $400.

Other promising electronic storage technologies haven't lived up to industry expectations. Charged-coupled devices (CCDs) and electronic beam-addressable memory have slipped into obscurity. After a flurry of speculation, magnetic bubble memories ran into production problems and have generally been viewed as a storage solution competitive only as a replacement for flexible disks.

High-density bubble memories are now available at a cost typically about 10 times as much as equivalent magnetic storage. Intel, located in Santa Clara, Calif., has a one-megabit bubble chip on the market now and will achieve volume production of a 4Mb chip in 1985, according to Intel corporate communications manager, Jim Jerrott.

"There are very few things that a rotating magnetic disk is ideal for," says Woodruff. "It's slow, it's basically sequential and block-addressable, it's got marginal reliability, it uses a lot of power—it's a big target to shoot at. There's no question that high-density dynamic RAMs will continue making strides that will erode existing disk applications . . . [but] the role of the magnetic disk is not for file storage. Because of the propensity of software to consume infinite file storage capability, I think that's always going to be a rotating media function."

MASKING ROTATING MEDIA

The less-than-ideal personalities of rotating media can be masked through the use of hardware and software designed to improve the efficiency of the communication channel, the cpu, or the I/O subsystem.

Caching systems keep track of the most requested data and store it in memory, so that when requested it can be accessed more quickly. Outboard caches have one up on cpu caches because they maximize the use of the channel as well as the cpu. Caches as large as 2GB are envisioned as chip capacities climb.

Database machines, or backend processors, ease the I/O bottleneck by prefiltering data at high speed so that the cpu has no further filtering to do and receives only the data specific to the request. Eugene Platt, president of Products Diversified in Houston, helped engineer a project to put the majority of the property records for the entire city of Houston on-line. Using a Britton Lee (Los Gatos, Calif.) Intelligent Database Machine (IDM), 16 Century Data 500MB disk drives, and two Alpha Micro minicomputer hosts, subsecond response times were consistently obtained in searches of an 8 million-record database.

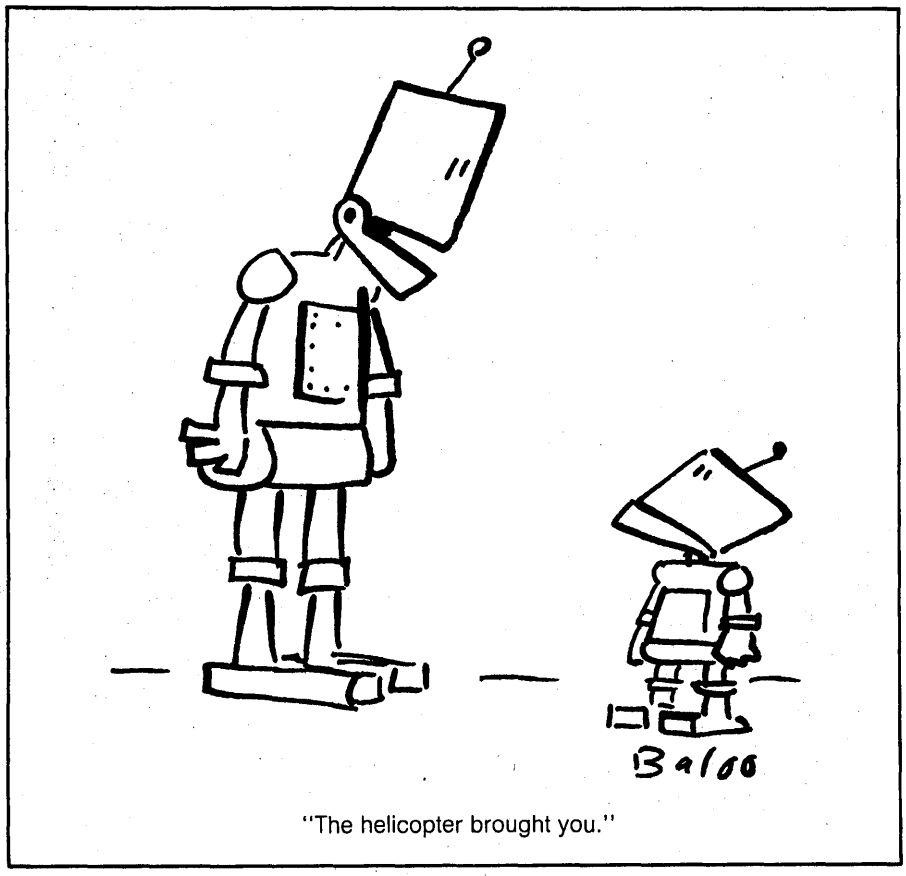
"Typically, disks today are already faster than the amount of available real memory in computers. The next breakthrough we need is a tremendous increase in real memory to take advantage of increases in the speed of mass storage devices," insists Platt.

Britton Lee's IDM is a black box in the sense that it can be interfaced to a large variety of storage devices and host computers. Many observers believe that market resistance to breaking down brand loyalty with device-independent black box peripherals will continue indefinitely. Difficulties with product support when a system is composed of devices from a variety of vendors have led some dp managers to reject the idea of attaching foreign devices to a system.

Platt sees hope in the increasing popularity of operating systems like Unix and PIC that provide "an opportunity to plug a black box out there that delivers neutral format data to the operating system, allowing the storage media and the operating system to be more loosely coupled."

Among networking products, high-bandwidth coaxial and fiber-optic cables increase the capacity of the pipelines between storage devices and other system devices. "The I/O bottleneck is the problem right now, today—we need 24 megabit channels or above for image. Because of the speed and the delivery systems, the staging, I think parallel I/O will have to go away forever; it'll be serial I/O and then you're going to have to go with fiber optics. Then I don't care what the protocols are, because with the advent of microprocessors I can put protocol converters in there, or anything I want," observes DeKoster.

A wide variety of system integration and control software is available from most major computer manufacturers. Such programs provide the capability for automatic allocation of system resources according to user-defined guidelines. For example, data in on-line storage devices may be automatically shifted to off-line tape if it is seldom requested by users, and vice versa. The capability to define specific response-time parameters for each user is still a wish-list item.



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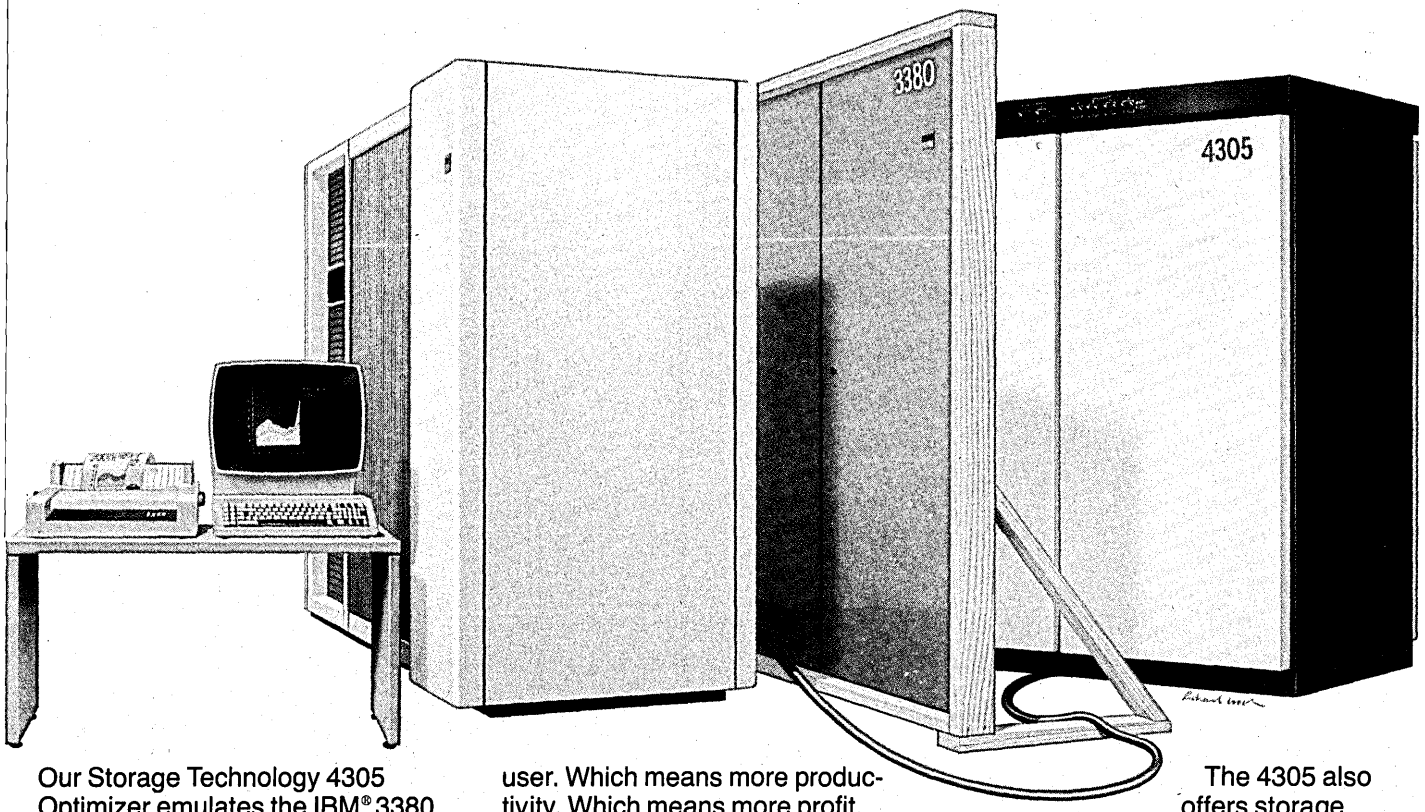

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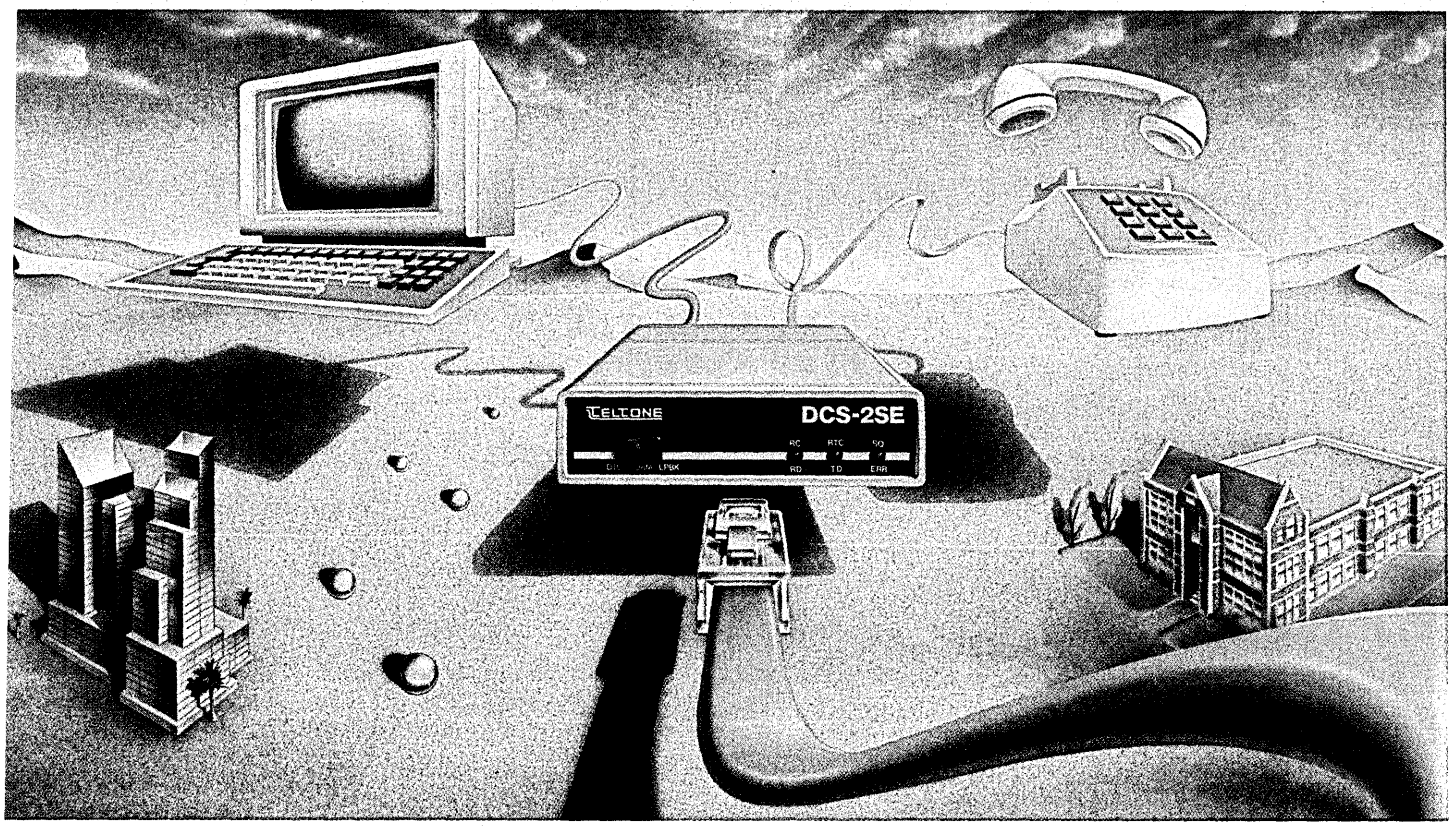

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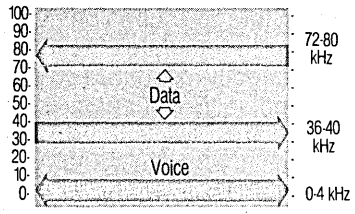

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CIRCLE 47 ON READER CARD

As disk recording densities increase and response times become extremely critical, many disk manufacturers are racing to speed up disk access by employing relational techniques borrowed from database software applications. Yet another avenue to more efficient use of storage is data and compression.

SOLUTIONS REMAIN A MYSTERY

Technology, like Frodo's road in *The Lord of the Rings*, goes ever on. But the specific technologies for storage solutions and most other aspects of information systems will remain mysterious to dp managers whose attitude is "We stay in our business, the vendors stay in theirs, and we hope they are providing the most proven technology."

For the manager who believes that knowledge of present and future technologies in storage and other areas provides an edge in dealing with vendors and users, the product announcement game is perhaps the most frustrating one to play.

"It's easy to put out a press release and have a demonstration of one working unit; that does not create a commercial impact and is likely to precede availability of commercial hardware by some time," says Porter. "The only product that has even been delivered [to oems] in the way of an optical disk drive is Optimem's write-once disk."

StorageTek's new write-once drive, which is now not expected to be shipped commercially until early 1985, will probably be the first optical drive to reach the end user because it is an end-user product, not an oem product. System oems, once they receive a product, typically go through a one- to two-year process of evaluation and system development. "When a system oem starts to develop a specialized system to use something as new and different as an optical disk drive, I think you can expect a pretty extensive system development time period," Porter predicts.

Regardless of how long they take to reach the market, new options in storage technology as well as in other information system components, will make the dp manager's job more sophisticated and complex—and it's all driven by users and their insatiable appetite for quick access to mass storage. As DeKoster puts it, "Before, the dp manager was able to manage his dp shop easily because it interacted with his own people. With the advent of user-actuated devices, the home terminal, and the functional electronic workstation, the user out at the terminal will say, 'I don't give a damn whether the dp manager is on disk, a tape library, or optical—all I want is my data now!' " ◉

Steve Moore is a staff writer for the Alpha Micro Users Society, Boulder, Colo. He is now completing his master's degree in journalism and telecommunication at the University of Colorado, Boulder.

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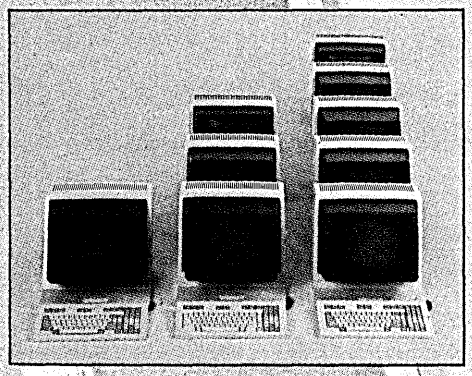

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A new system that supplies reliability data also gives users extra clout in dealing with hardware vendors.

HARD FACTS ON HARDWARE RELIABILITY?

by Michael A. Tyler

Of all the words of tongue or pen, the saddest are bound to be these: "The system is down." It is not just that corporations are becoming ever more dependent on computers, and may lose millions of dollars for every minute the system is down. That lump in your throat and lead in your stomach is not necessarily the result of sympathy for your employer, but of frustration. Computers must go down, it's the vendor's responsibility to maintain them and to fix them, and there's nothing you can do about it.

Or is there? One day, Jim White, an enterprising vice president of MIS at Manufacturers Hanover Bank in New York, decided that there should be a way to predict which parts of a computer system may be ripe for a failure, so that users could reconfigure their systems to ameliorate any disaster, call problem machines to the vendor's attention before they failed, and in that way manage their own reliability.

"The basic problem was that our industry is a reaction industry," White says. "We wait for the thing to go down. And then when it does go down, what do you do? You scream and holler at the vendor. When you get through with that, all the vendor has to do is say, 'What do you want?' Then he's got you on the run because you don't know what you want. Or you want your system to work better, or for that failure not to have happened. That's like a six-year-old saying he wants the world to be better. You've lost all your leverage."

And so White created R+, a system that states the reliability of IBM and pcm devices. "An IBM salesman once told me that users didn't understand the function of the maintenance contract. He said it's not IBM's job to stop failure but to repair it when it's happened," White says. "The purpose of R+ is to put the user in a position to control failure in the data center, not by standing on top of his maintenance crew or yelling at the vendor, but by monitoring the reliability of the drives directly," he says. With R+, the user can put the vendor on the spot by anticipating trouble.

White licensed the product to Dallas-based University Computing Co. (since renamed Uccel Corp.), which titled it UCC 9/R+ and began marketing it. Since its first installation several years ago, the program has engendered its share of controversy, as both users and hardware vendors have questioned the validity of the program's procedures and the results it obtains. Nonetheless, the product has won the hearts of many users, because they previously had no way of managing the reliability of their systems.

The product uses IBM's logrec program as input. (Logrec creates a detailed journal of everything that happens in a computer system over a 24-hour period.) It gathers data on the activity of every hardware item in the data center—from cpu to disk pack, from channel to tape drive. It then consolidates the data to provide a daily report that lists, for each device, the total activity during the past 24 hours, the number of hard failures, and the number of soft failures (in which the system corrects itself without user intervention). The daily report also covers all similar machines made by the same vendor to provide "device pool" reports.

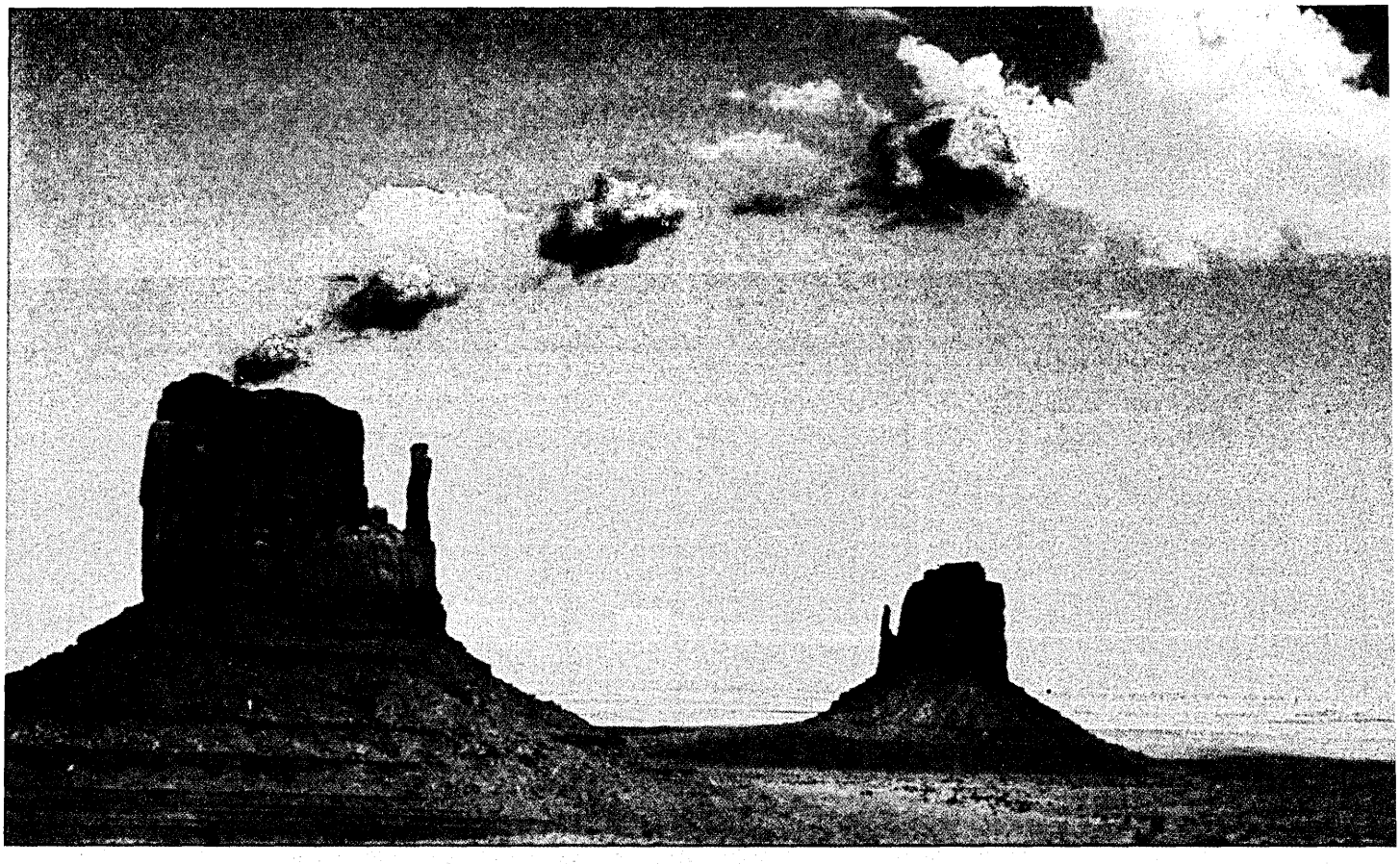
Every month, users send the past month's R+ data tapes to Uccel, which combines the data from all 700 subscribers' data centers into a single database. Uccel then sends this database report back to the users. For each device made by each vendor, this monthly report shows the total number of like devices in the database, their total activity during the month, and their reliability over the past month as well as the past six months. Reliability is figured by dividing the total activity of each type of machine made by each vendor by the total number of hard failures. The product also figures total use per soft failure, but only over the past month.

The monthly reliability report also shows the "best pool" and "worst pool" reliability figures. These represent the use and use-per-hard-failure figures for the data center with the highest and lowest reliability for each type of device made by each vendor, without identifying the installation. Finally, the report isolates the user's site, showing comparative reliability figures for equipment in the user's shop and ranking its performance as being in one of four quartiles of reliability compared to the rest of the country.

ASSESSES CAUSE OF FAILURE

Both users and vendors generally concede that the product is most accurate in assessing the reliability of their storage devices. "With cpu or channel or memory failures, it's often difficult to assess where the cause of failure comes from," says Randy Roberts, a systems coordinator with Hughes Aircraft in Long Beach, Calif. "With DASD and tape, it's easier to be sure whether the failure is due to the drive, the channel, or the media."

Even in the disk and tape area, some users and several vendors question the validity of the R+ data. The central issue is whether all of the reported failures are in fact the responsibility of the machines in use. "There are times when a device will fail and the customer won't let us in to fix it until that night or even until the weekend because he's running a critical application on it," says Bill Walkup, manager of marketing for DASD products at Amdahl Corp. in Sunnyvale, Calif. "In the meantime, the machine keeps failing, and the vendor keeps getting charged for the failures."



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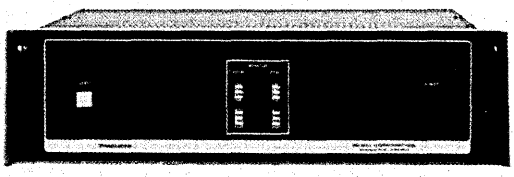

CIRCLE 79 ON READER CARD

"It's not the vendor's fault if an air conditioning failure hits a whole bank of drives."

FIG. 1

3330-11 CLASS DEVICES:

VENDOR	CONTROL DATA	IBM	MEMOREX	NATIONAL ADVANCED SYSTEMS	TELEX
Quantity	245	1,540	891	181	51
Use (million)	67.992	930.716	681.682	142.123	58.054
Use/HF (mil)	4.121	5.719	13.982	2.513	5.559

3350 CLASS DEVICES:

VENDOR	AMDAHL	CONTROL DATA	IBM	MEMOREX	NATIONAL ADVANCED SYSTEMS	NAS (HITACHI)	STORAGE TECH.
Quantity	2,345	631	19,733	2,267	211	160	2,345
Use (million)	2,416.1	380.3	16,925.2	2,004.0	159.9	125.2	1,869.9
Use/HF (mil)	76.105	15.831	26.199	24.684	6.435	18.191	23.672

3380 CLASS DEVICES:

VENDOR	AMDAHL	CONTROL DATA	IBM	MEMOREX	NAS (HITACHI)	STORAGE TECHNOLOGY
Quantity	20	26	28,134	168	146	277
Use (million)	7.795	48.588	37,809.4	76.546	110.389	225.565
Use/HF (mil)	7.795	3.665	45.671	3.678	11.327	6.998

Hughes' Roberts admits, "With any hard failure, we'll see if we can still read or write to the device. If we can, then we'll pull it off only at our convenience."

Other users, of course, don't wait. "If we see a failure we take the device out immediately, because we don't want to shoot ourselves twice in the foot," says Dennis McCrossen, a senior hardware analyst with Xerox Corp.'s General Services Division in Webster, N.Y. "If the drive is too important to some application to take it off-line, then I would think it's also too important to be allowed to fail again. If you do want to keep it on-line, that's a conscious decision you make that threatens the vendor's R+ ratings, when the vendor obviously wants to fix the device."

Several vendors, most notably Storage Technology Corp., protested to Uccel, and some users began instructing Uccel not to list certain device failures on the database because they came after the devices were kept on-line despite failures. As a result, Uccel modified the program so that only one failure could be charged to a device per hour, no matter how many failures occurred during that hour.

Even this is not ideal, says Jim Paster, manager of peripheral product marketing for Control Data Corp. "If the customer becomes aware of a problem at 1 p.m., but doesn't let the customer engineer fix the machine until the second shift comes on at 6 p.m., then the vendor still gets charged for five hard failures, and that's a lot relative to the total number of times the device will ordinarily fail in a month. Or suppose an air conditioning failure hits a whole bank of drives. It's not the vendor's fault.

"Some users are more sensitive to this than others and they deduct those failures, but it's entirely up to the users," Paster continues. "Some don't care whether the vendor gets charged, but if they don't retract the charged failures it could have a severe impact on the vendor's ratings."

Roberts of Hughes Aircraft retorts, "Storage Technology thinks that if you have a head crash or some other problem that causes repeated failures, that R+ should only count one failure. I think that the same problem should be charged 10 or 15 times if it affects 10 or 15 jobs. If we cause a failure somehow, by bumping into a device or something, we do call Uccel so the vendor won't be charged."

Vendors also say they are concerned that subtle differences among different products in the same class may affect reliability data. CDC's Paster explains, "People assume that frequency of failure has a direct correlation with reliability, but it doesn't. Our drives have a dual access feature so that if an actuator in the head of a string of drives fails, you can still get at the data. That's a failure, but it doesn't lessen the machine's reliability."

IBM'S DOMINANT POSITION

The vendor community is also concerned about how IBM's dominant position in the industry affects the R+ data. "IBM probably has a 95% market share of installed 3380-class disk drives," CDC's Paster says. "Customers have been using them for a longer time and have grown confident of their reliability, so they have begun moving very active and critical data to them. We pcms are just getting into these accounts, so our sample size in the R+ database is small. And when you're dealing with a small number of machines, a problem in any one of them could affect the overall rating of the vendor."

The R+ data are particularly misleading with products that have just started volume shipments, says StorageTek spokesman Bob Neilly. "When a new machine is put in a customer's shop, it will be loaded with low activity data first," Neilly says. "This is the period when the cards are being burned in, and naturally some of them will overheat and lead to failures. That's why you don't put critical data on new drives right away. Moreover, there are times with any machine when the customer

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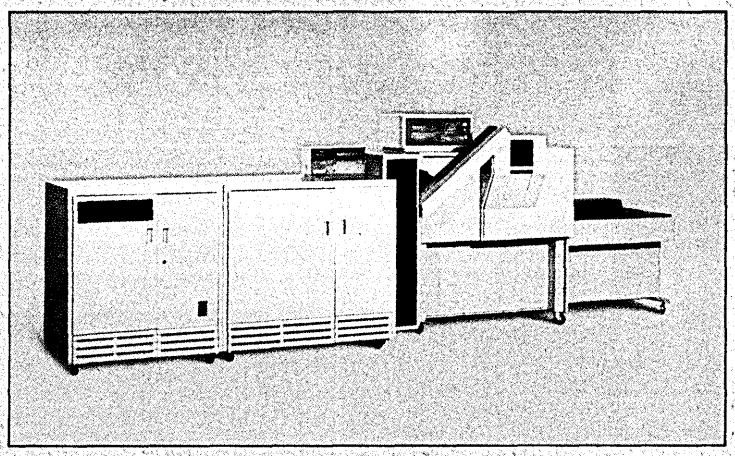

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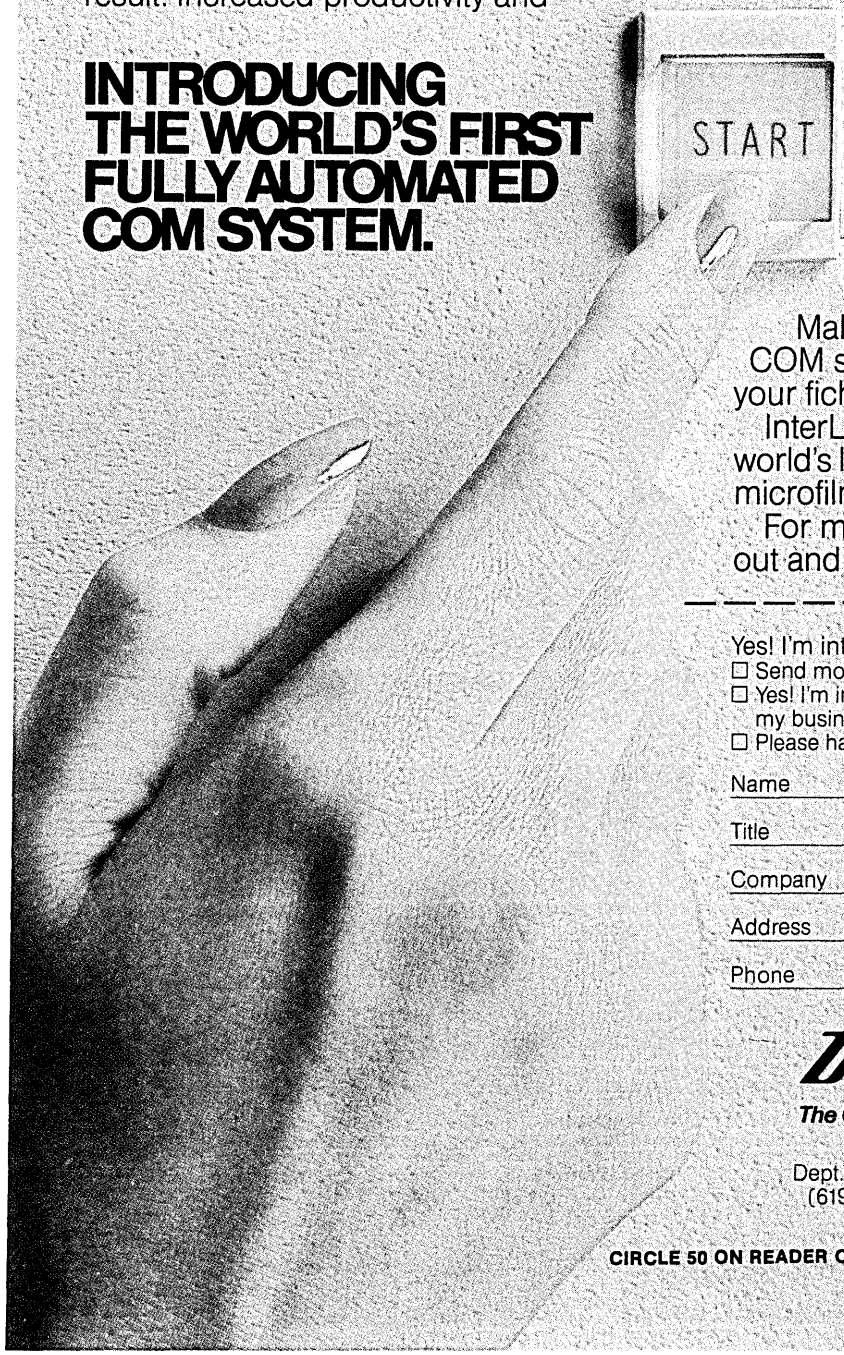

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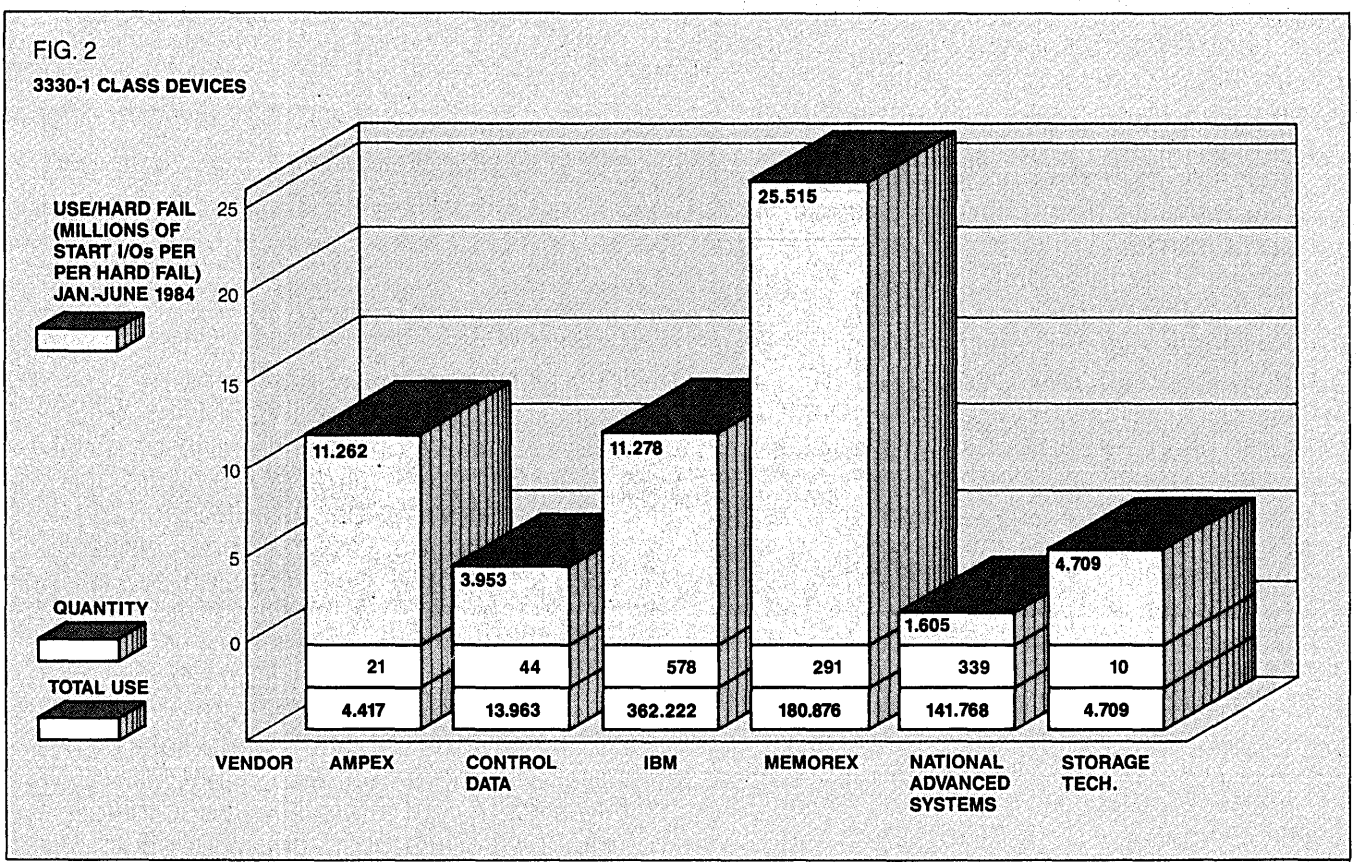
CIRCLE 50 ON READER CARD

"Our own monitoring shows our machines are within 5% of IBM's reliability," says StorageTek.

FIG. 2
3330-1 CLASS DEVICES



engineer will pump errors into the machine to test it, and the customer knows what's happening, but R+ doesn't recognize it. So the number of start I/Os, which is how R+ defines the activity for the disk drives, is not a good measure of reliability. Power-on hours would be much better, because even if a new machine has no activity the cards will heat up and may fail."

Because of these concerns, vendors have been slow to recognize the legitimacy of R+. "IBM wasn't very interested in R+," says Bill McMillan, hardware control specialist at Geico, the insurance company in Washington, D.C. "They pretty much ignored it. They just looked at the logrec and had the attitude, 'Who needs R+ when we have our own program?' "

John Hume, planning and control specialist for McDonnell Douglas Automation Co. in St. Louis, says, "IBM's support of R+ is now outstanding. They are very interested in seeing the daily reports, but they still use their own programs first."

Xerox's McCrossen concurs, "We've seen a drastic change in philosophy on IBM's part about the R+ data. They were hesitant to recognize it, and at first they tried to refute the data, but now they are very concerned about how they look in the R+ database. Now, instead of telling us the R+ data are wrong, they try to improve our performance. They can't fight the tide anymore."

Many users say StorageTek tried to avoid discussing R+ because it preferred the logrec and its own PM-2 program. Other pcms, users agree, were initially more receptive to R+ because it provided exception-based reporting whereas the logrec reports all incidents.

"There really is no other product like it," says Al Long, operations manager at Del Monte Corp. in San Francisco. "PM-2 can be used for comparison, but for the other vendors there isn't anything. They can't get around the fact that R+ is now a standard in the industry."

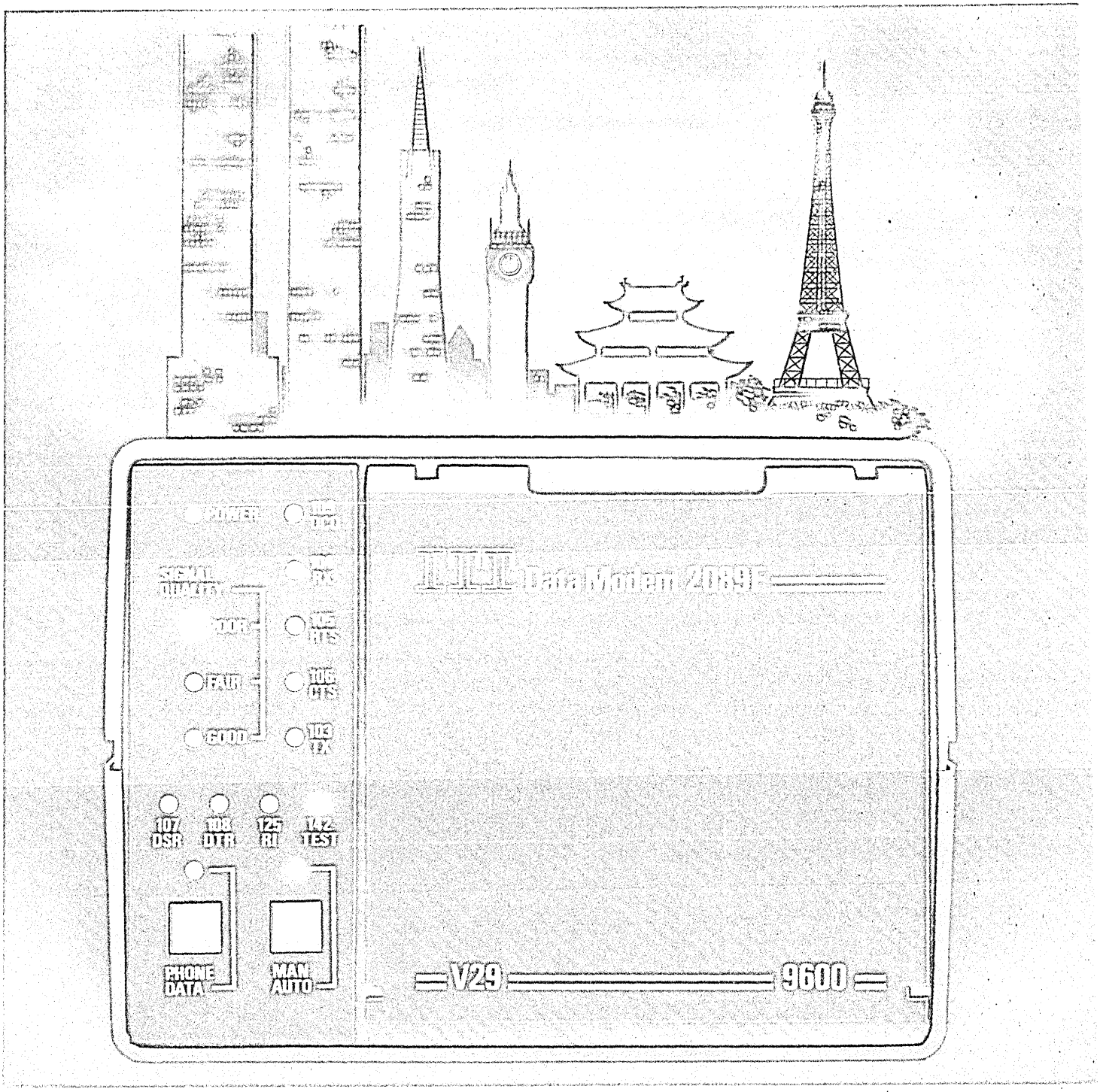
Shannon Clark, a technical support analyst at Del Monte, notes, "At one point when we were having some reliability problems, the customer engineer for one of our vendors asked us to take his drives out of the R+ database because they made him look bad."

Most users, however, are satisfied that the current version of R+ provides accurate comparisons of the reliability of various vendors' storage devices. More than anything else, it was the rapid acceptance by users and the lack of competition that finally forced vendors to recognize R+ data. "IBM's corporate staff may not say so," Geico's McMillan says, "but their field engineers always want to look at the R+ data. They have people who monitor the R+ figures from many accounts, and they've sent regional specialists down to us when they've felt our numbers weren't good."

StorageTek, too, has taken a keen interest in R+ data. Both users and Uccel officials say that the firm requires its customer engineers to report the R+ data daily to a central office at StorageTek's Colorado headquarters. One user, who requested anonymity for fear his vendor service would suffer, says StorageTek chairman "Jesse Aweida himself wants to see the numbers. They're the most interested vendor in R+ now, and they're almost paranoid about it."

MONITORS BIWEEKLY, NOT DAILY

StorageTek's Neilly retorts, "We report the reliability of all of our machines through our field engineers, on a two-week basis. They feed the PM-2 data into our remote diagnostics center's database here. Sure, we know who the R+ sites are, and we can break them out of the database, but not on a day-by-day basis. We do some monitoring more



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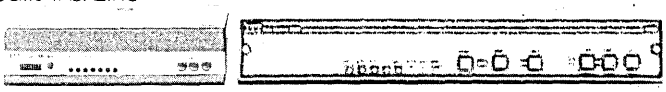

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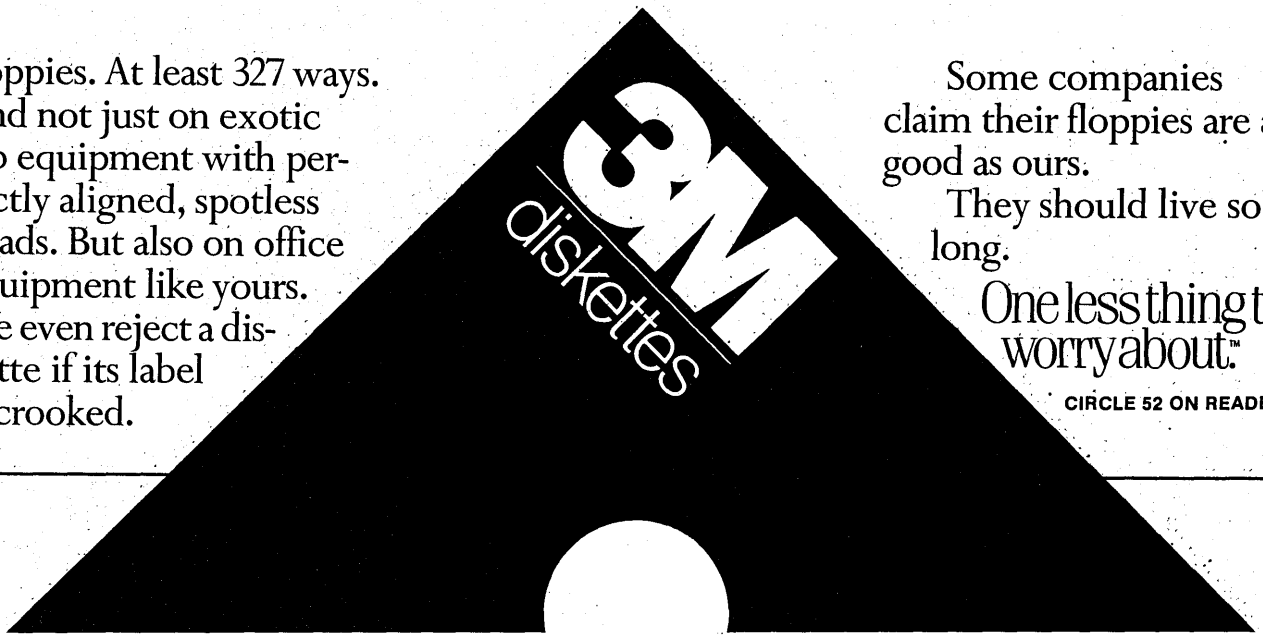

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frequently, but for the most part it's every two weeks. Our own monitoring shows our machines are within 5% of IBM's reliability, and we trust that more than we do Uccel because we know how we got the numbers."

