

HP Professional

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JUNE 1990

- CAD Data Management

- X Terminals: The New Desktop Standard?

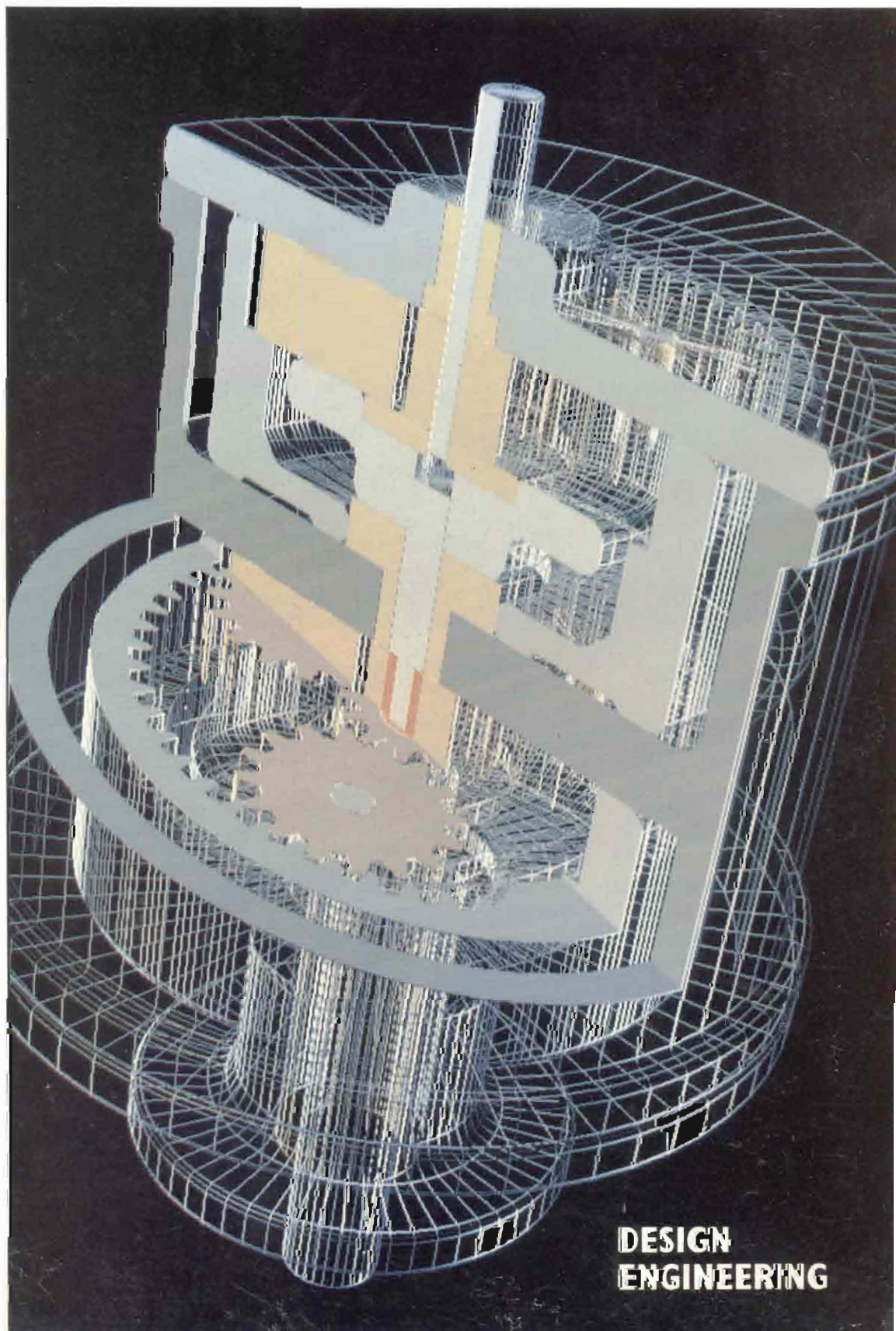
- Automate Operation Process Review



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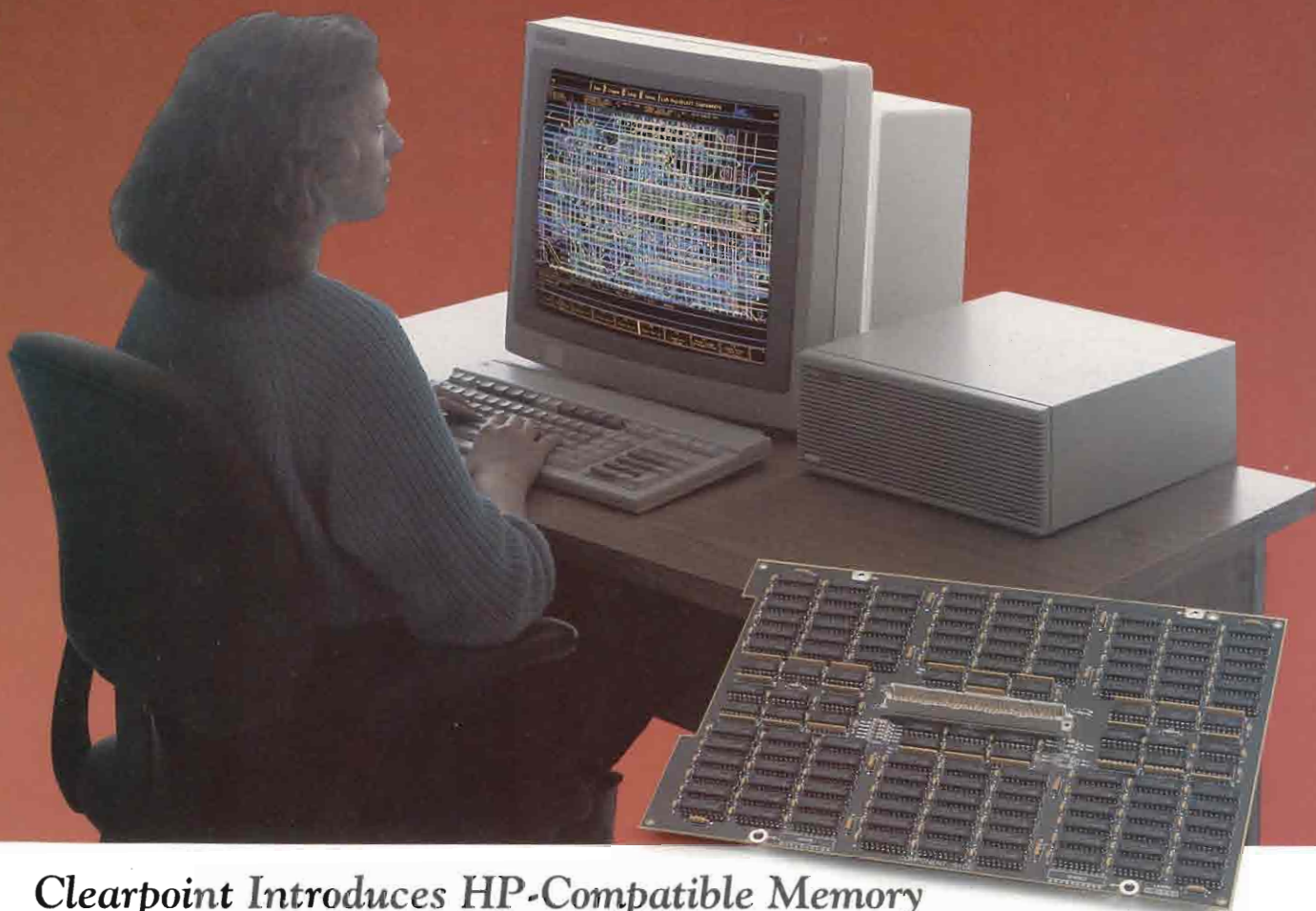
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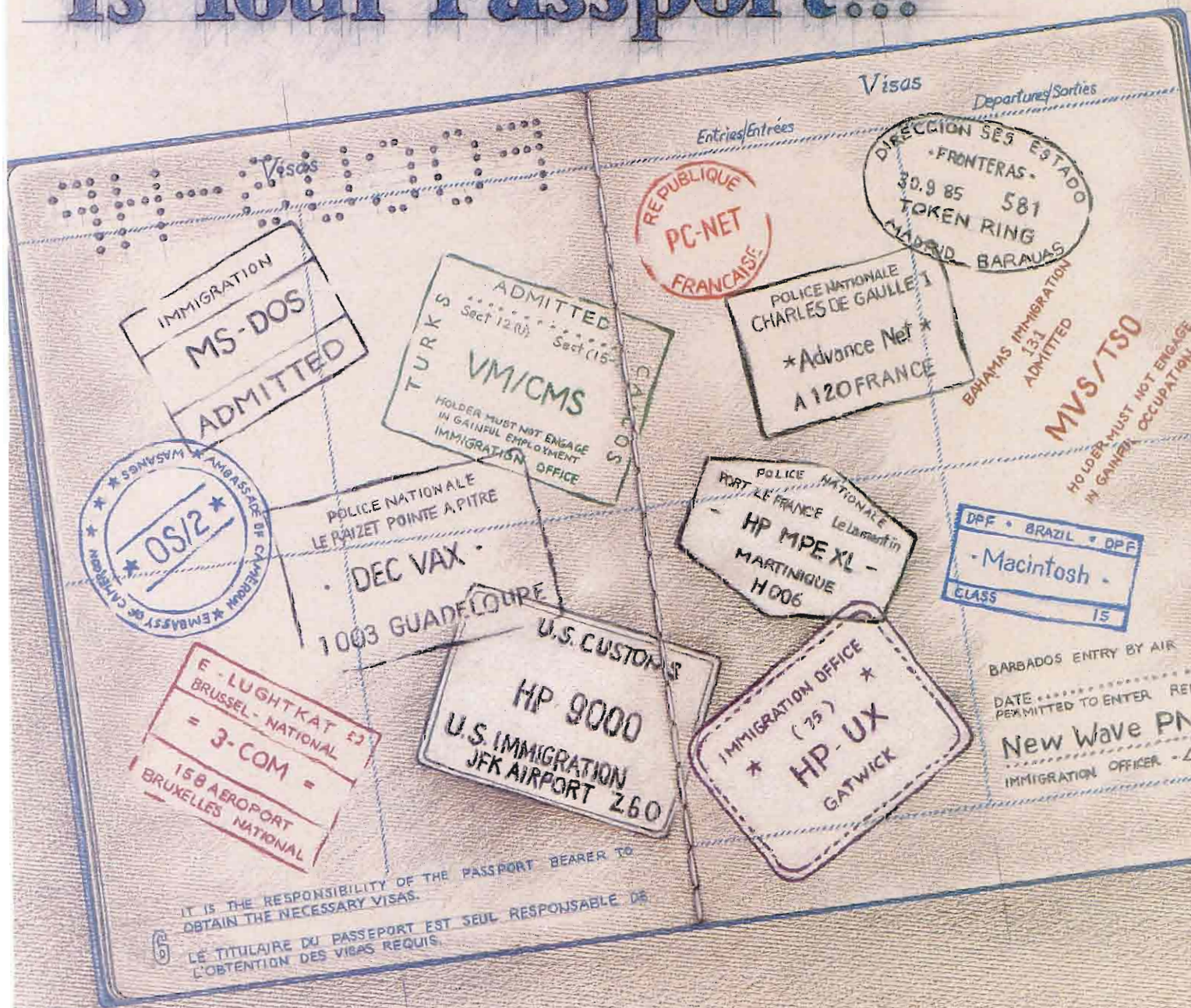
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CIRCLE 122 ON READER CARD

C CONTENTS

JUNE 1990

VOL. 4, NO. 6

26 FOCUS: CAD Data Management
by Bill Sharp
Database Management Software For MEs Without Database Background.

34 FOCUS: X Terminals
by Peggy King
The New Desktop Standard?

46 FOCUS: Paddling Up The Waterfall
by Tom L. Scott
Automate Your Operation Process With Reverse And Re-Engineering.

52 Report Writers
by Roger W. Lawson
No Longer The Simple Beasts They Used To Be.

C O L U M N S

FROM THE LAB:

EnGarde
by John P. Burke
InCase Corp.'s Security Audit Product ... 62

PC-Write Lite
by Miles B. Kehoe
A Fully Functional Word Processor That
Practically Invented Shareware 66

PC TIPS: WINDOW INITIALIZATION
by Miles B. Kehoe
A Different Environment For Your PC 72

UNIX: Effective Administration Tips
by Andy Feibus
Improve Your User's Environment 78

NETWORKING: OSI — What, No Standard?
by Gordon McLachlan
The OSI Model Misconception 82

RDBMS: Data Representation

by Fabian Pascal
Relational Fidelity Rules And Database
Flexibility 86

D E P A R T M E N T S

Editorial 8
Industry Watch 10
News & Trends 14
New Products 22
Advertiser Information 81
Product Showcase 92
Software Directory 94
Career Opportunities 95
Advertisers Index/Calendar 96



EDITORIAL:
*The Pinnacle
Of Computing...p.8*

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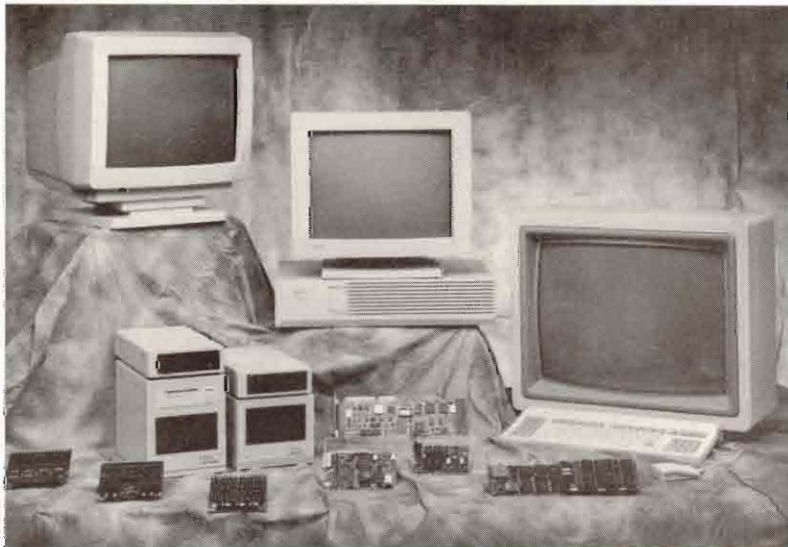
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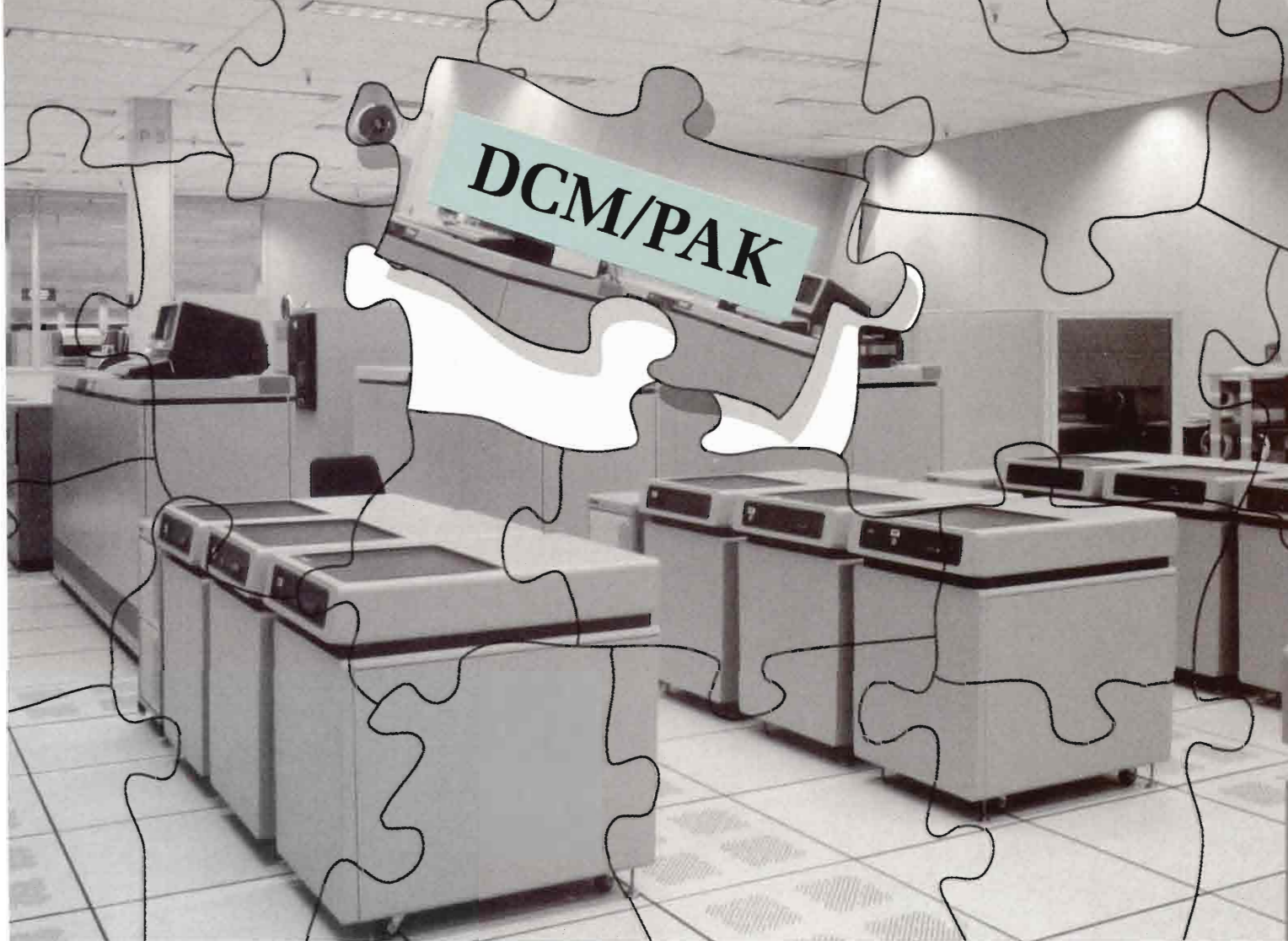
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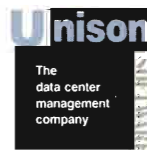
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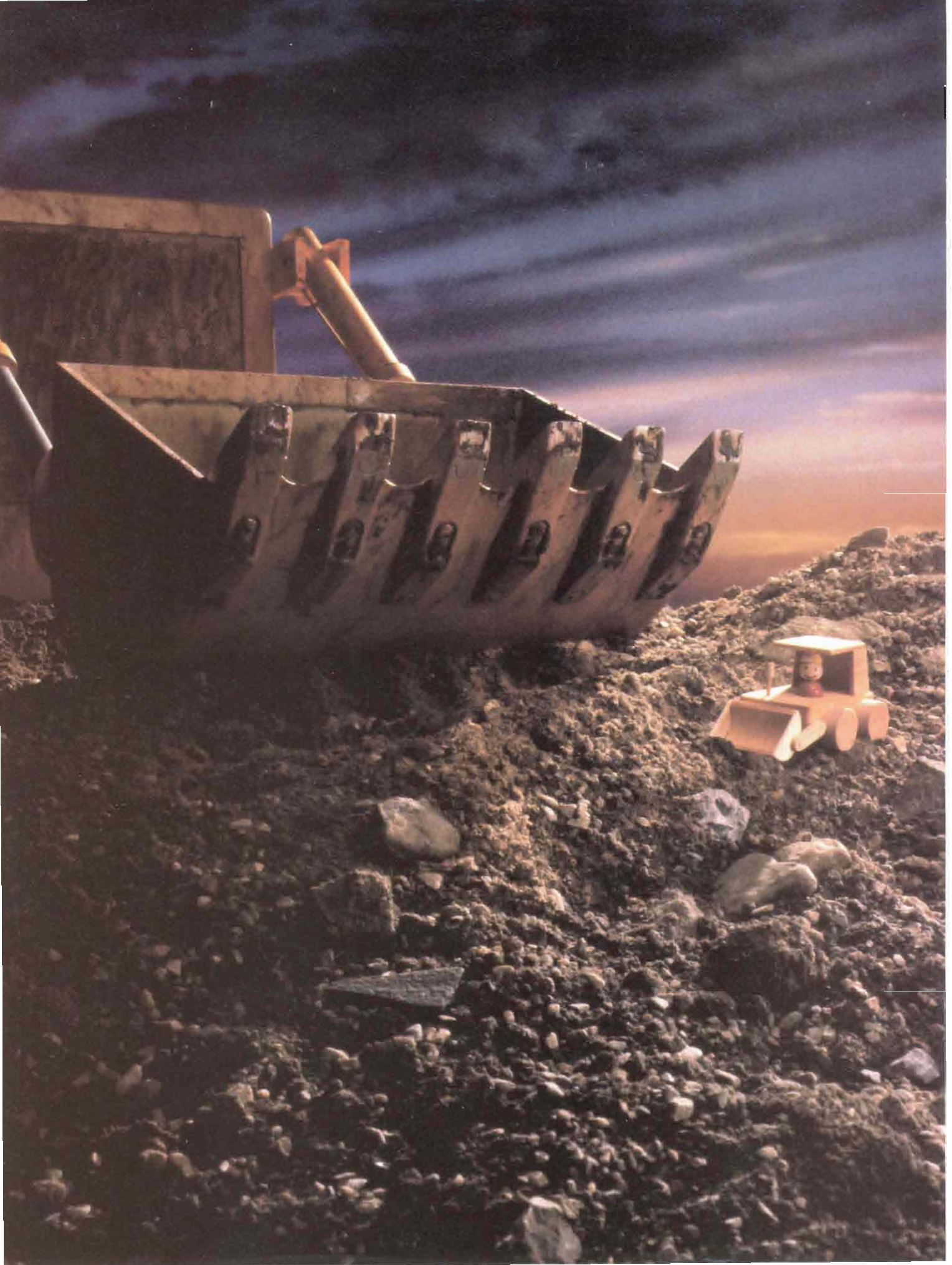
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I Can See It From Here

Do you have a vision of what computing will be like when we reach the mid-1990s? It isn't too early to start planning how your computers will be used enterprisewide to accomplish your company's computing goals.

There's general acceptance that a lot of our computing will be based on networks. Most of what we have today, however, is homogeneous processing. Non-homogeneous processors use the network for file services, data transfer and some mail functions. For these processors to become fully functional members of our network, we'll need standards that have been agreed upon and written but not yet executed by a sufficient number of software vendors to make them worthwhile.

Real network computing will become a reality when you can execute code on any processor on the network and display the graphical output on your own terminal or workstation screen. This is the promise of the X Window System.

Say, for example, I run a CAD/CAM application for designing a wing for the airplane I'm building in my spare time. The CAD/CAM program was written for and runs on an HP/Apollo workstation. It was also written to support X standards.

Using the X terminal on my desk, I open a window on the HP/Apollo workstation attached to the network via standard Ethernet connection hardware. When I run the program, it executes on the HP/Apollo workstation. However, instead of displaying the results on its own display device, it transmits X commands over the network, which my X terminal converts into the same graphical images that would have appeared on the HP/Apollo screen. The mouse on the X terminal produces the results on the terminal that would have been produced by the mouse on the HP/Apollo workstation. Opening another window (the first remains active) on a Sun workstation, I run a spreadsheet to do mathematical calculations necessary for my wing design. Back in the first window, I make changes to the design and print the results on a system printer.

The promise of network computing is the ability to put diverse platforms on the network and make them available as a shared resource for everyone to use. As we begin the 1990s, it's still only a promise — a gleam in a software designer's eye — and not a reality.

Network computing has limitations. The I/O bandwidth is limited to that of the network, about 1.25 MBps today and about 12.5 MBps when FDDI (the fiber optic Ethernet) becomes available. Don't expect to put hundreds of users on such a network and have all the I/O handled over the Ethernet.

The network is the communications channel among processors, not the main data bus of the network computer system.

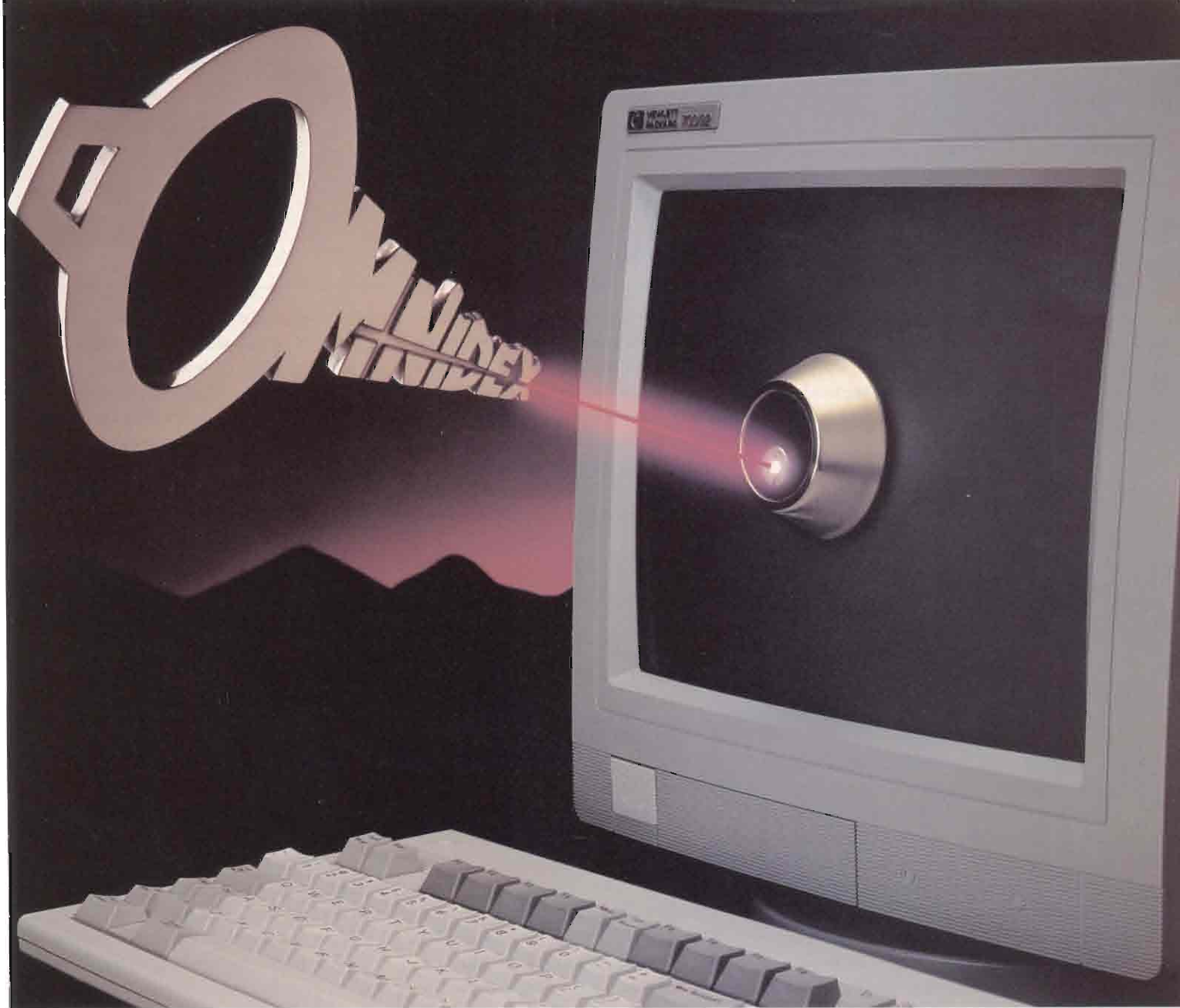
Each such "system" will require mainframe-powered computers whose I/O bandwidth can handle the immense amount of traffic thousands of commercial users can generate.

Workstations and other servers will give us the specialized CPU power for compute-intensive applications on the desktop. X terminals will let each "seat" use more computer power, so get ready to buy more servers and workstations. The number of person-mips will increase dramatically during this decade.

Where will the software come from? This is a case of "Which came first, the chicken or the egg?" We need to provide enough network computing seats so that Ashton-Tate, Lotus, Microsoft and others begin writing their software to support X standards. That hasn't happened yet. I recently read that God was able to create the world in six days only because he didn't have an installed base to worry about. Not everyone gets to design from a clean sheet of paper, and most of the major software suppliers have large installed bases of customers that they must support and protect. Only then can they spend time, effort and money to develop new marketplaces.

We have the networking, platforms, X protocols and hardware to put this together. Mix thoroughly, add a little time, and shake, and it will all come together. Remind all the software vendors you can that your view of computing for the '90s is a networked, multivendor environment in which all platforms work together to provide multiple solutions to users. We haven't reached that pinnacle of computing, but I can see it from here.





