

# HP Professional

AN INDEPENDENT PUBLICATION FOR USERS OF HP COMPUTERS ■ VOL.4 ■ NO.11 ■ \$4.00

NOVEMBER 1990

■ The Smart Way To  
Use Expert Systems

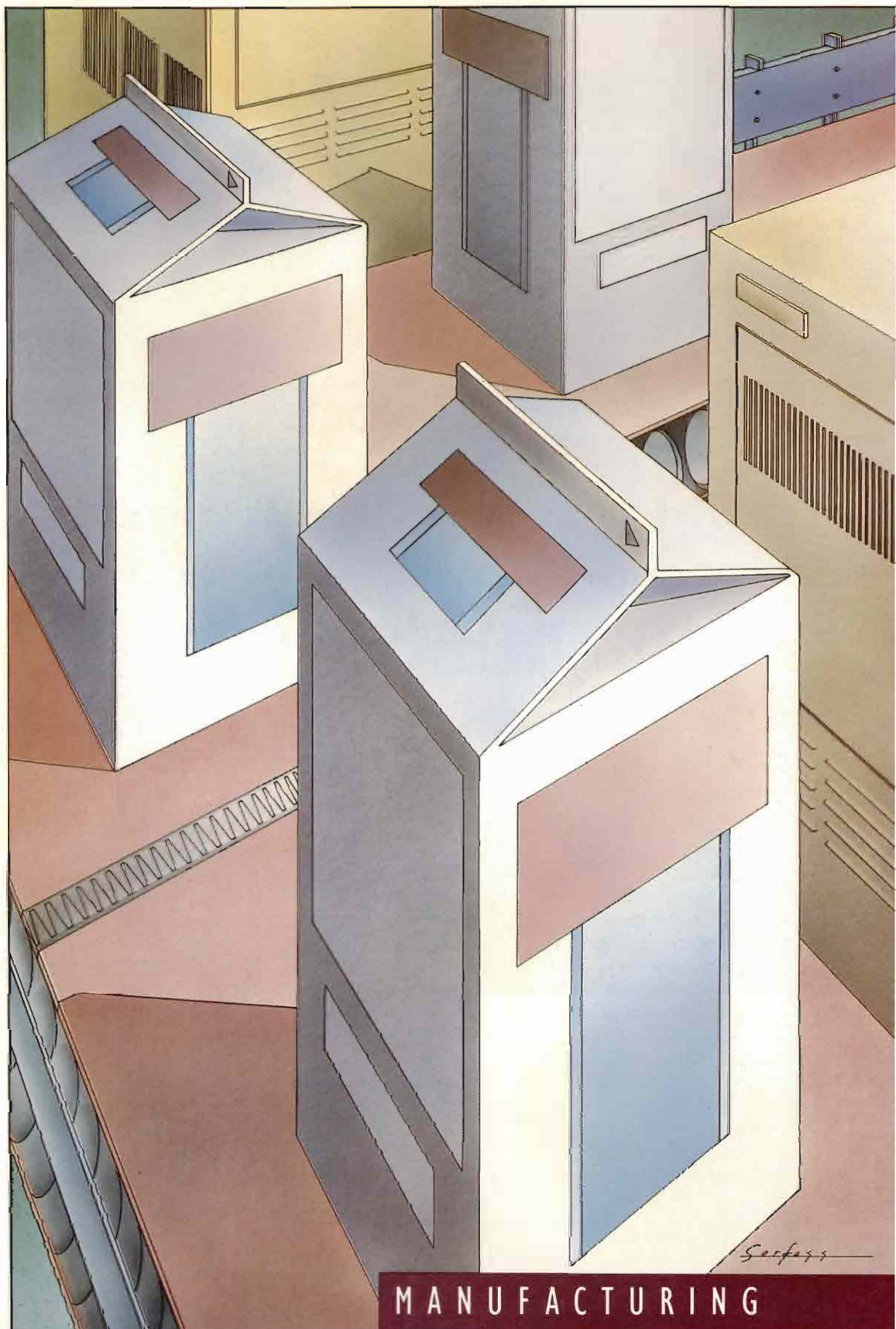
■ OOPlah!  
The Object-  
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■ Customer Service:  
Put Buyers Online



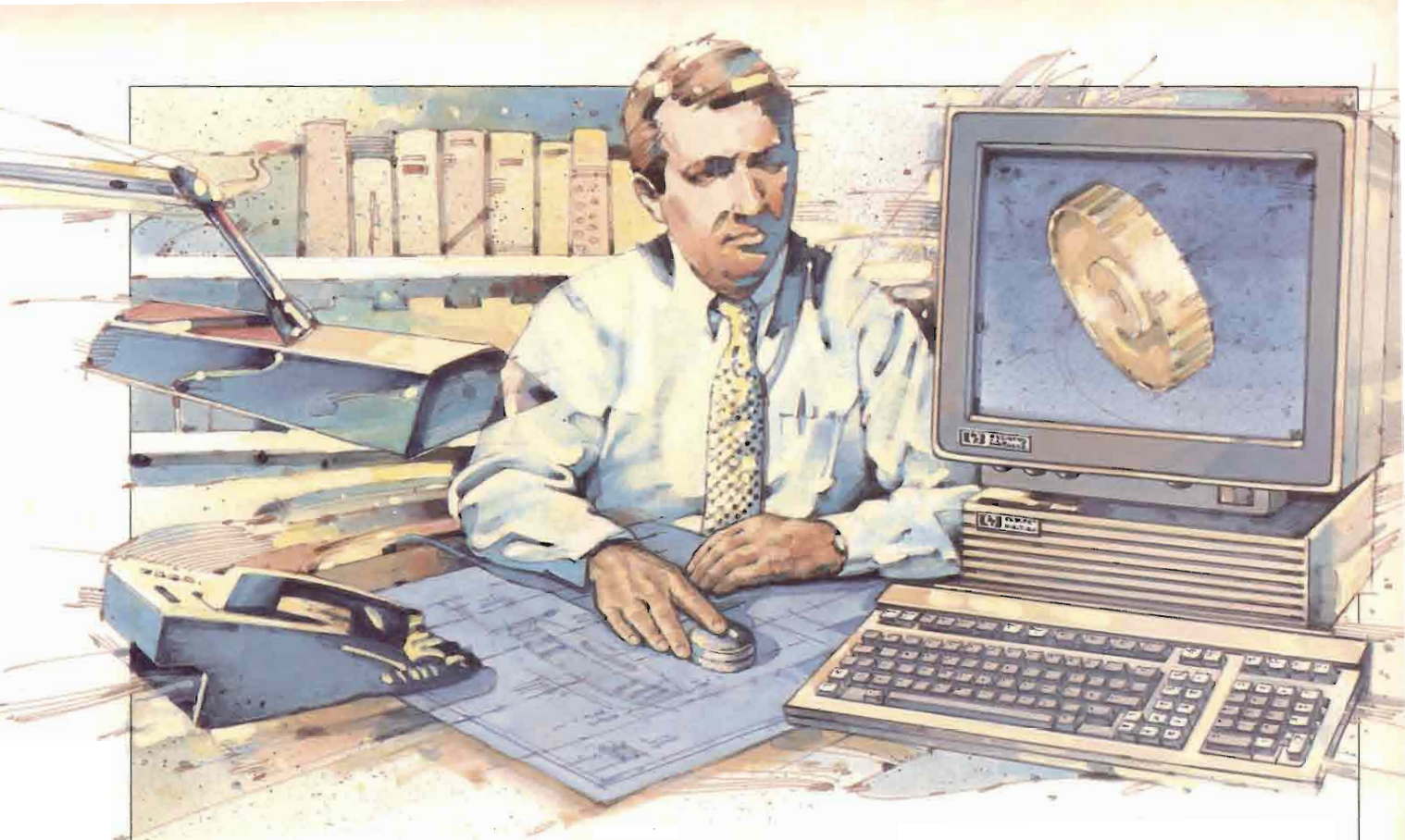
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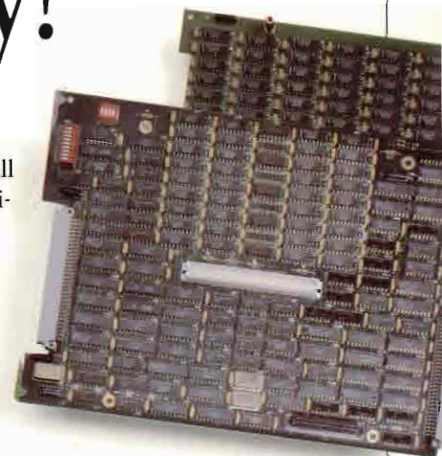
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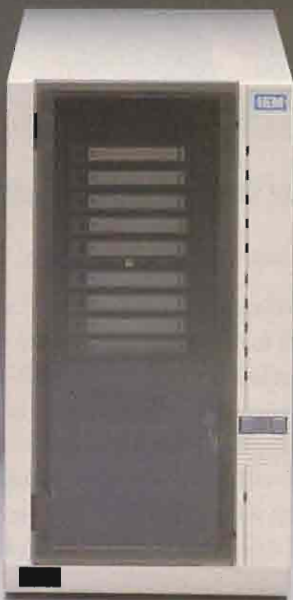
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# C CONTENTS

NOVEMBER 1990

VOL. 4, NO. 11

---

## 28 **FOCUS: Knowledge At Work** by Ross Hopmans

Today's Manufacturers Use Expert Systems In Intelligent Ways.

---

## 38 **FOCUS: OOP Without Objects** by Christopher Nelson

Understand The Philosophy Behind The Fad.

---

## 44 **FOCUS: The Tie That Binds** by William Walker

Manufacturers Harness Information Technology To Improve Customer Service.

---

## 54 **Look Out For Imaging** by Larry Kemp

The Future Is In Words And Pictures.

---

### C O L U M N S

---

#### FROM THE LAB:

##### **Who's Minding Your Operations?**

by John P. Burke  
Let MasterOp/3000 Help  
With The Workload ..... 62

##### **A LAN Alternative**

by George T. Frueh  
Tie Your Computers And Peripherals  
Together With Systemizer Plus ..... 66

##### **Resolving Dissonance**

by George T. Frueh  
S/Compare-Harmonizer Lets You  
Compare Source Code Versions ..... 72

#### **NETWORKING: Standard Network Survival**

by Gordon McLachlan  
Get On The Standard Operating  
Systems Bandwagon ..... 76

#### **PC TIPS: Power Windows**

by Miles B. Kehoe  
NewWave Gives You Power That  
Windows Alone Can't Match ..... 78

#### **UNIX: Vi Regular Expressions**

by Andy Feibus  
Use Search Patterns With Vi Editor ..... 82

---

### D E P A R T M E N T S

---

Editorial.....	8
Industry Watch.....	10
News & Trends.....	14
Product Watch.....	24
Advertiser Information.....	80
New Products.....	86
Product Showcase.....	92
Career Opportunities.....	95
Software Directory.....	95
Advertisers Index/Calendar.....	96



**INDUSTRY WATCH:**  
Confusion Arises  
As The Market's Model  
Of A Client-Server  
System Changes...p.10

**On The Cover:**  
Illustration by Jim Seifass

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# Are You Satisfied?

According to industry analysts, your answer to that question is, "Yes, indeed!" Most observers agree that of all major system vendors, HP leads the way in user loyalty. Frequently outranking DEC and IBM in customer satisfaction surveys, HP offers its installed base low cost of ownership, reliable service and support, and a strong growth path for the future.

All right, you're satisfied, but should you be? Let's face it, a company must do more than please existing customers in order to succeed. Unless it has a comprehensive strategy for growth and enough market savvy to make it work, any company can dissatisfy investors, employees *and* customers very quickly. To be truly satisfied with your vendor, you've got to believe it can protect your investment.

Lately, HP's market strength has been a topic of debate. An October 12 article in the *Wall Street Journal*, "Hewlett-Packard Revises Its Game Plan," suggests HP is struggling. The way the *Journal* sees it, HP is losing ground in several market segments, the recent reorganization may be too little too late, and John Young, HP's CEO since 1978, may be on his way out.

More distressing is the decline in value of HP stock. According to the *Journal*, HP shares have fallen to their lowest level in five years. Many attribute this to HP's poor performance in the PC market and its failure to deliver a competitive, low-end workstation. Others contend that HP relies too heavily on third-party channels to market its products. They suggest beefing up the company's direct sales force to improve profit margins.

But some explanations for the slump are simply preposterous: The *Journal* attempts to pin HP's woes on an overly conscientious policy of customer support. For many loyal HP users, this line of thinking is tantamount to sacrilege! A retreat from its installed base would severely jeopardize the company's future, and HP knows it.

## Taking Care Of Business

Perhaps the pessimists should take a closer look. From a business standpoint, HP is doing a lot of things right. The reorganization makes the sales force directly accountable to the division whose products they sell—instead of maintaining a separate sales and marketing division for the entire company. Now, HP can say good-bye to unnecessarily complex, and decidedly ineffective, matrix management strategies. The end result should be a more efficient, streamlined and competitive computer company.

Moreover, HP clearly realizes that the 1990s promise a vastly different world than the 1980s. The industry's big guns, the

purveyors of hardware and "complete systems," are going to see new levels of competition, which translate into lower profits. Worse than that, vendors heavily dependent on U.S. business enter the fray with one arm tied behind their backs. Although no one can predict economic events, it doesn't take a crystal ball to see that the U.S. market is headed into recession.

The great hope of the multinationals, of course, is Europe. John Young claims that over half of HP's business will come from outside the U.S. in 1990 and an even greater percentage in 1991. Wisely, the company has moved its PC division to Grenoble, France, in order to increase HP's presence in a burgeoning networked systems market.

In a period of economic slowdown, HP is growing at an annual rate of about nine percent. Sales of HP's multiuser UNIX systems—clearly the company's flagship systems for the '90s—are growing at a rate of 67 percent. At present, the company holds approximately 25 percent of the UNIX market and, according to the Gartner Group, leads all major systems vendors in its commitment to UNIX.

More significantly, sales of HP 3000s are rumored to be growing in the low double digits. If accurate, these figures indicate a substantial achievement for the company, given the present minicomputer market.

## An Eye-Catching Strategy

Finally, the HP's visionary NewWave Computing strategy has captured the imagination of the industry. Even the *Wall Street Journal* is taken with HP NewWave: "Because it makes it easier to use PCs and links them more effectively to larger machines, the 'new wave' [sic] software could turn [HP's] PC into a competitor as distinguished as Apple Computer's Macintosh."

People are paying more attention to HP than ever and, to some extent, this attention protects your investment. But some questions remain: Will a stronger sales force, international marketing, and the NewWave Computing strategy enable HP to become the premier open systems vendor that John Young has promised? If it succeeds, will HP maintain its long-standing commitment to its customers? And most important, will buying HP continue to make good business sense for you?

It would be satisfying indeed to know the answers.





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## INDUSTRY WATCH

Bill Sharp

# Service For ???

Every once in a while I stop by my local server dealership

to talk with the folks in the shop. I listen to the mechanics rev up the latest high-performance computational engines, and we banter about what seems to be wrong with the industry of late.

Servers are hot these days and the folks around the server dealership are very excited about new models and what they can do. They talk a blue streak about server this and client that, and then a glaze comes over my eyes. It's around the time we cover the number of clients each server can handle that I begin to get hopelessly confused. This is also right about the time they start to use indistinct phrases, such as "kinda sorta" and "maybe if."

I keep trying to make sense of conflicting claims for new servers. How can HP and DEC talk about serving 20 to a few hundred with their best workstation and minibased servers, while Compaq happily claims its SYSTEMPRO server, based on 386 or 486 processors, will serve up to 200 users? I may not be hard-wired to a 68040, but I can tell this doesn't add up!

### Determining Server Power

Paul Bemis, HP's RISC program manager at the Apollo Systems Division (Chelmsford, MA), provides some answers and advice. Until recently, Bemis was product manager for the DN 10000, one of HP's server systems.

The choice of using a PC-based server or something more powerful depends, he says, "On whether you want happy users or unhappy users. If you want unhappy users, you can use a Compaq," he laughs. He goes on to describe the fac-

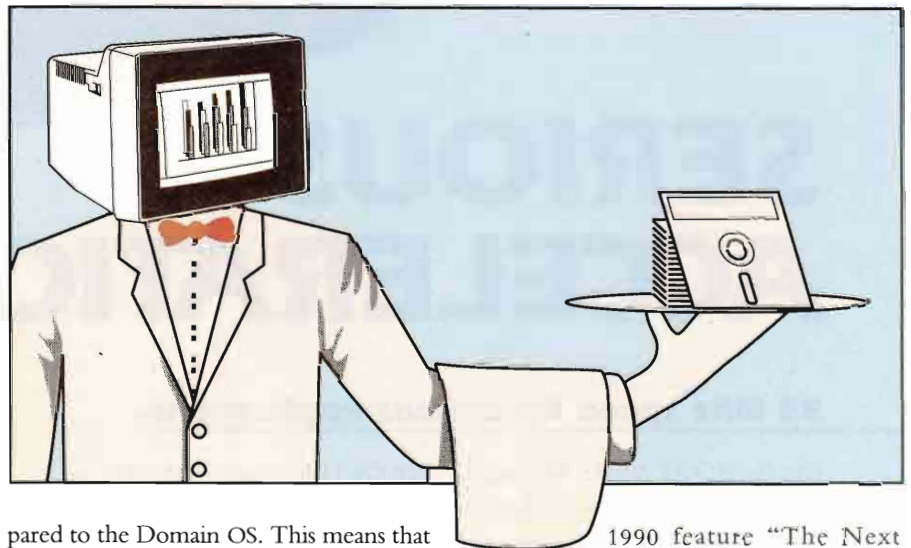
tors that determine how many users a system can support. They include operating system granularity, computational capacity and specific application requirements.

Computational capacity refers to the computing horsepower of the system. All other factors being the same, greater computational capacity will yield greater server effectiveness.

System granularity is more complex and is determined by the operating system. HP-UX and VMS, for instance, provide relatively fine granulation com-

to what your computing needs really are. If you're editing and sharing files, you have little need for a DN 10000 that was designed for heavy floating-point number crunching. It's a waste of resources to ask the 10000 to gnash its computational teeth on some spindly form letter when it might sink them into finite element analysis instead. And, asking a lightweight server system to handle lots of people sucking up massive amounts of computation power risks bringing a high flying server to a crawl.

As noted in *HP Professional's* October



pared to the Domain OS. This means that HP-UX cuts its processor time up into smaller chunks than Domain does. Fine granulation is more effective for serving a very large number of users. It ensures that each user gets a small piece of processor time in turn, and that the user's turn comes around again, before he has noticed much delay. Coarse granulation is more effective for a smaller number of users, says Bemis, giving each a significant piece of time. It's an effective solution for more substantial computational processes.

Application requirements boil down

1990 feature "The Next Generation," the market's model of a client-server system is changing. In the older, centralized system model, the server was big and smart, and the clients were small and dumb. Dumb terminals on RS-232 lines used to be the norm, says Bemis, and a lot of them are still out there. The new model more typically shows a server on an Ethernet LAN with clients that are at least as smart as a 286 PC. This configuration is much less of a drain on the server. When Compaq claims it can serve 1,000 users, it is visu-





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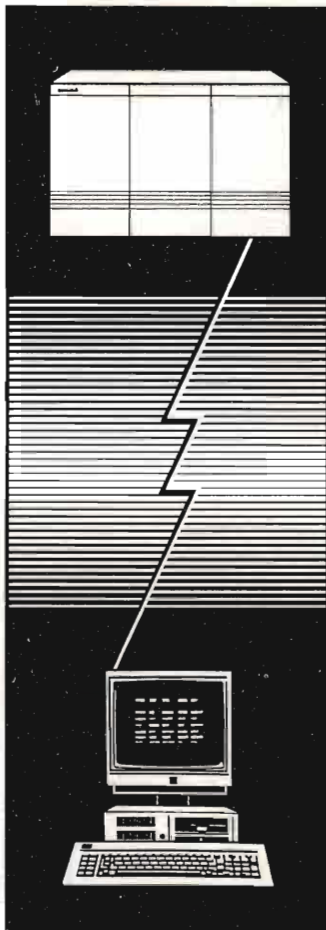
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*The audit trail built into HPPCPOLL includes the complete logging of errors and retries that occur during the execution of the HPPCPOLL command file scripts.*

*This product requires Reflection 3.0 or later and version 5.22 of PCLINK or later. Any modem used must understand the Hayes-compatible AT command set.*

*HPPCPOLL version 3.0, scheduled for release this summer, is menu-driven. This version lets you define script files, users' PCs, connections, ports, or phone numbers by filling in the blanks in the menu. A complete inventory of the PCs to poll and the script files to run when polling can be displayed at any time.*

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CIRCLE 195 ON READER CARD

alizing this newer type of system and non-demanding applications. It's also being very optimistic.

HP and DEC servers are not publicized with any claims for the number of users they serve, because the number varies widely depending on the applications and equipment used at client locations. When pushed and shoved and chased wildly around the bushes for hours on end, HP reluctantly notes that the Model 400S and 433S each will serve about 50 simultaneous users, or 64 in a LAN environment, and that the Models 635 and 645 will serve 30 to 200 or more. Clearly this is a much more conservative estimate than you will get from Compaq.

Bear in mind that, increasingly, servers will sit out on a LAN and will provide their services when needed. A database server may not be used at all during one hour, then may have 20 or 100 users during the next. A DN 10000 compute server on a LAN might not be involved in your work at all when you are reviewing and answering your e-mail on Tuesday. Then on Wednesday, it might be slavishly crunching away on a massive computing project that you tossed to it over NCS, while you skip lightly through your e-mail at your own workstation.