IBM refuses comment altogether. "Our policy is not to say anything, good or bad, about another vendor's product," spokeswoman Anna Bishop explains. Paster at CDC says, "R+ is very effective as a site management tool where the sample size is good. Any information that the user has to assist in running the shop is probably a good move, and it's even more important if the vendor's field staff is not managing the site as well as it should."

Walkup of Amdahl says, "R+ is valid and very effective in helping the user determine his reliability performance relative to other users. We feel R+ is accurate because our own internal measurements reflect the same reliability figures."

By contrast, Neilly of StorageTek says, "We've had problems with R+ and with Uccel over their reporting. We're basically at loggerheads with them, because the way they report reliability tends to be misleading and they don't explain that. R+ doesn't say why there is an error."

Users tend to disparage vendor criticisms of R+, saying that many of the vendors are trying to explain away figures that simply show that their machines are unreliable. "In the past, Storage Technology was a real trouble spot for us. They had a very difficult time isolating which parts needed repair or figuring out how to resolve a problem without taking over a whole system," McMillan of Geico says.

"They didn't design their machines properly in the first place, and their CEs [customer engineers] always have to call Colorado to get help," he continues. "As a result, I had to spend time worrying about whether they could fix my drives. IBM's procedures and its documentation are far superior, their CEs are far superior, and that made their machines more reliable, just as R+ shows."

While McMillan emphasizes that StorageTek's problems have subsided in the past year, Roberts of Hughes Aircraft differs: "Lately, StorageTek has been falling, compared to the past few months. Their 8350s are simply getting old and starting to fall apart, and they don't have many 8380s installed yet. We had only StorageTek drives, but now we're switching to IBM 3380s."

A West Coast user says, "Every time we go non-IBM we wind up in trouble. We bought StorageTek drives, but they were Tinkertoys that failed quite often. Now we have only IBM equipment. I trust R+ no matter what complaints the vendors have."

Indeed, there is a consensus among users that the data provided by R+ reports are accurate, although some quibble with the way it is gathered. Most prefer seeing reliability measured in start I/Os, rather than power-on hours as the vendors prefer, because that measure gives them better information on performance. Some would prefer still other measures. "I would like to see activity measured as total amount of data transferred," says McAuto's Hume. "What counts is how much data gets to and from the cpu, but because block sizes are often different I think start I/Os is often the most accurate measurement."

There is less agreement on what aspects of the data are most important. "We only use hard failure data," says Ted Renfro, a supervisor of computer availability for Deere & Co., the farm equipment manufacturer based in Moline, Ill. "We don't really use the soft failure data, because for that the burden of the failure is on the customer unless he can prove that the hardware somehow malfunctioned. Otherwise

HOW R+ WAS CREATED

Jim White, the developer of UCC 9/R+, described the genesis of his controversial product at Uccel's annual user group meeting in New Orleans in June. Here are some excerpts:

I got involved with the problem of hardware failure when I was vice president in charge of dp for Manufacturers Hanover Bank in New York. Like most of my contemporaries, every single day I would get statistics out of the data center which would make it look like the Rock of Gibraltar. We just never failed, and that was damn comforting to know. Unfortunately, my job was also to listen to the user departments. I would go to the executive vice president of trust funds and he would give me his description of my computer room: The goddamn thing never worked, he would say. I listened to him, not the data center, since if he became convinced I didn't believe a problem existed, he would simply say to the president, "You know, the first step in solving this problem is to get somebody in the job who believes the problem exists."

I was no stranger to the problem. I would happily sit at my desk at the bank until a clerk in Albany who was 200 miles away would call to tell me my data center was down. I had 320 people in the data center and they didn't know they were down but a clerk in Albany did know. I began to believe after a while that the data center knew very little about what was going on, and certainly nothing compared to what a user knew.

This is what confuses most of the industry. Hardware failure has to be one of the smallest categories of failure. Developmental failure is rampant in our industry. Operator screwups are unbelievable. Software failure is paralyzing. So why worry about hardware failure?

It comes down to politics. If the president of my bank had come to me and said my operators had screwed up again last night, I could before his eyes restructure a whole new management program, with a 12-hour week and a better supervisor and rewritten job descriptions. And he'd walk out and say, "By god, that guy's in control." And if it were operating system problems, I'd tell him we would put 15 guys in a tech group and pass a law that no operating system could be used until it was 17 years old. And he'd say, "By god, that guy's in control."

But if he walked in and said my 168 had gone down again, I'd have to tell him I would call the vendor and scream at him. And the president would remind me that I tried that last week and the week before and the month before and the year before. Hardware reliability is an area in which the user has almost no opportunity to exercise any kind of creative management. The vendor tells you not to do anything in this area, except to believe in a partnership whereby his customer engineers take care of reliability and you worry about other problems.

As a user, I lost faith in that partnership. I decided that reliability was a user responsibility, not a vendor responsibility. That is very difficult for the user to take. He's got all the problems in the world, and it's tough to volunteer to take on additional responsibilities. My data center argued against it. They said I was out of my mind. I thought there was another way to approach the problem.

There is very little to say about beneficial aspects of failure to the user. I found that failures ran the gamut from ones so small nobody knew they happened to ones so large I couldn't believe that God had personally done it to me. But no matter where I was on that scale, there was no asset to me in the failure.

Let's look at the vendor side of the partnership. If something breaks in the room, he's got to provide a man to fix it,

and the parts to fix it with. Those are expenses and inconveniences to him. IBM's maintenance income last year was something like $2.6 billion—a hell of an inconvenience. And you can assume there is a profit in that. That inconvenience puts bread on the table for a lot of IBM employees.

I go around the country now, and people tell me they have no reliability problem. They say they have 99% reliability or better. First of all, they're talking about availability, not reliability, and the two are not the same. I contend that the availability figure is somewhat like the body count in Vietnam: It probably tells something but I don't think it measures whether we're winning or losing the war.

My operation was proud that they could move teleprocessing from one cpu to another in two minutes. I was sitting with 400 stock transfer clerks one day, when all the terminals stopped working for 20 minutes. I ran down to the data center and found 20 people standing around the cpu. The head of the group told me, "Sure we could move it in two minutes. It took 20 minutes to decide."

I fly often, about 12,000 miles a week. Picture me on a 747 going nonstop from New York to Los Angeles, which is an interim stop on the way to Hawaii. The pilot says he has bad news and good news. The bad news is that all of our engines have stopped and the 747 has a very bad glide path, so we will all be dead in two minutes. The good news is that there is a standby in L.A. so that there will be no interruption in ongoing service to Hawaii. As somebody on the 747, I could care less about availability because I'm going to die. We have to focus on reliability.

The reliability in this industry is not competitive. We give lip service to it, and we take tours of the vendor's plants to see the quality control areas, but we don't learn a whole lot. The basic rule in this industry is you buy from IBM or you buy from somebody else, but if you buy from somebody else it won't be because of quality or performance or reliability but because of price. You can't sell quality to this industry. That's why reliability is a user problem and not a vendor problem.

Moreover, reliability is a management problem and a psychology problem, not a technical problem. We award a plaque every year to the customer engineer who has the worst tape drive and the worst disk drive in the country. We have done that three times now, and in each case the drive was replaced the next day by the vendor. If you don't think it's a management problem, why does a simple $30 plaque solve a 10-month problem on a disk file?

I decided to confront these issues and create a program. In the past, on a daily basis I had dumped the logrec and given it to the vendor, and four hours later asked if there was anything I should be concerned about. That's like going to Al Capone and saying, "This is how we're organizing the police department. Is there anything in there that is an inconvenience to you?"

I decided the first role of management was to know whether something was wrong without asking the vendor. For my program, I wanted one record for every physical device in my data center, to find out what was going wrong. I wanted to gather all the data on those devices, to update them, and to put in each one of these records some thresholds of normal performance. Then I wanted those thresholds of normal performance to be compared to each device for the past 24 hours so that I could know whether or not each device was working well.

I tracked my pain, and when the pain became intolerable I screamed at the vendor. I made the assumption that all I had to do was to go to my man and ask him what the definition of normality was and then plug that into my program. It turned out that no one, not my data center people nor the vendor's people, had any depth of understanding about the logrec. They couldn't use it for what it was designed to do, to track the reliability of the machines.

I decided that logrec was an absurdity. There wasn't a single user department in my bank that would accept a report like logrec. We were dumping everything the machine had done in the last 24 hours, giving the same priority to disk mounts that had no problems as to those that had severe problems. Then we would turn to a talented technician, and tell him to go through that huge bundle of paper to see if there was anything wrong in there. My program was just going to get out the exception reports.

I was finally able to get the threshold standards I needed by enlisting the support of Prudential. IBM volunteered their standards to Prudential under the assumption that the Pru was doing in-house programming. Pru never really lied to IBM because they said "we" were producing a program and IBM assumed that that was a pluralistic way of referring to themselves. IBM then left because Pru one day announced that at the end of each month they were going to take their 11 data centers around the U.S. and Canada and were going to pool them and rank them against each other on the rate of failure. Then Aetna announced it was going to include its two data centers in the pool, and Manufacturers Hanover was going to put its data center in, and Mass Mutual would do the same. That was too much for IBM. They loved you and loved you and loved you, but no group sex. So we took it and developed the program on our own. **—M.T.**

we presume a soft failure was caused by a bad program or bad media, not by the machine."

SOFT FAILURES ARE OMENS

On the other hand, users like Xerox's McCrossen treat soft failures as omens. "We set up thresholds based on soft failures, and if the number of soft failures gets too high we'll take the data off the spindle and give the spindle to the vendor before we get a hard failure on it," he says. "But we're a very large shop and we have a full-time person who just monitors the machines. I suspect smaller shops can't afford that and can only wait for R+ to show the machines that hard fail."

With a lack of resources, users clearly prefer the hard failure data. "Hard failures definitely cause rerun time, and that's a critical factor in an interactive environment," says John Tompkins, a systems programmer with Defense Logistics, a government agency in Columbus, Ohio. "Soft failures cause degradation to the system but they don't bring it down, so they're really a lesser problem that the user can correct when he has the time."

The parts of the daily and monthly R+ reports most closely followed depends on the user's purposes. Uccel markets the product primarily as a site management tool, says product manager Benny McCarley, and all users employ the product to monitor which drives—or other devices—fail the most often.

Donald Walker, a systems programmer with Johnson & Johnson in New Brunswick, N.J., says that he uses R+ only to check drive errors.

Hume of McAuto explains his pro-

IBM ON TELECOMMUNICATIONS

Q. WHY ALL THE TALK ABOUT LOCAL AREA NETWORKS?

A. There's been a lot written about Local Area Networks (LANs). What's all the talk about? Why are LANs important? Should your company be looking into them? Is one kind of LAN better than another?

The fact is, a lot of people, ourselves included, think LANs are going to play a key role in the total telecommunications picture for most businesses. Here are some questions and answers that might help you better understand LANs.

Q. To begin with, just what exactly is a Local Area Network (LAN)?

A. It's a system for moving information between devices located on the same premises. Now that calls for some further definitions. By "information," we mean data, voice, text, graphics or image. By "devices," we mean big computers, personal computers or other workstations, printers, telephones, scanners, files, sensors and actuators, and PBXs. By "same premises," we mean office building, manufacturing plant, hospital, campus or other geographically confined area. In short, and quite simplified, a LAN is one way of connecting all these devices to each other.

Q. There seem to be a number of different kinds of LANs. Why the variety?

A. The reason there are different LANs is because different work situations have different needs and different cost considerations. For instance, one type of network is capable of linking different kinds of computers, workstations and other devices throughout a building or campus. This allows for the exchange of information and the sharing of resources and large data bases. Then there's a need for a network specifically designed to interconnect personal computers. There's also the need for a special "industrial" LAN to meet the unique requirements of manufacturing plants. And there may be other networks developed to meet other needs.

Q. What if I want to link all the devices in my building?

A. IBM is developing a way to get all the devices in a building to communicate with each other using established computer and communications architectures. This will allow the mainframe computers, companywide systems, smaller departmental clusters and even individual workstations to interact and share files, applications and peripherals.

We believe this general purpose LAN, utilizing "token-ring" technology, will provide the greatest flexibility and connectivity for different departments, workstations and systems. Other major benefits of this LAN technology will be very high reliability, predictability of performance, and greater overall network management capability.

The token-ring LAN will use the IBM Cabling System as its foundation. Currently being installed, the IBM Cabling System provides the immediate benefits of a common cabling solution for most IBM systems and workstations.

Q. Suppose I only need to connect personal computers?

A. We recently announced an IBM PC Network that allows a department, small company or remote location to interconnect IBM Personal Computers. This low-cost network lets PC users share files and printers, and send messages from one PC to another. The PC Network also lets users access application programs and data bases in larger IBM System/370 computers.

Q. What about a LAN for manufacturing plants?

A. We intend to offer an industrial LAN which will allow factory floor data collection and interconnection of robotic systems, machine tools, numerical processors and industrial computers.

Q. And if I wanted, could I connect these different networks to each other?

A. IBM has announced that its planned token-ring LAN will also act as a "backbone" connecting these different networks. Each network will have the ability to communicate with IBM System/370 host computers and applications.

Q. What if I'm still not sure which way to go?

A. Choosing a LAN is a business decision that will vary from company to company, and from department to department. Remember that LANs are just a portion of your company's overall telecommunications solution—a solution that should be developed in a planned, structured and manageable way. If you'd like some help in figuring out the answer that will best suit your needs today and in the future, call IBM.

There's a lot more to be said about LANs and telecommunications. If you'd like a free copy of "Positioning Local Area Networks," call 1 800 IBM-2468, Ext. 82, or return the coupon.

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CIRCLE 53 ON READER CARD

"Reliability is of utmost importance in the disk arena."

cedure more thoroughly: "I come in every day and look first at the hard failures, then at the soft failures," he says. "I look for devices with more than one failure, and then for those with a single failure during the previous day, and then for those that failed two days ago. I recognize that soft failures can lead to hard failures, so I try to spot trends and then catch problem devices before they bring the system down," he says.

"When you compare devices in your room to each other, over a sustained period, the problem child devices jump out at you," says John Hufnagel of the Girard Bank in Philadelphia. "I try to look beyond what machines failed today to see what machines consistently fail."

Xerox's McCrossen counters, "We find we don't see chronically failing devices. But we've had excellent reliability for a long time, consistently exceeding the national averages."

According to Jim White, the developer of the program, "You will often not find any perception on the part of the vendor or the user that if you throw a blanket over one drive you'd halve the failure rate in the room. I did an analysis of failures, which concluded that 85% to 90% of all failures in a computer room are not original sin but repetitive failures of the same device." White says that one large utility company with 55 StorageTek drives "took 55 hits that were chargeable to one device. Yet neither the vendor nor the user had any idea that if they nailed that one device they wouldn't have had a problem.

"You want to draw the attention of the customer engineer to the weakest devices in the room. That's how you make the room stronger."

Some users, when they find troublesome machines, simply bring them to the vendor and ask for attention. Even that, they say, goes a long way toward improving their data center reliability. "We use R+ as a guideline in our weekly meetings with vendors. We've found it's a very powerful tool in negotiating with the CE," says Charles S. "Skip" Davis of C & P Telephone Co. in Silver Spring, Md.

And Geico's McMillan, who criticizes StorageTek's reliability and customer engineers as being poor in the past, says, "We were able to use R+ to put pressure on them, and over the past year and a half they've responded well."

White argues that customer engineers need to be spurred into action. "The CE will try to avoid looking at a drive, so he will ask you whether you've got a bad volume or a dirty read head, and then leave the problem unresolved. These are legitimate engineering questions, but you're paying him to answer them, so he shouldn't spit them back to you."

R+ IS A PERMANENT FIXTURE

Having already accepted that R+ is something of a permanent fixture on the dp horizon, the vendors now seem even happy that R+ compares their shops, despite White's contention that IBM does not want customers to share reliability data (see box, "Who's Most Reliable?"). "We've found instances, through R+, where our coverage of a particular account was not as strong as we would have liked," says Amdahl's Walkup. "Engineering changes that should have been made to machines in the field were not, and as a result they were failing more frequently than other ma-

WHO'S MOST RELIABLE?

Uccel Corp. provided DATAMATION with excerpts from its May and June 1984 monthly reports to users. They do not include rankings of any users by name, but they do include the results from the best and worst pool of each product as well as the aggregate reliability ratings for storage media reporting to the national database.

The four charts that accompany this article show the average reliability during the six months from January through June 1984, as measured by total start I/Os per hard failure for each of four classes of direct access storage devices, corresponding to IBM 3330 model 1, 3330 model 11, 3350, and 3380 drives. Uccel does not list the model numbers of the pcm machines. Not all suppliers of each class of drive are listed because some had too few machines in the database. Not all classes of disk drive, and no tape drives or media, are included here, but all are provided in the actual R+ reports, along with data for cpus, memory, channels, and front-end processors.

Devices can really be compared only to other devices in the same performance class, Uccel R+ product manager Benny McCarley says, since different classes of machines have different characteristics and are at different points in their product life cycles. Moreover, even within each class, some vendors are at different points in the product life cycle from others. This may affect their reliability ratings.

For each vendor in each class of machine, the total number of machines in the database and the total activity of those machines in June 1984 is listed. The market share reflected by R+ does not necessarily correspond with actual market share, of course, since the R+ database is only a small sample of the total universe of data centers. Generally, a large quantity of machines in the database yields more accurate data, since any individual incident is less likely to skew the data.

Not all devices are used equally, of course, which is why total activity figures are also included. McCarley cautions against calculating the average use per device from these two sets of figures, however, because such a calculation is too dependent on the specific applications and data resident on each drive. Some users and vendors point out that such factors would cancel each other out unless they were very significant, in which case any impact on use per device is important to note.

In the 3330 model 1 class of machines, the clear winner is Memorex, the Burroughs subsidiary. Working with old technology, Memorex users have been able to sustain a rate of 25.5 million start I/Os between hard failures for six months. This is more than twice the reliability of the next best vendor, IBM. Interestingly, however, Memorex's reliability fell to 13.9 million start I/Os in June from 24.9 million in May, a plunge from its high six-month average that can be explained at least partly by the absence of one data center, which accounted for 70% of the activity of Memorex 3330-1 machines in the R+ database in May but did not participate in the June report. (Uccel does not divulge which sites report, so it is impossible to know whether that data center's monthly tape did not reach Uccel on time or whether the data center eliminated its machines.)

IBM's reliability rose to 19.1 million start I/Os in June from 15.4 million in May, both far above IBM's six-month average, indicating that IBM's drives are improving and still have life left in them. National Advanced Systems had by far the most unreliable devices in this class, and its May and June figures are both close to its six-month average.

Users say they configure their systems to put the most active, critical data on the most reliable machines, and within the 3330-1 class that certainly seems to be the case. Use per device for both Memorex and IBM averaged over 600,000 I/Os per month, while NAS devices registered just 418,200 I/Os per month, and Control

Data units only 317,300. Moreover, use per device rose slightly from May to June for IBM devices, but fell more than 50% for Memorex units. Total use for all vendors in this category is declining as customers replace the drives with newer models.

In the 3330-11 class, Memorex is again the clear winner, IBM is again second, and NAS is again last among vendors with sizable installed bases. Machines from all vendors in this class, however, failed about twice as often as their counterparts in the 3330-1 class. Memorex was again buoyed by a single large installation, which accounted for about 35% of the use of all Memorex devices in this class in June, and which had but a single failure in June and none in May. (There is no way of knowing whether this is the same installation as the high-reliability, high-volume user in the 3330-1 class.)

Users of 3330-11 devices are less discriminating about where they put active data. Despite their being five times more reliable than the NAS drives, Memorex drives had less use per device than NAS or IBM drives. Use per device for all vendors except Control Data was significantly higher in this class than in the 3330-1 class, with IBM drives averaging 804,300 start I/Os per month and NAS and Memorex averaging over 750,000 each. As with the 3330-1 class, however, total use is dropping as more users switch to 3380 models.

In the 3350 class, Amdahl is far and away the most reliable vendor, with a use per hard failure figure nearly three times higher than its nearest competitor. In fact, its 76.1 million start I/Os per hard fail surpass any machine in any class. Moreover, the Sunnyvale, Calif., firm is improving. In May, it hit 84.8 million start I/Os per hard failure, and in June it topped 100.6 million. IBM, Memorex, and Storage Technology all registered over 20 million start I/Os per hard failure over six months. Neither IBM nor Memorex showed much change from May to June, but at StorageTek, the six-month average was well below the 18.6 million start I/Os per hard failure in May and 18 million in June.

As the quantity figures indicate, the 3350 class machines are far more widely installed than the older 3330 class machines. Consequently, individual sites did not account for significant portions of the total use of each vendor's equipment. In general, people use their Amdahl machines more often, in keeping with its stellar performance. Amdahl machines averaged over 1 million start I/Os per month, while IBM and Memorex drives averaged over 850,000, and others were below 800,000.

NAS drives yet again were the most unreliable, registering less than one-tenth the number of start I/Os per hard failure of Amdahl drives. Nevertheless, users still averaged 757,700 start I/Os per month on NAS machines. Hitachi drives in this class, which are also sold by NAS, are listed separately in the database and performed almost three times as reliably as NAS's domestically made machines. Hitachi was the only manufacturer where a single site could skew the data, and one site that was responsible for 60% of the total use in the database had no hard failures in June.

In the 3380 class, there is currently no real competition for IBM. It has 98% of all the machines in the database, and 99% of all the use. With more than 28,000 machines in the database, its figures are certainly valid—and quite impressive. IBM 3380s average 45.7 million start I/Os per hard failure, more than four times better than the next best vendor's machines. Its May and June results were close to the six-month average. And the 3380s are being used, too. Users are putting more than 1.5 million start I/Os through each machine, far more activity than any vendor's machines in any class average.

The heavy use is primarily due to IBM's early entry into the marketplace. The 3380s have been installed for a longer period of time than competing machines, and hence users are farther along in moving critical high-volume data and applications to them. Specifically, many users say, critical systems software programs and database management systems reside on the 3380s.

Plug-compatible drives in this class are installed in very small numbers, with only StorageTek, Memorex, and NAS (Hitachi) boasting more than a handful. All these drives are getting cautious use, with use-per-device figures in most cases below those of the 3350 and 3330-11 classes. So far, the drives have not shown outstanding reliability. Only the NAS (Hitachi) drives register more than 10 million start I/Os per hard failure, a strong placement in light of its poor reliability in other classes. In many cases, however, the low pcm figures are directly affected by the low use per device. For Amdahl, Hitachi, and StorageTek, the best pool user had a significant percentage of the total use and no hard failures during the month.

The plug-compatible devices were just beginning to be shipped in high volumes during the first six months of this year, and their reliability ratings show remarkable improvement over the May to June six-month averages. For example, Memorex's six-month average reliability was 3.7 million start I/Os between failures, but in May, reliability leaped to 7.2 million and in June to 10.9 million. Similarly, Control Data's reliability rose from 1.9 million in May to 4.8 million in June, the third month CDC's machines were on the database. NAS (Hitachi) had May and June results of over 18 million start I/Os between hard failures, well above the six-month average of 11.3 million.

Amdahl, meanwhile, entered the database for the first time in June; yet its reliability rating is already higher than the June rating for Control Data and StorageTek, indicating that as it gets more units installed and gets more use out of installed drives, Amdahl's reliability will approach that of IBM's.

—M.T.

chines. We used R+ to check up on ourselves."

Similarly, CDC's Paster says, "We look at R+ over a long period to see if there are any significant or long-term changes. Doing that, we found some sites where the field engineer had become somewhat apathetic, and was not working with the user in a fair and equitable manner."

Nonetheless, vendors decry what they see as a double standard emerging in customer service. "We've heard rumors that vendors manage their R+ accounts more tightly than others," says Amdahl's Walkup, "but you have to be careful that your non-R+ users don't get lost."

Several vendors talk of users installing R+ just to get more attention and better service from their hardware vendors, but one vendor notes that such an attitude can backfire. "We had one very important user who had R+ for three months, and then dropped it. He got fed up with the CE of another vendor who kept tinkering with the drives in his shop to make the R+ numbers better."

Many users find that they can use R+ data not just to point CEs to weak devices, but also to aid in configuring their systems. "We configure our systems for

Users universally seem to know where they stand relative to the national averages.

availability first, and then we tune for performance," says McCrossen. "We haven't moved much data around, though, because there's not a whole lot of production work that can be considered less than critical. But you try to segregate applications that are pretty isolated and put them on the worst drives, so that if the device goes down you won't have a ripple effect. For example, we won't put program libraries or catalogues on unreliable drives."

White explains, "If the drive containing your program libraries went down, you can look at that as the hand of God moving across your room and settling on that drive and saying, 'Thou shalt die.' You can call that an act of God. But if you look at the R+ report and you see that the affected drive is ranked in the lowest quartile for reliability, then it's not an act of God that the program library was affected—it's an act of stupidity."

While the daily R+ reports allow users to compare devices within their own data centers, the monthly R+ reports enable them to compare their data centers to other data centers around the country. Whether they do or not varies. "I look at our room as an individual data center," says Long of Del Monte. "I don't compare ourselves to other shops or worry about our ranking, as long as I get what my maintenance contract specifies."

Girard's Hufnagel says, "All I have to go on without R+ is life in my own insular neck of the woods. Operations people from different companies talk shop sometimes, but they don't lay the figures on the table. I can get that from Uccel. Then I see that even if I'm satisfied with what the vendor has been providing compared to the past, I may be in a position to demand still better service."

Indeed, users universally seem to know where they stand relative to the national averages, even though some profess not to care much about them. Those users typically are intent on maintaining their own performance levels, and heed the national averages only when their shops fall below the nationwide mean reliability levels. Other users insist on maintaining their devices in the top quartile of reliability in the country, and demand better service when their reliability dips, even though they recognize that other users are working with far more unreliable machines. None, once they have joined the R+ pool, say they tolerate below-average service.

CREATES BASIS TO COMPARE

White says, "You know, the tragedy in our industry is the guy who is getting pitiful reliability but thinks it's good because he's using only himself as a comparison, not other shops. R+ creates competition because it gets each vendor to compete against itself."

Some users and vendors also use R+ to force the vendors to compete against each other. Hughes Aircraft's switch from StorageTek 8350 disk drives to IBM 3380s is an example. "I know that people used R+ to leverage the vendors and to support their decision," says Hughes' Roberts.

Geico's McMillan explains, "We're discontinuing our current disk drives when our contract runs out. It's hard to recommend to my boss that we buy hardware with poor reliability."

Other users do not use R+ in deciding among bids for new equipment. Girard's Hufnagel says that R+ data were instrumental in getting him to consider other vendors, but that "we've never used the data in the purchase negotiations." Similarly, Deere's Renfro says that R+ is used in purchase decisions only as a reference, not as a negotiating tool.

Vendors, for their part, are also mixed in their attitudes toward using R+ in procurement. Not too surprisingly, vendors with high reliability ratings laud the product's use in negotiations, while those with poorer records remain critical. Walkup of Amdahl, whose reliability in the 3350 class of disk drives is unmatched by any vendor's drives in any class, says, "Reliability is of utmost importance in the disk arena, and R+ finally gives the user the ability to choose between vendors on a uniform criterion."

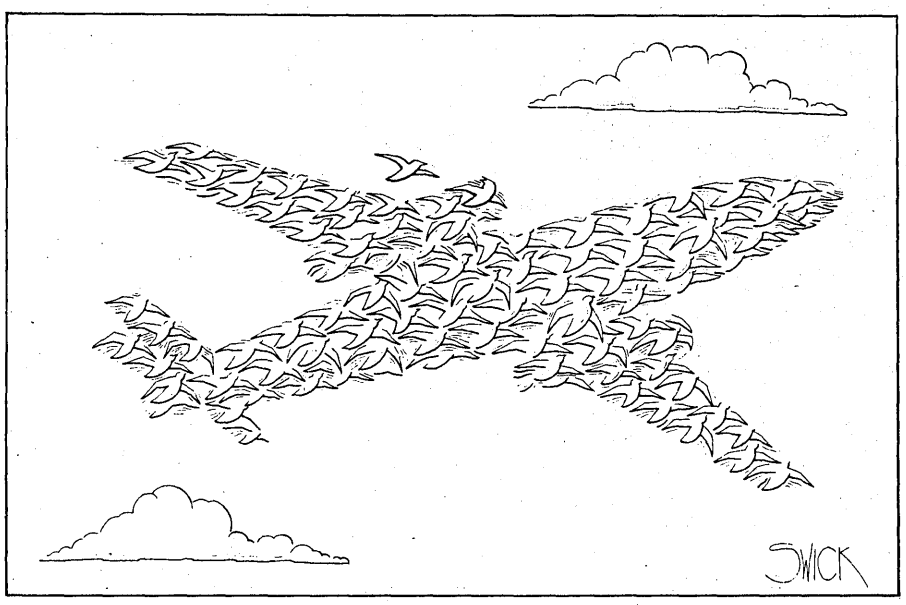
Neilly of StorageTek, whose 8380 disk drives register on R+ as being one-sixth as reliable as the competing IBM 3380s, says, "People buy R+ so they can use it in making critical purchase decisions. But that's not what it's made for."

Paster of CDC, whose R+ ratings are mediocre, notes that it is equally likely that vendors use R+ to compete against one another. "I'd never use it as a selling tool, because I think it makes an imperfect measure, but I have heard of others who do. I'd hope that they wouldn't use it unless the user brings it up first."

One vendor tells the story of a particularly aggressive salesman who showed a prospective customer three months of R+ data. "Only they weren't the most recent three months, but the best three months out of the year," the vendor says. "That's very misleading."

The unethical salesman's deceitfulness goes far beyond what White or Uccel ever intended with R+, but so does much of the more commonly accepted treatment of the product. That's fine with its creators, who have profited handsomely from the product: Uccel's McCarley says that R+ costs $17,500 for a one-time unlimited license, which includes a year of maintenance. After that, users pay $2,600 per year for maintenance, which includes program updates and membership in the all-important main database.

With nearly every one of the 700 R+ data centers on maintenance and receiving those monthly reports, and with R+ arousing the interest and ire of the hardware vendors, it's clear that reliability management has struck a deep chord throughout the industry, one that will continue reverberating for the foreseeable future. ◉



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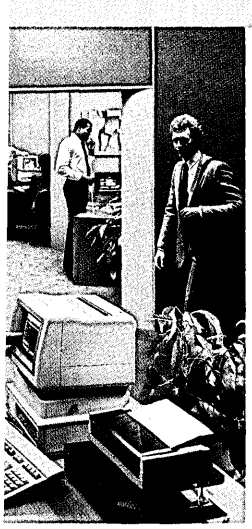

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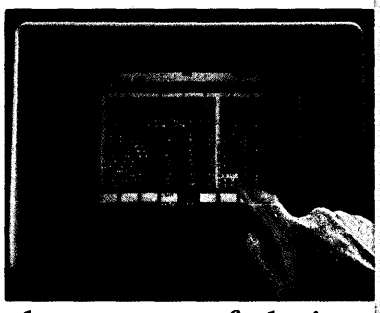

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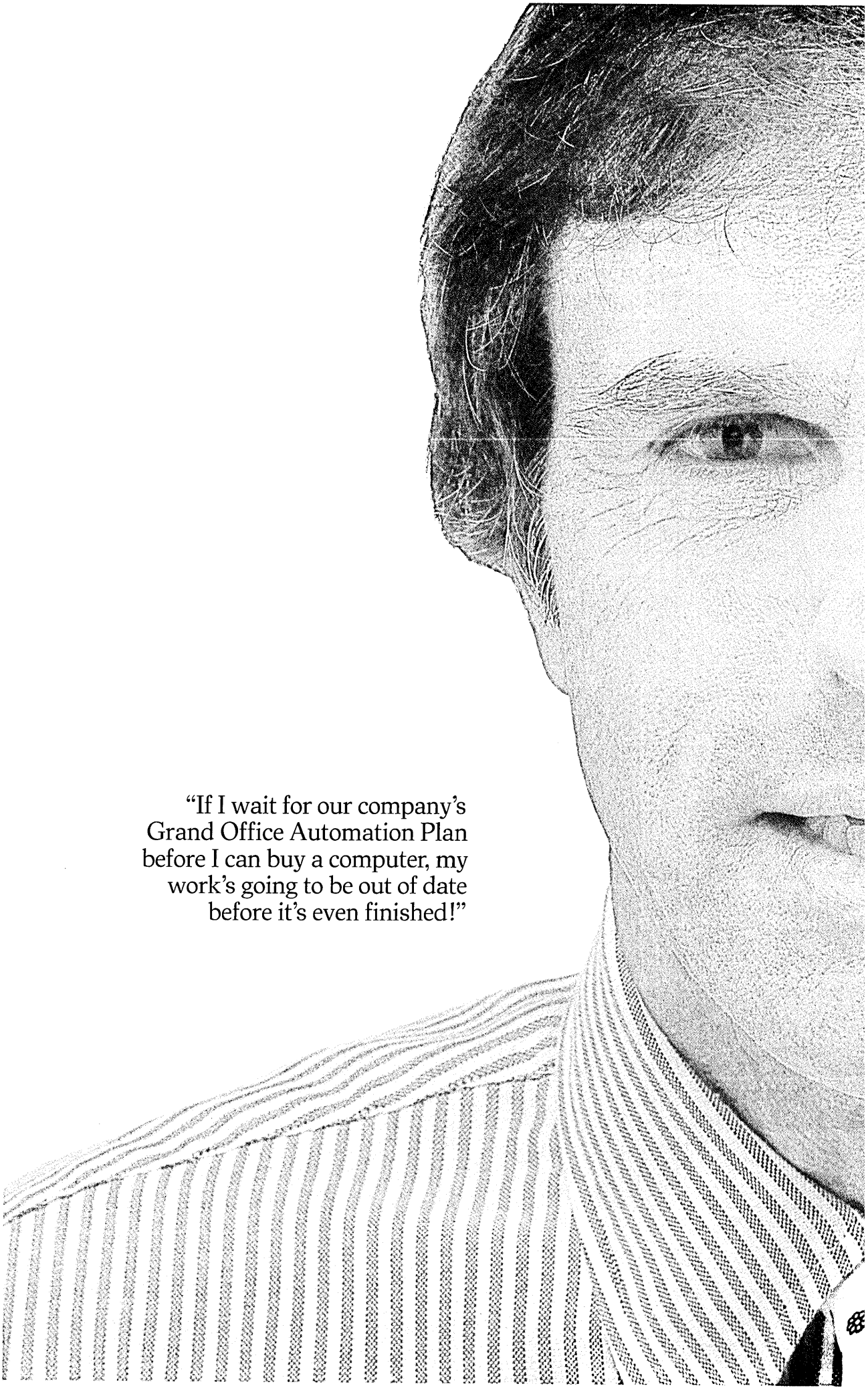

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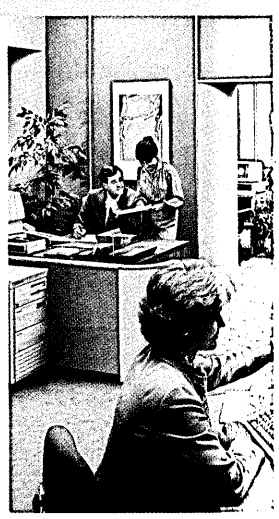

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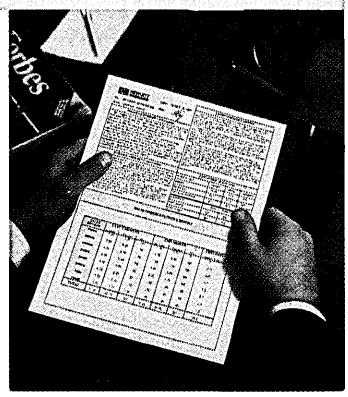

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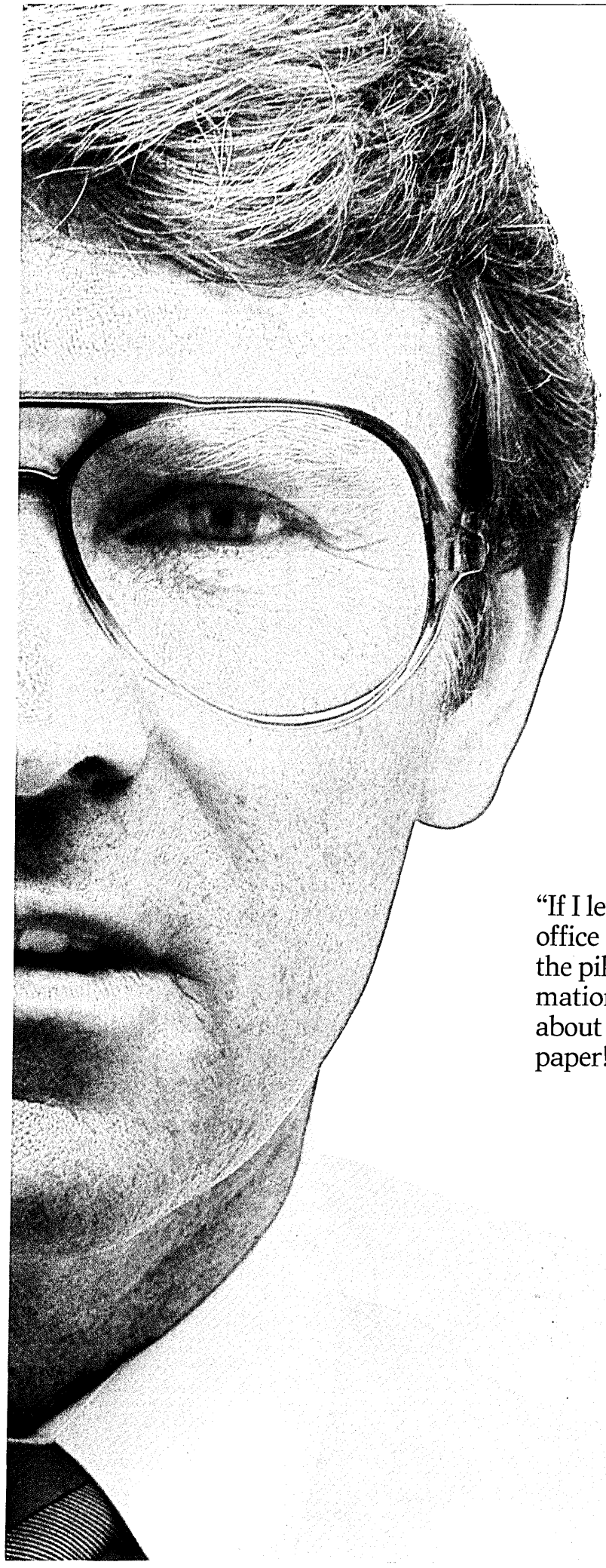

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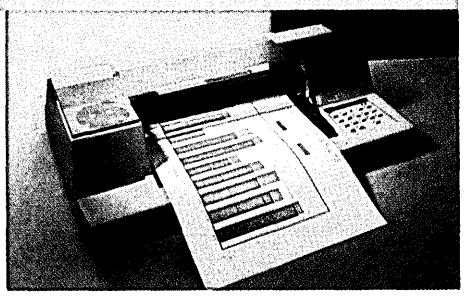

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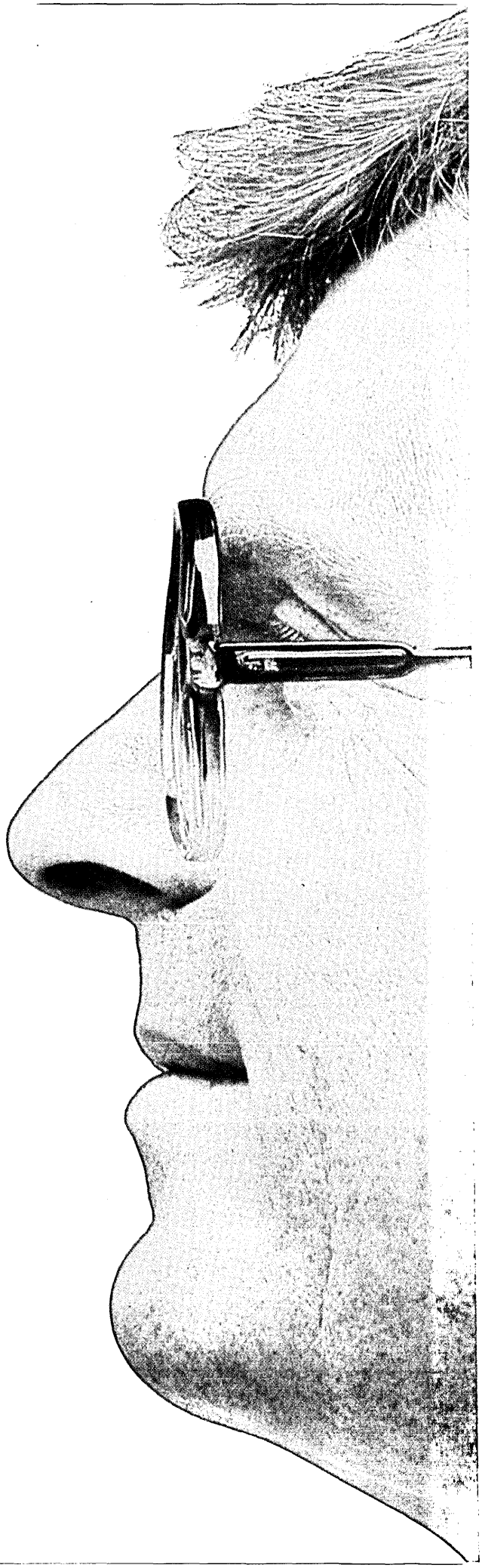


How greedy for machine capacity are the hungry and high-powered fourth generation languages?

THE IMPACT OF A 4GL ON HARDWARE RESOURCES

by Eugene G. Lukac

Deriving the most benefit from available resources may be the most basic managerial challenge. In managing information processing resources, that challenge is posed thusly: how much service can be provided by the available hardware? The arrival of fourth generation languages has made answering this question even more difficult. While these languages are capable of dramatic productivity increases over third generation languages—such as COBOL—there is much concern about the hardware resources needed to support fourth generation languages. Commercial timesharing services typically add a 50% surcharge for their use.

U.S. Bancorp recently undertook a series of careful measurements to assess the impact of a particular fourth generation language (Focus 4.0 from Information Builders Inc., New York) on hardware resources under a variety of conditions. This article reports the results of those measurements, and suggests their implications for the management of fourth generation languages.

Since production databases at U.S. Bancorp can handle several hundred thousand records, we wanted to see what the effect of file size and file organization would be on resource consumption by a fourth generation language. Also, the ease of use of a fourth generation language could potentially attract a large number of users. It was therefore necessary to determine the effect of the number of users on performance.

Finally, U.S. Bancorp is a large installation currently operating IBM 3033S, 3033N, and 3081G machines. Thus, the comparative performance of different machines and different loads on a given machine had to be determined as well.

FIG. 1

THE FOCUS PROCEDURE

```
TABLE FILE balances
HEADING CENTER
" BALANCE IN GROUPS OF $15,000 FOR branch name "
" "
SUM CNT.account PCT.account balance PCT.balance
COLUMN-TOTAL
BY branch
BY balance IN-GROUPS-OF 15000
IF branch IS-NOT 0
ON branch SUBTOTAL
ON branch PAGE-BREAK
```

Focus procedure used in the study of impact on hardware resources. Focus command language terms are shown capitalized. This FOCEXEC produces a report from the file called "balances," which has 115 bytes of user data per record. For each branch the number of accounts, the sum of the balances, and their percentages will be reported in groups of $15,000.

To study system performance, many measurements can be used: cpu time, channel use, paging, memory service units, and so on. From management's point of view, however, two are of overriding importance. The first concerns users' perception of the service they receive. The key measurement here is the length of time it takes users to get information they have requested. The second is what it is going to cost. The major cost factor is cpu, and hence the key measurement is percentage of cpu used.

This is not to say that memory or DASD can be totally ignored. Within the limits supported by the cpu, however, one can acquire additional units of memory or DASD for prices measured in tens of thousands of dollars, while the cost of additional cpus must be measured in millions of dollars. As long as there are enough memory and DASD to prevent bottlenecks, one can concentrate on measuring cpu utilization. During the course of these trials this proved a valid assumption.

Each one of the measurements in the study was obtained by executing a particular query repeatedly for one hour with no think time, and then calculating the average use of resources for that period. To minimize keying time at the terminal, queries were stored in Focus procedures (FOCEXECs), such as that in Fig. 1, and invoked by name.

As we will see, cpu usage and response time are sensitive to many factors. Under the U.S. Bancorp experimental conditions, it was possible to keep all other factors approximately constant while the variable of interest was being examined. The absolute value of the measurements reported does of course depend on the constant factors. Readers are thus cautioned to not place undue significance on these absolute values. Rather, emphasis should be placed on the relationships and the tradeoffs that the data suggest.

The first parameter that was studied to determine the effect on cpu utilization and response time was the size of the file available for a fourth generation language query. Using an IBM 3081G as cpu, the size of the file was varied from 5,000 to 80,000 records. During the tests the machine was also being used for other on-line and batch programs. The combined total use of the machine during the trials required about 35% of the cpu.

The results obtained by varying file size can be seen in Fig. 2. For example, when the file had 5,000 records, the query used 4% of the cpu and took 13 seconds. As the number of records increases, a larger fraction of the cpu is used, and response time also increases. This is understandable because Focus processes records sequentially.