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INDUSTRY WATCH

Peggy King

and customers is that the company is working its way out of the applications business and concentrating on selling hardware, peripherals and networking products.

Because the profit margins in the industry continue to shrink, it's increasingly important to sell more boxes. The old "applications leverage hardware" equation for profitability has changed. In the cutthroat UNIX workstation market, it's the selection of third-party applications rather than a single package from the hardware vendor that attracts customers to the platform.

A decade ago, HP and other minicomputer vendors kept their software engineers busy writing applications and utilities. In the heyday of proprietary operating systems, the more software applications HP could supply for the HP 3000, the more customers would have reason to buy the hardware. Many software developers had a chance to plan, design, code and test a software product from scratch, and a few of them got to see their work appear on the pages of a software catalog with a price attached to it. But times have changed...

It's not as easy as it used to be for a hardware vendor to make money selling software; in fact, it's even difficult to figure out whether selling a software package makes money for the entire corporation or merely for the division credited with the sale.

For example, it's questionable whether HP's DesignCenter software from the Electronic Design Division (Ft. Collins, CO) has made enough money to offset the number of workstations the company could have sold if certain elec-

tronic design automation (EDA) applications had been ported to HP. For every customer who bought an HP workstation in order to use DesignCenter, were there two who opted for hardware from another vendor because their favorite electronic design package wasn't available on HP systems? The product may not have been ported because software ven-

tools based on the HP-UX operating system and X Windows. The decision was in keeping with HP's new strategy of providing a framework for integrating third-party products rather than applications that compete with what other software vendors sell. For example NewWave provides the foundation for integrating office applications from vari-

A decade ago, HP and other minicomputer vendors kept their software engineers busy writing applications and utilities.

dors didn't want to port to a platform where they would have been "Brand X" when the HP sales force promoted a DesignCenter solution.

Profitable Yet Appeasable

Two years ago, Software Engineering Systems Divisions (SESD; Palo Alto, CA and Ft. Collins, CO) was formed under the direction of General Manager Chuck House. In addition to SESD's mission to promote best practices in software engineering and direct HP's Computer Aided Software Engineering (CASE) strategy, the division is also a profit center for the company. House knew that he had a challenge on his hands — find a way to be profitable and keep the group's software engineers, many of whom had spent more than a decade writing software at HP, happy with their jobs.

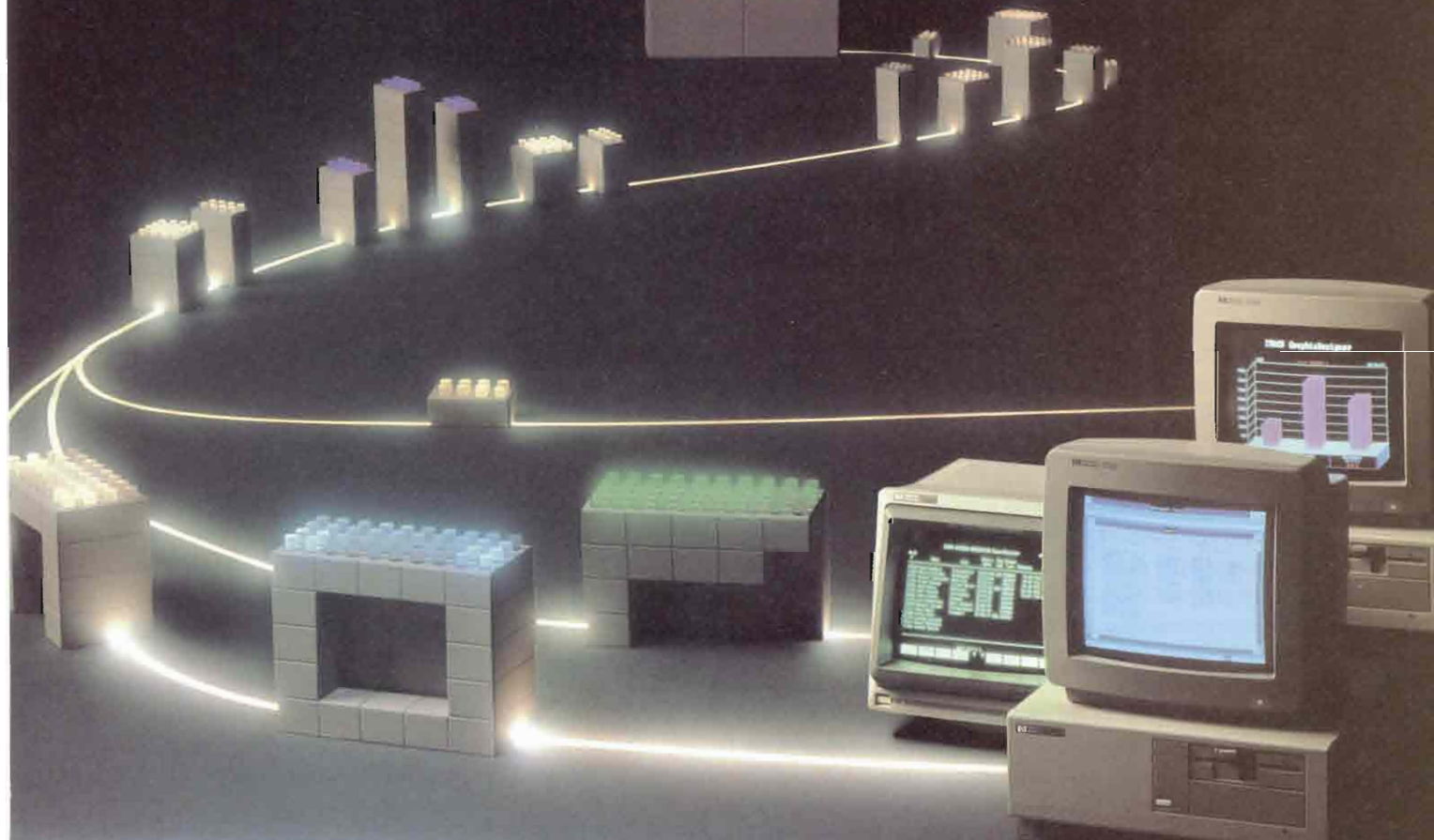
Although there were many engineers who would have preferred a project where they could design and code the best configuration manager or code generator in existence, the group created HP SoftBench, a set of program development

ous PC software vendors, just as SoftBench is a framework for integrating CASE tools. Expect to see similar frameworks introduced for electronic design applications and shop-floor control later this year.

Now that HP is selling frameworks as enabling technology instead of promoting its own end-user applications, the company is in a position to cooperate rather than compete with third parties.

Along with SoftBench, HP sells its Encapsulator product for integrating tools from third-party vendors. Most of the software vendors encapsulating their applications are participants in HP's Value Added Business (VAB) program. It's especially important for SESD to work closely with VABs because the success of SoftBench as a framework hinges on HP's ability to attract the "best of class" applications that customers want. In addition, the CASEdge/Knowledge consulting program depends upon the HP platform offering a variety of CASE products for each stage of the lifecycle. With a large

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selection, HP consultants can help customers evaluate the pros and cons of each product and decide which one would fit best in their current environment.

Recently, the VAB program was re-structured and services to VABs were expanded. The highest level of the program is now called Premier Solutions Provider (PSP), and HP intends to provide extended assistance to this group of vendors regardless of the size of the companies.

According to Dave Yewell, worldwide manager for the VAB program, HP will increase the technical support provided to VABs, especially those at the PSP level.

"When we surveyed the VABs to learn how we could be of most help, the need for technical support from HP ranked second, just under the desire for bigger discounts. Helping VABs create and maintain excellent products is more important than assisting them with lead generation," he said.

No More Code

At SESD, software engineers who used to sit in their cubicles and write code all day now assist with ports of third-party products to HP platforms. Rick Turley, an R&D section manager at SESD in Ft. Collins, commented upon the shifting emphasis on software in his group. "Fewer software engineers are getting to do initial design. Most programmers indicate a preference for working on a project from the design phase, but some are finding that they actually enjoy working with other companies. It gives them a chance to extend beyond company walls without leaving HP and to be a part of emerging technologies that we are not developing here."

Byron Jenings is one of the SESD engineers who works closely with vendors to port their applications and encapsulate them as part of the CASEdge program. He is currently working with CaseWare (Santa Ana, CA) to port their configuration manager Amplify Control to HP-UX and make it an encapsulated application under SoftBench. Jenings worked with CaseWare throughout 1989 and the port was announced at UniForum in January.

Jenings was no eager recruit to the Amplify Control port. Chuck House recalls the objections he raised, and Jenings explains that his biggest misgiving was his fear of not being able to keep up his technical skills. Jenings' job requires a lot of travel, but when he's in Fort Collins he likes to take on system administration projects in his workgroup to keep up to date on the technical side. When he's working with CaseWare he enjoys working as a liaison and directing questions from CaseWare to the people at HP who can answer them. He was glad that SESD management viewed his work as important and appreciated his efforts. In some environments within HP, "if you're not writing code, you're not valuable."

Martha Conant is another experienced software engineer who is no longer writing code. A nine-year veteran of HP, she has spent the past year and a half delivering consulting services to major account customers as part of the sales process and also to customers who pay for consulting services on a contract basis. CaseEdge/Knowledge consulting products include Software Engineering Requirements Analysis (SERA) based on a template developed at software groups within HP. Recently HP reorganized its consulting services so that customers contract for them through local sales offices rather than through the divisions, but CASEdge/Knowledge is still delivered by consultants at SESD.

SERA is an assessment product that examines key areas of software development including project management, configuration management and metrics. Conant interviews both software engineers and managers and identifies strengths and weaknesses. She then writes an analysis and delivers her long-term and short-term recommendations for improving software processes.

According to Conant, in consulting work "interpersonal skills differentiate the people whose work is respected. It's important to listen to customers' needs and absolutely critical to be able to express ideas well enough to communicate clearly." When Conant began at HP, she communicated only with her manager

for most of her projects at Loveland Instrument Division. "Now most software projects span divisions at HP and fewer people are working on their own as I did, so communication skills are important for all engineers."

Profit Potential

In addition to their providing a good career path for experienced software engineers, House views consulting services as having an even greater profit potential for SESD than the CASEdge software. It's also an advantage for the sales force to be able to bring in consultants like Conant to add value to a big hardware deal. The SERA analysis provides a way for companies to measure and analyze their software productivity. House believes that SESD's consulting services will be popular at technical sites, even those that have little or no investment in HP equipment.

"HP's reputation in the test & measurement area is well regarded in the industry. HP's RISC architecture is known to be the most measured operating system in existence. Customers know we can deliver performance metrics," House pointed out.

At various divisions of HP, many experienced software engineers who honed their skills writing applications now work directly with customers and/or third-party solutions providers. Not all software engineers were happy about the change in their job descriptions. For example, a number of engineers from SESD have taken jobs with other CASE vendors; at least six engineers from the group that worked on HP SoftBench now work at Atherton Technologies (Sunnyvale, CA), a company that sells Software Backplane, another framework product for integrating CASE tools from various phases of the software lifecycle. But others like Jenings and Conant have found that their new roles provide the best of both worlds. As Jenings puts it, "I get to work in a startup environment but still have the security of working for HP. I'm a typical HP engineer who's in software for the fun of it. I'm still having fun here and that's what counts." ■



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CIRCLE 145 ON READER CARD

HP Unveils New Products At NCGA '90 Exposition

Vendors Display Everything From Plotters To Printers

Hewlett-Packard exhibited several new graphics technologies and other products at the recent National Computer Graphics Association conference and exposition held in Anaheim, CA.

Some 30,000 people attended NCGA '90, featuring 250 vendors displaying the latest computer graphics hardware, software and peripheral products.

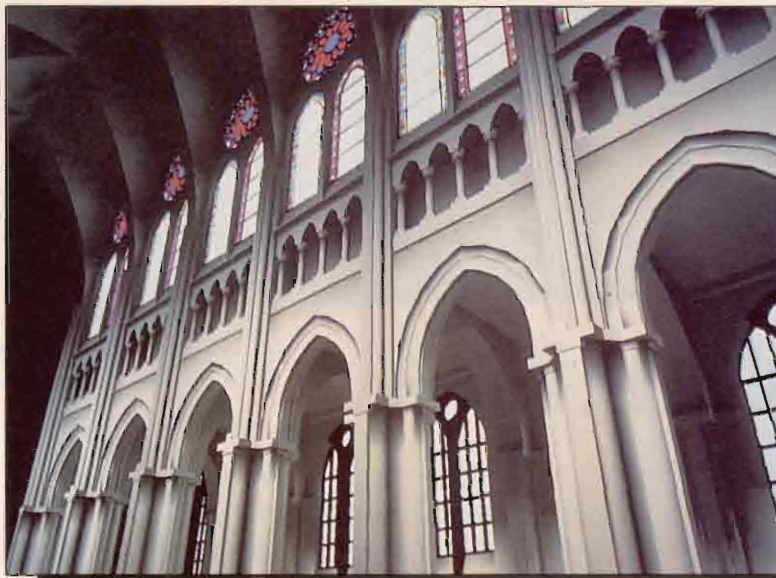
HP introduced its new graphical user interface (GUI), the HP Visual User Environment (VUE), that makes a UNIX operating system easier to use. VUE provides a simple and flexible set of icon/window-based utilities, including a file manager, help facility, mailer, and text and bitmap editors.

This new GUI for the HP/Apollo workstation line is built on the X Window System, Version 11 and OSF/Motif, and reaffirms HP's commitment to provide products based on industry standards.

"HP VUE is a break-

through for workstations based on a UNIX system that allows users to increase their productivity," said Bill Kay, HP's Workstation Group general manager. "This new product provides a natural-interface environment that preserves the power of the operating system."

Based on OSF/Motif, HP VUE has a 3-D appearance



The Chartes Cathedral, which contains 10,000 polygons, was rendered using 40 steps of progressive refinement in 100 minutes. Using the new version of HP's radiosity library on the HP 9000 TurboSRX, this image now can be computed using 40 steps of progressive refinement in 15 minutes.

and behaves like Presentation Manager. However, users can configure the software to meet their own needs, choosing such items as colors, borders, pop-up menus, keyboard and mouse actions.

ApolloLine

HP also introduced ApolloLine, a program that provides support services for Apollo users that surpass those previously offered through Apollo support contracts.

The HP ApolloLine program consists of two hardware and operating-system support packages that resemble Apollo's former serv-

ice programs. Apollo's Standard Support Agreement and Apollo Maximum Service have been enhanced under the HP ApolloLine umbrella, becoming HP ApolloLine Support Service and HP ApolloLine Priority System Support Service, respectively.

The program gives customers two choices for supporting their layered products:

- HP ApolloLine Response Center Support, which provides telephone assistance and update materials for layered-software products.
- Software Subscription Service, which provides only update materials.

Both system-support services include work-to-completion as a standard feature. This means that HP technical professionals remain on site as long as needed to resolve a problem.

Plotters

HP introduced six plotters that replace the products in its two high-end product families: the HP 7600 series electrostatic and HP DraftMaster pen plotters.

These new products are based on an advanced graphics language, HP-GL/2, and the company said that all future HP plotters will include the language.

The HP 7600 series Model 355 plotter, according to HP, "sets what appears to be a new price/performance level for color electrostatic plotters at \$45,900 (U.S. list), while similar plotters are priced from \$60,000."

The HP 7600 series Models 250 and 255 are monochrome electrostatic plotters.

3-D CAD Package

In addition, HP announced enhancements to the HP ME Series 30, a 3-D computer-aided design (CAD) and drafting software package that lets users take advantage of HP's radiosity and ray-tracing capabilities.

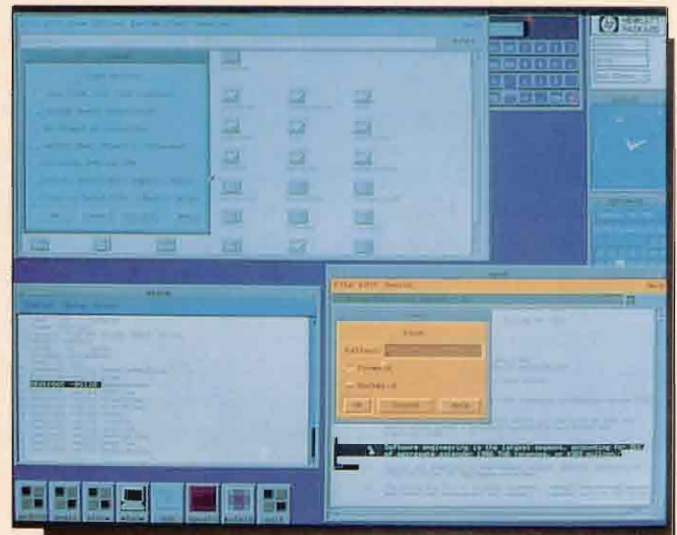
The HP ME Series 30 has implemented the radiosity and ray-tracings libraries in a module that lets users realistically represent the materials

in their models.

"Computer modeling technology has steadily advanced from wireframes, through surface techniques, to the current technology, namely solid modeling," said Tilman P. Schad, general manager of the Mechanical Design Division. Schad pointed out that surface modeling allows engineers to produce shaded images of their design. "Solid modeling goes one step further and allows realistic imaging of complete product designs and sectioned models," he added.

Other Products

Ashton-Tate Corp. (Torrance, CA) introduced Applause II, a new DOS-based graphics software package that offers charting, drawing and electronic slide show. It fea-



HP VUE is a graphical user interface that makes the UNIX operating system on HP/Apollo workstations easy to use.

tures 37 chart types, a graphical user interface and minimum hardware requirements.

CalComp (Anaheim, CA) introduced its Artisan 1026, a dual-mode 8-pen plotter that

outputs color hardcopy on A-to E-size cut-sheet or roll-feed paper or film; DrawingMaster Model 52236, a new low-priced, high-performance user-installable plotter that employs direct imaging technology to produce one or two color E-size drawings.

Nth Graphics Ltd. (Austin, TX) displayed its new high-resolution display controller for 2-D and 3-D CAD applications. The Nth Engine/550 Display Controller features 256 colors and 4 to 8 MB of display list RAM and four resolutions. Also exhibited was the 350 Display Controller, offering 256 colors and 1 to 5 MB of display list RAM and four resolutions. In addition, the company introduced the Nth-TV Video Output Board.

QMS Inc. (Mobile, AL) introduced a number of new products, including the QMS Lasergrafix 810 laser printer. The printer features an 8 ppm, single input cassette designed for single user and networked CAD/CAM printing environments. Also, the new Lasergrafix 820 features

Picture-Level Benchmark Announced At NCGA

Picture-Level Benchmark (PLB), a software package that provides a standard method of measuring graphics display performance was announced at NCGA'90.

PLB gives users a consistent way to measure how fast graphics derived from their application software can be displayed on different hardware platforms. Development of the software is funded by the 12 vendors sponsoring the Graphics Performance Characterization (GPC) project: HP, DEC, Alliant Computer Systems, DuPont Pixel Systems, Evans & Sutherland, IBM, Intergraph, Megatek, Prime Computer, Silicon Graphics, Sun Microsystems and Tektronix.

The PLB is a platform-dependent program for running graphics display performance tests on a particular vendor's hardware. It includes three elements:

- The Benchmark Interface Format (BIF), a standardized file structure that allows users to port geometry — as well as actions the geometry will perform — to the PLB program.
- The Benchmark Timing Methodology (BTM), which provides a consistent method of measuring the time it takes for hardware to display and perform requesting actions on a user's application geometry.
- The Benchmark Report Format (BRF), which provides a standardized report used to measure graphics display performance for different hardware systems.

Individual users will be able to convert their application geometry onto BIF format. Once in BIF format, graphics from user's application can be displayed by hardware vendors that support the PLB program. Vendors can then produce reports that measure the speed with which graphic are generated. The tests, reports and geometry used for evaluation will be consistent from machine to machine, allowing users to make direct performance comparisons.

SimGraphics Engineering Corp. (South Pasadena, CA) developed the software. NCGA is the administrator for the project.

During the last year, GPC sponsors have been beta testing the PLB program. At NCGA'90, the PLB was officially announced to the public domain. The package is available through NCGA for \$300.

an 8 ppm, dual input cassette designed for multiuser and networked CAD/CAM environments. The Lasergrafix 2000, a 20 ppm, high-volume laser printer, is designed for large CAD/CAM printing environments.

RGB Spectrum (Berkeley, CA) exhibited its RGB/VIEW 1000 Video Windowing System. The product displays television video as a window on a workstation display. It's autosync, hardware independent and features X-Window controls, overlays and a

real-time digitizer.

Silicon Graphics Inc. (Mountain View, CA) displayed its new midrange graphics super workstation. At \$49,500, the workstation is billed as a low-cost entry point to the GT/GTX graphics family.

Versatec (Santa Clara, CA) displayed ServeWare, a plotting solution for Ethernet users. According to Versatec, the product offers a high level of productivity and systems flexibility. —Tom Halligan, *Managing Editor*

HP Launches Fault-Tolerant Computer System

HP Series 1200 Targets Telecommunications Market

HP has introduced its first fault-tolerant computer system, bolstering HP's product offering for the telecommunications market.

HP believes its early entry in the emerging fault-tolerant UNIX systems market will extend its leadership in the UNIX systems arena.

Fault-tolerant computers are designed with redundant components so the system continues operating, even if a part fails. This provides virtually 100 percent reliability, an increasingly important requirement for business operations that are conducted online.

Telecommunication companies rely on fault-tolerant computers for telephone network management, online telephone service changes and

accurate customer billing.

The HP 9000 Model 1240 extends the HP computer-systems product line to provide uninterruptable systems. Since introducing a high-availability product in 1989, HP has offered customers 99.9 percent uptime for disk storage on HP 3000 and HP 9000 minicomputers.

The HP Series 1200 will be integrated into the HP 9000 family through continued enhancements of the operating system, networking, hardware and software tools. This will offer common user and application-developer environments for HP 9000 workstations, servers, minicomputers and fault-tolerant systems and make it easier to move applications among the four product lines.

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RGB Spectrum
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Versatec, A Xerox Co.
2710 Walsh Ave.
Santa Clara, CA 95051
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HP Supports Lotus Browser Facility

Browser Makes 1-2-3 Spreadsheet Act Like NewWave Object

Hewlett-Packard has developed a browser facility for Lotus 1-2-3 Release 2.2. that will be shipped and supported as part of the standard NewWave product. Lotus 1-2-3 currently does not run under Microsoft Windows. As a result, Lotus spreadsheets take over the entire screen instead of running in a win-

dow and they cannot be fully integrated objects in the NewWave environment.

The browser facility is a shell that allows 1-2-3 spreadsheets to be "launched" from an icon and makes it possible to update Lotus 2.2 spreadsheets within other applications. In HP's next release of NewWave, expected this August, it will be possible to

use the NewWave agent to automate routine tasks involving 1-2-3 spreadsheets. However, it won't be possible for these spreadsheets to accept objects from other applications because the browser facility for Release 2.2 doesn't make 1-2-3 spreadsheets aware of NewWave objects.

Lotus is developing Release 3.0 as a Microsoft Windows-based application that can be fully integrated in the NewWave environment. Lotus also is planning versions of Lotus 1-2-3 that will run under OS/2

and UNIX, two client platforms that HP intends to support in future versions of NewWave.

HP and Lotus have collaborated on projects involving Lotus 1-2-3 spreadsheets since 1983 when Lotus developed a special version to work with the HP 150 with touchscreen, a PC that was not compatible with IBM PCs. When HP developed its 110 laptop computer in 1984, Lotus and HP worked on a version of 1-2-3 that was available on a plug-in ROM chip. —Peggy King, *West Coast Editor*

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CIRCLE 106 ON READER CARD

EMC Reports Record Revenues

First Quarter Profits Up 68 Percent

EMC Corp. has reported a 68 percent improvement in revenues, a record first quarter for the Hopkinton, Mass.-based manufacturer of disk equipment, memory, controllers and software.

Company profits were \$1.01 million on revenues of \$40.4 million for the first quarter of 1990. This represents a 68 percent improvement over 1989 first quarter revenues of \$24.1 million.

EMC profited from a substantial sales growth in the middle and late part of 1989. Newer products such as solid state and magnetic disks and spectrum memory attracted repeat business from customers.

Brian Fitzgerald, manager

of information services for EMC, credits the company's success to new senior management philosophy. "President and COO, Mike Ruettgers has implemented a total quality improvement program that has strengthened the company's internal organization. We've been able to hold costs consistent and develop all our efforts from product design to sales and marketing," said Fitzgerald.

With a renewed confidence from investor and analyst communities, EMC appears on the rebound from two-year losses and does expect steady growth through the end of the year. —*Andrea Zavod, Assistant Editor*

HyPoint Awarded \$500,000 In Antitrust Case Against HP

Hewlett-Packard Found Guilty Of Monopolization

ACleveland, OH U.S. District Court jury on April 25th awarded HyPoint Technology \$500,000, finding Hewlett-Packard guilty of antitrust violations.

According to antitrust laws, HyPoint is entitled to \$1.5 million plus attorney fees and court costs, which may bring the total award to more than \$2 million.

HyPoint makes a large portion of their profits from selling maintenance contracts for HP systems. In August 1987, the company accused HP of discontinuing service to Hy-

Point customers under HP's four-hour Premium Response option in order to eliminate HyPoint as a service competitor and to monopolize the market for the service of HP minicomputers.

Based on six interrogatories, the jury agreed that HP had "monopoly power in the alleged market," and that, "HP had no legitimate business reason for ... modification of its Premium Response option..." —*Andrea Zavod, Assistant Editor*

Brant Technologies To Distribute Expert System Shell

Signs Agreement With Cognex Inc.

Brant Technologies Inc. recently signed an agreement with Cognex Inc. (Toronto, Canada) to distribute the Meccano Set expert system shell.

The Meccano Set is used to develop rule-based, backward-chaining applications, especially in diagnostic and advisory areas. Written in Prolog, Meccano Set can access external Prolog routines, which can in turn access routines written in C or other languages.

Contact Brant Technologies Inc., 2605 Skymark Ave., Mississauga, Ontario, Canada L4W 4L5; (416) 238-9790.

Circle 374 on reader card

Collier-Jackson Users Hold Annual Meeting

World Class Accounting Customers Share Tips For Implementation

Several hundred people recently gathered at the Fairmont Hotel in San Jose, CA for the Collier-Jackson Users Group (CJUG) fifth annual national conference. Collier-Jackson, a CompuServe Software Products Division Company, develops newspaper circulation, advertising and accounting software for both HP and DEC computers.

This year's conference focused on the company's World Class Series Accounting and human resources software introduced last year. Training sessions and discussion groups allowed attendees to compare notes and pick up tips on implementing the system.

The new modules redesigned or created with World Class features make use of "express keys" for navigating between screens and moving between modules. With this feature, one transaction can be suspended while a second

transaction is entered. It takes only one keystroke to return to the original transaction. Another benefit of the World Class Series is that screens have been designed to provide a consistent look and feel for all accounting applications.

Dennis LaVorgna, CJUG member and chief financial officer of Pathology Medical Labs (PML; San Diego, CA), explained how the new express screen feature has helped him.

"Before express keys, when you got six levels down in a module you would have to back out. Now, one function key will get you out. Also, you don't need to re-start when you are in the middle of a data entry screen and want to retain what you've entered while you move somewhere else in the application. One function key opens up the express capability," he said. —*Peggy King, West Coast Editor*

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Document Retrieval System Available For OS/2

Verity Inc. has announced shipment of its TOPIC document retrieval system for OS/2 standard and extended edition, version 1.2. Verity also announced shipments of TOPIC OS/2 versions to customers in the intelligence, legal, financial and information processing industries. TOPIC runs in heterogeneous networked environments including IBM PC and PS/2 computers and compatibles under both DOS and OS/2.

TOPIC is based on concept retrieval technology, a method that leverages a knowledge-base of "topics," providing users with a higher level of retrieval accuracy and relevance. The TOPIC architecture supports retrievals across large collections of documents stored in multiple formats on diverse computing platforms. Because TOPIC is designed for distributed network computing environments, it optimizes all computing resources on a network.

A typical TOPIC OS/2 configuration, consisting of an OS/2 server supporting up to 10 users, is available for under \$25,000. In addition to the OS/2 environment, TOPIC is also available on major PC networks, the HP 9000 Series, DEC VAX and DECstation products.

Contact Verity Inc., 1550 Plymouth, Mountain View, CA 94043-1230; (415) 960-7600.

Circle 400 on reader card

APECS 8000 Runs On HP 9000 Series 800

Project Software & Development Inc. has announced that its APECS 8000 project management software now runs on HP 9000 Series 800 computers from HP.

The new port to HP 9000 Series is the first RISC platform for APECS 8000. The software was ported in a collaborative effort launched to fill the need of a large European public utility, Rijkswaterstaat (RWS). The cooperative partners were PSDI, HP and Activity Project Management Services of Holland, the APECS 8000 distributor for the

European Benelux countries.