If you're planning to stop by your server dealership on the way home tonight:

- Plan on missing the entire rush hour. This is going to take some time.
- When they give you that wonderfully high number of users, ask them ever so gently just what the entire population of Iowa is doing with the server. Are they editing files or doing finite element analyses of corn fields?
- When all these folks are online, what is the interactive response from the server?
- What equipment do they assume each client is using? Is it something very smart and not very demanding or an old dumb terminal that sucks up server power?
- Finally, pull out your disk packed full of demanding server-based applications, smile devilishly and say, "Why don't we put it to the test?" ■

HP PROFESSIONAL



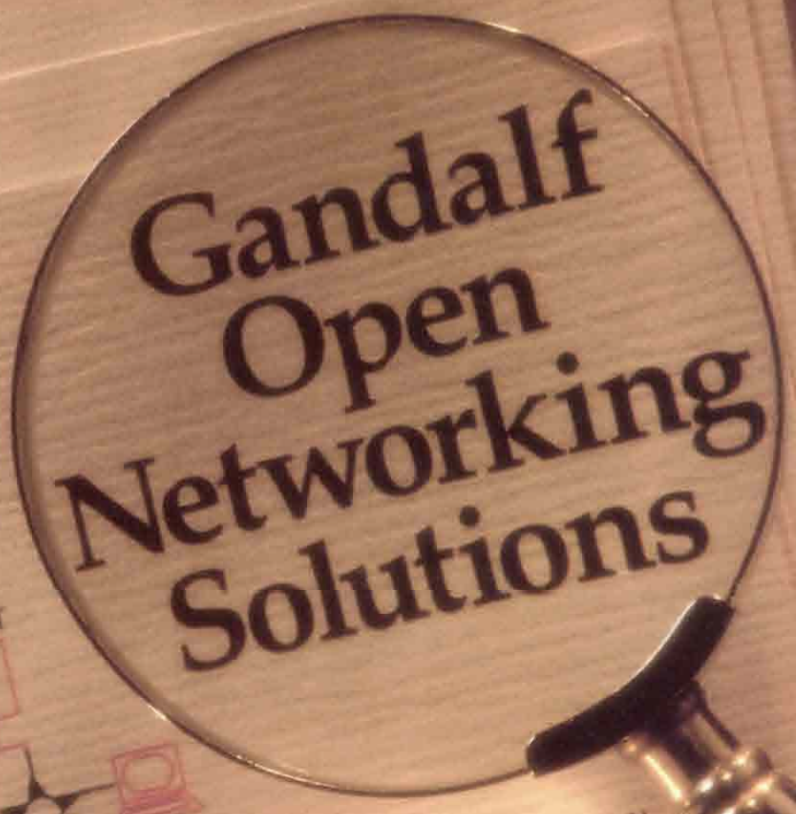
LAN Connectivity

LAN/WAN Interconnectivity

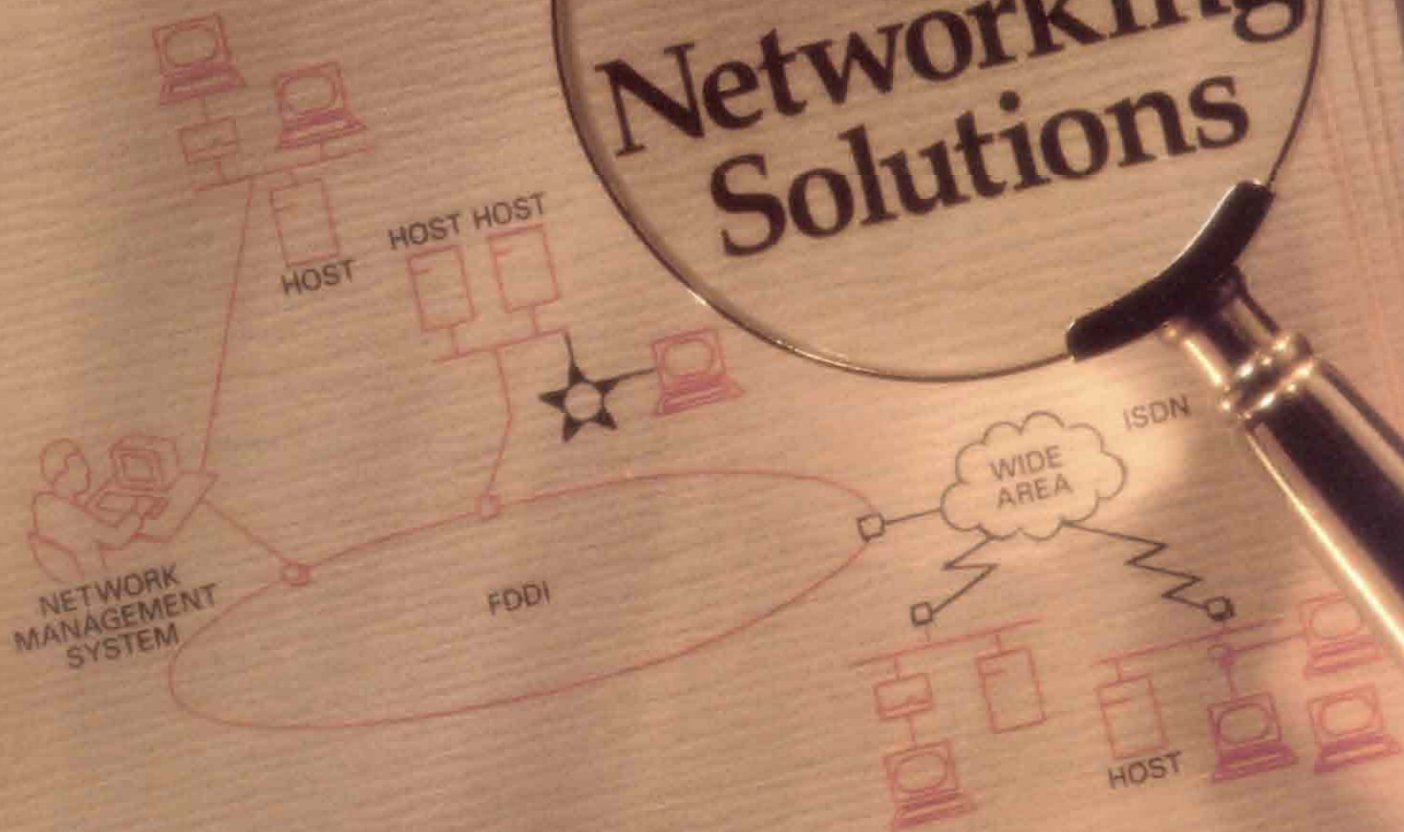
ISDN Networking

OSI Networking

Network Management



# Gandalf Open Networking Solutions



When you need to connect or interconnect workstations or computers – regardless of the operating environment or communications distance – GANDALF has the solutions you've been looking for.

GANDALF knows that what you buy today must work with what you plan to buy tomorrow. And we've answered this challenge with our open networking solutions. We solve the problems you face connecting your LANs, interconnecting your local- and wide-area networks and migrating to ISDN or OSI-based networks. Most importantly, our solutions

*We've got the  
solutions  
you've been  
looking for.*



Open Networks for Open Minds

CIRCLE 262 ON READER CARD

provide network management to control your entire network and shape its growth.

From bridges and routers to terminal servers and network controllers, GANDALF has the solutions and products that will tie it all together. And, though we're at the leading edge with products like our ISDN gateway, we know that the best solution is a cost-effective and reliable solution.

Your search for a company with the technology, experience and support to integrate your network ends here. Call us for your special solution: 1-800-GANDALF.



## HP Introduces HP 1000-A Series Model A990 Real-Time Computer

*Provides Twice The CPU Performance Of Model A900*

**H**ewlett-Packard introduced a new processor in the HP 1000 real-time product line.

The new high-end, single-board processor, the HP 1000 A-Series Model A990, provides more than twice the CPU performance of the present, four-board Model A900. The new model offers customers more compact size, faster processing and lower-cost packaging for real-time applications than competitive systems.

It will be available both in new systems and as a plug-compatible upgrade for all

existing A-Series Models.

Real-time computers are used in a variety of applications including high-speed automatic testing, factory automation, orbiting satellite control and lab automation, as well as machine and process control.

As with other A-Series models, the Model A990 can help increase profitability by controlling production-line defects, delivery times and material and labor costs. For example, the HP 1000 is used to detect defects or abnormalities in a wide variety of areas, including the manufac-



*HP's new single board HP 1000 A-Series Model A990 provides more than twice the CPU performance of the four-board Model A900.*

turing of compact disks and testing of automobile electrical systems, air conditioners and stereo equipment.

The Model A990 is fully compatible with other A-Series computers and is field upgradeable. Customers have four configuration options ranging from a 14- or 20-slot cardcage box to a 14- or 20-slot cardcage system. System upgrades of the new proces-

sor for Model A900 users and those with Model A400/A600+/A700 computers also will be available.

Prices for a fully configured Model A990, depending on box and system size, range from \$27,750 to \$39,450. When upgrading an A-Series system, credits range from \$1,000 to \$14,000, depending on the license and returned processor or system.

## ASK Bails Out Ailing Ingres

*HP, EDS Post Bond*

**H**ewlett-Packard and EDS Corp. agreed to purchase stock in ASK Computer Systems Inc., enabling ASK in turn to acquire Ingres Corp. for about \$110 million. HP expects to generate further hardware sales by supporting ASK's expansion.

HP's part of the deal calls for buying about 10 percent of outstanding ASK stock, while EDS will buy nearly 20 percent. Stock sales to HP and EDS will raise \$60 million that ASK will use as part of the Ingres purchase. Ingres is known for its tools and database products, including an intelligent relational database for distributed data manage-

ment, Windows/4GL, an object-oriented GUI development tool, and multivendor connectivity products.

ASK supplies manufacturing software in the HP, DEC and IBM markets. Some 40 percent of Ingres licenses are sold in these markets as well. ASK has been an HP customer since 1974 and has become an important HP value-added business (VAB) partner.

EDS, a subsidiary of General Motors, provides information technology services worldwide. Both HP and EDS indicate they will be making further announcements of joint efforts underway with ASK. —Bill Sharp, Technical Editor



## NETWORKING

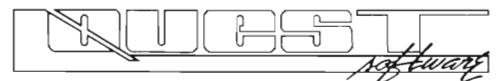
The proven solution for the integration of programs and data across computer systems. For the HP3000, the complete network solution is NetBase.

With NetBase you get transparent access to data located anywhere in your network. It spreads application load across more than one HP3000 and simplifies distributed processing systems.

Since NetBase does not need HP's NS Services, there's no need for DS lines, remote sessions or clumsy file equates. And NetBase is fast, up to 10 times faster than NS/RDBA. In fact, tests show that NetBase file access is the most efficient network software available for MPE/V and MPE/XL.

What's more, NetBase network file access gives you more than high speed access to IMAGE, KSAM and MPE files. Built into the software is a real time Application Tracing Facility, Network Modeling, Auto-RPM (remote process management), and Network Spooling.

With all of this power, why settle for anything less when you can have the "state-of-the-art" networking solution today?



Quest Software, Inc.  
610 Newport Center Drive, Suite 890  
Newport Beach, California 92660  
(714) 720-1434 FAX (714) 720-0426

In Europe Contact: System Software (UK) Ltd.  
TELE (+44) 0905 794646 FAX (+44) 0905 794464

**CIRCLE 268 ON READER CARD**

## Ford, HP To Collaborate On Major CIM Strategies

### *CIM Alliance Team Formed*

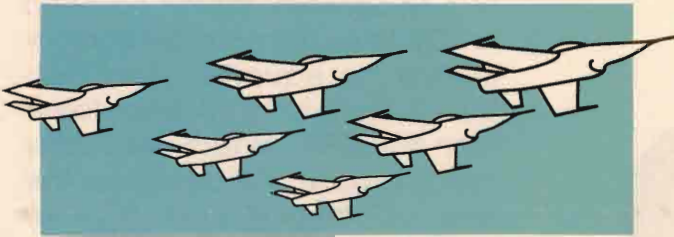
**H**P established a business relationship with the Automotive Components Group of Ford Motor Co. (Dearborn, MI).

The two companies will collaborate on CIM and information-technology strategies throughout the 1990s. A CIM Alliance Team has been formed to review the most productive methodologies to implement this strategic alliance.

The team consists of upper-management personnel

from HP and Ford's Automotive Components Group with aggregate experience in computer technology, enterprise-wide information management and automotive-components manufacturing.

The alliance between the two companies includes collaborative workgroups to focus on technology planning, a CIM Staging Center, third-party alliances to be selected by the Automotive Components Group and other areas.



## Cadre Signs Contract With GE Aerospace

### *CASE Products Used In Development Of Defense Electronics*

**C**adre Technologies Inc. announced a multimillion dollar agreement under which it will provide its *teamwork* and *teamwork/Ada* Computer Aided Software/Systems Engineering (CASE) products to GE Aerospace (King of Prussia, PA), one of the largest providers of defense electronics to the federal government.

The agreement, expected to provide revenues in excess of \$10 million to Cadre over

the course of the multiyear contract, is believed to be the largest single order ever for CASE software.

Cadre's *teamwork* products will go to 14 GE Aerospace facilities throughout the U.S. for use in the development of defense, government and commercial aerospace systems. The software will run on workstations from HP/Apollo, Sun Microsystems, DEC and IBM.

## HP To License NSD TranSpooler

### *NSD To Provide Ongoing Support*

**H**P signed a corporate licensing agreement for NSD Inc.'s TranSpooler software. The agreement allows HP unlimited internal distribution rights for TranSpooler software for use by any of its divisions. Ongoing support and maintenance also will be provided by NSD.

TranSpooler is a bidirectional spoolfile relocation program that allows manual or automatic spoolfile transfer between MPE systems or between MPE and HP-UX systems. Transfers are performed using Network Services over ThinLAN, ThickLAN, EtherTwist or X.25 networks.

## Expert System Speeds Product Forecasting At HP

### *Merlin Helps Reduce Parts Inventory And Enhance Productivity*

**H**P's Networked Computer Manufacturing Operation developed and is currently using an expert system, Merlin, that forecasts factory product demand. It saves forecasting time and produces consistent analyses of product demand trends.

Merlin develops forecasts covering a one-year period for more than 500 products and product options in less than two hours, a reduction in the amount of time required by human forecasters to manually perform the same task. Merlin uses past history order data and product information supplied by human forecasters to direct the expert system. As new information becomes available, forecasters can rerun and adjust forecasts.

Merlin runs on an HP 9000 workstation using HP-UX. The knowledge base software is Knowledge Engineering System (KES) from Software Architecture & Engineering Inc. Software A&E is a Premier AI/Knowledge System Software Supplier under HP's VAB Program.

The knowledge base is embedded into Merlin, meaning that the code to run the expert system is actually compiled with the rest of the system's code, providing increased performance. Merlin also features simulation mode that enables forecasters to improve the system by allowing them to test new forecasting algorithms and analyze the results via metrics displayed in graphical format.

Merlin also is designed to increase forecast accuracy. The benefits of increased forecast accuracy are a reduction in parts inventory, enhanced productivity, fewer production holds and fewer late shipments and cancellations.

Erland Renslo of HP's Networked Computer Manufacturing Operation, who developed the expert system, says the product is not designed to replace human forecasters, but to provide them with another tool to do a better job.



# Looking for a better vehicle to move spoolfiles?



*Integrate all of  
your MPE  
systems and  
UNIX systems  
easily with  
NSD's  
TranSpooler.*



## **TranSpooler™ lets you easily transfer spoolfiles anywhere on your network.**

**T**ranSpooler is a powerful spoolfile relocation facility from NSD designed to enhance MIS operation productivity. With TranSpooler, you can transfer spoolfiles using Network Services over ThinLAN, ThickLAN, EtherTwist or X.25 networks.

### **Integrate MPE and HP-UX Systems.**

TranSpooler is an efficient transfer mechanism to move spoolfiles between MPE systems or between MPE and HP-UX systems using a common transfer format. This bidirectional transfer power provides you with excellent system integration capabilities. TranSpooler is so powerful, it supports multi-tasking and performs multiple spoolfile transfers simultaneously.

### **Maximize your precious resources.**

Processing resources are costly and need to be used wisely. With TranSpooler, you can more efficiently utilize your processing and peripheral resources by offloading spoolfiles to a smaller system dedicated to printing or plotting. HP9000 users can also take advantage of high-speed HP3000 peripherals. Utilize your computer resources more efficiently and your entire operation will become more productive.

### **Look at your options.**

TranSpooler allows you to transfer spoolfiles automatically or manually. You can handle environment and binary file transfers. Save time and money by distributing reports automatically via LANs and WANs.

### **Easy to install, easy to use.**

TranSpooler only takes minutes to install and runs completely unattended. Spoolfiles sent to MPE systems are placed directly in the spool system and require no reformatting. Users can print reports using familiar HP-UX and MPE command syntax. TranSpooler is completely transparent, and integrates smoothly with HP OpenSpool/UX.

### **Test drive TranSpooler, free!**

NSD offers free 30-day evaluations of TranSpooler. Call us for more information or to order your trial copy. And leave the spoolfile transfers to TranSpooler.

**800.538.3818**



**NSD**

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CIRCLE 161 ON READER CARD

## HP Unveils Open Dialogue 2.1

*Adds Support For HP-UX, DEC Ultrix*

**H**P announced Version 2.1 of HP/Apollo Open Dialogue, the company's C++-based object-oriented, user-interface management system.

With its new enhancements, HP/Apollo Open Dialogue now is available on the HP-UX operating system and on HP PA-RISC systems running X Windows, as implemented in the HP Visual User Environment. HP/Apollo Open Dialogue also

will be available on DEC Ultrix.

HP/Apollo Open Dialogue, which already supports HP/Apollo Domain/OS and Sun/OS operating systems, allows software developers to use development techniques that create and maintain OSF/Motif-style user interfaces for standards-based applications across the complete range of leading workstation platforms.

## TPC Announced Results From First Benchmark

*HP, DEC Publish OLTP Benchmarks Results*

**T**he Transaction Processing Performance Council (TPC) announced results from its first benchmark, TPC Benchmark A (TPC-A), which measures online transaction processing (OLTP), one of several areas of transaction processing performance that the TPC is chartered to cover.

With the announcement, HP and DEC become the first two companies to officially submit TPC-A results. HP submitted results on its HP 3000 Series 900 Models 922, 949 and 960. DEC submitted results on the VAX 4000 Model 300.

Issued in November 1989, the TPC-A benchmark measures performance in update-intensive database environments typical in OLTP applications (TPC-A actually

simulates OLTP in a simplified banking environment). In these environments, users typically use terminals to access a database over a local or wide area network and then conduct a transaction. The TPC-A benchmark measures how many transactions per second a system can perform and how much the system costs (including maintenance over five years).

The TPC-A benchmark rules require that all vendors fully disclose the details of their benchmark run and system configuration to the TPC.

At its last general meeting in Burlingame, CA, July 12, the TPC voted to send its next benchmark, TPC Benchmark B, to the general membership for approval. It is a subsystem level benchmark that excludes terminal interaction and focuses on batch-mode database performance.



*The HP DeskJet 500 printer offers more fonts and better font spacing, water-resistant ink and compatibility with Microsoft Windows 3.0.*

## HP DeskJet 500 Replaces DeskJet PLUS

*New Printer Priced At \$729*

**H**P introduced the DeskJet 500. This new DeskJet printer offers more fonts and better font spacing, water-resistant ink and compatibility with Microsoft Windows 3.0. All DeskJet family (for IBM and compatible computers) and DeskWriter (for Macintosh computers) printers have 300 dpi resolution and use plain paper. The DeskJet 500 printer produces up to three pages of text or two pages of graphics per minute.

This printer replaces the DeskJet PLUS and DeskJet printers and is \$720. The DeskJet PLUS and DeskJet printers were \$995 and \$795, respectively. DeskJet PLUS and DeskJet printer owners may upgrade their printers to DeskJet 500 printers for \$175 and \$225, respectively.

## HP Expands Market For X Window Terminals

*Supports Multiple Asian Keyboards*

**H**P introduced Asian-language keyboard support for the HP 700/X family of X Window System graphics terminals. The company offers Japanese (Kanji and Katakana), Chinese (traditional and simplified) and Korean (Hangul) keyboards on HP 700/X terminals.

The addition of Asian-language support addresses the needs of HP's numerous installed-base customers in the Far East. HP now offers users

the option of selecting from more than 20 different foreign-language keyboards for the HP 700/X terminals.

The HP 700/X terminals handle the mapping of 8-bit keyboard input to 16-bit Asian-character output by means of the HP Native Language I/O program. This program is part of the HP-UX 7.0 operating system that is shipped with each HP 9000 computer system.

Prices for the graphics terminals start at \$2,995.



# How do I manage program changes without slowing down development?

Your programmers are at a premium—no surprise since your users outnumber them tens, maybe hundreds, to one. That's why your programmers need tools that both reduce errors and help them accomplish development goals more easily.

## Power for Programmers

LIBRARIAN has a number of functions—such as a fast copy and file movement facility with customized movement rules, the ability to manipulate files in logical groups independent of physical location, and a “scan and replace” facility—that make life easier for your programmers.

LIBRARIAN also offers some powerful advantages to data center operations:

## Source Revision Control

LIBRARIAN manages source code libraries, controls changes, and automates file movement from development to production—even across multiple CPUs. It allows an application release to be checked-out and then checked-in as a logical unit, automatically updating the revision level and validating the integrity of the entire application in one step.

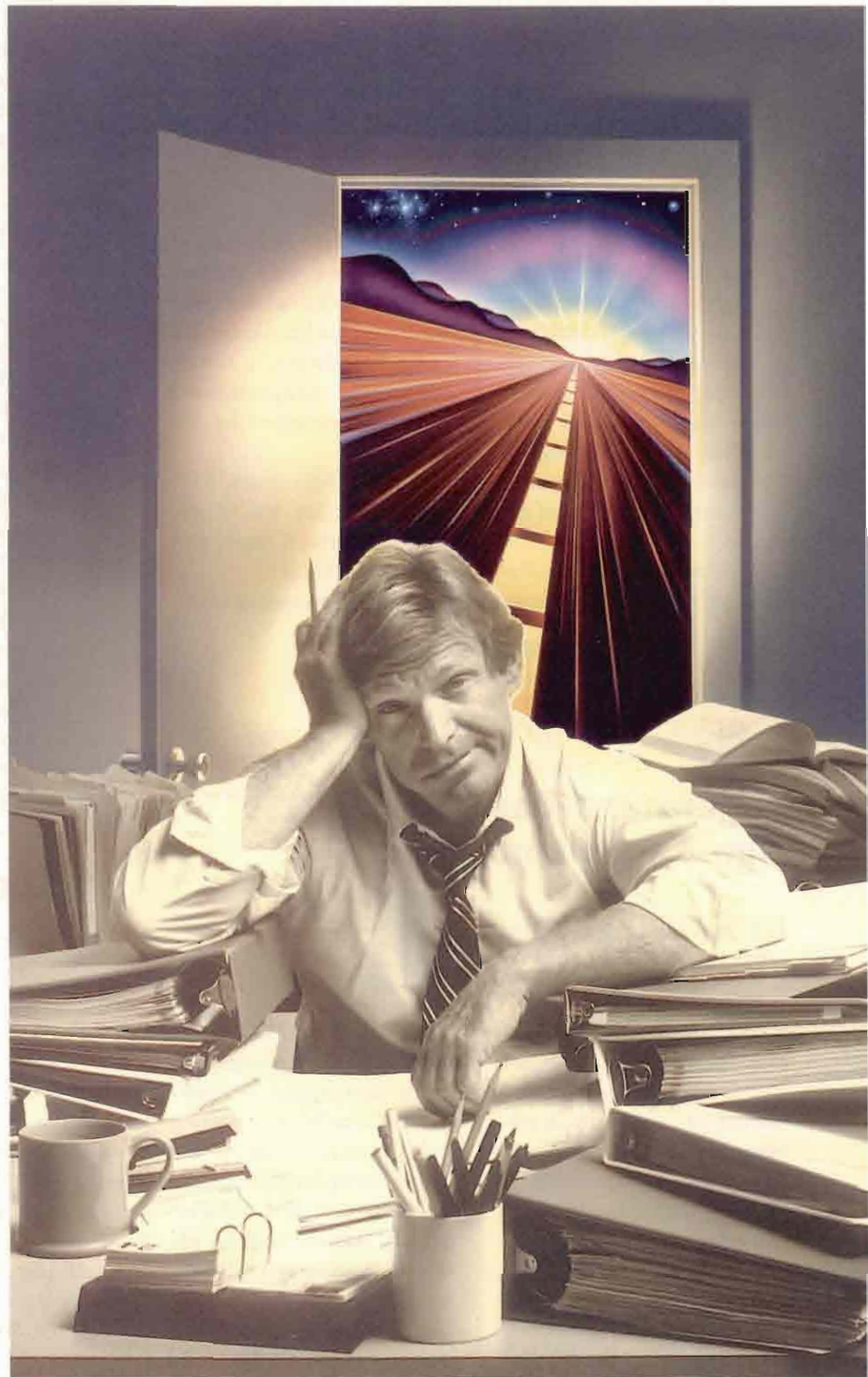
## Audit Controls

LIBRARIAN brings control and structure to your software development, maintenance, and production activities. It ensures that only the correct versions of programs and files are used, and maintains a complete audit trail of their movement and change.

## Data Center Experts

Best of all, LIBRARIAN is part of the most comprehensive line of data center management products available—from a company committed to support you with innovative, proven tools.

Give us a call today! We'd be happy to help meet your specific data center needs.



Clearly the Future in  
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## Operations Control Systems

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CIRCLE 162 ON READER CARD



## Infocentre, Pepsi Cola Join Forces

### Fieldwatch Services Outfitted With EasyReporter

Infocentre Corp. joined forces with Pepsi Cola Co. The venture involves Pepsi Cola's acquisition of Infocentre's EasyReporter software, an ad hoc reporting system. EasyReporter allows PC users within a corporation to access its central database.

All of the Fieldwatch Services offices nationwide have been outfitted with EasyReporter, running on HP 3000 Spectrum series computers. Installation of the system is complete.

In addition to the installation of the EasyReporter

system, Infocentre has updated Pepsi Cola's Fieldwatch software, a service dispatching application in place at Pepsi since 1986. The software, which monitors the servicing of Pepsi's vending machines and fountain syrup dispensers, has been enhanced using Speedware, a fourth generation programming language developed by Infocentre.

Contact Infocentre, 7420 Airport Rd., Ste. 201, Mississauga, Ontario, Canada L4T 4E5; (416) 678-1841.

Circle 369 on reader card

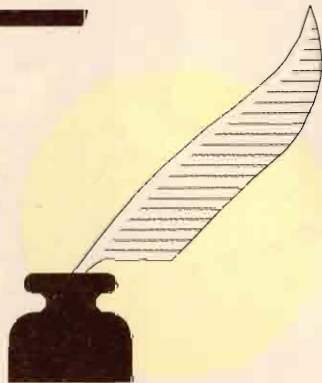
## MCSS, Ungermann-Bass Sign Agreement

### UPTIME Capabilities To Be Expanded

Mini Computer Software Specialists Inc. (MCSS) and Ungermann-Bass Inc. entered into a software development agreement that expands the capabilities of MCSS' UPTIME Service Management System.