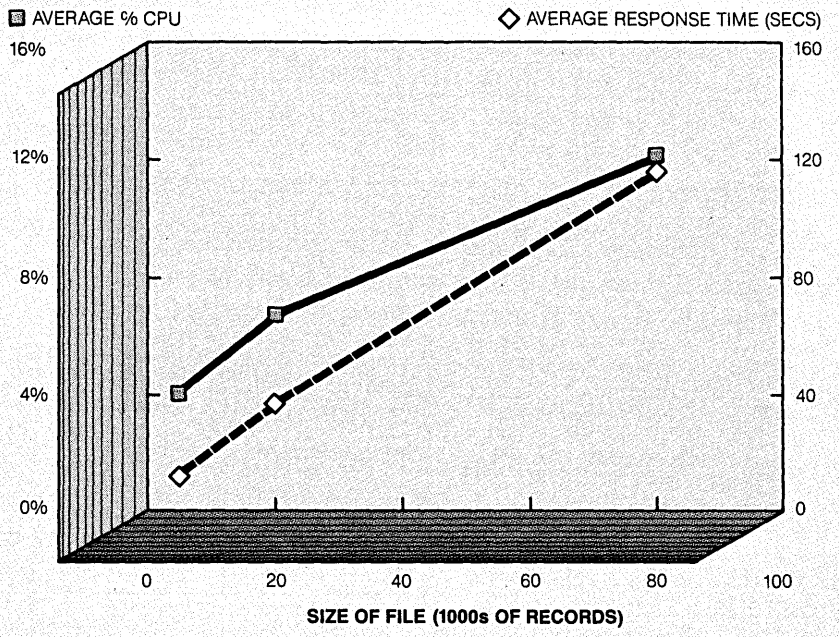
ENTIRE FILE REQUIRED

In general, the more records there are, the more work Focus will have to do to process the entire file. There are, of course, queries that require only a single record, which could be retrieved directly by an indexed field. The query used for these trials, however, required use of the entire file to produce summary information. This kind of summarization is not atypical of the decision support work in which fourth generation languages are used.

The implication for the management of information systems is clear: one can devote as much or as little of the cpu as seems appropriate for fourth generation language queries by controlling the size of the files (if all other factors remain constant).

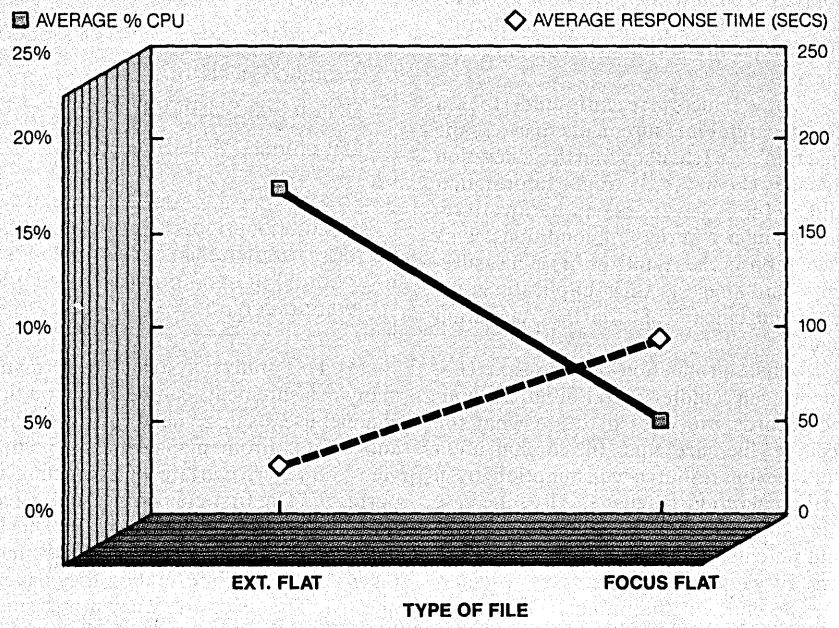
Controlling the size of the files is quite possible. If the files used for fourth generation language interrogation are themselves batch extracts or summaries of the larger production databases, their size can be regulated through the extract process. The trade-off here is that detailed information is being exchanged for both better response time and lower cpu utilization. Alternatively, in some cases one could

FIG. 2
EFFECT OF FILE SIZE



The effect of file size on cpu utilization and response time for a given fourth generation language query. The records, each of which had 115 bytes of user data, were in a flat Focus file. The cpu was an IBM 3081G operating at about 35% capacity.

FIG. 3
EFFECT OF FILE TYPE
(SIMPLE QUERY)



Comparative performance of a Focus flat file and a non-Focus (external) flat file. For each type of file a single Focus user executed a simple query. The files had 80,000 records, each with 115 bytes of user data. The cpu was an IBM 3081G operating at about 35% capacity.

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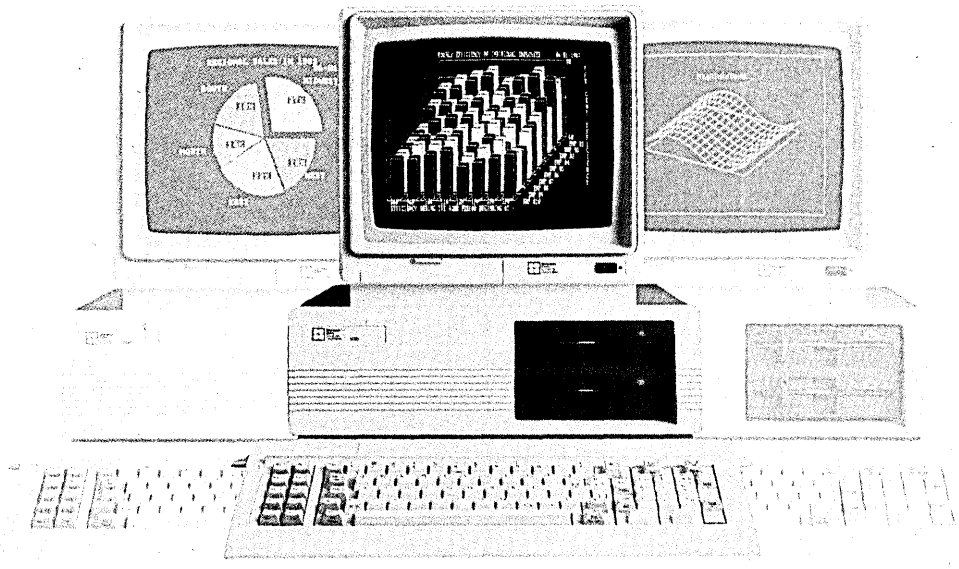

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DECIDEDLY BETTER

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divide large files into smaller subsets and gain a reduction of resources at the expense of convenience.

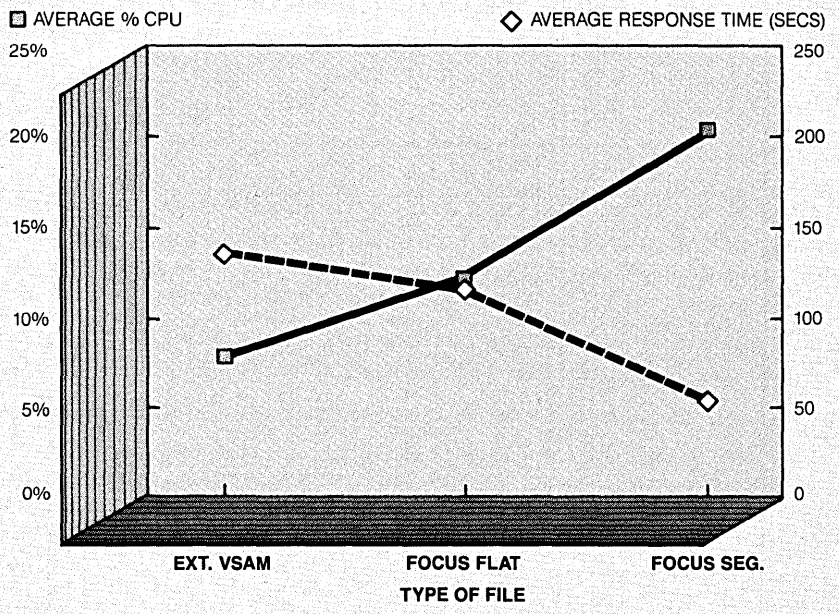
These comments in no way advocate a reduction in information detail or convenience for the user. On the contrary, they are intended to provide management with the insight necessary to make informed decisions about the resources required to best serve the user community

Besides a query language, Focus also contains a hierarchical database management system. Its queries, however, can address not only data in Focus files, but also data in certain non-Focus (external) files. Four types of files were examined: a flat sequential file (external to Focus), a VSAM file, a flat Focus file, and a Focus file structured with three segments. (A flat file is one that has no structure, i.e., it is in the form of a table. A sequential file is one in which a record can be reached only by starting at the beginning of the file and traversing all records preceding the one of interest. By contrast, in a VSAM file it is possible to access any record directly.) For each file type the same 80,000 records with 115 bytes of user data were used. The cpu was the IBM 3081G operating at approximately 35% capacity. One Focus user shared the cpu with batch and other time-sharing work.

The results for two of these kinds of files are shown in Fig. 3. Using the external file results in better response time and greater cpu usage than using a Focus flat file. The cpu is not as busy with the Focus file since it is spending more time waiting for I/O. Part of the reason for this is the difference in blocking factors: Focus files use a fixed block size of 4,048 bytes, whereas the block size for external files is adjustable, and could be greater. The bigger the block size, the more data can be brought in at one time for the cpu to process, and hence a greater percentage of the cpu can be used for a smaller period of time.

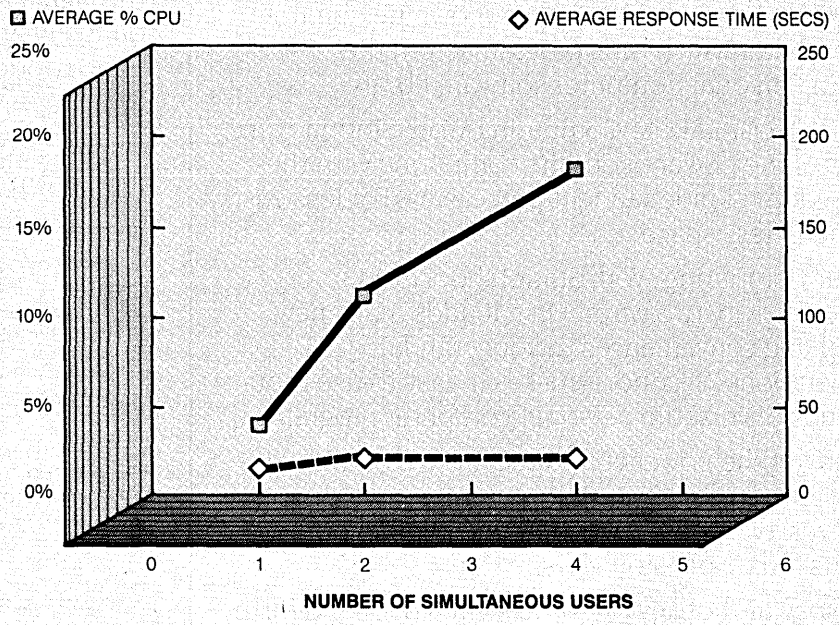
Shown in Fig. 4 are the results of performance measurements for a complex Focus query (like that of Fig. 1) contrasted with three types of files. Note the difference between a Focus flat file and a Focus segmented file. For the purposes of this experiment, the segmentation was deliberately, and perhaps somewhat artificially, designed to optimize the query. Each record of 115 bytes was divided into three segments. The first two segments contained all the fields that participated in the query. The third segment contained the remaining 85 bytes, which Focus could safely bypass. As shown in Fig. 4, the segmentation results in a better response time and in greater use of the cpu. Part of the explanation

FIG. 4
EFFECT OF FILE TYPE
(COMPLEX QUERY)



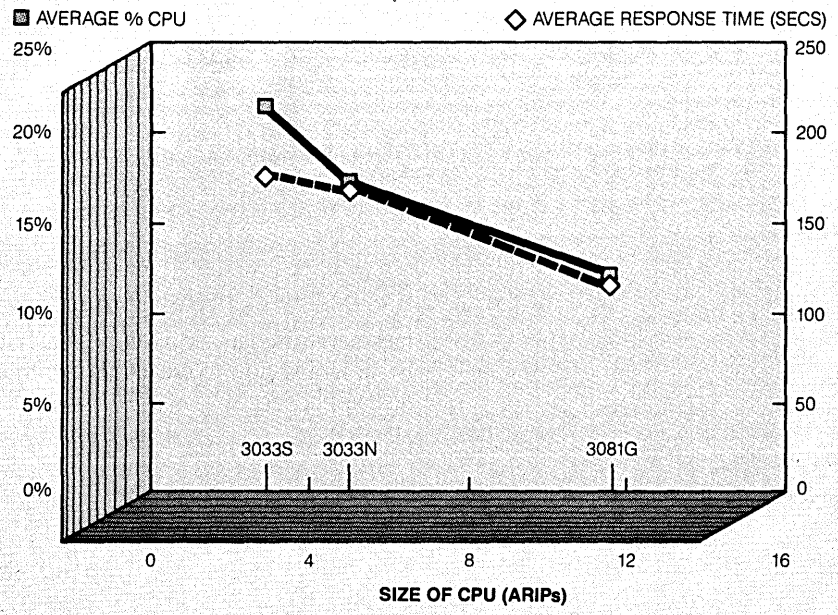
Comparative performance of a VSAM file, a flat Focus file, and a segmented Focus file. For each type of file, a single Focus user executed a complex query. The files had 80,000 records, each with 115 bytes of user data. The cpu was an IBM 3081G operating at about 35% capacity.

FIG. 5
EFFECT OF NUMBER OF USERS



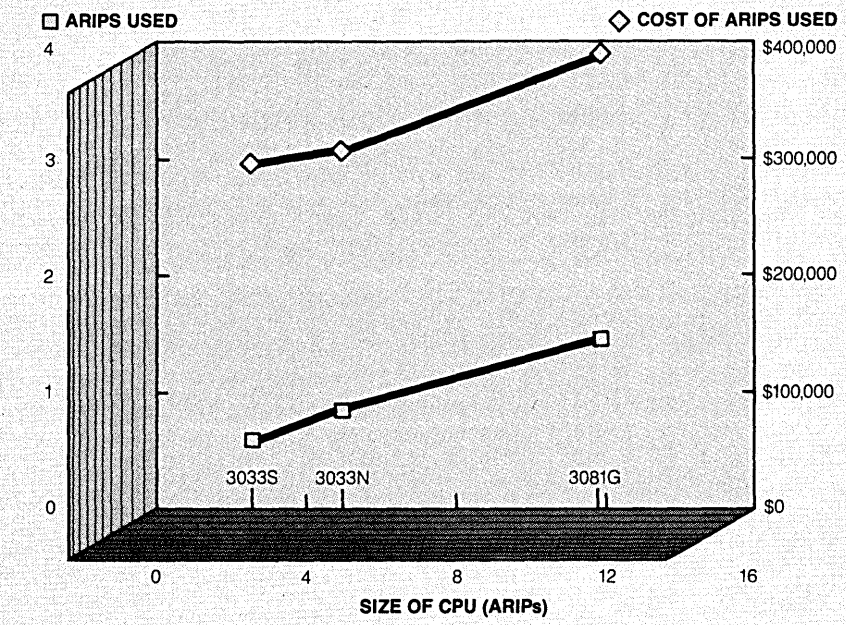
The effect of number of simultaneous users on cpu utilization and response time for a fourth generation language query. The query read a flat Focus file of 5,000 records, each with 115 bytes of user data. The cpu was an IBM 3018G.

FIG. 6
EFFECT OF CPU SIZE



Comparative performance of three different computers handling identical fourth generation language queries. Performance is measured by percent of cpu utilized and by response time. The file used was a flat Focus file of 80,000 records with 115 bytes of user data. Each of the machines was also supporting non-Focus users and was operating at about 35% capacity.

FIG. 7
EFFECT OF CPU SIZE ON ARIPS AND COST OF ARIPS



Comparative performance of three different computers handling identical fourth generation language queries. Performance is measured by the number of ARIPs used. Also shown is the cost of those ARIPs for each machine.

lies in the fact that with a fixed 4,048-byte block size, Focus can have more abbreviated than full records brought in at one time. Therefore, these results also give an indication of the performance that might be expected by varying the record length.

Both simple and complex queries take about the same amount of time, about 105 seconds (see Figs. 3 and 4). This is because in both cases Focus has to process the entire 80,000-record file sequentially. The more complex query, however, which calculated subtotals and percentages, required the cpu to do more work (12% of the cpu compared with 5%). The implication of this part of the study for information systems management is that good file design is critical to the performance of a fourth generation language.

File design requires trade-offs between economy of cpu resources and response time. Our results indicate the extent of these trade-offs. Of course, the posture that one adopts in managing a particular installation depends on the resources available and on the strategic requirements of the corporation. It is clear, however, that a manager should plan to offer assistance or instruction in the art of database design before releasing a fourth generation language to users.

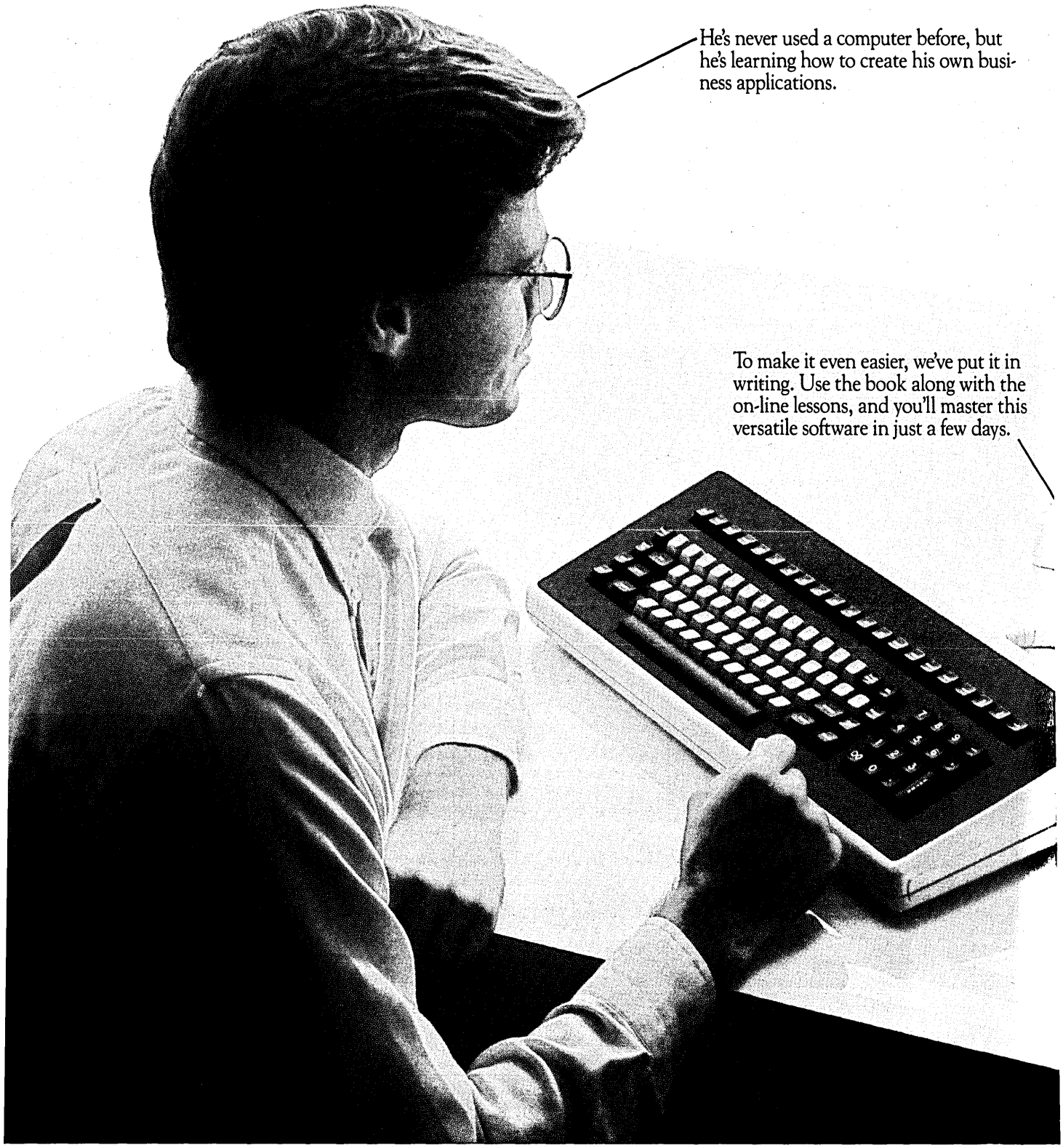
HOW MANY USERS?

Using the IBM 3081G, and a flat Focus file of 5,000 records, we varied the number of simultaneous Focus users from one to four. The use of the cpu for all Focus users is shown in Fig. 5. Also shown is the average response time for each user. Interpreting these results is not difficult. Users are working in their own address space, independent of one other. So the combined percentage of the cpu that is used is almost directly proportional to the number of users. Yet, to the extent that there are enough resources, users do not compete with each other. Therefore, response time in this range of users was insensitive to the number of users.

(It should be noted that the independence of users was ensured by not installing any of Focus's reentrant modules in the common area. This is an option designed to improve performance if there are several simultaneous users.)

Naturally, the question of most interest to managers of information systems is: how many simultaneous users can be supported? Using a larger file than that used in the above measurements (80,000 records), as well as a simpler query, 10 Focus users worked simultaneously on an otherwise empty 3081. As in the other

If you think big computers are hard to use, this will teach you a lesson.



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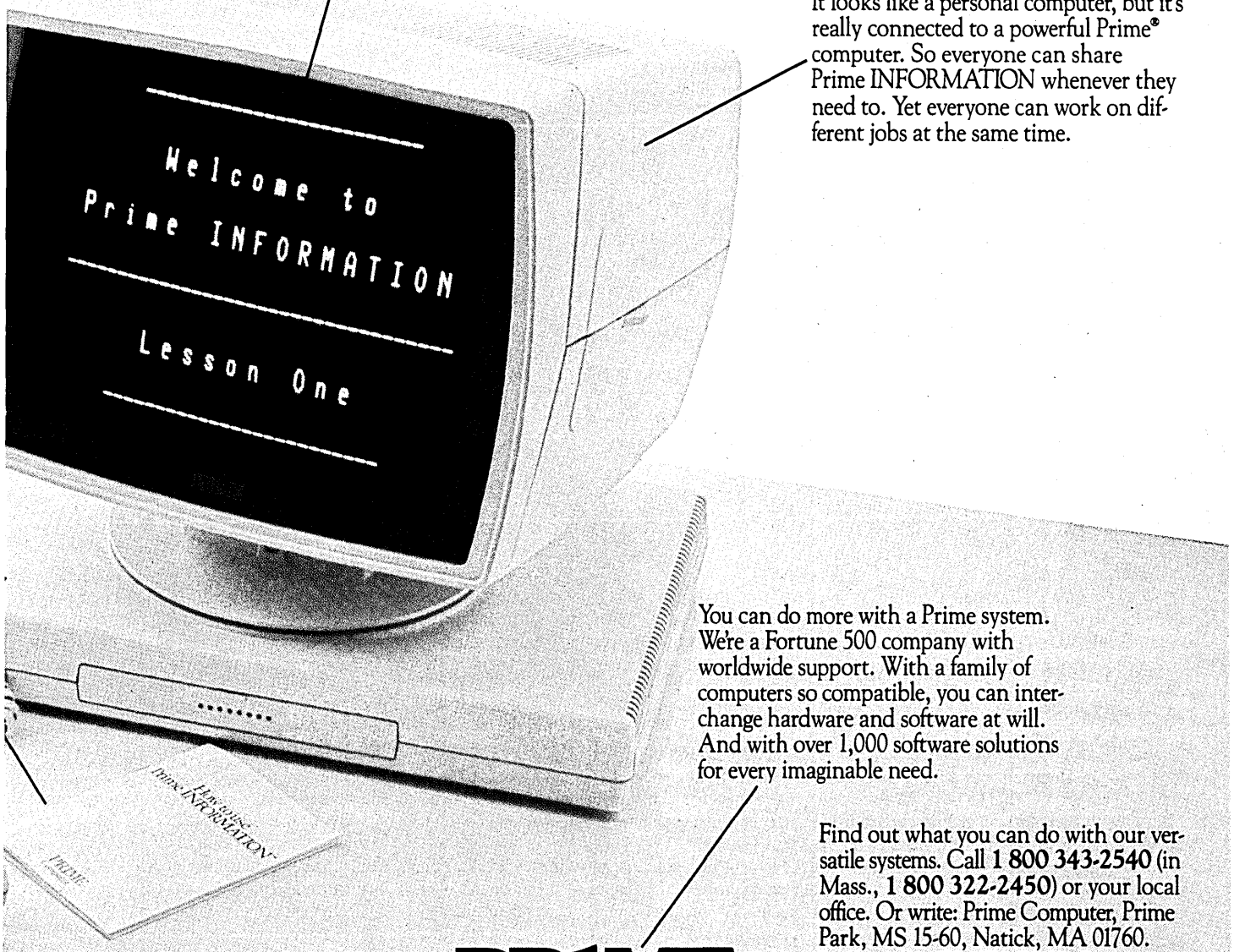

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The bigger the block size, the more data can be brought in at one time for the cpu to process.

experiments, the queries were invoked by name, and no think time was allowed. The result: 10 simultaneous users required 76% of the cpu.

With this figure as a benchmark, an extrapolation was made using a capacity planning tool (BEST/1 from BGS Systems Inc.). The model estimated that an IBM 3081G could support 13 simultaneous users, and a 3084 could support up to 30. The projections of the model were subsequently confirmed by the Focus vendor and other 3081 and 3084 sites.

Does this mean it will take dozens of machines to support a few hundred users? Not necessarily. Remember that not all users will demand responses to their queries simultaneously. One can safely assume that the total possible user population will never be signed on at the same time. Of those that are using the fourth generation language, some will be doing data entry, some will be thinking, some will be writing and editing queries, and so on. These activities consume fewer resources than answering queries.

NUMBER OF USERS WILL GROW

Furthermore, if only a few minutes are required to answer a query, a large percentage of the cpu might be used, but only for a short time. Nevertheless, as the ease of use of fourth generation languages improves, the number of users will grow.

We also examined the relative performance of three different cpus. For one hour, one user repeatedly executed a complex Focus query on each of the machines in turn. In each case the machine was concurrently supporting other (non-Focus) users, and was operating at about 35% capacity.

The file used was a flat Focus file of 80,000 records with 115 bytes of user data. The results are shown in Figs. 6 and 7.

Fig. 6 shows that the bigger the machine, the less of it is used, and the better the response time. This, of course, is as it should be.

Fig. 7, however, shows that more units of approximate relative internal performance (ARIPS) are used to respond to a query in a larger machine than to respond to the same query in a smaller machine. For example, while Fig. 6 shows that 21% of the 3033S had been used, Fig. 7 shows that 21% of 2.75 ARIPS (the power of the 3033S) is 0.58 ARIPS. Likewise, 0.82 ARIPS are used in the 3033N and 1.44 ARIPS in the 3081G.

For the fourth generation language user, better service is clearly obtained from the larger machine. For the manager of computer resources, the relative cost depends not only on the then-current price per ARIP, but also on the total resources, human and otherwise, that are required to operate a given machine.

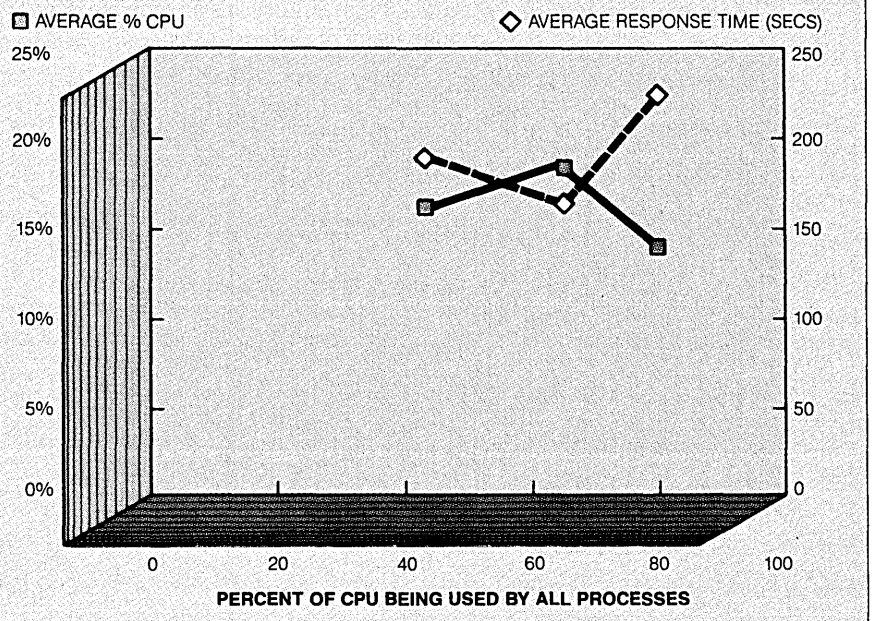
(Incidentally, in early 1984 the IBM list price per ARIP was $503,000 for the 3033S, $368,000 for the 3033N, and $273,000 for the 3081G. Using these rates, the cost for the number of ARIPS required to execute the same Focus query is shown in Fig. 7.)

The conclusion is inescapable: You can improve the response time for the user and use proportionately fewer resources if you have a larger machine. It is worth noting, though, that this does not necessarily mean that the cost per user will be less on a bigger machine.

Since in actual, nonexperimental use, a fourth generation language will probably run concurrently with other processes on a cpu, we also looked into the effect the presence of other processes would have on the performance of Focus.

Keeping the size of a flat Focus file fixed at 80,000 records of 115 bytes of user data, one user repeated a complex query on the 3033N under varying total loads. The results are shown in Fig. 8.

FIG. 8
EFFECT OF LOAD ON SYSTEM



The effect of system load on cpu utilization and response time for a given fourth generation language query. The cpu was an IBM 3033N. A single Focus user queried an 80,000 record Focus flat file with 115 bytes of user data per record.

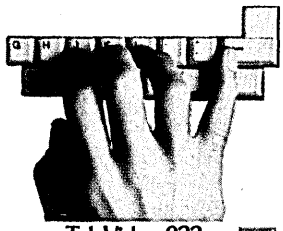
Fig. 8 suggests that the percentage of the cpu used by Focus is independent of the load on the cpu, provided the load is not too high. In this trial Focus used about 17% of the 3033N as long as there was enough cpu available. When the total load on the cpu was about 70%, Focus began to compete with other processes for the available resources. Similar results were obtained on the 3033S. These results agree with the conventional wisdom obtained from capacity planning models—that the saturation point for a machine is around 70% utilization.

At machine loads higher than this saturation point the performance of any given process depends on its relative priority among contending processes. In these trials, Focus priorities were identical to the other TSO processes occupying the machine at the same time. Nevertheless, the effect of load on the system shows that the other studies in this report were safely shielded from saturation effects, having been conducted on machines with about a 35% load.

Much attention has been given to the use of fourth generation languages in

TeleVideo corrects the VT220 key mistakes.

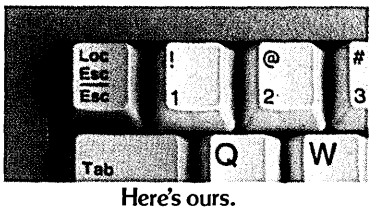
The new TeleVideo® 922 shares but one feature with the VT220®: full DEC®-compatibility. The similarity ends there.



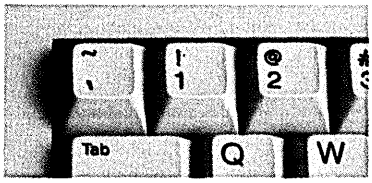
TeleVideo 922

DEC VT220

1. Take our keyboard, for example. The RETURN key is within direct, easy reach. But VT220 users must stretch over an additional key to hit RETURN. Or have the hands of a concert pianist.



Here's ours.



Where's the VT220 ESCAPE key?

2. Our ESCAPE key is located above the TAB key, right where you'd expect to find it.

Theirs isn't.

In fact, you have to go hunt for the VT220 ESCAPE key halfway across the row of function keys.

3. Take a look below at the 922 keyboard. That's a true accounting keypad, complete with a Clear Entry, Double Zero and a TAB key. Not merely the numeric keys you get with the VT220.

4. Our SHIFT key is exactly where it should be, so it does exactly what it should do—shift. Their SHIFT key is shoved over by the < and > key to create lots of < and > on the CRT. Of course with a little practice, you could relearn their keyboard. But why, now that you've seen our 922?

922 Display Screen.

<oving <he <hift Key <s A <istake.

VT220 Display Screen.

5. And after we built a better keyboard, we built a better terminal. With exceptional reliability. Quality. Advanced ergonomics. Everything you'd expect from the industry ANSI leader.

The new 922 is available now and priced to move now. And it's backed by a worldwide sales and support network. Which means doing business with TeleVideo is yet another key difference.

6. Here are 6 more advantages to the 922.

	TeleVideo 922	DEC VT220
Programmable Function Keys	15 (30 with shift)	15 (shifted only)
True Accountant Keypad	YES	NO
Plug-in Graphics Upgrade Option	YES	NO
Non-glare, Green Phosphor Screen	YES	NO
Full Tilt & Swivel	YES	NO
Enhanced ANSI Mode	YES	NO

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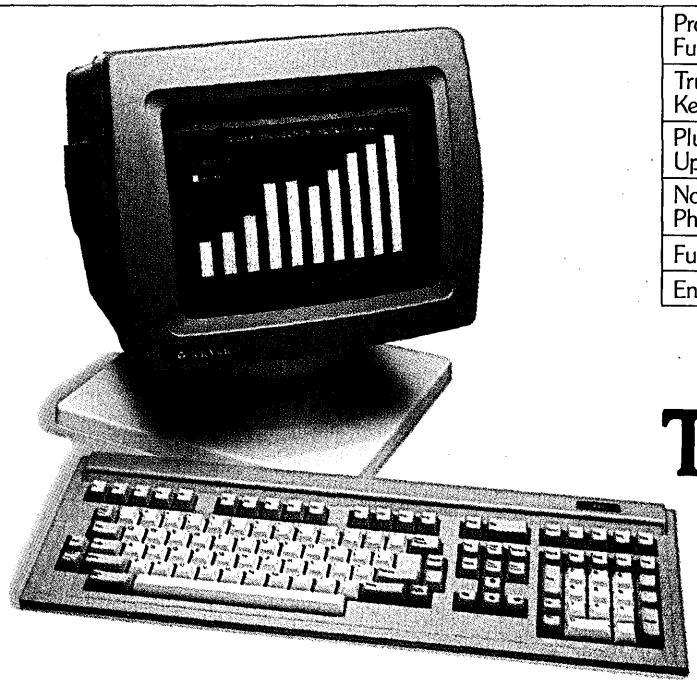

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TeleVideo Systems, Inc.

CIRCLE 56 ON READER CARD

As the ease of use of fourth generation languages improves, the number of users will grow.

information centers, end-user computing, and information systems productivity. There has been much speculation on the effect that the use of fourth generation languages might have on system resources. The bigger the file, the longer the response time, and the more required of the cpu. This relationship provides managers with one way of controlling the resources.

Good file design is crucial to the performance of a fourth generation language, and designers must weigh the amount of cpu used against the response time. Better response time for the user means more of the cpu will be used. Conversely, reducing cpu utilization means response time will increase.

DETERMINE SERVICE LEVEL The choice need not be left in the hands of the database designer. Management and users can determine the service level to be provided, and policy can guide the database designer to either conserve critical resources or improve throughput for the users.

Our studies show that, of all variables, the number of simultaneous users has the greatest effect on the resources consumed. The largest IBM mainframes available today could support up to 30 simultaneous queries. The expected random rate of arrival of queries, however, means that a much larger user population, perhaps in the hundreds, could be supported before saturating a machine. In any case, managers must face the politically sensitive issue of limiting user access if they don't keep resource availability ahead of user population growth.

Increasing the power of the cpu leads to better response time and the use of a smaller fraction of the cpu. In absolute numbers, however, a larger machine uses more power than a smaller machine. The reduced cost per unit of power in a large machine is not enough to compensate for the fact that more of it is being used. But the human resources, maintenance experience, and other overhead associated with the operation of a given computer must also be taken into account.

As long as there is sufficient cpu available to avoid contention, the combined total load on a computer system does not affect the performance of the fourth generation language. When contention takes place, performance will depend on the relative priorities assigned to the fourth generation language processes. ◉

Eugene G. Lukac is senior information resource management specialist at U.S. Bancorp and principal of Lukac Data Systems, a software and consulting firm. He holds a doctorate in theoretical physics and a master's in information science, both from the University of British Columbia.

This report is derived from ongoing work at U.S. Bancorp aimed at supporting the information needs of management. The work involves the concerted effort of a committed group of people. Without their vision, initiative, dedication, and resourcefulness this report would not have been possible. The author is much indebted to all of them.

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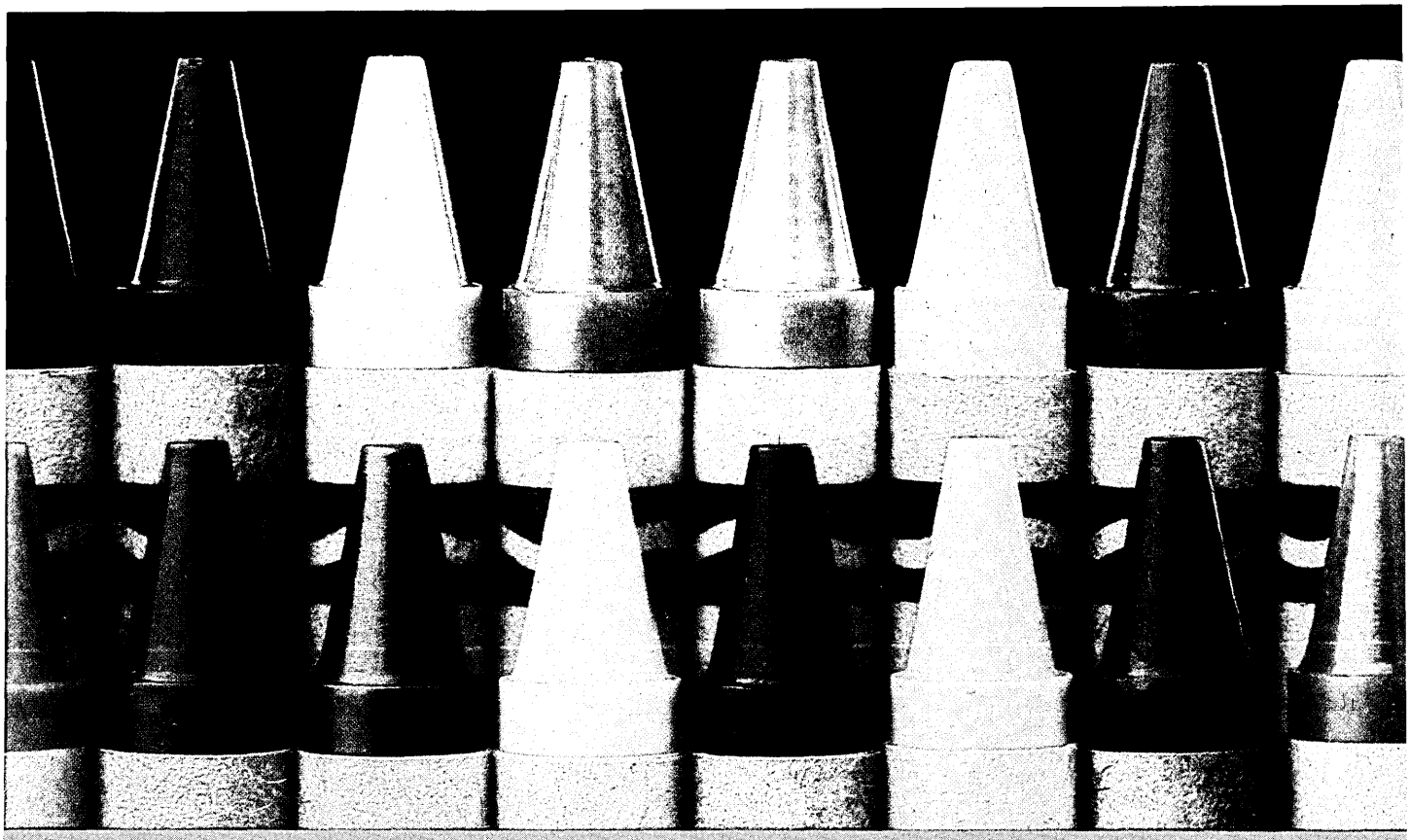

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CIRCLE 117 ON READER CARD

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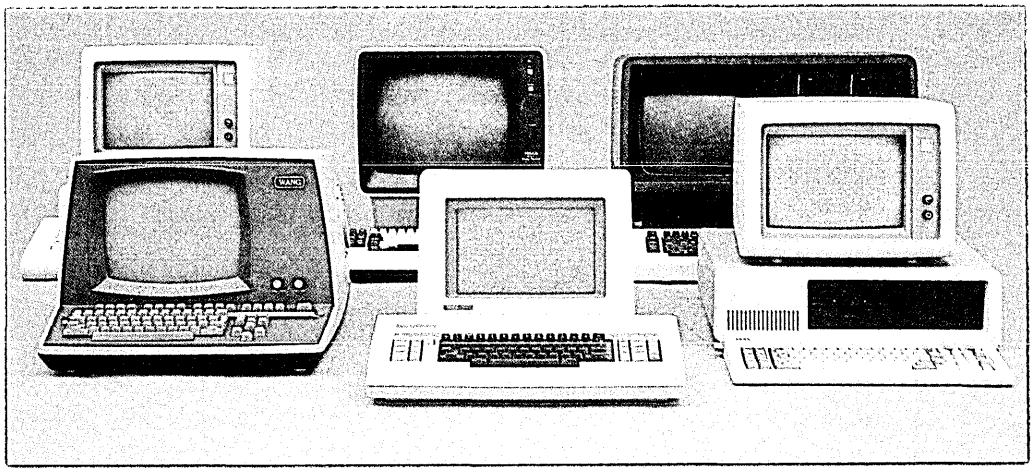

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Soft-Switch Communicates

The idea seems simple enough: connect all of your office systems so that documents can be freely interchanged for editing, storage, display, and printing. That includes word processors, PC's running word processing packages, and mainframe terminals accessing DCF and PROFS.

Many vendors claim to connect multiple vendors' equipment through "protocol translation." And connect they can, but not communicate. To really communicate requires transforming the document coding so that it is fully editable at the receiving system. After all, what good is it to transmit a document to a different workstation if that workstation can't manipulate the document once it's there?

Soft-Switch is compatibility

IBC's Soft-Switch is a program product for your IBM mainframe (MVS or VM) that allows users to send documents to other users with document translation performed automatically, to store documents in host libraries, and to retrieve documents from these libraries.

Soft-Switch communicates with IBM, Wang, Xerox, and NBI. It communicates with the MultiMate word processing program on the IBM PC, with DCF and with PROFS, with the IBM 6670 laser printer, and with standard hard copy printers.

Soft-Switch is totally consistent with evolving standards for office systems. In fact, Soft-Switch integrates multi-vendor office environments by first translating a document into IBM's level 3 Document Content Architecture (DICA), and then into the exact format required by the receiving workstation.

Soft-Switch solves today's problems

Let's say an analyst prepares a document on his PC with MultiMate. He executes Soft-Switch (which executes in the PC, as well as in the IBM host) and specifies distribution to his secretary and to the 6670 laser printer down the hall. Soft-Switch provides the micro-mainframe link, transports the document from the PC to the IBM host, translates the document from MultiMate format to DICA, translates the DICA format to Wang's WPS format and the IBM 6670 laser printer OCL format, and routes the documents to their final destinations.

Another example: a document is prepared on a Xerox word processor at Detroit headquarters and must be sent to a user at a Wang word processor in New York for further editing and printing, and to an IBM Displaywriter user in Tampa for review. The Xerox operator simply transmits the document to Soft-Switch at the IBM host and instructs Soft-Switch to route the document to the New York user and to the Tampa user. Through its directory, Soft-Switch recognizes that the sender and receivers are using different word processors and automatically translates the Xerox document into DICA and then into Wang and Displaywriter formats. The resulting documents are then routed to the recipients.

Soft-Switch: a path to tomorrow

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CIRCLE 5 ON READER CARD

Two standards are more probable than one.

ELECTRONIC MAIL

by Raymond R. Panko

There's been much activity lately in the area of electronic mail standards. But, as the dust settles and the view clears, it looks like we can expect two sets of standards (much to the dismay of the National Bureau of Standards; see "It's in the Mail," Aug. 15, p. 62) to link electronic mail systems from different vendors. One is an ad hoc standard from IBM. The other is an international standard from the CCITT (International Consultative Committee on Telephone and Telegraph)—the international standards agency for telecommunication.

Now that we can link mail systems from different vendors, use of electronic mail should increase much more rapidly. Standards for electronic mail may even spur the growth of fully integrated office systems. If IOS's from different vendors exchange mail, a good deal of what is needed for full interworking will already exist.

Will IBM win? Will the CCITT win? Or will they coexist? The outcome of the inevitable slugout between the IBM and CCITT standards will be critical for office systems planning during the next five years.

The IBM ad hoc standard is an extension of systems network architecture (SNA), the company's overall architecture for linking its various products via telecommunication. SNA was first announced in 1974 and has undergone constant revision since its introduction.

SNA has seven distinct layers, each with its own standards. The highest layer is reserved for standards for specific applications like electronic mail.

In 1981, IBM formally announced its seventh-layer standard for electronic mail. Actually, IBM divided the seventh layer into two sublayers and announced electronic mail standards for each sublayer.

The standard for the lower sublayer is called the document interchange architecture, or DIA. As the name suggests, DIA is concerned with delivery of documents from one process to another. It is like the postal service, delivering envelopes to the proper destination without looking inside the envelope to see the contents.

The document content architecture (DCA) specifies the higher sublayer. It governs the format of the document contents. The DCA actually embraces an open-ended family of standards, not just a single standard. Currently, two DCA standards have been released. The first is for documents ready for printing in final form. The other is for documents that are still revisable. More DCA standards will undoubtedly be released in the future. DCA is intended to be an architecture for multimedia messages. Facsimile has already been integrated somewhat into DCA, and further multimedia standards will certainly follow.

Although IBM announced DIA and DCA publicly in 1981, the company had been making use of these architectures internally since the mid-1970s. Several products that comply with the standard have already been released, notably DISOSS. SOSS is a software package for large mainframe systems that use the MVS and DOS operating systems. It can link virtually all of IBM's word processors and terminal devices, and the number of devices it can support is increasing constantly. In addition to implementing DIA and DCA, DISOSS is capable of storing documents and retrieving them by keyword combinations. It also has an interface to other processes, such as the company's STAIRS full text retrieval system.