Contact Project Software & Development Inc., 20 University Rd., Cambridge, MA 02138; (617) 661-1444.

Circle 392 on reader card

Wingz-DataLink Links Desktops With SQL Databases

Informix Software Inc. has unveiled its solution for seamlessly linking desktop computers with SQL databases. With Informix's Wingz-DataLink interface, non-SQL literate users can create queries through simple point-and-click options and developers can create custom graphical interfaces for accessing and manipulating data stored in Informix databases.

Vital corporate data stored in both local and remote SQL servers can be imported directly into a Wingz worksheet, or into a completely customized Executive Information

System running on the major graphical desktop platforms Wingz supports.

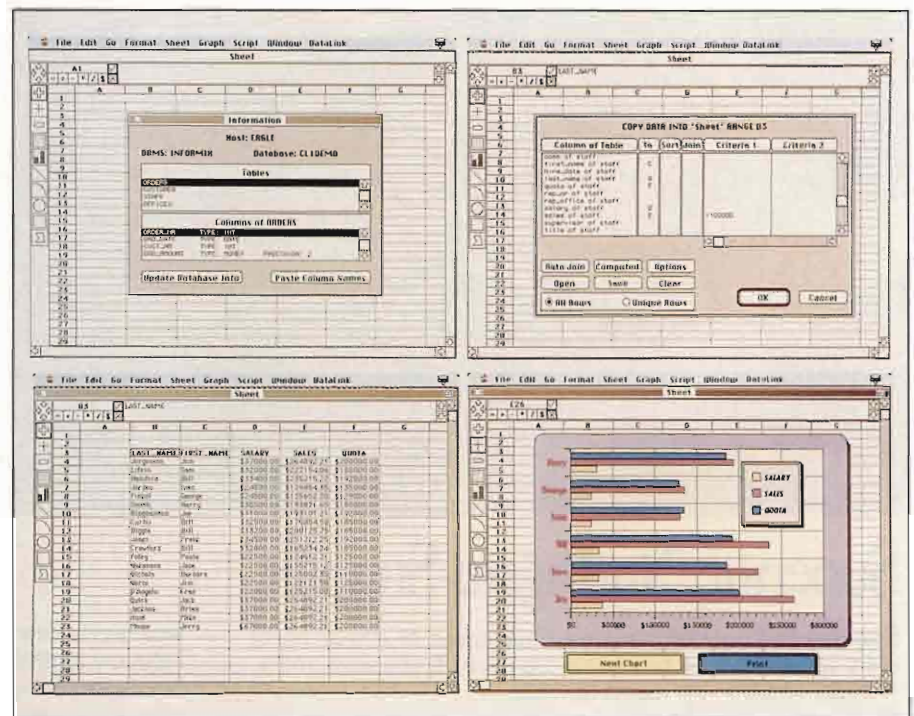
DataLink was created with the Wingz programming language HyperScript, an event-driven command language for developing graphical software applications. HyperScript gives developers the ability to create applications that exploit all of the graphic controls in a graphical user interface together with the advanced graphics, spreadsheet and presentation features found in Wingz.

Contact Informix Software Inc., 4100 Bohannon Dr., Menlo Park, CA 94025; (415) 926-6300.

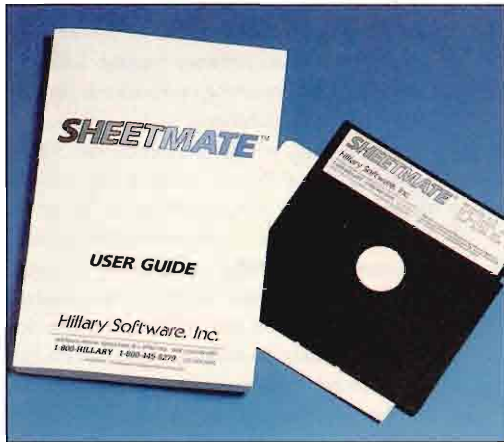
Circle 380 on reader card

UniPress To Distribute VisionWare UNIX-DOS Links

UniPress Software Inc. has announced an agreement with VisionWare Ltd. (Leeds,



Wingz-DataLink is Informix Software Inc.'s solution for seamlessly linking desktop computers with SQL databases.



Hillary Software Inc. has released a pocket-size demonstration package of Sheetmate, a Lotus 1-2-3 conversion utility.

England) to distribute a suite of products that display DOS and UNIX applications at the same time on PCs networked with a UNIX host computer. The products, PC-Connect, SQL-Connect and XVision, are compatible with HP, Sun, IBM and other UNIX platforms and are currently licensed to more than 1,600 sites worldwide.

The VisionWare suite of products is centered around PC-Connect. PC-Connect integrates IBM PCs and compatibles running Microsoft Windows with one or more multiuser UNIX host systems. It enables a PC to act as a display server, with multiple windows linked to one or more UNIX host systems. Host-based applications can coexist on the PC screen with DOS programs running on the PC. The physical connection can be RS-232 serial lines or an Ethernet network. Host-based applications run unmodified with full support for the Windows Dynamic Data Exchange protocol that allows communication between the UNIX program and a DOS program in the Windows environment.

Prices for PC-Connect and SQL-Connect start at \$495 depending on the host system and the number of PC users. XVision is \$349 per CPU.

Contact UniPress Software, 2025 Lincoln Hwy., Edison, NJ 08817; (201) 985-8000.

Circle 381 on reader card

Hillary Offers Conversion Utility

Hillary Software Inc. has released Sheetmate, a Lotus 1-2-3 conversion utility in a pocket-size demonstration package. The PC disc supplied loads itself onto any HP 3000 with a single "INSTALL" command with either Walker Richer & Quinn's Reflection or HP's Advancelink software.

Sheetmate operates on spoolfiles or MPE files. It offers soft keys and a "point-and-shoot" interface. It delivers HP 3000 reports in Lotus 1-2-3, Dbase, or WordPerfect formats in a single step.

Sheetmate is sold on a HP 3000 CPU license basis. Any number of PCs can take advantage of a single Sheetmate license. Sheetmate pricing ranges from \$995 to \$2,995. Site licensing is available for \$8,000. Corporate licenses are negotiable.

Contact Hillary Software Inc., 309 Morris Ave., Spring Lake, NJ 07762; (800) HILLARY.

Circle 391 on reader card

VISIONAEL Now Supports X Window Environment

ael-Advanced Graphics Systems Inc. has released Version 4.6 of its VISIONAEL Automatic Drawing Creation and Management System to its current customer base and for use as new customers are added.

The most significant enhancement of VISIONAEL is the full support of the X-11 windowing environment. Improvements also have been made in the bill-of-materials and parts list capability, whereby all important information may be linked to a relational database instead of searching individual files for related information.

VISIONAEL products now support HP-UX 7.0, Apollo 10.0, Sun-OS 4.0 and the Network File Systems OSs; Cobra Plus and HP-GL printers HWs and Oracle and Informix relational database management systems on Sun 4.

Contact Hartman Communications Inc.,

1723 South Boston, Tulsa, OK 74119; (918) 592-5200.

Circle 397 on reader card

CCS Announces C Compiler Family For MPE XL

Corporate Computer Systems has announced three C language compiler products for the HP MPE-XL system. Based on CCS' family of compilers, CCS/C-XL is a native mode implementation of the ANSI C language supporting features such as function prototyping, enum data types, initialization of auto aggregates, long pointers and inline assembly language.

CCS/C-XL is source code compatible with CCS' C compilers on the classic 3000 and the HP 1000.

CCS is offering three different configurations of CCS/C-XL: Programmer's Version, Professional Version and Migration Version.

Contact Corporate Computer Systems Inc., 33 W. Main St., Holmdel, NJ 07733; (201) 946-3800.

Circle 390 on reader card

JetLink 2.0 Supports LaserJet Series III

OPT has announced version 2.0 of its JetLink product, providing native-mode support for all HP laser printers and adding support for the advanced PCL 5 features in HP's new LaserJet Series III printer.

JetLink version 2.0 allows the use of many of the Series III's new features such as scalable typefaces, multiple orientation printing, bitmap compression and special font effects. This is achieved without sacrificing application software compatibility.

JetLink allows earlier LaserJet printers such as the Series II and Series IIP to emulate many features of the PCL 5 imaging model. JetLink 2.0 provides multiple orientation printing and special font effects on these earlier printers as well as on the HP2680 system laser printer and the LaserJet 2000 departmental printer.

Other features new to JetLink 2.0 include automatic conversion of HP2680 envi-

ronment files for use on LaserJet family printers and support for Formation, OPT's device-independent workstation-based professional electronic form design system. Contact OPT Inc., 10681 Foothill Blvd., Ste. 201, Rancho Cucamonga, CA 91730; (714) 944-7528.

Circle 383 on reader card

AutoSIGHT 2.0 Increases AutoCAD Utilization

AutoSIGHT Inc. has released AutoSIGHT 2.0, a file-access software tool designed to increase the utilization of AutoCAD and other CAD systems.

AutoSIGHT 2.0 allows non-CAD users to display, compare, convert, enlarge, reduce, mark up, print and plot CAD system graphics files on their desktop PCs. Specifically, it converts DWG, DXF and HP-GL files, prints and plots output, redlines and annotates, allows viewing of scanner files, displays net differences between drawings, and provides a PCX bridge to desktop publishing.

AutoSIGHT works with IBM PC, XT, AT, PS/2 and compatible units and requires a memory of 512K and an MS-DOS 2.0 release or higher.

The product is priced at \$495.

Contact AutoSIGHT Inc., P.O. Box 362086, Melbourne, FL 32936-2086; (407) 242-5865.

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JetPropulsion Speeds Graphics Jobs To Laserjets

Digital Products Inc. has announced JetPropulsion, a printer utility that increases the speed that a PC can send graphics applications to HP LaserJet III and IIP printers by two to five times.

JetPropulsion is a 2-KB terminal-and-stay resident (TSR), proprietary software program that operates on the PC to compress the

graphics job being sent to the printer. A 200 percent speed increase can be realized when sending files to the printer via the PC's parallel port; up to a 500 percent increase can be realized when sending files to the printer through the serial port.

The same speed improvements are available to a PC user whether the PC is connected directly to the printer, connected to the printer through a printer sharing device, or connected to the printer through a LAN. JetPropulsion supports the HP LaserJet III, the IIP, the DeskJet, the DeskJet Plus and those printers that use HP Print Control Language version 5.0 or greater.

Contact Digital Products, 108 Water St., Watertown, MA 02172; (617) 924-1680.

Circle 386 on reader card

PrintAPlot 2.0 Expands Graphics Capabilities

Insight Development has announced PrintAPlot 2.0, the latest version of its device management software that allows HP and other laser, inkjet and dot matrix printers to emulate conventional pen plotters.

PrintAPlot 2.0 is a PC-resident software translation program. The utility allows software applications that use HP-GL, such as Lotus 1-2-3, Versacad, AutoCAD and Sigmaplot, to work directly with a variety of printers. Compatible with any MS-DOS-based system, it works with a variety of laser, inkjet and dot matrix printers to produce either color or monochrome output. PrintAPlot 2.0 prints plot file graphics at the full resolution of the printer with which it is used.

Features include tiling, expanded scaling capabilities, independent X and Y positioning, rotation, shadow setting sheets, multiple language support and extensive printer support.

PrintAPlot 2.0 has a retail price of \$299.

Contact Insight Development, 2200 Powell St., Ste. 500, Emeryville, CA 94608; (800) 825-4115 or (415) 652-4115.

Circle 379 on reader card

F/A Software Includes Multibook Comparisons

Collier-Jackson has upgraded its World Class Series Fixed Assets software (version 1.07) for multiple-book reporting comparisons used in determining tax liability.

The system, which operates on HP 3000s, now has the ability to project amounts of depreciation for periods of up to 20 years, based on Federal, Alternative Minimum, Accounting and Adjusted Current Earnings tax books. The new version also features online recalculation of annual depreciation for individual assets. In addition, calculations can be based on mid-quarter or mid-year status for first-year depreciation.

Pricing for the Fixed Assets system ranges from \$18,000 to \$60,000.

Contact Collier-Jackson, 3707 W. Cherry St., Tampa, FL 33607; (813) 872-9990.

Circle 396 on reader card

Six Sigma CASE Offers New CASE Tool

Six Sigma CASE Inc. now offers The Canonizer, an automatic database normalization package for UNIX applications, for HP 9000 Series 300 and 9000 Series 800 systems.

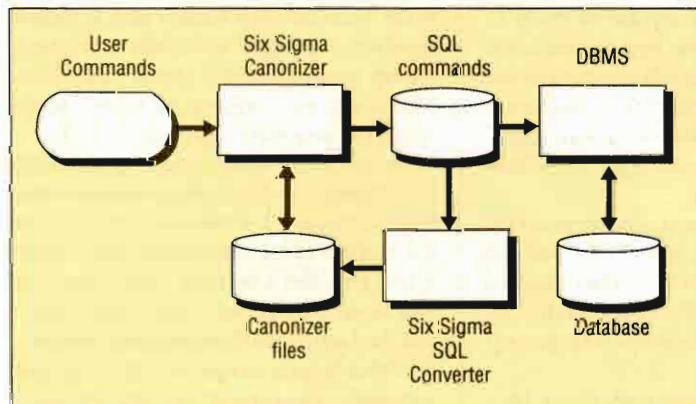
This CASE tool uses precise and rigorous methods for database design, eliminating data redundancy and improving data integrity. The Canonizer features a spreadsheet-like format with menu-driven commands, automatically scrolling windows and online help. With no limit to the number of fields or records in the system, designers can view displays of relations between data items and are offered full edit capabilities on databases, views, data times and relationships.

The HP version of the Canonizer runs on HP-UX. It's for use with most UNIX database management systems, including Informix, Oracle, Ingres, Unify and Sybase.

The Canonizer for the HP 9000/300 is priced at \$1,295 and the 9000/800 version is \$1,995.

Contact Six Sigma CASE Inc., 14405 SE 36th St., Ste. 210, Bellevue, WA 98006-1515; (800) 827-4462.

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The Canonizer from Six Sigma CASE Inc., an automatic database normalization package for UNIX applications, is now available on HP 9000 Series 300 and HP 9000 Series 800 systems.

Continued on page 90.

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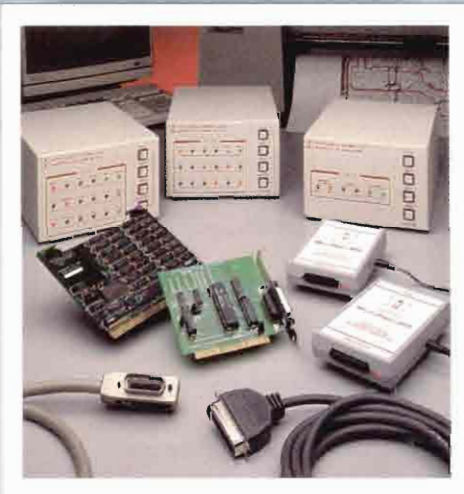
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*Database Management Software For MEs
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CAD Data Management

[By Bill Sharp]

Computers have revolutionized the way products are designed and developed using computer-aided design (CAD). They also have buried many engineers and

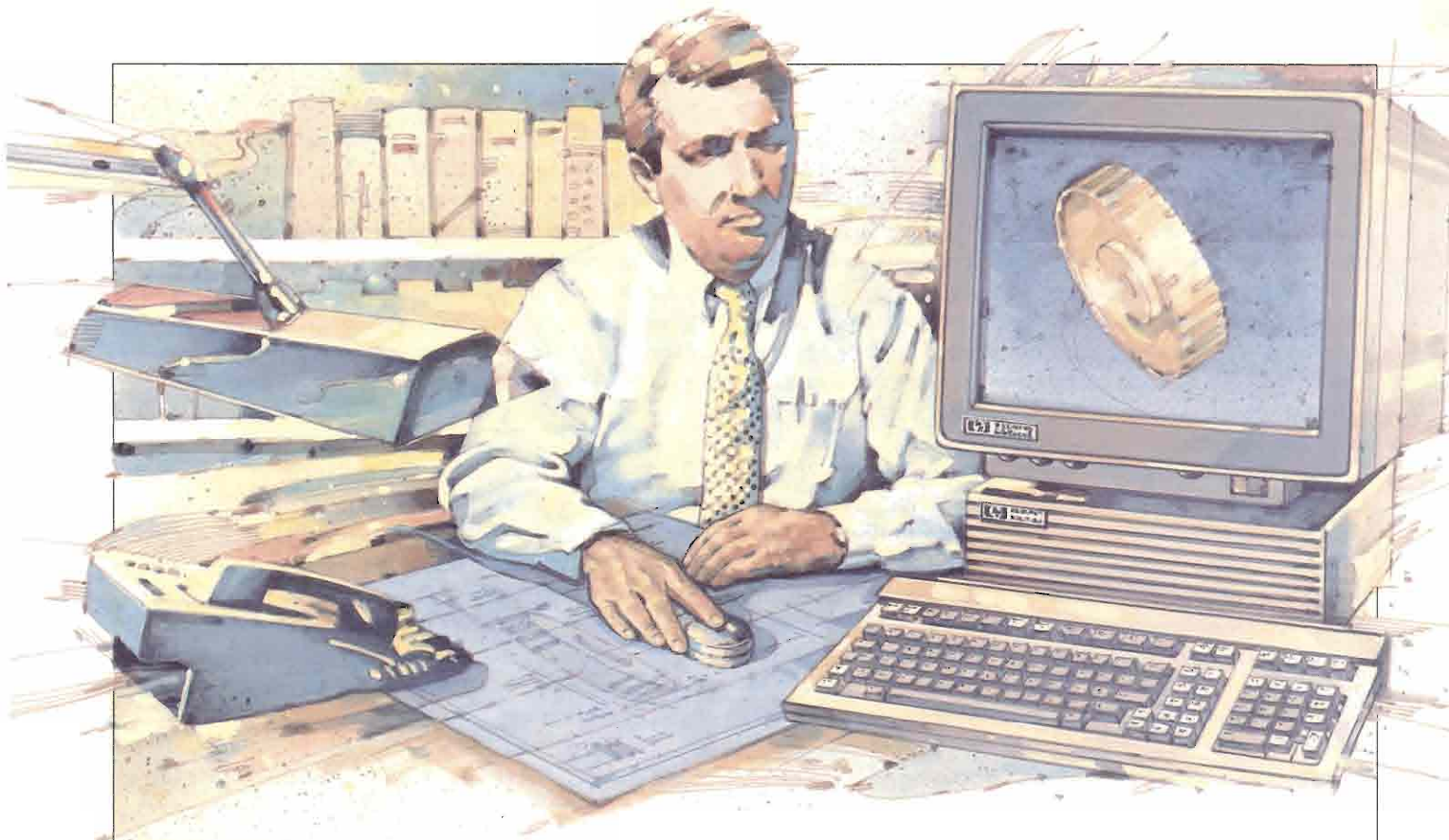
support staff under an avalanche of data stored on paper and magnetic media.

The flip side of the speed made possible by computers is that this same speed can translate into many more revisions of the product before it reaches the marketplace. And, with an accompanying increase in the number of places and times where somebody could get the wrong information.

Design revisions meant to yank out the appropriate drawer of the flat file, pull out your drawing and go at the thing with eraser and pencil for a while until your latest flash of genius was transferred from that restaurant napkin onto the official drawing. Four hours later, you ease the big drawing back into the flat file, and your napkin finds its way to the trash.

Today, things are different. Those four hours of drafting time is expensive compared to the several minutes the same change takes on a good CAD system. But you need to be certain that the new drawing is the only one people will see, that unauthorized employees cannot change it, and that the updated drawing will be relayed to production when the time comes, not some earlier version.

Properly identifying design information, archiving it for efficient retrieval later and effectively relaying appropriate information to other departments to speed the pro-



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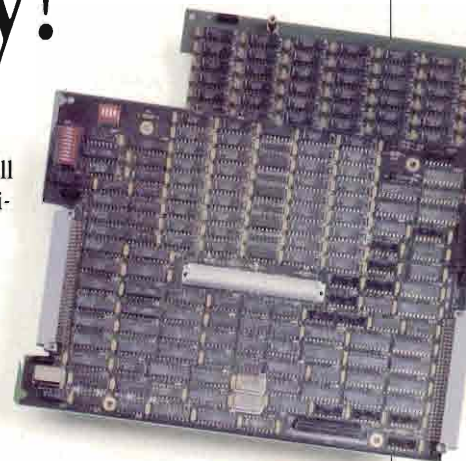
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duction process all require effective systems for data management. In spite of all the improvements in computers and their applications, many firms still use inadequate systems to perform these functions. In fact, for relaying data between departments, the oldest networking system of all, walknet, is still widely used.

As the realm of CAD begins to get its data act together, those who use (or plan to use) this area of technology will pick the methods to organize your data. Use of these tools is growing rapidly, with one estimate of the growth rate in CAD data management running as high as 100 percent per year with market saturation to date at only about one percent.

Dave Burdick, a CAD/CAM analyst with Dataquest (San Jose, CA), sees more moderate growth ahead. He calls mechanical engineering data management a "fledgling market with very few players," and therefore difficult to accurately size. He estimates that the size of the market is about \$500 million this year, with strong growth of 30 to 40 percent per year as users struggle to manage "the volumes of data that CAD tools are creating."

"If you extend that market size with those growth figures, you get a market of \$1 billion in the next four or five years," he says. "But you are not going to be buying these kinds of systems as separate products, but rather as embedded parts of larger CAD systems or as separate larger systems. It's also a mis-

take to think of these systems as entirely new. They are adaptations of existing commercial database technology into a new market using special-purpose shells and frames."

Data management software provides database services to the CAD user without requiring great knowledge of either databases or UNIX commands. Because CAD users are frequently mechanical engineers, less accustomed to computers than electrical engineers, they are often more intimidated by the need for detailed knowledge when using tools such as databases.

PCs Vs Workstations

CAD IS ONE OF THE AREAS WHERE the gap between PCs and workstations widens a bit. High-end personal computers can perform quite well for many CAD tasks, although slower than UNIX workstations. However, PCs fall short of the file moving capabilities and relative ease of sophisticated networking that's possible with UNIX-based systems. Adding terminal emulation or UNIX capability to personal computers reduces this problem.

In the U.S., where many users favor the PC for low-priced CAD applications, the networking and data management problem may be more significant. European and Japanese users tend

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to favor UNIX workstations for CAD, and may reap some advantages in larger networked systems.

Meanwhile, workstation makers continue to strive to keep their product costs as low as possible to entice users into the growing ranks of UNIX devotees. HP recommends using X-terminals for this application rather than trying to build up PC capability to handle the necessary memory.

CAD Information Types

DOCUMENTS FOR CAD COME IN many shapes and sizes, and include printed circuit board layouts, integrated circuit designs, manuals for installation and assembly, design specifications, user handbooks and test data, among others. All describe the product under development, in part or whole, or its use. This is the information that needs managing. It may be sitting as drawings in huge flat files, tucked away in some corner filing cabinet, or in among the nameless thousands of archived floppy disks — but it's out there somewhere, and much of it, someday, will be needed again.

In addition to the documents themselves, engineers create attribute information. This information defines the who, what, why, when and where for each of the engineering documents. Specific examples include, who created the document, when the work was done, who approved it, when it was approved and date of last revision. This information typically appears in the title block of a drawing, but can become part of an engi-

neering database when one is implemented.

The trick is to develop systems that make it easy to manipulate design data in the many different ways required during product development and support.

Data Relationships

KNOWING THE IDENTITY OF A particular part is not enough. We have to know which parts go into which subassemblies and where those subassemblies go in the final product. We need to know how to machine a part or temper the steel. This is information that directly relates to building the product.

Barry Odbert, product manager with HP's Mechanical Design Division (Fort Collins, CO), says that while the generalities of relationships between parts seem intuitive, automating these relationships for assembly is often difficult.

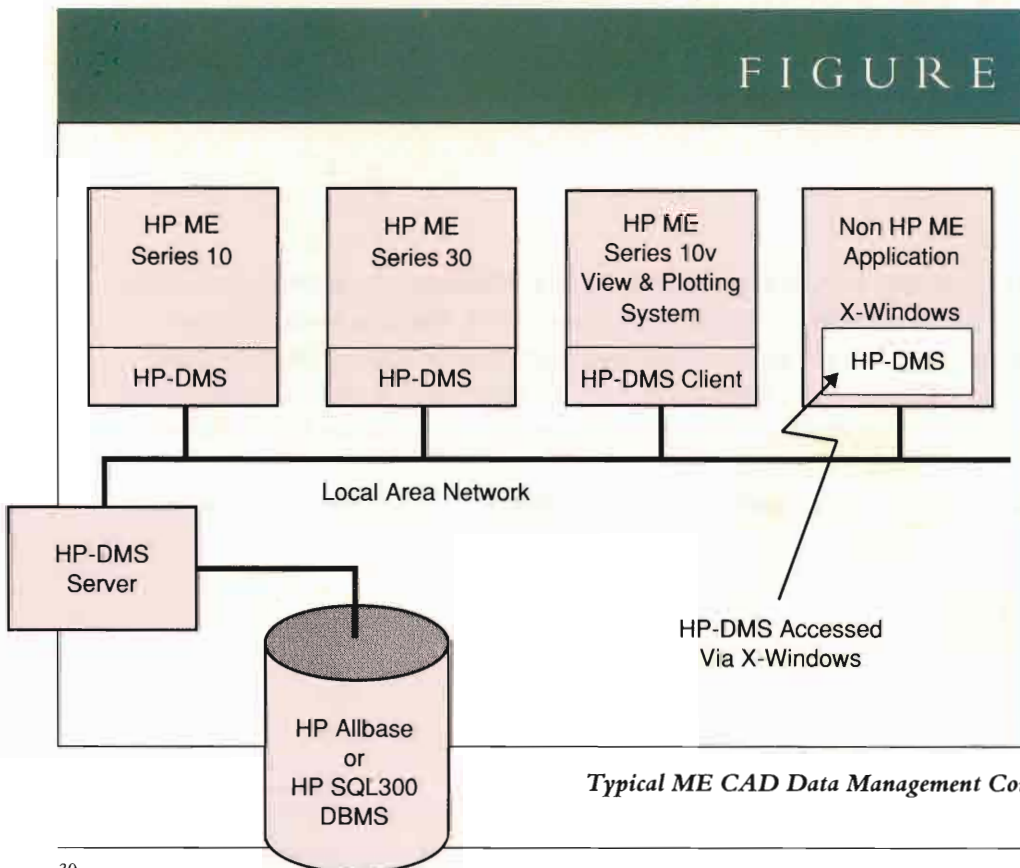
"I talked to a man two weeks ago that still uses manual methods to get parts counts. He goes through exploded drawings of subassemblies and counts the parts in each, adding up the totals to know how many of each part to order — he counts for days!" said Odbert.

Many firms that have moved to automating such processes are doing so with custom software or using what Odbert calls "kluged" systems. Linking CAD data management into one cohesive system allows users to pull together parts lists from across a range of subsystems, or to search for all the locations in a product where the same part is used, and get the answer in seconds. This last application is called a "where used" query and is quickly accomplished with a centralized CAD database, but requires exhaustive work when such a database is lacking.

Older systems of storing product drawings tend to organize information by product. But a designer wishing to replicate some subassembly to use some or all of it in a later product would have to know which product to look for, then pull the drawings and find the particular assembly to study.

Using a database sys-

FIGURE



Typical ME CAD Data Management Configuration.

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CIRCLE 130 ON READER CARD

tem, data can be searched to provide specifications for all the subassemblies of a particular type, and all can be quickly pulled to determine if any meet the requirements of a new design. Databases allow users to change data classifications to suit the needs of the project at hand. CAD data may be filed by product name, but using a database and data management system, the engineer can quickly find all the analog to digital converters used in several products, for instance.

Backup and Access Control

ANY LARGE DATABASE SYSTEM requires some kind of reliable backup system, such as backing up the discs and taking the copies to a storage vault at another site, or relaying backup data electronically to a remote CD-ROM system.

Access to drawings and data critical to a new product is not something to be given out blithely. Access is essential in different departments at different times to ensure smooth development and production. Some people may make important design changes to improve the product, while others may only view the materials. At the same time, the information must be stored in a fashion that allows many people to get at it when necessary. Creating a balance between the need for both access and security requires a creative approach.

Odbert says the CAD industry calls its solution to this problem the "electronic vault." "It's a lot like the idea of a library card," Odbert says. "You have different kinds of cards with varying levels of access to the documents, providing varying degrees of permission to work with them."

Databases

THE DATABASE BECOMES, IN Odbert's words, "an engine underlying our work. Our application sits on top of that database. In our case, it is engineering data, or it might be cost accounting elsewhere. The advantage in having the same database type is that another system can pull data from this system." In fact, he notes, the database becomes part of the system platform, an application that becomes an assumed part of the whole system, like LAN software.