Under the agreement, Ungermann-Bass will install the following UPTIME modules: Service Calls, Service Orders, Inventory and Maintenance Agreement. They also will install the optional Depot Repair, Support Desk and Techlink modules.

MCSS, in turn, will cooperate with Ungermann-Bass in the design and development of a problem reporting and support database for Ungermann-Bass' software products. This new software support database will be accessible from several different departmental PC LANs within Ungermann-Bass, in both the U.S. and overseas. The software support database also will be tightly integrated with the central UPTIME database.



## For Your Information

■ QMS announced new pricing on its eight page-per-minute PostScript printers. The \$4,005 QMS-PS 810 is \$3,995. The \$5,995 QMS-PS 820 is \$4,995. The QMS-PS 810 turbo printer is priced \$500 lower at \$5,495, and the QMS-PS 820 turbo's price has been reduced from \$6,995 to \$6,495. (205) 633-4300.

■ MICOM Communications Corp. released a free applications guide containing examples of ways to use communications servers in a variety of networking applications. (800) MICOM-US.

■ *The Fiber Optic LAN Handbook*, which provides guidelines for the design, implementation and effective use of fiber optics technology in LANs, server backbones and heterogeneous networks, is available from Codenoll Technology Corp. (914) 965-6300.

■ The Federal Communications Commission granted several proposals initiated by Metropolitan Fiber Systems

Inc. during reconsideration proceedings on the FCC's Individual Case Basis (ICB) Order, finding that the Regional Bell Operating Companies (RBOCs) cannot financially or otherwise penalize customers for selecting competing carriers such as MFS for DS3 service and that most RBOCs' ICB rates for DS3 dry fiber service are unlawful. The ICB Order had found that ICB rates for most DS3 services were unlawful and the FCC ordered the RBOCs to remove ICB rates from their tariffs and file generally available tariff rates for DS3 and DS3-equivalent services.

■ Lund Performance Solutions announced a "Taming the HP 3000 Video Seminar II" workshop that covers performance basics and capacity planning methods. It emphasizes MPE XL-specific concerns and explains how to identify memory and other resource bottlenecks. (503) 327-3800.

## HP And Oracle Form Closer Ties

### Oracle Among Top Participants In HP's Preferred Solution Provider Program

HP and Oracle Corp. work so well together that they plan to do more of it. An agreement between the two should bolster Oracle sales and give HP an advantage as a hardware supplier for Oracle software customers.

HP placed Oracle among the top participants in the HP Preferred Solution Provider program for relational database, applications development, CASE and accounting systems. HP agreed to consider taking customer orders for Oracle software and prod-

uct support.

Oracle has selected HP workstations as the development platform for Motif-based tools, and established an HP Products Division for HP 3000 software systems. Oracle will also use HP 9000 systems as a reference development platform for its UNIX Products Division.

Both firms will train their sales forces to sell Oracle software for HP 3000 and HP 9000 products. — Bill Sharp, Technical Editor



September 11, 1990

*PC Magazine* Reviews  
Twenty-four 80486™ Systems...

“Only one machine stands out as a winner because of its wealth of features: price, design, service and...performance.”



Call toll-free 24 hours a day, 7 days a week! 800-548-1993

New Northgate® Elegance™ 486i™ System...

“Editors’ Choice” said *PC Magazine!*\*

(Adding: “Northgate stops at nothing to please its customers...97% would buy again!”\*\*)

*InfoWorld* labs scored it 9.1—top rating ever!†

Incredible power and unmatched performance at a price you'd expect to pay for a 386™!

**\$5199<sup>00</sup>**

Delivered to Your Home or Office

Whether 80286, 386 or 486 technology, Northgate consistently brings you top rated systems. Our value and performance is unexcelled when you look at the experts' opinions. Northgate is a company in which you can place your trust — perhaps our most important advantage!

In January, 1988, Northgate won its first Editors' Choice for the 286/12 SuperMicro. Northgate leadership prevailed again when *PC Magazine* benched 386 systems. One couldn't do better. Three Editors' Choice — one for each speed in our Elegance line of 20, 25 and 33MHz systems. Northgate is the only company who can make this claim!

*PC Magazine* then called for 486 ISA systems for review. Result: there was no question about it. “Only one machine stands out,” they said, “you could pay less for a 486 system, but not get the bonuses that are offered with the Elegance.”\*

Along the way, we added another Editors' Choice of our *OmniKey*® keyboard. There you have it...

A record five Editors' Choice Awards in one year's time!



About the same time, the tough testers at *InfoWorld* were thoroughly and methodically examining Elegance 486i. They reported you could buy the next highest ranked system (scoring 8.2 vs. our 9.1) but you'd also pay three times as much!†

*InfoWorld's* editors concluded that Northgate's 486i “leads the pack by a comfortable margin. It offers impressive performance, exceptional expandability and it is tops in support and value.”†

*InfoWorld* showed Elegance 486i leading the pack again as a network file server and stand-alone system as well.

And, as if we had planned it, *PC Magazine* came along with its Service and Reliability issue in which Northgate's dedication to

customer support was well evidenced. “As we learned more about its service policies, it became clear that Northgate stops at nothing to please its customers.” No wonder “Northgate was the hands-down winner when it came to customer loyalty.”\*\*

That's the story. Designed and built to perform. Proven by the industry's most demanding testing. Fairly priced. And backed by people with a passion to serve you with a support policy that inspired one magazine columnist to say:

“What WordPerfect is to software support, Northgate is to hardware and there are even a few things that WordPerfect could learn from the folks in Minneapolis. Northgate is fast becoming the Nordstrom of the computer world.”††





# NOW! Northgate leads the pack again with a new 60-day no-risk trial!

The secret to Northgate's state-of-the-art power! The 486 processor combines the capabilities of an enhanced 386, an advanced internal cache controller and 8K of supporting static cache memory. The chip also incorporates an enhanced 387 FPU (Floating Point Unit). You get increased performance for the most demanding math-based applications.

Northgate caching enhancements give you greater speed! We've added a 64K read write-back SRAM cache (Northgate exclusive 256K system available) to further accelerate the execution of instructions. I/O transactions are faster than ever thanks to a 32K hard drive cache controller. Finally, we armed Elegance 486/25 with Smartdrive DOS disk caching

software. Result? Processing speed you must see to believe!

Elegance 486i ISA is the perfect high performance graphics/software workstation or network server. Its multi-stage caching is an excellent match for tough number-crunching operations.

Look at everything you get! Elegance 486i comes complete with the spectacular 100Mb super-fast hard drive! This hard drive operates so quietly only the flashing red light tells you it's running.

PLUS, you get 4Mb of RAM, 1.2Mb 5.25" and 1.44Mb 3.5" floppies, desktop case, 14" SVGA color monitor with 1024 x 768 resolution, 16-bit SVGA video adapter with 512K memory and exclusive *OmniKey*®

keyboard. We've even included Microsoft® Windows™ 3.0 and a mouse!

**FREE Performance Software Package with SVGA color system purchase!**

**Limited time only!** Select Northgate's SVGA color system and you'll get Samna® Ami™ Professional word processing and Informix® Wingz™ graphics spreadsheet — FREE!

**Support power!** Elegance 486i ISA is backed by expert toll-free technical support 24 hours a day, seven days a week. PLUS, free on-site next day service to most locations if we can't solve your problems over the phone AND a 1 year parts and labor warranty; 5 years on *OmniKey*® keyboard.

**Northgate doubles no-risk trial offer!** We're so sure you'll love Elegance 486i, we'll let you use it RISK FREE for 60 days! If it fails to meet your expectations, return it for a full refund. No questions asked!

**ORDER TODAY! ASK ABOUT CUSTOM CONFIGURATIONS.**

**Complete SVGA Color System**

**ONLY \$5199<sup>00</sup>**

**EASY FINANCING:** Easy payment options. Use your Northgate Big 'N', VISA, MasterCard ... or lease it. Up to five-year terms available.

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**Notice to the Hearing Impaired:** Northgate has TDD capability. Dial 800-535-0602.

 **NORTHGATE  
COMPUTER  
SYSTEMS** *"We hear you!"*  
7075 Flying Cloud Drive, Eden Prairie, MN 55344

## Elegance 486i SVGA Color System Features

- ◆ 25MHz Intel® 80486 processor
- ◆ 4Mb of 32-bit RAM (expandable to 8Mb on motherboard; total system RAM of 16Mb with optional 32-bit memory card)
- ◆ U.S.-made motherboard
- ◆ 100Mb IDE hard drive; 16-bit controller with 1:1 interleave; 32K disk read-look-ahead cache buffer
- ◆ 64K SRAM memory cache; read/write-back caching
- ◆ High density 1.2Mb 5.25" and 1.44Mb 3.5" floppy drives; also read/write low density disks
- ◆ Eight expansion slots; one 32-bit slot; six 16-bit and one 8-bit slot
- ◆ Weitek math coprocessor support
- ◆ One parallel and two serial ports
- ◆ 14" SVGA color monitor with 1024 x 768 resolution
- ◆ 16-bit SVGA adapter with 512 K video memory
- ◆ Clock/calendar chip rated at 5 years
- ◆ 200 watt power supply (220 watt power supply in tower case)
- ◆ Desktop case with room for 3 exposed and 2 internal half-height devices
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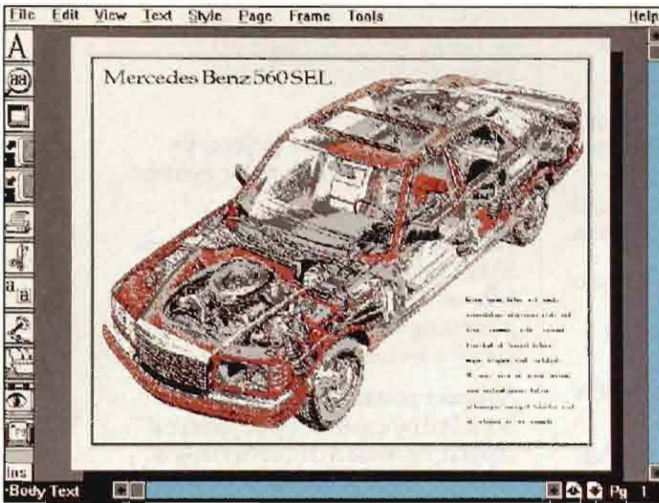
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\*PC Magazine, September 11, 1990 \*\*PC Magazine, September 25, 1990  
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# Word Processing Goes NewWave



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Think

If your current word processor makes you wait until print time to show you exactly what your document looks like, consider Ami Professional Version 1.2 from Samna Corp. (Atlanta, GA).

Ami Professional is a word processor for your IBM AT, PS/2 or compatible microcomputer that has desktop publishing and graphics features built in. It works under Microsoft Windows 2.0 or higher and is compatible with any printer that supports Microsoft Windows.

Ami Professional also supports HP NewWave Version 3.0. Under HP NewWave, documents in Ami Professional appear as icons on the HP NewWave desktop, but can also be given more specific names of up to 32 characters.

You can move text or graphics between applications using mouse-controlled "click-and-drag" techniques. Similarly, a document can be printed by dragging its icon and dropping it into the

printer icon, or mailed electronically by dragging it into the mailroom icon.

"Unlike a Windows application that has been encapsulated to run under NewWave, Ami Professional has been built specifically with the HP NewWave environment in mind," stated Samna president and CEO Said Mohammadioun. "As a result, users can take advantage of NewWave's interoperability capabilities, using Ami Professional in conjunction with other HP NewWave software applications."

In addition, Ami Professional includes more than 24 professionally designed style sheets, paragraph style and page layout controls, and graphics file import capability (TIFF, PCX, EPS, PIC, WMF, clipboard).

The software is distributed on both 3 1/2-inch and 5 1/4-inch disks. Included is a Single Application Environment (SAE) version of Microsoft Windows. This is provided in case you don't have Windows running on your PC. The Getting Started section of the User's Guide explains how to install and run Ami Professional, whether you're using the SAE or a full version of Microsoft Windows.

Ami Professional uses paragraph style settings to let you control the way text is formatted on the page. A paragraph is defined as any text that appears between two carriage returns. A paragraph style is assigned to each headline, subhead and paragraph.

With paragraph style settings, you can alter or choose different font types and attributes such as boldface, italics and underline. You can also specify text alignment, spacing and page breaks.

Paragraph styles are assigned by selecting the desired style from the Style Box. You can click on the desired style before you start typing, or change the style after you've typed the paragraph. You can also assign paragraph styles as you enter text.

The frame feature serves as the basis for drawing and charting. It lets you include graphics in your document, enter text in a box away from the rest of the document, or have a title spread across a multicolumn page.

Page layout settings control the format information that pertain to a page as a whole. You can set margins, control the page size or specify the number of columns.


Ami Professional's desktop publishing features let you create just about any document you can imagine. And its ability to display your document exactly as it will appear in print makes Ami Professional one word processing package you'll want to check out.

Ami Professional is priced at \$495 for first-time buyers. — George T. Frueh, Technical Editor.

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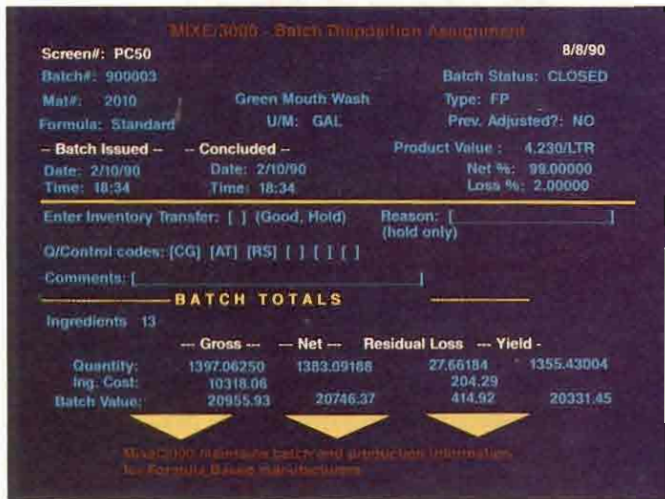
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# The Perfect Mixe



## Mixe/3000 Is Software For The Process Manufacturer

Process manufacturers are often faced with an array of complex problems ranging from materials management and production scheduling to quality control and long-term forecasts. The demand for a more efficient set of software tools designed to aid the process manufacturer has led to the development of Mixe/3000 from Perfect Software Solutions.

Mixe/3000 runs on your HP 3000, and it consists of a "Core System" and optional modules. The Core System modules are the primary building blocks. From these, the optional modules can be implemented depending on your needs.

"Mixe/3000 is designed to help the formula-based manufacturer control production, maintain product quality and maximize profitability by providing easily accessed and accurate information," said Paul Sita, president of Perfect Software Solutions Inc.

The center of Mixe/3000

is the Formula Management (FM) module. This module is designed to provide flexibility in the set up, costing and management of product formulation. As costs, resources and other requirements change, Mixe's FM module helps you maintain product quality and cost efficiency.

FM enables manufacturing personnel to implement formulation changes and view any past, present or future formulas online. Standard ingredient costs are computed dynamically whenever a formula is created or changed. A global replacement feature permits the replacement of a given component in all formulas or a group of formulas with a single instruction.

The Materials Requirements Planning (MRP) module is a "rough cut" planning system. Its planning tools maximize resource utilization. Mixe MRP helps make production decisions by taking into account customer demand, ingredient quality and availability, product definitions, user-defined time periods and the status of other resources. Production schedules are viewed and maintained online in a "worksheet" format.

The Process Management (PM) Module tracks batches through each manufacturing process stage. It helps manage the manufacturing cycle from the analysis of ingredients and packaging availability, through grading and quality control of the final product.

Prior to a batch's release into production, the system confirms the availability of all material requirements. Personnel are notified of shortages and provided with alternate sources of supply.

The Inventory Control (IC) module maintains up-to-the-second information on the availability, allocation, cost and storage location of raw materials and finished goods. IC also tracks inventory that's been transferred to outside sources for processing or other user-defined operations. Conversion to or from any unit of measure is accomplished automatically by the system.

The Purchase Orders and Receiving (PO/R) module allows you to manage the process of procuring the materials you need for manufacturing. When combined with Mixe MRP and Inventory Control, Mixe Purchasing completes the materials management cycle — planning, purchasing, expediting, receiving and usage.

Optional Mixe/3000 modules include Lot Tracking, Sales Order Processing and History, Accounts Payable and Receivable and General Ledger.

Mixe/3000 is priced from \$29,500 to \$80,000. — *George T. Frueh, Technical Editor.*

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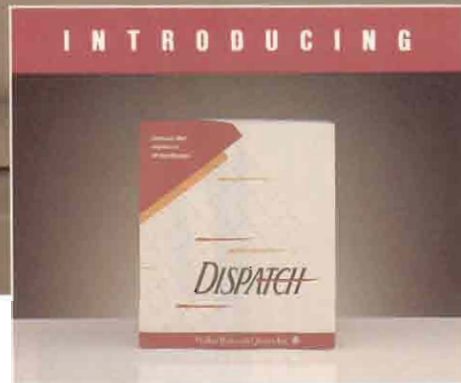
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**CIRCLE 146 ON READER CARD**

**Today's Manufacturers Use Expert  
Systems In Intelligent Ways**

# KNOWLEDGE AT WORK

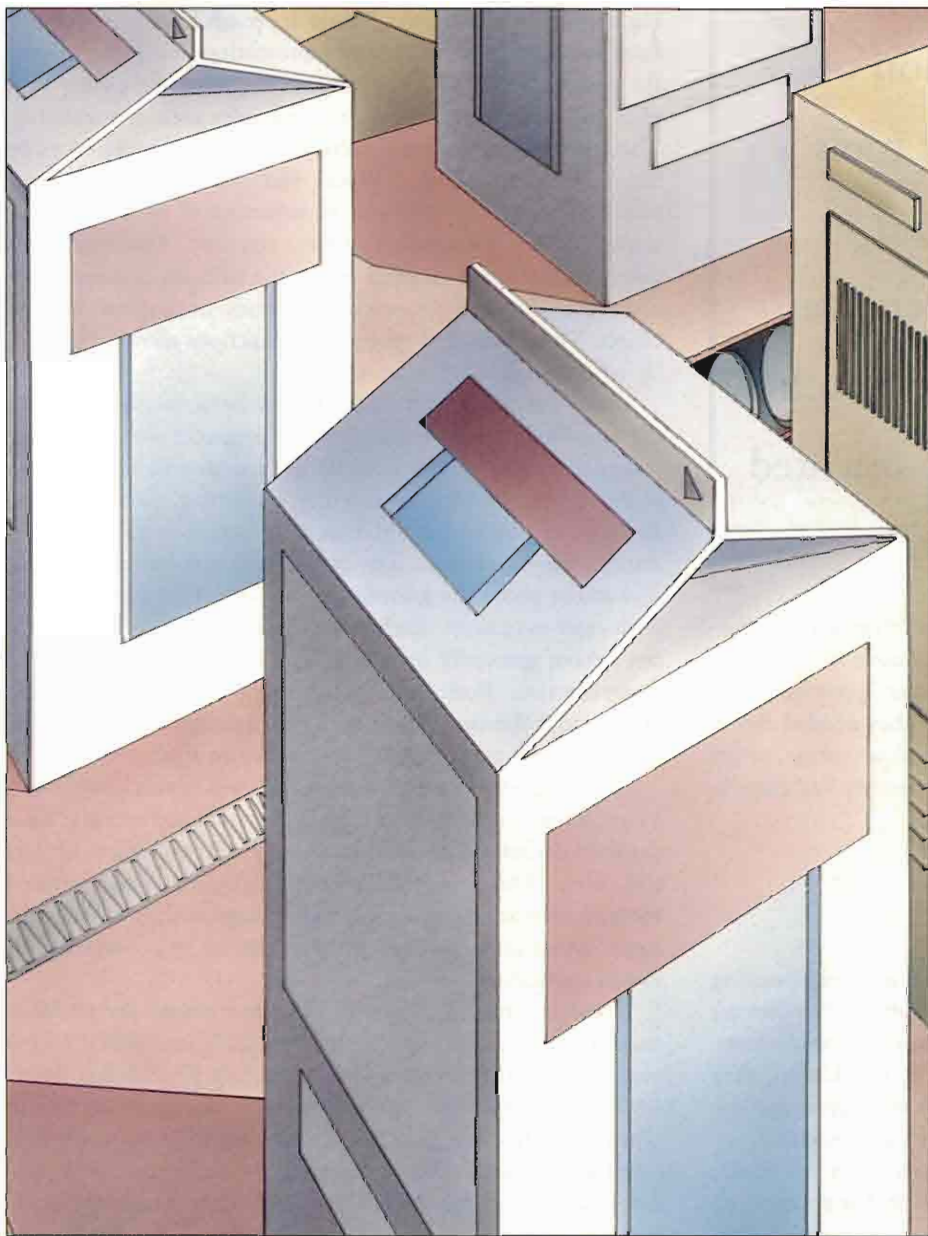
[BY ROSS G. HOPMANS]

**T**he first commercial expert system, XCON, was brought to market by DEC in 1981. As the technology has matured and advanced, the use of expert or knowledge-based systems (KBS) has become increasingly common, both as stand alone applications and integrated with other software.

Expert system building tools, known as shells, were introduced in the early 1980s. Now in 1990, a second generation of tools has begun to appear that makes very sophisticated programming techniques readily available. In the next two years, we will see the evolution of these tools and the establishment of knowledge-based systems as a pervasive technology. Already the number of KBS applications in production using the top 10 tools in the industry is more than 6,000 with an estimated 25,000 to 30,000 users. And these numbers are rising rapidly.

Why build expert or knowledge-based systems rather than hire





more human experts as we need them? There are many good reasons. KBS can perform repetitive, logical operations consistently at remote sites, 24 hours a day. They never get bored or overworked, and they don't change jobs.

### Knowledge-Based Systems

**K**NOWLEDGE-BASED SYSTEMS do not constitute a market unto themselves. Rather, they are one of many available technologies within the software applications development market. Knowledge-based systems tend to focus on integration into the information processing environment by adding intelligence to existing applications and databases. Ac-

ording to Harry Tennat, Texas Instrument's chief technologist, "Transaction processing moves data through companies. Knowledge processing makes sense of the data that moves through the companies."

Knowledge-based systems incorporate the knowledge of human experts to solve difficult problems. Their power comes from their ability to reason beyond the knowledge directly stored in their files. This ability, known as inferencing, allows the computer to go beyond its traditional role and into areas where there may be missing, incomplete or uncertain information. KBS allows for a heuristic, qualitative approach to problem solving.

Knowledge-based applications capture the knowledge necessary to understand a complex system or domain. In developing a knowledge-based system, the knowledge engineer builds a realistic model of the actual system. The knowledge base is populated with the components, behaviors and relationships in the actual system. Knowledge systems are most common in application areas such as planning, diagnosis, design, scheduling, training, data interpretation and configuration. If you can understand how the components of a system interact but the operation is too complex to predict the behavior of the whole system, a knowledge-based application is in order. Another good candidate for a knowledge-based system is any situation in which you want to distribute the knowledge of a few

experts to a broad base of people.

Companies using expert systems view them as strategic technology. Consequently, expert systems have come to the attention of top management. According to Steve Martino, senior manager of the Price Waterhouse expert systems group, "The CEO of a Fortune 500 company asked me recently why his company was not using expert systems. He would never have asked me why they weren't using SQL or DB2."

The finance industry is probably second to manufacturing in its use of KBS. In a widely circulated report of data collected in 1986 and then again in 1987, Coopers & Lybrand found that 43 percent of the top financial companies were using, developing, or actively researching expert systems applications. Insurance companies were the most active of this group. Be-

The new generation of  
KBS development tools  
provides a hybrid  
knowledge and inference  
structure that supports both  
rule-based and object-oriented  
programming.

tween 1986 and 1987 the number of insurance companies actually using one or more expert systems increased from 2 to 25 percent with underwriting the most popular application. In 1986, 50 percent of those surveyed said that they needed expert systems technology to survive, gain a strategic advantage, or get ahead of their competitors. By 1987, the number had risen to 75 percent.

### Industry Trends

**E**XPERT SYSTEMS ARE concerned with representing facts and the relationships between them. They also are able to represent the heuristic knowledge that allows new facts to be inferred from existing facts. In addition, they must be able to control procedural flow in the system and the developer must be able to create an effective user interface.

The new generation of KBS development tools provides a hybrid knowledge and inference structure that supports both rule-based and object-oriented programming. These tools generally have a graphical interface (MS Windows or X Windows) and should offer a graphical way of presenting the knowledge base to the developer.