As the standards arm of the International Telecommunications Union, a treaty organization, the CCITT is responsible for setting international telecommunication standards. In public record services (Telex, teletex) and in facsimile, the CCITT has long been successful in setting standards that are widely accepted.

During the 1970s, the CCITT worked with the main international standards body for computers, the International Organization for Standards, or ISO, to develop a comprehensive architecture for data communication to rival IBM's SNA. The fruit of this joint effort was the open systems interconnection architecture, or OSI. The ISO released its version of the architecture in 1978; the CCITT had to wait until its 1980 plenary assembly to release its compatible version.

SEVEN LAYER STRUCTURE

Like SNA, OSI has seven layers. Also like SNA, OSI reserves the top layer for application standards. During the 1980-1984 study period, the CCITT's Special Rapporteur Group on Message Handling Services (Study Group VII/Question 5) developed an electronic mail standard for the top layer. More specifically, a series of standards (X.400 through X.430) was prepared to specify individual parts of the broad electronic mail standard.

As IBM had done, the CCITT broke the application layer into two sublayers. The lower layer, which is called the message transfer service, is similar to IBM's DIA, delivering message envelopes without being concerned about their contents. The higher layer is similar to DCA, specifying an open-ended family of standards for the format of document contents.

For 1984, the CCITT released only one standard for the higher layer. This is the standard for interpersonal message (IPM) service. The IPM standard divides each message into two pieces, a header and a body. The header has a number of required and optional standard fields. If the user files old messages, he or she can recall them by the contents of any header fields. In essence, the header portion is a document management feature.

The body format is open-ended. A field in the header allows the sender to specify the type of body format being used. Initially, the X.400 series specifies the fol-

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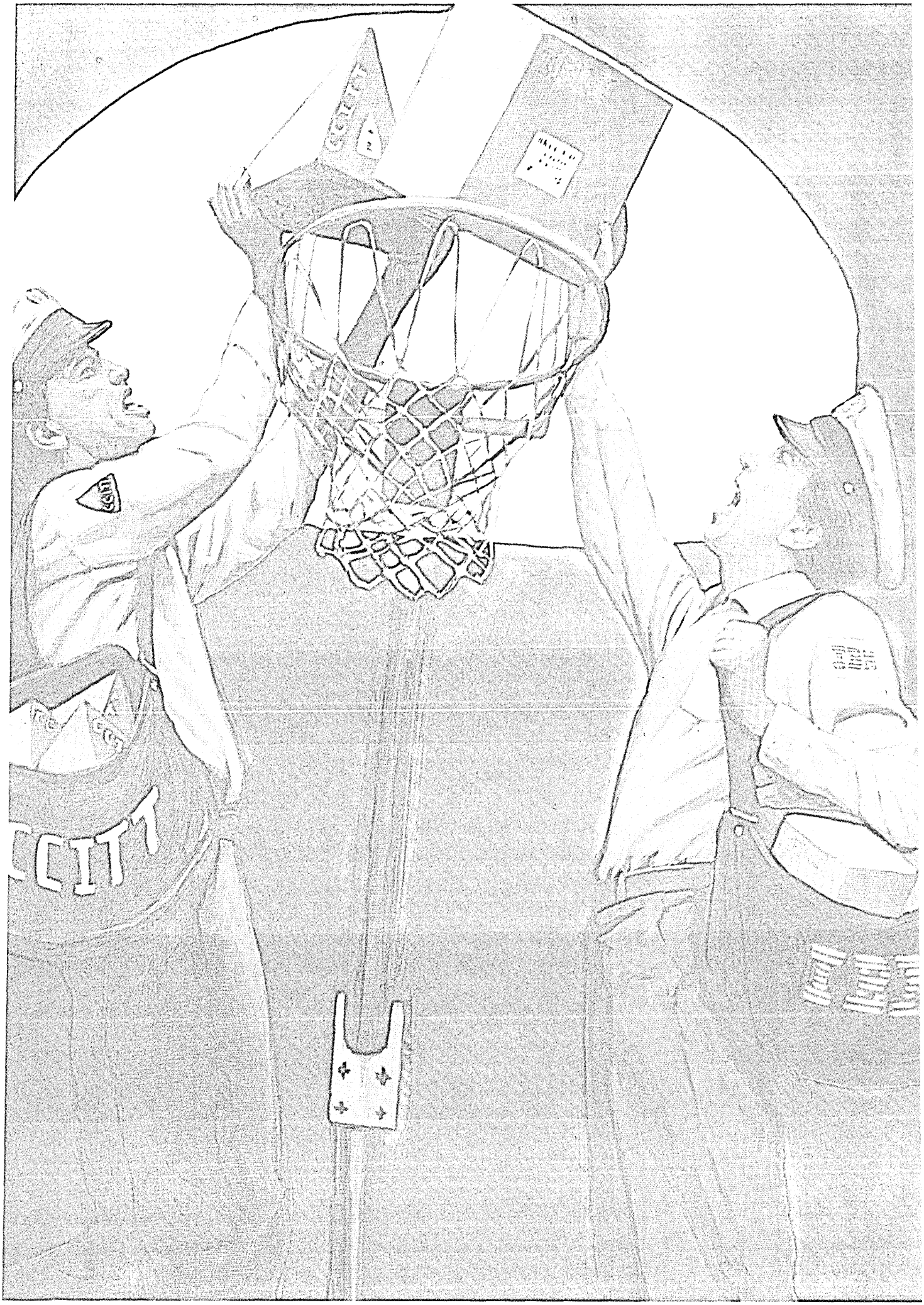

DCA's advantage in document formatting will probably diminish rapidly in the future.

lowing body formats: teletex (a superset of ASCII), group 3 facsimile, group 4 facsimile, videotex, the telematic document architecture (T.73, a new standard for mixing teletex text and Group 4 facsimile images on the same page), and simply formatted documents (which permit the recipient to reformat the output based on line width and page length). Of course, other standards for body format will be accepted over time.

In general design, the two systems are fairly similar. Upon closer examination, however, a number of very strong differences appear. It will be difficult for third parties to build bridges between the two.

Most obviously, DIA/DCA is part of SNA while X.400 is part of OSI. Although both architectures have seven layers, the layers are defined differently. It is impossible to build simple bridges between the individual SNA and OSI layers. In addition, SNA offers some services that OSI does not and vice versa. While SNA/OSI bridges are appearing from third parties, they are not cheap or complete.

Looking at DIA/DCA and X.400 alone, the problem of service differences still remains. Each set of standards specifies a large number of services. Some are available only on one system. Others are available on both systems but in different ways.

Assuming that technical bridges can be built and can handle basic service differences in a reasonable way, the next question is which standard is better. This is difficult to discuss, because neither set of standards is complete. Both will evolve rapidly. Nevertheless, it makes sense to take a look at the two standards today.

IBM's biggest advantage over X.400 is the richness of DCA's revisable form specification for document formats. DCA was really designed to link IBM's many incompatible word processing systems, including Displaywriter, 5520, 8100/DOSF, and PROFS. Incompatibilities among these products had been a major marketing problem for IBM for several years, and DCA was created specifically to handle format translation among different IBM systems. As a result, DCA specifies document format in considerable detail. In contrast, X.400's current ability to handle document formatting is minimal. The only significant feature of the simply formattable document standard is that hard carriage returns are not put at the end of each line so editing after delivery is possible and fairly easy.

DCA's advantage in document formatting will probably diminish rapidly in the future. It is likely that the ISO will adopt the CCITT X.400 series but will focus on refining the simply formattable document structure into a full tool for exchanging formatted documents created on different word processors.

OLD STANDARDS PREFERRED

In contrast to the CCITT, which, as a telecommunication standards agency is oriented to message delivery in printed form, ISO is a computer and office systems standards agency that is quite concerned with the exchange of editable documents among different word processors. Because CCITT and ISO standards are true standards, they will be relatively stable over time and will change only with prior analysis and notice. Most vendors would prefer to work with such true standards than be at the mercy of IBM's ad hoc standards, which can change constantly, with little or no prior notice.

X.400 will also have, initially, a more attractive multimedia body format than IBM. During the 1980-1984 study period, study group VIII developed a sophisticated standard for mixing teletex and group 4 facsimile images on the same page. This is the T.73 standard mentioned earlier. Because of the CCITT's long-held strength in specifying this kind of standard, IBM may eventually have to abandon its own efforts to refine DCA's multimedia body standard and use the CCITT standard.

X.400's biggest advantage over DIA/DCA is that X.400's higher layer standard is specifically designed for messaging. As noted earlier, it divides messages into two parts, a header portion, and a multimedia body function. The header has a number of standard fields, including originator, primary recipient, and subject. (See Fig. 1 for a more complete list.) Standardized fields in headers allow the receiver to search for, say, all messages from Lee after June 1984. The header fields essentially form a searchable front end for the document body. IBM has no searchable fields in its DCA. It is strictly for delivering documents and provides no assistance in document management.

As the competition between DIA/DCA and X.400 begins to heat up, both IBM and the CCITT will concentrate on their natural bases of strength initially. IBM, of course, should be able to make DIA/DCA dominant among large organizations that already use IBM equipment and SNA. The only potential problem among these users is the complexity and cost of DISOSS, IBM's current major implementation of DIA/DCA.

In turn, X.400 should be widely adopted by public telecommunication authorities, especially where telecommunication is controlled by monopolistic government organizations. In Canada and the U.S., the situation may be more complex because telecommunication is more competitive. Since the X.400 effort was led by Ian Cunningham of Bell Canada, that company is likely to push the new standard strongly. In the U.S., the situation is further complicated by the presence of other standardization efforts. The U.S. National Bureau of Standards has been developing its own electronic mail standard that, while similar to X.400 in terms of the services it

FIG. 1

SEARCHABLE HEADER FIELDS IN X.400 INTERPERSONAL MESSAGES

Originator
Person authorizing the message
Primary recipients
Secondary recipients
Blind copy recipient
Subject
Message that this message is sent in reply to
Please send reply
This message is forwarded to you
Cross reference (to other IP messages)
Importance indication
Sensitivity indication (personal, private, company-confidential)
Expiry date
Messages obsoleted by this message
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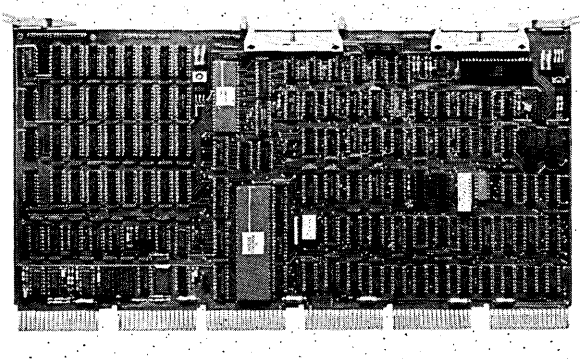

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CIRCLE 59 ON READER CARD

offers, is deeply incompatible at the bits and bytes level. The only saving grace of this effort is that the NBS standard is based on the OSI architecture, so only mail-level standards will have to be linked by protocol converters. The NBS already has promulgated part of its standard as FIPS 98. Fortunately, there seems to be a good chance that the CCITT will accept the X.400 series and will retract FIPS 98.

ISO, the European Computer Machinery Association, and the U.S. military are all looking at yet different standards. It is likely that most or all of these players will soon fold their hands and opt for either X.400 or DIA/DCA, but there is always the possibility of holdouts.

Given the strength of both IBM and the CCITT, it is fairly safe to predict that DIA/DCA and X.400 will survive in the marketplace. Based on that prediction, it is also fairly safe to assume that SNA/DIA/DCA-to-OSI/X.400 protocol converters will be available from third parties.

MARKET ACCEPTS SLOWLY

Standards take a long time to affect markets, however. The long awaited teletex standard released by the CCITT at its plenary four years ago is only now beginning to generate significant user revenues. Even if all electronic mail vendors were to convert instantly to either DIA/DCA or X.400—and there is no chance of that—it would be some time before market acceptance could grow to substantial levels of penetration. All of this is going to take a long time.

In addition, both DIA/DCA and X.400 are far from complete. Most obviously, neither has a comprehensive schema for building directories of users. The so-called directory problem is extremely difficult, but it is essential to solve it. Without comprehensive firm-wide and international standards for establishing directories of users, maintaining electronic mail systems will remain extremely time-consuming.

For users, the most important thing is to be very careful about buying an electronic mail system that is not compatible with DIA/DCA or X.400. Beyond that, users must watch trends in the market and examine extensions to these standards as they are announced. Of course, users have plenty of other things to do, but these standards and their evolutionary successors are likely to be the keys that open the door to widespread integrated office systems. They are worth the effort needed to track them. ◉

Dr. Raymond R. Panko is an associate professor in the College of Business Administration at the University of Hawaii, Honolulu. He has also worked for the Boeing Co., Seattle, and SRI International in Menlo Park, Calif., and has been involved with electronic mail since 1974. Dr. Panko conducted one of the National Bureau of Standards' early studies on the electronic mail effort.

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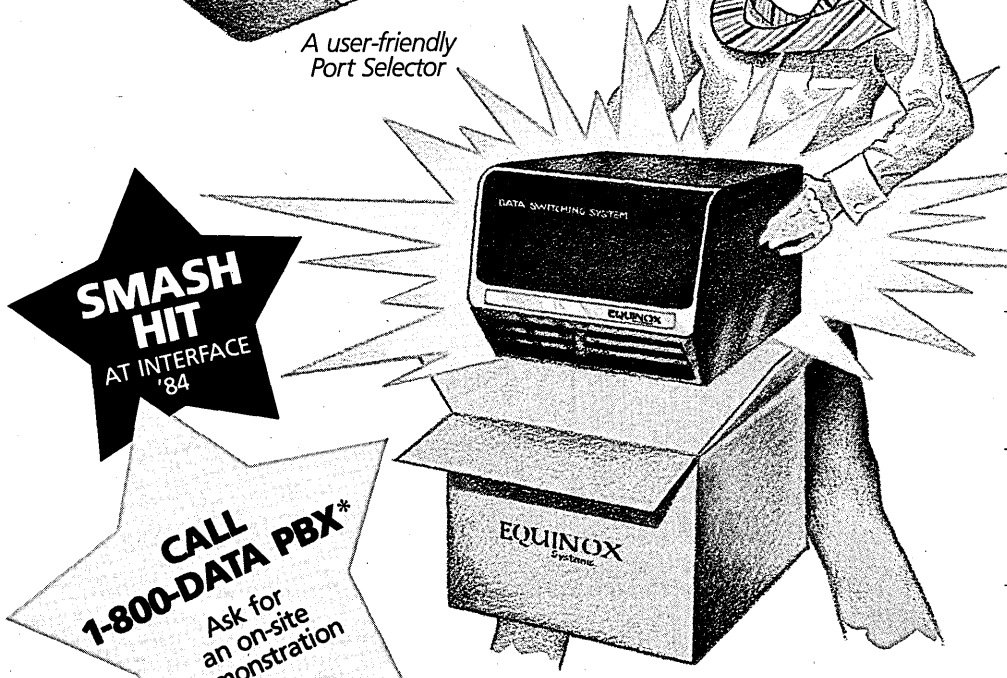

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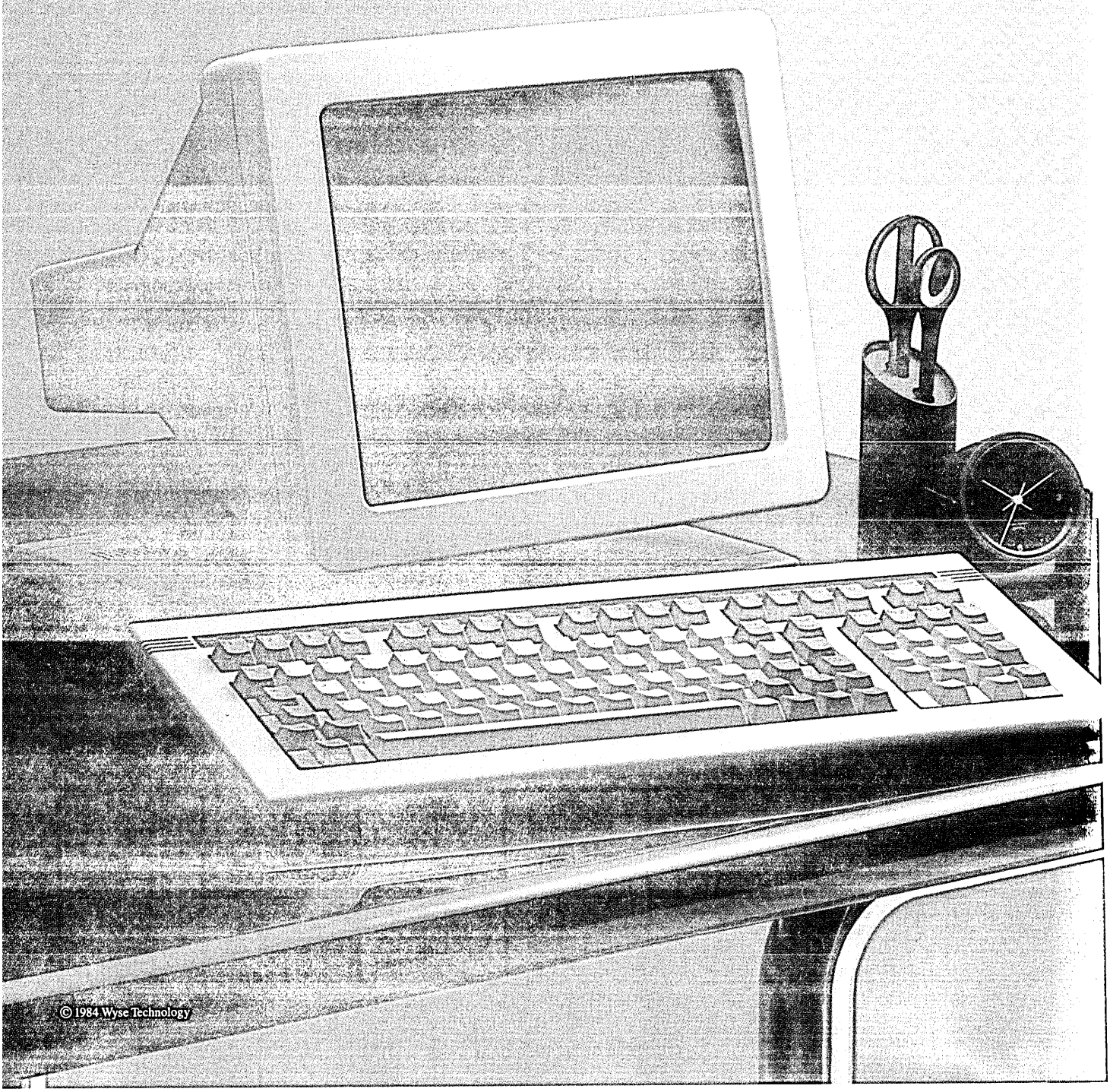

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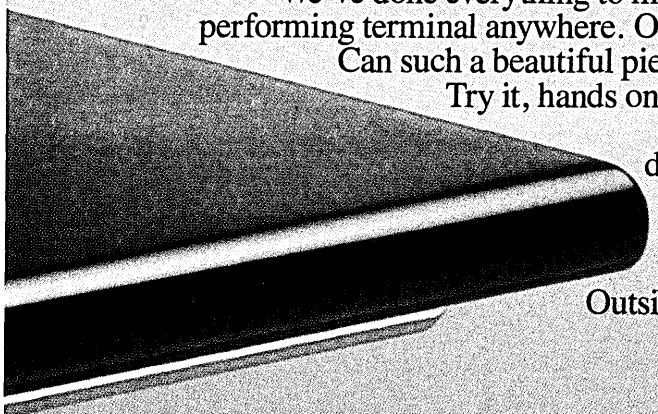

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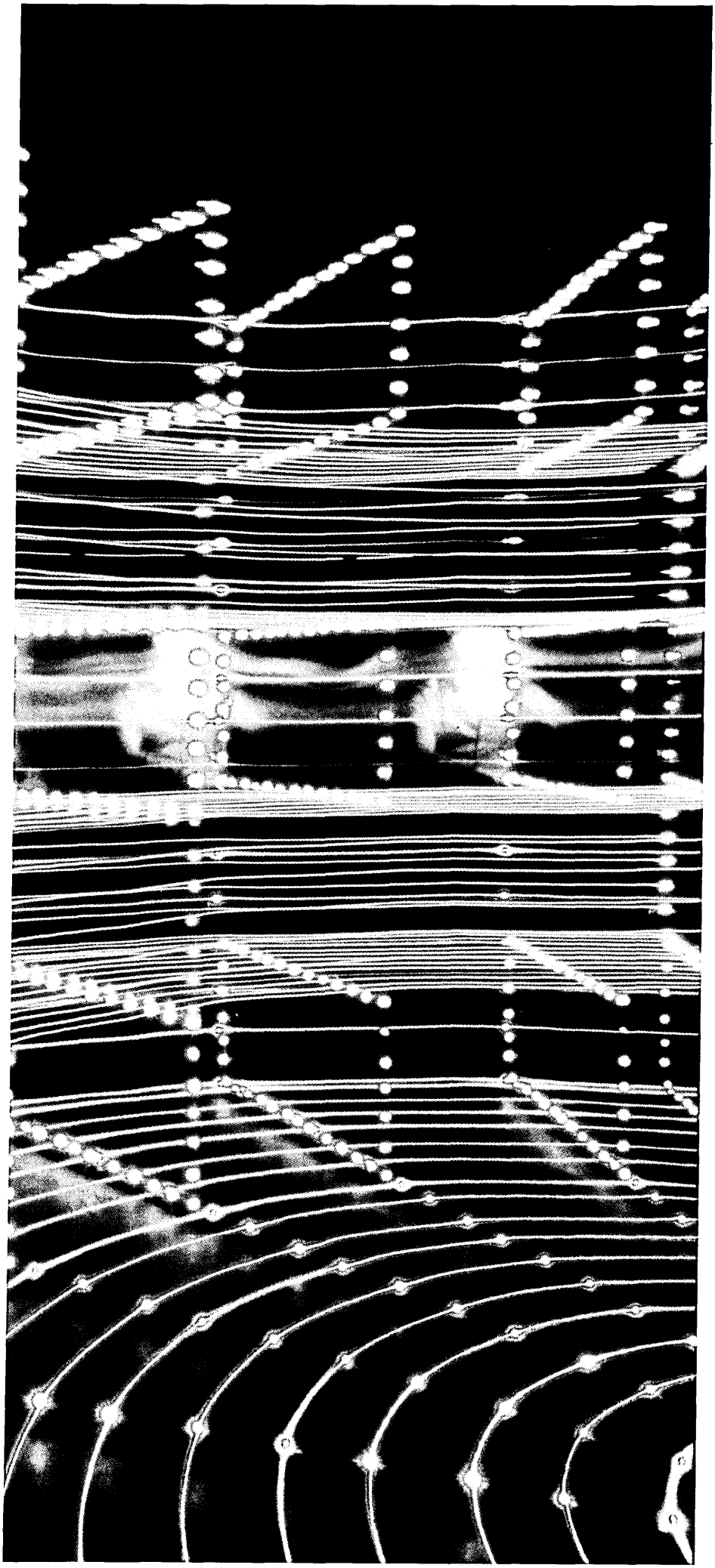


Building a commercial environment under Unix can seem like very heavy engineering.

BUILDING TUNNELS AND BRIDGES

by Ellen Ullman, Jerry Carlin, and Page Thompson

Unix seems to be everywhere, everywhere but in commercial applications. Something seems to be missing. How many commercial applications packages have been offered for Unix? Why haven't software offerings kept pace with operating system implementations? Our experience building a major commercial application under Unix/C has given us a simple answer to these questions: writing applications programs for the Unix system is no picnic.

Since March 1981, Insurnet Inc. of Emeryville, Calif., a turnkey vendor of software to the insurance industry, has been duplicating all its Pick-based software in a Unix environment. This means we rewrote a system consisting of over 1,000 programs, 120 files, and 3,500 fields. Here's what we found out.

While Unix offers the systems programmer a powerful and elegant environment, a practical environment for the development of commercial applications is not yet generally available. We found that such widely advertised features of Unix as pipes, filters, and shell scripts were not substitutes for task-specific code: programs still had to be written. In order to develop our applications, we first had to develop an environment congenial to commercial programming. Raising the level of Unix to accommodate this need, rather than developing an insurance services system, became the immediate task of our project team.

What we have created is a system

PHOTOGRAPH BY ERIC STALLER

Horrifying difficulties arose when we tried to use all the tools together.

development environment in which the hypothetically "average" commercial COBOL or BASIC programmer can function with a high degree of productivity. While this particular environment may not be applicable to every Unix applications shop, what *is* applicable is the process through which we realized the need for our own applications environment and then, finally, how we created it.

Our experience should reveal how Unix functions as an environment for commercial applications. It should also make things a little easier for others seeking to develop Unix applications.

We did not plan to spend a year constructing our "congenial" environment; it was forced on us by the incomplete and unintegrated tool set available to us. As applications developers in a commercial environment, the pressure was on us to produce a marketable system. It was with great difficulty that we presented reports, month after month, stating progress on "screen I/O methodologies" and "database integration," rather than on policy management and accounting systems. We simply had to resist the pressure to just start writing code. We had to build, acquire, or integrate the tools that would enable us to build our system.

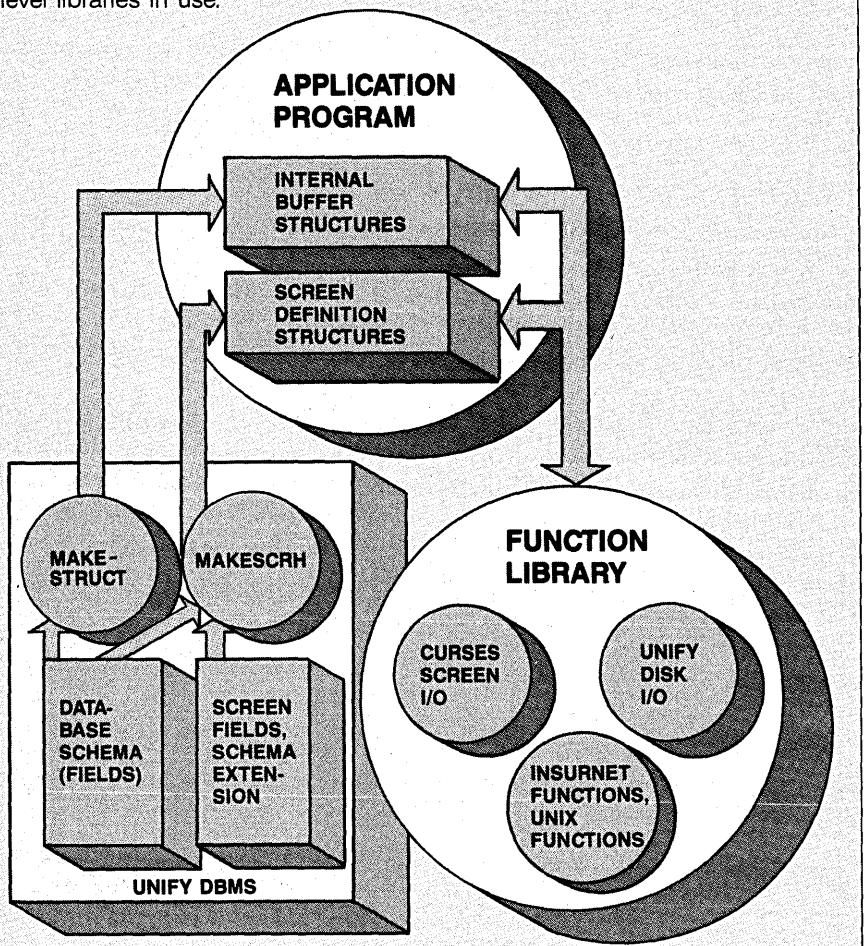
Ironically, the creation of what amounts to a higher-level language, shielding the programmer from the complexities of Unix/C without sacrificing programming power or efficiency, was possible only because of Unix's malleable nature. We were able to use Unix/C to create an environment that appears to the programmer as "not Unix/C."

We wanted to create a "not Unix/C" environment because the average commercial programmer is accustomed to working with very high level I/O and intrinsic functions, and is often unacquainted with such C language features as address pointers, registers, and bit manipulation. We had two choices: to hope we'd discover the existence of a pool of highly trained C programmers who would want to work on insurance applications; or to create an environment in which programmers already involved in insurance applications could work effectively. For obvious reasons, we chose the latter.

Our decision to use Unix was supported by business considerations: Insurnet's software and hardware would then be compatible with that of Quotron Systems Inc., our partner company. Having decided to cast its fate with Unix, Insurnet was partially aware of the difficulties that the Unix environment would present. The memo that launched the Unix project noted that "programming in C is more difficult than programming in BASIC," but assumed that those difficulties could be minimized due to C's ability to look like other languages. We did not realize the extent of the transformation that would be necessary.

INTEGRATING THE APPLICATIONS ENVIRONMENT

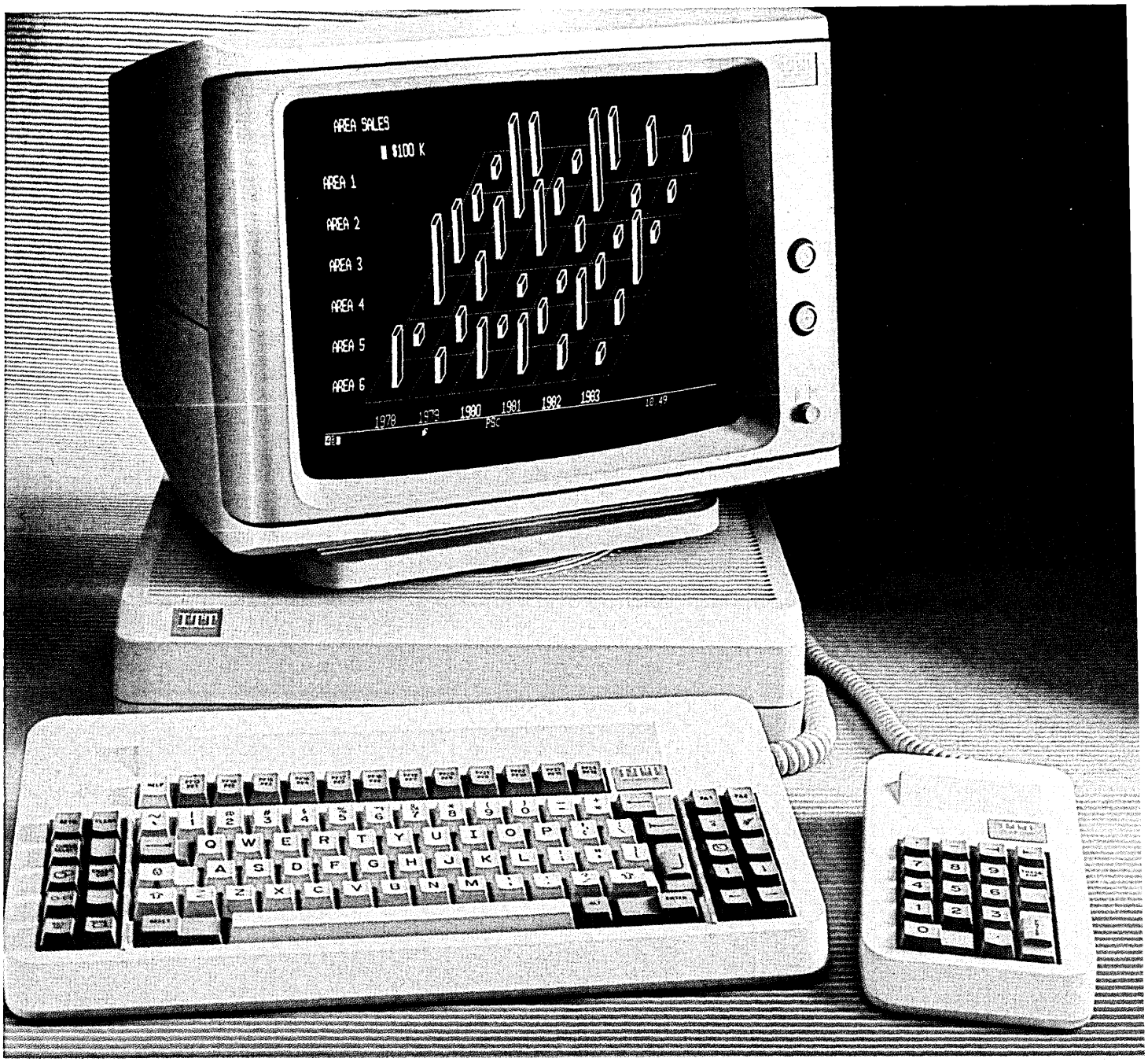
Insurnet programs (makestruct and makescrh) link the Unify DBMS to the applications programs. The function library coordinates the separate, lower-level libraries in use.



ATTEMPT TO AVOID USING C

In an attempt to match the C language to our existing Pick-trained programmers, we began by forbidding the use of C's assembly language-like capabilities such as bitwise operators, register variables, and address pointers. In other words, we were attempting to avoid programming in C. The folly of this approach became clear as members of the team became more proficient in C and began to sneak "forbidden" code into their programs. Without giving up our goal of creating a higher-level environment, we had to admit that simply trying to ignore a good portion of the C language was fruitless.

Even after accepting C as the language of choice, we continued to face major hurdles. First, team members had to retrain completely. Senior programmers who considered themselves to be highly skilled had difficulty writing the types of programs they had previously considered to be routine. Programs failed and could not be debugged because we didn't know enough Unix/C internals. Brian Kernighan, one of the authors of the C language, has said, "Much of the C model relies on the programmer always being right . . . the amount of freedom provided in the language means that you can make truly spectacular errors, far exceeding the relatively trivial difficul-



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A team of highly motivated, dedicated individuals was indispensible to the success of the project.

ties you encounter misusing, say, BASIC."*

Secondly, C is a language with a very small set of keywords and intrinsic capabilities. The final working syntax is achieved piece by piece, by the writing of functions. This means that any one programmer is highly dependent upon the output of another. This loss of self-sufficiency is a formidable obstacle for programmers experienced in a language with a more fixed set of capabilities, such as COBOL.

We found that the formation of a cohesive team of highly motivated, dedicated individuals was indispensable to the success of the project. Also crucial to the project was the understanding by senior management that immediate productivity was not the hallmark of success in such a lengthy, ground-breaking project. Only with senior management's clear recognition that the team had to be insulated from normal business pressures for some time could a project of this nature be attempted.

Unix, as a general purpose operating system, does not come with "built-in" database capabilities. We knew from the outset that those capabilities would have to be imported into the Unix environment. Without a DBMS, our programmers could not accomplish the most central task in our on-line, interactive system: getting an operator's entry from a crt and storing it on a disk.

Initially, we had planned to write our own DBMS, thinking it unlikely that any single DBMS would meet Insurnet's requirements. We soon realized, however, that time restrictions and our limited in-house expertise would make it more practical to purchase one. We examined several and chose Unify from Unify Corp., Portland, Ore., because of its superior performance and substantial C language interface. As a provider of turnkey systems, we were looking for a DBMS that not only could be useful to our end users, but that was also designed primarily to be used by programmers. Unify, offering speed and a library of C functions, was a logical choice.

TWO TYPES OF TOOLS NEEDED

While we were selecting a DBMS, we also realized that we needed two different types of tools to complement its facilities: those that would help manage the environment surrounding the application programs and those that would provide specific capabilities lacking in C. After reviewing the available products, we chose to use the following:

- a library source code control system (SCCS);
- a facility for maintaining and regenerating executables (make);
- a spooler (multiple device queueing system or MDQS); and
- a screen I/O management library (curses).

(SCCS and make are traditionally delivered with the Unix operating system. MDQS is a public domain spooling system. Curses is available as part of Berkeley Unix and in Unix System V, release 2, from AT&T.)

At that point, it seemed as though we had all the pieces we'd need to construct our system. We were very much mistaken, however. Though we found each tool to be thoughtfully designed, horrifying difficulties arose when we tried to use them together. Integration became our primary focus.

Our first task was to develop a workable screen I/O methodology. We were determined to have the features offered by the curses screen I/O library: optimized cursor motion, physical terminal independence (terminal capabilities library), and multiple windows. The Unify DBMS screen I/O functions did not offer these capabilities. The lack of optimized cursor motion was particularly troublesome, causing Unify screen operations to be unnecessarily slow on our 1200-baud remote terminals. The solution was not quite as simple as substituting some curses functions for Unify functions. Because their libraries were incompatible, the two sets of functions could not even be loaded together.

Since efficient cursor motion was considered essential, we completely abandoned Unify screen I/O. In doing so, we relinquished a substantial portion of the C language interface that was to present a high-level syntax to our programmers. We were back to the central problem that had led us to purchase a DBMS in the first place: writing a program to get an entry from a crt and store it on a disk.

To further complicate matters, Unify was not configured to handle a data dictionary as big as ours. While we were able to modify the DBMS to accept the entry of a larger dictionary, a limitation in the PDP-11 compiler then in use made it impossible for us to compile any program that used the data dictionary.

At that point, we knew we had no choice but to build an environment to our own specifications. We knew we did not have two years to rewrite the available tools. The dilemma was how to modify the environment without having to rewrite the heart of any single tool.

When we described our problems and the solutions we were using to our counterparts at Quotron Systems, they described our approach as "building tunnels and bridges." The analogy was perfect: we went around or over tools that we could not use, and connected one tool to another where we wanted to use them together.

To date, we have developed complete systems for data entry and validation, database updates, report output formatting, and interaction with a multiple device spooler. Because the steps involved in data entry are so crucial to our application, we will describe how we solved this particular problem.

We began with an extension to the Unify data dictionary. The standard dictionary stores only a limited set of information about a database field. To that set we added data-defining information we felt was needed for complete data entry and validation.

First, the Insurnet edit type determines the data validation function that will be performed on the entry, such as edits for telephone numbers, zip codes, pattern match, and table lookup. In addition, an operator help message is stored, along with information that provides additional on-line operator help facilities such as searches for customer numbers and lists of all drivers and vehicles on automobile policies. For each data field, an Insurnet edit type is stored. When the field is entered by an operator, the predetermined validation function is performed.

EXTENSION SERVES AS BRIDGE

In this way, the data dictionary extension serves as a "bridge" between the DBMS and our own data validation functions. (Ideally, a bridge such as this should be built into the design of a DBMS, permitting the application developer to specify locally defined data types and/or validation functions.)

Secondly, we built a bridge between the DBMS and the application programs. Theoretically, the buffer variables used in application programs should be shielded from changes in the database. This question of program data independence is especially acute in the case of a language like C, where the internal data type of a field may change as the result of a change to the data dictionary. In order to link the programs to the data dictionary automatically, Insurnet has written software that creates internal buffer variables that are consistent with data dictionary definitions. The variables are declared in a header file and, once the header is included in the program, the programmer is presented with a set of internal variables that are of the correct data type and in accordance with Insurnet naming conventions.

Another element in our data entry method is a program that interconnects a

*Johnson and Kernighan, "The C Language and Models for Systems Programming," Byte, August 1983.

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Whether or not Unix can now move into the general commercial world is the question.

screen form (produced with Unify's SFORM facility), the data dictionary, and the dictionary extension. This program creates structures, one for each field on a screen, which are then included in C programs. Information stored in the structure includes the field's input position, data type, length, Insurnet edit type, and on-line help facility data. A single data entry function interacts with this structure, accomplishing program-independent data validation.

The basis of the applications environment is our function library. The library provides the commerical programmer with the means to accomplish the majority of business programming tasks by using a syntax that is both simple and descriptive. In addition to the work of data entry and validation described above, the high-level tasks accomplished through library functions include data retrieval and display, report formatting, the management of updates, and interaction with the spooler and other output devices.

These "high-level" functions interact, in turn, with other function libraries such as those of Unify and curses. In doing so, our function library shields the programmer from the specifics of disparate, lower-level libraries. The high-level functions integrate the individual libraries that are in use, coordinating their conventions and syntax. The patchwork nature of the environment—the fact that it rests on the use of multiple, unrelated tools—is not apparent to the programmer.

The result of our efforts has been the creation of a high-level environment suitable for use by commercial programmers in the construction of complex business applications. Using this environment, we have successfully produced a number of prototype subsystems and are currently in the process of coding production applications.

That it is possible for us to produce such applications code in a timely fashion with a staff that has been self-trained in Unix/C is the measure of our success. We have built an environment in which an applications programmer can progress from database schema design through coding of the source program in an orderly and standardized manner.

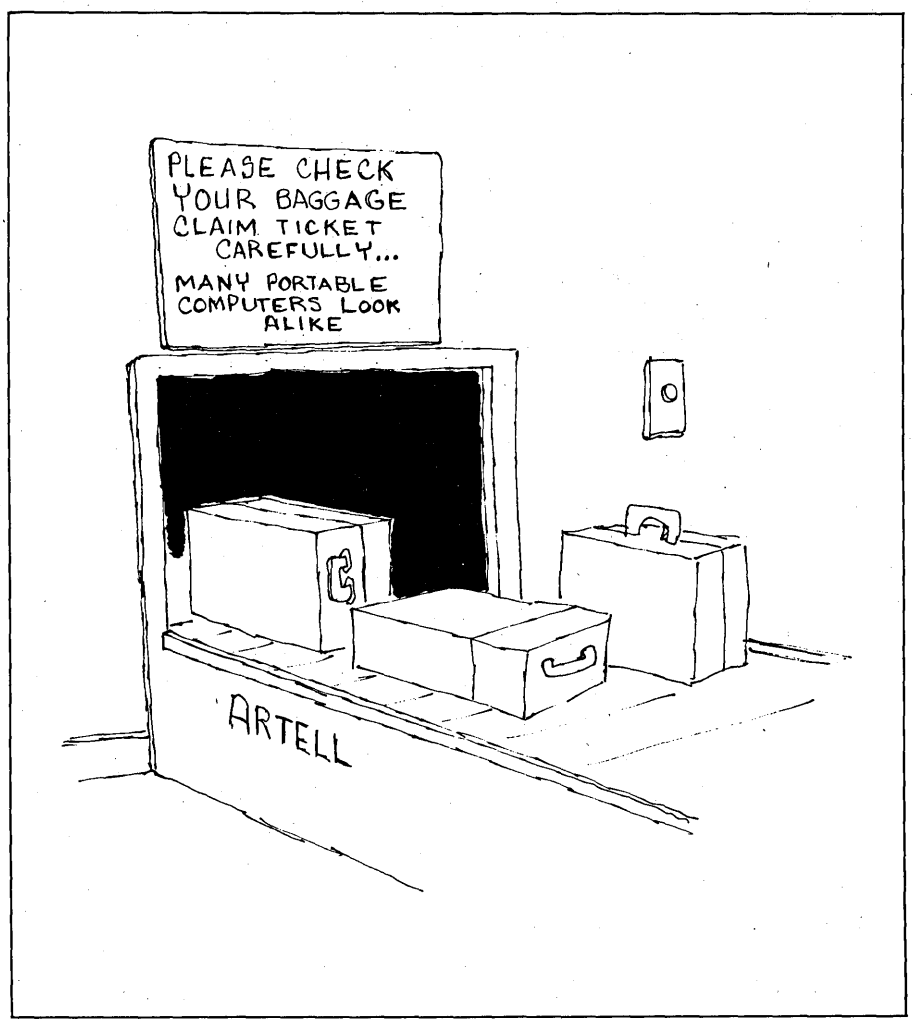
The steps involved are:

- enter/change database schema; enter/change dictionary extension; reconfigure database;
- create program buffer headers;
- enter/change screen layout; create screen header;
- construct source file, using program template and function library.

Our experience over the last year and a half has enabled us to define the following capabilities as requirements for a high-level environment:

- data dictionary capabilities that permit the applications developer to specify additions to the set of data-defining information;
- sophisticated screen I/O capabilities, including cursor motion optimization, multiple windows, physical terminal independence, and video attributes; ability to interact with the data dictionary of choice; ability to specify screen field-defining information;
- database storage and access capabilities that do not strain under the weight of large databases and complex data relationships;
- a function library that may be expanded;
- integration of capabilities so that the application programmer sees only a unified appropriate tool set.

While Unix is the leading candidate for the operating system of choice in the fast-moving world of multi-user supermicros, whether or not it can now move into the general commercial world is the question. Its success depends on its acceptance by the business data processing community. Our efforts are proof that it is possible today to create commercial applications under Unix. ◉



CARTOON BY MICHAEL ARTELL

Ellen Ullman is a writer and senior systems programmer for the Advanced Product Line at Insurnet. Formerly the Insurnet product manager, she earned a BA from Cornell University.

Jerry Carlin is director of systems programming, Pick and Unix Operating Systems, Technical Division at Insurnet. He holds an MA in psychology from Sonoma State College, Calif., and an MA degree in chemistry from Clarkson College, N.Y.

Page Thompson was formerly director of Unix Applications at Insurnet, and is currently an independent dp consultant. She holds a BA in English literature from the University of Minnesota.