Data management software sits between the database and the user's application, managing the flow and storage of data for the user in a manner more sophisticated and easier to use than the database alone could provide.

Implementing an engineering data management system requires a commitment to making the necessary changes with more than lip service, says Odbert. "Data management is often discussed as a part of computer integrated manufacturing (CIM), and like CIM, it often crosses internal political boundaries."

Involving the MIS department, working with multiple areas of the company that should have access to some part of the data to speed their work and deciding who owns the data at what points in the process can all be points of contention. Yet, says Odbert, if these can be effectively worked out, the process of developing and producing products can be much more efficient and profitable.

HP Data Management System

HP QUIETLY INTRODUCED its own data management product, the HP Mechanical Engineering Data Management System (HP-DMS), in November 1988 (see *Figure 1*). HP-DMS is sold as part of HP's three mechanical engineering products, HP ME 10, HP ME 30 and HP ME 10v. New enhancements to HP-DMS this year include:

- Connectivity to Oracle DBMS running on HP 9000 computers.
- Title block management for automatic update of drawing title blocks directly from the database.
- Classification functionality for easy part classification and retrieval.
- Bill of materials processor for easy creation and editing of complete bill of materials (BOMs).

DMS has proven to be a successful product. "The number of people on this project [HP Data Management System] has grown 700 percent," says Odbert.

Each workstation using the data management system needs an HP-DMS client software module, which communicates via LAN with an HP-DMS server module. The server module in turn communicates with the database. HP-DMS can support either HP's own database products, HP ALLBASE/SQL with HP SQL/300 or Oracle RDMBS.

HP ME series products such as the ME 10, once linked into an HP-DMS system, can manage not only its own files, but can pull files from other applications into the DMS using X-Windows. The system can be used, says Odbert, with any data stored in UNIX-based application files. He also notes that, while the system uses HP ME-style user interfaces at present, other options will become available.

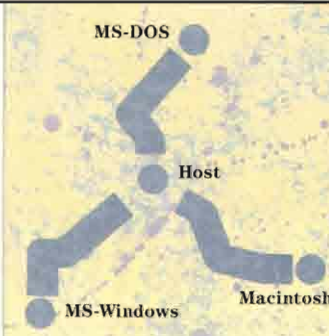
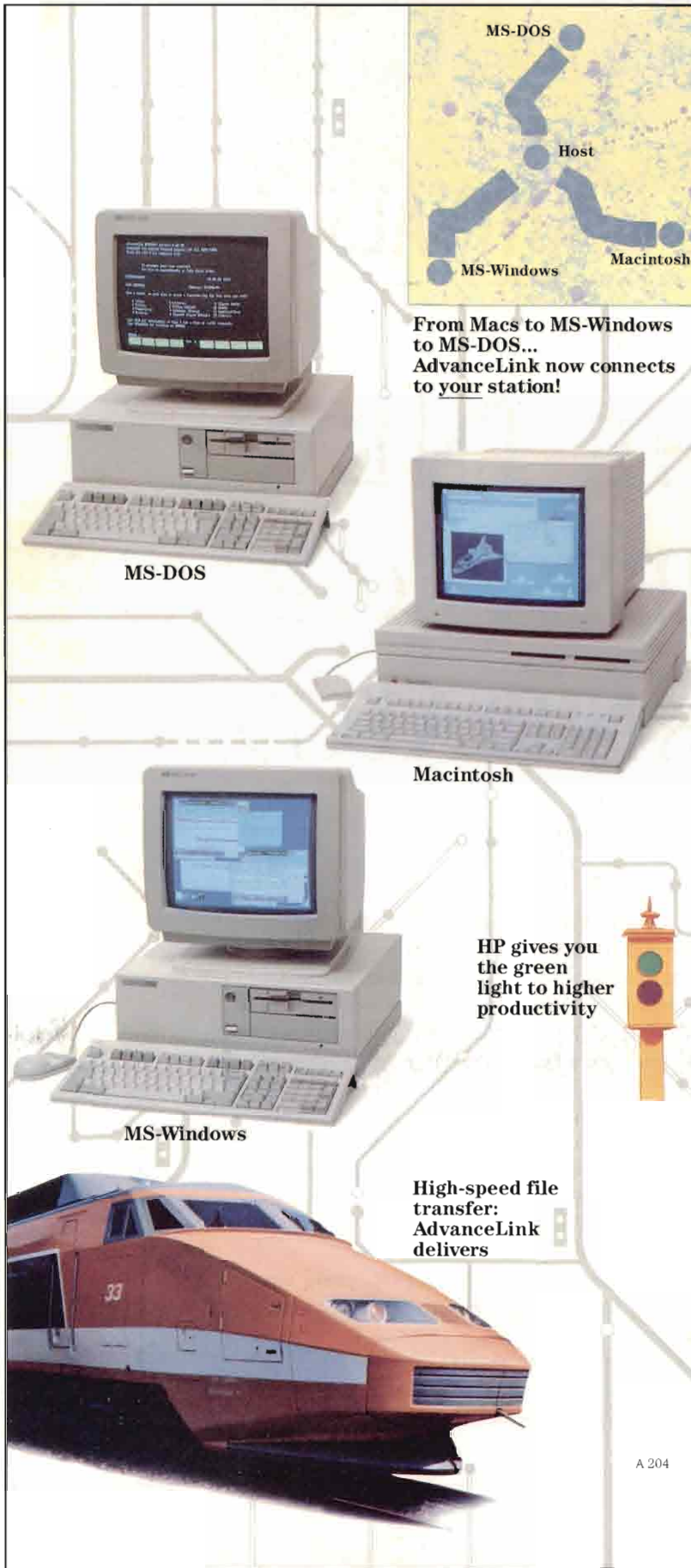
HP-DMS provides product information management, including drawing and design administration, drawing title block management, bill of materials (BOM) processor, query capability, design retrieval, design description and data integration between HP-DMS and HP ME products. Under design process management, DMS includes revision and version control, release control, access control and project management functions. Under network and security management, provides network control, data security, backup and archiving features.

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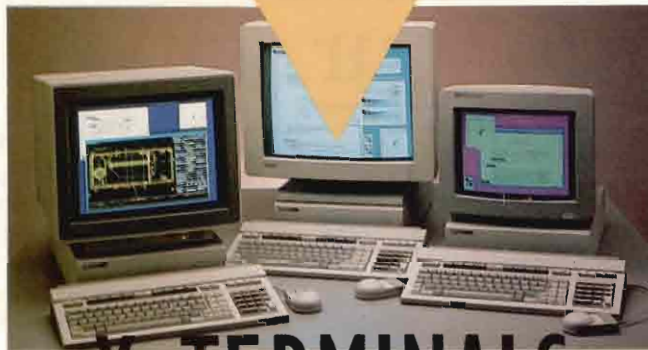
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CIRCLE 248 ON READER CARD



X TERMINALS

THE NEW DESKTOP STANDARD?

[BY PEGGY KING]

At HP's Corporate Computing Center, system managers use X terminals and workstations running X "clients" to monitor network traffic to an Amdahl mainframe host. At Amdahl, software engineers use HP 370 hosts for X terminals on a project that uses HP 640000 microprocessor emulation tools to develop private network data communication products.

Today, without the X Window System, it would not be possible to communicate in multivendor environments where there are multiple display devices, each one using its own windowing system. When all the devices in a "mix and match" environment use X as the windowing system, everyone can talk.

Suddenly it seems that all the major UNIX system vendors offer some way to process X on terminals, workstations and host computers.

In X windows lingo, *clients* are programs written specifically for the X Window system, *hosts* are the computers that process the programs that display on these terminals, and *X servers* refer

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CIRCLE 152 ON READER CARD

to the programs that control the terminal's input devices (usually a mouse and a keyboard) and the output that appears on the display screen.

X Becomes Commercial

BEFORE X TERMINALS HIT the market, there were X "display servers" on workstations and then on PCs. Graphics terminal vendors who visited MIT and other university computer labs sensed a market opportunity when they saw workstations whose sole task was to display windows for applications that resided on host machines.

HP began commercial development of X when X was still in MIT's control. The first X product from HP, X 10 Windows and an X toolkit for the Series 300, shipped in March 1987. In 1988 and early 1989, several vendors including HP brought out software that turns a PC (or a Macintosh) into an X terminal. HP's AXDS/PC (accelerated X Window System display server), which began shipping last fall, works together with HP's intelligent graphics controller, a LAN card such as PC FTP (file transfer protocol), and LAN software from HP or other vendors.

X terminals have been commercially available for just over a year. Models from HP and DEC began shipping this year, and most of the X terminal vendors who brought out products last year have upgraded at least one of their models since the first of the year.

If good performance on an X terminal required little more than a bit-mapped graphics controller, there would be more than one X terminal start-up by now. Except for NCD, the other companies that have rolled out X terminals to date are all veterans of the graphics terminal business.

But X terminals are considerably more complex than graphics terminals because of the X server firmware and software required. Dataquest analyst Bill Fleming estimates that it takes a calendar year and eight to 10 man-years to develop an X terminal from a graphics terminal.

How Early Adopters Use Their X Terminals

ALTHOUGH INDUSTRY ANALYSTS predict that the market for X terminals will heat up over the next couple of years, the best places to look for X terminals these days are in trade show booths and on the desktops of software engineers and research scientists. But it's not too soon to foresee the day when companies will begin to use X terminals to replace all kinds of display devices and minimize overhead by cutting back on purchases of new PCs and workstations.

Does it make sense for vendors like HP, Tektronix and DEC to sell X terminals for a few thousand dollars when they could be selling workstations that cost much more? On the surface it

doesn't, but if they don't sell X terminals to their current customers, someone else will. Ask the vendors why they sell them and the answer will usually be something about their commitment to standards-based computing.

Why Use X Terminals?

AT THE MONTEREY BAY Aquarium Research Institute (MBARI; Monterey, CA), MIS Director Hank Wright needed to provide an X display device for researchers and to utilize the networked resources of the HP 350s, 370s and the 850 server at his site.

As a non-profit institute, MBARI has a limited budget. Wright discovered that X terminals are a cost-effective way to provide access to a variety of applications. When more X-based word processing, spreadsheet and general business applications are available, he also plans to move the PC-based staff away from DOS.

Wright considered three alternatives for getting X up and running on HP equipment: adding X to existing DOS PCs, purchasing diskless workstations and buying X terminals.

Turning PCs into X display stations: If you already have a top-of-the-line PC to put on the network, turning that PC into an X display device with AXDS/PC might be cost effective—but not likely. Remember that the AXDS X server software is just one of the pieces you'll need to buy. If you don't have an EGA monitor or that PC, you'll need to upgrade to that resolution or higher. The graphics controller card costs just under \$1,000 and if the PC is not yet networked you'll need a LAN card for a couple hundred more. Wright tried AXDS with the graphics controller that sells for under \$1,000 and found the resolution was not adequate. HP sells its higher resolution graphics card for \$2,500, more than the list price of some X terminals.

Using diskless workstations on the network: Wright also tried a diskless Series 340 workstation with 4 MB of RAM and found that the refresh rate wasn't adequate, network backup was difficult and that the diskless nodes generated more network traffic than X terminals. With extra memory for better performance, one diskless workstation could cost up to three times the price of an X terminal.

X terminals: Before the HP Series 700/X terminals became available, Wright purchased several 15-inch NCD monochrome units. He found that they had adequate performance even with minimum memory configurations. Recently, MBARI received its four 16-inch color X terminals from HP with high resolution color monitors with 4 MB of memory, and more are on order.

Emulation Windows on multiple hosts: Both software maintenance and software development engineers have reasons for wanting the kind of windowed environment an X terminal can supply. Terminal emulation is a key task for X workstations in software development environments, especially in cross-target

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Planes	1, 4, 8	1, 8	1, 8

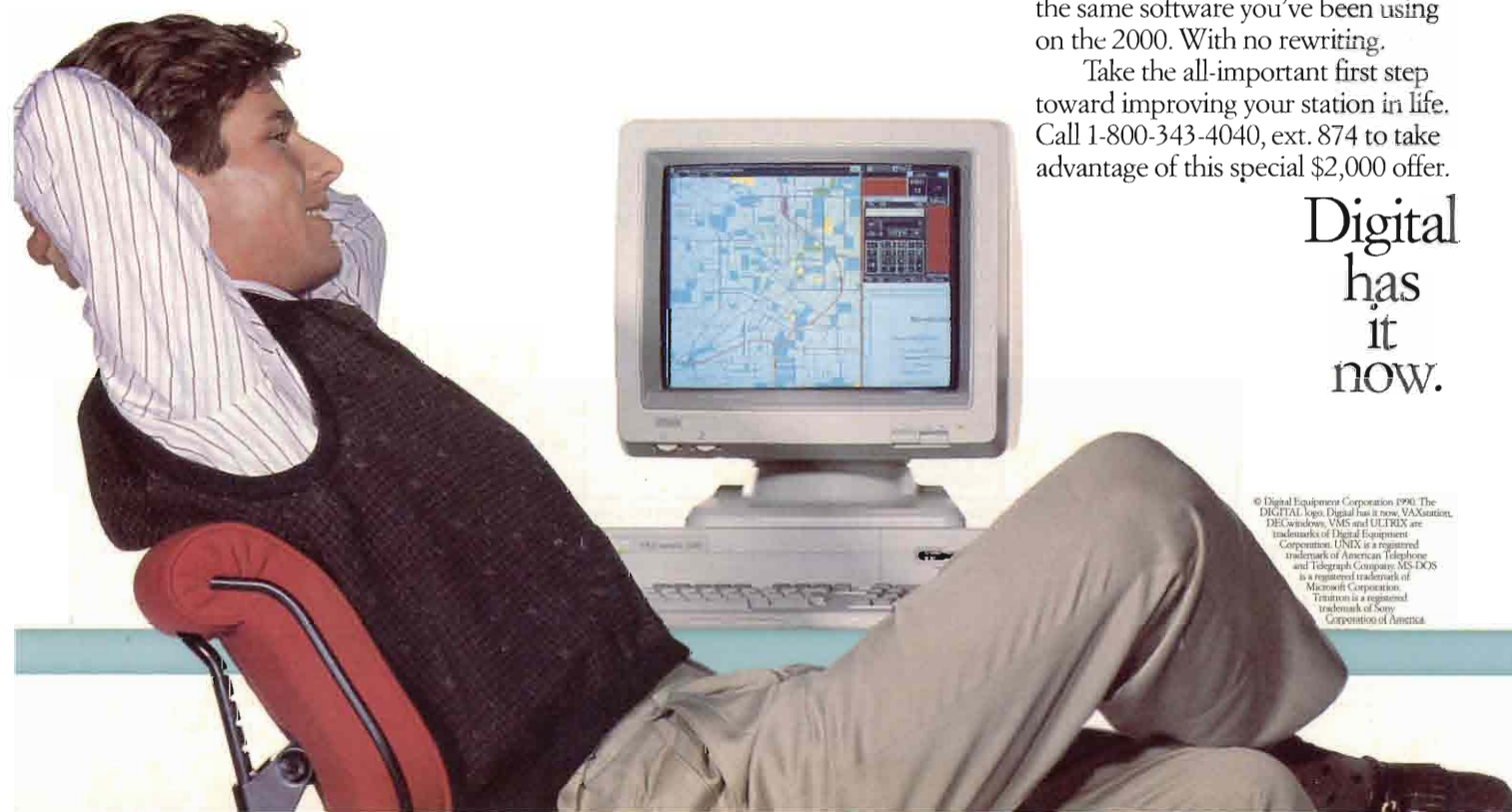
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development where a workstation is used to develop software for a different host. With X terminals, software engineers can open a window to any machine on the network. The use of X Windows as a standard window environment eliminates the need to be familiar with the windowing environments of various machines on a network.

At Amdahl, three HP 370s are emulation servers for 68020 and 68030 circuit emulation. With X terminals, software engineers doing cross-target development can open a window on any of these host machines. They can use the UNIX *pmon* utility to select between emulators and open up a terminal window from a machine anywhere on the Ethernet.

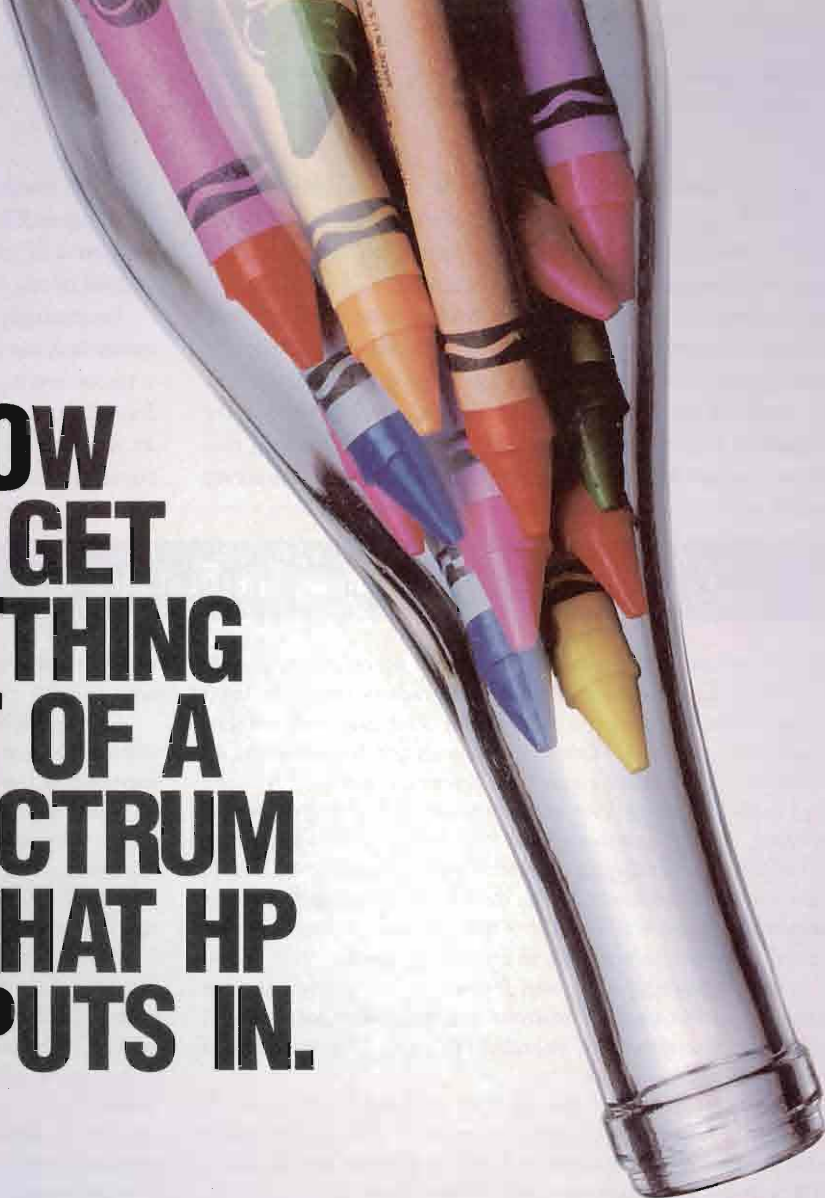
Emulation windows on X terminals are also superior to char-

acter-based terminals for network monitoring applications. This is because it's possible to view a graphical representation of network activity and check for changes in shading or colors that signify alarm conditions. At HP's Corporate Computing Center there are network administrators who manage network traffic on the Amdahl mainframe that runs a version of X. The Amdahl can run X clients on the network so that network administrators can use a window on their X terminal to monitor this mainframe and any devices connected to it via Ethernet.

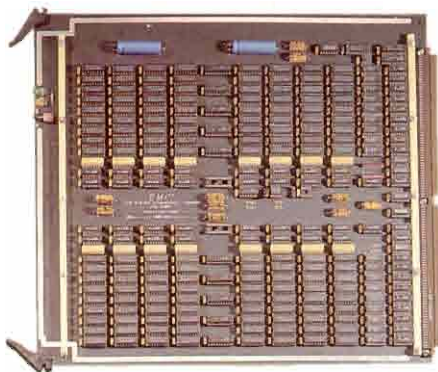
More room on the desktop: In software development environments, working with more than one target machine used to mean that engineers needed to work near the host machines

	Product Offerings	Volume Ship Dates	Resolution & Screen Size Monochrome	Resolution & Screen Size & Colors Displayed	Memory-Minimum/Maximum	Fonts Stored In ROM	Microprocessors & Clock Speeds	Refresh Rate	Keyboard Style	Input Devices	Communications Protocol
DEC	VT1000	6/90	15" and 19" 1024x864; 19" available w/flat panel	no color model	1 MB/ 4 MB	6	AMD 7990 (LANCE)	60 hz	LK 401 (new style keyboard compatible with earlier DEC terminals)	three-button mouse	TCP/IP and LAT
GraphOn	Optimax 2.0 monochrome	3/89 Optimax version 1.0	14" 800x600 visible on screen; 800x920 accessible by automatic screen scroll	no color model	640 KB	none	Motorola 68000 12 mhz	75 hz	Enhanced VT 100/220	three-button mouse	proprietary GraphOn x Protocol
Human Designed Systems	Viewstation vs 14, vs 16, 19 monochrome; vs 14c, vs16c, vs17c, vs21c color	5/89 vs 21c 12/89; vs 17c 4/90	14" 680x500; 16" 1024x1024; 19" 1280x1024; 4 grey shades (all models)	14" 680x500, 16 colors; 16" 1024x800, 16 or 256 colors; 17" and 21" 1280x1024, 256 colors	14" .5 MB / 4.5 MB; 16" and 19" .5 MB / 8.5 MB	16	processor — Intel 30186 10 mhz; graphics— TI 34010 40 mhz	60 hz 14" monochrome and all color models; 70 hz 16" monochrome; 65 hz 19" monochrome	IBM 101 PC/AT style or VT 220	two or three-button mouse	TCP/IP
HP	HP 700/X choice of 6 monitors (5 color and 1 monochrome)	3/90	17" 1024x768; 16 grey shades	14" 640x480, 16 colors; 16" and 19" 1024x768, 16 colors	1 MB/ 4 MB	3	processor — Intel 80c188 12.5 mhz; graphics — TI TM34010 50 mhz	60 hz	HP 9000 Series 300 style (also found on 2397 graphics terminal)	three-button mouse or trackball	TCP/IP
Jupiter	Model 310 color	8/89	color only	19" 1280x1024, 256 colors; 16" (by special order)	4 MB/8 MB	3	processor — Motorola 68030 20 mhz; floating point — Motorola 68882; graphics — proprietary	60 hz	84-key	three-button mouse	TCP/IP
NCD	NCD16 and NCD19 monochrome; NCD17c color	NCD16, 2/89; NCD19, 8/89; NCD17c, 3/90	16" 1024x1024; 19" 1280x1024	17" 1024x768, 256 colors	16" 1.5 MB/4.5 MB; 17" and 19" 2 MB/8 MB	8	NCD16 — processor Motorola 68000 12 mhz, graphics — proprietary; NCD19- Motorola 68020 15 mhz, graphics — proprietary; NCD17c 68020 20 mhz, 2 proprietary graphics coprocessors	70 hz	monochrome models 101-key PS/2 style; color terminal choice of 97-key UNIX style, 101-key PS/2 style, 105-key DEC style, 97-key Kana	three-button mouse	16" TCP/IP or SLIP for RS-232; 17" and 19" TCP/IP, optional NCDnet supports DECnet
NCR	NCR Towerview XL15, XL19 monochrome	Towerview XL15, 6/89; Towerview XL19, 12/89	15" 1024x800; 19" 1280x1024	color terminal under development	1 MB/4 MB	8	XL15, XL19 68020 16.7 mhz	15", 76 hz; 19", 70 hz	U.S. 101-key; International 102-key	three-button mouse	TCP/IP or SLIP
Tektronix	XN5, XN7 monochrome (OEMed from NCD); XN10, XN11, XN11/RM color	11/89	monochrome models made by NCD; XN5 same as NCD16, XN7 same as NCD19	XN10, XN11 15" screen (option for 19") 1024x768 256 colors; XN11/RM 19" rack-mountable 1280x768 16 colors, option for 256	2 MB/8 MB	20	processor — Intel 386SX; graphics — TI 34010 20 mhz	60 hz	VT 200 style- North American; 7 different international keyboard options	XN10 — three-button mouse, optional thumbwheel; XN11 — three-button mouse, thumbwheels, graphics tablet; XN11/RM — same as XN11 plus barcode reader and touchscreen options	TCP/IP
Visual	X-15, X-19, X-19 Turbo monochrome	8/88	15" 1024x800; 19" 1152x900; X-19 Turbo 1280x1024 optional 4 grey shades	color terminal under development	15" and 19" 1 MB/4 MB; 19" Turbo 2 MB/8 MB	8	X-15 and X-19 Motorola 68000 16.6 mhz; X-19 Turbo Motorola 68020 20 mhz	15" 79 hz; 19" 72 hz	PC/AT 101 key or DEC VT220	three-button optical	15" TCP/IP; 19" TCP/IP and DECnet

Vendors in the X terminal marketplace.



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and to use a dumb terminal attached via a short cable to each machine. Because an X terminal can provide terminal emulation windows for each of the hosts, there's no longer a need to have a separate terminal for each machine.

In the financial services industry, traders now need multiple windows to access both UNIX and DOS hosts. But in the future they may need to access various more specialized servers. Many traders have at least two monitors on their desk, one for the Quotron and another for their PC. With an X terminal, one window can provide realtime quotes from a UNIX quote server

and a PC emulation window can give the broker access to DOS-based spreadsheets and office automation tools. The need to emulate a PC may go away when the traders' favorite PC applications become available on UNIX platforms.

Increasingly, brokerages are installing specialized servers so a trader may use an X terminal to access various hosts (for example, a quote server, a database server that holds client account information, and a news wire service) simultaneously. Now that an X terminals can replace multiple terminals, traders might have room to read *The Wall Street Journal* at their desks.

[X TERMINALS — FIND THE FEATURES THAT SUIT YOUR NEEDS]

The X terminal marketplace is so new that no one terminal style has emerged as a standard for cloning and each vendor's offering is unique. The following is a summary of comments from vendors about unique features of their X terminals and brief descriptions about how each vendor entered the X terminal market:

Visual Technology: According to Mike Braca, vice president of software, Visual's terminals have very robust X servers because Visual has been developing X terminal software since 1987, longer than any other company in the market. In designing the server software, the goal was to make it feel interactive. Therefore, the server's schedule gives priority to interactive clients.

Visual Technology Inc. was founded in 1978 as a character terminal manufacturer and entered the graphics terminal market in 1986 with a terminal that provided integrated text and graphics capabilities.

Tektronix: Tektronix was the first company to ship color X terminals in August 1989. Beginning in March 1990 the XN10 and XN11 ship with a minimum of 5 MB of DRAM and up to 11 MB optional, more than any other vendor offers.

According to Brian Holgate, X product marketing manager, a key feature of the XN11 is their backward compatibility with the X 4211 graphics terminal that Tektronix introduced in 1988. It's also possible to upgrade an X4211 to an X terminal by purchasing Tektronix' server software.

Tektronix terminals also offer options specifically designed for discrete manufacturing and process monitoring applications. The XN11/RM is the first rackmountable unit. The graphics module and the display module are separate, making it possible to change monitors without changing the server. To date, Tektronix is the only vendor to offer alternative input devices; the XN11 has an optional graphics tablet, barcode reader or touchscreen.

For Tektronix, the X terminal business is an outgrowth of 20 years in the graphics terminal business.

NCR: Towerview X stations are the only X terminals to date that have the capability of running certain client applications such as terminal emulators and window managers within the terminal server rather than on the host, thereby reducing communication traffic between the host and the window server. Towerview X terminals are expandable. Both models have two additional slots so that OEMs and VARs can add value. For instance, some resellers

of NCR's terminals have used a slot to add 3270 communication with an IBM mainframe.

Since 1984, NCR has sold the multiuser UNIX TOWER series manufactured at its Columbia, SC plant. More than two years ago, members of the TOWER design team reecognized the potential of X terminals and began to design one. In 1988, the Towerview design team moved to the Orlando, FL site that manufactures these terminals. The first Towerview terminal was packaged as an integrated unit, but the redesigned XL15 and XL19 have a monitor that's separate from the base.

NCD: Network Computing Devices, the only startup in the X terminal market, is also the industry's leading vendor with more than 10,000 units shipped. NCD has modeled the design features of its X Window "display stations" after workstations rather than terminals. All models are cooled with an internal convection cooling system rather than a fan, and the NCD19 has a landscape screen capable of displaying two pages rather than one. This feature is especially useful in technical publishing or in applications where text and graphics are displayed side by side. Neither the 19-inch model or the color model use a graphics chip, but the processor boards on these models have a socket for a graphics coprocessor that can be added to support PEX (PHIGS Extension to X) when PEX becomes a standard.

NCD was founded in February 1988 and received its first funding in July of that year. Its OEM customers include Tektronix, Motorola and MIPS Computer Systems.