Many expert system development efforts have now shifted from rule-based, backward-chaining systems to the object-based hybrid systems that the new tools allow. Although small, backward-chaining systems may be easier to write initially, they can become more confusing as the system grows. Facts, heuristics and procedural control are all specified through the rules of a simple rule-based system. As the system grows, more control rules are required to manage the knowledge base and the system slows down because more rules require more inferencing, which takes more time and memory.

Because the structure of the domain that we are represent-

ing consists of objects, the hybrid approach is simpler. Objects have the advantage of directly representing items that exist in the real world. They can represent tangibles like power supplies and tape drives, as well as intangibles such as ownership. The relationships among objects in a model are represented by linking them according to object class in a hierarchy. Pattern-matching rules can examine all instances of an object class, which reduces the number of rules required. The object-oriented programming facilities within the KBS development tools allow the developer to associate methods, or demons, with an object. These inherited programs or functions allow us to specify what the objects can do.

Once the objects and methods have been developed within the knowledge base, the knowledge engineer uses rule-based programming to specify how the objects should behave along with the heuristics. In rule-based programming, each rule specifies a set of conditions and a set of conclusions to be made if the conditions are true. The conclusions may represent logical deductions about the knowledge base or specifications of how it changes over time. Each rule is independent and the system can evolve gracefully over time by adding or modifying rules as appropriate. Both forward chaining (where conclusions are drawn from the facts) and backward chaining (to determine if a conclusion is true) may be used within an application.

IBM's announcement that AD/Cycle will have a knowledge-based systems component is seen as a step toward creating standardized definitions of some knowledge entities such as objects and rules. This provides IBM customers with a standardized method of storing, retrieving and managing their knowledge bases. More importantly, it provides sharing of knowledge between applications.

Carnegie Group, DEC, Ford, Texas Instruments and US West announced in April that they had formally established a new organization, the Initiative for Managing Knowledge Assets (IMKA), to develop a technology for managing corporate knowledge that integrates with conventional and knowledge-based applications. This will apparently challenge IBM's standardization effort for VAX, UNIX and other distributed environments.

### Applications

**T**HE AMERICAN ASSOCIATION of Artificial Intelligence (AAAI) recently held its second annual Innovative Applications of Artificial Intelligence conference. The 22 papers selected were chosen to demonstrate successful implementations of expert systems in real-world situations. These systems exemplified a diverse range of application areas, development tools and hardware platforms.

It's important to examine some applications from the manufacturing, financial and retail sectors to show how knowledge-based systems are being used. The needs of these three sectors





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Expert systems are used to perform continual monitoring and provide plant operators with guidance and assistance in locating and preventing production problems.

are all quite different. Many manufacturing and process control facilities operate 24 hours a day. Expert systems can be used effectively to perform continual monitoring and to provide plant operators with guidance and assistance in locating and preventing production problems. The financial industry faces increasing competition, often applying expert systems in service-oriented areas where the knowledge of its most skilled employees can be captured and distributed to less skilled people. Retail is also a very competitive industry, often accompanied by low margins. Here, expert systems can provide intelligent database access and analysis for improved scheduling and planning.

Canbuild is an expert system for inventory monitoring in use at DEC. The system was developed to track, coordinate and analyze inventory at DEC plants worldwide. Canbuild allows management to identify the amount of inventory left over in order to determine if it is more economical to write it off or build it up to make more products.

Prior to Canbuild, the inventory control systems only looked at a single plant. The analysis of data across plants was done manually. As a result, it was time consuming, inconsistent and inefficient. Canbuild allows inventory information to be easily accessed in a consistent format, regardless of where the inventory is kept. Decisions are more timely and are based on up-to-date, corporate-wide inventory information.

Campbell Soup Co. uses an expert system to monitor the sterilization processes in its product canning operations. Each product has its own sterilization parameters. Before a product can be released, the product safety department determines if the strict guidelines for sterilization have been met. If problems do occur in the sterilization process, it's necessary to determine if the sterilization process has been adversely affected. This necessitates the destruction of the product.

Prior to implementing the expert system, Campbell used a FORTRAN-based system to monitor processing deviations in sterilization. This system required that data be sent to the processing safety department, which determined whether the product should be released or destroyed. This decision could take several weeks. Now, using the expert system to transfer data from the laboratory to the factory, the decision can be made in two or three minutes, and the system handles multiple processing deviations simultaneously. This newly acquired ability to make rapid decisions on the status of products has led to a reduction of unnecessary inventory. Products no longer need to be held in inventory pending a decision; the product is either determined as fit for release or destroyed immediately.

Foreman's Assistant for Intelligent Scheduling (FAIS) is a 500-rule expert system that provides machine scheduling at General Dynamics. It was designed to assist foremen in prioritizing manufacturing jobs to be set up and loaded into numerically controlled (NC) machines.

The need to reschedule may arise anywhere from several times a day to several times an hour, depending on the type of work. Efficient, cost-effective scheduling involves considering several factors including the number and status of jobs in backlog, how long each job takes, individual machine constraints as to part dimensions, and the time it takes to set up the machinery for a particular job. FAIS selects the next job to be manufactured, which frees the foreman from that decision.

The system has a database of machine tools and manufactured parts that it uses, in addition to the user consultation, to determine which part should be manufactured on which machine. The system provides information on whether jobs can be run sequentially to save setup time, and it accommodates different priorities.

In addition to faster, more efficient scheduling, FAIS has reduced the number of backlogged jobs and freed the foremen for more important tasks.

Auditor's Assistant is used by Chemical Bank of New York in their \$750-billion foreign exchange trading department to monitor trading patterns for any irregularities that could indicate embezzlement or kickbacks.

The early system was developed for American dollars and pounds sterling only. Because of its implementation as an expert system, it was easily expanded to include German deutsche marks and Japanese yen.

Citibank is using an expert system to aid in the disbursement of approximately 250,000 pension checks each month. The 100-rule expert system helps support Citibank's Disbursement On-line System (DOLS) by adjusting state and federal withholding taxes on customer pension funds.

Development became necessary in 1986 when California passed new legislation requiring mandatory withholding of state income tax from pension funds. Prior to this, state tax withholding had been a voluntary process with pensioners electing a specified amount to be withheld.



Expert systems can provide intelligent database access and analysis for improved scheduling and planning.

In order to update the system to allow for the possibility that other states might follow California's lead and pass similar legislation, it was necessary to create an expert system in which the knowledge base would remain separate from the rest of the program. Citibank officials say this would not be possible using conventional programming techniques.

The U.S. Securities Exchange Commission is using a system known as Financial Statement Advisor (FSA) to capture information embedded in the financial statements that companies file with the SEC. These statements are stored electronically in another SEC system.

Because individual companies use a variety of formats and wording, SEC has always reviewed these statements manually. Now, FSA can electronically extract the wealth of information in the files and perform automated numerical analysis of standard financial ratios. Once these ratios are calculated, the system can highlight companies that stand out because of higher or lower average, unusual balances, or missing information. The system uses object-oriented programming and natural language processing techniques.

Warehouse Expert Diagnosis Systems (WEDS) is an expert system designed to assist salespeople in evaluating a restaurant's cleaning and sanitation requirements. A subsidiary of S.C. Johnson Wax uses the system to assess a restaurant's cleaning problem and offer the correct machine and chemical solution.

WEDS functions as a training aid to help familiarize salespeople, who may have little or no knowledge of restaurant cleaning requirements, with the problems involved in evaluating any restaurant sanitization problem. This has allowed the

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company to begin selling restaurant cleaning products in new markets.

Packaging Advisor helps users design plastic containers and then select the most cost-effective resins for their production. DuPont created this expert system to simplify the task of analyzing and designing food containers and provide information on all available resins. DuPont provided Packaging Advisor to its potential customers, allowing packaging designers to create container specifications more quickly than before. In this way, DuPont was able to develop a customer base quickly and establish itself as a leader in resin technology.

According to Expert System Strategies, DuPont now has acquired some 30 percent of the U.S. resin market and attributes much of this success to Packaging Advisor.

Through the implementation of expert and knowledge-based systems, artificial intelligence has contributed to business by improving the efficiency of some traditional processing systems and services, by simplifying access to information, and enhancing decision support.

Expert systems increasingly are being used to solve management problems. They can predict effectively the outcome of decisions that depend on the manipulation and analysis of large amounts of data. In the process, management has found that

the time saved in automating various administrative tasks is paying off in the areas of better production planning, marketing and forecasting, increased employee productivity and company-wide dissemination of knowledge.

KBS technology transcends application size, with significant successes reported in small, midrange and large systems. With the tools available today, applications can be developed quickly and effectively so that the management of expertise and knowledge is available to all organizations.—*Ross Hopmans is general manager at Brant Computer Services Ltd. Ontario, Canada.*

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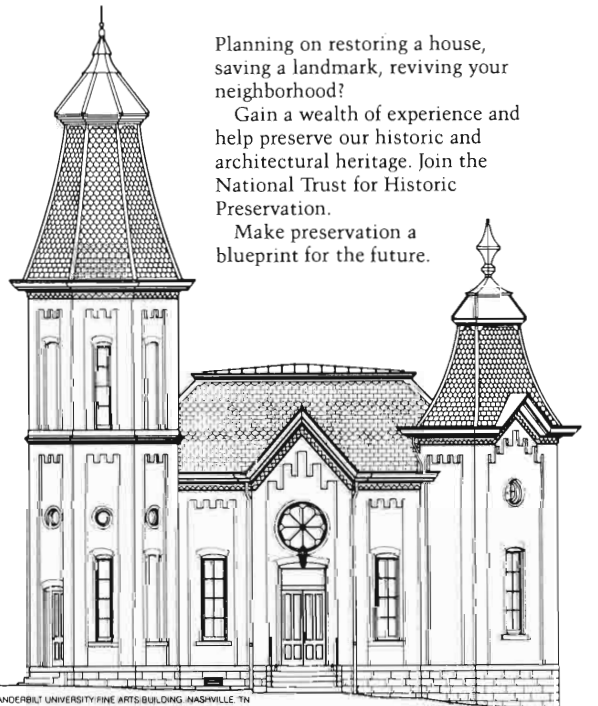
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CIRCLE 109 ON READER CARD

# OOOP

## WITHOUT Objects

Understand The Philosophy Behind The Fad

Object-oriented programming (OOP), like many other innovations in the computer field, has suffered from passing through a fad phase. Artificial Intelligence and Computer Aided Software Engineering were both supposed to revolutionize the programming profession, too. Although good things have come from AI and CASE, they came after the furor died down. It may be too early to talk about OOP without hype, but I'll try.

It has been said that it's possible to write bad programs in any language, it's just easier to write good programs in some languages. *Figure 1* illustrates this point with respect to structured programming (another paradigm that was going to save the programming world).

The listing on the left shows a simple IF/THEN/ELSE structure in FORTRAN/77. The listing on the right shows the same logic implemented in FORTRAN/IV. FORTRAN/IV lacked the THEN and ELSE keywords that added "structure" to conditional execution, but it was still possible to write readable, structured code if one exercised discipline in using GOTOs and indentation.

One of the important things to realize about OOP is that it's as much philosophy as technology. Just as knowledge of structured techniques and dis-

cipline in coding could produce structured Fortran/IV (or even assembler) programs, discipline and a knowledge of OOP philosophy can allow you to write better programs in any current-generation language without waiting for your vendors to add OOP extensions to their compilers.

### The Status Quo

GENERATION AGO, APPLICATION programs were file-oriented and application programmers had to have intimate knowledge of the structure of files, indexes, etc., and complex systems of semaphores were needed for two or more programs to use the same files. Today's application programs are generally database-oriented with the details of file management and shared access largely off-loaded from the application into a database management system (DBMS). *Figure 2* shows a very simple database-oriented program (DBOP) that's used to access an Image/1000-II database. (The schema for the database is shown in *Figure 3*.)

If you look at the DBOP example closely, especially if you have any knowledge of Image, you'll notice that the programmer had to have an intimate

[ BY CHRISTOPHER NELSON ]



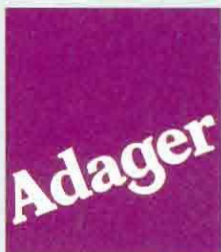
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knowledge of the structure of the data and data access method. For example, he had to know the names of datasets and had to specify a shared read/write mode to allow other programs to access the database at the same time.

Although I wouldn't question the power of database technology, this level of detail in the main program makes the application fragile (i.e., susceptible to changes in the underlying database) and difficult to maintain. Relational database technology partially addresses these problems but does so mostly with respect to the structure of the data. In other words, an RDB-oriented program is less reliant on the details of the underlying data storage, but it's closely tied to the data access method, namely relational operations.

### Get The Facts

**M**ODERN DATABASE-ORIENTED programs treat a database as a passive lump of bits and bytes that must be acted upon. As mentioned earlier, this means that the application programmer must know the structure of the data in some detail. Object-oriented programming philosophy holds that application programmers should not know the details. To accomplish this, OOP calls for data structures and data access methods to be closely linked. Generally, the same programmer or team of programmers should maintain the data and access methods in parallel. If the methods don't change, radical changes in the data structure are transparent to application programmers who access the data. There are other aspects of OOP, such as inheritance, instantiation, and reuse of code, but they generally require support in the language or development environment and will not be discussed here.

Figure 4 shows an object-oriented version of the DBOP example. Instead of accessing an Image database directly, it uses

FIGURE 1

<pre>PROGRAM Struct LOGICAL *2 Flag Flag = .TRUE. IF (Flag) THEN     ! IF clause ELSE     ! ELSE clause ENDIF STOP END</pre>	<pre>PROGRAM Struct LOGICAL *2 Flag Flag = .TRUE. IF (.NOT. FLAG) GOTO 10     ! IF clause GOTO 20 10 CONTINUE     ! ELSE clause 20 CONTINUE STOP END</pre>
--	--

Structure, with and without help.

an abstract "name database" (ndb), which has various methods (Init, Done, Exists, GetLastError and GetAge). The overall logical structure of the OOP version is much like the DBOP program, but several differences need to be clarified.

Perhaps the most obvious difference between the OOP and DBOP examples is length: The OOP version is at least 40 percent shorter than the database-oriented program. This results, in part, from not having to deal with the details of Image calls but also from being able to use more natural CHARACTER representation of strings rather than the INTEGER buffers required by Image. Whatever the reason, a shorter program is easier to write and easier to maintain.

More important than length, but somewhat less obvious, is

FIGURE 2

```
PROGRAM DBOP ! Data-base oriented program
IMPLICIT NONE

INTEGER *2 DataBase(32), Level(3), Status(10), IRetVal(5), Mode
INTEGER *2 Junk

INTEGER *2 IVal(5)
CHARACTER *10 CVal
EQUIVALENCE(IVal, CVal)

INTEGER *2 IDataSet(3)
CHARACTER *6 CDataSet
EQUIVALENCE(IDataSet, CDataSet)

DATA DataBase/ 'SAMPLE',/,Level/'MGR ' /

Mode = 1 ! Shared read/write
CALL DBOPn(DataBase,Level,Mode,Status)
IF (Status(1) .NE. 0) THEN
    WRITE(1,*) 'DBOPn error ',Status(1)
    GOTO 9999 !-> STOP
ENDIF

CDataSet = 'NAMES'
CVal = 'Chris'
Mode = 7 ! Keyed read
CALL DBGet(DataBase,IDataSet,Mode,Status,3hAGE,IRetVal,IVal)
IF (Status(1) .NE. 0) THEN
    WRITE(1,*) 'DBGet error ',Status(1)
ELSE
    WRITE(1,*) 'Age(',CVal,') is ',IRetVal(1)
ENDIF

Junk = 1
Mode = 1 ! Close database
CALL DBCls(DataBase,Junk,Mode,Status)
IF (Status(1) .NE. 0) THEN
    WRITE(1,*) 'DBCls error ',Status(1)
ENDIF

9999 CONTINUE
STOP
END
```

Database Oriented Program (DBOP).



the abstraction of the data access method. There are *no* Image-dependent calls in the OOP version. You can't tell from the listing if the data is stored in a file, a hierarchical database, or a relational database. It might even be keyed in by a user at another terminal.

Finally, there's the abstraction of data. It seems questionable to store an age in the database, because ages change. It might be better to store date of birth and compute age

on request. The way OOP is structured, it would be easy to change the database field from AGE to BIRTHDATE and change GetAge to ComputeAge rather than return a database field, all without affecting the application program.

Of course, there's no such thing as a free lunch. *Figure 5* shows the library of methods that had to be written to provide data abstraction to the main program. Even this simple example requires nearly two pages of support code. However, this code growth is misleading precisely because the example is so simple. If the OOP example, instead of being a simple program, were one of several, large, complex applications that accessed a database, putting all of the access details in one place (the data abstraction library) would likely yield an overall reduction in code. And, again, the applications would be more robust and easier to maintain.

One last note about abstraction: Access routines can make

FIGURE 3

```

$CONTROL:ROOT,LIST,FIELD,TABLE;
BEGIN DATA BASE:SAMPLE;
LEVELS:
  1 OPER;
  15 MGR;
ITEMS:
  Name, X10 (1,15);
  Age, I1 (1,15);
SETS:
  NAME: NAMES,M;
  ENTRY: Name(0),Age;
  CAPACITY: 97;
END.
    
```

SAMPLE schema.

Perhaps the most obvious difference between the OOP and DBOP examples is length:

The OOP version is at least 40 percent shorter than the database-oriented program.

up for deficiencies or eccentricities in software or language implementations. The first example, DBOP, has to include a lot of code to pack and unpack the INTEGER buffers used to communicate with Image. At best, this is tedious; at worst, it's a potential source of error. With the access routines, a much more natural interface is provided.

Also, if the DBOP program were larger, divided into subrou-

tines and functions, the application programmer would have to either pass the database buffer, etc., to all the relevant routines, or would have to put those variables in a COMMON block. The first solution leads to complexity. The second is a common source of error. By moving this burden of communication to the access library, the problem only has to be solved once, no matter how many applications use the database access routines.

Object-oriented programming shouldn't be perceived as a

FIGURE 4

```

PROGRAM OOP ! Object-oriented program
IMPLICIT NONE

LOGICAL *2 ndb_Init, ndb_Done, ndb_Exists
INTEGER *2 ndb_GetLastError, ndb_GetAge

IF (.NOT. ndb_Init('SAMPLE')) THEN
  WRITE(1,*) 'Initialization error ',ndb_GetLastError()
  GOTO 9999 !-> STOP
ENDIF

IF (ndb_Exists('Chris')) THEN
  WRITE(1,*) 'Chris' age is ',ndb_GetAge('Chris')
ELSE
  WRITE(1,*) 'Chris is not in the names database.'
ENDIF

IF (.NOT. ndb_Done()) THEN
  WRITE(1,*) 'Done error ',ndb_GetLastError()
ENDIF

9999 CONTINUE
STOP
END
    
```

Object-Oriented Program (OOP).

FIGURE

5A

```

LOGICAL*2 FUNCTION ndb_Init(dbname)
IMPLICIT NONE

$INCLUDE OOPLB.INC
CHARACTER*6 dbname
INTEGER*2 I

INTEGER*2 TrimLen

INTEGER*2 Idb(32)
CHARACTER*64 Cdb
EQUIVALENCE (Idb,Cdb)

Cdb = ' '//dbname(1:TrimLen(dbname))//';
DO I = 1, 32
    Database(I) = Idb(I)
ENDDO

Level(1) = 2hMG
Level(2) = 2hR ! 'r'
Level(3) = 2h ! ' '
Mode = 1 ! Shared read/write

CALL DBOpn(Database,Level,Mode,Status)
IF (Status(1) .EQ. 0) THEN
    ndb_init = .TRUE.
ELSE
    ndb_init = .FALSE.
ENDIF
RETURN
END ! ndb_Init

LOGICAL*2 FUNCTION ndb_Done()
$INCLUDE OOPLB.INC
CALL DBCls(Database,1,1,Status)
IF (Status(1) .EQ. 0) THEN
    ndb_Done = .TRUE.
ELSE
    ndb_Done = .FALSE.
ENDIF
RETURN
END ! ndb_Done

INTEGER*2 FUNCTION ndb_GetLastError()
$INCLUDE OOPLB.INC
ndb_GetLastError = Status(1)
RETURN
END

LOGICAL*2 FUNCTION ndb_Exists(Name)
$INCLUDE OOPLB.INC
CHARACTER*(*) Name

INTEGER*2 IKey(5)
CHARACTER*10 CKey
EQUIVALENCE (IKey,CKey)

INTEGER*2 IDataSet(3)
CHARACTER*6 CDataSet
EQUIVALENCE (IDataSet,CDataSet)

CDataSet = 'NAMES'
CKey = Name
Mode = 7 ! Keyed read
CALL DBGet(Database,IDataSet,Mode,Status,3hAGE,IRetVal,IKey)
IF (Status(1) .EQ. 0) THEN
    ndb_Exists = .TRUE.
ELSE
    ndb_Exists = .FALSE.
ENDIF
RETURN
END ! ndb_Exists

INTEGER*2 FUNCTION ndb_GetAge(Name)
$INCLUDE OOPLB.INC
CHARACTER*(*) Name
LOGICAL*2 ndb_Exists

IF (ndb_Exists(Name)) THEN
    ndb_GetAge = IRetVal(1)
ELSE
    ndb_GetAge = 0
ENDIF
RETURN
END
    
```

*OOP Library Source.*

FIGURE

5B

```

INTEGER*2 DataBase(32), Level(3), Status(10), IRetVal(5), Mode
COMMON /ndb/ Database, Level, Status, IRetVal, Mode
    
```

*OOP Library Include file.*

can, however, get lost in hyperbole.

To get the maximum productivity out of OOP today, keep this in mind: When writing a new application, never access data items directly (if necessary, write your own library of mini-access routines), and when writing a new subsystem, always provide access routines to isolate application programmers from the details of your implementation. With a little practice, access routines will soon be as natural to you as IF/THEN/ELSE statements.—*Christopher Nelson is the president of S/Wizardry, Ltd., a computer consulting and software development company in Troy, NY.*

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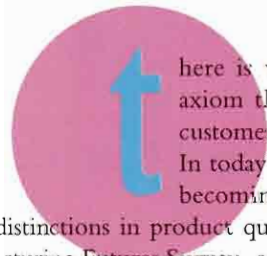
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# The Tie That Binds

[ By William Walker ]



here is wisdom, if not truth, in the axiom that it's easier to keep an old customer than it is to find a new one. In today's market, customer service is becoming an important differentiator,

gaining in strategic value as distinctions in product quality, price and features fade. The North American Manufacturing Futures Survey, conducted by the Boston University School of Management, recently found that service is second only to speed of delivery as a top concern for managers of manufacturing operations.

Customer service used to be limited to fixing a product that had stopped working. But now, economic pressures are causing companies to revamp their service and support. Customers expect value-added service throughout the entire product life cycle: from initial purchase to full use to eventual replacement. Many manufacturers use information technology to engineer and implement competitive customer service strategies.

In fact, as manufacturers move to improve customer satisfaction, information technology is being leveraged in increasingly innovative ways to ensure quality response to individual customer needs. One guaranteed way to improve your company's customer service is to identify with your customers and see things from their perspective.





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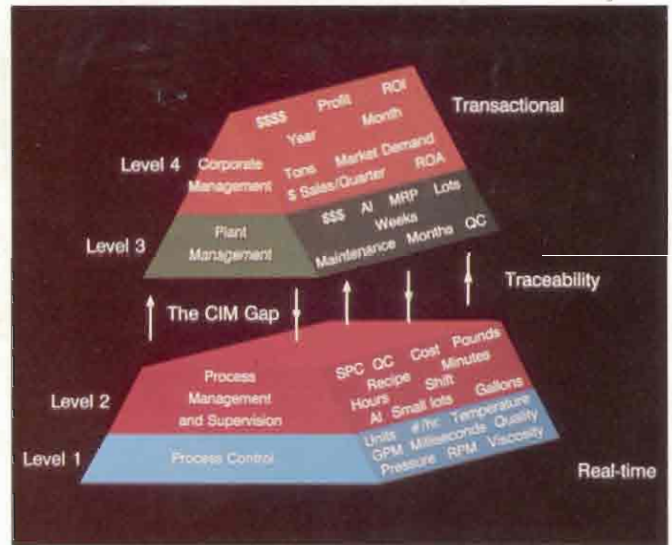
Creative technology solutions can enable you to provide customers with timely information, to deliver a product exactly when the customer needs it, or to link customers directly to your operation, allowing for closer cooperation and increased productivity. But implementing these customer support solutions depends on your ability to bridge the CIM gap—the gap between the factory floor and the corporate departments that provide product planning and customer service.