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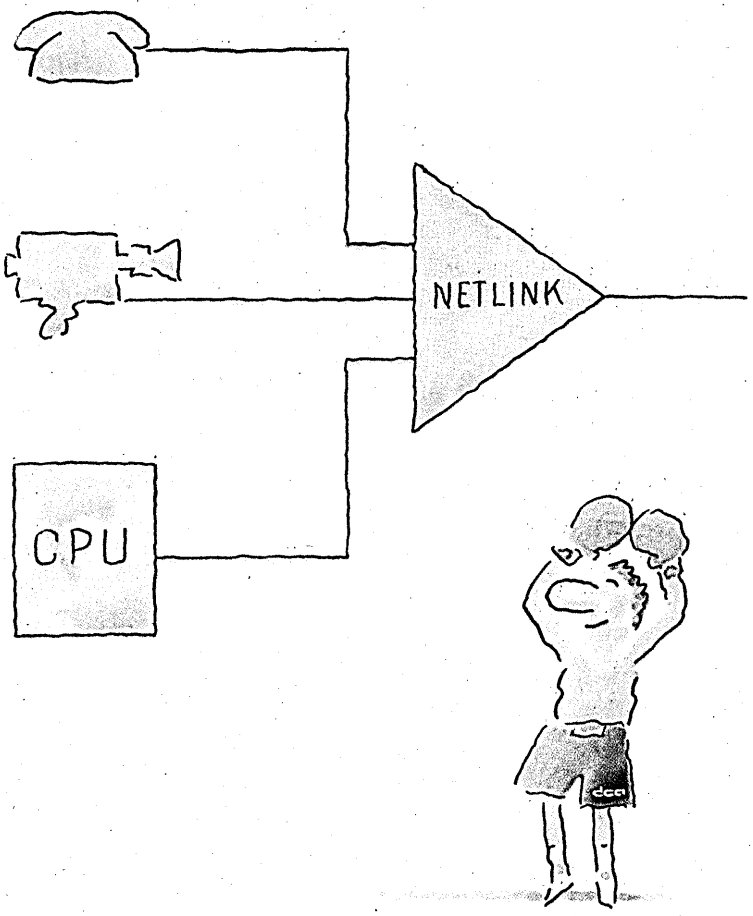

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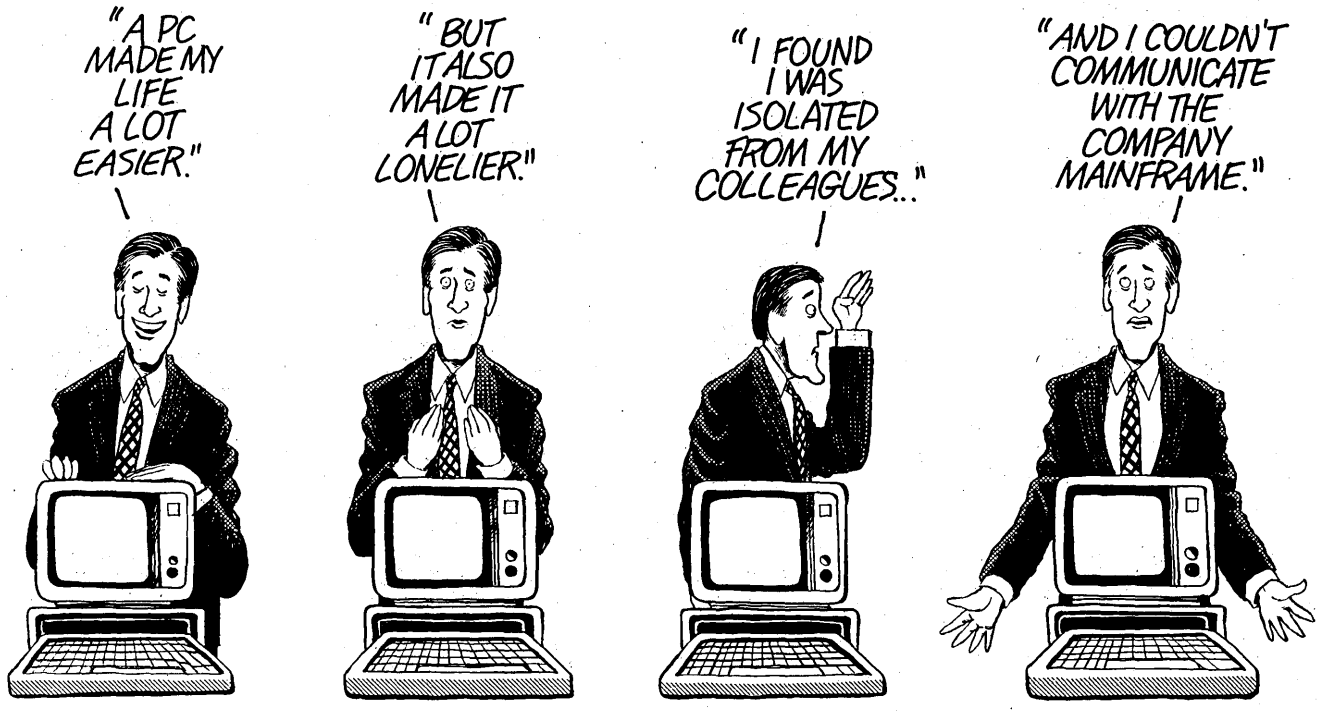

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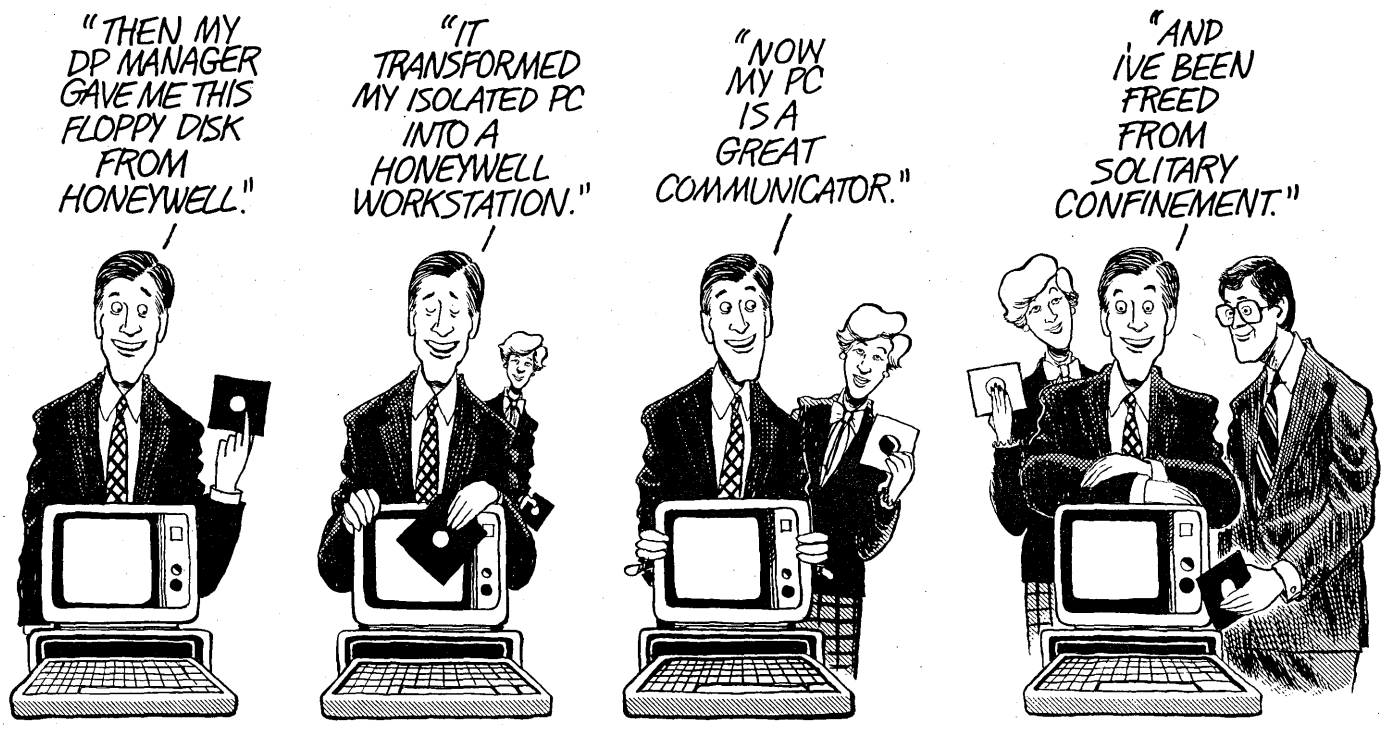

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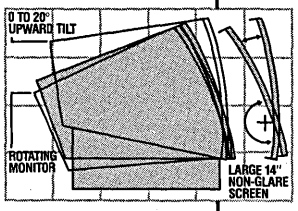

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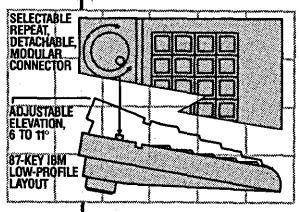
Even more, depending upon your system's requirements, the CIE-7800 is available with concurrent alternate personalities, such as DEC® VT100, IBM 3275/3276-2 (bisynch single station) and HP® 2622A, while still retaining IBM 3178/3278 capability.



The CIE-7800 is, indeed, setting whole new standards for the industry. It's a terminal that could come only from manufacturing experience and the financial resources of C. Itoh & Company Ltd., with over $60 billion in sales throughout the world.

To learn more about the CIE-7800, just contact our exclusive sales representative, Alternative Channel Marketing, Inc. Call toll free 1-800-854-5959. In California, call 1-800-432-3687. In Europe, phone (022) 29-8384.

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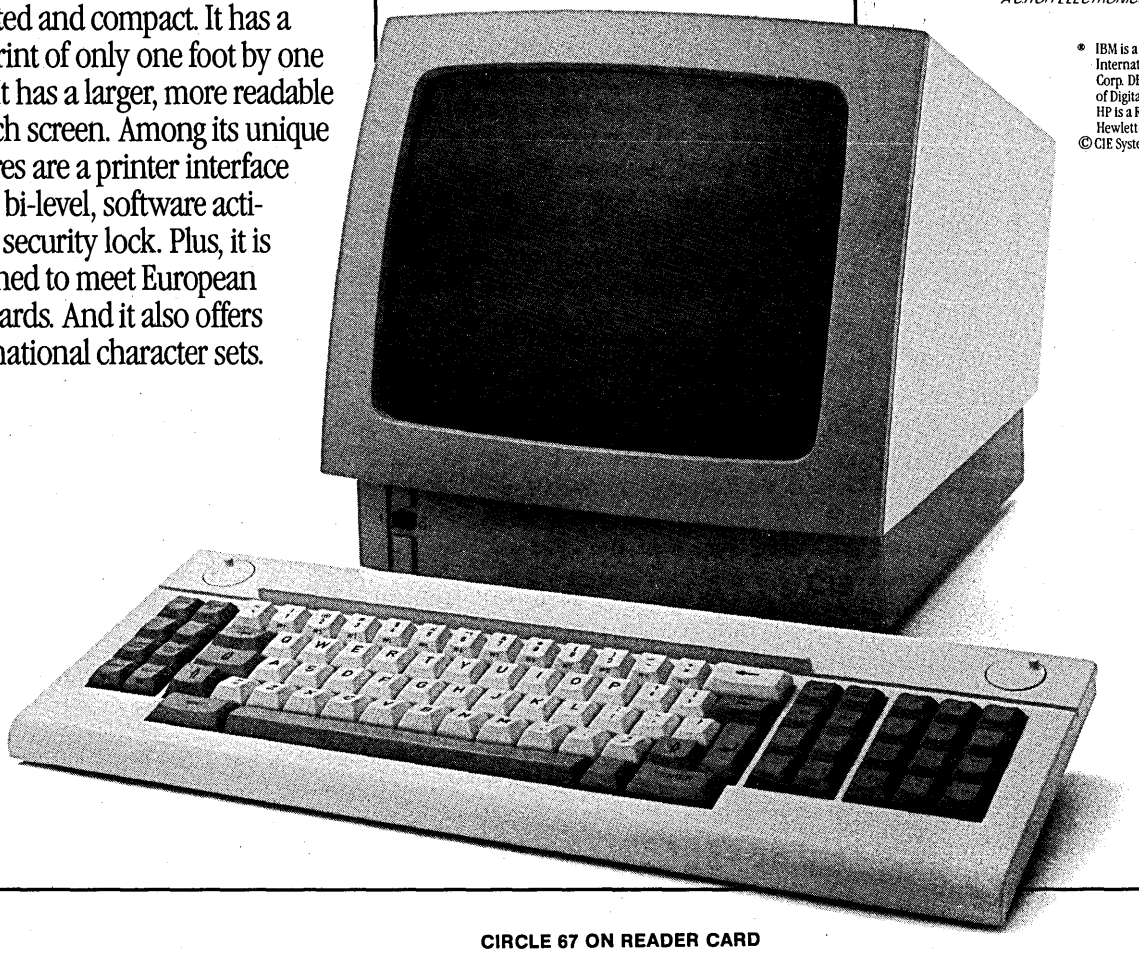

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CIRCLE 67 ON READER CARD

PEOPLE

PANCAKES AND PC BOARDS

Albert Wong, Safi Qureshey, and Thomas Yuen believe very firmly that three heads are better than one—when the heads are theirs.

The trio of 33-year-olds are the A, the S, and the T of AST Research Inc. of Irvine, Calif., a company that in three years has parlayed the IBM PC add-on market from nothing into $63.8 million in revenues for FY '84, which ended June 30.

"Together, each of us is one third of what we are, but separately none of us would be even one tenth," says the affable, outgoing Yuen, appropriately enough the company's vice president of marketing.

All three hold degrees in electrical engineering, but they have divided the company's functions according to character traits. Qureshey is president and is responsible for operations and planning. Wong is vice president in charge of manufacturing and engineering. Wong also is secretary and Yuen, chief financial officer. "We had to put something on paper," Wong says.

Hong Kong-born Wong came to the U.S. in 1969 to attend Orange Coast College in Costa Mesa, Calif. Yuen arrived there a year later from Hong Kong. "We never had any classes together," Yuen recalls. "But it was a small school. We met socially and became friends, maybe because we were both from Hong Kong."

"I'm a loner," says Wong. "I was living with a host family. I had a room and Tom was sharing an apartment. I got lonely and when a vacancy came up in Tom's apartment, I moved in."

Pancake breakfasts served by management are among the perks offered employees of AST Research Inc.

Subsequently, Wong went on to California State University, Fullerton, and Yuen to the University of California, Irvine, but since the two schools are close, they remained friends and saw each other regularly.

Both Wong and Yuen came to the U.S. with the firm intention of remaining here. "America is the land of opportunity," says Wong. "Hong Kong has everything, but there are a lot of people, and competition is extremely keen."

With Yuen the issue was "freedom and fairness. In other countries there is an unfairness in how business is conducted."

While Wong was an electrical engineer from the start, Yuen began in mathematics and switched to civil engineering before he set his EE goal.

In the meantime, Qureshey had come to this country from his native Pakistan in 1971 to attend Oklahoma State University because "friends from Pakistan had gone there." Shortly after he arrived at the school, OSU raised the out-of-state tuition fees for foreign students. "Out of economic necessity I left and went to the University of Texas." He graduated from UT with a BSEE in 1975.

Unlike Wong and Yuen, Qureshey intended to return to his native country after completing his education. "I guess Pakistan is very nationalistic. When I

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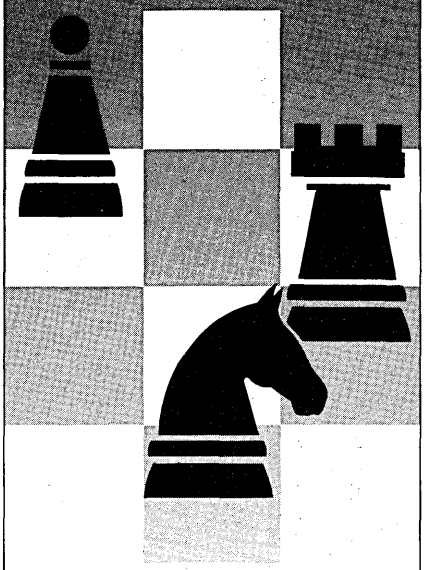

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PEOPLE

graduated, though, I found that I couldn't apply there what I had learned here. I had friends who went back and took jobs with power companies."

Qureshey's first job after college was with AM International's Documentor Sciences in Santa Ana, Calif. From there, he went to Telefile Computer and Computer Automation. At about the same time that Qureshey started with Documentor, Wong started with Datum Inc. in Anaheim.

Yuen went the big company route. "I had several job offers after I got my degree," he says, "and I took one from Hughes Aircraft Co. in computer graphics at their Oceanside, Calif., plant. I thought it offered stability and job security. That was very false. Six months later there was a major layoff, and the staff was cut by one third at my plant. I was last in and first out. It was very disheartening and was a turning point in my career. I decided a big company was too impersonal and I wanted something more human oriented."

That people orientation is something for which all three founders are striving at AST Research. In growing from three to 325 employees, the company has lost less than 2% of its workers. It offers such perks as surprise bonuses, vending machines that require no money, and regular pancake breakfasts for which management shows up at 6:30 a.m. to serve the employees.

"We'll never have layoffs just to adjust the financials," says Wong, who never worked for a large firm. "I heard enough about life in big companies from Tom and when I was a waiter in college during massive layoffs in the aerospace industry. I'd see guys spending all afternoon in the bar talking about how they'd been doing their jobs for 10 or 20 years and suddenly were laid off."

Yuen continued with a string of large companies. From Hughes he went to Computer Automation, where he stayed for 3½ years. He left to join Sperry Univac's minicomputer operation for a bigger salary and a better title, but "I soon learned that it was not what I thought it would be. I learned nothing technologically but I learned a lot about the structure of a large organization." After one year he returned to Computer Automation for a year and a half stint. During the first few months, he met Qureshey.

"Tom was one of my interviewers," recalls Qureshey, who joined Computer Automation from Telefile.

"It was just because my boss didn't have technical know-how," says Yuen. "We were of equal rank. We were both test engineers. We soon learned we had the same beliefs and goals, maybe because we were both foreigners. We both worked hard, stayed late, and talked a lot."

At the same time, Yuen and Wong were meeting and talking regularly. "I'd talk about Safi to Albert and about Albert to Safi," Yuen says, "and I'm sure each was wondering who the other guy was."

They had an opportunity to find out when a friend of Yuen's at Computer Automation started a company on the side and needed some electronic equipment to be developed. Yuen decided he and his two friends could do the work during their spare time. "We found we worked well together. There were many sleepless nights and meetings every other day at my house. It was design work, paper work," Yuen says.

And so AST was born, first as AST Associates and then in 1981 as AST Research. The new company was at work on its first big consulting contract designing a local area network when IBM announced its PC. "Tom believed immediately that this product was for the office, not the home, and that this was where our product focus should be," says Wong.

AST had its first product, an add-on memory board for the IBM PC, on the market within a month of the PC's announcement. They were first with a mainframe-to-micro link for the PC. Today they estimate they have 34% of the IBM PC add-on market with 15 products.

"We believe we have a balanced approach because we are such different characters," says Yuen. "Albert's quiet and meticulous, I'm outspoken and emotional, and Safi is more philosophical. Safi looks into the future for us."

In July of 1983, the company went for its first outside money. "You can rely on your own resources just so long," says Yuen, who tends to do most of the talking for the three. "It was easier than the first money we raised by mortgaging our three homes for $50,000. That took two months."

The primary reason they went out for venture capital was for industry contacts, Yuen says. "We didn't know the key industry people." Now, they're about to go public in anticipation of further growth. From offices in Yuen's home they've expanded to 153,000 square feet in two buildings, a headquarters building, and a second facility acquired from Sperry—the same Sperry facility in which Yuen once worked.

Whether they keep up their torrid pace is up to the marketplace, and Yuen says he and his friends have no specific goals for their growth. "How far will AST go? I don't know. We'll find out. And if we get too arrogant, we'll be told by the market."

—Edith Myers

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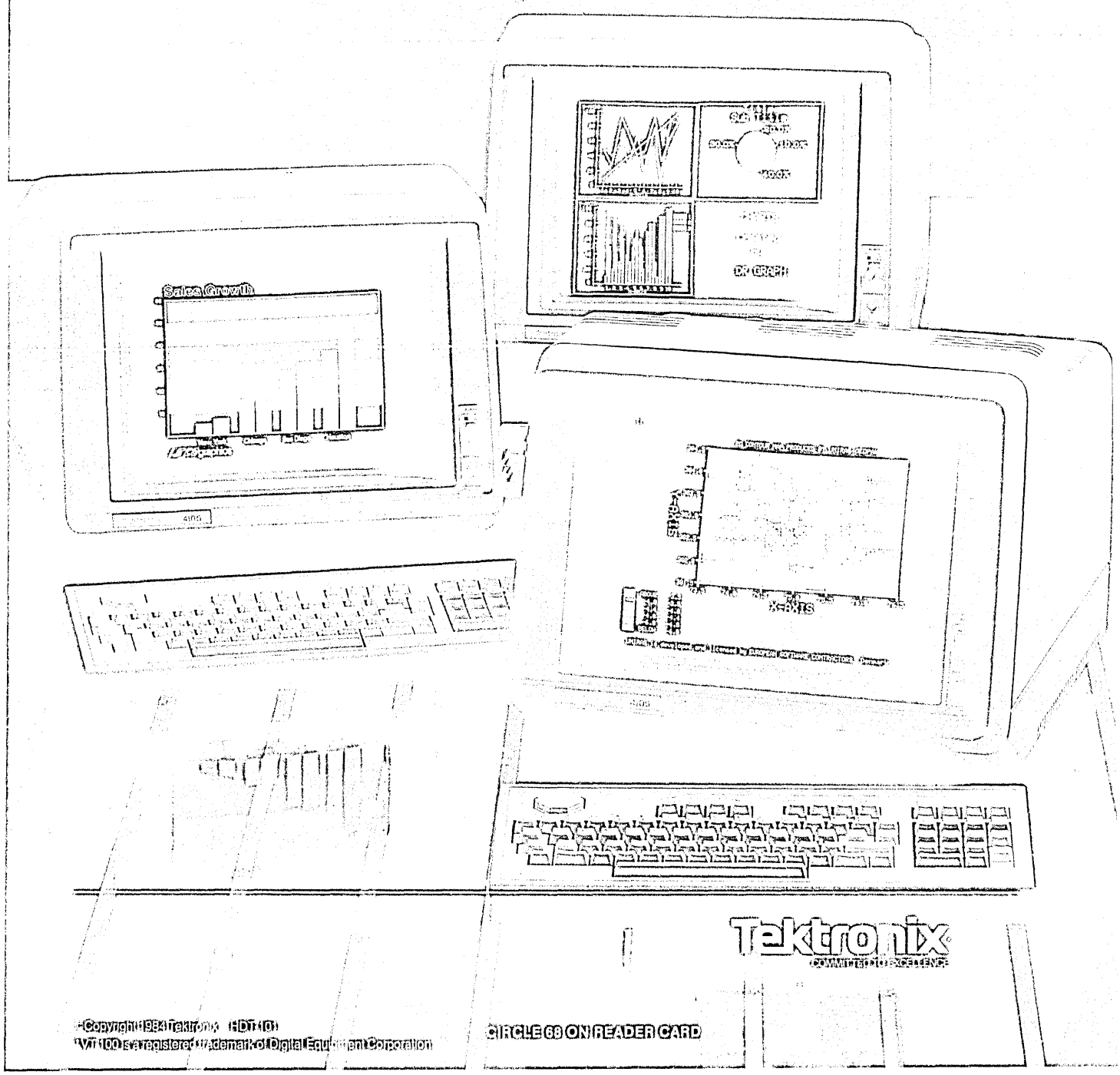

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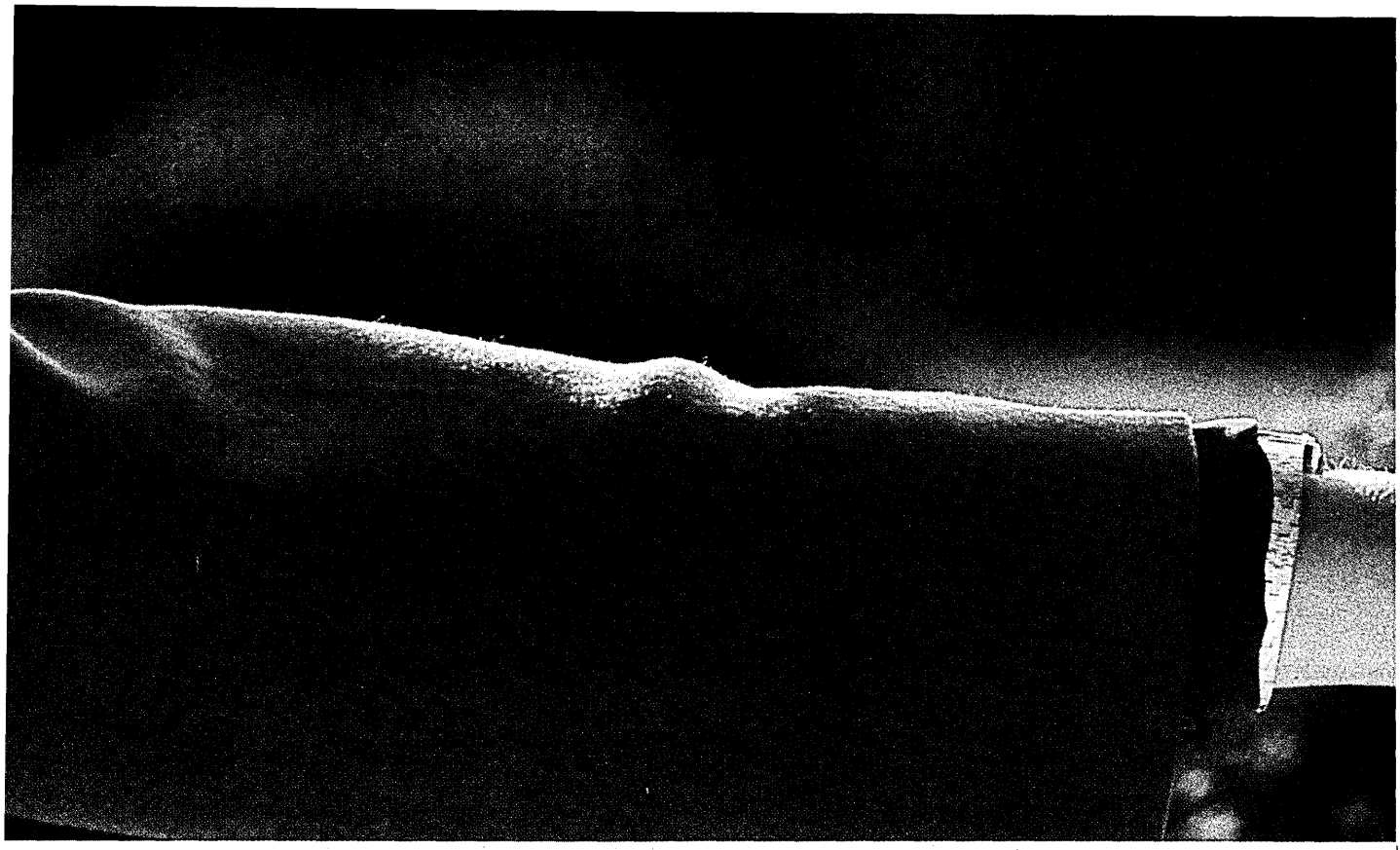


"THE KEY ELEMENT IN OUR WORLD IS COMMUNICATION. AND DIGITAL'S VAX IS TYING THE AVON WORLD TOGETHER."

Frank Giannantonio
Director of Information Services
Avon

There are few companies that understand the critical importance of communication better than Avon. So when it came time to choose an office automation system, the company evaluated all three leaders in the field.

The ground rules were these:

The system would have to use personal computers as universal workstations, for professionals, managers, secretaries and administrative staff alike.

It would have to network the variety of computers made by other companies which Avon was already using.

It would have to be elegant both in physical design and in ease of use.

The one system that perfectly matched Avon's needs was Digital's VAX™ computer – the best-selling 32-bit computer in the world – with ALL-IN-1™ office management software.

"IT DOES EVERYTHING WE WANT IT TO: PERSONAL COMPUTING, OFFICE AUTOMATION, EVERYTHING."

Frank Giannantonio explains. "The key was this: were we able to do more with this system than any other one? Would it let us communicate with our other systems better than any other one? And the answer both times was 'Yes.'"

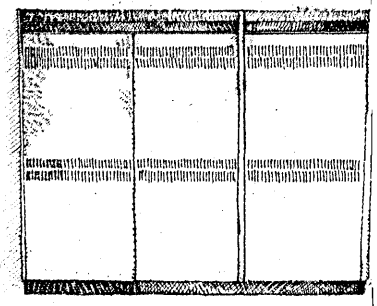
The 200-plus employees linked to the system at the Rye, N.Y., data processing headquarters have access to every function necessary to do their jobs effectively via a single workstation at each desk.

A plain English, menu-driven format appears on screen, so people can incorporate time-saving applications into their daily work routine. These include, among others, word processing, electronic mail, desk management tools and graphics.

Giannantonio elaborates. "You can come in in the morning, turn on your personal computer, and go right into the ALL-IN-1 system. From any of the various kinds of personal computers we use.

"The communications capabilities are very significant."

In addition to enormously enhanced individual communications capabilities, VAX computer



power makes a vast difference in the way people communicate with each other. For example, scheduling meetings.

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"You don't have to call up somebody and say, 'I'd like to reserve the conference room.' It gets done automatically. The secretary just keys it in, and checks the time against everyone's schedules."

"PRODUCTIVITY GAIN IS JUST ABOUT 53%."

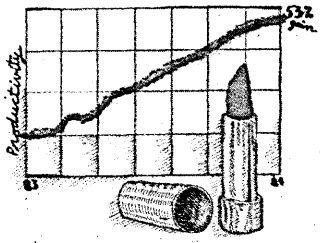
Menus and operating commands for these and other applications have been engineered in a consistent format, often requiring just two keystrokes to complete a function. Tasks can be performed without interruption. In preparing reports, for example, users can reference a chart on screen and then return directly to the report.

Not surprisingly, with fewer interruptions and immediate access to important information, the VAX system streamlines office efficiency.

To put it simply, Frank Giannantonio says, "People are becoming more productive."

Avon conducted a test to see just how much more.

Among professional and managerial personnel, productivity increased approximately 23 percent. Among secretarial



and administrative staff, the increase was even more dramatic, at 53 percent.

Those kinds of savings alone might have justified the cost of putting a VAX system to work for Avon. But there was more involved in the company's decision.

As Frank Giannantonio says, "We did not even consider the indirect savings from the productivity gain as cost justifications. They were added benefits.

"We used only the direct savings. And the direct savings amounted to a return on investment in one year.

"That's just about $1 million."

"I CAN QUICKLY GET INFORMATION TO PEOPLE – AND JUST AS QUICKLY GET IT BACK."

There are other savings that are harder to quantify. "Like the fact," Giannantonio says, "that now I get information sooner. Which means I can make decisions sooner. Information flows very quickly – very quickly."

Some Avon managers are connected to the VAX system from their homes. So if they've been away on a business trip or a vacation they can key into the system and know what's been happening even before they come back to the office. No more wasted time trying to catch up.

Time itself is being redefined. Through DECnet™ networking software, Avon plans in the very near future to link its Rye headquarters and domestic branches with its overseas offices. One of Avon's London managers was quick to see how a VAX computer could make the difference in time zones between his office and New York work to Avon's advantage.

"His first comment when he saw the system," says Giannantonio, "was 'I now have the opportunity to prepare a lot of information for New York during the first five hours I'm in, so that when you come in, you'll instantly know exactly what's happening in the European area.'

"Of course the same is true," Giannantonio adds, "in every one of our other locations.

"This is a great vehicle. It's going to bring our international companies closer to the home office. It's going to tie the Avon world closer together."

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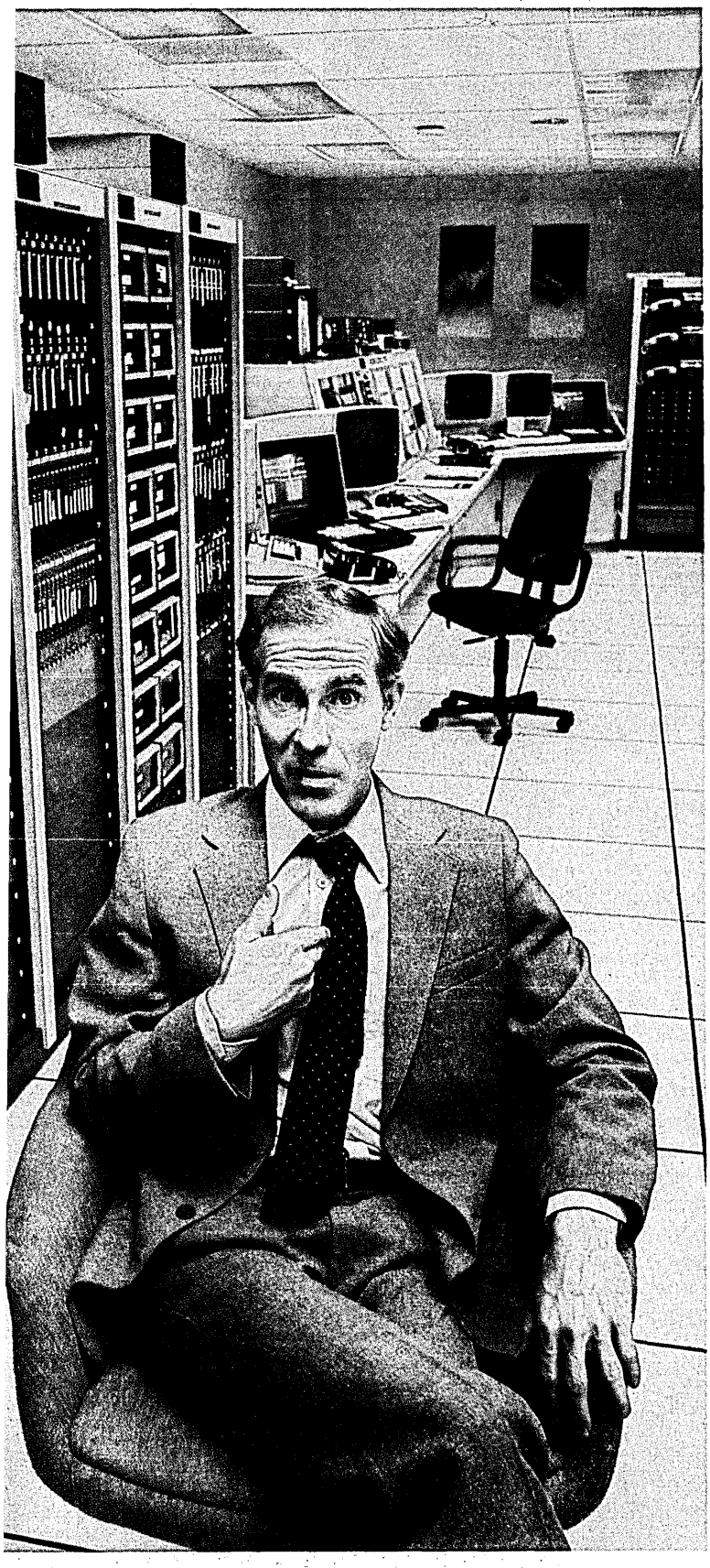

With the new Environmental Data Acquisition and Control System (EDACS) from Computer Power Systems, it was easy. Because EDACS is fully programmable, he just specified all the aspects of his computer room environment he wanted to monitor and control (like electrical power, security, life-safety, air conditioning, fire or water detection, etc.) and custom-designed his own system.

Once on-site, the EDACS user can even do additional programming as his system requirements expand. One example: new halon zones can be added to EDACS as required.

A FRONT-END PROCESSOR: Programmability and computer room monitoring/control are only the beginning. The same microtechnology that runs your computer runs EDACS. This means that the crucial environmental data monitored by the system can be instantly formatted into management reports (via a desktop monitor or printer) for the ultimate in computer room control. It also means a constant flow of fresh information between EDACS and your computer for real front-end processing of all the external factors affecting DP operations. Result: more uptime, fewer headaches, greater productivity, maximum control.

UTILITY COSTS, TROUBLESHOOTING: Two examples of what EDACS can do for you. It can trim your utility bills. The EDACS management reports tell you precisely how much power your computer system is using. At peak power periods, these reports can help you decide which non-essential peripherals to temporarily shut down so that power usage falls below maximum allowable levels. This will save you a bundle on power costs.

Everybody has power problems. But many such problems don't require a service call. With EDACS, an interface between your computer and the manufacturer's remote diagnostic center can instantly diagnose power problems and, many times, on-site corrective procedures can be taken. Result: less downtime, fewer service calls.

ONLY THE BEGINNING: EDACS is now available with our new Series 4000 family of power peripherals. To find out how the industry's first environmental data acquisition system designed specifically for computer rooms can help your DP operation, call Bob Miller at 213-515-6566.

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CIRCLE 69 ON READER CARD

HARDWARE

OFF-LINE

Zilog Inc., an early entrant into the Unix marketplace, has introduced Series Two of its System 8000 line of supermicrocomputers. In an effort to gain more attention and improve sales in this saturated market, Zilog has upgraded the 8000 line to offer better price and performance. The Campbell, Calif., subsidiary of Exxon says these machines run at nearly double the speed of its current line. The primary target for Zilog's marketing efforts is still the nation's largest firms, vars, and oems.

The Series Two consists of three 16-bit models, all with a cache memory: the 32, 22, and 12. The 32 and 22 can each handle up to 40 users, and cost $30,000 and $24,000, respectively. The 12 can accommodate up to 16 users and is priced at $21,000. Zilog is also selling more software for both the new and old 8000s, including database management, spreadsheet, word processing, and graphics applications.

Certainly, Zilog's challenge in selling the line is to beef up its public image. The first 8000 was among the fastest engines in its class when it was introduced, but it was hurt by a lack of attention-grabbing marketing. Price, features, speed, and software will all help sell the new line, but the company still lacks the pizazz needed to attract new buyers.

Fall is traditionally the time for students to return to the classroom. Futurists predict that schoolchildren will very soon have to know some programming language and how to use a computer in much the same way older generations had to learn a foreign language or take a shop class. Others suggest that the idea of computer literacy is a hoax, and that students merely need to learn how to type. Either way, it seems clear that a child's future now depends at least in part on her familiarity with computers. Yet who will see to it that all students have the chance to work with computers? Ed Lee, ceo of Pro-Log Inc., the STD bus maker in Monterey, Calif., argues that the onus lies with America's schools to ensure that all students have equal access to computers.

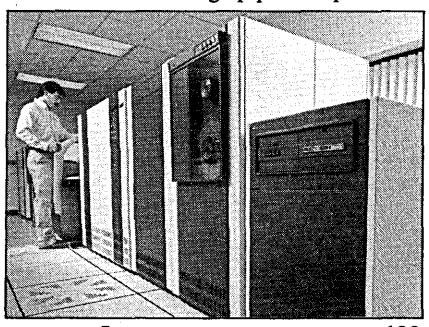
A survey conducted by the University of Minnesota warns that the "growing disparity in computer literacy can lead to polarization of economic and social groups segregated from interaction with the computer. Reducing the inequity in access to computers is the greatest challenge for learning and living in the information age." The study went on to say that because of the computer's complexities and multiple functions, its rapid diffusion into society produces a "knowledge gap." The survey, funded by Control Data Corp., reveals that in Minneapolis and St. Paul, home computer usage was highest among college educated, white-collar workers living in suburban areas and making more than $25,000 a year, while the lowest usage was among city dwellers with less education and annual incomes under $15,000.

Clearly, says John Anderson, director of the university's Center for Social Research, there is a definite link between income and computer ownership. "Not only are the poor deprived of a tool, but the children in these homes do not have the computer literacy advantage that is available to children in wealthier households," he says. The disparity in access to computers at home and in school is widening the gap between wealthy and poor families, recalling many of the education issues of the 1950s. Then, unequal access to facilities was struck down by the Supreme Court because of race; now, economics threatens to segregate schools because of computer literacy.

SUPERMINICOMPUTERS

This vendor has added two midrange superminicomputers to its line, the Prime 9650 and 9570. Both products have advanced diagnostic processor subsystems and support all Prime 50 Series communications and peripheral devices. The machines operate under the Primos operating system and are designed for use in interactive transaction processing, computation-intensive scientific and engineering applications, timesharing environments, and CAD/CAM/CAE.

The 9750 has ECL circuitry combined with a five-stage pipeline cpu archi-



tecture. It can support up to 128 terminals and 255 interactive processes simultaneously. A typical packaged configuration includes 48MB of memory, two 315MB fixed media disks, a 1,600bpi streaming magnetic tape subsystem, a crt console, and the operating system.

The 9650 utilizes a custom gate array-based processor and two-stage pipeline architecture. It supports up to 69 terminals and 255 interactive processes simultaneously. A typical packaged configuration consists of 2MB of memory, two 315MB fixed media disks, a 1,600bpi magnetic tape subsystem, a crt console, and the operating system.

Prices for a packaged configuration of the 9750 start at $250,000. The vendor's model 50 can be upgraded to a 9750 for $98,000. A packaged configuration of the 9650 starts at $145,000 with an upgrade package for the model 50 costing $52,000. PRIME COMPUTER INC., Natick, Mass.

FOR DATA CIRCLE 301 ON READER CARD

HARDWARE

TIME AND ATTENDANCE

TASS is a time and attendance system for the IBM PC that automatically records actual hours worked, calculates overtime and fringe benefits, and profides clean payroll data transmitted to various automated payroll systems.

The system was originally developed for use with IBM's Series/1 computers, and is now available in a PC configuration. The vendor will supply all hardware and software for this turnkey system. It can monitor how people enter, leave, and move about within industrial, commercial, retail, public, and military facilities by using either coded electronic or magnetic identification cards.

Through the same card used to gain access to certain areas, employees clock in by inserting the badge into a reader near their work areas and clock out the same way. The system notes the time, date, employee information, and reader location as each badge is read, and builds an electronic time card file. An electronic time record report is produced by department. Once employee records are corrected by supervisory personnel, the data can then be transferred to an automated payroll system. It also generates a variety of personnel- and security-related reports. Prices for the personal computer version of this system start at $15,000. COMPUTER APPLICATIONS SYSTEMS INC., Boyton Beach, Fla.

FOR DATA CIRCLE 302 ON READER CARD

HARDWARE SPOTLIGHT

COMPUTER SECURITY

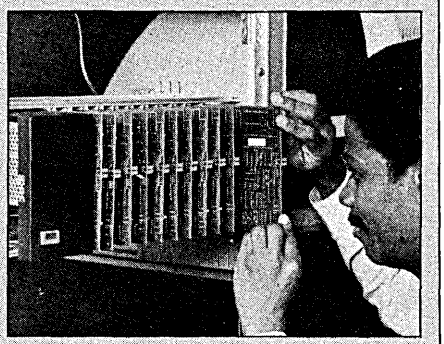
MultiSentry is a computer access control terminal offering security for large multiport data systems and computer networks. Totally software independent, the unit operates on the analog side of the host modem and allows only authorized callers to gain access to the modem. This prevents unauthorized users from easily identifying data centers by randomly dialing telephone numbers.

The product can handle up to 128 telephone calls simultaneously and responds to each call in less than a second, the vendor says. Each of the 128 lines has its own individual call-answer and callback circuitry. This allows callers to gain immediate access and avoid the inconvenience of waiting in a queue. The vendor says this device keeps unauthorized users out of a computer center while assuring that too many protocols and procedures do not penalize users with valid access.

In operation, the unit answers each call with a synthesized voice that prompts the caller for identification (a version with the voice speaking French is also available). If a valid access code is entered, it clears the caller for system access. If the code is invalid, the call is diverted and an alarm can be activated. MultiSentry can be accessed by either Touch-Tone telephones or by voice commands when using rotary dial telephones. According to the vendor, answering the call on the analog side of the modem with a synthesized voice thwarts hackers and others who are randomly looking for data centers through the use of an autodialer and a modem.

The security device will work with any multiport data system or computer network, and with any modem meeting FCC and Bell specifications, the vendor says. The product's response features three different access capabilities, which include direct connect, assigned callback, or variable callback, and a choice of two alarm modes.

In the direct connect mode, the caller is connected directly to the modem as soon as a valid code is given. In the assigned callback mode, the device calls a



preassigned telephone number associated with the valid access code entered. The variable callback mode requires the caller to give both a valid access code and the telephone number the call originates from. The unit then calls the number entered, connects the caller to the modem, and enters the number in its audit trail.

The dual alarm mode scheme allows the system manager flexibility in reacting to unauthorized access attempts. The soft alarm reduces the number of attempts a caller has to enter a valid code, and the hard alarm prevents any further access to the system. The unit allows the system security officer to enter as many as 1,000 access codes from any terminal, local or remote. Each access code can contain as many as 10 digits.

The product provides a hardcopy printout of its activity in real time. A full report of all calls entering the data center or an exception report of invalid codes, alarm events, and symbol changes can be provided. Actual access codes are not included in the printout.

The system is fault tolerant. Its database is stored in E2PROM, which means its nonvolatile memory will withstand power failure without loss of either security or configuration information. AC line filtering protects it from power surges. Also included in its design are redundant power units that assure a source of internal power. MultiSentry is modular in design. A 16-line configuration costs approximately $21,000. The average charge is $1,000 per line. T.A.C.T. TECHNOLOGY INC., Philadelphia.

FOR DATA CIRCLE 300 ON READER CARD

DIAL MODEMS

DialNet 3000 is a series of 1,200bps modems for full-duplex communications over the dial telephone network. Capable of supporting either asynchronous or synchronous devices, these modems include two dual-speed auto answer units, plus another dual-speed modem with directory-driven autodialer.

The four basic models are offered as desktop units or card modules, accounting for eight distinct models. Desktop and card module versions use identical printed circuit boards, which can be used interchangeably. The modems can be controlled by the computer or the terminal they support.

Each has nonvolatile memory for up to 20 telephone numbers. Stored numbers may be linked and may incorporate both pulse and tone dialing in the same sequence. The units can automatically answer incoming calls, adjusting their speed and transmission mode to match the calling modem. The modems have a set of built-in diagnostic aids that include analog and digital loopbacks and a test pattern generator that can be used during troubleshooting.

The Model 3012, compatible with Bell 212A modems at 1,200bps and with Bell 103 modems at up to 300bps, costs $500. The Model 3012TA is priced at $700. It is an answer-only triple modem intended primarily for computer site applications, with Bell 212A and Recal Vadic 3400 compatibility at 1,200bps and also Bell 103 compatibility at speeds of 300bps and less. The 3012plus, which offers directory-driven auto dialing, is priced at $600. The 3024, at 2,400bps, is a full-duplex modem for use on the dial telephone network. It is compatible with CCITT recommendation V.22 and Bell 212. It costs $800. MICOM SYSTEMS INC., Chatsworth, Calif.

FOR DATA CIRCLE 303 ON READER CARD

COLOR WORKSTATION

The Series 70 is a color graphics workstation that is functionally compatible with the IBM 3270 PC and is capable of handling PC graphics as well as 3279-S3G host graphics.