Jupiter: According to Bill Schindler, director of sales and marketing, Jupiter Systems is the only vendor that is designing its X terminal for the high-end applications (approximately 20 percent of the market). The Model 310 is designed for medical imaging, seismic processing, mapping and high-end CAD (computer-aided design) applications and is the only X terminal that comes with a floating point processor that enhances its performance in these applications. Jupiter's graphics engine has a lookup table for 12 bit images as part of its frame buffer. This feature is important for medical imaging because most X-rays are stored as 12 bit images. The image can be stored in RAM and displayed eight bits at a time.

Jupiter will soon replace the Model 310 with Model 410. The CPU will be faster, the graphics engine will be redesigned to use two VLSI chips instead of the six-chip set in the Model 310, and

How X Terminals Are Being Used Today

MOST OF THE CURRENT USES for X terminals are for applications that would otherwise use monochrome 2-D workstations:

Programming: Programmers can use a large window for coding and a smaller one for checking on a compiler. The project leader may have a powerful workstation that is also the host machine for the X terminals of team members.

CASE: CASE tools that are designed for networked

workgroups are suitable for monochrome X terminals. Software through Pictures from IDE (San Francisco, CA) has used X Windows since 1986 and other CASE vendors are developing X versions of their products.

Electronic Publishing: FrameMaker is the first WYSIWYG (what you see is what you get) publishing application to become available in an X version. Hank Wright, who has installed FrameMaker at MBARI, notes that Frame's floating license scheme is not well suited to workgroups with X terminals. In order to begin a session in FrameMaker, you need to start it

the cost will go down. Jupiter Systems was founded in 1981 as a graphics hardware manufacturer. Two years ago, Jupiter changed its focus when they discontinued its previous product and became a research and development company for over a year while they designed a new graphics engine for their X terminal.

HP: HP offers the widest selection of color monitors. The five different color X terminals come in various sizes and resolutions (including two Sony models that have adjustable screen resolutions) and some monitors have a tilt and swivel base. In addition, HP is willing to sell its X Window server along with any HP monitor that supports VGA (640x480) or higher levels of graphics. Customers who start with the 17-inch monochrome monitor can upgrade to color simply by trading up to a color monitor.

HP's monochrome monitor is the only one that can produce 16 shades of grey. Multiple grey shades can make 2-D applications have a 3-D look and feel. In contrast to the many monitor styles offered, the only style of keyboard offered is the HP-HILL, the kind used on HP 9000, Series 300 workstation. To date, HP is the only vendor offering this style of keyboard.

HP's Panacom Division (Waterloo, Ontario) produced the HP 3081 and 3082 graphics terminals popular in the oil and gas industry. The division produced its own software for the 700/X series, but all of the standard monitor selections come from OEMs.

Human Designed Systems: HDS recently replaced its top-of-the-line 19-inch color monitor with a 21-inch Sony monitor, the largest monitor currently available for X terminals. HDS has a highly configurable product line. In addition to a choice of several color and monochrome monitor sizes and resolutions, all models can be delivered with either an IBM- or a DEC-style keyboard and either a two- or a three-button mouse.

HDS has been in the terminal industry for more than 13 years and has built graphics terminals since 1983. Until recently, most of their sales have been in the DEC marketplace. Their ViewStation series sells to a broader market through OEM and dealer channels.

GraphOn: GraphOn's OptimaX terminal is the lowest priced terminal running X. What makes the OptimaX different from other X terminals is that its X server resides in the host computer rather than in the terminal. Unlike other X terminals that can be used with any host that runs X Windows, OptimaX works only with hosts to which the X server software has been ported. Recently,

GraphOn ported to the HP 9000 Series 300. Because the X server resides on the host, the OptimaX performs well with a standard configuration of less than one MB of memory. On the other hand, GraphOn customers will need to beef up the memory on host machines to accommodate the X clients.

The terminal communicates via a unique language over the RS232-C cable rather than over Ethernet. GraphOn terminals have higher performance over a modem because they use complex display commands rather than the slower X wire protocol that was designed for higher bandwidth communications. The modem capability makes OptimaX terminals convenient to use for sales demos and as a "second seat" for engineers working way from their offices, but GraphOn has not yet procured an FCC "B" certification that authorizes these terminals for home use. People using OptimaX terminals at home via a modem do so at their risk because GraphOn neither advertises or supports their use in homes.

GraphOn has been manufacturing graphics terminals in the DEC marketplace since 1983. Its graphics terminals emulated DEC terminals beginning with VT100 and Tektronix beginning with the 4010. According to Executive Vice President Mark Brown, "GraphOn already had the heart of an X terminal in place because of our decision to use bit-mapped graphics on a single board for both graphic and alphanumeric displays." In late 1986, GraphOn recognized that X Windows would become an industry standard for human interfaces. Soon after, they began to develop the X server software and firmware and made the decision to keep the server on the host in order to provide a low-cost unit.

Digital Equipment Corporation: DEC introduced its VT1000 X terminal at the NCGA (National Computer Graphics Association) conference in March. In addition to running X, VT1000 runs DECwindows and uses the LAT communications protocol with VAX/VMS or Ultrix hosts. The VT 1000 features a "snap-in" ROM cartridge board that can easily be replaced when new versions of X Windows or DECwindows become available. DEC is also the first vendor to offer an electroluminescent monitor, also known as a flat panel. This option is available for the 19-inch monitor only and increases the cost by over \$10,000.

The terminal uses the same monitors as Digital's low-end workstations and the X server software comes from the Low-end Systems Division in Littleton, MA. —Peggy King

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at an ID Module. In the HP implementation, that ID module must be a workstation. This means that when a user begins to edit in FrameMaker, that session must have originated on a machine with a CPU or else the work done during the session cannot be saved.

Wayne Uegio, a software engineer at General Electric (Schnectedy, NY) has found that FrameMaker on NCD X terminals has a crisper display than it does on some of the workstations used in his R&D group.

In the non-WYSIWYG category, Elan Computer Group offers Elan/Express for writers using the UNIX editor *troff*. With Elan/Express, a user can work on editing a document in one window and in another window view the way the document will appear after it's been printed on a laser printer.

Training: X terminals work well for training because they provide seats at a lower cost and there is only one disk to back up.

UFA, a company that sells turnkey systems for training air traffic controllers, has incorporated X terminals as part of a flight control simulation package. The air traffic control trainee sits in front of an Apollo workstation and views a simulated radar scope that shows the position of aircraft. Visual Technology X terminals that UFA refers to as pseudo-pilot stations have an initial display that shows the aircraft IDs of all planes a "pilot" is responsible for. Via headset, the person assisting in the controller's training will click on an aircraft ID when he hears an aircraft ID for one of the planes under his control. Then the display changes to show an instrument panel for the identified plane. Usually the pilot responds accurately to the controller's commands, but he also may simulate an emergency condition by failing to respond or by disobeying the commands. In these instances the controller at the Apollo workstation uses the mouse to adjust other aircraft instructions as a result.

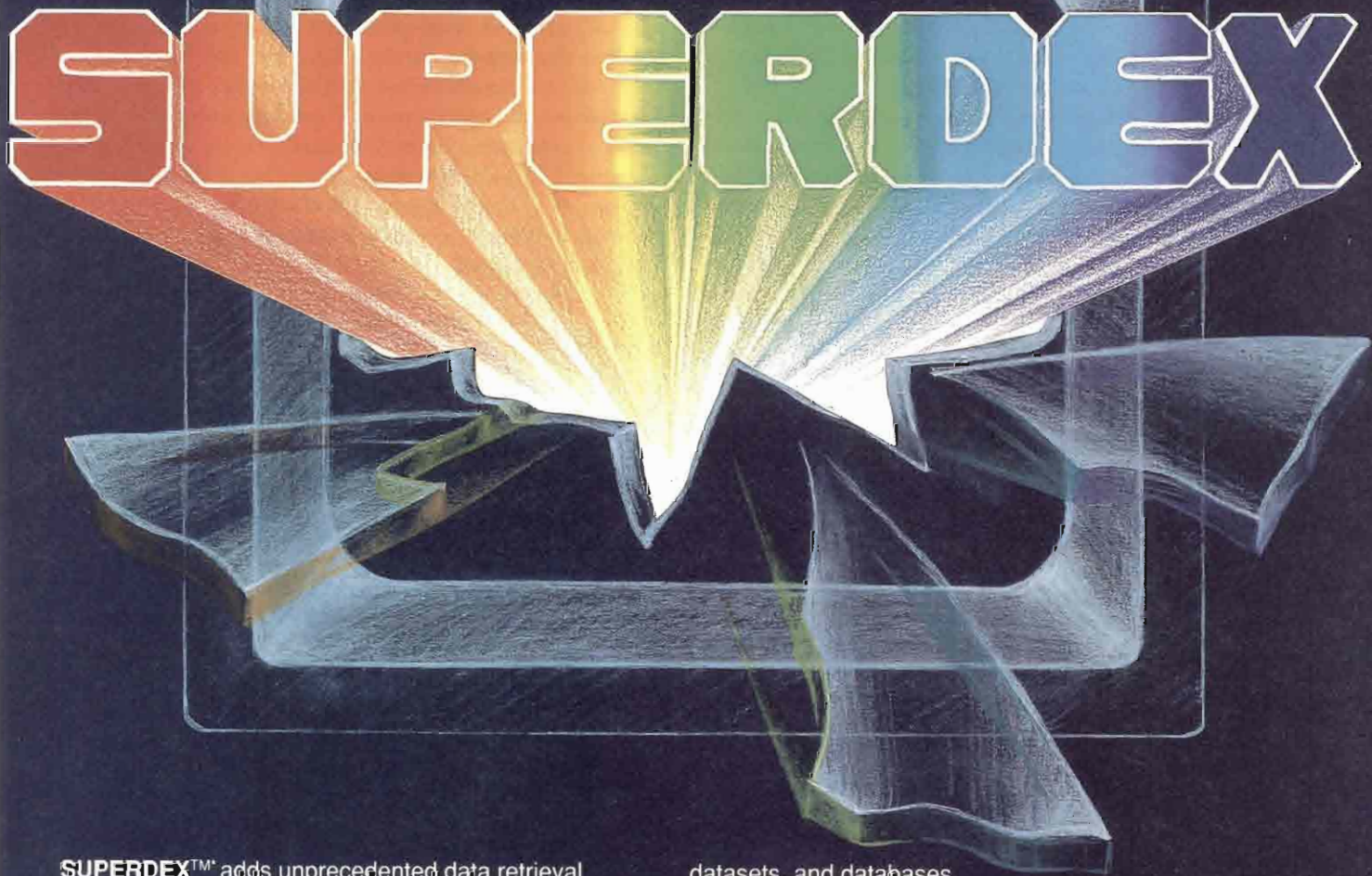
When Will X Terminals Begin Replacing PCs?

THE ANSWER IS NOT UNTIL a good selection of familiar applications become available. How many users will be willing to part with their trustworthy MS-DOS machine with VGA monitors, their 20-MB hard disks, their Lotus or Excel spreadsheet and a word processor they know by heart, when the only advantage that an X terminal might offer is a larger screen?

To date, there are just a few applications that would allow X terminal users to recreate the convenience of their PCs and get some additional functionality. Synchronize from Crosswind Technologies Inc. (Felton, CA) was the first office automart X Windows. Where are X versions of the word processors most commonly used in business settings?

And where are the spreadsheets? Wingz from Informix (Menlo Park, CA) will most likely be the first graphical spread-

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sheet for X terminals when an OSF/Motif version becomes available later this year.

New Applications For New X Terminals

COLOR X TERMINALS HAVE been available for less than a year. Within a few years, color 2-D and 3-D X terminals will be used in many applications that now use color graphics terminals and high-end workstations. Fleming of Dataquest estimates that color terminals now account for five percent or less of the total installed base but that within three to five years color units will outsell monochrome ones.

The X industry is still waiting for PEX, the PHIGS extension to X that will provide standard 3-D graphics. When PEX standards are added to X, 3-D graphics capabilities will follow as soon as manufacturers can make the firmware for it available. Some of the new uses for X terminals will include:

Factory automation (process monitoring and shop-floor control): Terminals with color graphics displays that represent the state of the processes and equipment on the factory floor will be networked to real-time data collectors. Changes in the color or hue of an icon can represent alarm conditions.

3-D CAD: When the PEX standard is approved, high resolution 3-D graphics X terminals can be used for solids modeling applications if these terminals are connected to sufficiently powerful host computers.

From Distributed To Cooperative Computing

THE REAL SIGNPOST IN THE movement from 1970s-style distributed computing (minicomputers and character-based terminals) to 1990s style cooperative computing (the client/server model) will be when the sales of low-priced X terminals surpass the sales of ASCII terminals.

The catalyst for this switch will be the availability of client/server versions of traditional mini-computer applications.

According to Peter West, vice president of Business Development, ASK Computer Systems will begin to roll out an open systems version of its software for manufacturing companies. ASK's MANMAN manufacturing management software has been available on HP 3000s since the mid-70s and West estimates that about 300,000 character-based terminals and terminal emulators are used to display data entry screens from various modules of MANMAN.

The new cooperative computing manufacturing software from ASK will debut this year when X Windows-based versions of order management, general ledger, accounts receivable, and inventory control modules become available. Over the next few years, X versions of all of ASK's new client/server software modules will become available. Current ASK customers who use the HP 3000 and plan to migrate to the new software are hoping that HP 3000 will have the X Windows capability by the time that ASK delivers the software. It's expected by the end of the year, but HP hasn't announced a date yet. The new ASK software also will run on multiuser UNIX computers and DEC VAXes.

West predicts that many current customers will stay with their distributed setups into the 21st century. Nevertheless, he believes that most new installations will choose the flexibility of an open system that allows the MIS manager to use any database that supports standard SQL. The benefit for the end users will be a friendly point-and-click interface to replace command-driven data entry screens. When large manufacturing sites begin to order hundreds of X terminals, expect to see X terminals priced below \$1,000 outselling any other kind of terminal. At that price, sales of X terminals will put a dent in the number of new PCs and workstations that get sold into offices and R&D settings as well.

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Paddling Up The Waterfall

Automate Your Operation Process With Reverse
And Re-Engineering

R

reverse engineering is nothing new to the human race. We've reverse engineered the products of others for political and competitive advantage since the earth cooled! Nor is reverse engineering new to the software developer. Post implementation support of software products has demanded reverse engineering of source code since Charles Babbage debugged the first program written by Ada Lovelace.

In a study conducted by IBM Corp. (R. K. Fjelstad and W. T. Hamlen) on how post implementation support personnel spent their time, it was determined that 47 percent of their time is spent on code analysis, or reverse engineering.

Assuming 60 percent of the overall software development time is spent in post implementation support (some estimates are as high as 80 percent), and 50 percent of that time is spent in-code analysis, then reverse engineering as a manual activity currently occupies at least 30 percent of our total software development resources. How can we make that more productive?

Here are definitions that will help put this in perspective: *Reverse engineering* is examining a completed product and developing a blueprint or design specification for that product. *Re-engineering*

is using a design specification derived by reverse engineering to recreate the product, usually with modifications.

These definitions apply to all products, not just software. Two principles key to understanding our activities as software developers are:

1. The product from reverse engineering is a blueprint or design specification. It is not a requirements statement.
2. Re-engineering uses the results of reverse engineering plus other information to create a new product.


As an activity, re-engineering encompasses many subactivities of which reverse engineering is one. This is represented graphically in *Figure 1*.

No one is going to commit resources to the generally unpleasant task of Reverse Engineering without good reason. The design specification that results is of little value unless something about the product it represents is going to change. This maybe to fix a problem or implement an enhancement. By developing a blueprint of the product, the developer successfully can eliminate redundancies and anomalies within an existing system, and understand exactly how enhancements best can be added.

The computer systems of today represent knowledge and business rules crafted by thousands of labor years. There could be serious consequences

[By Tom L. Scott]

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if some of these rules were overlooked or violated in a new system. It may be a good business decision to reuse the current product as a component of a larger system to preserve these business rules even if the overall re-engineering effort is larger than an anticipated new implementation.

The blueprint will define the system's boundaries so that it can be efficiently reused and reduce future development and

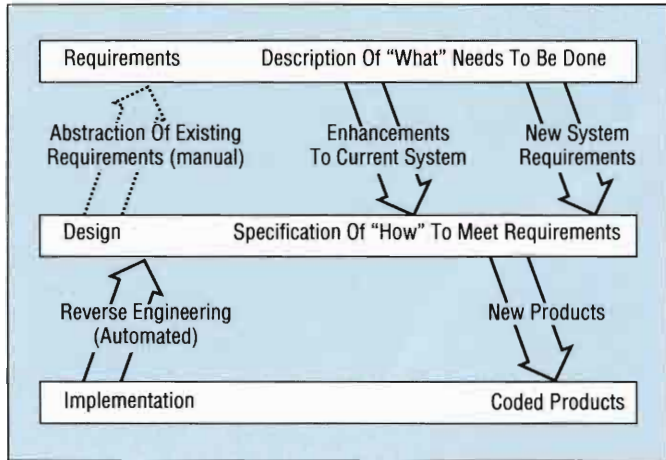


Figure 1: Components of re-engineering.

support costs.

There may be a need to reverse engineer existing products into a more structured and more easily supported format. This may include conversion to a different source code to increase portability over hardware platforms, or to reduce post-implementation support costs.

Selecting Candidates For Re-Engineering

RE-ENGINEERING IS A STRATEGIC POLICY, and must be consistent with the company's strategic plans. Re-engineering for a portion of the business from which market withdrawal is being considered would not be a good decision. Re-engineering around an old product in a new, volatile market also may be unwise. The box in Figure 2 may give some insight into what are good candidates for re-engineering.

Re-engineering offers the promise of extending the functionality of existing systems by directing post-implementation support activities from a structured model. The "as is" blueprint from reverse engineering serves as the point of departure for developing the new system model and its subsequent implementation.

What the automated reverse engineering tools should offer, then, is the ability to create this blueprint in a format that can be used by an automated forward engineering environment or a CASE tool.

Not all CASE tools lend themselves to being automatically populated by an external source. And not all CASE tools offer

a sufficiently rigorous design component for representing the detailed blueprint that should result from reverse engineering.

Abstracting The Requirements Model

B E CAREFUL IN DISTINGUISHING between the design, or blueprint and the requirements model. CASE tools have made data flow diagrams a popular device for software developers, and they are useful in describing requirements. They are often referred to as part of the Logical Model. Software developers often misuse data flow diagrams as the design technique. The design specification is the Physical Model.

A description of the right requirements is certainly prerequisite to developing the right system. But reverse engineering doesn't produce a description of requirements, rather it produces a blueprint or specification of the design, the Physical Model.

There may be a need to abstract a Logical Model from the reverse engineered blueprint as a part of the overall re-engineering activity to insure that new requirements are consistent with the requirements currently being met by the existing solution. This must be identified as a re-engineering step (see Fig-

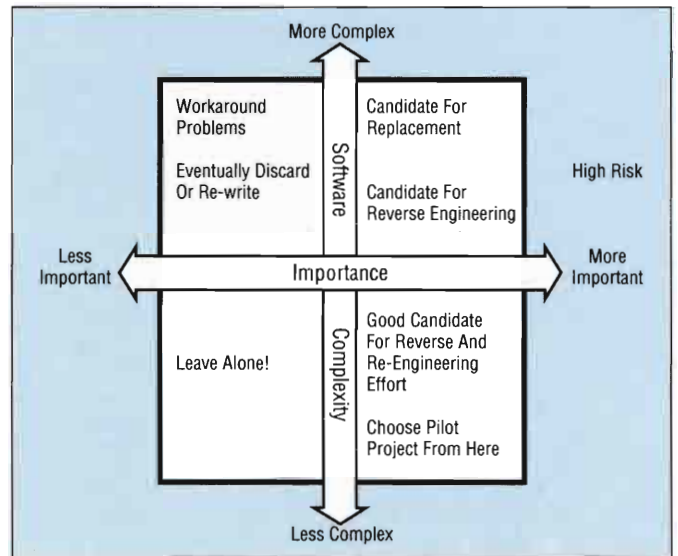


Figure 2: Selecting candidates for re-engineering.

ure 3) and principally will be completed by the direct input of the class of intelligent humans that we call analysts!

Input To Reverse Engineering

THE INPUT FOR REVERSE ENGINEERING may be source code in a known (or possibly little known) language. General reverse engineering tools will focus on common languages. If yours is uncommon, you may need to develop your own reverse engineering tool that outputs the

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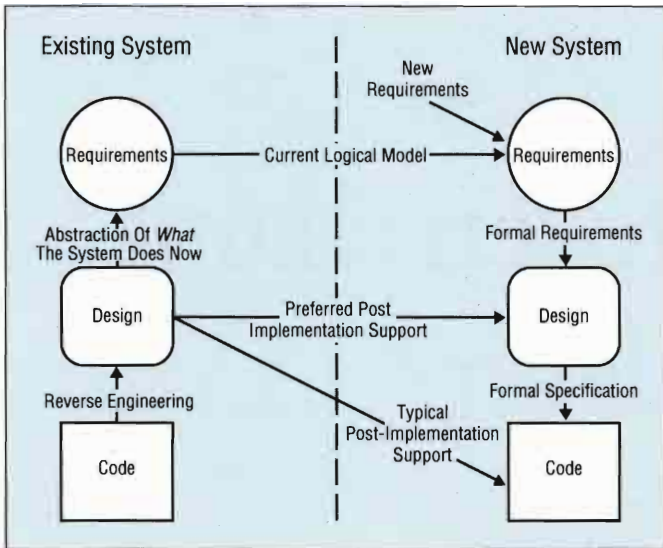


Figure 3: Abstracting a logical model.

design in CDIF (CASE Data Interchange Format), an evolving exchange format used by leading CASE tools. Cadre's (Providence, RI) Teamwork product will accept CDIF files to populate its design tool, Teamwork SD.

Common languages have many variants. Source code parsers associated with reverse engineering tools must recognize variant syntax and semantics in a given language. This makes it difficult to handle "C" code in a general way. Ada, on the other hand, is standard by definition. The AdaGen product from Mark V Systems (Encino, CA), therefore, can accept any Ada code as input and directly produce accurate graphics representing its design. This design then can be modified as needed with subsequent generation of new Ada code from the graphics.

The input may be run-time results from the execution of test data. Capturing this information is popular for embedded systems, and there are tools to run multiple test suites, mapping information to CASE design tools. The Software Analyst Workbench (SAW) from Cadre has been interfaced to Teamwork. With this combination, the actual design as captured at execution time can be input into Teamwork SD, producing structure charts with performance annotations and building the "as-is" blueprint for subsequent enhancements.

Output From Reverse Engineering

REVERSE ENGINEERING IS A multifaceted operation. A collection of representations of the facets of the code represent the blueprint.

One facet is the structure of the components of the total system, represented graphically as a structure chart. Knowing the structure is important to understanding how the components may be reused, understanding how new components can be fit into the system and identifying structural design errors.

Each box in a structure chart derived from a reverse engineering activity contains the business rules of the company. This must be captured with intelligent human interaction, most likely by scanning the source code in small chunks and writing English statements defining how this code works. There are tools to aid this as well. ProDoc, from Scandura Intelligent Systems (Narberth, PA), works with COBOL, FORTRAN, C, PASCAL and Ada, making it easy for a technician to organize and annotate existing source code, documenting it at the procedural level. ProDoc also will generate code from design and even translate from one language to another.

Examining the complexity of the system may be an important step in determining the feasibility of embarking on a reverse engineering project. Tools that support both Halstead and McCabe metrics also would insure that the new system resulting from the re-engineering activity meets your complexity standards. Logiscope from Verilog USA (Alexandria, VA) produces graphical and textual representations of the design of the code with an emphasis on complexity. Logiscope provides both static and dynamic analysis.

One problem in populating a CASE design tool automatically is in the CASE tool itself. Good design tools prevent bad design techniques. But bad design techniques inevitably will be present in existing products! How are they represented? How are they captured and reported at the design level? Cross reference and where-used lists, completeness and consistency checks, and other reports from the CASE tool are needed to complete the documentation of an existing product.

When do you start re-engineering? The chances are good that you're already doing it!

Tools exist to automate and help in this process. There will never be a magic wand to do all the work automatically, but there will never be a better time than now to start automating the process in your operations. —Tom L. Scott is vice president of ECS Associates Inc., Torrance, CA.

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R E P O R T W R I T E R S

**No Longer
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Used To Be**

Report writers are a perennial interest to commercial computer users. Why? Because in many installations, more than 70 percent of the computer resources may be taken up in producing printed reports or terminal displays for informational purposes.

Life would be easy if a system manager could get rid of report production or just optimize its processing. Every MIS manager would save time and effort if he could really place report creation solely in the users hands.

In reality, the power and capabilities of report writers are rapidly increasing, and there are very few cases now where a 3-GL language is required to produce a report. However, users needs also have become more diverse and more complex — life for the software developer isn't getting easier.

Report writers are therefore heading off in different directions — some emphasizing ease of use, some emphasizing facilities, some emphasizing performance, etc.

User Needs

Who uses report writers? The original report writers, were designed for use by the software professional (or possibly because of their lack of user friendliness they were only capable of being used by such people). However, if you examine real user needs, they tend to fall into these categories.

End Users. Typically, end users such as middle and upper management, secretaries and clerks, want to produce relatively simple reports quickly — often they are one-offs. The training period must be short (management doesn't want to spend more than the absolute minimum of time and lower-level staff turn over rapidly). Also computer-illiterate staff must be able to learn the software. Complex facilities or features aren't likely to be of much interest to this group. Similarly, such users are often happy with default layouts of data columns and head-

ings — they won't want to take the time to manipulate layout.

Recently, a menu-based approach has become popular to meet the users needs.

Semitechnical Users. These are staff members who are willing to spend some time learning a report writer and are capable of doing so, but they may not be trained computer experts. Examples would be accountants, engineers, senior secretaries, etc. Command-driven report writers may be acceptable to such users.

Software Professionals. These folks want lots of facilities so they always can produce requested information. They often produce reports that become part of some routine application processing that's run daily or weekly. So, efficient processing and the ability to optimize record retrieval at a low level is important. They may need to interface it to other software and the ability to control and modify output layout is important.

System Managers. His concern is keeping computer resource usage within reasonable limits, balancing conflicting user needs, controlling routine production processing, etc. He has a big interest in the performance of report writers.

Trying to meet the needs of everyone with one product isn't sensible. It's like trying to produce an automobile that's friendly enough for grandma to drive around the block, beat a Ferrari in a standing-start quarter mile, and has every conceivable gadget on it you can imagine. It just isn't possible to do it and still deliver a product that costs less than a million dollars.

Performance Aspects

Report writers fall into two categories — interpreted and compiled. Traditionally, on HP 3000 computers, interpreted report writers have been more popular because they are easier for software developers to produce (with relatively sophisticated features) and they were out first in the market. However, when compared with a



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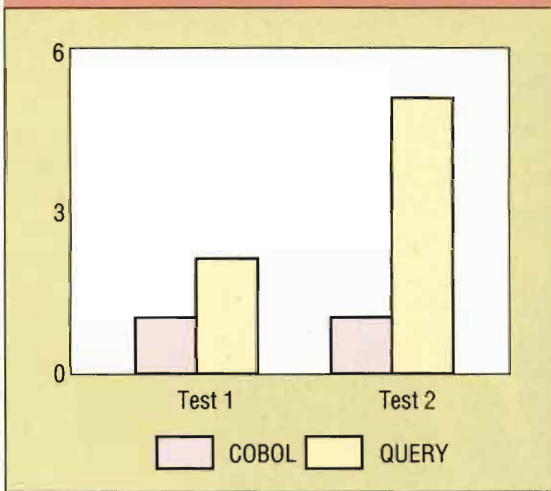
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FIGURE 1



Comparison of QUERY and COBOL to produce identical reports.

compiled program, they don't have comparable performance (see Figure 1).

If you want to improve performance, definitely look at compiling your reports — compilers for several interpreted report writers now are available and this trend will accelerate.

Second, look at low-level software aspects.

- Does it run in native mode on MPE XL systems (and does it generate native mode code if it's a compiler)?
- Does it have the option of using

have multiple processes running in parallel to produce a single report.

Another way to optimize reports is to improve record indexing. Reference the third-party solutions that are becoming more popular to assist IMAGE record retrieval. These can help you with the "finding the needle in a haystack" problem even if they don't help much with a lot of routine accounting reports. If you don't want to spend money, then it's often a good idea to look at adding extra paths (e.g., add an automatic master

MR,NOBUF reads on databases thus bypassing the overhead of access via the database software?

■ Does it optimize record retrieval automatically, or at least let you analyze and tune database access? For example, how does it handle cross data set joins in IMAGE?