### Efficient Order Management

**T**HE ROOFING PRODUCT OPERATING Division (RPOD) of Owens Corning Fiberglas manufactures flat shingles for residential applications and commercial roofing systems for large-scale projects. With 22 manufacturing plants throughout the country, quick response to customer orders is imperative.

In the past, when a customer placed an order, customer service representatives could only record order information. No information was immediately available to the customer as to availability of goods or possible delivery dates. The best that a representative could do was promise to get back to the customer — usually several hours later.

The representative then had to manually research current inventory status, production capability, and shipment and carrier data. What's more, after a delivery date had been promised, if a customer called back to inquire further about the order, the entire manual process had to be repeated.



*The CIM Gap lies between the data acquisition devices and computers on the shop floor and the plant-wide functions further up the corporate hierarchy.*

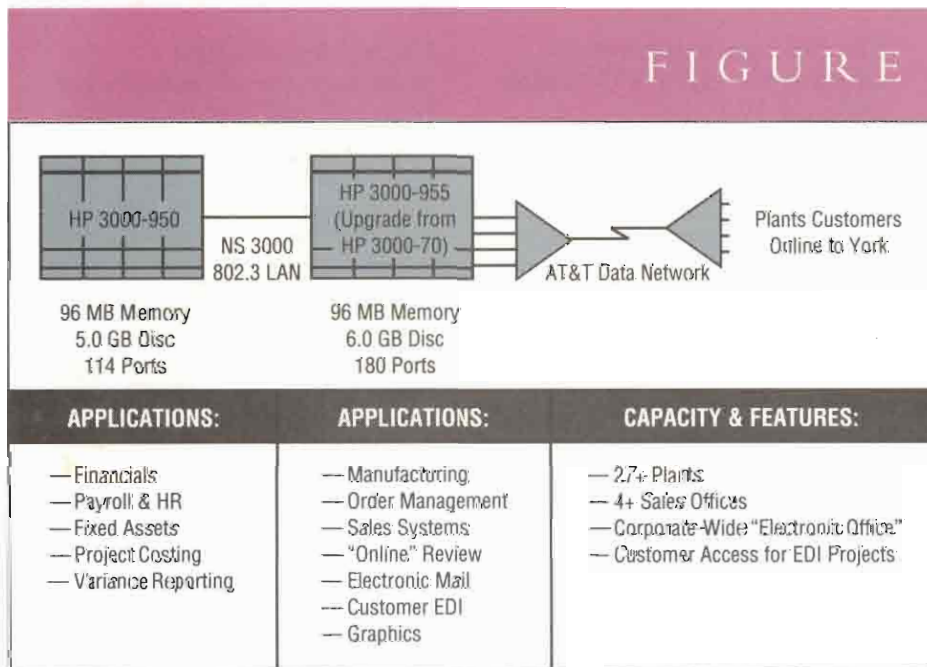
“Our goal is to get customers the right product, on time, and make it easy for them to order it,” says Warren Knowlton, vice president of industrial material sales. “To do that we had to provide our people with the capability to access good, reliable information as quickly as possible.”

To achieve this, RPOD decided to completely revamp its order entry process. It elected to implement an integrated information system that tied manufacturing and distribution

operations into one unified network. The backbone of the new system is a distributed network of 22 HP 3000 Series 922LX mini-computers.

“Our objective was to establish a reliable communications network between each of the 22 plants and the corporate office,” says Knowlton. “We also wanted to give our people the ability to access data easily. We wanted full system integration in order to eliminate redundant efforts. And, we wanted to get away from manual record keeping altogether.”

These objectives were achieved by distributed linkage between the HP mini-



*Sonoco Graham Company - MIS Plan.*



computers at each plant site and the company's main frame in Toledo, OH. Inventory data for each plant now is stored centrally, but can be accessed by each of the HP 3000s. HP's LU6.2 API/XL program-to-program application interface enables users to perform program-to-program transfers between the minis and the mainframe. Thus, customer service reps have open access to real-time information with which to answer customer questions.

"When you're trying to promise orders 5-to-7 days out, you need information that will let you predict the future," says Knowlton. "You need to know what you have on hand, what you can produce, and when you can ship it. Now, we can do all that online in a matter of minutes."

When an order is recorded, it's automatically placed on one of the RPOD plants' open order backlogs. Inventory data also is updated automatically on the corporate mainframe to prevent inventory from being assigned to any other order.

The system is fully integrated, from order entry and processing through planning and scheduling to MRP and purchasing, and its all tied and driven by the same database. Information in the system is always current, no matter where it resides.

### Getting It There JIT

**A**NOTHER CREATIVE TECHNOLOGY solution to a customer service problem recently was implemented by Sonoco Graham Co. (York, PA). Sonoco Graham is an industry leader in the design and manufacture of plastic packaging for consumer products. It currently operates 27 manufacturing plants nationwide and furnishes containers for such products as Hershey's syrup, Tropicana orange juice, Wisk detergent, and Quaker State oil. Historically, Sonoco Graham has strongly supported its customers' efforts to implement just-in-time (JIT) production.

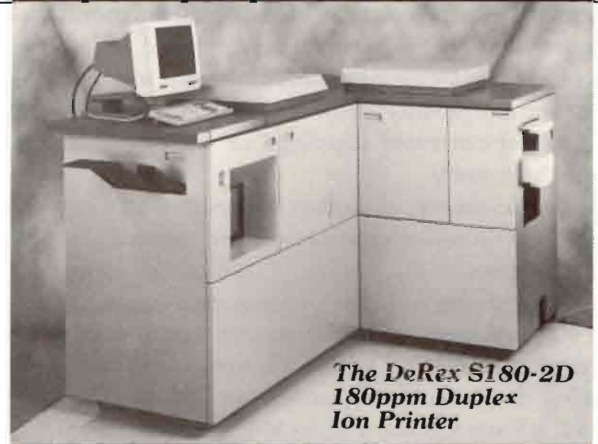
The emphasis in JIT production, of course, is to have "the right part at the right place at the right time." Numerous direct and indirect benefits follow as a result of this, but perhaps the greatest direct advantage derived from JIT is a reduction in inventory costs. However, for manufacturers to reduce their working inventory levels, they require a corresponding increase in service from their suppliers. Delivery schedules of raw materials or component parts must be exact, and suppliers must guarantee that these schedules will be met.

In selecting suppliers for a JIT environment, a dependable delivery schedule can actually be far more important to a customer than the price of the goods delivered. Recognizing that their customers had this unorthodox arrangement of priorities, Sonoco Graham concocted an equally unorthodox solution. Rather than transport its container products to the customer, the company reasoned, why not move production of the products to the customer's facilities?

Today, 13 of its 27 production operations are located on site

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at the customer's plant. The unique design of Sonoco Graham's automated, multistation, blow-molding wheel — which blows and forms the plastic product containers — enables the company to integrate its equipment directly with the customer's filling lines. This degree of proximity and level of integration, makes it possible for the customer's production schedule to serve as the container product "delivery" schedule as well. Thus, Sonoco Graham can avoid shipping "air" — empty bottles — around the country.

As a result, delivery of product is near-instantaneous. Freight, storage, and inventory carrying costs are reduced, thus reducing overall costs for the customer.

In this instance, as in the previous example, the manufacturer supports its solution to customer service with information technology. The 27 Sonoco Graham manufacturing plants, including the 13 on-site operations, are linked to two HP 3000 systems, a Series 955 and a Series 950, at the company's corporate headquarters. According to Sonoco Graham's MIS director, there were absolutely no "communications issues" between the sites and York. In fact, all 27 plants were linked to corporate headquarters in less than five months via AT&T dedicated telephone lines (see *Figure 1*).

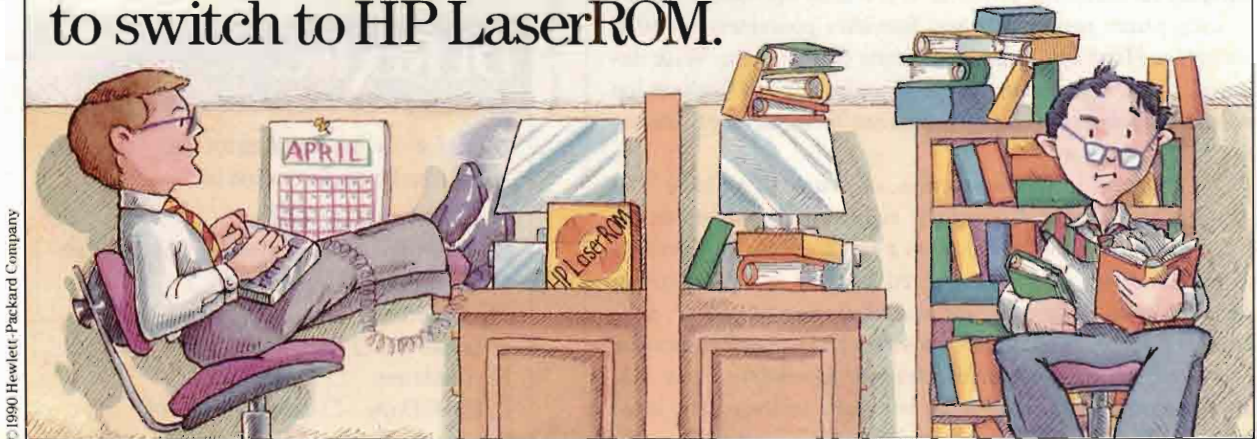
The application software running on the company's Series 955, which is dedicated to manufacturing production manage-

ment, is Materials Management II (MM II), with a JIT submodule, from HP. MM II provides precise information about inventory levels and usage, which can be translated into scheduling operations. When to order, when to ship, how to forecast based on inventory trends — all can be determined via MM II. The JIT submodule facilitates access to MM II; it is especially useful for managing batch processing for repetitive functions. It also offers an improved user interface for MM II, and HP plans to incorporate it into the advanced version, MM/AV.

MM II's flexibility also provides a close software fit to the process manufacturing environment. Some critical functions it supports are: maintenance of bill-of-material structures; management of inventory usage and lot control; and development of costing. Sonoco Graham and its customers now are interfacing to HP Desk for consistent electronic communications, and the company is evaluating the benefits of MM/AV. Currently, about 100 users in the 27 plants and at the corporate office access MM II, each with his own terminal. Users range from vice-presidents to product managers to inventory clerks.

Of course, information technology can aid operations management in a variety of other ways, too. For instance, the high-speed data processing throughput afforded by the HP3000 facilitates electronic data interchange (EDI), which can simplify inventory management and order processing.

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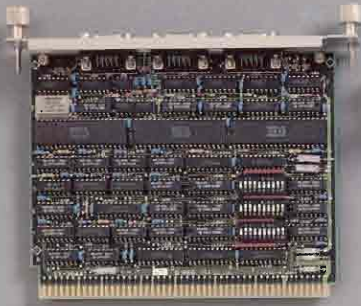


CIRCLE 147 ON READER CARD



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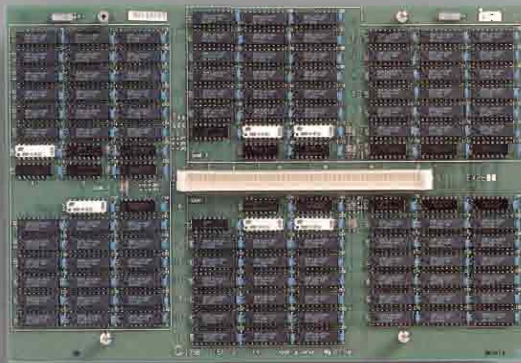
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EX-2245C	4MB			
EX-2304	4MB	350/370	HP98258B	PARITY
EX-2312	12MB		HP98258C	PARITY
EX-2404	4MB	340	HP98268A	PARITY
EX-2501	1MB	332	HP98269A	
EX-2504	4MB		HP98269B	PARITY
EX-2604	4MB		HP98267A	
EX-2608	8MB	360	HP98267B	PARITY
EX-2612	12MB		HP98267C	
EX-2704	4MB	345	HP98229A	ECC
EX-2708	8MB	375/400	HP98229B	ECC

### Interface Card Family

MODEL	DESCRIPTION	HP EQUIVALENT
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CIRCLE 245 ON READER CARD



To capitalize on this capability, Sonoco Graham established an EDI trading partnership with a multinational manufacturer at an adjacent site. Sonoco Graham keeps additional inventory belonging to this trading partner on-site at its own facility. Each day, this company accesses Sonoco Graham's computer to determine how much inventory it has on hand and how much has been used. This arrangement helps the trading partner to better decide when to order more inventory for its own needs.

The EDI software that makes this relationship possible was developed jointly by both companies. Security levels allow the trading partner access only to relevant information from Sonoco Graham's system. Also, because the trading partner is also a user of MM II, the two companies can communicate using the same procedures and protocols.

In addition to high-speed processing, the HP 3000 also offers a "backflush" feature that improves transaction processing for manufacturers. Backflush is an HP-defined system transaction used to update inventory records. It permits material to be

issued according to a production schedule but, if you choose, records the transaction after the process is completed, rather than by discrete allocation at each step in the process. By eliminating the need to track material movement (because the rate of material usage, or consumption, is so rapid), backflush simplifies inventory accounting, and it more accurately models how things are done in process manufacturing.

The integration software that links Sonoco Graham's manufacturing operations with other critical corporate systems is dependent upon the customization technology imbedded directly in MM II. HP's customization features are designed to facilitate integration with a client's own order management or shipping and receiving systems, as well as with HP Financial Management software. Thus, the MIS staff can integrate inventory and accounting information effectively.

The information loop from orders to production to financial accounting provides company management with a "window" through which to view production performance at any

## [ TECHNOLOGY AND SOCIOLOGY: TWIN PILLARS OF CUSTOMER RESPONSIVENESS ]

In the last three years the American consumer has become more vocal in his demand for better quality products at affordable prices — in short, more demanding of better value.

Two pillars support this change in consciousness; one is technological, the other is sociological. The former is driven by relentless advances in computing technologies; the latter stems from notions of empowerment among the workforce.

Real-time access to information is the linchpin around which customer responsiveness has become a rallying cry at many Fortune 500 companies, especially (and understandably) those in the service sector. Leaders in this effort include the following: American Airlines' Sabre System, Federal Express, J.C. Penney and Nordstrom. A few leaders in the manufacturing sector include HP, Honeywell, Merck, Milliken and 3M. Thousands of lesser companies serve as microcosms of the newfound emphasis on responsiveness at these major companies and the companies mentioned in the adjacent article.

Distributed computing, and the coming predominance of open systems, based upon standards, is the driving force behind more timely access to information at these companies. Its realization depends upon a host of computing, networking, and telecommunications resources, including: notepad computers, toll-free 800 numbers, a proliferation of desktop PCs on LANs, smart terminals, high-end minicomputers, and e-mail and v-mail systems.

Consequently, for example, J.C. Penney is able to deliver via UPS to anywhere in the U.S. within 48 hours; and Federal Express, routing through its hub in Memphis, is able to deliver anywhere in the U.S. overnight — and give the exact location of shipments en route, as well. Enterprise-wide integration is the goal at all companies, regardless of their respective product lines, that want to achieve this level of responsiveness.

John Young, CEO and president of HP, has said, "The impediments to America's productivity aren't technological; they're sociological."

The sociology of the American workforce for too long has been an adversarial relationship between the production workers and management. This has aggravated a divorce in which notions of ownership among the workforce — such as a say in the tactics and strategy of the parent company — were nonexistent in the business-as-usual mindset of upper management.

This mindset, often fostered by book-learned arbitrageurs and financial analysts from the nation's business schools, has led in recent years to a frenzied mergers-and-acquisitions industry, leveraged buy outs, and a deliberate churning of the business portfolios of otherwise solid companies. The results? Massive layoffs, calls for Congressional investigations and the consolidation of strong companies into weak conglomerates.

Consequently, workers have felt little concern for lagging productivity. U.S. productivity levels in the 70s and 80s failed to offset cheaper offshore labor and a dramatic rise in imports. In the service sector especially, whose lifeblood is customer responsiveness, annual increases in productivity seldom exceeded two or at best three percent.

Now, of course, productivity is recognized as being inextricably linked to customer responsiveness. To succeed in a global manufacturing economy, all of a company's departments must pull together: engineering, manufacturing, marketing, service, human resources, and administration. It's clear that the pendulum has swung back to hands-on, management-by-walking-around practices that pull workers and management together to reach their common goal: productivity.



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CIRCLE 148 ON READER CARD

Clearly, there are  
no short cuts to quality  
customer service.  
It requires both  
commitment and vision.

plant in the entire distributed operation. This capability enables management to make sound business decisions based on accurate, real-time information.

Highly-integrated solutions, such as Sonoco Graham's, allow manufacturers to monitor data on far-flung, divergent operations in terms of market, customer, region, product or plant. At the same time, the automation of data collection inherent in such a system saves clerical data processing time and ensures accuracy of information.

### Fine Tuning Distribution

**F**OR MOST MANUFACTURERS AND SUPPLIERS, efficient distribution is crucial to customer satisfaction. American Cyanamid's Agricultural Group (Wayne, NJ) is known as a supplier of agricultural products. Its efforts are focused in three primary areas: crop protection chemicals, animal nutrition and health, and vegetation and pest control management.

In 1987, the company's Agricultural Division launched a move to realign its U.S. distribution network. Wanting to secure brand loyalty with its prime customer — the American farmer — it decided to expand its existing network of 30 centralized distributors. To do this, it decided to create 200 AgriCenter dealers to work with and sell directly to farmers.

The company's main concern in its effort was how its six largest distributors would respond. Another critical issue was whether the company's production capability could efficiently support increased market penetration.

Manufacturing management understood the role production had to play and implemented an integrated information system for manufacturing planning and control. Like the implementations described in the previous example, this system employed HP 3000s, as well as HP Desk and MM II. But, here, the primary goal in installing MM II was not to monitor inventory or streamline production, but rather to support the market growth of products as a new distribution network began to come online.

American Cyanamid needed an online distribution network for two reasons. First, the company's product recipes, which are complex and subject to governmental regulations, were forwarded to its processing plant in Hannibal, MO by way of its corporate headquarters in Wayne, NJ. This routing created a lot of unnecessary paperwork and increased the time it took to process the recipes, which in turn increased the potential for error. Giving each office access to the information via MM II simplified the routing process.

Second, American Cyanamid is involved in a seasonal business, selling 60 percent of its products between March and May. During the peak selling cycle, timely reporting on production is critical. Even a half-day response is too long. It was crucial to have an information system that could give timely reports on the status of production.

The technical ingredients for the Agricultural Division's diverse product line are primarily produced at its Hannibal, MO plant. American Cyanamid relies on numerous product "formulators" to mix and package the array of finished goods that carry its label. Inducing these contract formulators to establish true online linkages to the Hannibal plant via MM II was essential to the company's distribution strategy.

Once the users completed the new system implementation, it soon became clear that they were satisfied by the change. Support calls to central MIS — previously a common occurrence — dropped off almost to zero. MIS was forced to be content with calling the users in the field if it wanted to find out how things were going. The system was flexible, yet exacting, and it simplified numerous tasks. The backflush feature alone reduced 17 steps to one, effectively reducing the time it took to report production from three days to one.

Management and users were pleased. They found the reporting features in the system helpful for making timely, informed decisions. Efficiency, trends, possible trouble spots — all could be noted and highlighted by the system's reporting features.

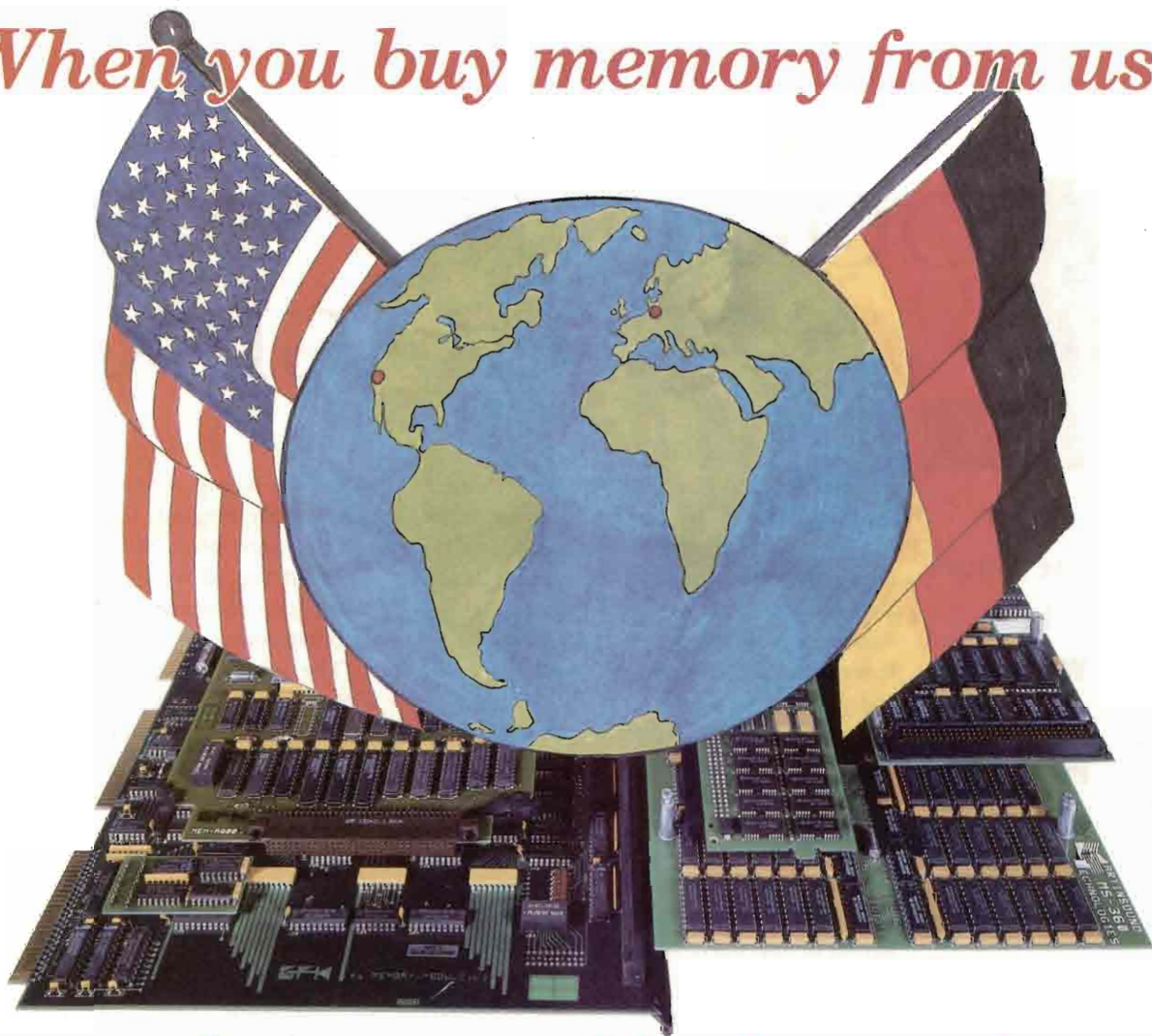
Manufacturers are increasingly willing to recognize the long-term market value of customer service. Without it, the most sophisticated, factory-of-the-future is little more than an exercise in futility. And many leading-edge manufacturers are applying state-of-the-art information technology to assure that customer satisfaction is more than simple sloganeering.

However, the transition to a customer service orientation is not always easy. For some manufacturers, improving service is simply a matter of shifting emphasis. For others, significant cultural change is required to alter the way the company operates. Clearly, there are no short cuts to quality customer service. It requires both commitment and vision.— *William Walker is manager of Process Industries Programs at Hewlett-Packard's Manufacturing Industries Center, Cupertino, CA.*

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**CIRCLE 130 ON READER CARD**

# LOOK OUT FOR IMAGING

## The Future Is In Words And Pictures

For the first time in perhaps two decades, a revolutionary new technology has come to the marketplace — it's called *imaging*. It provides the ability to present, store and retrieve data in a mixed textual and graphical format. This is a considerable departure from conventional mainframe applications that work with numerical and character data. And, it's different from most PC applications in that it stores and retrieves graphics as data rather than simple named files.

Imaging technology combines the useability of the PC (or workstation) with the database and production control of corporate mainframe systems. It has the potential to provide the greatest step forward in computing since the advent of interactive computing itself.