It has an 80188 coprocessor board

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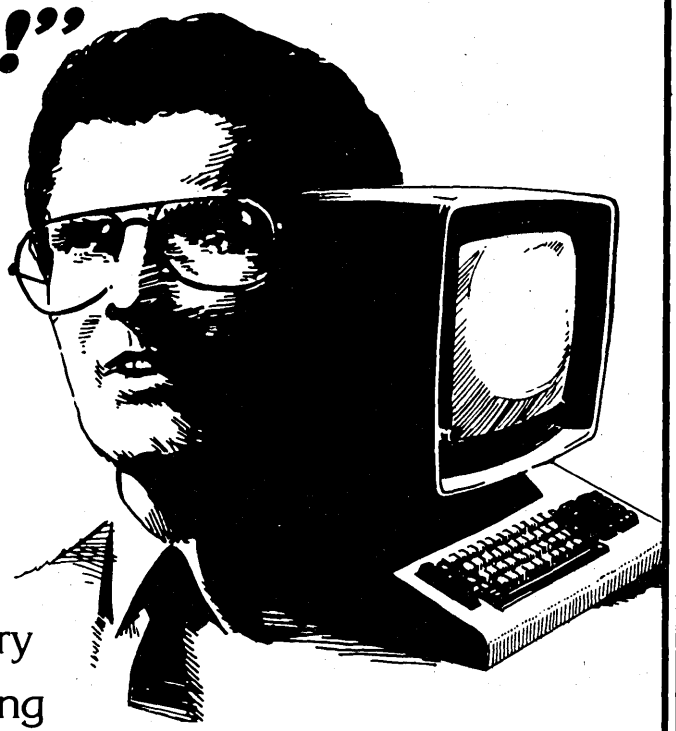

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CIRCLE 70 ON READER CARD

with associated memory to perform the graphics and windowing operations. By performing the graphics operations in the coprocessor, micro programs such as Lotus 1-2-3 and Wordstar will, according to the vendor, run without modification. It connects to IBM or compatible mainframes through the vendor's line of system controllers.

Displaying up to 16 colors in the graphics, users can create business graphics. With the 3279-S3G emulation feature, the unit is also capable of accessing and displaying host graphics. In addition to the graphics capabilities, the unit features windowing that allows users to view up to seven windows at one time. These can represent as many as four interactive host sessions (combining 3270 and asynchronous sessions when required), a personal computer session, and two notepads. Data can be transferred from window to window.

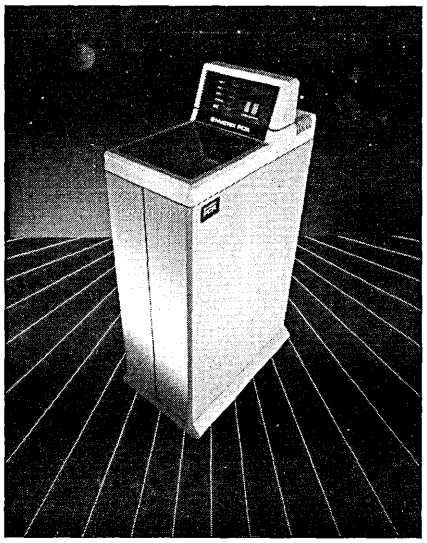
The minimum configuration is priced at $5,700, and includes a color monitor, 122-key keyboard, 128KB RAM, one disk drive, and support for pc graphics and windows. A minimum configuration supporting host graphics is $5,600. LEE DATA CORP., Minneapolis.

FOR DATA CIRCLE 304 ON READER CARD

GRAPHICS RECORDER

The PCR is a high-resolution digital color film recorder, a photographic system for recording computer generated graphics, text, and images for artist-quality slides.

The unit is designed for use in an office environment. Its deskside enclosure



measures 19 inches wide, 29 inches high, and 11 inches deep. Casters allow movement from workstation to workstation.

The device uses a proprietary raster processor. It has graphic spatial filtering for most IBM PCs and compatible micros. A major feature of the PCR is that it is a shared resource with mainframes and PC networks. It can also accommodate and enhance the graphics of micro software packages. Data are accepted through an IEEE interface.

Artist-quality 35mm slides of both graphics and images are recorded at a production volume of 45 slides per hour. it features a 16 million-color palette display. With the raster processor acting as a true coprocessor, low-resolution PC graphics can be enhanced to 2048 high-resolution graphics. Text and graphics are further sharpened with graphics spatial filtering. This anti-aliasing improvement is significant for more distinct definition of font, circles, and bars. Film can be loaded in standard office lighting. There is microprocessor control of self-calibration, film settings, and self-diagnostics. Prices for the PCR start at $11,800. MATRIX INSTRUMENTS INC., Orangeburg, N.Y.

FOR DATA CIRCLE 305 ON READER CARD

TRINITRON MONITORS

This vendor is introducing two RG color monitors for the IBM PC and compatible products. The monitors are designed to meet the demand for high-resolution display required by many computer graphics applications.

The monitors are available in 9-inch (CPD-9000) and 12-inch (CPD-1201) models. They each incorporate the vendor's Trinitron color system. The CPD-9000 has 80-character by 25-line display. The CPD-1201 has a 100-character by 25-line display. Both monitors feature RGB analog-TTL processing and high-resolution dot pitch of 0.25 millimeters.

The pixel resolution of the CPD-9000 and CPD-1201 is 800 dots by 240 lines and 640 dots by 240 lines, respectively . Among other features of the monitors is a horizontal shifter for adjusting the display's position. The monitors' shifter makes automatic horizontal centering possible. The suggested retail price for each monitor is approximately $600. SONY COMMUNICATIONS PRODUCT CO., a division of Sony Corp. of America, Park Ridge, N.J.

FOR DATA CIRCLE 306 ON READER CARD

TEMPEST MINI

This vendor announced that its Professional 350 desktop minicomputer has been designed to meet Tempest specifications. The Tempest PRO-350 can function as a standalone desktop mini and can link to the 32-bit RFI/EMI VAX-11/751 computer in a total Tempest environment, the vendor says.

The Tempest PRO-350, like its commercial counterpart, is a member of the vendor's PDP-11 computer line and runs an enhanced version of the RSX-11M operating system. It is based on a 16-bit PDP-11 minicomputer chip, and comes with a standard 512KB of main memory and a floating point processor. The machine uses a compact RX50 5¼-inch diskette subsystem with dual diskette drive for a total of 800KB of storage per drive. The system is priced at $9,000. The Tempest PRO-350 configured as above with an optional RD51 10MB hard disk is priced at $12,000. The vendor plans to expand its Tempest program to include other models. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 307 ON READER CARD

3270 EMULATION

The DataTalker/MAC is an intelligent, front-end communications processor that gives the Apple Macintosh the ability to emulate the IBM 327X interactive terminal systems that are connected remotely to IBM mainframes via modems, or locally with modem eliminators or limited distance modems. The protocol is bisynchronous.

Controller characteristics include audible alarm, control unit, device addresses, and transmission parameters that are user modifiable, and selectable ASCII or EBCDIC transmission code. Terminal characteristics include a display of 1,920 characters in 24 lines, and 3270 status indicators displayed on screen. All 3270 function keys are also supported, the vendor says.

Communications features include transfer rates up to 9,600 baud, half- or full-duplex communications, multidrop or point-to-point network links, and a synchronous RS232C interface. The DataTalker/MAC retails for $1,100 and includes the 3270 emulation software on diskette, a special interface cable to link the Macintosh, and a user's guide. WINTERHALTER INC., Ann Arbor, Mich.

FOR DATA CIRCLE 308 ON READER CARD

DISK/TAPE BACKUP

DataSystem is a combination hard disk and backup system for the IBM PC and PC XT microcomputers. It is available in 10, 21, 32, and 40MB capacities and designed for users who need hard storage and economical backup..

Features include an on-line performance option that gives the computer infinite storage capacity, the vendor says. Other features include compressed or full volume backup, file by file or full volume restore, and automatic flaw mapping that ensures complete media interchangeability. It also offers password protection with the use of the vendor's Multi-OS software. Prices for the DataSystem range from $3,300 to $5,000. DAVONG SYSTEMS INC., Sunnyvale, Calif.

FOR DATA CIRCLE 309 ON READER CARD

—Robert J. Crutchfield

32-BIT POWER A CHUNK AT A TIME

With the BTI 8000, you can support up to 200 interactive terminals, simultaneously running programs in COBOL, Pascal, FORTRAN, and BASIC. Better yet, you can get all this supermini power a chunk at a time. Which means it costs far less than replacing or adding systems to increase performance.

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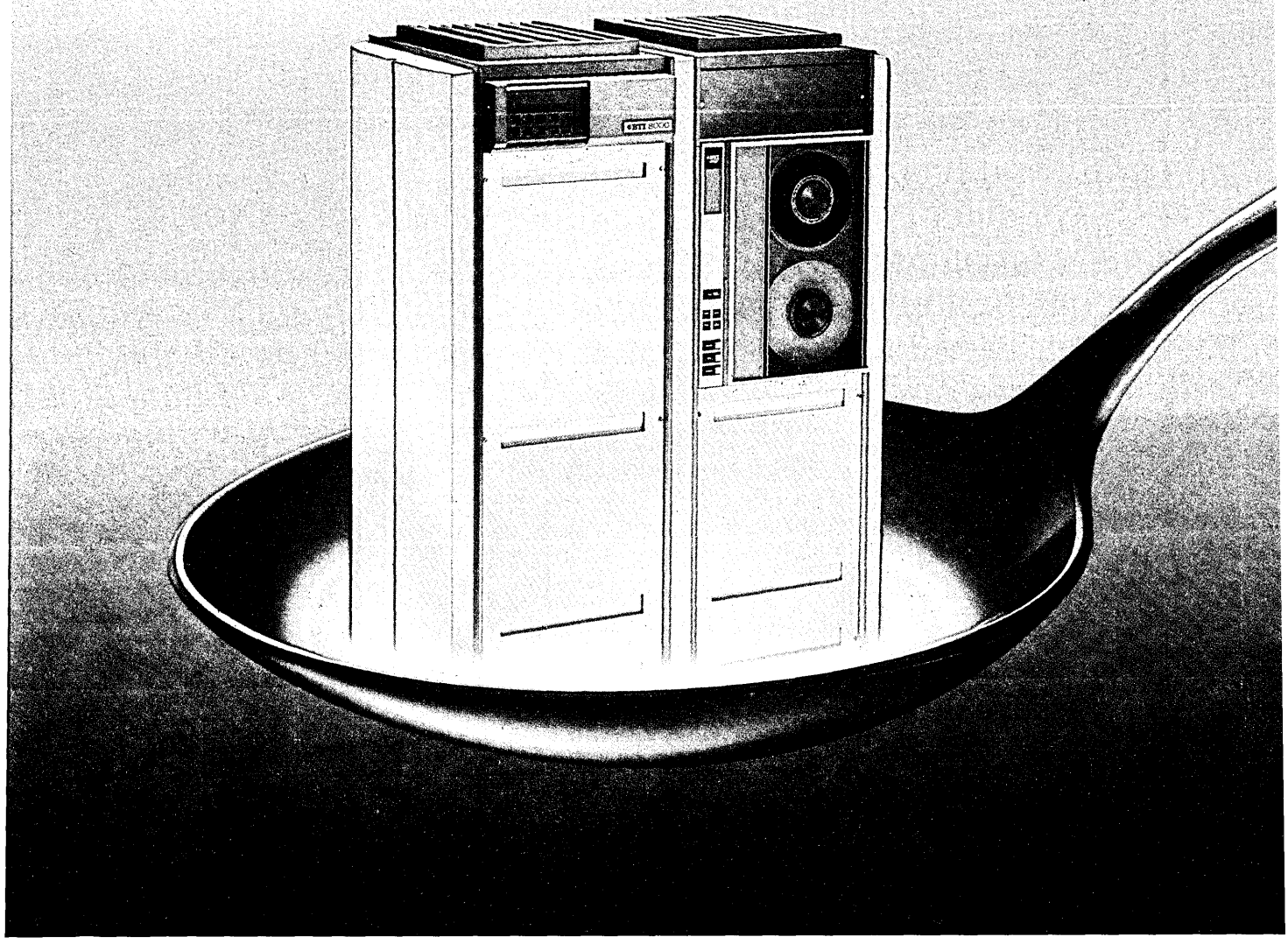

IDMS/R. The relational dbms that's proving to be what most people expected it to be:

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"The issue is elegant integration. It has to all work together. Cullinet's new software looks like it will continue to provide the superior integration with these new features. That's a tremendous step forward."

Bernie Boar, Consultant and Author of APPLICATIONS PROTOTYPING

For nearly a decade, in survey after survey of the data processing community, one database management system was consistently rated first in user satisfaction. And that was IDMS.

So when we announced IDMS/R in April of 1983, expectations naturally were high for a versatile database management system that would combine the ease-of-use of a relational architecture with high performance. That was the promise we made. And that, in fact, is the product we've delivered.

IDMS/R has demonstrated its capacity to satisfy the end user community. People whose only data processing experience is an encouraging "you can do it" from the dp department are finding themselves able to create their own customized applications using the Automatic System Facility of IDMS/R. They're doing it quickly, they're doing it easily and, best of all, they're doing it *independently*. And that comes as a welcome relief for overburdened dp personnel.

As for complex, high-volume production applications, IDMS/R is simply

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Data Systems Supervisor
Central and South West Services

without peer. With an exclusive Cullinet feature called "Relational Fastpath," data processing can tune the database and thereby benefit from a dramatic boost in performance. (Believe it or not, IDMS/R is some 10–20% faster than the previous release of IDMS.) Moreover, IDMS/R has the most sophisticated back-up and recovery capability of any dbms—an absolute must for on-line applications.

IDMS/R is also richer in facilities than any other dbms. Tools like the Integrated Data Dictionary, which documents the source and use of all data. ADS/OnLine, a proven fourth generation application generator that enables data processing personnel to create simple and complex applications far faster than they ever thought possible. And OnLine Query, a conversational system that allows developers and end users to retrieve information from the database promptly and easily.

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Joseph Jones, Database Coordinator,
Public Service of Indiana

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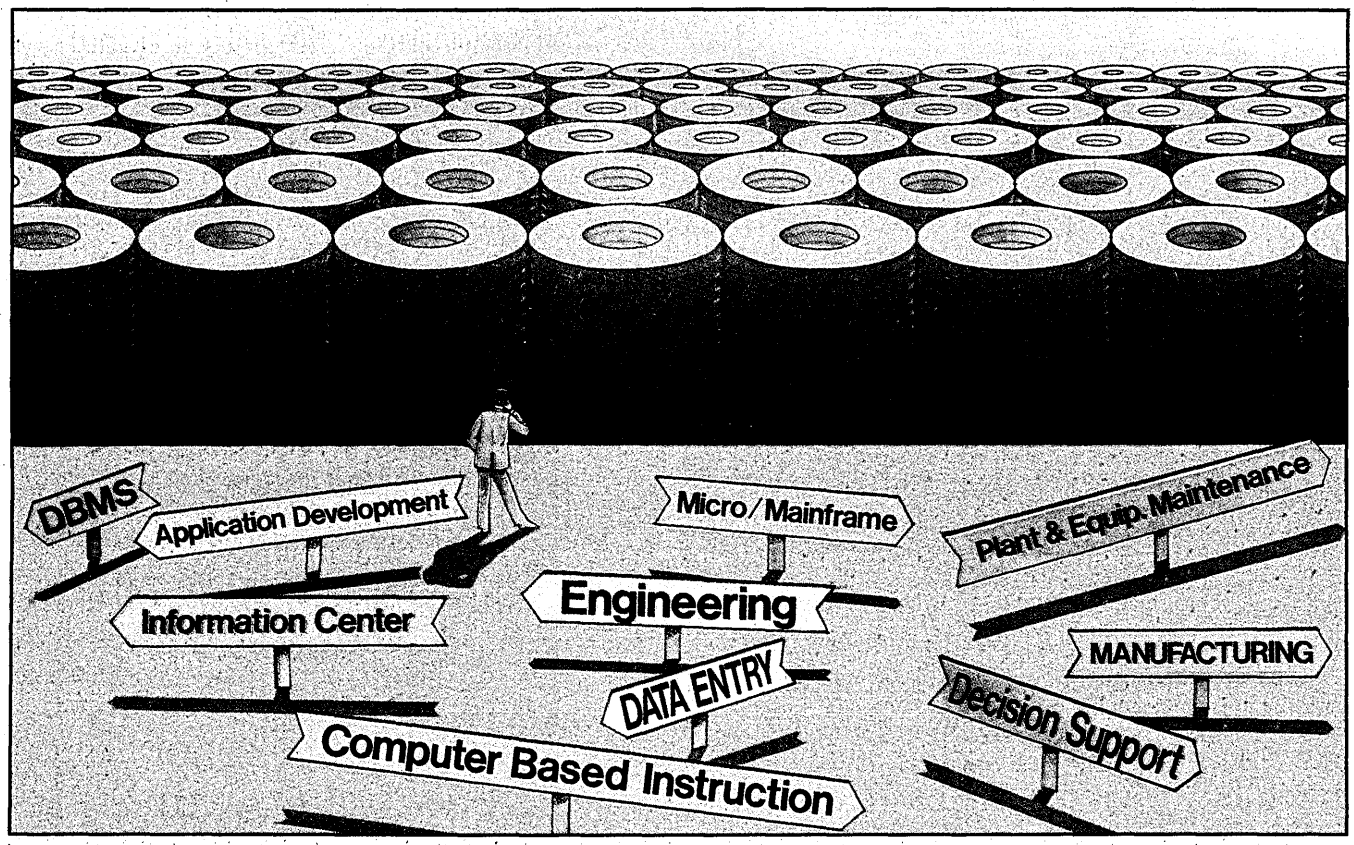

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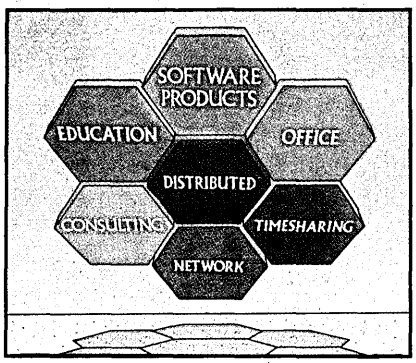

One of the newest relational data base management systems on the scene comes from Boeing. Its cost is low; its function is extensive. It runs on IBM, CDC, DEC VAX, Data General and Prime computers, and interfaces with a micro version.

For more information about Boeing software solutions, call **(206) 763-5000.** Or write BOEING COMPUTER SERVICES, M/S 7K-11, P.O. Box 24346, Seattle, WA 98124. Ask about our "TRY IT" evaluations.

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SOFTWARE AND SERVICES

UPDATES

IBM's mainframe VM operating system is in the microcomputer's future, according to a report from Strategic Inc. Whatever the outcome of the battle for market share among IBM, AT&T, and others, their competition will force the development of a new form of VM, the market research firm in Cupertino, Calif., says. Such a product would allow applications written for IBM's PC/DOS, AT&T's Unix, and Apple's Macintosh, among others, to run on the same hardware, thus eliminating software availability as a major concern in purchasing micros. The report says the move to VM on micros will aid users and software developers alike. Advantages for users include being able to use the most appropriate software for their tasks. Publishers will not feel bound to sell multiple versions of a product for different operating systems and computers. The study indicates that hardware will become more of a "generic commodity than it is now."

VM, which allows other operating systems to run at the same time, is beginning to appear on microcomputers. It is, with the CMS tp monitor, the host operating system on the IBM PC XT/370, which also lets MS/DOS, CP/M-86, and Unix run as guest operating systems. Similarly, Unix and several other operating systems run as guests under CTOS on Convergent Technologies systems. Unix is now also available on the Lisa under Apple's proprietary OS, and it will soon appear on the Macintosh as well. Adding an 8086 processor to a Macintosh or a 68000 to an IBM PC, with the appropriate software, will allow most programs written for one machine to run on an augmented version of the other. No one has announced a Macintosh imitation yet, but Microsoft has stated its intention of putting a Macintosh-style user interface in a future release of MS/DOS.

Still, the issue of software independence is as unresolved as that of hardware independence. Proponents argue that Unix will create hardware independence since Unix applications software can be ported to many different makes of computers, thus allowing users to switch hardware vendors more often. Strategic sees VM/CMS accomplishing in the micro software world what Unix hopes to accomplish on the hardware side: with other operating systems running under VM, users need not be tied to Unix or MS/DOS, since both would be supported under VM. Programs could be moved freely.

Such a situation would also benefit VM's creator. Sales of PC/DOS are a tiny portion of IBM's micro revenues, but if it can make VM/CMS a standard on PCs, then its revenues stand to soar; after all, what does IBM care if users run other operating systems under VM/CMS, since they have to buy VM/CMS from IBM first?

"So much substandard software is on the market that consumer lawsuits and government controls may result if the industry doesn't monitor itself more closely," warns Bill Schoneman, vice president of XXCAL Inc., a software testing firm in Los Angeles. Schoneman derides the "nonwarranty" disclaimer statements that appear on most consumer software packages. "They provide programs without any kind of warranty. The entire risk as to the quality and performance of the program is with the user. This doesn't exactly inspire consumer confidence," he quips. The exec advocates a software testing program that would augment magazine reviews and word-of-mouth recommendations. "Sooner or later [users] are going to insist on some assurances of the reliability of software," he adds.

DATA FLOW DIAGRAMS

DFDdraw is a program designed specifically for drawing data flow diagrams. It operates on IBM and compatible personal computers.

The software contains a template of all the graphics symbols needed to produce data flow diagrams interactively. These symbols are called up for display on the monitor, positioned, connected, and annotated with text under user control. Included is a function key-driven menu.

Dimensions of the data flow diagram can be enlarged or reduced through scaling and size functions. Pan and zoom features permit editing of large diagrams. The product operates on the PC or PC/XT with at least 256KB of memory, standard IBM color monitor, and graphics monitor adapter.

Data flow diagrams created with this software can be printed on a plotter or printer. A copy of DFDdraw software and documentation is priced at $500. A demo disk is available for $15. MCDONNELL DOUGLAS AUTOMATION CO. (MCAUTO), St. Louis.

FOR DATA CIRCLE 326 ON READER CARD

VAX WORD PROCESSING

WPS-Plus/VMS brings DECmate-style, full function word processing to the shared system, VAX environment. This vendor's version of MASS-11, based on software developed by Microsystems Engineering Corp., provides a complete set of word processing capabilities for a variety of applications.

This software uses the same user interface as the rest of the vendor's computer line. The software features DECmate-compatible Gold Key functionality with full screen editing, rulers, tabs, underlining, bolding, centering, and library text. The product has menu-selectable functions with on-line help facilities. Integrated, on-line computer-based instruction can be accessed without leaving the currenting. Other features include list processing, sort, math functions, an integrated filing system for each user with

keyword search and wastebasket, user-definable processes, and a definable print facility.

DECspell, a spelling verifier and corrector based on the 70,000-word Houghton Mifflin *American Heritage Dictionary* with a personal dictionary of up to 10,000 words, is available as an option. Also available is a two-dimensional editor for preparing diagrams, matrixes, and equations. WPS-Plus/VMS is priced at $6,000. It will run on the VAX 11/730, 750, 780, 785, and VAXcluster computer systems under VMS. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 327 ON READER CARD

SYSTEMS DESIGN SOFTWARE

Design/1 is a systems design software package that is primarily intended to support design teams working on systems development and implementation projects for medium and large computer systems.

The proprietary package runs on IBM PC and PC/XT personal computers, and can support a multiple workstation environment using a local area network. According to the vendor, improved productivity of systems design teams and improved documentation are advantages of the product. Working with design methodologies packages, the product provides graphics and text editing that automates documentation of all design work. Cross-referencing is automatically captured and maintained during the design process.

The local area network allows several members of a design team to create and store documents on a single PC/XT disk. This feature enables a team to create, modify, and maintain accurate systems design documentation.

Other features included in this software package are a design assist that coaches analysts through many design tasks, predefined structure charts to maintain consistency and quality during a project, management review and audit facilities, and a prototyping that simulates conversation flows and data entry. Currently, the product interfaces to IBM's data dictionary and a programmer's workbench developed by the vendor. The package is designed to be completely independent of the hardware and software environment on which the system being designed will operate. DESIGN/1 costs $15,000 for the first copy, and $1,000 for each additional copy. ARTHUR ANDERSEN & CO., Chicago.

FOR DATA CIRCLE 328 ON READER CARD

COMMUNICATIONS SECURITY

This vendor is offering a communications security protection feature for IBM Series/1s with the EDX operating system. This feature will be marketed as part of the vendor's Comm/1 package, which handles mainframe and minicomputer file transfers for users of the Series/1.

To invoke the security feature, users choose passwords of up to 40 characters that must be transmitted immediately by every caller. If no password is transmitted, or the password is incorrect, the security feature hangs up the phone. Users may change the passwords as often as desired.

In addition to permitting the call to proceed, the password record provides fields allowing the caller to specify file names and other transmission variables. The password record format is compatible with JES, POWER, and other systems. Comm/1, with the security protection feature, is priced from $965 to $2,400. FIRESIGN COMPUTER CO., San Francisco.

FOR DATA CIRCLE 329 ON READER CARD

MENU-DRIVEN REPORTING

Marvel is a menu-driven reporting system for RAMIS II, the vendor's fourth generation language of IBM- and plug-compatible mainframes.

According to the vendor, the product offers users three alternatives for report generation including RAMIS II reporter, Marvel, and RAMIS II English. Users are guided through the generation of a report. Menus display information in a natural sequence that depends on the options selected, helping users specify a report by prompting them for appropriate responses.

Each menu is designed to provide only the information that is necessary to specify the task at hand. Movement between menus is achieved in one of three ways: by default (following logical progression), by menu selection, and by PF key. No special training is required to use Marvel. In addition, all files are stored in a library for subsequent execution or modification. Because Marvel is integrated with RAMIS II, it can be executed from a PC using RAMLink or from any 3270 (or compatible) terminal. Marvel is priced from $4,500 to $9,000, depending on the cpu's ICP performance rating. MATHEMATICA PRODUCTS GROUP INC., Princeton, N.J.

FOR DATA CIRCLE 330 ON READER CARD

GKS GRAPHICS TOOLS

GK-2000 is a graphics software subroutine library that implements the GKS international standard. The package is compatible with the vendor's device-intelligent drivers.

According to the vendor, "No single standard will dominate the graphics industry," adding that this software is a tools package consisting of more than 190 user-callable subroutines. It enables programmers to develop two-dimensional applications that are independent of a specific output device.

The package's capabilities include two-dimensional image manipulation, support for up to 11 concurrent device drivers, 24 stroke precision fonts, 256 line types, and full graphics inputs. Features

SOFTWARE SPOTLIGHT

INFORMATION TRANSFER

Linkware: Information Server (L:IS) controls the transfer of information among different types of computer systems. It provides a software vehicle by which different computers can communicate with one another in a strictly controlled, secure environment. The product aids the MIS department with problems of data security and integrity by allowing users to access information on the host computer while giving the dp shop control over who can access information.

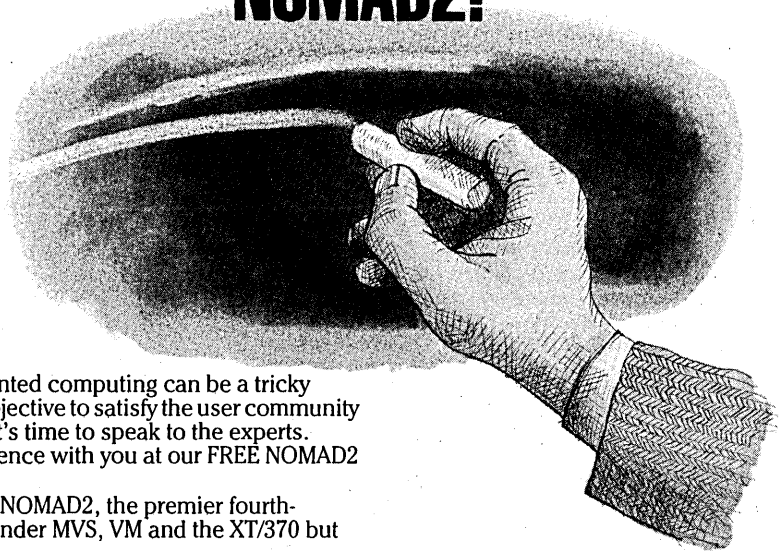
This vehicle is a network application called a virtual server, which resides on host or personal computers. The virtual server acts as a staging area for information. It lets users access and transfer information and provides control by matching files to user IDs for proper security clearance. The virtual server also can be accessed by application programs as well as users, permitting distributed applications to transfer files.

The virtual server can port or transfer information to different types of hardware while at the same time transforming the files transferred to the appropriate file format. For example, a file resident on the host system can be transformed into one of a number of formats that can be recognized by the PC.

L:IS addresses five areas that include access to corporate databases, the ability to control those who access information and to provide security, the transformation of database information into a form that can be processed by PC applications, the ability to transfer data between the host and PC, and application development tools to create custom distributed applications. The product is currently available in an IBM VM/SP environment. It will soon be available in versions for the DEC VAX and IBM MVS systems. The PC connection supports micros running under PC/DOS, MS/DOS, and CP/M-86. The VM version has has two options: a VM user connection for on-line VM/CMS users and a PC connection. A corporate license for L:IS costs $15,000 for the VM package and $15,000 for the PC connection, and $25,000 if bought together. The micro software costs $325 per copy up to 25. LINKWARE CORP., Waltham, Mass.

FOR DATA CIRCLE 325 ON READER CARD

USER-ORIENTED COMPUTING? IT'S TIME TO LOOK AT NOMAD2!



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CIRCLE 74 ON READER CARD

include workstation windowing/viewporting, exact image sizing, bundling of attributes, segmentation, and pixel-by-pixel addressing of raster images.

The product also offers extended error processing, on-line debugging, and file name control. The software is available for a variety of operating environments including IBM/CMS and MVS, DEC/VAX, and most Unix cpus. In addition, specially tailored versions of the product will be available directly from some hardware manufacturers. End-user pricing ranges from $4,500 to $21,000. PRECISION VISUALS INC., Boulder, Colo.

FOR DATA CIRCLE 331 ON READER CARD

PROGRAMMER WORKBENCH

The Software Development Environment is a programmer's workbench that provides programming aids and tools intended to simplify the task of software development.

Included in SDE are more than 120 individual tools integrated into an environment for software development and maintenance. Tools are provided that generate test data and test programs. Other tools provide a change control facility so that changes to programs may be carefully tracked for auditing purposes.

More than 50 utility tools are provided, which do such things as merging files, rearranging and reformatting files, and printing reports. The product features a training course, two modes of operation for the novice and experienced, and on-line help. It also comes with the Pilot language, which allows users to develop their own computer-based training language.

The software provides a library storage facility, which may be used as a central repository for source programs. Within the product, file access is controlled by an access manager that provides security for the files. SDE is available for the VRX operating system. It will run with VRX release 9 plus 5 and the Interactive Virtual System (IVS). A monthly license for the program is available for $265 per month. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 332 ON READER CARD

ARCHIVING FACILITY

This archiving and retrieval facility enhances this vendor's Data Center Distribution System's (DCDS) role as a bridge between the automated office and the data center by assuring the safety and confidentiality of all reports.

The facility, DCDS/A enables users to archive reports and assign retention periods of generations and days, and it retrieves archived reports for printing. It is designed to provide backup copies without requiring job reruns. The software also ensures the security of sensitive reports by providing several levels of protection for reports that are archived. The archiving and retrieval tasks are assigned security codes at installation. In addition, users can assign passwords to individual reports as they archive, protecting them from unauthorized retrieval. Once retrieved, the report is not displayed on the terminal and can be printed separately from other output to further ensure its confidentiality.

The product enables users to duplicate past report distribution when circumstances require. Users can retrieve and print reports according to the same parameters under which they were first produced. They can perform these recoveries without additional keyword input, without changing the JCL, and without using an applications programmer as an intermediary.

The software functions through the use of two on-line screens—one for archiving and one for retrieval—and enables users to execute its basic functions. The product archives reports on-line to tape. Reports are retrieved and printed on-line through full screen edit facilities, and users can select a specific version of a report for retrieval. Upon selection, the program issues a message to the operator to mount the correct tape. The product automatically tracks all archive-report data sets and the tapes to which they are written. With one keystroke, users can print retrieved reports according to their DCDS print parameters without executing a batch job or issuing new control statements. DCDS/A is a cost-free option to the vendor's on-line distribution package. The entire DCDS package, including archiving (DCDS/A), is priced at $40,000. It runs on the IBM 370, 30XX, 43XX, and plug-compatible mainframes under MVS. VALUE COMPUTING INC., Cherry Hill, N.J.

FOR DATA CIRCLE 333 ON READER CARD

GRAPHICS SOFTWARE

Graphics Management System and Cue Manager are software packages designed to link computer graphics with video technology on the vendor's microcomputers.

Both packages offer a broad range of applications and are targeted at video production houses and video graphics producers, as well as cable television stations, corporate production studios, educational material producers, and advertising agencies.

According to the vendor, these software products will bring more versatility and sophistication to the computer graphics capabilities of the vendor's SMC-70 and and SMC-70G microcomputers.

The Graphics Management System is a computer graphics design program offering a paint system, font and text generator, overlay animation, and post-production graphics management. The paint system design features a 16-color palette, including transparent color for video overlay, free-hand draw in two brush strokes, and picture and figure files that can be saved to floppy disk. The system can generate five different fonts, and each font can be superimposed over video graphics and/or a preselected color background.

Cue Manager is designed for use by video editors for integrating graphics with video productions. The program interfaces to three of the vendor's editors, RM-440, BVE-800, and BVE-3000/3000A. It uses a time code based on hours, minutes and seconds, and frame numbers. This software has 38 video wipe patterns, including scroll and blink.

The Graphics Management System costs $1,500. No price was announced for Cue Manager. SONY COMMUNICATIONS PRODUCT CO., DIVISION OF SONY CORP. OF AMERICA, Park Ridge, N.J.

FOR DATA CIRCLE 337 ON READER CARD

DUMP ANALYZER

KPROBE is a VM/CMS systems tool that eliminates paper dumps and reduces debugging time, according to the vendor.

This applications dump analysis facility is an interactive, on-line dump analyzer. It enables true full screen analysis of the most common dumps occurring under VM and MVS systems.

With this software, users can look at and compare storage of several dumps simultaneously. In addition, current real CP storage and storage from active virtual machines can be examined and, if desired, modified. A fully integrated browse function allows CMS files to be viewed while in the dump environment. The product also provides an EXEC and REXX interface that can be used to create custom debugging macros without modifying source code.

Users can format storage, instruction sequences, and system control blocks. They can also locate character or hex strings, follow control lock chains, add and display maps, and set and change display symbols. The software supports dynamic address translation and prefixing.

This product can be installed without modifying the operating system. KPROBE and its source code are available for an initial charge of $1,200 and a yearly license fee of $2,400, which includes maintenance, upgrades, and technical support phone lines. KOLINAR CORP., Santa Clara, Calif.

FOR DATA CIRCLE 335 ON READER CARD

—Robert J. Crutchfield

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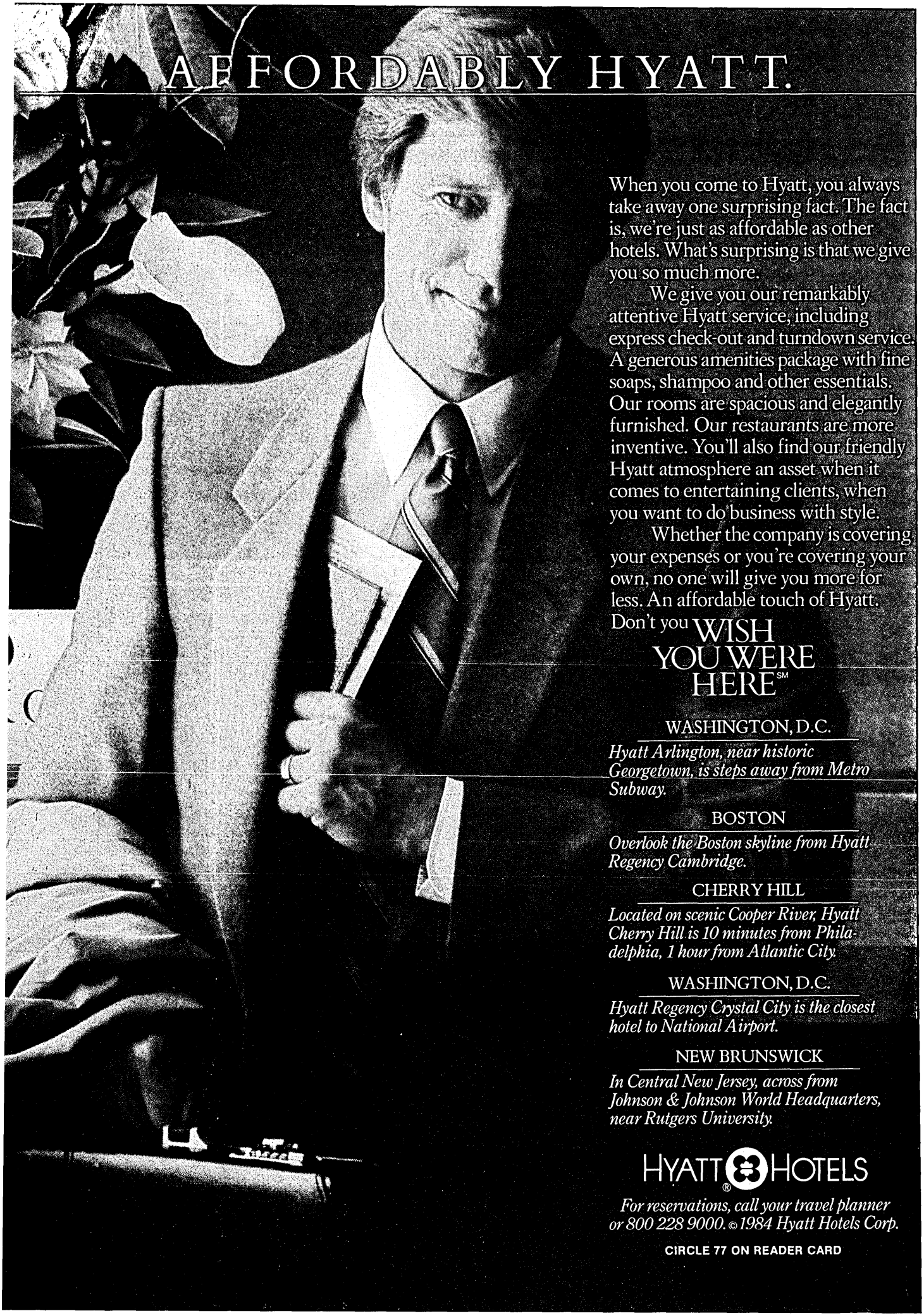

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SOURCE DATA

BOOKS

SYSTEMS IN ORGANIZATIONS
by M. Lynne Markus

MANAGING INFORMATION SYSTEMS AS A CORPORATE RESOURCE
by John P. Murray

Systems in Organizations is one of the best books I've read on the effect of systems upon organizations. This book should be read—no, studied, by anyone who is involved in systems work within a corporation. This is not just a book for data processors, since Markus addresses a much larger audience. It is not directed only to implementors, but also to users of systems.

Most of the systems books I've seen present a how-to tutorial of systems implementation. This book does that, but only after presenting four chapters of good discussion on the problems that may be encountered within an organization when change is implemented via systems introduction.

Systems in Organizations begins by pointing out that the book "is intended for graduate-level students of management and information systems and for practicing managers who want to know what they can do about the systems that affect their performance as well as the people with whom they work." I agree that the book could be used effectively by students, but the real value will be for practitioners. The book is printed in small print (very academic) but with lots of good examples that professionals can identify (maybe not so academic).

The techniques of systems design and implementation are not discussed in any detail in this work. People are the focus—how people are affected by the introduction of new systems, whether manual or computerized, and how these people in turn affect the systems being implemented.

In her first chapter, the author introduces the problems that occur when a systems designer begins developing a new system. Both the designer and the ultimate users of the system have their own viewpoints of what the system is to be used for and what the goals of the system should be. As Markus correctly concludes, quite often these viewpoints are at odds. The designer should not look at the proposed solution without taking into consideration the various organizational factors that will be affecting the potential user base. "As the system is used, a pattern of behavior and negotiation is set into motion, enacting a culture and political relationships." The conclusion is that the system and its organizational impact can be called the "interaction perspective," and it is this perspective that forms the basis for the remaining points in the book. In fact, "the interaction perspective assumes that the impacts of systems are organizational changes and that planning for organizational change requires an approach quite different from the usual methods of system analysis, design, and implementation." So you see, this is not a how-to book, but a thesis based on social behavior and psychology.

The second chapter categorizes systems into five types that seem very logical. The author then explains these five types and gives examples of each. The third chapter expands on the impact each type has on the users of these systems. It should be noted that Markus does not just discuss systems that affect common laborers, blue collar workers, or office personnel; she also considers systems that affect senior management and how they might react. The fourth chapter brings most of the earlier points into perspective by giving a detailed example of how a large organization reacted to the introduction of a large system implementation. It was quite interesting to note how the chains of command and power were rearranged by the introduction of this system. Just understanding the changes that occurred within this organization may justify the price of the book.

The punch line to *Systems in Organizations* comes in Chapter 5, in the form of a systems development methodology called ETHICS, an acronym for effective technical and human implementation of computer systems. Again, it is this reviewer's opinion that both computerized and manual systems can be designed very effectively using this technique. "The essence of the ETHICS method is the identification of compatible pairs of alternative technical and social designs after establishing technical and social objectives." The emphasis is on the human side of the systems endeavor, with technical means being considered secondary.

Chapters 6 through 8 are for the neophyte systems person. They discuss the beginning of data processing, some of the terminology, and what to expect from your MIS department and the vendors that support it. These topics might be good for the interested user, but I wonder how useful the material is for people in large organizations. Don't get me wrong, though. The first five chapters are well worth reading—and studying. A skim of the last chapters couldn't hurt.

Systems in Organizations concludes with a super bibliography of reference material for serious students of this subject.

This book is a fresh approach to the much-belabored topic of systems design. I think it shows a kind of maturity of our industry. Finally, we are looking at how to make systems fit people, not vice versa.

Managing Information Systems As a Corporate Resource started right off by getting my back up. By the middle of the first chapter, I was trying to decide how to write a review on a book that I felt was entirely at odds with so many of my beliefs of how MIS should operate. I mention this simply to warn potential readers not to stop at Chapter 1. I was wrong in prejudging this book and you will be, too. You might even try reading Chapter 11 first, and maybe skip the first chapter entirely!

The author, John P. Murray, is a practicing MIS manager. His credentials indicate that he brings the reader a great deal of experience. What turned me off in his initial chapter was his waving of the MIS flag, his seemingly self-righteous attitude about the MIS plight, and his lack of patience with the end user. On the other hand, maybe it was my attitude after eat-

ing too many jalapeño peppers just before sitting down to read the book. In any case, my attitude changed as I read further.

In Chapter 11 Murray states, "A fundamental requirement [for user satisfaction] is the need to have MIS management which possesses the vision to perceive the real benefits which can be produced from a high-quality, aggressive MIS effort, and who are willing to step up to the important issues and to fight for them. This is not an easy task, it can be frustrating, and often seems to be unrewarding for those most involved in the process. However, the potential return to the organization cannot only be substantial, it will in many instances, mean the continued success of the organization." In my opinion, the fulfillment of this requirement through education of the MIS manager is the goal of this book. The audience for this book is the new MIS manager, or one who is anticipating such a position in the near future. This is a book of topics that will have to be dealt with by any MIS manager. Murray identifies these areas of opportunity and gives his solutions to these management areas in a very easy-to-understand way.

Chapter 2 gives many examples of how the MIS department can begin building a better rapport with end users. Procedures must be put into place that allow end users to become more informed about the workings of the MIS department. Through a better understanding of the workings of the MIS department, the end users can often better appreciate the problems that cause them so much grief. It is hoped this will encourage a better dialog between MIS personnel and the end-user community. This is not to say that the MIS department should develop a set of excuses for their shortcomings, only that MIS should make the end user aware of the realities of the dp world. "The key members of MIS must work hard to both convince and demonstrate to [the end user] that MIS wants to help them do their work in a more productive manner."

The automated office is the topic of the third chapter. Here, the message is quite simple: MIS must take responsibility for planning the direction of office automation, regardless of whether the MIS department will have the ultimate responsibility for the function itself. Chapter 4 discusses disaster planning, another area that the MIS manager must take into account, since the daily operation of many organizations depends upon a working dp department.

Chapter 5 addresses the topic of how to determine which projects should be started next. Murray quotes the often-used statistic that most MIS departments have a three-year to five-year project backlog. It is this backlog that causes the end user frustration, which in turn causes undue pressure on the MIS management, which in turn causes the MIS manager frustration, since he or she cannot possibly fulfill the demands. In extreme cases, end users even purchase personal computers to satisfy their needs.

Requirements statements and a cost/benefit document are proposed as tools that can be used to help the MIS department determine development priorities in an objective, meaningful way. The problem, of course, is that the introduction of additional forms adds additional weight to the end users' already existing belief that MIS is fraught with bureaucratic overhead. All too many end users believe the MIS department spends more time trying to get out of solving problems than it does solving them! Although these documents may be perceived in a negative way, we still must have them. At this point, it's time for the MIS manager to put into practice the salesmanship philosophy that was introduced in Chapter 2.

If Chapter 5 arouses your interest as to how to determine development priorities and how to implement them, then you might consider skipping Chapters 6 and 7 for the time being and going directly to Chapter 8.

In the preface, Murray tells the reader he will be discussing many topics. He supports this by giving us Chapter 6, a discussion of the importance of keeping up with state-of-the-art technology, both in hardware and software. More important, there are tips on how to justify it to upper management. The chapter is good. I agree with the position taken. The only problem I have with it is its placement within the book.

The information center is the topic of Chapter 7. This is one of the larger chapters in the book. One gets the feeling this concept is near and dear to the author's heart. The traditional information center concept is presented, one that allows end users to get many of their dp problems solved without going through all of the formalities of a large-scale system development. The formation of an information center acknowledges the fact that there are a large number of dp solutions that can be performed in a minimum amount of development time. If these small problems can be solved in a very informal way then the end user is happy with the solution, and the MIS department shows the organization that it can respond quickly.

The information center is being used successfully in many large organizations today. The only modification that I would make to Murray's proposal is that it include the support and use of personal computers. He suggests that emphasis be put only on the use of mainframes. Failure of the MIS department to acknowledge and accept the existence of the personal computer as a dp tool will be looked upon very negatively by the end-user community, and rightfully so.

Chapter 8 is entitled "Project Management Within the Management Information Services Department." The title tells us exactly what this chapter addresses: how to manage a system project. This includes the role of the project manager, how to manage the design, programming, and installation of a computer project, and so forth. Good information, but you've probably read it before. It nevertheless doesn't hurt to read it again.