One interesting feature that may be available soon with the introduction of multiprocessor HP RISC machines is the possibility to

in IMAGE or add an index in SQL). However, faster reporting tends to have a trade-off in slower updating unless you split your database into two replicated copies: one for online updating and the other for reporting. This is now possible and you can even put the two copies on separate computers.

PC Processing And Downloading

Another way to improve performance is to off-load work to those cheap PC computers. These have been used for defining reports (i.e., handling the report definition/compilation stage) and for actually processing the information after extraction from the main system. HP ACCESS is a typical example of such an approach.

In addition, with the growth in PC populations and the increased use of spreadsheet and graphics on PCs, it has become essential to be able to produce at least Lotus 1-2-3 format files for download and processing on a PC (and there are many other possible PC formats also).

More Features And Complexities

Let's look at other popular attractions.

- Menus for everything (as exemplified by HP's BRW). Now, I think it's generally accepted that menus make life easier for the non-expert user. Whether

FIGURE 2

SALES BY PRODUCT		
DESCRIPTION	VALUE	PERCENT
CHALK	157.50	11.91
SHOES	271.25	20.51
FOOTBALL	318.55	24.09
TENNIS RACKET	124.45	9.41
TENNIS BALL	107.35	8.12
BASEBALL BAT	342.80	25.93
Final Total	1321.90	100.00

To calculate the percentages, the totals must be formed before reprocessing the data.

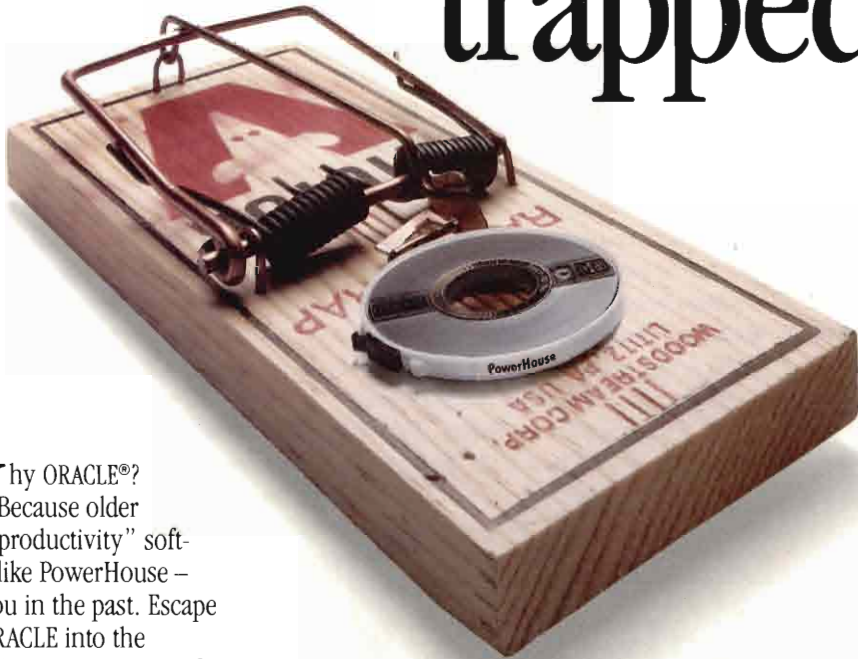
FIGURE 3

QUERY: Print a list of sales sequenced on stock code within supplier and showing supplier name and product name

SQL COMMANDS: select distinct products.description, sales.account, sales.stock_cde, suppliers.supplier from inventory, products, sales, suppliers where products.stock_cde = sales.stock_cde and sales.stock_cde = inventory.stock_cde and inventory.supplier = suppliers.supplier order by supplier asc, stock_cde asc

An example of the translation from English to SQL performed by a prototype system.

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they are the ultimate answer to all report writing needs remains to be seen. There comes a point where it takes longer to step through all the menus than it does to write commands. Would turning the COBOL language into a set of menus really make it easier to use?

■ **Dictionary driven.** Dictionaries are very essential to make life easier for end users and software professionals alike. I've seen databases where items are named AB123X, or similar. Item alias names and alternate column headings are a must. To do a true multilingual database and reporting system you also need multiple aliases (or multiple dictionaries). Messier yet, are cases where multiple items are defined (e.g., 10 weekly sales figures are defined as a single X100 item that contains 10 packed decimal numbers). Another example that's quite common but even more difficult to handle is where the same item name is used for different purposes in different data sets or tables.

■ **Easy passing of data from one report to**

another. In *Figure 2* you'll see that to calculate the percentages, a first pass to form the totals must be made before reprocessing the data. This can be done by supporting a disk output format that can be re-input, or by some programmatic mechanism to pass working storage values (the latter is much more efficient).

■ **Load control.** If you go to many computer installations, and ask them why they don't let users write their own reports, they often reply: We tried that but we found they overloaded the system. Several report writers now enable system managers to control report writing load. For example, the system manager can force users to submit reports in job mode and/or limit the size of serial database reads.

■ **Output pagination.** Being able to produce a report and then simply browse through it on a terminal without printing is a very useful capability. For example being able to select "first page," "last page," "next page" or "previous

page." With 132 column terminals now common, this facility can reduce the need to print many reports. It can either be done by integration into the report writer or there are other standalone, third-party products that can pick up files in the spooler and display them.

■ **Integration with electronic mail services.** Being able to deliver a report to a user directly into his mailbox via a mail system can save printing and postage costs.

■ **Multiple database and hardware support.** The ability to support more than one database and file type is becoming important. For example, the ability to access HP IMAGE, HP SQL, and other databases plus the ability to run on multiple hardware platforms is becoming important.

As a result, many report writers are moving toward a relational view of databases, e.g., IMAGE sets are simply viewed as tables and the software works out how to join them (but look out for performance implications inherent in this approach).

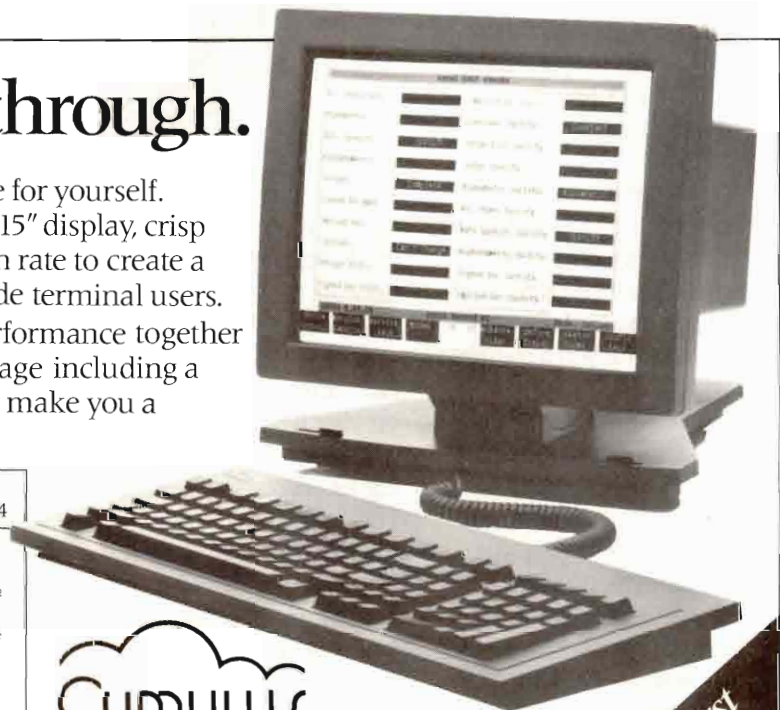
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Tilt/Swivel	Yes	Yes	Yes	Yes
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"HP Professional is an important part of our advertising," says George Hubman, "because of the size of its circulation and because it's targeted toward qualified buyers wherever they may be."

Why is that important?

George Hubman responds, "Of particular value to us, in addition to reaching large numbers of data processing professionals, HP Professional also reaches qualified buyers who aren't sitting in the computer room."

"That's really important, because our products are often used by people outside the DP department."

HP Professional Spans the Marketplace

Hubman summarizes why Walker Richer & Quinn, Inc. is an every-issue advertiser in HP Professional this way, "It's extremely important that non-DP people know about us and HP Professional targets qualified buyers both in and out of the data processing arena."

HP Professional

With distributed systems becoming more common, the ability to retrieve from multiple databases on different nodes also is required. Even efficient retrieval from remote databases presently can be a problem using standard NS/RDBA facilities on NS. Again, there are ways to speed this up using NetIPC and various other techniques. Query optimization in a distributed system, where often there are replicated copies of databases, is an area for much future development.

These are just some of the improvements that are becoming popular and which in most cases can be grafted onto existing report writer products.

Natural Language

Some argue that the English language is the ultimate user-friendly interface. Why bother with command languages or menu systems when you can simply interrogate the database directly? The user types in a request in English and receives the answer back in a tabular form (some systems can graph the output also). Commonly the interface to the database is via SQL.

An example of the translation from English to SQL that was performed by a prototype system we have developed is shown in *Figure 3*.

Notice how concise English is in comparison to the SQL. There are some commercially available products that also claim to do this. To date, user take-up has been limited partly because of performance problems and partly because of the set-up effort. You tend to have to spend several man-weeks teaching the natural language system about the contents of your database. However, I believe that within five years these products will be technically and commercially viable.

They could be a good solution for end users, but I'm not sure that they're the ultimate solution for software professionals. But note that they often produce SQL, which is becoming the lingua franca of database access.

SQL Standardization

With SQL rapidly becoming a de-facto industry standard (for example HP has

now provided read access to IMAGE data bases from SQL), it's obvious that many products will use SQL as the underlying data access mechanism.

However, don't imagine that SQL is much use as a report writer by itself. You need a lot of pre- and post-process-

ing to match the report writing capabilities of current products.

Graphics Integration

Many printed reports could be improved enormously by including line, bar or pie charts at suitable points. If this could be

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done easily, and without much CPU overhead, which has been the problem with graphics in the past, then it'd be a real step forward.

The advent of low-cost laser printers has transformed the ability to produce graphics economically and quickly. For example, even a standard LaserJet Series II can print integrated text, data and graphics at several pages per minute.

The other big advantage is you can easily produce really high-quality output. However, it does introduce more complexity — no longer is there a fixed pitch of 10 characters per inch and a fixed line spacing of six lines per inch. With nice proportional typefaces the horizontal spacing is totally dynamic (it even depends on the words/data on the line) and vertical spacing also can be totally variable. But don't panic, professional graphic designers and printers have been coping with this for a long time — it just

**Low-cost
laser printers
produce graphics
economically
and quickly.**

requires different thought processes and a different technical approach.

Now there are products on the market that can post-process output from existing report writers to do this. But wouldn't the obvious answer be to integrate them. Similarly, chart production and the "electronic forms" support could be integrated. There are already products in the PC market that do this.

Likewise, users often want to manipulate or edit report output. Integration with word processors/editors or spread-

sheets would be another possibility (in the latter case an approach already taken by more than one company was to design their report writer as a spreadsheet production facility).

Well, after you've been through all this you'll realize that report writers are no longer the simple beasts they used to be. The likely result is that computer installations will run more than one product and the market for report writers generally will become more fragmented. The likely result is users having more freedom and choice in facilities available to them even if they are constrained by the usual limits of processor capacity. One thing is certain — software professionals won't be out of a job. —Roger W. Lawson is president of Proactive Systems, Los Altos, CA.

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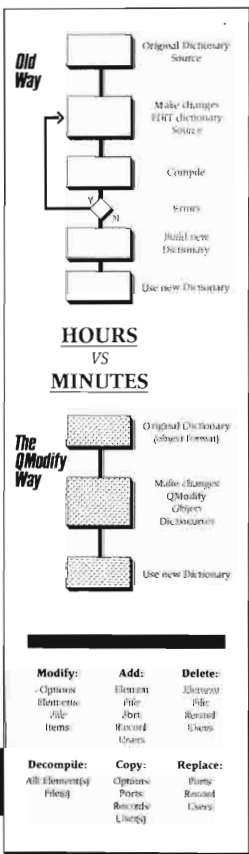


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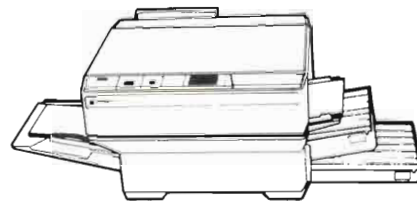
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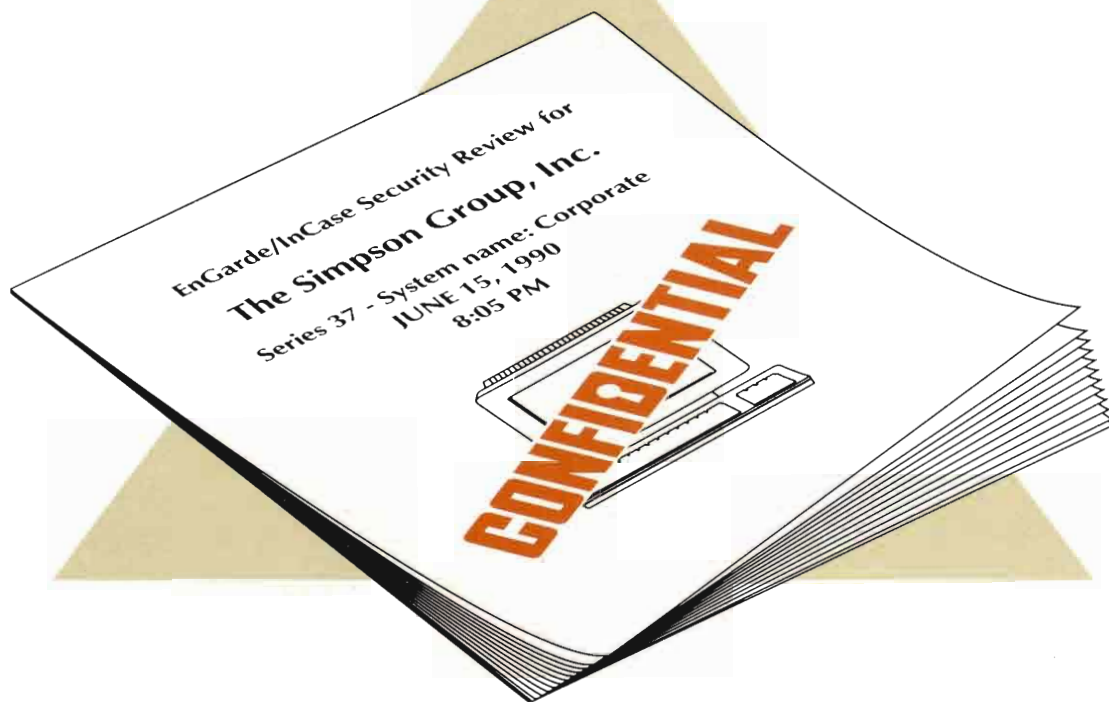
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EnGarde



InCase Corp.'s Security Audit Product For The HP 3000

Do you get a little weak in the knees when you learn that the outside auditors are coming next week to take a look at MIS? Or, do you have trouble sleeping when you read about the latest hacker abuse? If not, then either you've been in a coma for the last decade or you have a procedure in place to measure, evaluate and correct any deficiencies in your system's security.

EnGarde, a security audit product for the HP 3000 from InCase Corp. (Red-

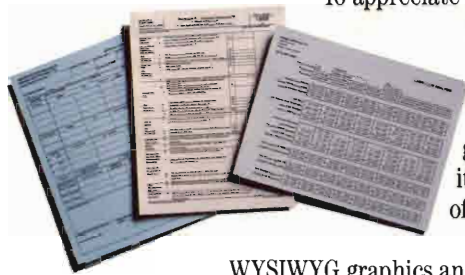
wood City, CA), could be an important part of your security monitoring procedures that may help ease your worries.

A few years ago, if you had off-site storage and a locked computer room, you at least could send your outside auditors away happy even if you still had some nagging concerns. All they knew were Big Blue batch systems. Times have changed. Now, nearly everyone is aware of how vulnerable online systems can be. The very robustness of

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MPE makes possible little-known or little understood loopholes that can grow into major security breaches.

EnGarde is a security audit tool that identifies, prioritizes and makes suggestions for correcting potential weaknesses in your system's security. EnGarde also keeps a historical record for comparison purposes, for password aging and to help identify account structure changes that might affect overall system security.

Installation, Set-Up And Documentation

EnGarde is easily installed on any MPE or MPE XL system by restoring a handful of files, issuing an "ALTACCT" and "ALTGROUP" command and running an installation program. EnGarde is *not* an end-user tool. It's for system managers, account managers and system auditors. Considering this, the manual that comes with the product is appropriate though a bibliography of security articles and an expanded discussion of MPE security would be helpful. Online HELP is available.

EnGarde may be run in either PM or non-PM mode. InCase Corp. recommends, and I agree, that PM mode be used. In PM mode, EnGarde bypasses normal MPE file open procedures. In particular, EnGarde won't alter the "date last accessed" field of any file label. Thus, in PM mode, the use of EnGarde will not affect your internal back-up schemes or housekeeping procedures.

EnGarde is command-driven and can be run either online or in batch mode. The first time EnGarde is run, a complete system analysis should be performed to establish a baseline. A job stream is conveniently provided. (This will take a long time. If you have a CPU limit on your system for jobs, override it with "TIME=UNLIM" and stream the job to run when there is no other system activity.)

Features And Impressions

When preparing to test EnGarde, I mentally reviewed the security on the test system and convinced myself that, while there were holes, I knew what they were and, for the most part, they were the result of conscious decisions. Well, if the

EnGarde is a security audit tool that identifies, prioritizes and makes suggestions for correcting potential weaknesses in your system's security.

system's security scheme were likened to a hunk of swiss cheese then, according to EnGarde, the system was mostly one big hole with very little cheese. Report options include DP Manager reports, summary and by-account analyses.

No security audit tool will claim to find every potential problem, but EnGarde certainly tries. Of course, EnGarde identifies the obvious security problems, such as system manager users without

passwords. Additionally, it even tries to determine if, for example, passwords could be guessed easily or if database schema files (which may contain very sensitive database passwords) are readable by too wide a class of users.

A nice added feature of EnGarde is its matrix accounting structure report that displays in a concise, readable manner the system account structure.

EnGarde operated as claimed and I experienced no problems or unexpected side effects. The current version of EnGarde doesn't support ACDs, but neither does MPE XL, so this is a minor point.

Special Features: Customizing

EnGarde provides numerous opportunities for customizing your security audit reports to reflect special concerns or situations.

You may control criteria such as minimum password length or maximum allowable password age. The defaults are four characters for password length and 30 days for password age. Passwords shorter than the minimum length or older than the maximum age are flagged in the EnGarde analysis.

EnGarde assigns one of five threshold levels of importance to the security errors it encounters (EXTREME, HIGH, MEDIUM, LOW and NOTE). You may redefine the level of importance for any error. Furthermore, you may restrict EnGarde to print only those errors that have an importance greater than or equal to a specified threshold value.

Another very powerful customizing feature gives you the ability to turn analysis off or on for specific accounts, groups, users and errors in almost any combination desirable. For example, suppose you have a password control system for a certain account that is activated by a logon udc and you don't want password or file analysis on that account. No problem. A STATUS command displays the values of all control variables and the detail of any error or analysis customizing in effect.

Periodic use of EnGarde and adherence to its recommendations will improve any HP 3000's security.

ENGARDE

SYSTEM REQUIREMENTS: EnGarde runs on all MPE V and MPE XL HP 3000 systems. It will operate in either batch or interactive mode.

PRICE: The first copy license is \$1,495-\$3,150 depending upon machine size with discounts on second and subsequent copies. Maintenance is 15 percent of the purchase price.

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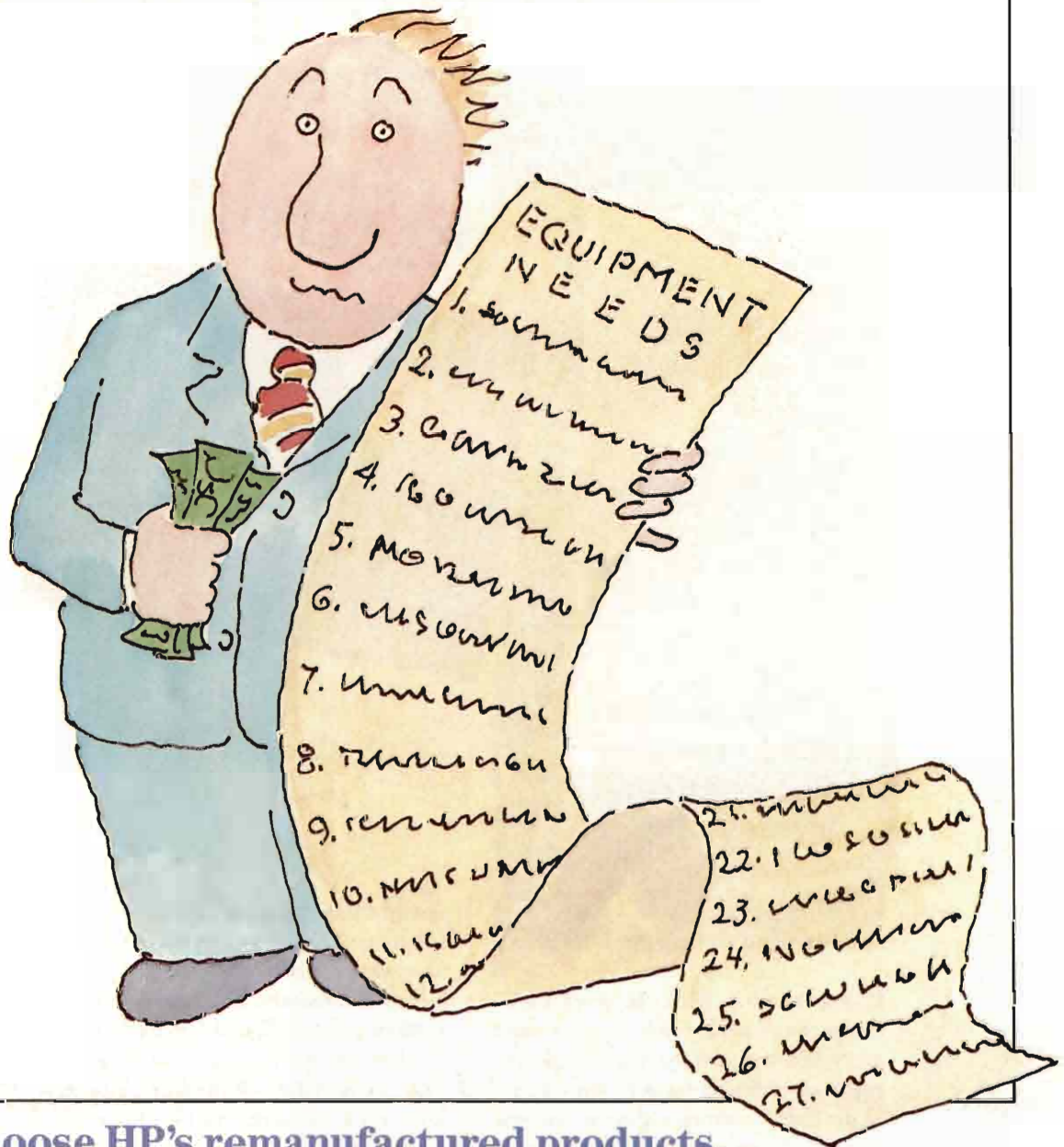
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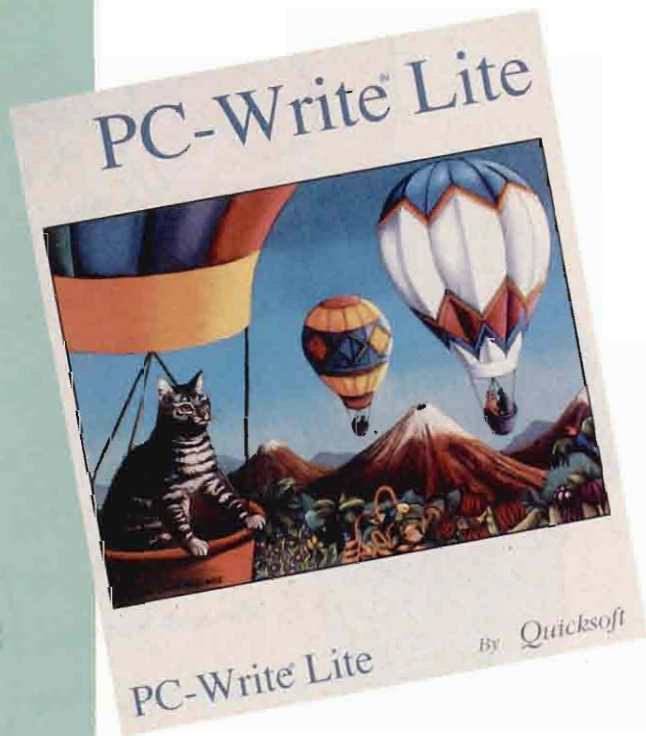


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If you use your Vectra to write documents of any kind, you know that word processors and desktop publishing programs are adding more and more features all the time. Sometimes it seems that new versions of commercial products are adding feature sets faster than anyone possibly could understand.

To be honest, I do most of my typing in HP's Executive Memomaker. It isn't *the* solution for desktop publishing,



and it doesn't support dozens of fonts automatically, but it's easy to use and it does what I need to do.

For two months, however, I've used a different product, and I think Executive Memomaker is about to be replaced. That product is PC-Write Lite, a shareware product marketed by Quickssoft (Seattle, WA).

PC-Write Lite is a fully functional word processor, and is the "entry-level" version of PC-Write, the program that practically invented shareware. The program disc can be freely distributed over

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electronic bulletin boards, by user groups or from friend to friend. However, Quicksoft suggests you register your copy for a cost of \$79.

As a registered owner, you receive the professional quality manual, the latest update to the program, and full phone-

in support on a national 800 number. You also will receive any future upgrades to the product as well as product bulletins as they are published.

I was skeptical about the level of support I'd get for \$79, so I decided to give them a call. The 800 number was an-

swered on the second ring by a real support person who was able to help me right away. I know companies that charge hundreds of dollars for support and yet are almost always busy, or that are staffed with people who know less about the product than I do. Not so with Quicksoft.

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Hardware

PC-Write Lite runs on virtually any IBM PC compatible, and I had no trouble even with a Classic Vectra. PC-Write Lite will run on a dual flexible disc system with as little as 256K, although I tested it on a system with 640K of conventional RAM. On the minimum 256K system, Quicksoft says you can edit files of up to 50K in size, which should be acceptable for all but the most intensive text processing needs. On disc, PC-Write Lite requires less than 500 KB of storage.

The program works fine on monochrome or color displays and supports several printers. I used both the Epson and HP LaserJet drivers and had no trouble with either device.

Installation

PC-Write Lite features a simple yet functional batch file to perform the installation and to check your system. It's one of the few programs I've seen that, during installation, suggests an answer for every question it asks. If you're a novice and unsure of how to answer, this can make your life much easier.

I was surprised when, on initially running the installation batch file, PC-Write Lite found my system unacceptable. It turns out my environment space was smaller than suggested, and PC-Write Lite even told me what to do to expand my environment. I was surprised it needed much additional environment space, but it handled it very nicely. Finally, it didn't modify my CONFIG.SYS or AUTOEXEC.BAT files, a trait I always like in a new application.

Features

Great support and great documentation is one thing. Having both for a product that is average still makes the investment questionable. Quicksoft, however, pro-

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CIRCLE 101 ON READER CARD

FROM THE LAB

vides a great product as well.

PC-Write Lite is a full-function word processor. Like HP's Executive Memomaker, it allows you to enter and edit text easily; it automatically performs the line wrap-around when you reach the defined margins; and it includes a spelling checker and full printer support. It isn't a "what-you-see-is-what-you-get" word processor: Print enhancements and proportional fonts do not display on the screen. Still, it gives you the feeling of control that some of the newer word processors seem to lack.

In addition to the features you'd expect in any word processor, PC-Write Lite has several extra features. I say this because, despite the fact that I do a lot of writing on my PC, I am an awful typist and my spelling is atrocious. In fact, I type with four fingers and an occasional thumb and can still keep up with some of the better typists in my office. I can do so because I'm incredibly fast with the backspace key.

One handy and unique feature is automatic spell checking as you type. When you've ended a word by pressing the space bar or punctuation, PC-Write Lite checks to see if that word is in the system or user dictionary. If it isn't, it "beeps" to warn you that you have entered a possible misspelled word.

Of course, as it automatically checks, it doesn't give you the option of adding the word to your user dictionary, but it's very fast and doesn't slow you down at all. If you want to add a word, you can either manually edit the user dictionary or add the word when you check the entire document, very much like Executive Memomaker. I remember years ago wishing someone did this automatic spelling checking: I never figured I'd find it in a \$79 program!