What is imaging technology? It's normally considered to have at least two and, ultimately, three components. First there's a backend database capability to organize and store a combination of conventional and graphical data. This database must be keyword indexable. Several new peripherals are used to store and maintain this database: optical storage devices, which allow for storage of very large quantities of data; scanners and optical character recognition (OCR) devices, which turn hardcopy images into binary forms; and network interfaces created specifically for the transfer of graphical images. The second component is the ability to display graphical images and character data concurrently on a screen. PC windowing technology is very useful for this in that it allows the concurrent display of any number of images. The third and final component is application software, which manages the information.

In its simplest form, an imaging application is an automated filing cabinet. Information that might have been stored as hard copy now is stored as computerized images. No rekeying, or translation of the original input media takes

place; the computerized image is an exact copy of the original, including handwriting and fine print. Next, these images can be keyword indexed, allowing retrieval of information based upon content, rather than by file name or classification.

The immediate advantages are two-fold. First, there is a dramatic decrease in office space requirements, since computerized storage is considerably more space-efficient than filing cabinets. Second, there's an even more dramatic improvement in efficiency; documents can be retrieved in a fraction of the time using a fraction of the labor that they used to require. What's more, documents are *never* lost.

Today, imaging technology thrives in a set of niche markets where its benefits are most obvious. Some examples are insurance claims processing, legal correspondence and medical records. These are paper-intensive businesses where filing costs are highest.

But there's no reason for imaging technology to stay only in niche markets. In fact, the technology is applicable to nearly all interactive business applications. Consider the following possibilities:

- From an inventory inquiry screen for machine parts, a user can retrieve parts based on their description (as well as by part name or number). The user is presented with pictures of the qualifying parts, as well as with written descriptions.

- A personnel screen displays a picture of an employee together with potentially all written information about the employee.

- A credit inquiry screen shows all correspondence received from a customer.

- A sales inquiry screen compares the invoice sent to the customer with the purchase order that the salesperson received from the customer.

- A maintenance management application



## TECHNOLOGY

Larry Kemp



shows the original maintenance documentation for the machine to be serviced. Also, original, hand-written repair orders are presented to show the machine's past service history.

These are traditional applications, seen in a modern light. What is fundamentally different about these implementations versus the traditional approach is that all corporate information, rather than simply numerical data alone, is viewed as useful information. Also, these imaging applications are more intuitive and, therefore, easier to use than conventional methods. People can identify or understand graphic images much more quickly than they can process verbal information.

### Requisite Hardware

It's certainly possible to implement an imaging solution using conventional hardware. Some early systems were implemented along these lines. Unfortunately, imaging applications present problems that conventional applications don't. Images are large, much larger than their character and numerical counterparts. This presents new challenges in the areas of storage, transmission of images across networks, and manipulation of images on screens. Many new devices have been created to meet these needs.

**Optical disks** are a logical choice for large volumes of "online" storage. They are relatively low-cost and long-lasting. Some states even consider documents stored on optical disks to be admissible as evidence in court. As the technology improves and the media drops in price, optical disks could represent the ideal imaging storage solution.

However, optical disks also present new problems. First, their access time is slow. At worst, an optical disk drive could take as long as 20 seconds to access an image. This makes optical disks very useful as an archive media; but somewhat less useful as a primary media. In practice, using a combination of magnetic disks and optical disks seems to be the real solution. Active copies are stored on the magnetic disks, with archive copies left on the optical disks.

Even with the much increased stor-

age capacity of optical disks, there's a need for even more storage. If an impressed image requires an average of 64 KBs to store, then a 2 GB disk can store only 32,000 images. Some companies make devices called *jukeboxes*, which mechanically load and unload optical disk drives from storage. In effect, this multiplies the amount of optical storage accessible at a given time. Jukeboxes also make possible storage servers that can swap files between active and archival media in a manner transparent to the user.

**Networks** are key critical components of imaging applications. With image sizes in the 64 KB range, bandwidth and transmission speed are critical. It's simply not feasible to transmit large volumes of binary images over a 1200 baud dial-up telephone line. Networks provide the hard-wired connections needed for this kind of data transmission.

Image compression can be used to shrink the size of image files that are transmitted around a network. Currently, the compression standard in the imaging industry is CCITT Group 4.

**Workstation and server** technology is used to distribute the workload onto multiple processors, allowing uniform response times and expandability. In the workstation and server configuration, the server only functions as the storage and retrieval device. All graphical manipulation is done on workstations. The process of displaying graphical images, manipulating windows, and responding to a graphical user interface is made possible by dedicating a processor to each user. These highly computational processes could be performed on a host processor, but the overhead would quickly consume the system, even with a small amount of activity.

Modern software allows systems to be developed on workstations, and then implemented on either small, shared host configurations, or in client-server configurations. This allows low-cost development and graduated implementation. This approach has only become feasible since the advent of moderate cost desktop computers that can be used as workstations.

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CIRCLE 267 ON READER CARD

Today, you have a choice of workstation computers. One route is MS-DOS-based PCs using the Intel processors, the other is UNIX-based workstations built upon a variety of processors. Depending on the needs of the application, workstations can be complete systems that include their own storage, or they can be diskless units that rely on network storage. One caution about MS-DOS platforms: client-server applications require significantly more memory than conventional office automation applications, so you might have to adjust your thinking about PC memory size.

**High-resolution monitors** allow multiple images to be displayed concurrently upon a screen while retaining readability. This is particularly important when the documents contain information other than character text. For example, handwriting, engineering drawings and illustrations all require high resolution. High-resolution monitors can be attached to standard workstations (like PCs) in the

place of conventional monitors. Nineteen-inch monitors are becoming the standard. They conveniently allow a full-size vertical display of a letter-size page at 100 dpi.

**Scanners** are devices that translate hardcopy images into binary form. These are commonly called raster images, which means the image is represented as a 2-D series of ones and zeros, a one indicating black and a zero indicating white. Scanners are relatively inexpensive.

**Optical Character Recognition (OCR)** devices analyze scanned images, and translate them into character format. This allows, for instance, a letter to be OCR scanned, and then brought into a word processor for modification. OCR devices also can be used for keyword indexing of a scanned document. They are normally sold in a package deal that includes a scanner.

OCR devices are quite flexible. Some OCR devices allow masking — the ability to exclude parts of a document and

include others. This allows, for instance, the scanning of preprinted forms containing lines, logos, and other non-useful information. Some OCR devices can be “trained” to read different types of fonts.

Unfortunately, OCR devices aren't perfect. They do their best to translate binary sequences into text, but they do make mistakes. They are commonly used with a word processor, where the text is manually scanned for correctness. OCR devices perform best when scanning consistent type fonts. They aren't great at reading handwriting.

### Requisite Software

As with hardware, there have been a number of advances in imaging software, some of which are specific to imaging technology. The approach of imaging applications is to make information accessible by content (or meaning, or description) rather than by names, numbers or the like.

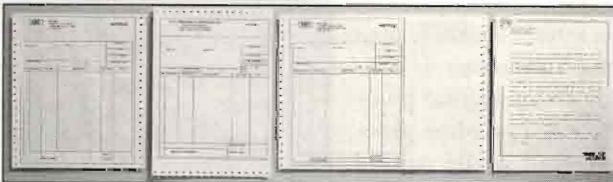
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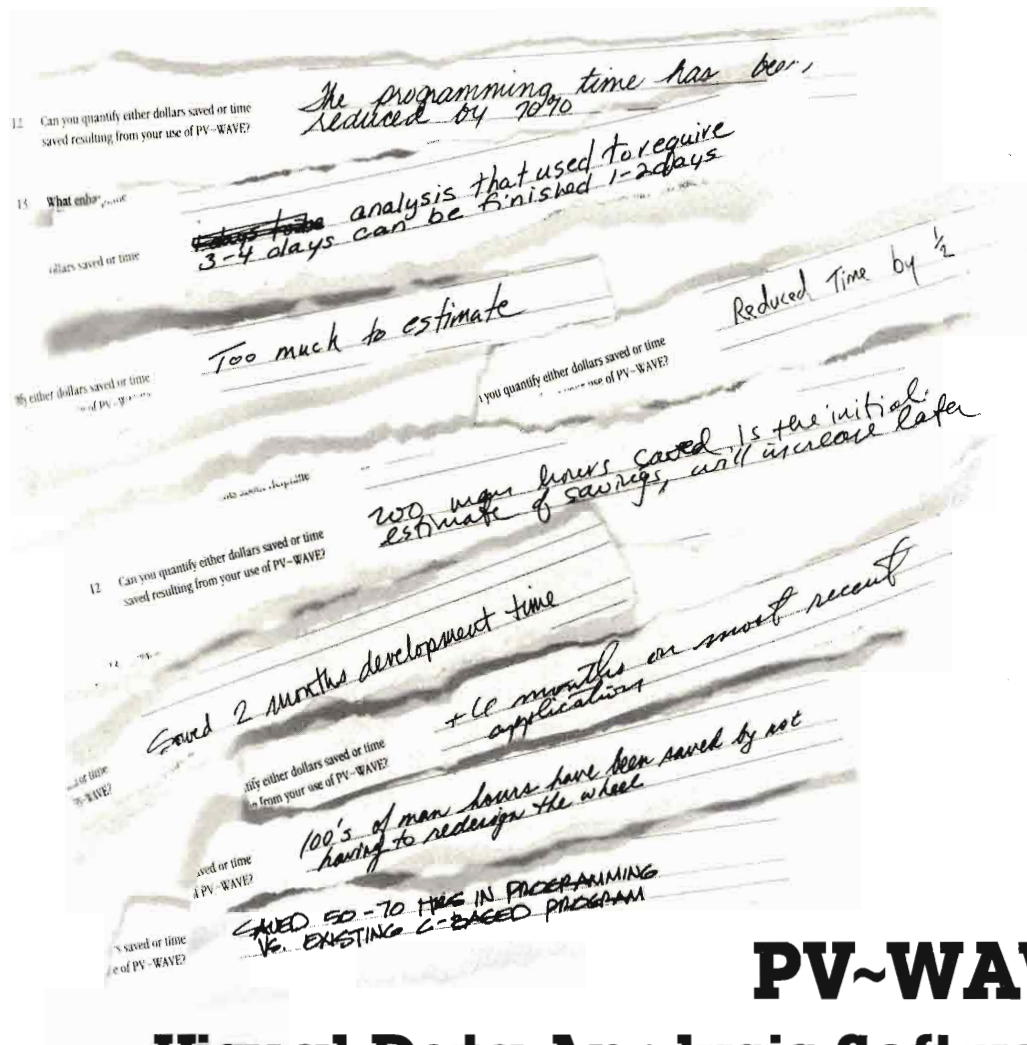
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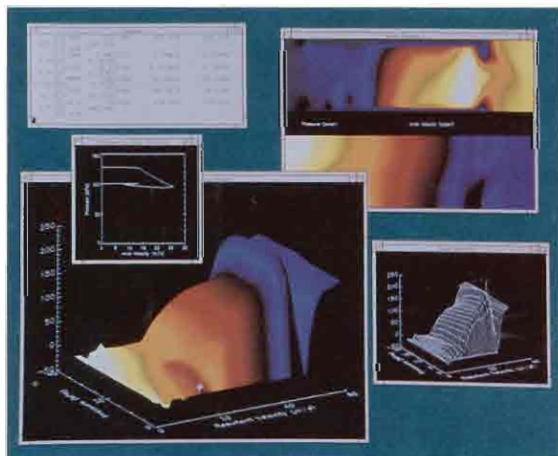
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CIRCLE 169 ON READER CARD

**Systems** (RDBMSs) are commonly used as the core part of imaging software. But relational databases, in their raw form, are not sufficient. Several features must be added specifically for imaging applications.

The **Binary Large Object datatype** (BLOB), defines a field or column to have "large" size. Conventional datatypes, such as character or integer, are intended for use on small and simple entities. Titles or descriptions, for example, occupy relatively small amounts of storage. Graphical images or large text files have very large and undefined sizes. The BLOB datatype was created to handle these formats. BLOBs have an undefined format, and can range up to 2 GBs in size. Some RDBMSs distinguish between textual type BLOBs, which can be keyword indexed; and binary blobs, which contain undefined information.

**Device Specifications** are also a concern. Conventional RDBMS applications use a single form of storage, magnetic disk drive; but imaging applications use both magnetic and optical disk drives. Some RDBMSs allow precise specification of which relational tables, or which columns of which tables, reside on which media. This allows an application to identify tables or columns of tables as either active media on magnetic disk drives or archive data on optical disk drives. Archiving then, simply entails copying data from one table or column to another; refreshing an image or text file requires only a copy from the archive table or column to the active table or column. For example, the following SQL command copies a document from archive to active status:

```
INSERT INTO active (doc-id,doc-text) AS
SELECT (doc-id,doc-text) FROM archive WHERE doc-id = :ws-doc-id
```

**Keyword indexing** is a feature that allows relational columns to be searched for keywords. Keyword indexing involves the building and maintenance of index structures, as well as an addition to the SQL syntax to allow retrieval based upon the existence of keywords. For example, the following command retrieves

all documents containing the word "computer" preceded by the word "programmer":

```
SELECT doc-id,doc-text FROM active
WHERE doc-text CONTAINS 'computer' PRECEDED BY 'programmer'
```

Most RDBMSs include what is called a *stop list*, or a list of commonly used words that shouldn't be used for indexing. For example, the word "the" occurs in practically all documents, so it would make no sense to use it for indexing. Eliminating the commonly used words reduces both storage size and indexing time for imaging applications. Most commonly, the stop list is maintainable by an organization, to allow for addition of application-specific common words. Some systems also implement *stemming algorithms*, which strip words of suffixes and prefixes.

**Windowing software** is an asset to imaging applications. Applications with windowing capability allow users to concurrently access multiple windows for display of text and graphics. One way to achieve windowing is to use MS-Windows or X-Windows directly, but most people would agree that maintaining a large-scale application written at the low level of these facilities is too costly.

More commonly acceptable solutions are **Fourth Generation Languages**, (4GLs) that incorporate windowing and graphic displays as part of their package. Like conventional 4GLs, these languages simplify database access; but they add the simple manipulation of windows and device independent transfer of images from disk format to the display window.

Some products (Windows 4GL from

Plexus, for example) allow designations of graphics files into windows; translation and mapping of the data is built-in to the package. This allows the application developer to concentrate on the functional application logic, rather than programming display logic.

A second advantage of these 4GLs is

that they are built to execute in a client-server environment. They incorporate an RDBMS that has all of the necessary fea-

tures to function as a server. The attached personal computers then run the 4GL programs that retrieve data from the server (or servers). An added benefit of the 4GL configurations is that applications can be developed either on a host or a personal computer, and the production application can be executed either in client-server mode or directly on the host.

## Structures For Building Applications

It would seem that the tools themselves have enough functionality to permit imaging to be added into any conventional application; and certainly, it can be done. There are a certain number of application structures that, once understood and defined, can make the job significantly easier. These structures facilitate ease of inquiry and control of information.

To begin with, all documents are not equal; or more precisely, different documents fulfill different functions. Purchase orders, for example, have different characteristics than blueprints. So, one of the most useful design exercises is the *categorization* of images. This allows segregation of searches, and it also allows different information to be kept, depending upon the types of images stored.

A useful structure for the categorization of images is a *header*. A header is information that's associated with an image or document that's entered *manually*. For instance, a blueprint for a part may have revision information, an author name, and perhaps specification numbers. A purchase order, on the other hand, may have a company name and address, an order and expected delivery date, and so forth. In other words, different document types may have completely different types of headers. The header not only identifies the document, but it can also be used for searching, and general document control.



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Security, for example, can be implemented by placing restrictions on headers. The following example shows the use of an SQL view for restricting access to purchase orders to those placed by the MIS department:

```
CREATE VIEW dept-po AS
SELECT * FROM po WHERE dept='MIS'
```

Headers are best introduced as additional columns in a table that contains the

active image of the document.

Another useful structure is a *Synonym* table. This is a list of "other" names that describe one "official" name. For example, Hewlett-Packard is frequently referred to as "HP," although "Hewlett-Packard" is the official name. In a simplistic system, if a document contains the word "HP" and the user entered a search for "HP," then the document would not be found. Use of a synonym table allows the word "HP" to be translated to "Hewlett-Packard," so that the search succeeds.

### Toward The Future

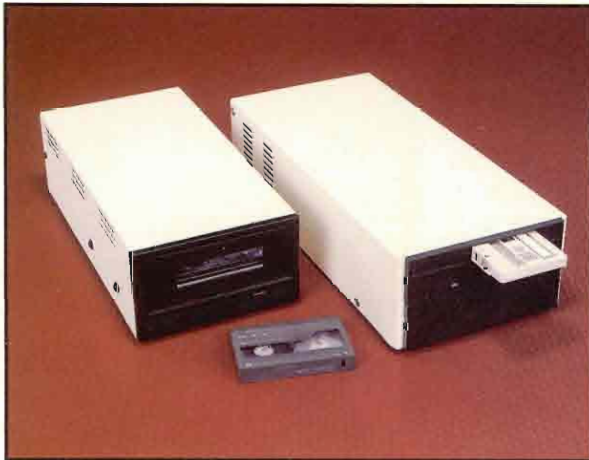
Several studies have indicated that 95 percent of corporate information exists in paper form. In the first place, that says that a lot of physical space is being consumed. But more importantly, most of the useful information is not accessible from our current computer systems. In spite of our fast online processing, proliferating personal computers, and so forth; we are still not addressing some of the basic information needs of organizations.

The cost savings from implementing imaging solutions are enormous. The current imaging outlook makes its cost justifications solely on reducing the labor content of filing and searching. Future cost justifications may be made on more sophisticated metrics.

For instance, circulating images rather than hardcopies of engineering drawings for revision approval can decrease dramatically the time required to get an engineering change to the factory floor. That reduces part reworks, and therefore manufacturing costs. Another case might be financial: Reducing the time to settle invoicing disputes could decrease the time to payment, thereby reducing the receivables time.

The tools exist today. They're neither abstract nor exotic. Designers of new applications should consider the relevancy of imaging. It will play a part in our future.—*Larry Kemp is a systems consultant for Hewlett-Packard in Bellevue, WA.*

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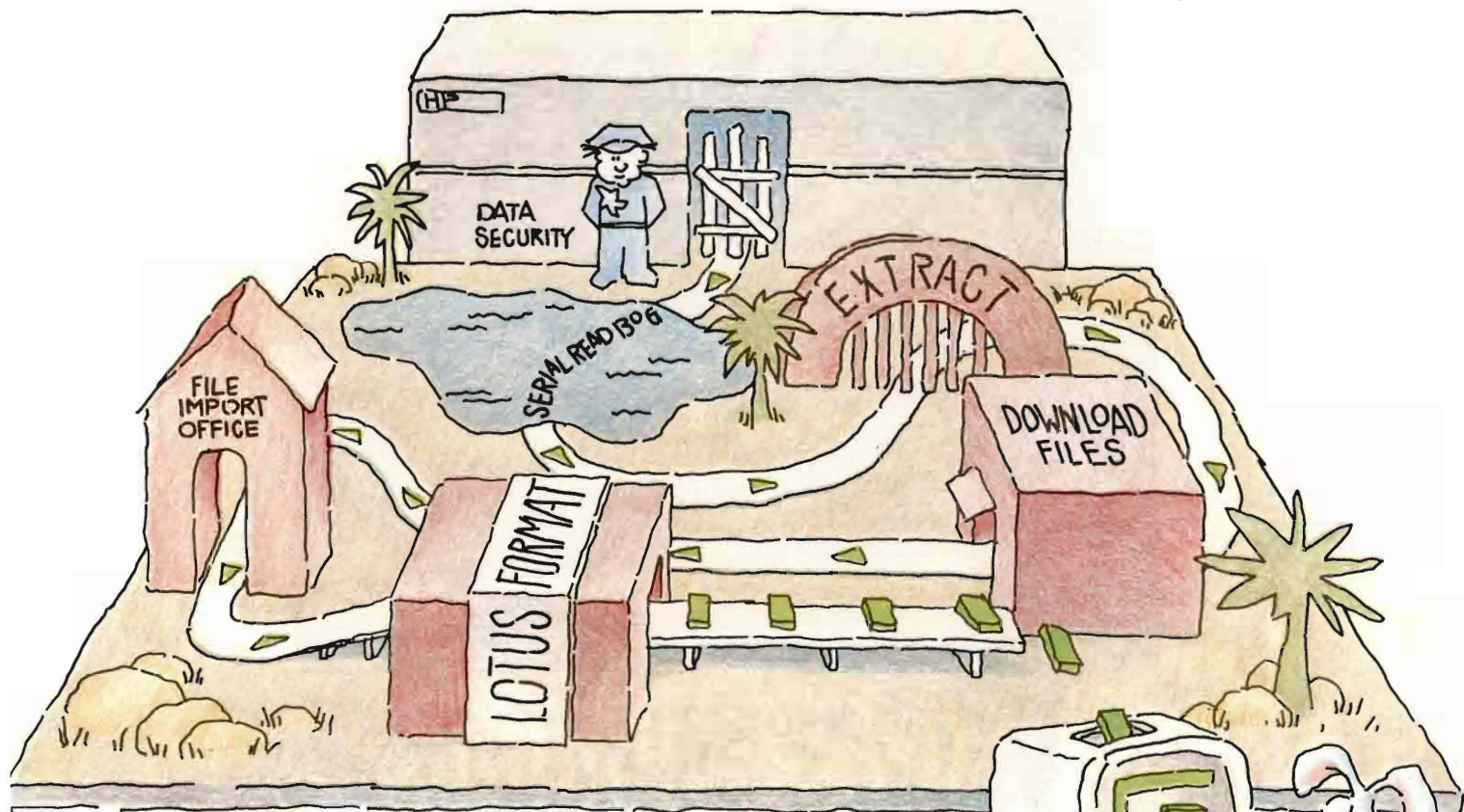
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Lotus users now have to exit the spreadsheet program, log-on to the HP, extract the records of interest (usually with lengthy serial and chained reads of the database), download the records to the PC, import them into Lotus, then modify the existing spreadsheet format to accept the incoming data. Simple in theory. Slow and cumbersome in practice.