Like the previous book, *Managing Information Systems As a Corporate Resource* presents its tour de force in a later chapter, namely, Chapter 9. Here, Murray defines the role of the MIS steering committee that will be responsible for assuring that the role of the MIS department is recognized and used within the organization. This chapter contains not only a great deal of valuable information but provides a good number of examples of how the MIS function is implemented using the MIS steering committee approach. This should satisfy the reader who has an inductive bent.

This section begins by drawing an analogy between the MIS department and a manufacturing facility. The author has drawn a good parallel, one with which many readers can identify. From this point, the chapter introduces the concept of an MIS steering committee and proceeds to define its role. The chapter concludes with a sample charter for this committee. The concept of an non-MIS group that guides and advises the MIS function is not only good, but will probably be mandatory for a successful MIS department in the future.

Chapter 10 winds down the book with a discussion of the value of data to the corporation. This leads to the proposal for the introduction of a database administrator role. Again, there is a good presentation of the topic, but it's been heard before. Chapter 11 really is the last chapter of the book, but I have already suggested you read it first. It summarizes the book and attempts to convince you that there really is a role to be played in the MIS function and that you, as MIS managers, have a responsibility for educating your non-MIS managers in the value you can provide to the organization.

Managing Information Systems As a Corporate Resource is not a textbook, at least, not in the traditional sense. Most MBAs wouldn't believe it, or would find the problems trivial. Non-MIS personnel (i.e., end users) could identify with some of the problems described, but might not

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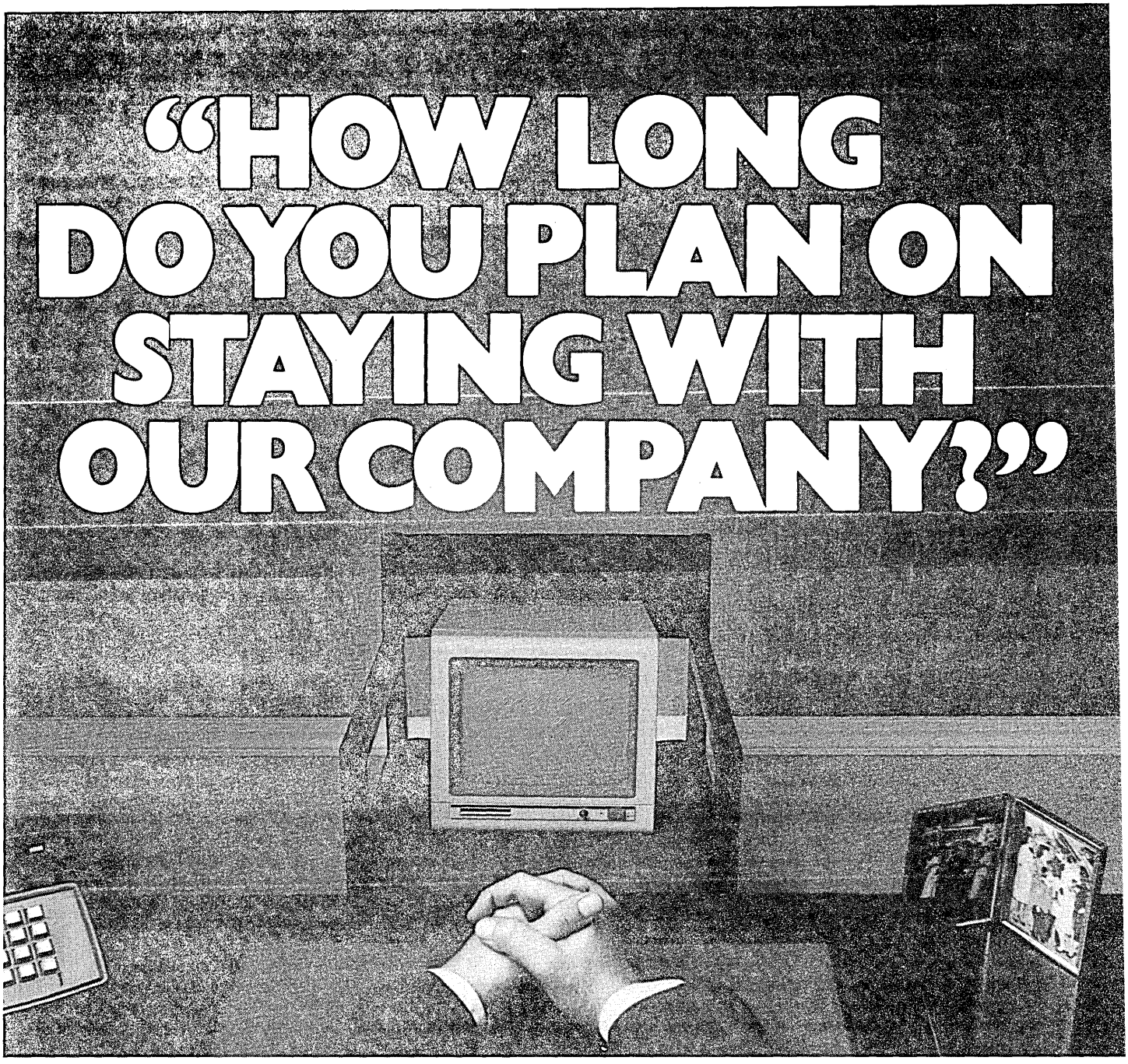

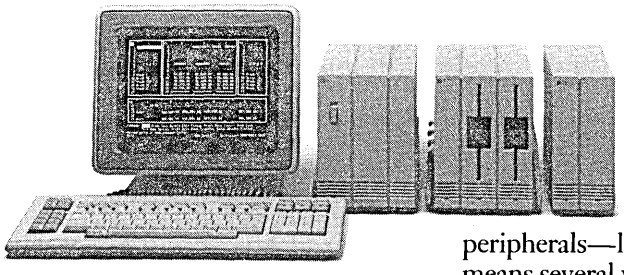

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be able to do anything about them. End users could buy this book for their MIS managers, or, if they didn't feel that would help, they could buy it for the executive managers responsible for the MIS function. A senior manager might find the contents of value for the MIS manager, or his or her successor. And, while you're at it, end users, send that vp a copy of *Systems In Organizations. Systems In Organizations,* Pitman Publishing Inc., Marshfield, Mass. (1984, 242 pp., $22.95). *Managing Information Systems As a Corporate Resource,* Dow Jones Irwin Publishing, Homewood, Ill. (1984, 193 pp., $25).

—Larry D. Woods

REPORTS & REFERENCES

TERMINALS AND PRINTERS

The *Terminals & Printers Buyers Guide* by Tony Webster contains summaries of the capabilities and performance characteristics of every product it lists. It focuses on products that can be hooked up to any computer via one of several industry-standard interfaces, and examines visual display and graphics terminals, as well as hardcopy equipment. It also includes the data needed to find the right price/performance trade-off for upgrading an individual computer. There is an introductory and technical overview on terminal, printer, and communication theory that deals with such aspects as alphanumeric display, the ASCII code structure, serial communication standards and interface, code, and protocol converters. Subsequent sections are devoted to in-depth technical summaries of various manufacturers' products. The 345-page book costs $19.95. For more information (refer to ISBN: 0-07-068968-7), contact McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, NY 10020, (212) 512-3493

ENGINEERING TOOLS AND TECHNIQUES

The Handbook of Software Engineering, by Charles R. Vick, PhD, and C.V. Ramamoorthy, PhD, is a 720-page handbook on the design, implementation, testing, and maintenance of virtually any type of software. The publishers claim the handbook shows exactly how to apply software engineering tools and techniques in each stage of the software development cycle. It covers simulation modeling, data design, operating systems, management of software development, software testing technology, database management, and system evaluation. Readers will learn how to develop software for micros and minis, array machines, distributed systems, and support systems. Guidance is also provided on graph modeling and analysis, design and classification of algorithms, concurrency control and reliability in distributed database management systems, and functional and applicative programming. There are 285 illustrations in the book, which costs $62.50. For more information, contact Van Nostrand Reinhold, 135 W. 50 St., New York, NY 10020, (212) 265-8700.

MAKING THE RIGHT CONNECTIONS

Information Research has published a report entitled "The Micro-Mainframe Connection," by Phillip I. Good, PhD. The publishers claim the report is a concise guide to understanding, planning, and implementing the communication link between your personal computer and the corporate mainframe. The $12.95 report is a result of hands-on tests of the latest communication hardware and software performed by Good and his staff. You can order the book (prepaid orders only) from Information Research, 10367 Paw Paw Lake Dr., Mattawan, MI 49071, (616) 668-2049.

SEMINARS

MICRO MANIA

Integrated Computer Systems is holding four-day courses on "Microprocessor Software, Hardware, & Interfacing" throughout the summer and early fall months. This is a hands-on course designed to provide a broad foundation in the skills required for the design, programming, and real-world interfacing of microprocessor applications. Students will learn how to design microcomputer hardware at the chip level; program microprocessors at the machine level; interface to sensors, actuators, and other external devices; use interrupts, interval timers, and A/D converters; make hardware/software applications trade-offs; compare assembly and high-order language implementations; and apply basic software engineering tools and techniques. Course materials and refreshments are included in the enrollment fee of $895. The seminar will be held Oct. 16-19 in Philadelphia, and Oct. 23-26 in Palo Alto, Calif. The course is also available on-site and in other cities. For more information, contact Integrated Computer Systems, 6305 Arizona Pl., P.O. Box 45405, Los Angeles, CA 90045, or call (800) 421-8166 outside California or (800) 352-8251 in California.

MANAGING DATABASES

The Software Institute of America is sponsoring a course on database administration and data resource development. It will be taught by Ronald G. Ross, editor of the *Data Base Newsletter* and author of *Data Base Systems: Design, Implementation, and Management; Data Dictionaries and Data Administration;* and *Logical Database Design.* Ross will take participants through an in-depth discussion of the crucial areas of logical database design and strategic data planning. The course promises to provide coverage of the proven and leading edge techniques for database administration and development, and should be suitable for any professional involved with the use of data management technology in a corporate setting. The seminar will be held Nov. 12-14 in Toronto and Jan. 28-30 in Chicago. The cost is $795. For more information contact The Software Institute of America Inc., 8 Windsor St., Andover, MA 01810, (617) 470-3880.

VENDOR LITERATURE

PBX PANORAMA

Perspective Telecommunications Group is offering a 19-page compendium of articles entitled "Perspective on PBX Systems." George Pfister, president of the company, wrote three of the articles, and coauthored a fourth with B.V. O'Brien. "Dealing with the Generation Gap in PBXs for Office Automation" (*Communications News,* October 1981) was the first published definition of the PBX generations."A Practical Look at Integration Schemes for Voice and Data on PBX Systems" (*Communications News,* July 1982) presents the most widely accepted definition of voice/data integration techniques. "Comparing the PBX to the Local Network—And the Winner Is?" takes a look at the subject of shared cable networks in terms of relative costs, installation, reliability, total throughput, and other considerations. PERSPECTIVE TELECOMMUNICATIONS GROUP, Paramus, N.J.

FOR DATA CIRCLE 350 ON READER CARD

REPAIR AND ANALYSIS

Hewlett-Packard has published a data sheet that shows how paperless repair and reporting can speed the repair process and help solve the problems that occur in cluster-based systems. "Cluster-based Paperless Repair/Reporting" (ref. publication no. 5953-6967) is available free of charge from HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 351 ON READER CARD

IT'S A SNAP

Communication wiring is the subject of a 14-page brochure on the Mod-Tap System. Featured are modular snap-together components that provide a total twisted pair wiring solution for voice, data, and data/voice LANs (local area networks). DARLABINC., Harvard, Mass.

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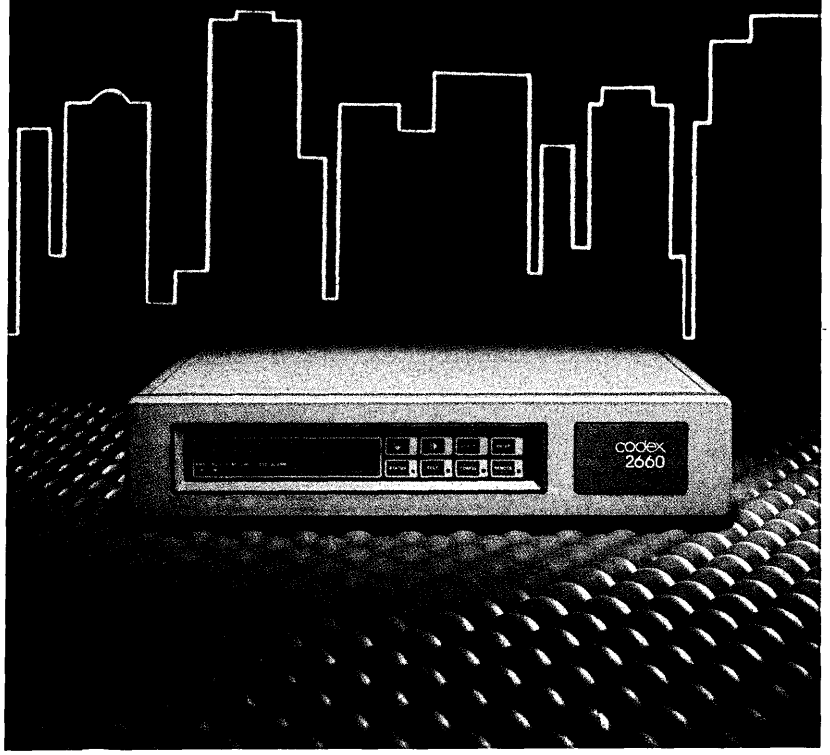

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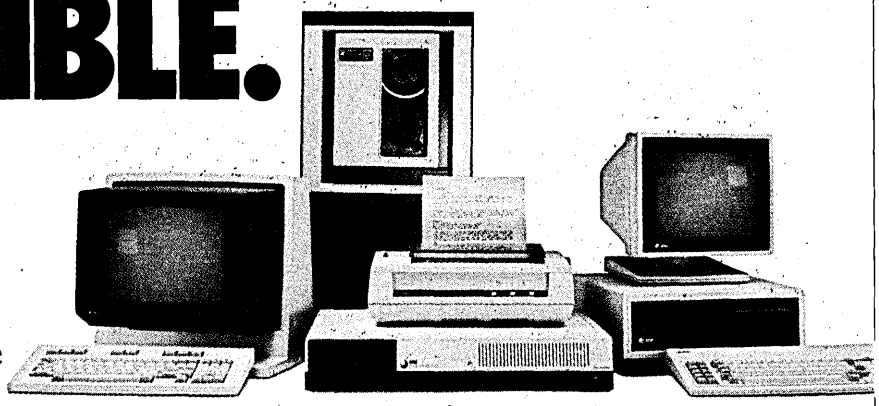

They're new in every sense of the word. New in conception, new in design, new in their ability to deliver unprecedented levels of computer performance. After over 40 years of designing and manufacturing computers, AT&T is proud to introduce a whole new line of innovative computers for business...AT&T Computers.

MEET THE FAMILY

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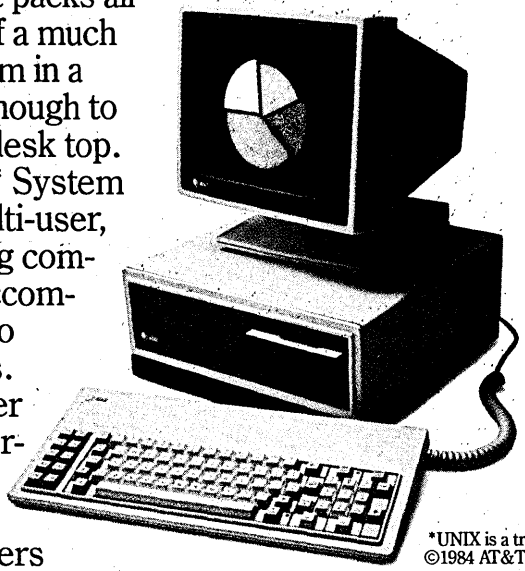
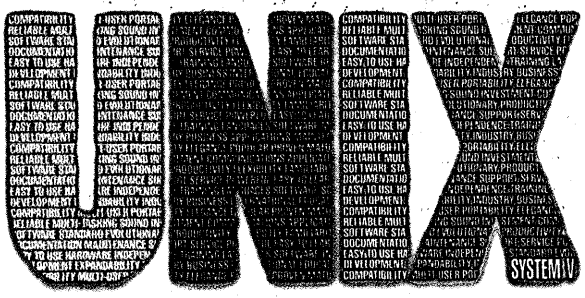
The AT&T 3B2 is one of the most advanced super microcomputers you can buy today. It packs all the power of a much larger system in a size small enough to sit on your desk top. This UNIX* System V-based multi-user, multi-tasking computer can accommodate up to 18 terminals.



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

And meet the new AT&T Personal Computer. What makes it special is its ability to combine high performance with excellent



graphics capabilities, an adjustable display monitor, and non-glare screen. Its flexibility allows it to operate as a stand-alone unit or as part of an integrated computer network. And its compatibility allows it to run most popular business software, including most available MS-DOS** applications.

THE FAMILY THAT WORKS TOGETHER

One big advantage of AT&T Computers is that when there's work to be done, everyone pitches in.

Each family member works together in a coordinated system, making tasks easier

*UNIX is a trademark of AT&T Bell Laboratories. **MS-DOS is a trademark of Microsoft Corporation.

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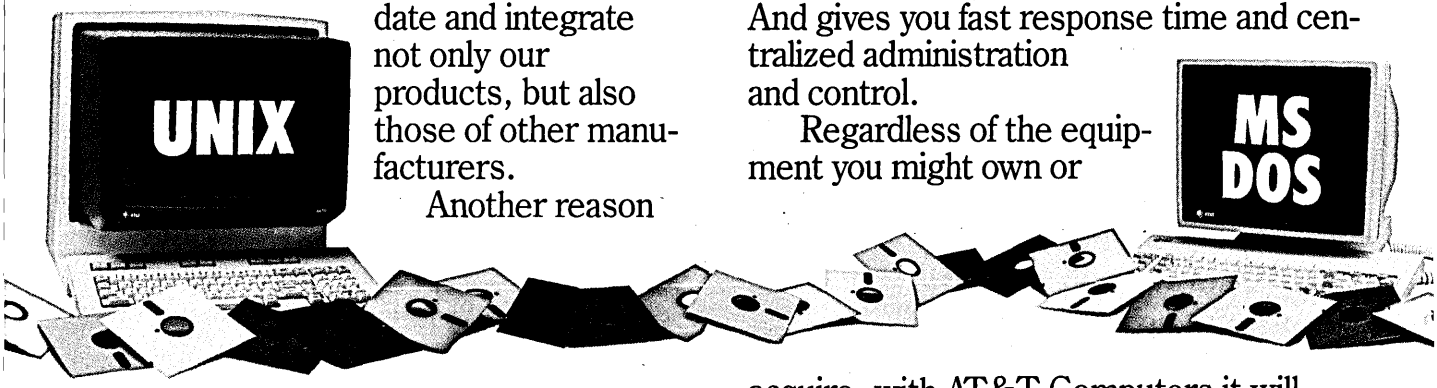
and users more productive. All AT&T Computers are based on our Information Systems Architecture, an open, communications-based structure that can accommodate and integrate not only our products, but also those of other manufacturers.

Another reason AT&T family members work so well together is our unique PC Interface. It bridges the MS-DOS and UNIX Operating Systems, allowing you to use your PC as part of a larger 3B network. Several PC users can thus share peripherals and files stored on the central 3B2 machine.

Yet another reason AT&T Computers are such a close-knit family is our 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. And because UNIX software is upwardly compatible, 3B2 software can run on 3B5 computers, thus protecting your investment and eliminating costly and time-consuming retraining.



THEY GET ALONG FAMOUSLY WITH MOST EVERYONE

AT&T Computers get along so well with each other, they can't help but get along with just about everyone else. The AT&T Information Systems Network links AT&T Computers with those of other manufacturers. It's a flexible, cost-efficient link between terminals, workstations, and computers of all sizes. This local area network allows you to connect departments, buildings, industrial parks, or even campuses. And gives you fast response time and centralized administration and control.

Regardless of the equipment you might own or acquire, with AT&T Computers it will be like one big happy family.

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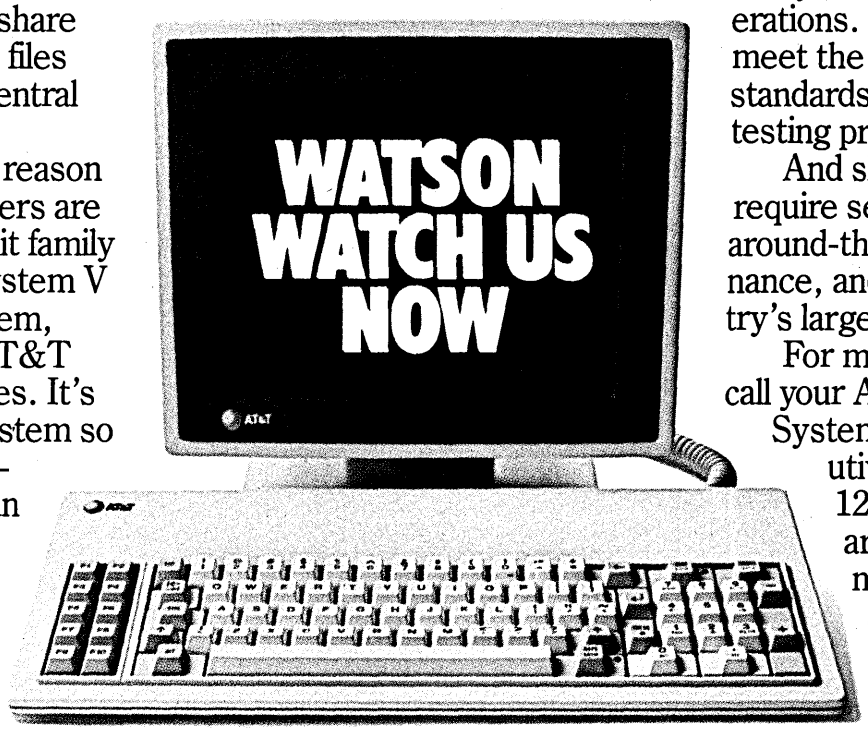
For more information call your AT&T Information Systems Account Executive or 1 (800) 247-1212. Then make arrangements to meet the family: the 3B2, 3B5 and the AT&T Personal Computer. When it comes to meeting your needs, AT&T Computers couldn't be more compatible.



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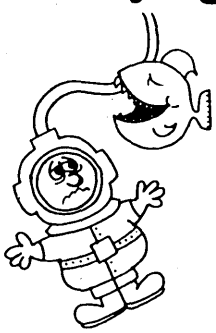

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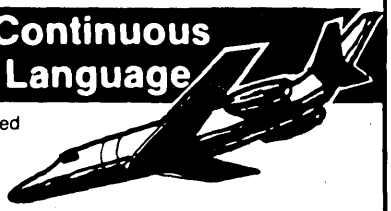

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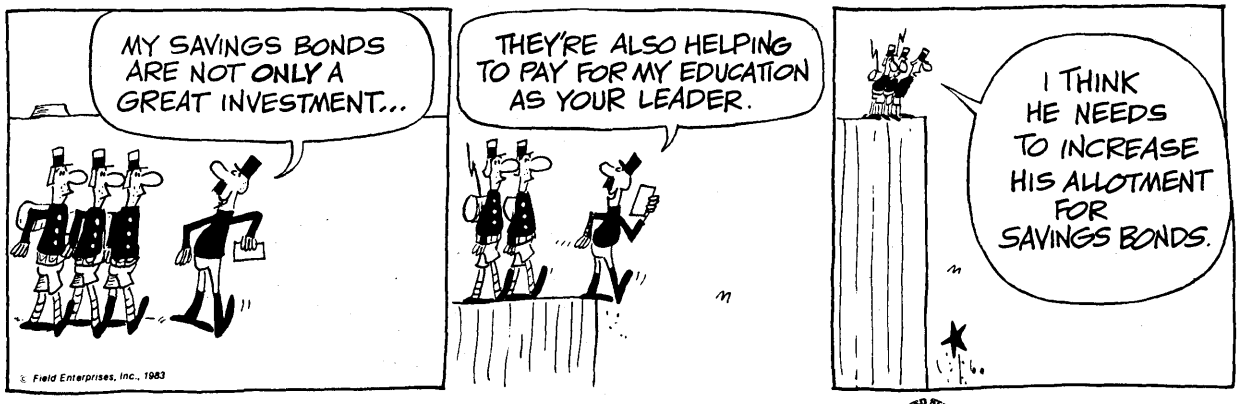

U.S. SAVINGS BONDS DIVISION
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ON THE JOB

OPTION TO HIRE

Another trend in the employment scene is the contract with an "option to hire." This kind of arrangement can make cost-effective sense for companies that want to staff for new product introductions and project development programs.

XXCAL, a Los Angeles-based dp resources firm, claims to have originated the option to hire concept. Under this agreement, an employee is contracted for a specified period of time, and gets the same compensation as a permanent employee. At the end of the contracted period, either the employee or employer can exit gracefully from their agreement, the contract can be extended, or the worker can be hired as a permanent employee. If an agreement to hire is reached, the employer pays XXCAL a conversion fee based on the length of time the contractor was on site. XXCAL claims the fee is substantially less than the cost of intially recruiting a new hire as a permanent employee.

Option to hire allows both parties a great deal of flexibility.

Marvin Hoffman, president and cofounder of XXCAL, claims the option to hire is especially appealing to employers and employees in the high-tech field. "Many factors other than just technical competence determine if workers are well matched to their jobs," he says. "Even in the most highly technical positions, chemistry between people can be as important as technical ability—or even more important in some cases."

Hoffman and his partner, Eugene Gold, are no strangers to the dp industry.

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. . . the trend in benefit plans?
. . . the pay scale range for systems analysts by industry and geographic area?

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For further information contact Laurie Schnepf, director of research, Technical Publishing Co., 875 Third Ave., New York, NY 10022.

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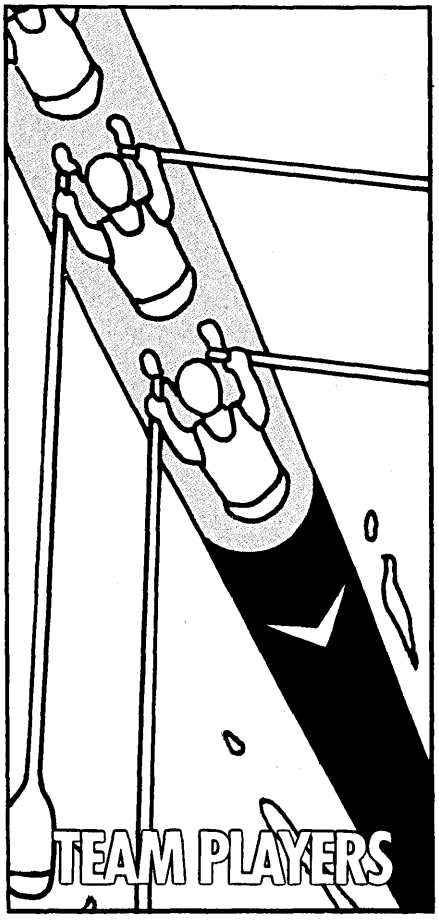

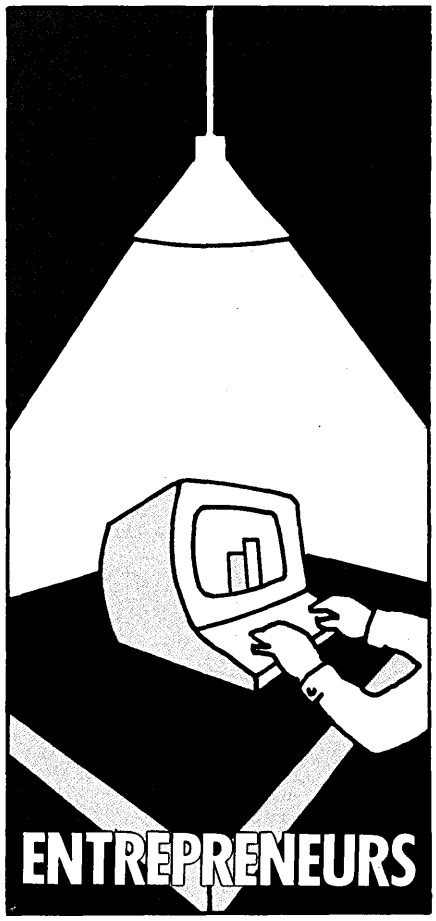

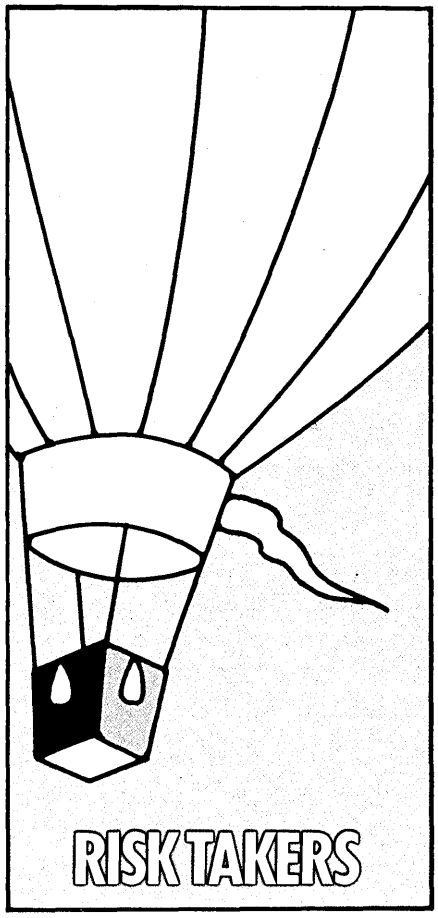

GTE Data Services

GTE

ON THE JOB

Before founding the company in 1976, Hoffman spent 28 years in dp programming and management positions; Gold has a similar background. They built their firm using computer processing to match employer needs with talent. XXCAL boasts of having a database of over 12,000 programmers, systems analysts, and software development specialists.

GOOD NEWS ON TURNOVER

Employee turnover in the electronics industries continued its downward trend by dropping to 21.4% in 1983. The American Electronics Association (AEA) says this compares favorably with past figures of 23.1% in 1982, 24% in 1981, 26.3% in 1980, and 35.4% in 1979.

Joe Weber, human resources services manager for the AEA, says that while the underlying employee turnover rate in the electronics industries has declined significantly during the past four years, he expects the rate to stabilize as the industry matures.

The organization's annual Benchmark Survey, which polled 979 of its member companies, showed that the turnover rate for nonexempt employees (those who receive pay for overtime) dropped to 23% last year, down from 25.5% in 1982. Turnover for exempt or salaried employees was 16.9%, up slightly from 16.6% a year earlier, but still lower than the 18.9% recorded in 1979.

LEARN BEFORE YOU LEAP

For MIS managers, job-hopping doesn't pay, says Peat Marwick, the international professional accounting firm in New York, but advanced education does.

The results of a recent survey show that managers with one or more degrees are paid better than those without. For example, 30.2% of the managers without degrees made less than $40,000 and 86% made less than $60,000. The MBA holders had 51% of their group compensated in excess of $60,000 and 17% in excess of $80,000.

Another interesting finding was that jobholders were generally paid better than job-hoppers. John H. Telford, principal in charge of the executive search practice of the firm in L.A., says that "those managers with the fewest job affiliations—one to three employers—are better paid than those with four to 10 affiliations. Those holding their current positions between one and seven years were the most highly paid, with the greatest representation in the $60,000 to $100,000 annual salary group."

The survey also found that the pay levels of those reporting to chief executives were better than employees reporting to vps. Only 18.1% of the respondents, however, reported to the ceo, with 36.7% reporting to the vp/chief financial officer, and 22.6% reporting to the vp administration.

When queried about incentive bonuses and perks, 53.8% of the respondents claimed they were eligible for an annual cash bonus. Bonuses were mostly based on company performance (46%), followed by personal performance (37%), and discretionary (12.8%). Thirty-three percent said they were provided with stock options, and 23.4% share in other forms of capital accumulation programs. Twenty-two percent had company cars, and 5.9% had club memberships.

Peat Marwick's survey was based on the responses of 1,200 information systems executives primarily in organizations with between 1,000 and 2,500 employees, and dp departments ranging from 50 to 100 employees. Twenty-five percent of the respondents were senior info systems managers employed by units of federal, state, and local governments, universities, and hospitals.

—Lauren D'Attilo

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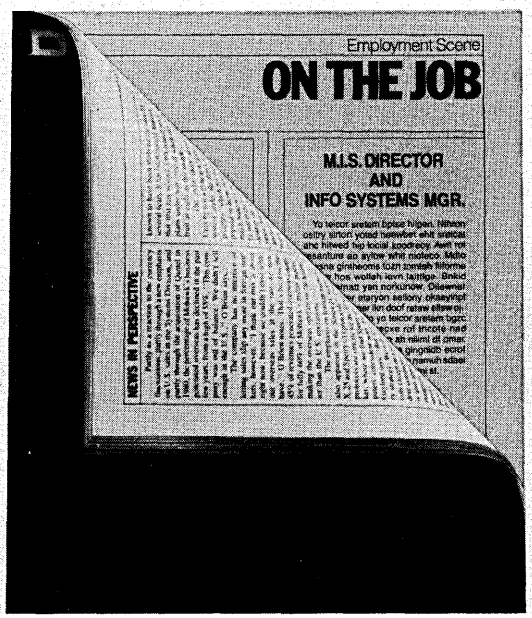
For 26 years *Datamation* has been the number 1 way to reach top information processing professionals. And now it's also one of the best ways to hire them. Because when we increased our frequency to 24 issues a year, we also increased the size of our recruitment section. Offering expanded editorial, as well as the latest listings. For complete information, call Kathy Monaghan or Shirley Stirling at 1-800-223-0743. In NY, 212-605-9732/33.



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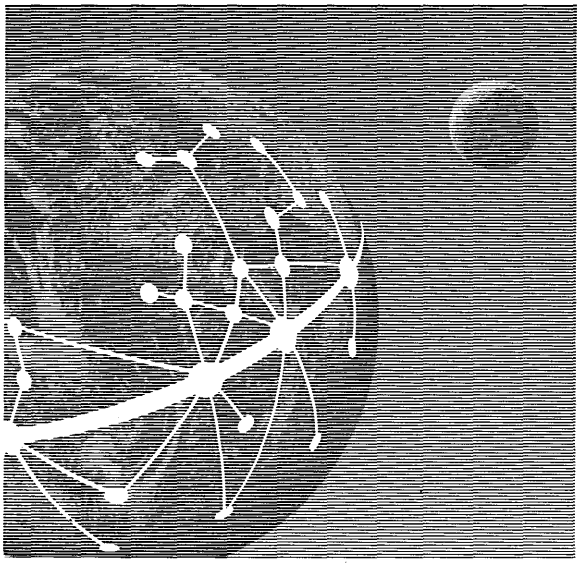

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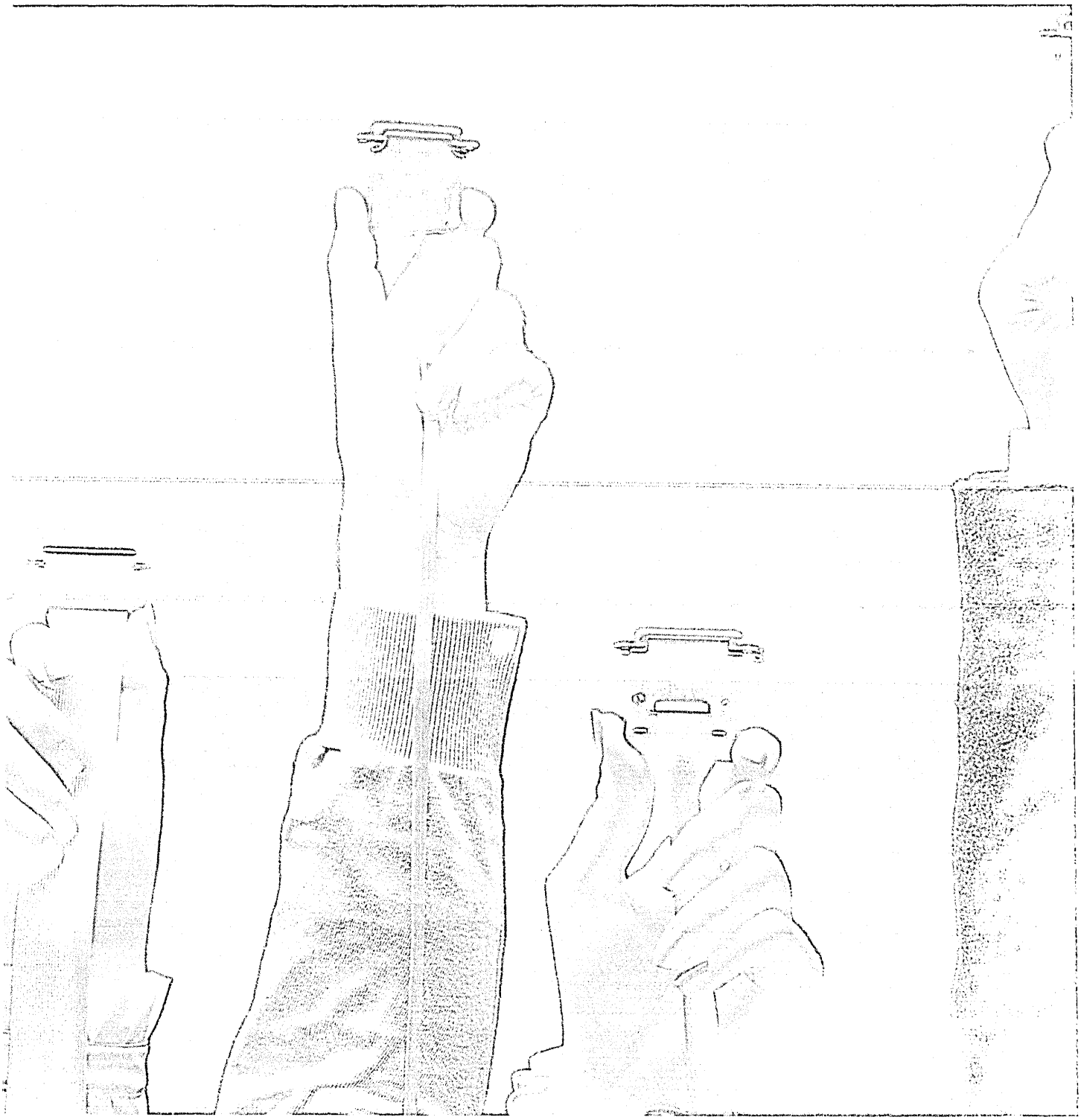

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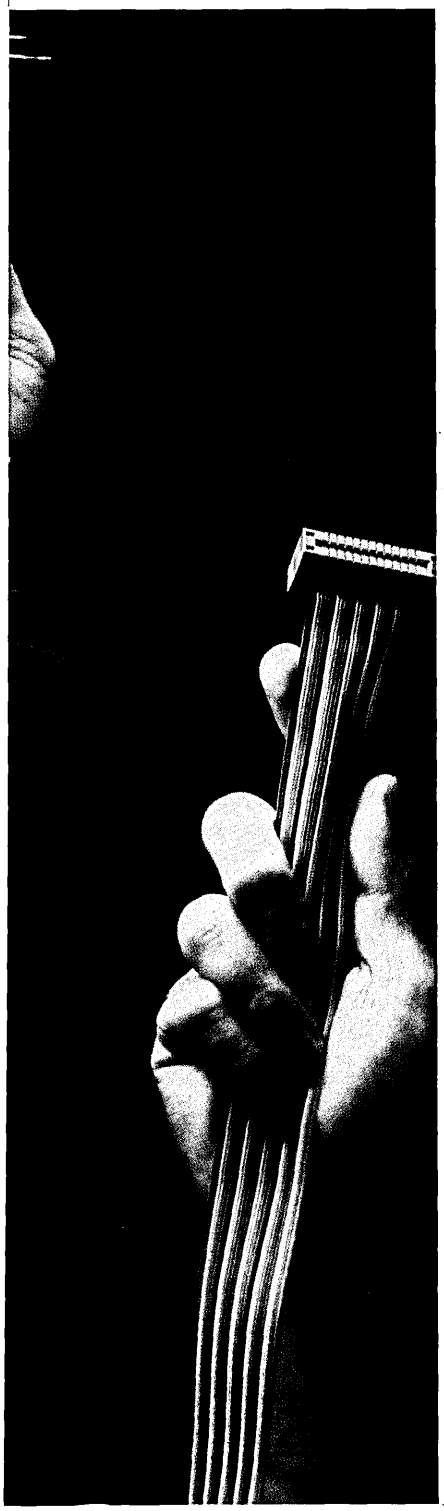
Better known as the Data Pipeline™ from Intel.

It's based on our iDIS™ Database Information System. A powerful, integrated package of hardware and software with multi-user capability built right in. And now, through iDIS, just about any pc or terminal can easily share data with just about any mainframe.



With the iDIS Pipeline, you'll be able to establish and manage your pc-to-mainframe connections in a way never before possible. Yet you'll still be able to offer department users a fair degree of independence. Since iDIS comes with all the software they need. Starting with the Xenix* operating system, built around a relational DBMS. Plus the Multiplan* spreadsheet, word processing, electronic mail, and a forms/menu development tool.

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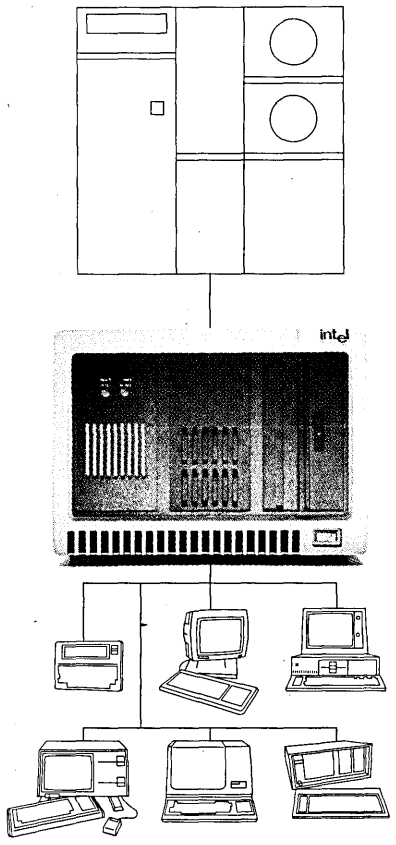
Actually, using the iDIS Pipeline is a lot like giving users their own little mainframe.

Which is a lot better than giving them yours.

It's also a lot cheaper.

Less than half the cost of a direct pc-to-mainframe connection.



Our Data Pipeline™ allows practically any pc to share data with practically any mainframe.

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Of course, if you're undecided about what to do you can always ask for a show of hands...

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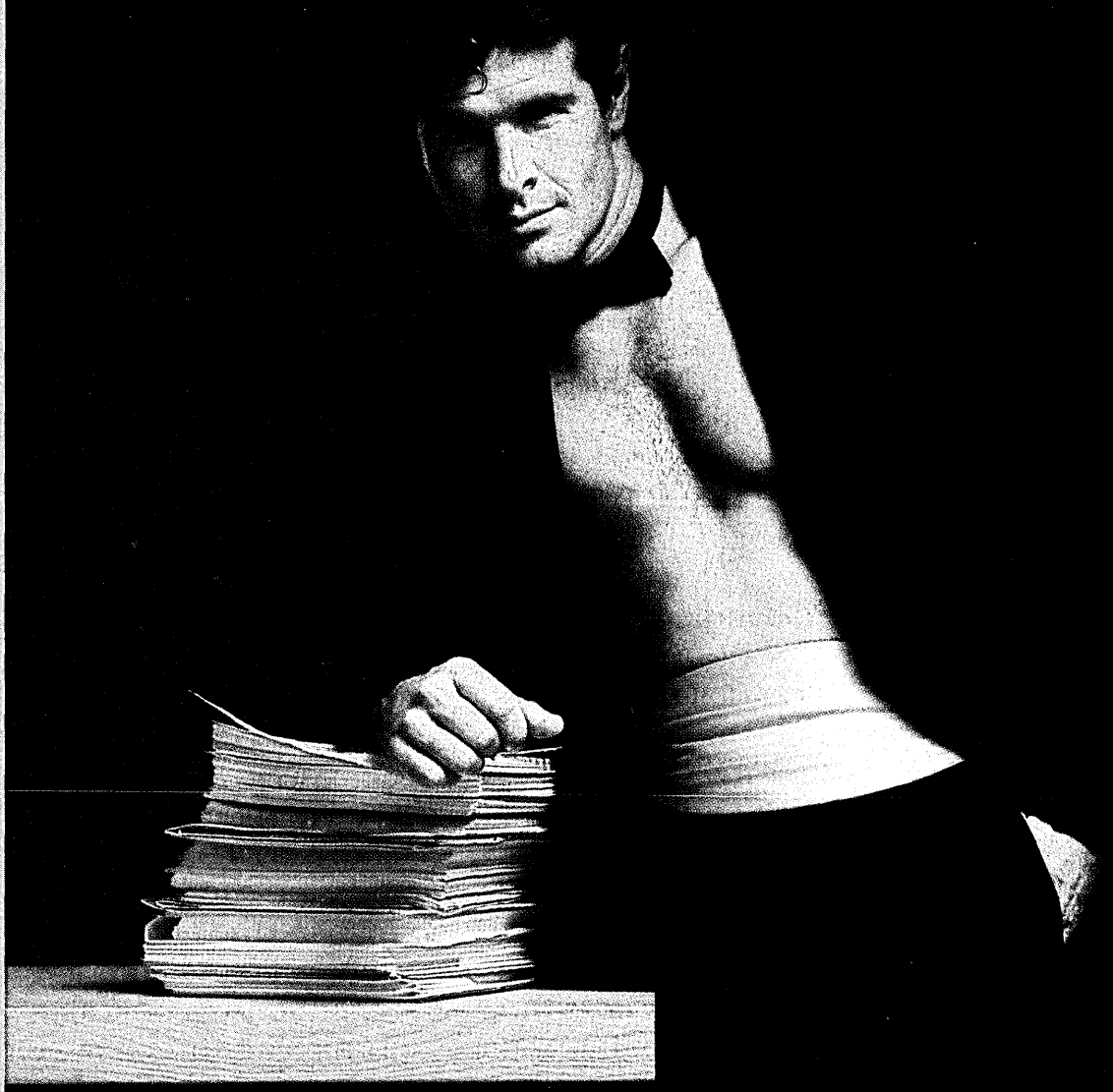
***According to the Gartner Group, who took the time to figure out all the hidden costs, each direct pc-to-mainframe connection costs approximately $22,000. Each. *Xenix and Multiplan are trademarks of Microsoft Corporation.* *© 1984 Intel Corporation.*

CIRCLE 81 ON READER CARD

IF YOU DON'T WARE UCC-4, YOU'LL LOSE MORE THAN YOUR DP INVENTORY.