Another feature I like, again because I type so badly, is the ability to transpose two letters automatically. For example, the way my chubby little fingers roll over the keyboard at 9600 baud, the word "the" is just as likely to come out "teh." When the spelling beep warns me I've made a mistake, a single keystroke transposes the last two letters and corrects my error.

Unlike so many low-cost word processors, PC-Write Lite includes a mail-merge function that lets you manage mailing lists or other document related database functions.

Another unique feature is its ability to perform "block mode" operations on all parts of a line, not just on all lines in a range. This means that if you've imported a portion of a spreadsheet and decide to move one or two columns to the right (or left), you don't need to manually use the space bar or delete key to align each line. The block move operation can handle it automatically.

PC-Write Lite doesn't use any proprietary file format — all of its files are simple ASCII text files, so exporting Lite's files to other word processors or page layout programs is easy. Importing from other word processors is easy as well.

Finally, PC-Write Lite allows you to define and include a number of "dot" commands. You can use these to perform printer font operations, page control, or any other required function anywhere in a document.

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CIRCLE 240 ON READER CARD



PC TIPS

Miles B. Kehoe

WINdow INItialization

Microsoft Windows represents a step forward in providing a better user interface to MS-DOS, and it's something everyone who uses a PC should know. NewWave goes well beyond the capabilities of Microsoft Windows: you can think of it as "Windows for the rest of us."

If you've read this column in the past, you know the CONFIG.SYS file is important in getting your system set up for the various options you have installed or want to use. Your CONFIG.SYS remains important when you are using Windows, but there's another file that is almost as important.

You can think of Microsoft Windows as a different environment for your Vectra, one that has its own start-up information. This information is maintained in a ASCII file called WIN.INI. You'll find it in the directory into which you originally installed Windows. On my system, it's in C:\WIN286.

When you make changes to any important file, make a safe backup copy in case you make a mistake. If you've used Microsoft Windows but have never edited the WIN.INI file, you may not think it is important, but it is.

Start Safe

Windows only reads the WIN.INI file when it starts. If you make changes to the file while you are running Windows, the changes won't take effect until you exit and restart Windows. You don't need to reboot your system.

Microsoft Windows has several sections. Throughout the file you'll find that—

- Any line that begins with a semicolon is a comment and is ignored by Windows.

- Each major section begins with the section name surrounded by "square brackets" (like [windows] or [ports]).

- Each non-commented entry is of the form:

```
option=param1 param2 ...
```

You can change many of these parameters by using the "Control Panel" program "CONTROLEXE" provided with Windows. When possible, you'll want to stick with that utility for safety. On the other hand, if you want to take more control and are comfortable with the possible consequences, feel free to make all the changes by hand. I usually

use a combination of these two methods to customize WIN.INI for my system.

WIN.INI: Part I

The first section of [windows] from a typical WIN.INI file is shown in Figure 1.

As you can see, Microsoft has tried to make WIN.INI self-documenting. This often happens when programmers are involved: Very rarely does it really prove useful. It usually means the specifications hadn't been finalized when the manual was sent to the printer. This is probably why the options are not better documented in the early user manuals and other books on Windows.

The [windows] section defines several

FIGURE 1

```
; Lines preceded by a semicolon are comments ( i.e. this line is
; a comment ). Comments may not contain an equal sign.

[windows]
; The 'spooler' entry enables and disables the Spooler. Setting
; this entry to "yes" enables the Spooler; setting it to "no"
; disables the Spooler.
spooler=yes
DoubleClickSpeed=500
CursorBlinkRate=550
; In the MS-DOS Executive, the View menu's Program command displays
; those files which have an extension specified by the "programs"
; entry. You may want to add the "pif" extension to this list.
programs=com exe bat
; The "NullPort" entry determines the text used to denote that a
; peripheral device ( i.e. a printer ) is not connected to a port.
; In the Control Panel, see the Set menu's Connections command.
NullPort=None
; The "load" entry determines what applications should be loaded
; as an icon when you start Windows.
load=
; The "run" entry determines which applications will run when Windows
; is started. Specify an application name or a file with one of the
; file extensions listed in the [extensions] section. The former simply
; runs the application; the latter not only runs the application, but
; also loads the specified file into the application.
run=e:\win286\exe\clock.exe
PrinterSetup=1
device=PCL / HP LaserJet, HPPCL, LPT1:
beep=yes
```

A partial listing from a typical WIN.INI file.

general parameters about your Windows sessions. The first setting in the [windows] section concerns print spooling (see Figure 1). The spooler option should be set to either "yes" or "no." If it is "yes," any printer output will be sent to a temporary file rather than to the actual printer. When the output is complete, Windows will start a program called "SPOOLER.EXE" that will send the temporary file to the printer while you continue to use other programs in Windows. Spooler must be in the current directory or in your PATH.

If you set the option to "no," your program actually will send the output directly to the printer. Because printer output is relatively slow, you may find you can't do anything else on your Vectra until the output is complete. About the only time it really makes sense to set spooler to "no" is when you have an external printer buffer that lets you continue to work while the printer produces your output. You also may want to set it to "no" if you are working with limited memory.

The next lines in the [windows] section affect the mouse "click" speed and the rate at which the cursor blinks. The blink rate specifies the rate at which the cursor will flash. The click speed determines the maximum delay between two consecutive presses of a mouse button that still constitute a "double click." Both are specified in milliseconds: the higher the number, the slower the rate. Both of these can be set best in the Control Panel program because it provides some feedback as to what the values mean.

One option in Windows is to display all files, a subset of files specified by the user, or to display only program files in the MS-DOS Executive window. Select this option by using the "View" menu bar selection. Windows identifies files that are "programs" based on the file types or file extensions specified in the "programs" line of WIN.INI. The default file types that indicate a file can be executed are the three indicated. As the comments in WIN.INI suggest, you may want to add "pif," which indicates a control file for a non-windows program.

The "NullPort" entry provides very

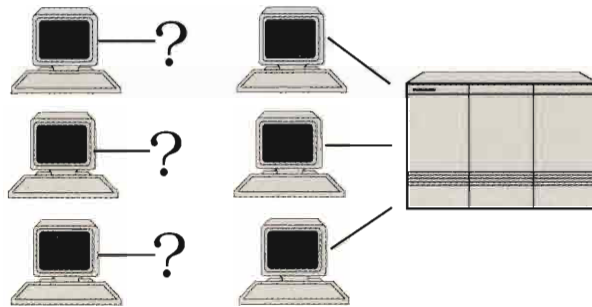
little real value. When you've installed a printer in Windows and don't wish to specify the port to which it is connected, the text specified by "NullPort" is what the user will see in the Printer Selection window. Unless you really want to play, leave this as is.

The "load" and "run" options are similar in function, and allow you to

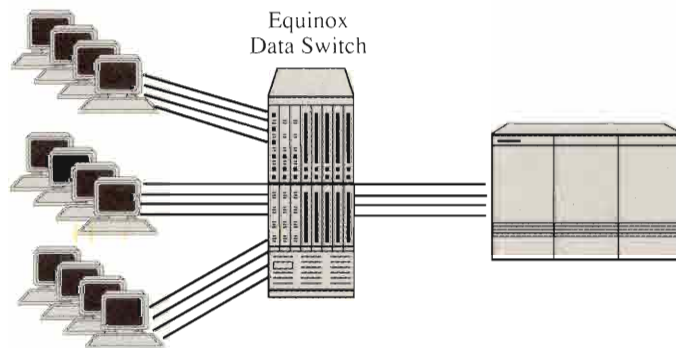
specify which programs and data files you want available on the Windows "surface" when you start Windows.

The "load" option specifies those programs and data files that are to be opened but maintained in the background as icons. To actually start one of these programs, you must "double click" the icon. Still, this is often easier than trying to

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locate the program file in a subdirectory.

For example, to see the MS-Windows Clock program in icon format visible every time you start Windows, change the "load" line to read:

```
load=c:\win286\clock
```

Of course, your path may be different. Note that you don't have to specify the file type because the "program" line already has specified "EXE" as a valid program type.

You also can specify a data file name if you link a particular file type to a program in the [extensions] section of the WIN.INI file. This loads the application with the specified data file opened. This is handy when using the Windows Cardfile and Calendar applications.

Use the "run" option in the same way as "load" when you want the program to actually be running in a window every time you start Windows. Like the "load" option, you can specify a data file name if the file type is linked to an application in the [extensions] section of WIN.INI.

Both "load" and "run" shouldn't be used on TSR programs, nor on programs that use a large amount of memory. TSR programs that work with Windows are rare, but they should be loaded before you start Windows. Large programs will constrain the usefulness of Windows, and you may want to load them only for the time you actually use them.

The next two lines in WIN.INI specify the primary printer for your system and a flag indicating whether the printer actually has been set up or not in the Control Panel. The file shown in *Figure 1* specifies an HPPCL LaserJet printer; using the driver file HPPCL, it has been initialized ("PrinterSetup=1") on port LPT1:, and is the default printer for Windows.

The "beep" option can be set to "yes" or "no," and specifies whether or not an audible sound should be made whenever you press a wrong key or select a wrong option.

Unlisted Options

There are other options that you might want to use. Usually, these options can't

be set in the Control Panel, so you'll have to insert these. Remember to backup your original file first.

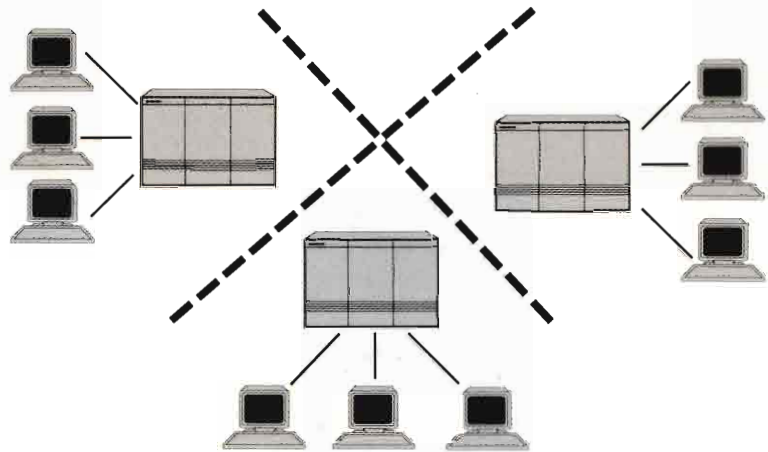
The first option is "swapMouseButtons" and can be set to "yes" or "no." The default is "no," which means the left mouse button is the primary button for selections and highlighting. If you prefer to use the right button for

most of your mouse activity, enter "swapMouseButtons=yes".

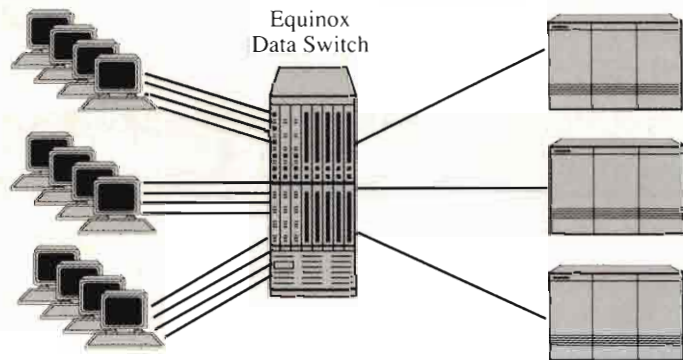
There are three options that, when used together, can give your mouse a better feel. These options, along with their default values, are:

```
yMouseThreshold=2  
xMouseThreshold=2  
MouseSpeed=1
```

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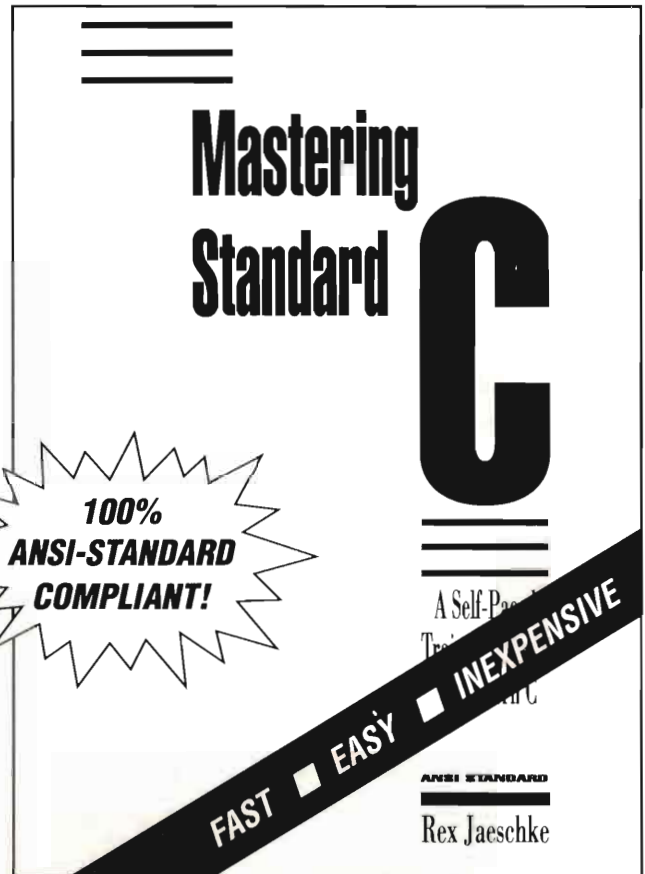
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It's these three options that control the speed with which the cursor will move across the Windows screen.

The `yMouseThreshold` and `xMouseThreshold` specify a number of pixels in the vertical and horizontal direction respectively. If the mouse moves less than or equal to the number of pixels specified by these options, each "mouse pixel" is equivalent to a screen pixel. If the mouse moves more than these threshold values specify, the number of screen pixels skipped will be two raised to the "MouseSpeed" power.

Let's put that into numbers. By default and using the above values, if you move the mouse slowly the cursor will move slowly in direct proportion to the speed of the mouse. If you move the mouse very quickly across the screen, the cursor will move two pixels (two raised to the "MouseSpeed" value of one) for every one pixel the mouse motion would indicate.

If you want the mouse to move very fast, raise `MouseSpeed` to four. Then, every quick movement of the mouse by one pixel will move the screen cursor two to the fourth screen pixels: much faster, but much harder to control.

If the mouse is too sensitive, specify the following values for these options:

```
yMouseThreshold=8  
xMouseThreshold=8  
MouseSpeed=2
```

The final three options you can use in the [windows] section of `WIN.INI` control the default window border width and the default timeout period for your printer. These options, along with their default values, are:

```
BorderWidth=5  
DeviceNotSelectedTimeOut=15  
TransmissionRetryTimeOut=45
```

The "BorderWidth" option specifies the width, in pixels, of any borders around opened Windows.

The two "timeout" options specify the period Windows will wait before reporting a printer problem. The "DeviceNotSelectedTimeOut" specifies the time Windows delays prior to displaying

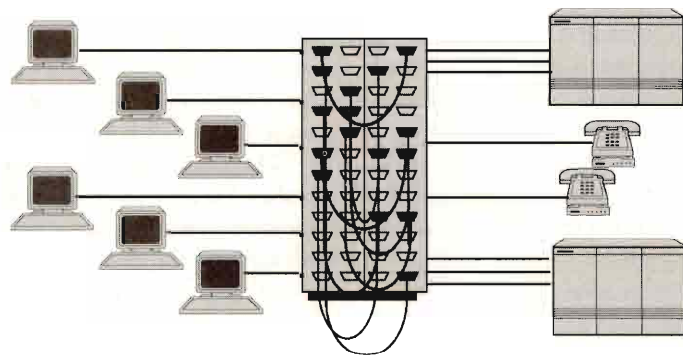
a window telling you the printer is offline.

The "TransmissionRetryTimeout" determines the time Windows will allow before notifying you that the printer failed. If my printer is out of paper, I usually can add the paper and get the printer ready in the delay between the two timeout values. On the other hand,

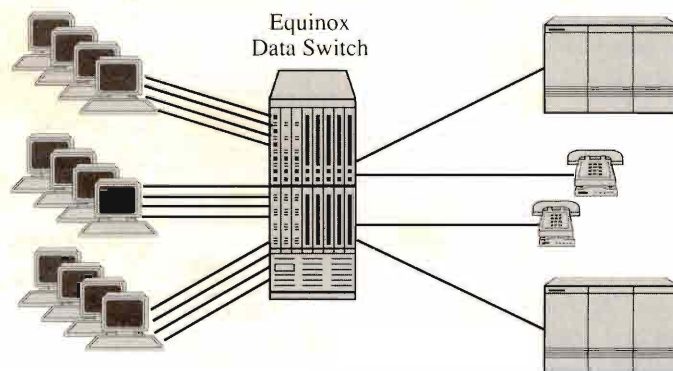
I know people who want to know about a printer problem much faster than 15 seconds. See what you like for your Vectra. —Miles B. Kehoe is an online support manager for Verity Inc., Mountain View, CA.

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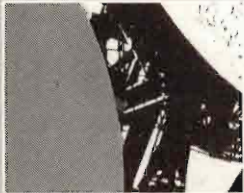
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Effective Administration Tips

Lately, many UNIX-based systems (especially workstations and PCs) are purchased for only one or two users. Consequently, many users now also must act as UNIX administrators (at least for their own system).

UNIX vendors recognize this trend and many (including AT&T, HP and SCO) now provide menu-driven system administrator tools to assist new administrators with adding users, managing printers and creating a backup of the system's disks. These tools are wonderful if the administrator *only* needs to add users, manage printers or back up disks.

However, as most administrators discover, these tasks aren't the only ones important to users of a UNIX system. An administrator is also expected to be the local "wizard," providing assistance for any arcane task desperately needed by the system's users. For this task, only time and experience can help.

Administrators also are responsible for providing a user environment that improves the speed of the system's users. For example, the directory path for a regularly used program should be included in all users' **PATH** shell variable (instead of requiring each user to specify the full file path each time the program is executed). The files that are executed when a C Shell user logs in are **/etc/csh.login** (or **/etc/cshrc**) and the user files **.login** and **.cshrc** (in the user's login, or **HOME**, directory).

Administrators usually are asked to provide **.login** and **.cshrc** files to new users and to tailor **/etc/csh.login** for all users.

The **/etc/csh.login** script is executed at login for all users with **/bin/csh** as their login shell. Some tasks performed by this script include: setting a good **stty** to control the user's terminal

modes; establishing the proper values for the shell environmental variables **SHELL**, **PATH**, **TERM**, **TZ**, **EDITOR** and **MAIL**; and reporting if a user has new mail.

In general, any tasks you want all users to perform during login should be performed by the **csh.login** script. A sample **csh.login** file is shown in *List 1*.

The **.cshrc** file is executed for each C Shell started. For the user's login shell, this file is executed once the **csh.login** has completed, but before the **.login** script (described below) executes.

The main tasks performed by the **.cshrc** file include defining any variables assigned with the **set** command (e.g., **history** and the shell **prompt** string) and specifying any aliases (synonyms for certain complex commands). A sample **.cshrc** file is shown in *List 2*.

The aliases **pushd**, **popd**, **swabd** and

dirs provide support for a directory stack.

The **.login** file is executed only for the login C Shell (and not any subsequent C shells that might be executed). Some tasks that users may want to perform in this file include redefining the **PATH** variable or any other environmental variables, and performing any tasks that only need to be performed when the user logs in.

Because aliases and most variables defined by the **set** command are not passed to any subsequent C Shells, do not include any **set** or **alias** commands in **.login**. A sample **.login** file is shown in *List 3*.

The system administrator may also provide a sample **vi** editor start-up file (**.exrc**) to new users. This sample file should tailor **vi** to the type of environment needed by users. An example **.exrc** file is shown in *List 4*.

All administrators are expected to keep their systems running. One of the most bothersome administration problems

```

#
# A sample CSH.LOGIN file
#
umask 002 # set default file creation mask

# issue message of the day
if (-r /etc/motd) cat /etc/motd

# set default attributes for terminal
stty erase '^H' echoe intr ^C kill ^U brkint -ignbrk tab3
susp ^Z

if ( $?LOGTTY == 0) set LOGTTY = 'tty'

setenv MAIL /usr/spool/mail/$LOGNAME

# check mailbox and news bulletins
if ( (-z $MAIL || -e $MAIL) && !( -z $MAIL && -e $MAIL )
) echo "nYou have mail"

# Check to see if any NEWS has been stored
if ( $LOGNAME != root && -x /usr/bin/news ) news -n

# Set up some shell variables
setenv PATH
./bin:/usr/bin:/usr/local/bin:/usr/lib:/usr/games/bin
setenv SHELL /bin/csh
setenv TZ EST5EDT
setenv EDITOR /usr/bin/vi

# Set up the TERM variable based on the line
if ("tty" == "/dev/tty1a") then
    setenv TERM ms-ansi
else
    setenv TERM ansi
endif

```

List 1.

```

# Define any aliases needed by me
alias h history
alias pr 'pr -e6 -l80 -f'
alias ls 'ls -F -C'

# Redefine rm to be a temporary delete
alias rm '/bin/mv !' /tmp/$LOGNAME'

set prompt = '\>'
set history = 25

# some BSD lookalikes that maintain a directory stack
if (! $?_d) set _d = ()
alias popd 'cd $_d[1]; echo $_d[1]; shift _d'
alias pushd 'set _d = ("pwd" $_d); cd !*'
alias swabd 'set _q = ("pwd"); popd; set _d = ($_q $_d[2-])'
alias dirs 'echo "pwd" $_d'

```

List 2.

```

# Set up the directory for temporary removals
/bin/rm -r /tmp/$LOGNAME
/bin/mkdir /tmp/$LOGNAME

# Add directories to the PATH
setenv PATH $PATH:/usr/pdm/bin:/etc

```

List 3.

```

set showmode ai sw=3 ts=6 magic
map ^X :!spell

```

List 4.

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```

:
#
# Shell script to determine which files are greater than
# 500K and
# have grown since last night.
#
# The purpose of this script is to detect files that grow
# out
# of control (like log files).
#
umask 133
new_files="find / -type f -size +1000 -print 2>/dev/null"
bigger_list= # List of files bigger than last nite.

for check in $new_files
do
  is_there="grep " ${check}$" /etc/lastbigfiles
  2>/dev/null"
  if [ -n "$is_there" ]
  then
    #
    # Check to see if file has grown.
    # If so, add to bigger list.
    #
    to_check="ls -l $check"
    set -- $to_check
    to_check_size=$5
    set -- $is_there
    to_compare_size=$5
    if [ $to_check_size -gt $to_compare_size ]
    then # Bigger - Add to bigger list
      bigger_list="$bigger_list $check"
    fi
  else # New file to add to list
    bigger_list="$bigger_list $check"
  fi
done

if [ -n "$bigger_list" ]
then
  echo "Files greater than 512K that grew last night....\n"
  /bin/ls -l $bigger_list # echo'ed to stdout for
  mailing by cron
fi