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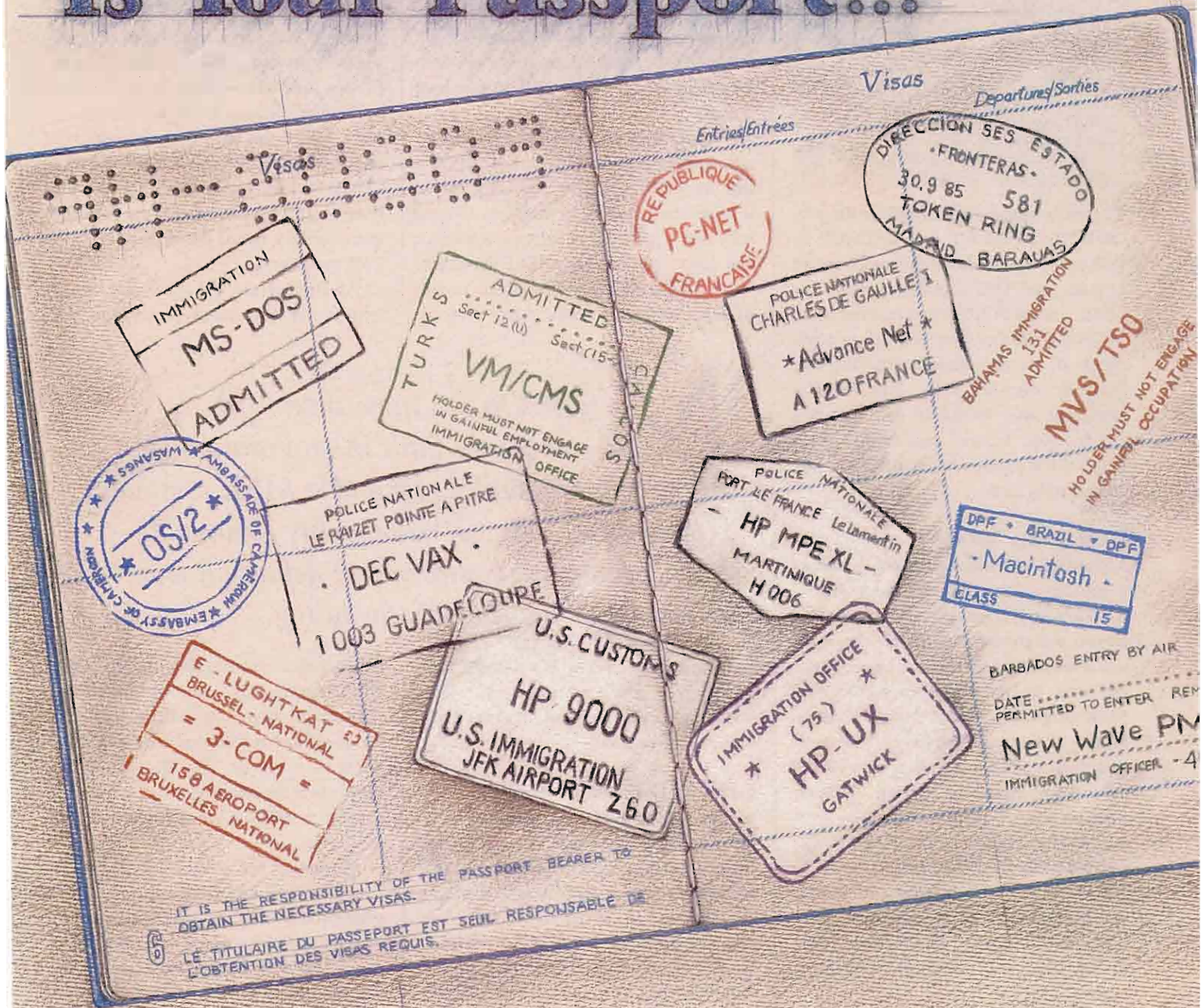
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CIRCLE 247 ON READER CARD



Consider this sequence of commands issued from within MasterOp/3000.

```
SETJCV ONLINE=0
SETJCV POST=1
SETJCV DUMP=1
AFTER ONLINE SETJCV ONLINE=1
AT 23:00 SETJCV DUMP=0
AT 0:00 WHEN POST=1 AND ONLINE=1 &
DO STREAM2 BACKUP
AFTER BACKUP SETJCV DUMP=1
WHEN ONLINE=1 AND DUMP=1 &
DO (SETJCV POST=0\STREAM2 BIGPOST)
```

These commands logically order the jobs ONLINE, BIGPOST and BACKUP in such a way that if ONLINE finishes before 11 p.m., BIGPOST is streamed after ONLINE, and BACKUP is streamed after BIGPOST finishes, but not before midnight. If, on the other hand, ONLINE finishes after 11 p.m., BACKUP is streamed after ONLINE finishes. But again, not before midnight. And BIGPOST is streamed after BACKUP finishes. Pretty neat.

### Master The Set-Up

MasterOp/3000 follows the basic “restore a job file... modify any passwords... stream the job, which creates the accounts and groups and restores the product files... and you’re done” procedure. No muss, no fuss, no surprises. Note that MasterOp/3000 doesn’t use Privilege mode. This means, however, that each user must be able to obtain access, via the Allow command, to certain operator commands. These commands are: ALTPOOLFILE, LIMIT, JOBFENCE, ALTJOB, DELETESPOOLFILE, ABORTJOB, REPLY, SHOWCOM and WARN. If the user doesn’t have access to these commands, but can use Allow, MasterOp/3000 will obtain the necessary access.

MasterOp/3000 uses process handling and must be able to create at least five extra data segments. It requires no specific set-up or configuration procedure. However, with time you’ll certainly develop your own set-ups. And, MasterOp provides for default set-up files. A minor nuisance is the prohibition against moving MasterOp or any associated files to anywhere other than the installation account and groups.

Documentation is provided in two parts: a 39-page user guide and a 203-page technical reference manual. Both are supplied on the installation tape and as many copies can be printed as desired. MasterOp/3000 contains a complete on-line help facility for command description and syntax.

I have mixed emotions about documentation that’s provided on tape in file format for printing locally. On one hand, it’s easier and cheaper to maintain. Hopefully that’s reflected in improved service and lower support costs. On the other hand, it’s usually bulkier and more difficult to follow than glossy printed

ous types, it’s doubtful that they ever would become of practical importance.

At the heart of MasterOp is its ability to set up linear jobqueues (i.e., queues in which each job is introduced only after the previous job has reached a satisfactory state of completion) and to link multiple jobqueues in any of a variety of ways. Jobqueues are initialized with the MasterOp STREAM, STREAM1 and STREAM2 commands. They differ by the type of EOJ condition enforced on the queue and are linked primarily by the AFTER command.

All this is great, but what about users who could be streaming jobs right and

**M**asterOp has more than 100 commands built in and can process any programmatically executable MPE command. Furthermore, you can rename any command and schedule commands whose definition won’t be known at the time of scheduling.

documentation. While it’s detailed and complete, there’s no index, too few meaningful examples and, of course, no pictures or diagrams.

### Getting The Job Done

MasterOp can be run either interactively or in batch. When run interactively, MasterOp uses one of two types of timed reads (user-configured) because it has to periodically check to see if anything needs to be done. Multiple commands are allowed on a single line (use \ as the delimiter) and a command may be continued on the next line by using & as the last character of the current line. The final command line, after possible expansion, must be less than or equal to 255 characters.

Want to redo or modify and redo a previous command? MasterOp has a Redo facility for up to 1,023 commands. Active commands also can be modified. Although there are specific limits on the total number of active commands of vari-

left in direct contradiction to your grand plan? The QLIMIT command provides a measure of control by defining job traffic rules that can limit end-user jobs. One word of warning: The QLIMIT command alters the system JLIMIT, and it isn’t reset to its original value when you exit MasterOp.

MasterOp has more than 100 commands built in and can process any programmatically executable MPE command. Furthermore, you can rename any command and schedule commands whose definition won’t be known at the time of scheduling. And if that isn’t enough, MasterOp allows for command file processing, complete with parameter passing and an extended UDC facility that even permits function returns.

You can explicitly load existing MPE UDC files while in MasterOp, though the UDCs must use only MasterOp/3000 executable commands. That’s nice, but there’s more. You can have multiple UDC directories, you can create and



test UDCs on the fly (because the loaded UDCs affect only this MasterOp session), and MasterOp UDCs can have functional returns, much like SPL and FORTRAN procedures.

Sometimes a schedule is too complex to type in or unsuitable for UDC processing. With MasterOp/3000, you can process files of executable commands with the XEQ command. You may pass parameters to the XEQ file and even use a GOTO construct within the file for branching control.

MasterOp gives you the capability to define several paths, which the program will use to satisfy file requests. This is much like the PATH command in MS-DOS. You can define separate paths for jobs, XEQ files and programs. This, of course, gives you a shorthand way to reference jobs, XEQ files and programs.

MasterOp is also a sophisticated process handler. Programs run through MasterOp can be scheduled in much the same way as jobs. For example, suppose you want to run the program TELECOM, but if the program hasn't terminated by 11:55 p.m., you want to abort it. The following MasterOp commands will accomplish this:

```
AT 23:55 (CONTINUE\KILLSON TELECOM)
RUN TELECOM
```

This also illustrates an important feature, and possible trap, of MasterOp. It doesn't do error checking on a scheduled event until the event is released for processing. This gives you tremendous power and flexibility, but also tremendous opportunity to screw up big-time.

In planning your scheduling tasks for MasterOp, consider error recovery. MasterOp doesn't have any way of recovering from a system failure or other catastrophic event. If you're in the middle of a complex schedule when your system goes down, recovery could be very difficult.

### Special Features

Suppose you don't want to keep a session and terminal dedicated to MasterOp but you want to be able to set up

long-term schedules, make periodic additions or changes or just monitor progress. No problem. MasterOp has a feature called Networking, which allows you to communicate with another MasterOp process (usually a continuously logged-on batch job) via a message file and the MasterOp MESSAGE command. This feature even works across networked HP 3000s.

MasterOp is hooked into SPOOK so that users with SM or OP capability can submit extended commands directly to SPOOK. The extended commands are just the standard SPOOK commands, such as ALTER, with the addition of MasterOp descriptors and clauses, such as JOBNUM=#. For example,

```
P PRI=D, STATE=READY, LDEV=LP2
```

will purge all the ready, deferred spoolfiles on device class LP2.

MasterOp/3000 is an impressive tool for managing work on one or more HP 3000s. Whether you're scheduling repetitive tasks or one-shot wonders, MasterOp/3000 provides the tools to manage the work with little or no human intervention. It will take some effort, and probably a few false starts, to learn all the features. But if you persevere, you'll be rewarded.

## MASTEROP/3000

**SYSTEM REQUIREMENTS:** Classic HP 3000 MPE V and Spectrum HP 3000 MPE XL.

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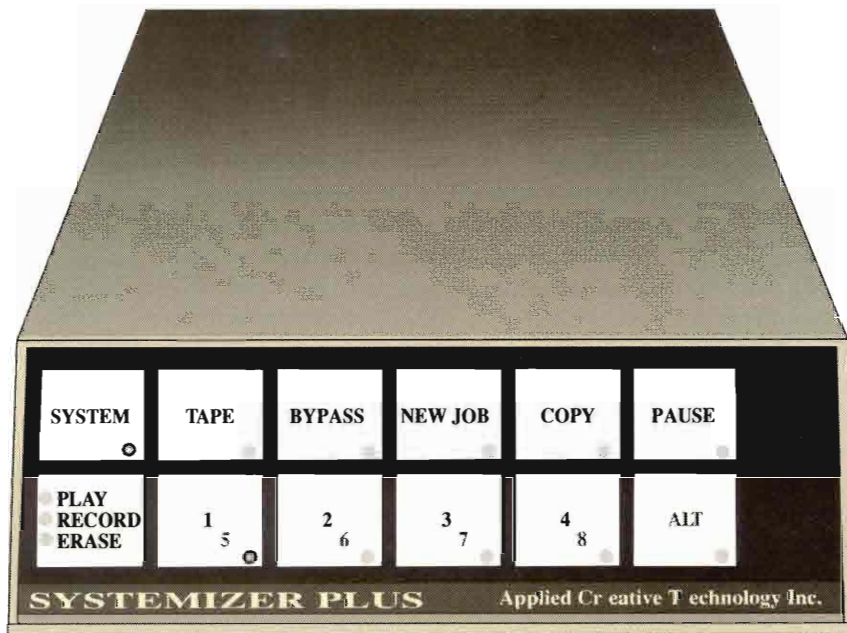
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# A LAN Alternative

## Tie Your Computers And Peripherals Together With The Systemizer Plus

Growth in business often means growth in the number of computers and peripherals used by the business. And, as the number of computers increases, the same old questions keep popping up, "How do I tie my computers and peripherals together, and how do I get them talking to each other?"

One solution is to build your own LAN and link your computing investments together. If you're thinking along these lines, you should consider System-

izer Plus from Applied Creative Technology Inc. (Dallas, TX).

The Systemizer Plus lets you share peripherals, transfer data files, and transmit e-mail between the HP 3000, PCs, workstations and other minicomputers.


### How It Works

The Systemizer Plus unit measures approximately 8 1/2 x 6 1/8 x 1 3/4 inches and has two DB-25 connectors located on the back labeled INPUT and OUTPUT.



By George T. Frueh





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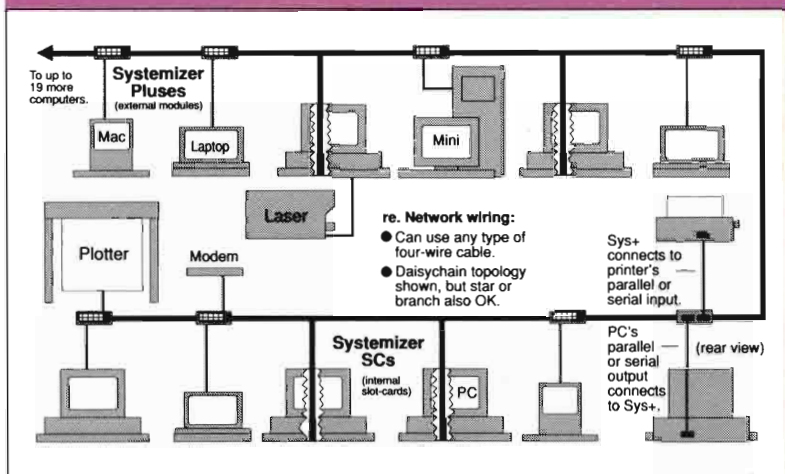
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## FIGURE



*Systemizer Plus units are connected via daisychain (shown), star or branch topology.*

Each computer is connected to the INPUT of a Systemizer Plus unit, giving each computer user his own Systemizer Plus control box. The OUTPUT can be connected to a printer, plotter, modem or any output device.

The Systemizer Plus can be programmed using the front panel keypad or through software running on your PC. Using the software method, you program the Systemizer Plus by creating a special text file, which contains a list of equations and commands that the Systemizer Plus recognizes as its programming language.

Each Systemizer Plus unit has a single RJ-11 network connector located on its rear panel. The units can be connected together using either the daisy-chain (see Figure 1) or branch technique. The layout you choose depends on your office arrangement and where your computers and printers are located.

You can use four-wire unshielded telephone cable to install your network cable. Your main network layout consists of the combined length of all network cables. The total length of network cable, the distance from one end of the network to the other, determines the maximum operating speed of your network.

For example, the Systemizer Plus will

work satisfactorily with up to 700 feet of unshielded network cable.

If you use shielded network cable, the total usable distance may be reduced at a given network speed. For this reason, the Systemizer Plus has an external DIP switch that lets you configure network speed. For example, if your installation requires more than 700 feet, but less than 1,200 feet, you must use the Systemizer Plus long-distance selection.

### Putting It Together

We created our own Systemizer Plus LAN with three Systemizer Plus units, two AST Premium/286 PCs, an HP 3000, a LaserJet Series II printer, a Facitt B3100 printer, and a MultiTech Systems Multi-Modem 224E.

An INPUT/OUTPUT switch is located on the bottom of the unit. The INPUT switch lets you configure the input to the Systemizer for parallel or serial operation, while the OUTPUT switch configures the output for parallel or serial operation. An eight-position DIP switch lets you assign a unique ID number to each Systemizer Plus.

We attached the HP 3000 serially to the input of the first Systemizer Plus unit and set the DIP switches on the bottom of the unit for ID#1. The output of this unit was attached to the HP Las-

erJet Series II printer using a parallel interface.

One of the AST Premium/286 PCs was connected through the COM1 port to the second Systemizer Plus unit. We set the DIP switches on this unit for ID#2 and connected the output to the Facitt B3100 printer with a parallel interface.

The second AST Premium/286 PC also was connected through its COM1 port to the third Systemizer Plus. DIP switches for this unit were set for ID#3. The output of this unit was attached serially to the MultiTech Systems Multi-Modem 224E.

We set the input baud rate for all three Systemizer Plus units at 9,600, with eight data bits, one start bit, one stop bit and no parity. The Systemizer Plus with output connected to the MultiModem 224E was configured at 2,400 baud.

We daisy chained the three Systemizer Plus units together using four-wire unshielded telephone cable. With our small LAN arrangement, we were able to share the three peripherals attached to the outputs of the Systemizer Plus units.

### Operation

Systemizer Plus units don't have an ON/OFF switch. The unit is powered by plugging an AC adapter into a standard 110 VAC outlet and connecting the output of the adapter to the Systemizer Plus.

We first tried to access the two printers and the modem using the PC connected to Systemizer Plus 3.

One way to access a peripheral is to press the number on a Systemizer Plus keypad that corresponds to that peripheral's ID. For example, our HP LaserJet printer was connected to Systemizer 1. This gave the HP LaserJet ID#1.

To send data to the HP LaserJet printer, using the PC connected to Systemizer 3, we pressed 1 on the keypad of Systemizer 3. A small LED next to the number 1 lit, indicating the HP LaserJet was selected. We printed files to the LaserJet successfully with this configuration.

Pressing 2 on the keypad of this Systemizer Plus enabled us to print files to the Facitt B3100 printer using the same PC.



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Finally, with Walker, Richer & Quinn's Reflection running on this PC, we accessed the MultiModem 224E by pressing 3 on the keypad and then dialing out.

We performed similar functions with the second PC and the HP 3000. We experienced no difficulties or errors when accessing the three peripherals with the three computers simultaneously.

**Features**

Systemizer Plus has an e-mail feature that's used with optional ACTMAIL software. This feature enables a PC-compatible computer to send and receive messages to and from other PC-compatible computers. It uses a dedicated mailbox in the Systemizer Plus. The size of this mailbox can be set to 4 KB (reg.), 16 KB (med.), or 64 KB (large).

Systemizer Plus has a copy function that allows you to reprint copies of past jobs. Once you print a job, the

**Systemizer Plus**

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**PRODUCTLINE:** Connectivity devices for PCs and peripherals

**OWNERSHIP:** Private

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Systemizer retains the data in its memory. You can recall the data and reprint the job to the same printer, or select a different printer.

LEDs located on the front panel may blink at different rates of speed or remain on to indicate the status of the Systemizer or a peripheral device.

**Documentation**

The Systemizer Plus owner's manual is broken into four sections: Introduction, Operation, Installation and Troubleshooting. A 13-part appendix includes information on DIP switch configuration, a condensed installation summary, HP-GL plotter, modem, HP 3000 and VAX options, and Systemizer Plus add-on memory board installation.

Systemizer Plus will link together your increasing computing power with your growing number of peripherals. It could be the answer to, "How will I tie it all together?"

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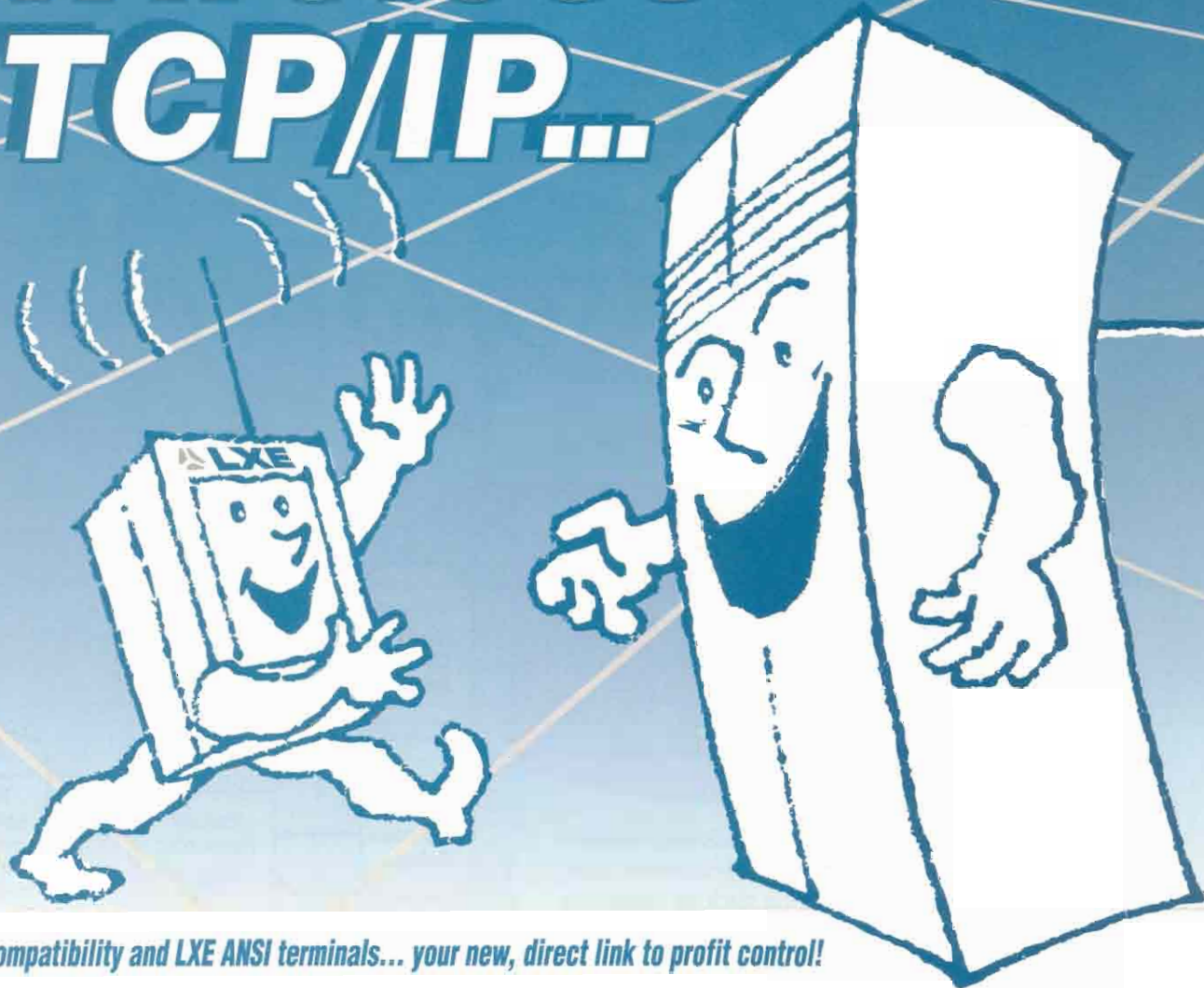
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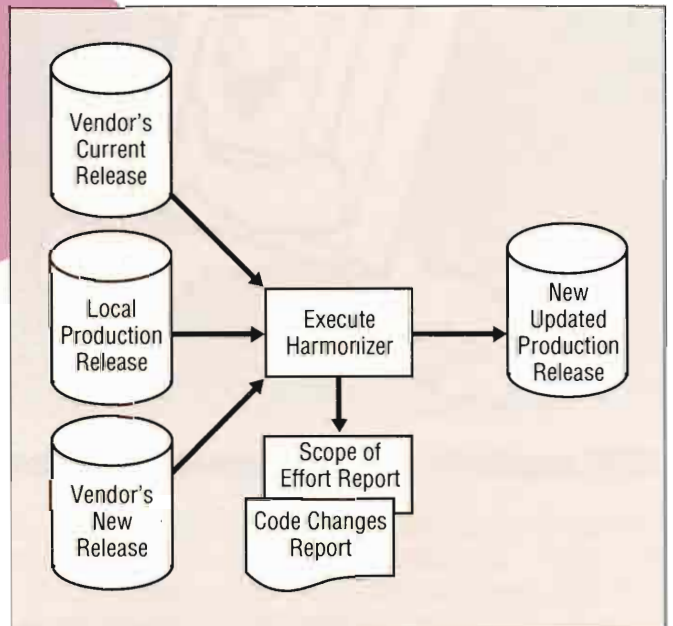
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# Resolving Dissonance

## S/Compare-Harmonizer Lets You Compare Source Code Versions

In the field of data processing, change is not only inevitable, it's inherent. Consequently, keeping track of changes in source code is essential to the development and maintenance of reliable software. For the software developer, efficient, dependable and easy-to-use source comparison utilities are vital tools.

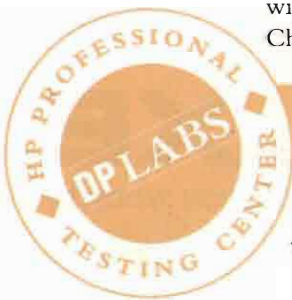
Aldon Computer Group's (Oakland, CA) S/Compare utility is specifically designed to compare source code. It locates inserted, deleted, changed or moved records in two source code programs without regard to sequence numbers. Changed records are determined by the



context in which they appear, not by a merge or look-ahead technique, which is limited to a few hundred records.

You can control the comparison by language. Comments and blank lines

By George T. Frueh





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are included or excluded from the comparison at your discretion. Minor formatting differences can be ignored, and one command can compare entire filesets.

Harmonizer is a separate module managed by S/Compare. With the S/Compare-Harmonizer combination, you can compare up to 16 versions of a program simultaneously and merge them into a composite output file. S/Compare automatically invokes Harmonizer whenever three or more filenames appear in the COMPARE command.

## Installation

We installed S/Compare-Harmonizer on our HP 3000 Series 37 using the nine-track cartridge tape supplied by Aldon. From the MANAGER.SYS account, you create an ALDON account and the PUB group. The PUB group requires the DS and PH special capabilities.

After the new account is built, you log on to MGR.ALDON and restore the files to disk. Once the Aldon files are restored, you run the INSTALL program using the validation numbers supplied with S/Compare-Harmonizer. The INSTALL program prompts you for the group and account for the validation file, your company's name, a product code from 1 to 9, which corresponds to a specific Aldon product, and the validation number.

Your operating system must be configured to allow 16 KB code segments and at least two extra data segments per process with a maximum of at least 8 KB words per segment.