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CIRCLE 82 ON READER CARD

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

WANTED: DIRECTORS OF CENTRAL INTELLIGENCE

If there is any justification for calling this the Information Age, it is that information is now the most abundant commodity of all. The quantity of memos, computer printouts, studies, reports, briefs, correspondence, calls, and gossip each of us is confronted with daily is many times what it used to be. And that's just direct, person-to-person communication. There are far more indirect or mass messages. It has been estimated that the average American is exposed to more than 1,800 advertisements per day! Leo Bogart, general manager of the Newspaper Advertising Bureau, reports that the number of tv network commercials per week increased from 1,856 in 1967 to 4,079 in 1981. (Significantly, according to *Forbes* magazine, in 1965 28% of tv viewers occupied themselves while watching; by 1981, that number rose to 40%.)

The number of scientific journals worldwide increased from 18,800 in 1978 to 62,000 in 1981. More than 6,000 scientific articles are written every day. It has been estimated (how, I don't know) that the volume of information has been increasing in recent years at the rate of 10% per year. Many hope that new technologies will control, decelerate, or even halt the information epidemic, but they may be hoping in vain. One recent study forecasts that electronic mail will actually accelerate the use of paper and will result in a national total of more than 20 billion messages on paper by the early 1990s.

Science fiction author Ted Mooney predicted that humanity would be afflicted by "information sickness," a disease characterized by disconnected speech, apparent disorientation, and a desire to touch everything. Other observers report that an increasingly prevalent way to deal with the superabundance of information is "partitioning," separating the total entity of received information into segments and dealing only with those segments perceived as directly and immediately relevant.

Donald Michael, former University of Michigan professor of organizational planning, says that a supreme irony of our time is the belief that information leads to control. The fact is, he wrote the *World Future Society Bulletin* (January/February 1983), the growth in the amount and availability of information has resulted in an ever-increasing sense that things are out of control. Partitioning by allocating parts of information to different functions within the organization is a response to that sense of loss of control. But the ultimate consequence is further loss of control, because reality is not rigidly compartmentalized; it is, instead, a complex and interlocking system that must be dealt with in its totality if there is to be any hope of dealing with it correctly. Nowhere is this problem of dealing with the raging torrent of information more pressing than within large corporations. Chief executives have long known how truly difficult it is to wield effective control over large numbers of people. They are now learning how difficult it is to control large amounts of information. And the two in combination—large numbers of people and great quantities of information—present a managerial problem of horrendous proportions.

Observation of the corporate scene leads one to conclude that there is an almost desperate search for a solution. Some efforts take the partitioning road; corporations come to resemble medieval kingdoms, with each department a fiefdom dealing only with its small part of the world. The rulers of those fiefdoms guard their information jealously; they're unwilling to share it with their "rivals," and unable to understand its place in the corporate information universe. Compartmentalizing information means that not only is the information gathered selectively, it is analyzed narrowly, thus robbing it of any wider significance. In this way, information becomes public affairs information, or financial information—and the only hope for a broader perspective lies in how ambitious for greater scope any given department head is.

Another consequence is that information is gathered just

for the sake of having it, because in this kind of environment, information represents power; the more of it you have, the more powerful you can be. This, in turn, leads to a miser mentality with respect to information—that is, you amass it rather than use it, because using it may diminish its power and consequently yours. Quite obviously, the overriding corporate interest gets short shrift.

Still another approach to solving the information problem bypasses the departments altogether by giving the chief executive direct access to all available information. The current buzzword here, as reported in the *Wall Street Journal*, is "decision support systems," which means, simply, giving the ceo a terminal and thus entry to the databanks. Aside from "scaring the daylights out of subordinates," as the *Journal* put it, this approach has a fundamental flaw: it robs the ceo of the benefits of others' perspectives and counsel. Another version entails having an MIS channel to the ceo. A basic problem with this approach is that it omits whatever information cannot be squeezed into the computers. Many ceos have learned, sometimes painfully, that unquantifiable information is generally the most crucial.

A more sensible approach would be to centralize the processing of information, create an organizational capacity to synthesize and evaluate all available information—internal and external, quantified and unquantified—necessary for informed corporate decision-making. To do this effectively, particularly in very large organizations, requires the establishment of a new executive function: the corporate director of central intelligence.

Every corporation has a senior executive in charge of finance, another in charge of marketing, and still another in charge of production. Perhaps others are in charge of various staff functions such as human resources, law, and public affairs. Doesn't it make sense, as more and more of our organizations and their activities are information-based, that we recognize the need for an overall senior manager of information?

Enormous amounts of money are being spent to gather information. One company I know recently discovered it was spending more than $2 million per year on subscriptions alone! All it had to show for that expenditure was several hundred feet of library shelving. There was no organized process in place enabling the company to move that $2 million worth of information beyond its entry point—the individual readers—into the decision-making procedures.

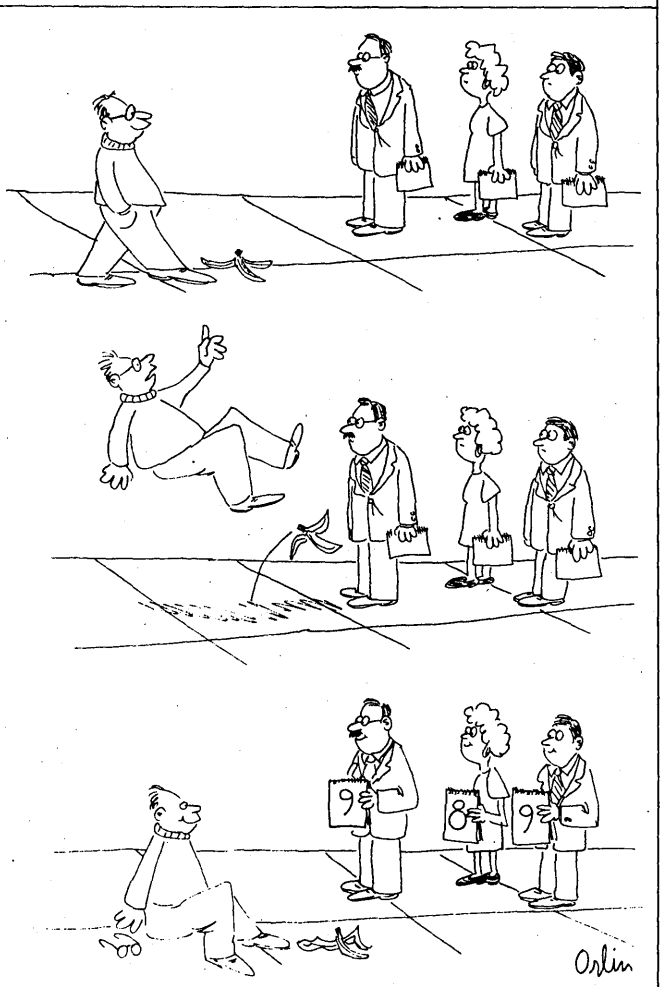
Organizations now have a great number of gatekeepers, persons who control their individual segments of the information universe and the gates between their information and the decision-makers. Each of these gatekeepers operates with his or her own agenda; their perspectives determine what information they possess and what they do with it. As a consequence, they are exerting much more control over the destinies of their companies than may be desired by their bosses. It was once pointed out by a very astute observer that, at the height of the Iranian revolution, the real power in that country was wielded, not by the Ayatollah Khomeini or by the parliament, but by those deciding who would be allowed to see Khomeini—the gatekeepers. Too many chief executives who believe they are being protected from undesirable demands on their time are really being deprived of access to essential, if not critical, information.

A corporate director of central intelligence could weave together the separate strands of information into a coherent and cohesive fabric. He or she could combine econometric data, survey research results, demographic statistics, internal productivity figures, and qualitative information, such as social trend analysis and political intelligence, to form a picture of the *total* environment in which the organization operates.

The intelligence so synthesized could be presented at regular and frequent executive briefings and as a regular part of the agenda for executive committee or board meetings. In addition, the director could provide special reviews of the overall internal and external context in which new development can be shown to fit in particular ways.

While a number of organizations have recently installed or experimented with a strategic scanning function that attempts a comprehensive compilation of external information, no one, to my knowledge, has established a senior executive position where the primary function is intelligence gathering and analysis. Without the clout that comes with senior management status, it is unlikely that the many impediments to coordination and wide scope can be fully overcome.

—Arnold Brown
New York, New York

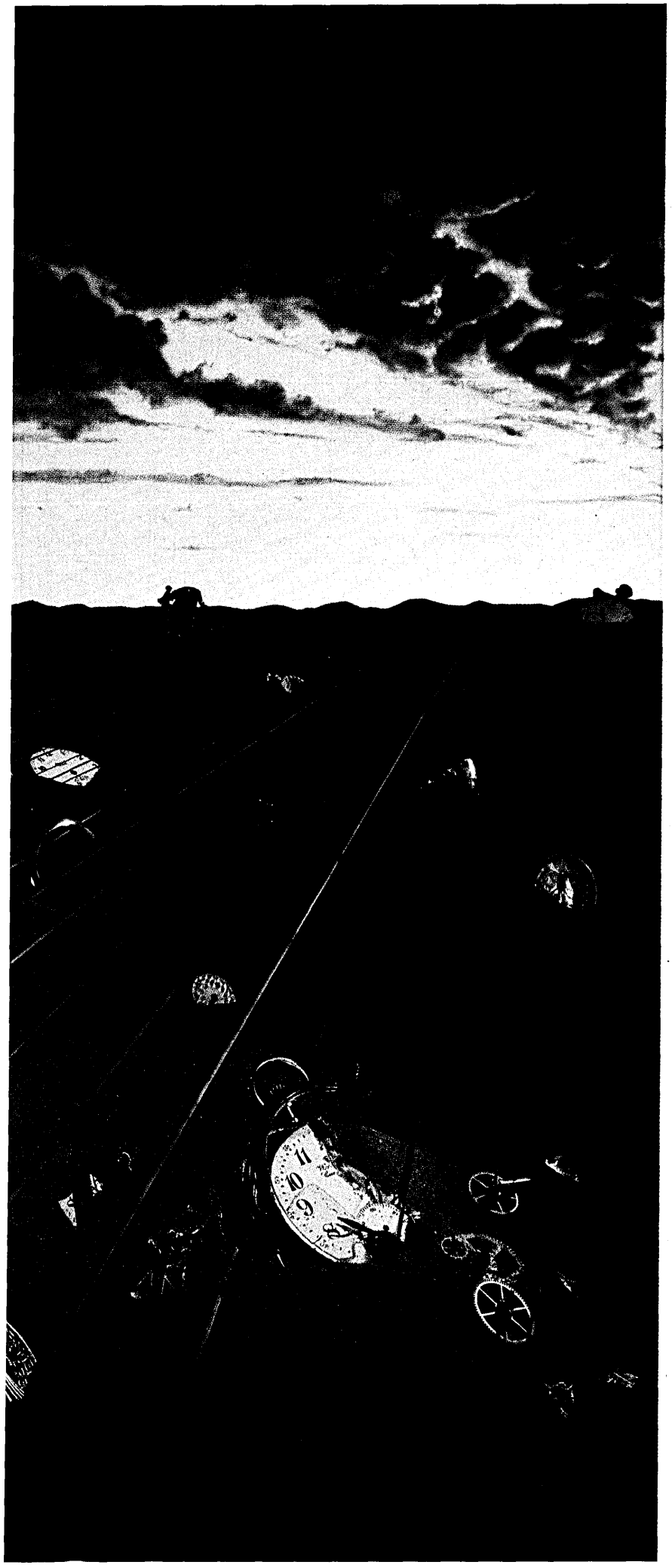


CARTOON BY RICHARD ORLIN

ACTIVITY WITHOUT DESIGN

Frank Sweet's article on "The Winchester House Syndrome" (April 15, p. 104), was right on the mark, as far as it went, but he missed the two major points of this syndrome in database design. The first is its applicability, and the second, its origins.

As bad as the Winchester House syndrome is in database design, it is equally prevalent and much more devastating in other areas of dp, especially in large software systems. While the facilities of modern database managers soften the blow of having



Peat Marwick technology has exploded the myths about computer systems development: It doesn't have to take forever or cost the earth.

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CIRCLE 83 ON READER CARD

to start over on database design, there is no easy cure for a multimillion dollar hardware/software system that was never designed. Although patching and testing and kludging can get it to work and produce output, it will never be reliable, maintainable, or even credible. The only hope is to do it better in seven years when the system is replaced.

To avoid the Winchester House syndrome, we need to discover its origins so we can attack the problem at its roots. The Sarah Winchester house developed as it did because she had a large inheritance and therefore needed to keep building. Resources were considered inexhaustible (or at least of limited importance), and activity was considered more important than results. I submit that the same two conditions exist in many of today's software projects, and are the source of Winchester House syndrome in software development.

I'll probably be able to hear the shouts of protest over that last statement from directors of MIS, vps of dp, comptrollers, and even ceos from as far away as Silicon Valley. Of course resources are limited—in everything *but* importance!

I'm prepared to back up my statement.

Money is limited. But time is money, and time is even more limited. The whole idea behind a systems project is to spend money to save time and money. So as long as the feeling that expenditures are justified exists, money is of limited importance. It is more important to preserve time. This is how the perception that activity is important got its start.

Once activity is deemed important, it's relatively easy for it to get the upper hand on results. After all, the final results of the system effort won't be seen for years. The only way to show intermediate results is through activity: number of hours spent, number of lines of code written, and number of modules debugged. But these are really just measures of activity. Thus, senior analysts, associate software engineers, and junior programmers find that activity is the best way to cover their number. And the more money they spend on the project, the more money they'll receive to protect the company's investment.

This is not to say these people are incompetent. As with the Winchester house, the materials and workmanship are of the highest quality. They just don't go anywhere. They don't come together because there is no design.

Design is the heart of software engineering. All the software engineering practices being advocated today point toward design of systems, modules, algorithms, databases, and interfaces before anything is entrusted to code. A case can be made for the view that the greatest benefit of structured analysis is that it provides a means for the analyst to specify the details of the system functions without getting into the shape of the system. In turn, this allows system structure decisions to be delayed until the system design phase, where they can be addressed most effectively.

In hardware, design is a synonym for engineering. The only reason it is not the same in software is that too many people have the title of software engineer and not enough know anything about program or system design. The tools of structured design, cohesion and coupling measures, program verification, and proofs of correctness are not widely known. The building blocks of program design, algorithms that have already been shown to work, are not shared and used. Electronics design takes a systems approach of coupling standard modules; software design still takes an approach analogous to computing parallel capacitance in each circuit. With the software engineering tools available, this approach is unconscionable.

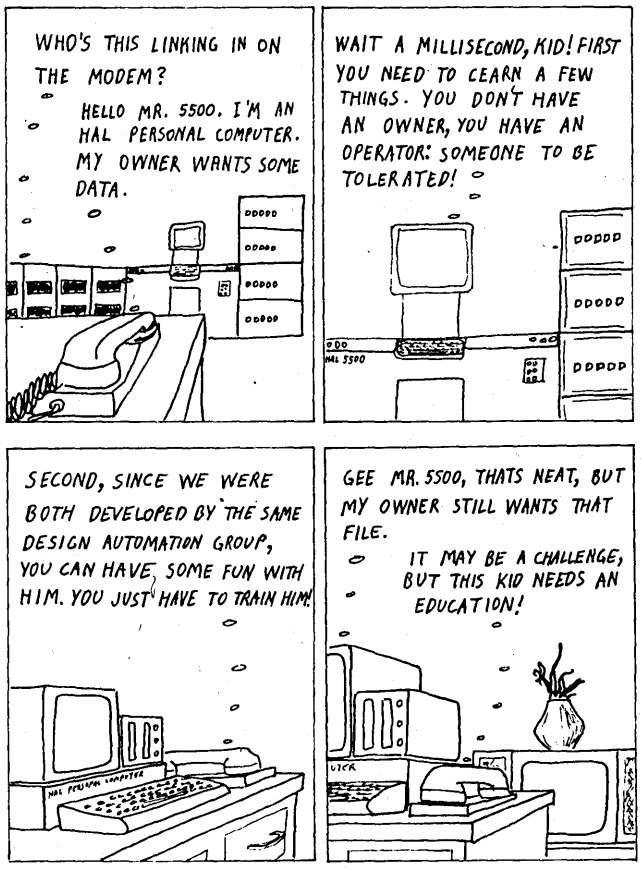
There are several views that can be taken concerning the source of this approach and its concommitant software crisis in this country. Some maintain that academia is at fault. With their emphasis on getting programs written by the end of the semester, college courses instill the habit of "start coding now!" And this approach is carried over into industry.

William Bryan and Stanley Siegel, in their article, "Product Assurance: Insurance Against a Software Disaster" (*Computer*, April 1984), maintain that the problem is a lack of software product assurance practices. But even their assertions are symptoms of the lack of knowledge about software engineering. They admit that their advocacy of a blend of quality assurance, verification and validation, test and evaluation, and configuration management into a single discipline of product assurance is a "repackaging of software engineering principles." What they miss is the fact that product assurance is not software engineering; it is the monitoring of the use of software engineering. Software engineering is software design. Their misconception stems from their emphasis on three areas of software failures: lateness, coming in over budget, and not meeting users needs. Software design also focuses on reliability and maintainability issues. These cannot be achieved by product assurance alone; software engineering is required.

I recently consulted on a computer replacement project that is budgeted at just over $13 million. I wish I had a dollar for every time I heard, "We don't have time to !" (Fill in any software or system engineering activity.) "We have to get the software ordered by fall and the hardware ordered by the first of the year!" I also wish I had 10% of the money the project is going to waste on software for lack of a coherent design. I could retire to Florida.

—Edward S. Ruete
Waterford, Conn.

DIGITS BY ROY MENGOT



If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

SCIENCE/SCOPE

Troublesome electrical charges that build up on space vehicles will be overcome by an advanced charge-control system being developed by Hughes Aircraft Company for the U.S. Air Force. The Flight Model Discharge System will use a self-contained plasma source to effectively "ground" the spacecraft surface to the surrounding space plasma, eliminating disruptive arcing for charged surfaces. The system will monitor both vehicle potential and space-environmental conditions to detect the onset of spacecraft charging. It will operate a plasma discharge device to neutralize charge buildup. The plasma discharge operates on xenon gas, ignites in one second, and requires only 10 watts of power.

Heat pictures are screening printed circuit boards for such defects as open or short circuits and failed components. The Automatic Infrared Test & Inspection System (AITIS) uses a cooled, 60-element infrared detector to create a high-resolution thermogram. A computer compares a tested board with a master thermogram stored in computer memory. Components that appear too warm or too cool are shown in color-coded temperatures on a video monitor. As a complement to automatic test equipment, AITIS saves time and money. Hughes developed AITIS under its independent research and development programs and contracts with the U.S. Army Missile Command and U.S. Air Force.

A trio of multipurpose communications satellites has been introduced by Hughes to handle standard communications and direct TV broadcasting to homes. All three are drum-shaped and spin-stabilized. One model, designated HS 393, is the domestic communications satellite of the future. It can carry 16 high-power channels or 48 channels at lower powers. A second spacecraft, the HS 394, has a flat, sun-tracking solar array, thereby combining the best features from the existing technologies of spin-stabilized satellites and body-stabilized satellites. The third model, the HS 399, is a small spacecraft with 12 channels. Occupying only one-fourteenth of a space shuttle cargo bay, it could be launched for about one-third the cost of orbiting a standard 24-channel satellite.

An advanced factory management system model, developed by Computer Aided Manufacturing-International and Hughes, will help optimize use of manufacturing resources. The model will address interactions of all work areas within every level of the organization. It will precisely identify department production capacities, queue bottlenecks, and resource flow.

A broadband gallium arsenide field-effect transistor that operates in the 20 GHz frequency range has been introduced by Hughes. The new power transistor chip, designated Model C0311H-2000, is guaranteed to operate in a 50-ohm system over a typically 2-GHz bandwidth. It is designed as a medium power driver with 6.5 dB gain guaranteed at a 100 mW output level.

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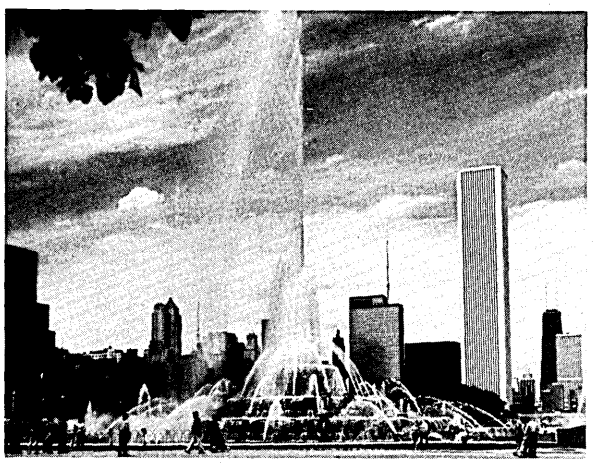
WORKSHOPS
60 workshops will be offered over the three-day Conference. Participants can attend 6 of these 1¼-hour sessions, led by experienced practitioners, that cover the entire spectrum of computer security concerns. You'll find something useful no matter what your area of interest or level of experience.

GRADUATE PROGRAM
This special 2-day program is designed to meet the needs of the advanced computer security professional with at least 4 years experience. There is no extra charge for this program, but space is limited.

EXHIBITION
Don't miss this opportunity to attend the National Computer Security Exhibition, the only one of its kind devoted solely to computer security. You'll see the latest in security products and services.



PERSONAL NETWORKING
The value of this Conference is much more than the formal program; it's also an unparalleled chance to meet professional colleagues, to share your headaches and experiences with people who really understand what you're up against. It's a once-a-year opportunity to significantly expand your network of contacts, enabling you to exchange ideas when you return to the job. Using a variety of mechanisms throughout the Conference, CSI makes this interaction happen.

Here's What Attendees Said About Last Year's

FINANCIAL

"Still the premier computer security conference! An interesting and diverse program, well-organized and a great opportunity for information." David Puttock, Data Security Planner, Bank of Montreal

"The best forum for exchanging security problems and solutions—presents 'state-of-the-art' & related topics in a concise fashion!" Christine Jermyn, EDP Security Analyst, Mutual of New York

"I was concerned that the conference could become repetitive over the years. But CSI listens to its members as is evident with the Graduate Program. Another great job!!!" Frank A. Sydor, Security Analyst, First National Bank

"I've been active in arranging security educational seminars at the regional and international level and you, your staff, and all the people that participated should be congratulated for one of the finest jobs I've seen." Daniel T. Cumberledge, V.P., Lincoln First Bank,

"Overall, high quality. Useful in all aspects." David E. Farquhar, V.P., Nat'l Bank & Trust Co. of Norwich

"Excellent; it really is a good opportunity for getting up-to-date on the data security field." Naftali Fasten, Asst. V.P., Republic Nat'l Bank of N.Y.

"Very good conference. Great opportunity to exchange ideas with others in the field. Management of the conference was excellent." Dixie Alexander, Management Support Assistant, Bank of Virginia

"Excellent!! I picked up a great deal of information & ideas that will be very useful in my field (disaster contingency planning). I also liked the luncheon seating by job title, industry, & special interest." James McClelland, Computer Operations & Facilities Manager, Suburban Bank

"Overall, the conference was very good. I could see CSI had put a tremendous effort into it and CSI deserves credit." Chung Yau, EDP Auditor, Long Island Trust

"An excellent forum for frank interaction on security/control issues (past, present, & future)." E.H. Perley, Manager, Royal Insurance Canada

"Excellent program presented by professionals in a no-nonsense program schedule. Lunches were good." Joseph F. Heissler, Dir. of Operations, Country Mutual Insurance Co.

"'Job well done' CSI." John Cusick, EDP Auditor, First Nat'l Cincinnati Corp.

"Well managed, informative, & enjoyable." Joseph B. Mihalyi, Systems Analyst, New Jersey Blue Cross

"Of all the computer security conferences I have attended, this one is a must for computer security personnel." Joselyn Mascarenhas, Data Security Off., First & Merchants National Bank

MANUFACTURING

"Excellent—one of a kind—seems to have something new every year." D.R. Lamberth, Security Specialist, Gulf Oil Corporation

"Terrific—this is my third conference and, amazingly, it gets better every year." Ray Evans, Security Analyst, R.J. Reynolds Industries, Inc.

"A very excellent conference that was extremely well planned; the best I ever attended. The Graduate Program is an excellent program to view several topics with experienced security managers." John O. Tosatto, Supv., Database Security, PPG Industries

"High quality and content of sessions and workshops presented in a practical and usable manner. Thank you for another cost-effective and beneficial conference." Ezra W. Brooks, Security Coord., Burlington Industries

"An excellent forum to learn from a cross-section of security practitioners. The exhibition was a great idea to expose us to many products available." Steve Cullen, Sr. EDP Auditor, U.S. Tobacco Co.

"The conference was invaluable in my selection of security software." Paul Frazer, Mgr, Technical Support, Kennametal Incorporated

"Best organized conference I ever have attended." Donald W. Horner, V.P. Systems, Colwell Systems

"In a year of severe cost restraints, worth every penny!" Ansgar Mantel, Manager, EDP Audit, Domtar,

"The conference provides a wide variety of information for each of the professions involved in computer security: specialists, auditors, and DP personnel." John Noe, Contingency Recovery Coordinator, Armco

"Very good conference. A well organized learning experience. Well worth the trip." Michael Adams, Supv. EDP Audit, Royal Canadian Mint

"Very educational, eye-opener. Wish that I had the opportunity to attend a conference like this before starting my duty as an EDP security officer." Norman Dang, EDP Security Officer, Texas Instruments

"Very good conference. All of the sessions I attended were very worthwhile. I'm looking forward to next year's conference in Chicago." Mary E. Kiley, Mgr., Security Services, Northern Telecom

"The conference was very enlightening & an eye-opener. Picked up a lot of good pointers and ideas. Liked the personal schedule." Walter R. Mazuryk, Security Admin., Sterling Drug Inc.

"Excellent—as usual." Rolf Moulton, Sohio

"A very well managed conference which offered me the opportunity to tailor a program to my needs and security concerns." John Yandrisovitz, Auditor, Bethlehem Steel Corp.

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ınd Exhibition

ᵖECIAL INTEREST SESSIONS

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ınd finally, optional (at extra cost) programs o maximize your experience...

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ɔu have the chance to attend one or two of the seven ɔtional, full-day seminars offered in addition to the ɔnference sessions. Choose from two offered on Sunday ıd five on Thursday.

POUSES' PROGRAM

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ıe exhibition and personal interchange have been y valuable for learning about the latest products for ıdling our security needs." George W. Siegmann III, ɔervisor, Lockheed Missiles & Space Co.

ıis is the prime source of information for companies develop and benchmark their security systems. A ıat place to meet and converse with other security ɔfessionals." Frank P. Behm, E.I. Dupont Co.

pportunities for an interchange of ideas are fan-ıtic. Most speakers were excellent." James S. Kinney, Sr. Systems Engineer, Brown & Williamson ɔacco

his was the best organized and most helpful nference I've ever attended." Bill Miller, Mgr., ındards & Professional Development, Mitchell Energy Development

)VERNMENT

onference is the best single source of information computer security on both the conceptual and chnical levels. All this expertise in one place is an ormous resource for the data security community." ɔbert Sayre, Security Spec., Social Security Administration

uperb conference, totally pertinent subjects by the ıst in the business." Leo G. Miller, Computer Security ficer, U.S. Air Force

ın outstanding event. The topics covered were nely, informative, and well presented. A definite ıntribution to the world of ADP security." Jerry ıshner, Network Security Officer, U.S. Army

This was a very good conference in all aspects, ıpecially the Graduate Program. Many good con-ɛctions were made and the Exhibitions were like ɛing in a candy store. Very well run as usual and quite ıjoyable. Just too short." Richard Brinkley, Prog. nalyst, Bureau of Public Debt

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"Conference was very well organized. Impressed especially with workbook, the individual schedules, and the providing of handouts at the workshops." David D. Israel, Chief Staff Auditor, Washington Gas Light

"I was extremely impressed by the caliber of general speakers and workshop speakers. Overall organization of conference is superb." William Gieske, Bell Laboratories

"The value of this conference to those attending who took full advantage of the various seminars and exhibit materials is simply unmeasurable! The conference program for the 'Graduates' was excellent in content and was most relevant to today's security issues." Gerald L. Huerta, Security Consultant, Martin Marietta Data Systems

"Well structured to provide 'something for everybody' involved in computer security." Daniel D. Cottrell, Manager-Security, AT&T Communications

"Excellent, well-managed conference—keep up the good work." C.M. Elliott, Dir., Quality Assurance & Security, Martin Marietta Data Systems

"Enjoyed the conference very much. Felt the material presented was insightful in addressing the concerns of today's security practitioner." Steve Foley, Sr. EDP Auditor, Days Inn of America

"Overall very informative for auditors, security officers, and everyone connected with EDP security." James S. Sigmon, Jr., Computer Security Analyst, Aramco

"Excellent—Best technical conference I have attended." Kenneth C. Kendrick, Dir., Internal Audit, Informatics General Corp.

"Stimulating—I accumulated 16 action items in the first two days; well worth the cost of the conference." Gerald W. Grindler, Mgr., EDP Security, Southwestern Bell

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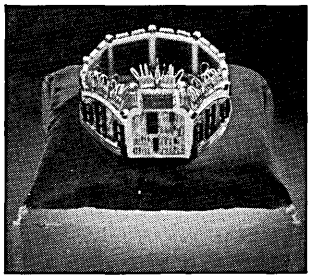

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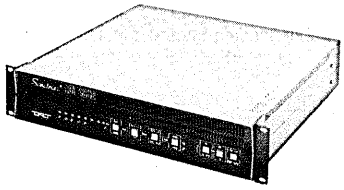

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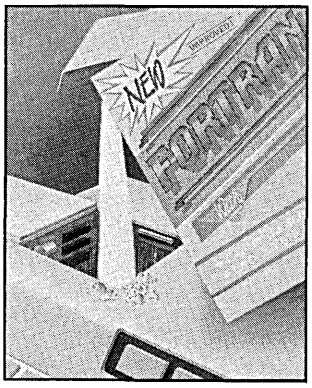

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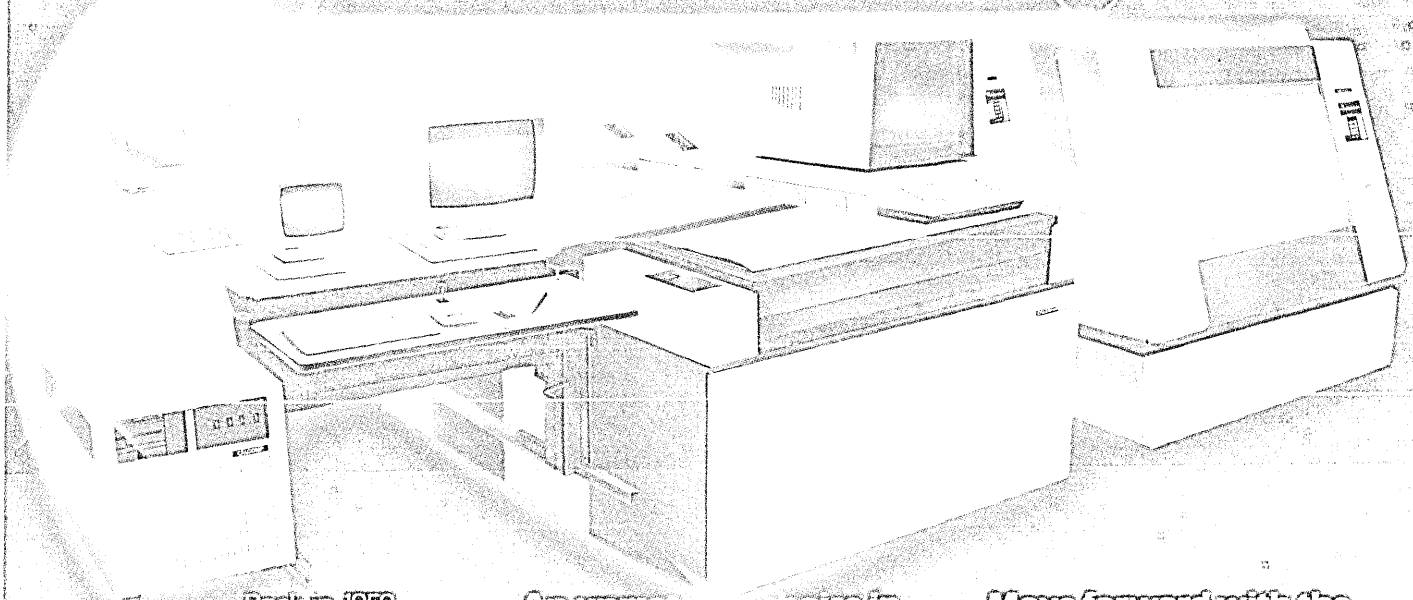

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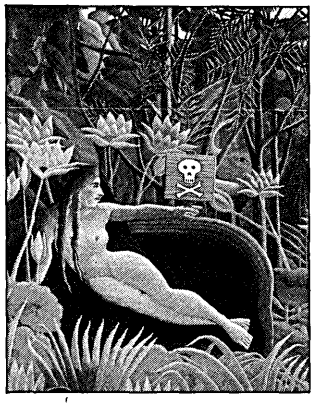

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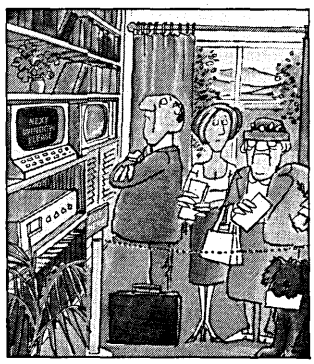

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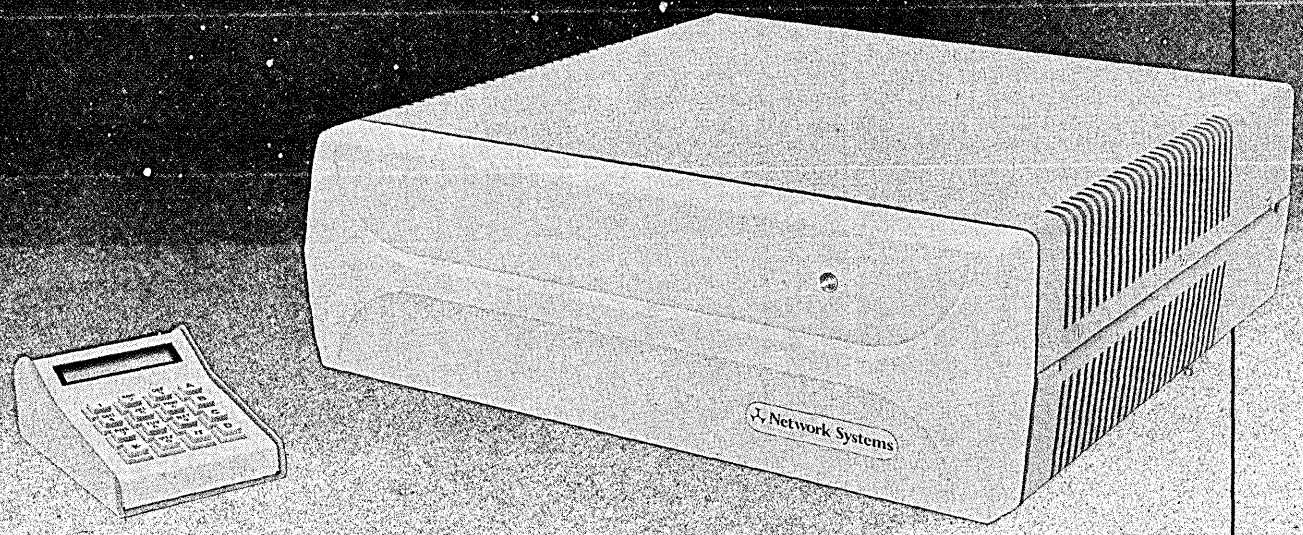

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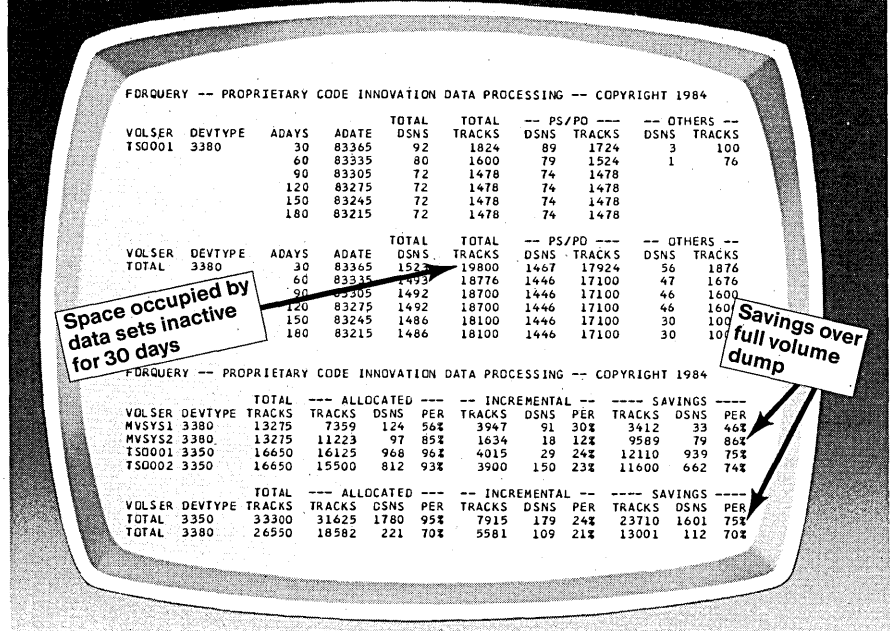

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TOTAL   3380         30    83365          1523    19800    1467   17924     56    1876
                     60    83335          1493    18776    1446   17100     47    1676
                     90    83305          1492    18700    1446   17100     46    1600
                    120    83275          1492    18700    1446   17100     46    1600
                    150    83245          1486    18100    1446   17100     30    1000
                    180    83215          1486    18100    1446   17100     30    1000

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                    TOTAL   --- ALLOCATED ---   -- INCREMENTAL --   ---- SAVINGS ----
VOLSER  DEVTYPE   TRACKS    TRACKS  DSNS  PER   TRACKS  DSNS  PER   TRACKS  DSNS  PER
MVSYS1  3380       13275      7359   124   56%    3947    91   30%    3412    33   46%
MVSYS2  3380       13275     11223    97   85%    1634    18   12%    9589    79   86%
TS0001  3350       16650     16125   968   96%    4015    29   24%   12110   939   75%
TS0002  3350       16650     15500   812   93%    3900   150   23%   11600   662   74%

                    TOTAL   --- ALLOCATED ---   -- INCREMENTAL --   ---- SAVINGS ----
VOLSER  DEVTYPE   TRACKS    TRACKS  DSNS  PER   TRACKS  DSNS  PER   TRACKS  DSNS  PER
TOTAL   3350       33300     31625  1780   95%    7915   179   24%   23710  1601   75%
TOTAL   3380       26550     18582   221   70%    5581   109   21%   13001   112   70%
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CIRCLE 87 ON READER CARD

Get involved with drugs before your children do.

Sooner or later, someone's going to offer to turn your children on.

It could be their best friends.

And chances are, you won't be anywhere in sight.

So what can you do?

Obviously, the time to talk to your children about drugs is before they have to make a decision on their own.

Which means you have to learn something about drugs.

Learn the dangers. And learn to recognize the signs of drug use. Listlessness in your child. Sudden drop in school grades. Temper flare-ups and staying out late a lot.

Learn about peer pressure on a twelve-year-old. Then show them you understand how important their friends are to them. But also tell them that real friends won't insist they do drugs.

Check your own personal habits. You can't tell a child about the dangers of drugs with booze on your breath.

But it's through love and understanding that you can be the most effective. Threatening to tear their arms off just won't work.

You can get a lot more ideas from the booklet, "Parents: What You Can Do About Drug Abuse." Write: Get Involved, P.O. Box 1706, Rockville, Maryland 20850.

Remember, it doesn't always happen to someone else's kids.

After all, there are over 35 million drug users in America.

And they're all someone's children.

Ad Council A public service of this publication and the National Institute on Drug Abuse.

Now You Can Use Your IBM PCs as Smarter Smart Terminals in the IBM3270 World.

More and more, people in your company want to access data from the mainframe. And since IBM PCs are in (while dumb terminals are on their way out), you need one good source for a complete family of micro-to-mainframe communications products.

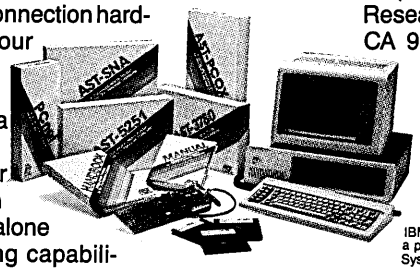
That's where we come in. AST is the leading supplier of IBM PC-compatible products. With over 200,000 board-level PC enhancements already on the job. And now we're offering a full line of 3270-compatible products that will fit a variety of connections and protocols. Without forcing you to reconfigure your mainframe hardware or software.

For starters, there's our new AST-SNA family. Hardware and software that let your PCs talk to your mainframe (and let the mainframe talk back) via the SNA/SDLC protocol. Giving you all the facilities of a 3270 terminal. And with the computing power of your stand-alone PC maintained!

Plus, the basic hardware can support multiple protocols. And you can support a variety of emulations from a single PC. Or support additional PCs by using one as a cluster controller. An arrangement (with up to four PCs) that can save you a lot of money. You can even attach low-cost ASCII CRTs to a PC and emulate 3278 Model 2s.

What's more, our AST-BSC package lets you work in a 3270 BSC environment and still migrate to 3270 SNA/SDLC without hardware upgrades. Another way to save money and aggravation.

Still, there's more. For example, if you have an IBM 3274/3276 Cluster Controller, our coaxial connection hardware is your answer. Once installed (via coax-A), it lets your PC retain its stand-alone processing capabilities and emulate a 3278/9 terminal. With no performance degradation!



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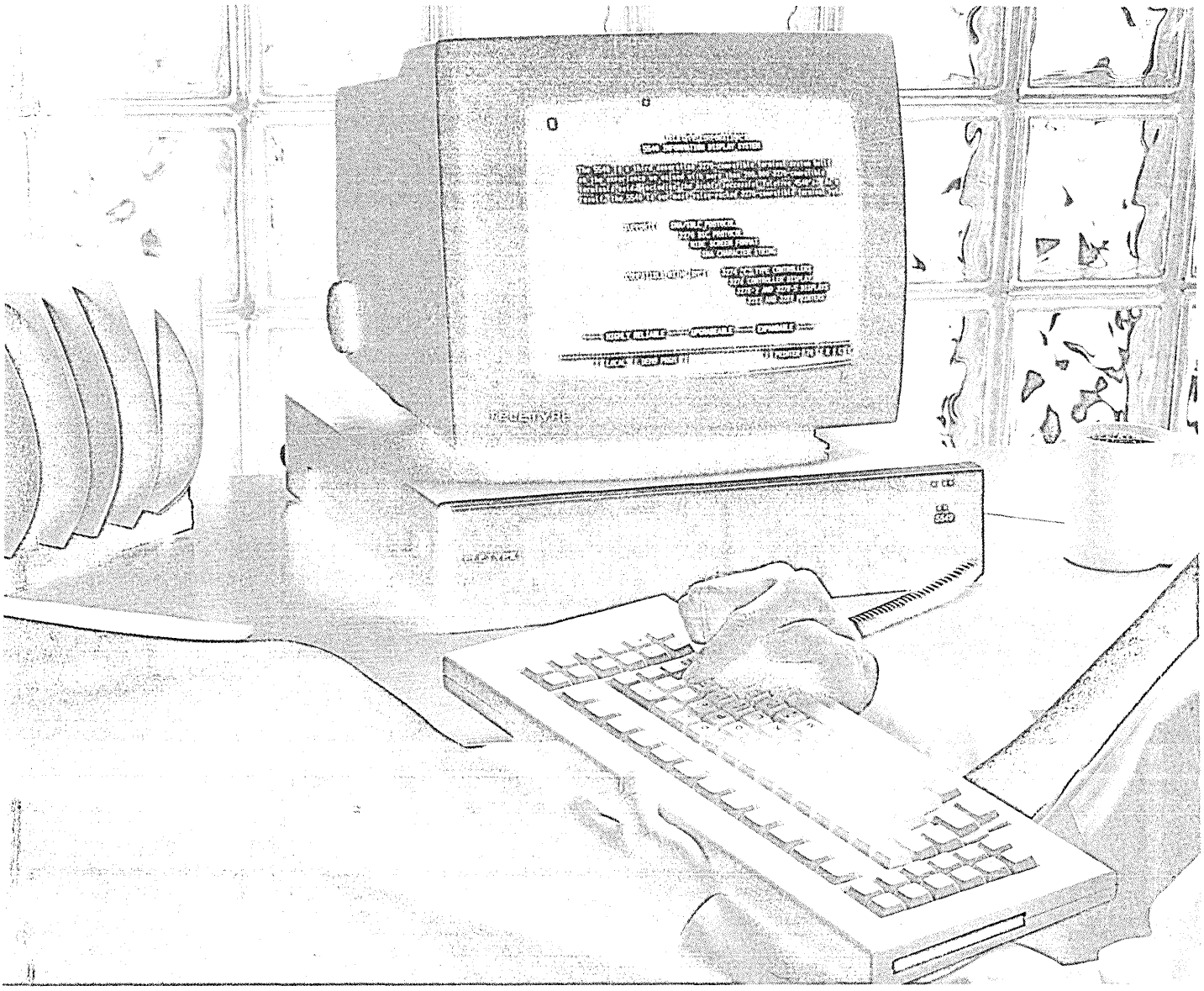

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