#
# Put list of all files > 512K into /etc/lastbigfiles for
# comparison
# tomorrow nite.
#
/bin/ls -l $new_files > /etc/lastbigfiles
exit 0

```

List 5.

is discovering when system log files grow without bound and fill my system disk (e.g., if UNIX accounting is running, large log files can be generated).

For this reason, I've developed a Bourne Shell script to report when any file larger than 512 KB has grown since the last time the script executed. I configured the **cron** utility to run this script (as root) at 3 a.m. each day. The script is shown in List 5.

This script must be stored in a file that has execution permissions set (i.e., **chmod +x**). The other files discussed in this column must be readable (**chmod +r**). —Andy Feibus is president of Processware, Atlanta, GA.

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NETWORKING

Gordon McLachlan

A common misconception about the International Standards Organization's Open Systems Interconnection Reference Model (ISO/OSI) is that it's a network standard. In fact, the OSI model is just that: A model that computer vendors may use to develop compatible network architectures.

This subtle, conceptual difference between the model and the standards it accommodates is often lost, especially under the onslaught of vendor hyperbole. There are ISO standards that fit into the model, but there will be many more. Standards setting will probably never end.

It's important to understand what the OSI model defines, and then take a step back and look at the standards already defined and nearing finalization.

Layers And Protocols

Modern network models attempt to break down the complexity of network design by defining different layers of network function. Each network layer performs a certain set of actions, for which it alone is responsible.

Even though they may not be standardized, minicomputer and mainframe communications subsystems typically are layered in this fashion. A system's communication ports, I/O drivers, operating system functions and programming language calls clearly are separated from one another, and they interact in a well-defined manner.

In a layered network model, each layer thinks that it is talking to a peer process: the same layer on another machine. I/O ports talk to other I/O ports and the application programs talk to other programs. Higher level functions don't know or care what's going on at the lower levels.

Within a layer, the communication between peer-processes is called a protocol. Between each layer of the network is an interface, which specifies the type and format of information passed between layers, and the services provided by each layer to the layer above.

If the layers of a network model are properly specified, one layer protocol may be substituted for another. Terminal and printer device drivers are a common example of this substitution.

Personal computer applications are not often layered. For performance, and because of the lack of good operating system control over network functions, PC-based applications may have to handle everything from the user interface and transaction logic to control of the communications hardware.

Clearly, a layered design makes networks easier to design, program and even standardize. It's real nice if you don't have to code new device drivers for every application program. The less an application program(mer) has to deal with

the specifics of network device-handling, the better.

The ISO/OSI Model

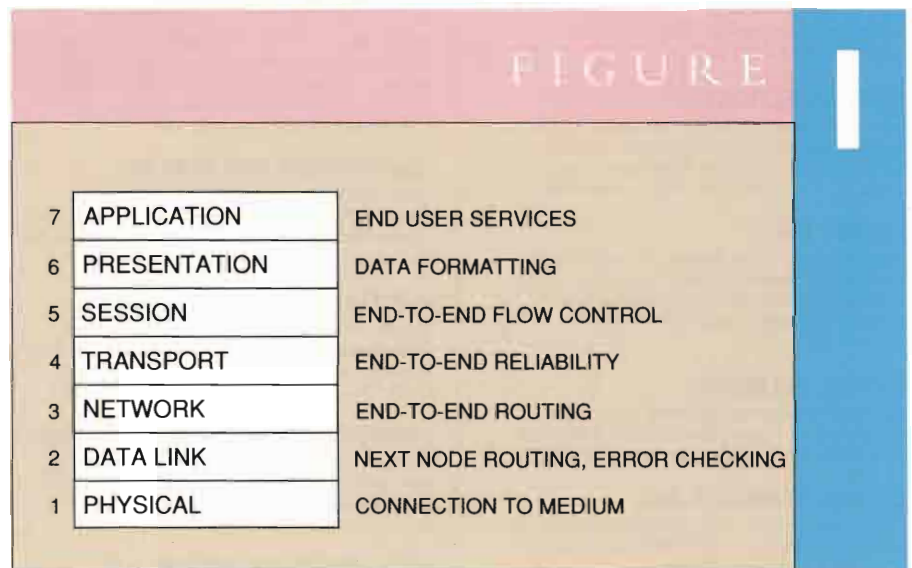
The ISO/OSI model is an attempt to provide a standard framework for network design using a layered approach.

OSI is broken into seven functional layers (see *Figure 1*). This is an arbitrary number, determined presumably after much serious scientific debate, and not just because seven is the number that comes up most often when shooting craps.

Logically, each layer communicates with the same layer on another machine. In reality, each layer talks only to the layers directly above and below itself. Only the lowest layer, which handles the physical network interface, actually communicates with its peer process directly.

The beauty of a multilayer network model like OSI is that the function of each layer, and the interfaces between layers, is constrained by the model, but the inner workings of each layer are not.

It's kind of like sending Ollie North to



OSI 7-Layer Communications Model.

work with the Nicaraguan Contras. The job gets done, but nobody at the higher levels has to know the sordid details.

In practice, this means that we can use a variety of protocols at lower levels of the network, and our applications will never know the difference. If the layers are properly split, a program wouldn't care whether it was being used by a PC on a LAN, or by a hardwired terminal.

The Physical Layer

This layer defines the physical connections to the network, such as cables, plugs, modems and other equipment. Standards for the physical layer are primarily concerned with the electronic and mechanical aspects of connecting the computers on a network.

The Link Layer

Once the physical connection to the network is established, we still need some way to control the communications that

We can use a variety of protocols at lower levels of the network, and our applications will never know the difference.

are to take place. The physical layer knows how to move bits on a communication line. The link layer teaches those bits some manners.

The link layer handles media access control (who talks when) and error correction, thereby presenting nice, orderly data to the next higher level. Data is pack-

aged into frames, which are packets of data surrounded by header information, and sent to its destination. When received, an acknowledgement is sent by the receiver and processed by the sender. If there's an error, the message must be retransmitted.

The Network Layer

The network layer establishes, maintains and clears network-wide connections between systems. That's the fancy way of saying that this layer manages network addressing and the movement of data packets between the proper addresses. It's just like the post office, except the packets come in teeny-tiny envelopes.

The network layer handles routing between subnetworks and often maintains network usage accounting and statistics as well. This is the top level of what we usually consider "the network." Once you get past this level you can come out of the wiring closet and start thinking

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about transactions instead of bit streams and routing.

The Transport Layer

The transport layer is right in the middle of all the confusion, where the network meets the application.

The job of the transport layer is to hide the dirty details of the network from the higher level application services. The trans-

The presentation layer is the interpreter that translates one system's data representation to another's via a neutral format.

port is responsible for making sure that any messages sent are received at the other end in the proper sequence.

The transport layer may provide an end-to-end virtual circuit that delivers messages in the order sent, it may send out unacknowledged broadcast messages, or it may send datagrams, which are isolated packets of information that need not be received in any particular order. The type of service is dependent upon the needs of the network user process.

The Session Layer

Once the physical connection and message routing between two machines is established, a connection between the application processes on those machines also must be established. The session layer provides that link.

When you log onto a remote computer, or when two applications connect to pass data, a session between those processes must be established and maintained. For one user process on the network to reach another requires security authorization, maintenance of billing information and other bookkeeping.

The session layer also performs error-handling and synchronizes the flow of information between application processes. For example, a distributed database application may require several individual updates to be grouped into a single logical transaction. It's the job of the session layer to make sure that the entire package of independent updates are correctly delivered before the transaction is considered complete by the sender.

The Presentation Layer

The presentation layer is the interpreter that translates one system's data representation to another's via a neutral format.

The presentation layer may perform such jobs as text compression, encryption and conversion from the EBCDIC character codes used for data transmission to ASCII, and vice versa.

The presentation layer also handles terminal devices, providing the screen and keyboard control required to let them use network facilities. Terminals are often the most proprietary type of device on the network. Every vendor thinks it has a better idea about how to move the cursor around the screen, or how to perform block-mode screen and data-transfer operations.

The Application Layer

This layer provides the application programming interfaces (APIs) that are required for user programs to access services of the network. The application layer also handles security and negotiation between systems about the responsibility for error recovery and the data encryption methods to be used.

Where The Standards Fit In

The first thing to note is that OSI is called a reference model rather than a standard. That's important because it underscores the fact that ISO is a model that may accommodate many standards. OSI is not itself a standard.

In every layer of the OSI model, there may be competing and incompatible standards at work. For instance, there's a tremendous difference in the ways in

which local area networks (LANs) and wide area networks (WANs) work. No one standard could fit them both, but within the OSI model, each type of network can be easily accommodated.

Put simply, the model defines the interfaces between layers: the inputs and outputs. Various standards define the protocols, or the specifics of what goes on inside each layer. To OSI, the layer is just a black box.

But Where Are My Standards?

Here's the rub. OSI does a wonderful job of conceptualizing a network design. It doesn't specify the dirty details that always get us into trouble.

There's no limit to the number of individual standards that flesh out the skeleton model. At the physical and link levels of the OSI model, there are but a handful of standards to choose from.

With every succeeding level, the number of standards choices increase. The higher level services needed for database access will vary widely depending upon the database management system in use.

The battle for "standards" at the higher levels will be fought and won in the marketplace...

E-mail needs user directory information. File transfer to a shop-floor machine controller is a little bit different from sending a FAX to Peru.

All of these capabilities must be accommodated by the OSI model, but there's no way they can all be accommodated by a single standard.

Some network requirements are, or will be, so common that the standards will stick. X.25 is a safe bet, and the IEEE 802

standards for local area networks are going to stabilize. They move the bits around just fine, and the major changes to them will be in the speed and type of the physical media.

The higher level standards for electronic mail are emergent and will be widely accepted, as the standards for telex and facsimile transmission have been.

Application-level standards will be very difficult to design. What types of database models should be supported? What is the standard terminal? Do graphics have to be accommodated in the specification? What about facilities for coordinating distributed databases and providing data directory services?

Standards at the presentation and application layers have to take aim at the fastest moving target in the network architecture: the area of interaction between the user, the application and the operating system.

Pinning down and getting a good shot off at any but the most narrowly defined services or applications may be an exercise in futility. The battle for "standards" at the higher levels will be fought and won in the marketplace, and we will settle for "industry standards" yet again.

This brings us to the concept of "OSI compliance," a vendor favorite.

As we have seen, there is no OSI standard. There is a model. The model defines the scope and interaction of the network layers. A network architecture is OSI compliant if it has the same layer structure, and if the interfaces between layers are the same. Where formal standards are available, they should be incorporated.

Sounds good so far, but there are very few completed ISO standards defined above the first couple of layers. For the time-being, a network can be OSI compliant without doing much more than supporting X.25, and that is just what our computer-selling buddies are doing. — *Gordon McLachlan is an independent consultant based in Canton, MI.*

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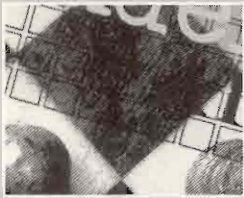


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RDBMS

Fabian Pascal

Data Representation

There are two levels of data representation in databases. At the *physical* level, data is stored on disc files which, depending on the hardware, operating system and DBMS implementation, are structured as bits and bytes in clusters, B-trees, ISAM and VSAM formats, etc.

At the *logical* level, relational databases present the data to users as tables, namely base R-tables (whose data is actually stored at the physical level) and views (virtual tables drawing their data from base tables, possibly through other views). So, within the logical level there are two user views of the data: the *real* view (consisting of the base tables), and the *virtual* view (consisting of views).

To support physical data independ-

ence, a relational DBMS must keep the logical and physical levels separate and insulate applications (and users) from the physical level. This is mandated by the Physical Data Independence Relational Fidelity Rule (8) and achieved with system optimization.

But it also is useful for the DBMS to separate between the real and virtual views and, to that end, there is a fidelity rule similar to Rule 8 that mandates it.

Logical Data Independence

Consider, at the logical level, the base tables. Suppose that the EMPLOYEES base table in *Figure 1* had to be split into two base tables of salaried and commissioned employees called SAL_EMPL and COMM_EMPL as shown in *Figure 2*. What would happen now to applications accessing the EMPLOYEES table for data?

Obviously, they would no longer work, because they would try to access a table that no longer exists.

With a traditional DBMS, all applications accessing base tables that have been reorganized would have to be adjusted to the restructured database. With dynamic databases, accessed by many complex applications, this creates a considerable maintenance burden, because users would have to figure out which applications are affected by each change and in what ways, and they would have to modify all affected applications accordingly. This makes traditional products very inflexible and costly in dynamic business environments.

Is there a way to avoid this burden? With a relational DBMS, there is. For example, it's possible to create a union view of the two employee tables and call

FIGURES 1 - 5

EMP#	ENAME	DEPT#	HIRED	SALARY	COMM
100	Spenser	E21	6/19/80	26150	
150	Adamson	D11	2/12/72		25280
160	Pianka	D11	10/11/77	22250	
310	Setright	E11	9/12/64	24180	
250	Smith	D21	10/30/69	19180	
260	Johnson	D21	9/11/75		17250

Figure 1: EMPLOYEES Table

EMP#	ENAME	DEPT#	HIRED	SALARY
100	Spenser	E21	6/19/80	26150
160	Pianka	D11	10/11/77	22250
310	Setright	E11	9/12/64	24180
250	Smith	D21	10/30/69	19180

SAL_EMPL Table

EMP#	ENAME	DEPT#	HIRED	COMM
150	Adamson	D11	2/12/72	25280
260	Johnson	D21	9/11/75	17250

COMM_EMPL Table

Figure 2: Split EMPLOYEES Table

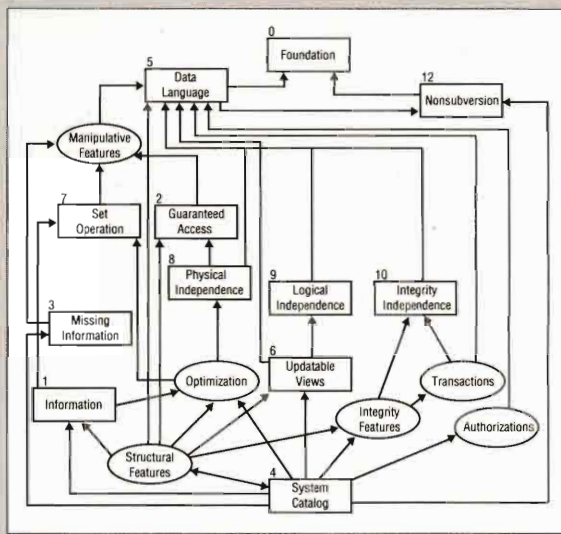


Figure 3: Features and rules interdependencies.

DEPT#	
E21	26150
D11	22250
E11	24180
D21	19180

Figure 4: Grouped View with Derived Column

ENAME	HIRED	ENAME	SALARY
Smith	10/30/69	Smith	19180
Smith	9/11/75	Smith	17250

PERS Table

ENAME	HIRED	SALARY
Smith	10/30/69	19180
Smith	10/30/69	17250
Smith	9/11/75	19180
Smith	9/11/75	17250

PAY Table

Figure 5: Nonadaptable View

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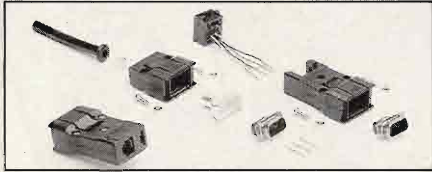
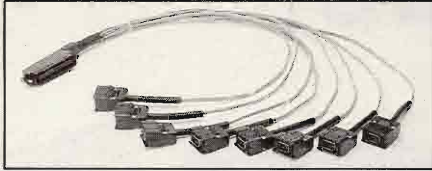
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it EMPLOYEES. Because views are tables that can be manipulated in the same way in which base tables can, applications that were accessing the initial EMPLOYEES table now will access the EMPLOYEES view, and nobody will be the wiser. Users will see the same data, and may not even be aware that it's now coming from two tables.

Views are virtual tables. They don't have their own data, but rather they reflect data in base tables...

The ability to reorganize base data into views without having to modify queries and applications is a unique property of relational databases called *logical data independence*. The Logical Data Independence Rule (9), therefore, mandates the DBMS to support it.

- Interactive operations
- application programs

should not have to be modified whenever changes

- to the *base tables*

involving

- *no loss* of information

are made to the database.

This is similar to Rule 8, because the concept of level separation is the same, except that Rule 8 involves the logical-physical, and Rule 9 the real-virtual separation. While physical data independence is achieved by a relational DBMS with optimization, views are the mechanism with which logical data independence is supported.

You can see why it's important for a DBMS to support all the features of the relational model. Traditional products do not support union or views, and even some SQL DBMSs fail to support union, while others disallow union operations

for views. They can't possibly support logical data independence in a case like the one in the above example, and application adjustments would be necessary. You can see these tight interdependences in *Figure 3*.

Because views are windows into base tables and have a table format, they are created by applying any and all table operations to the base tables. Thus, the only theoretical limitation in the *creation* and *querying* of views is when table restructuring results in loss of data that applications need to access.

An example would be dropping columns from base tables. If one of the columns in the SAL_EMPL table was dropped, the EMPLOYEES view no longer would work, because the two tables over which it's defined no longer would be union compatible (i.e., they would have a different number of columns). There is no way to avoid modifying applications in such cases. The rule recognizes this by qualifying logical data independence to "no-loss" database changes.

Also, if views always were *updatable* as base tables, logical data independence could be complete. Unfortunately, not all views are updatable.

The View Updatability Rule 6

Views are virtual tables. They don't have their own data, but rather they reflect data in base tables, possibly through other, intermediate views. So what does it mean to "update" a view? It actually means updating the base data "through" the view. In other words, when we update a view, the DBMS must trace the data reflected in the window down to the base table(s) that "underlie" the view. Therefore, the system must be able to identify the base rows affected and exactly what changes to apply to them. Such identification isn't possible for all views.

Suppose that in a view we don't just include straight table columns, but also columns that *derive* from table columns by applying, for example, an aggregation function to them. In *Figure 4* a view defined over EMPLOYEES shows the total salary by department. It is called a *grouped*

view because its rows were produced by grouping together EMPLOYEES rows from the same DEPT#. This view can be created and queried as a table. But can the data reflected in this view be updated?

The problem is that if we try to update a summed salary in the second column, the DBMS can't translate such a change into changes to individual salary values back in EMPLOYEES. And if we try to update a *specific* DEPT# value in the view, neither is the DBMS capable of figuring out exactly which base row we mean, because there are several such rows per DEPT#. The best it probably could do is to update DEPT#s in EMPLOYEES where there's only one employee per department, or all the rows for that department.

Some derived columns are updatable. For example, a DBMS can update a view column such as RAISE = 1.5*SALARY by propagating the *reverse function* RAISE/1.5 through the base SALARY values, but currently no product does this.

Difficulties also exist for certain multi-table views. Figure 5 shows a natural join view of two tables, PERSONNEL and PAYROLL, that have two employees with the same name. The view attempts to combine the separate personnel and payroll base data into one user view. But note that because of the name duplication, the view would contain meaningless rows. Second, we can't insert, update or delete arbitrarily *any* row through the view, because then the view no longer would represent a view of the two tables. And neither can we update or delete a *specific* row through the view, because the DBMS wouldn't be able to tell which base row we mean.

What kind of views *can* the DBMS update? From the theory behind the relational model, it turns out that the following views are updatable:

- restrict views.
- project views which "inherit" the PK column(s) of base tables.
- PK-FK natural join views.
- inner and outer PK-PK natural join views.

Be especially aware that the reason for that is that PKs (and referencing FKs)

uniquely identify rows. Thus, if the DBMS supports keys, views preserve the keys of the base tables, and the DBMS understands the meaning of this inheritance, it can map the view operations to the underlying base tables, which makes the views updatable. In fact, had the PERSONNEL and PAYROLL table had PKs and FKs (which they don't), and assuming the DBMS understood their inheritance by the view, they would've been updatable.

Thus, there are updatable views, views that can be updated only in certain ways, and non-updatable views. And it is impossible to determine whether or not some views are updatable. Rule 6, therefore, requires the DBMS to "figure out" the updatability of every view (which is known to be updatable) when it creates it, and to perform the proper updates when necessary.

- For each view the DBMS must have
- a way of determining
 - at view definition time whether the view can be used to
 - insert rows
 - delete rows
 - update which columns of its underlying base table(s), and store the results of this decision
 - in the system catalog.

Figure 4 shows why the DBMS must comply with the Guaranteed Access Rule (2) and support keys. View updatability (Rule 8) and, therefore, logical data independence (Rule 9) depend upon them. Note also that a system catalog is required by Rule 6, because that's where information about keys and views is stored.

In fact, the interdependence between rules and features is even tighter than what Figure 4 shows. There is also a dependency of Rule 9 on the manipulation features because, as we saw, if certain data operations are not supported, or available for views, logical data independence is defeated. It is not drawn in the figure to maximize legibility. —*Fabian Pascal is president of micro-paSQaL, Washington, DC.*

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CIRCLE 128 ON READER CARD

Continued from page 24

LANSoft 2.0 Works With Proxima IPS

Computer Accessories Corp. has developed a power monitoring software program that works in conjunction with its Proxima IPS (Intelligent Power System) battery backup systems, LAN-Soft 2.0. The program communicates directly with the microprocessor in a Proxima IPS to monitor power and provide orderly unattended network shutdown when utility power fails.

LANSoft 2.0 runs as either a value-added process or a NetWare Loadable Module. The program works with Novell NetWare 2.1 and above, including ELS Level II, Advanced NetWare, SFT NetWare and NetWare 386 version 3.1 and above and any Proxima IPS with a network interface.

LANSoft 2.0 is priced at \$139.95.

Contact Computer Accessories, 6610 Nancy Ridge Dr., San Diego, CA 92121; (619) 457-5500.

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Unison Unveils Data Center Management Solution

Unison Software, a supplier of data center management software for the HP 3000 user, unveiled DCM/PAK a product to integrate multiple data center management functions under a single user interface.

DCM/PAK streamlines the day-to-day activities of the data center by providing system managers and operators with a common interface to job management, report distribution and tape library management.

Contact Unison Software, 675 Almanor Ave., Sunnyvale, CA 94086; (408) 245-1412.

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TranSpooler Moves Spoolfiles Between MPE And HP-UX

NSD has introduced TranSpooler, a relocation facility to move spoolfiles between MPE and HP-UX operating system hardware platforms using Network Services, over ThinLAN, ThickLAN or StarLAN.

TranSpooler performs bi-directional spoolfile transfers — MPE to HP-UX to MPE; handles environment and binary file transfers; provides creator information to the receiving system; pre-pends user supplied information and accommodates a default printing environment.

Contact NSD, 1400 Fashion Island, 4th Fl., San Mateo, CA 94404; (415) 573-5923.

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FAX/3000 Sends Faxes Directly From HP 3000

STR Software Co. has released version 4.0 of FAX/3000, a product that allows users to send faxes directly from an HP 3000. Version 4.0 includes expanded submission capabilities, enhanced reporting and the use of distribution lists. Four distinct interfaces are provided so that HP 3000 users may fax data directly from MPE spoolfiles, application programs, terminals or HPDESK mailboxes.

Contact STR Software, 3601 Sweethorn Court, Fairfax, VA 22033; (703) 689-2525.

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MCBA Software Features Fast Line Item Entry

MCBA has enhanced the Customer Order Processing package in Release 3.5 of MCBA Classic Accounting, Distribution and Manufacturing Software for HP platforms.

The enhanced package features "Fast Line Item Entry," "Order Quotations," "Instant" counter invoicing capability and several system upgrades. The expanded window look-up capability extends across all 19 packages of the entire closed loop MRP II system. There's also a menu bypass capability that shortens the distance between packages and screens to one keystroke.

Contact MCBA, 425 W. Broadway, Glendale, CA 91204-1269; (818) 242-9600.

Circle 393 on reader card

DAT Drives Available For Apollo Workstations

Workstation Solutions Inc. has announced a subsystem, DATaTape for use on all Apollo Workstations. DATaTape utilizes helical scan recording technology and the DDS format developed by HP and Sony.

DATaTape stores up to 1.3 GB on a single 4mm cartridge and has an average file access time of less than 20 seconds. DATaTape is shipped complete with SCSI interface board, driver software, cabling, mounting hardware and user's manual.

Contact Workstation Solutions Inc., 15 Trafalgar Square, Nashua, NH 03063; (603) 880-0080.

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Suprtool 3.2 Means Faster Batch Reporting On HP 3000

Robelle Consulting Ltd. has released Suprtool version 3.2, which offers faster batch reporting on the HP 3000. Suprtool is used to select records from a file (IMAGE, KSAM

or PE) to feed into a report program.

Version 3.2 recognizes the new series 6000 "Blitz" drives as disc drives. It has a link output option for communicating with Suprlink and other products, and creates and accepts self-describing KSAM files. Because a common application generator for PowerHouse uses 13 fields, Suprtool now supports them in its ASCII and PRN (i.e., PC-downloadable) output options. The Calculator has ASCII input and output and saves the last result for reuse.

Contact Robelle Consulting Ltd., 8648 Armstrong Rd., R.R. #6, Langley, B.C. Canada V3A 4P9; (604) 888-3666.

Circle 394 on reader card

Valid Introduces Analog Workbench II

Valid Logic Systems Inc. has introduced the Analog Workbench II, its next generation analog computer-aided engineering design system. A new open architecture gives the Analog Workbench II tight integration with Valid's full line of electronic design automation (EDA) tools and facilitates easy integration of third-party tools.

The Analog Workbench II is available on HP/Apollo, Sun, DEC and IBM workstations. The base price starts at \$10,000, which includes the Communications Manager, basic analysis tools and the SPICE PLUS simulator, Valid's proprietary, enhanced version of SPICE 3.

Contact Valid Logic Systems Inc., 28280 Orchard Pkwy., San Jose, CA 95134; (408) 432-9400.

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PLUS10 Series 700 ROM CARD Designed For HP 700/xx CRTs

Houston Computer Services Inc. has announced the availability of the PLUS10 Series 700 ROM card, an expansion printed circuit board for HP 700/xx CRTs.

Designed for OEM and quantity purchasers of the HP CRTs, the PLUS10 ROM card is used to change the firmware contained within the HP CRT. Custom firmware (which may be developed either by Houston Computer Services or the OEM) is stored on the ROM card. The ROM card is then inserted into the ROM drawer of the CRT. Such OEM-specific custom firmware might be used for new terminal emulations, customized modem support, or specialized standalone features.

The PLUS10 Series 700 ROM card may

NEW PRODUCTS

be used with any HP that has a ROM drawer. HP terminals with a ROM drawer include the HP 700/42 and HP 700/32 CRTs. The PLUS10 Series 700 ROM card is compatible with HP's own expansion ROM card, but includes several additional features.

The PLUS10 Series 700 ROM card is available for \$65 each in quantity 100. Contact Houston Computer Services Inc., 11331 Richmond Ave., Ste. 101, Houston, TX 77082; (713) 493-9900.

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Computer Peripherals Expands JetWare Family

Computer Peripherals Inc. has expanded its JetWare family of hardware with the introduction of JetMemory IIP. The JetMemory IIP was specifically designed to be compatible with the HP LaserJet II printer; boards are available in two memory combinations that allow a total maximum memory capability of 4.5 MB.

JetMemory IIP boards can be used alone or in conjunction to achieve the maximum memory limit. Modules come in increments of 2 or 4 MB, with 1 MB installed. The balance of memory can be installed as users require.

The boards contain no jumper or switch settings. Memory boards can operate in conjunction with previously installed HP modules.

JetMemory IIP boards are priced from \$445 to \$545.

Contact Computer Peripherals Inc., 667 Rancho Conejo Blvd., Newbury Park, CA 91320; (805) 499-5751.

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For Your Information

■ Associated Technology (Huntsville, AL) has announced a book titled "How To Become A Successful Consultant In HP Computer Applications." It contains detailed discussions on locating clients, fees, ethics, professional advertising, developing business plans and writing contracts. Call (205) 895-9187.

■ Northern Telecom (Research Triangle Park, NC) has published a manual describing terminal-to-host, PC-to-PC and host-to-host communications via Northern Telecom's Colorado-based data services. The guide describes how a local telephone company can connect a user's HP gear via the switched telephone network to terminals, PCs,

mainframes and shared resources such as printers, modem pools and protocol converters. (919) 992-5000.

■ MICOM Communications Corp. (Simi Valley, CA) has released a free Data/Voice Applications Guide containing examples of ways to reduce toll-call charges by integrating voice transmissions into WAN applications. (800) MICOM-US.

■ The 1990 COSMIC Software Catalog is now available from the University of Georgia (Athens, GA) in four forms: printed softbound edition (\$25), microcomputer diskette (\$30), magnetic tape (\$50), and microfiche (\$10). The COSMIC software library emphasizes scientific and engineering programs in areas such as aerodynamics, reliability, composites, heat transfer, artificial intelligence, structure analysis and turbomachinery engineering as well as programs that facilitate project management. (404) 542-3265.

■ Oracle Corp. (Redwood Shores, CA) now offers a free Database Server Evaluation Guide compiled by industry analyst James Buzzard. The independent study discusses application development challenges and how to meet them with client/server architectures; database servers and their components; features to look for in a database server and a comparison of three OS/2 servers. (800) 345-DBMS, Ext. 94.

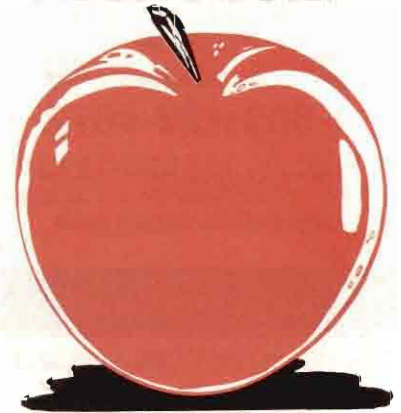
■ Symmetrix Software (formerly Test Quality Company; Santa Clara, CA) has published a capabilities brochure on its solutions, software tools and services for automated test and measurement. (408) 986-8880.

■ StereoGraphics Corp. (San Rafael, CA) has published a brochure that outlines the benefits of stereoscopic 3-D visualization for PCs and workstations in a variety of industries, such as CAD and molecular modeling. The book includes specific benefits by industry of using stereoscopic technology with PCs and workstations. (415) 459-4500.

■ Jensen Tools Inc. (Phoenix, AZ) offers a catalog that features tools, tool kits and test equipment specifically for use in workstation and network servicing. (602) 968-6231.

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ADVERTISERS INDEX

Reader Service Number	Page	Reader Service Number	Page
127 Accudata	80	244 Hypoint Technology	84
104 Adager	49	122 IEM, Inc.	2
128 Applied Data Communications	89	123 IMACS Systems Corp.	11
250 Arkwright	59	199 Indigo Software	63
106 Bering Industries	17	156 Infocentre Corporation	47
109 Bradmark Computer Systems, Inc.	43	247 Information Builders	1
108 Bradmark Computer Systems, Inc.	I.B.Cover	181 Infotek Systems	27
172 Brant Technologies	53	124 Innovative Information Systems	61
151 Clearpoint, Inc.	I.F.Cover	126 Intelligent Interfaces, Inc.	25
110 Cognos Corporation	6-7	150 Interex	74
101 CompuTech Systems Corp.	70	249 Interop, Inc.	19
160 Cort Directions	88	155 M.B. Foster & Associates	60
242 Cumulus Technology Corp.	56	130 Martinound Technologies	31
240 Dataram Corporation	71	197 Mitsubishi International Corp.	28
191 De Rex, Inc.	42	173 Northgate Computer Systems	20-21
Digital Equipment Corp.	37	152 NSD, Inc.	35
193 Digital Micronics	4	190 Oceonics, Inc.	91
166 Digital Products, Inc.	80	133 Oracle Corp.	55
113 Dynamic Information Systems Corp. ...	9	170 Productive Software Systems, Inc.	85
114 EMC Corporation	39	148 SOTAS International	69
115 Equinox Systems, Inc.	73	132 SST	60
116 Equinox Systems, Inc.	75	139 Tynmlabs Corp.	29
117 Equinox Systems, Inc.	77	243 Tynmlabs Corp.	45
178 Facer Information Design	57	140 Tynmlabs Corp.	79
119 Herstal Automation Ltd.	68	183 Unicom Electric, Inc.	88
248 Hewlett Packard	33	143 Unison Software	5
198 Hewlett Packard (Remarketing Div) ...	65	145 Walker Richer & Quinn, Inc.	13
120 Hi-Comp America	51	146 Walker Richer & Quinn, Inc.	B.Cover
		192 Workstation Solutions	67

[CALENDAR]

[JUNE]

19-20: MTLRUG is holding its quarterly meeting at the Dorval Airport Hilton, Canada. Call Mich Kabay (514) 931-8167.

23: The Cincinnati Municipal Users' Group (CINMUG) is holding a meeting at the BB Riverboat in Covington, KY. Call Joseph Speier (513) 351-8888.

24-28: The 27th Design Automation Conference is being held at the Orlando/Orange County Convention Center in Orlando, FL. For more information call (303) 530-4333.

29-6/1: Interop Inc. is sponsoring two-day Internetworking Tutorials for networking professionals. Call 1-800-INTEROP for course information and registration.

[JULY]

18-19: MINNRUG (Minnesota Regional User Group) is holding its first conference on "Solutions for the '90s," at the Hotel Sofitel in Mpls, MN. Call (612) 337-9899.

19-20: MARUG is holding a quarterly meeting at the Williamsburg Hilton, Williamsburg, VA. Call (919) 248-6707.

[AUGUST]

20-23: 1990 INTEREXHP Users Conference will be held at the John B. Hynes Veterans Memorial Convention Center, Boston, MA. For more information call (408) 738-4848.

[SEPTEMBER]

9-13: The 1990 Lasers in Graphics (LIG) and Electronic Design in Print (EDP) conferences are scheduled concurrently in Orlando, FL. Call Patrice Dunn, (619) 758-9460.

[OCTOBER]

11-12: NEVCAL'90, a regional user group conference is being held at Caesar's Lake Tahoe Resort Hotel/Casino, Stateline, Nev. Call (916) 544-6474, ext. 281.

18-19: MARUG is holding its quarterly meeting at the Ocean/Sands Dunes Hotel in Myrtle Beach, SC. Call (919) 248-6707.

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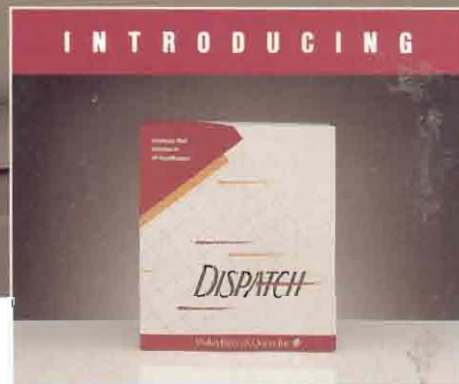
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