## Getting Started

To run S/Compare, enter the following command at the colon prompt:

```
:RUN SCOMPARE.PUB.ALDON
```

S/Compare responds with a sign-on message and a question mark prompt. (S/Compare's online HELP can be accessed from this question mark prompt at any time by entering HELP or H.)

We tested S/Compare by comparing the two demonstration source files, SRCTST1A and SRCTST1B, included

with the product. These files are located in the PUB group of the ALDON account. Because the report generated is 132 columns wide and unsuitable for most terminals, you can use the SET command with the OFFLINE option to direct the report to a line printer as follows:

```
SET OFFLINE  
[=device,priority,copies,environment]
```

To compare the two files, we issued the command:

```
COMPARE SRCTST1A.PUB.ALDON  
SRCTST1B.PUB.ALDON
```

The first file specified in the COMPARE command is the referencefile, the second is the comparefile. The referencefile is the baseline from which differences are measured. All insertions, deletions and moves are relative to the referencefile.

The first page of the S/Compare report is a summary report that describes the comparison. It lists the commands used to invoke S/Compare, the names of the files compared, the language of the source in the files, record counts and memory use statistics.

The comparison report immediately follows the summary report. This is a composite listing of both the comparefile and referencefile with their differences highlighted. The heart of the comparison report contains three overlapping columns of source text. A fourth field along the left margin lists flags and block numbers. Block numbers and flags are formatted as: referencefile-block-number flag comparefile-block-number.

Sequential block numbers are assigned to blocks of code in both the referencefile and comparefile to be used during comparisons. Four flags indicate the type of change the code has undergone.

The == flag indicates that the flagged referencefile-block-number's code equals the flagged comparefile-block-number's code. The -> flag shows that the flagged referencefile-block-number code has been moved in the flagged comparefile-block-number. The DD flag means that

the flagged records have been deleted from the referencefile and therefore don't exist in the compare file. Finally, the II flag indicates that the flagged records that didn't exist in the referencefile have been inserted to create the comparefile.

The center column of the comparison report lists the code present in both the referencefile and comparefile. The left column lists code found only in the referencefile, and the right column lists the code found only in the comparefile. Therefore, the left and center columns create the referencefile, and the right and center columns form the comparefile.

## Operation

To compare three or more files, you must specify the names of the files in the COMPARE command. The first file named is the referencefile, the second is comparefile 1, the next is comparefile 2, and so on, up to comparefile 3. Additional comparefiles are lettered A through F.

Harmonizer checks the accessibility of all files named in the command by opening them. The referencefile and the first two comparefiles are left opened. All other files immediately are closed until they're compared. The actual comparison begins by comparing the referencefile to comparefile 1. Upon completion, information is written to a temporary file, called a chain file. The referencefile is then compared with the next comparefile. This process continues until the referencefile is compared with each of the comparefiles. The Harmonizer comparison report and the output file are produced by processing the information in the chain file.

Control then returns to S/Compare to process the next member or file a fileset, or to await the next command.

## Comparison Summary

The results of each comparison are summarized at the end of the comparison report. The summary consists of one line for each file compared.

Each line shows the name of the file, the number of deleted lines (i.e., the number of lines in the referencefile, but



not in the comparefile), the number of inserted lines, (i.e., the number of lines in the comparefile, but not in the reference file), the number of matching lines, total number of lines compared, total number of lines in the file, and the percentage of the lines compared that match.

### Wildcards

A useful feature of S/Compare is the support of wildcards for filenames and member names. A wildcard is a filename specification that contains at least one of the three wildcard characters. The @ character matches any character or group of characters, the ? character matches any single character, and the # character matches any single digit, 0 through 9. A single COMPARE command can compare many files by matching a set of referencefiles with a set of comparefiles. The files are matched on common characters within their names. When the characters specified by the wildcard characters match, the files are compared.

If you're looking for an easy-to-use source code comparison utility, S/Compare-Harmonizer provides a tool that saves valuable time and relieves programmers of tedious modification checks and record keeping. ■

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**HEADQUARTERS:**

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(415) 839-3535

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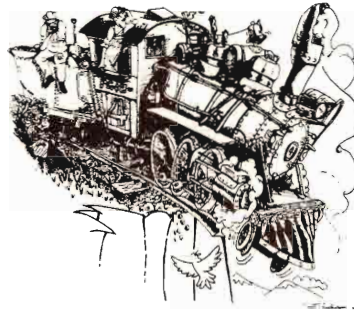
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## NETWORKING

**Gordon  
McLachlan**

# Standard Network Survival

I need some excitement. Let's talk about operating systems — that always gets the juices flowing. I know I'm a network guy, and I'm not supposed to worry my pretty little head about such things as operating systems. In fact, I've been told more than once that it's none of my business.

However, it's an immutable fact that if you want to survive as an MIS manager in the world of standard networks, you must get on the standard operating systems bandwagon. Good luck. You're going to be about as popular with your users as a hobo at a conductors' convention.

Enterprise networking is the buzzword that got us into this trouble. It means we're supposed to get office automation, engineering and business systems all running on the same network. To accomplish this miracle, we've been given standard networks, or at least the glimmer of hope that there will be standard networks.

The trouble is, we haven't been given any control over the garbage that's running on all these different systems. Our job is merely to make every bizarre combination of hardware, operating system and application software talk on the same wires. Start talking about changing platforms, or standardizing them, and you'll get the evil-eye, an up-turned lip or the back of somebody's hand.

What's the problem? Why do we have to stick our noses where they don't belong? And, why is everybody else so defensive about their precious platforms?

### What's The Big Deal?

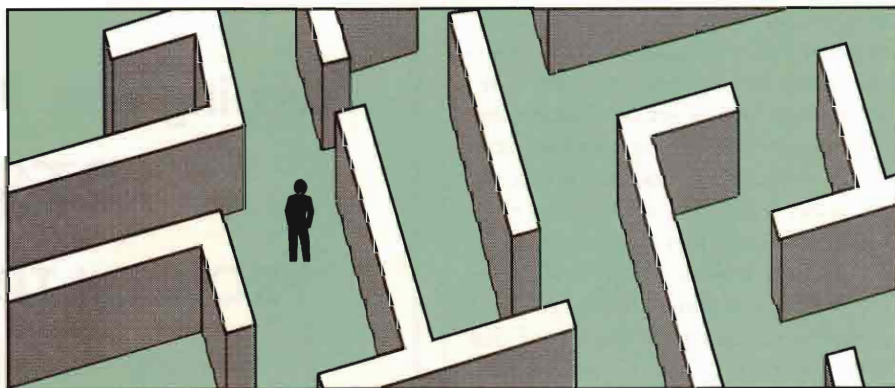
The more platforms (and vendors) you have to deal with, the worse your prob-

lems will be. A lot of money is being made by people who put together multivendor, multiplatform networks, and there's a reason for this — it's a real pain in the nether regions.

If you want to a) do it and b) do it on a budget less than the GNP of your average third-world nation, you have to reduce the degree of freedom in your

the same silicon and software from the bottom to the top of the product line.

Within a single vendor's product line, you usually have to contend with multiple platforms. At minimum, there will be a personal computer platform and a mini/mainframe platform. More typically, there is also a workstation or mini-computer platform stuck in the middle



network choices. This means reducing the number of different platforms you have to deal with.

If you think that the ISO/OSI-based standards are going to save you, think again. I've heard speculation that if all of the current and proposed ISO standards are considered, more than 64,000 unique network configurations are possible. I'm too lazy to do the math myself, so I don't know if this number is accurate, but you get the idea. Couple this with the fact that different vendors (and product lines) will implement the various standards on different schedules, and you have a recipe for incompatibility.

The easy way out is to adopt a single-vendor, single-platform strategy, but even this is harder than it sounds. Our hardware-mongering buddies have always pushed single-vendor approaches, but they don't seem to be able to come up with a single, scalable platform. What I mean by scalability is being able to use

somewhere. What it boils down to is this: Within any vendor's product line you will have to contend with the same kinds of incompatibilities that arise between vendors.

To further complicate your situation, the vendors have got your number. If you are part of the dreaded MIS department, your friendly salesman figured out long ago that he should try to sell directly to your users.

The explosion of the personal computer and engineering workstation markets made this common practice. You may have thought it was clever to avoid getting stuck with responsibility for those systems, but you gave up control over your networking strategy when you turned the special-interest groups loose in the marketplace.

If you try to clamp down on your users by making them change platforms, you'll be the bad guy. You'll be cursed,



reviled and hanged in effigy if you try anything that looks like a power play. Your users may be more sophisticated than you think, and MIS was never that popular anyway.

### **What's The Answer?**

First, disabuse yourself of any notions of total victory. Enterprise networking should be sought after like peace in the Middle East. Use diplomacy and accept small triumphs. Face the fact that there will be multiple players in your computing and networking strategies. There's no way that you will be able to find one platform that will satisfy everyone.

On the other hand, don't treat all of the players as equals. You have to draw the line somewhere. The best way to do this is to look at which platforms give you the biggest bang for the buck in given applications. Once you have decided on these, standardize within categories.

"Bang for the buck" in this case means two things — cost and the availability of software. Don't get hung up in a religious war over which operating system or hardware is "the best." There is no such thing.

For personal productivity tools like word processors, spreadsheets and crummy little graphics programs there's nothing like the good ol' PC. That means MS-DOS or OS/2. Engineers would rather suffer the removal of vital bodily organs rather than give up their UNIX platforms. (Is there a pun in there somewhere?)

Despite the emergence of the downsizing phenomena, there's still no substitute for big iron when it comes to large, multiuser applications. But big iron usually means a proprietary operating system.

The trick is to minimize the variability within each category. In the PC realm, you have to standardize on the hardware. Until now, DOS gave you the latitude to mix and match all manner of brand Z clones and get away with it. Unfortunately, OS/2 is picky about hardware, which means the compatibility problem is going to rear its ugly head.

The Apple Macintosh is another issue entirely. If it dictates your networking strategy, you deserve what you get. The Mac is cute, but it's the computer for the rest of them. If your Macs don't network the way you want them to, tough. Let them eat mice.

If your shop is so far gone that hardware standardization is out of the question, I feel sorry for you. OS/2 will be a lovely network platform pretty soon. You'll either have to suffer with 50 different versions of the operating system, replace a bunch of hardware, or use something like Novell or 3Com as your network OS.

Whatever you do, don't try to integrate multiple PC network operating systems. That is an exercise in frustration, and won't leave you with enough energy for the hard stuff.

### **The UNIX World Is Even Uglier**

Once touted as the moral high ground of standards-based computing, the UNIX market has degenerated into a feeding frenzy. The unholy alliance of AT&T and Sun Microsystems as Unix International, and the reactionary bonding of HP, IBM, DEC, et. al., into the OSF has caused a break in the UNIX ranks that will take some time to sort out.

The proliferation of RISC processor-based workstations also has thrown a wrench in the works. What it all means is that UNIX ain't compatible, friend.

Having different software and hardware platforms means problems. Compatibility exists only at the source-code level. Once upon a time, the college kids who were writing all of the software didn't mind swapping source. Now that they've graduated and want to make big bucks, you're at the mercy of your vendors. If your software vendor doesn't support one of your platforms, you're out of luck.

This doesn't mean you should throw out UNIX, but you have to get onto compatible platforms. Choose between UI and OSF and stick with it.

Hardware is a stickier issue. RISC systems are all the rage because of their supposed performance edge. You may want

to question that supposition carefully. Remember that every RISC box is incompatible with every other RISC box. They have to have their own operating system versions and compilers. That's a painful fact.

For compatibility, you may be better off with the ubiquitous Motorola 680x0 iron. At least the assembly code is the same, and there are all sorts of software available for it.

On the big system side, your options are more limited. If you have big mainframes (not glorified minicomputers) you're stuck with proprietary operating systems. Do the best you can. (You might get ambitious and try to use networks of minicomputers instead of mainframes, but I won't open that bag of snakes just yet.)

If you're using minicomputers, you have an option, but it's painful — UNIX again.

Networked workstations have overtaken minicomputers, and using proprietary hardware and software on minis is an anachronism. There's no excuse for running things like DEC's VMS and HP's MPE on a network. Running an IBM mini or mainframe operating system is an abomination.

None of these even pretends to be a standard, except in its own little self-appointed fiefdom. Trash them at the earliest opportunity. You'll be a better person for it.

I won't even pretend to tell you how to make these standards decisions into policy. That's what you get paid for, and I'm running out of space. Just believe me when I tell you that no matter how difficult it may seem now, it will be worth it in the long run to implement a sound, standards-based policy.

With a little blood, sweat and tears, you may be able to reduce your networking options down to a manageable 32,000 or so. — *Gordon McLachlan is an independent networking consultant, based in Canton, MI.*

---

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## PC TIPS

Miles B. Kehoe

# Power Windows

In one sense, NewWave is a standard Windows 3.0 application. In another sense, it's a *shell*, a front-end application that changes the way you see Windows. After all, NewWave requires Windows in order to run and works very closely with the Windows Executive.

NewWave is more than an application or shell: It's an environment that begins where Windows ends. It provides more power to novice and expert users alike and even provides some super capabilities that software developers can integrate with their own applications.

Unlike most Windows extensions, NewWave allows you to use this additional power with both Windows and non-Windows applications, whether or not the application is "NewWave aware."

As an environment, NewWave lets you forget most of the restrictions of MS-DOS. You no longer are concerned with directory structure, MS-DOS commands, or even executable files. If you already know MS-DOS, this may not seem like a significant advantage over Windows 3.0. However, if you have never used a PC, NewWave finally provides an easy-to-learn environment for IBM PC and Vectra compatible computers.

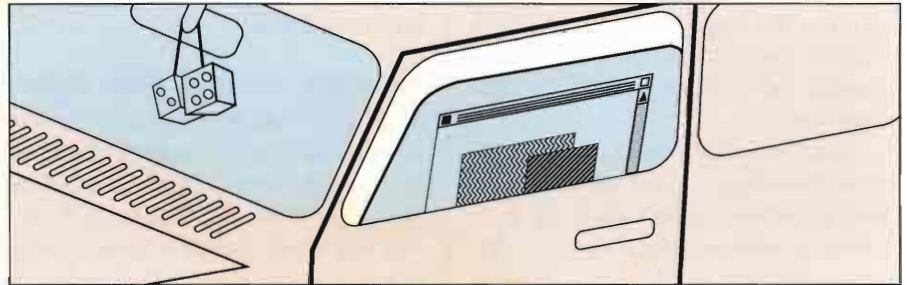
### How Do You Use NewWave?

When NewWave is installed on your Vectra, you can either start it right from your AUTOEXEC.BAT file or use a DOS command. Note that you don't even see Microsoft Windows as part of the process. HP has done an excellent job of making NewWave appear to be the only environment on the system.

Several metaphors have been used to help people understand the workings of

their computer, and HP has chosen the concept of the "NewWave Office."

The "NewWave Office" screen displays a window similar to the desk blotter you may have on your desk. On the desktop are several small pictures called icons. In NewWave, these icons represent two items: tools, which are special types of application programs; and objects, which you can think of as files for the moment. Tools are represented



as 3-D graphics icons, and objects are represented as 2-D icons.

Like every Windows application, there is a Menu Bar. However, in NewWave, the commands along the bar are specific to the NewWave environment and include Action, Object and Task management rather than the standard Windows commands. This contributes to making NewWave a total environment.

Objects and tools are the basic building blocks of NewWave because you don't see most conventional applications. A tool, as I mentioned before, is a special type of application. A tool must remain on the NewWave Office, and usually involves an application that doesn't use data files. For example, a program like HP AdvanceLink, which typically has only a configuration file, might be installed as a tool. The standard Windows 3.0 Cardfile could be installed as a tool as well, if you only use a single card file for data.

An object is a bit trickier. In the simplest case, an object is a file that is associated with a specific application. When you want to create an object, such as a NewWave Write document, you use the Menu Bar to create a new object. You then specify that it's of the NewWave Write type, and provide a name. In NewWave applications, the name of an object is not restricted to the eight character MS-DOS limit. When you have

completed this step, you'll see an icon representing the newly created, empty object.

To actually enter the document, you select the icon and double click the mouse. Because the object is a NewWave Write object, NewWave will load the NewWave Write application. Of course, NewWave is based on the underlying MS-DOS file system, so NewWave and Write will give the object an MS-DOS filename. However, this is managed by NewWave and not really available outside of the environment.

In this case, NewWave may not seem any better than standard Windows. However, objects can contain more than one part, and each part can be associated with a different application. So, for example, the NewWave Write object we created above can be extended to include a Drawing Gallery figure and even part of a Lotus 1-2-3 spreadsheet.

The process of adding a spreadsheet



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# HP Professional



to the document is very easy. If the spreadsheet exists as a NewWave Lotus 1-2-3 object, all you need to do is highlight the icon and choose the Menu Bar, Edit Copy selection. Then, go into NewWave Write, position the cursor, and choose the Menu Bar, Paste selection. It's that simple.

Because of NewWave, the user doesn't need to be aware of which applications are associated with which parts of a document. If you wanted to edit the spreadsheet included in the object, you could simply double click the NewWave Write icon; move the mouse pointer to the spreadsheet portion of the document; and double click. NewWave and Write keep track of which application is used by each part of the document, and automatically start Lotus 1-2-3 for you.

These links are automatic and can be dynamic. Specifically, when you Paste one object into another, you can specify whether the pasted object is a copy of the original or a link to the original object. If it's a copy, you can make changes to the original and not have the changes reflect in the copy. However, if it's a link, any changes made in the original will be reflected in the duplicate. This is a powerful capability, and stays with the document even if it's moved to another PC.

Having these links available and yet automatic is a significant advantage NewWave has over any environment I've seen on any platform.

## Agents

The Agent facility is a new feature within NewWave 3.0. You can think of an agent as a super macro, one that executes across applications. For example, you can define an agent to perform a complex task involving data collection from a remote HP 3000, loading data into a Lotus spreadsheet, graphing the data in Drawing Gallery, and printing the entire report in NewWave Write.

Furthermore, agent tasks can be performed interactively, or scheduled to execute at a predetermined time. This flexibility allows you to make the most of your personal resources.

Incidentally, agent tasks are implemented by means of a high-level task language that can be compiled into executable tasks. You can create tasks either by recording a series of tasks, or by writing them in the task language. There are some limits on non-NewWave applications (such as the ability to sense and determine mouse positions), but the capability can be very powerful.

Another feature of NewWave is the ability to integrate non-NewWave applications into the environment. With the

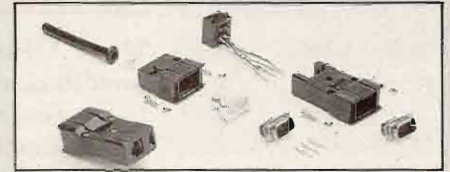
**N***ewWave stands  
an excellent  
chance of being a new  
multivendor standard in  
user interfaces.*

Bridge Builder application, HP provides the ability to create classes of objects to be used by non-Windows and Windows applications. For non-Windows applications, NewWave even allows an advanced user to create and use mouse-driven menus, even if the application itself can't accept mouse input.

Overall, HP has done an excellent job of providing an environment ideal for the end user. It's easy to use, integrates well with existing applications, and protects the user from having to know operating system-specific details. In the coming years, we will probably see NewWave become a common platform across many of HP's systems. In fact, with major OEM agreements with AT&T, Data General, and others, NewWave stands an excellent chance of being a new multivendor standard in user interfaces. —*Miles B. Kehoe is an online support manager for Verity Inc., Mountain View, CA*

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UNIX

Andy Feibus

# Vi Regular Expressions

When I first wrote about **vi**, I mentioned the **/** (search forward), **?** (search backward), and **:s** (substitute) commands. However, my discussion of these commands covered only how to perform searches or substitutions using normal characters. I did not discuss search *patterns* or how they are used.

A search pattern is similar to a shell wildcard pattern, except much more complicated. These search patterns are called *regular expressions* and can be used not only with the **vi** editor, but also with **grep**, **sed(1)** and **awk(1)**.

As complicated as regular expressions (*REs*) are, learning how to use them is one of the quickest ways to unlock some of the power of UNIX. *REs* are documented in the manpage entry for **re-gexp(5)**. Not all *REs* are discussed in this column; some are rather exotic.

An *RE* is composed of both text characters and special characters called *metacharacters*. (Who makes up these words?) Text characters are matched identically with the text being searched; metacharacters provide the mechanism for pattern searches. *REs* can be used with both the **/** and the **?** search commands.

Two important metacharacters are **^** and **\$**, which indicate the beginning of

a line and the end of a line, respectively. For example, to search forward through your file for the next line that begins with "The", the search command is:

```
/^The
```

To search forward for the next line ending with an exclamation point (!), the search command is:

```
!/!
```

The **^** is a metacharacter if no characters precede it in the search string; otherwise, **^** is considered to be just another character. The **\$** is also a metacharacter if no characters follow it in the search string.

If you want to search for any line ending with a period, use the search string:

```
/\.$
```

The period is preceded by a backslash, because the period is also a metacharacter; preceding a metacharacter by a backslash disables that character's *magic* properties. The act of preceding any metacharacter by a backslash is called *escaping*.

A period (when not escaped) matches any single character (except for the new-

line character). For example, to search for the next line containing exactly one character, use the search command:

```
/^.$
```

You can represent a set of characters to match by enclosing the set within square brackets [ ]. A set can contain both single characters and ranges of characters (two characters separated by a minus sign indicate a range containing all characters between the two specified characters). For example, to search for any number in your text file, use the search string:

```
/[0-9]
```

Another way to think of the period metacharacter is as the complete set of all available characters.

The **\*** metacharacter has a very different use compared to the way in which it is used by the shell: The **\*** represents any number (zero or more instances) of the preceding text character or set of characters. For example, to search for any word beginning with a capital letter, use the search pattern:

```
/[A-Z][a-z]*
```

The **[a-z]\*** represents any number of lowercase letters.

When scanning for a match, the **\*** represents the *largest, left-most* number of instances that match the preceding text character or set. For example, if you have the string **Ansg28fhalen10**, the *RE*:

```
/[0-9]*
```

matches the **28** and not the just **2**.

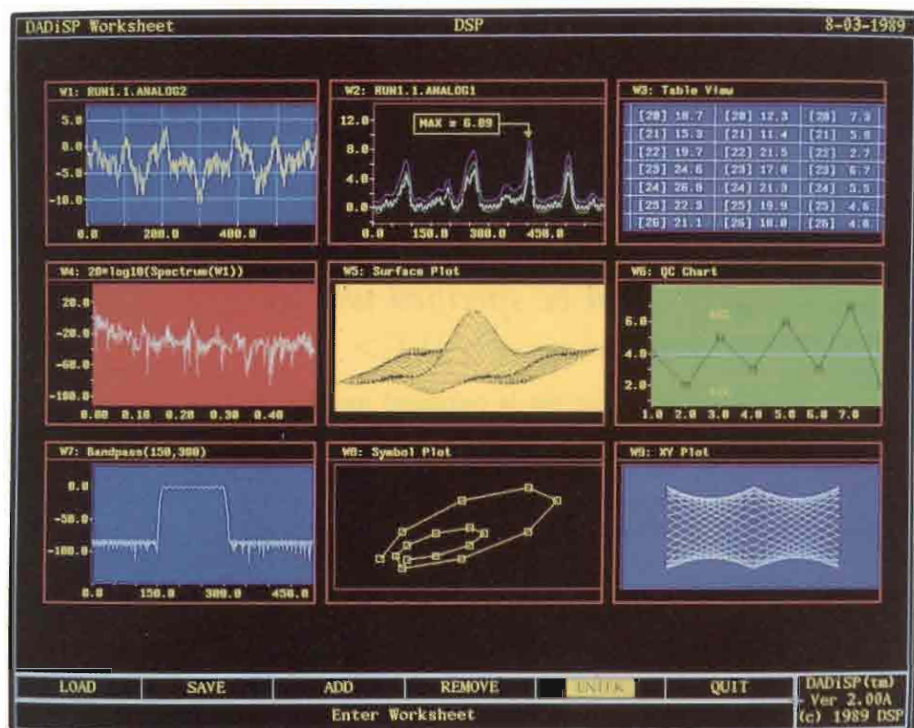
More *RE* examples and their meanings are shown in *Table 1*.

<b>th[eo]se</b>	Matches <i>these</i> and <i>those</i> .
<b>^[0-9][0-9]*.*\$</b>	Matches a number at the beginning of a line containing other characters. Useful for searching for FORTRAN line numbers.
<b>tty[0-9]*</b>	Matches any string beginning with <b>tty</b> and ending with zero or more numbers.

Table 1: *RE* examples and definitions.



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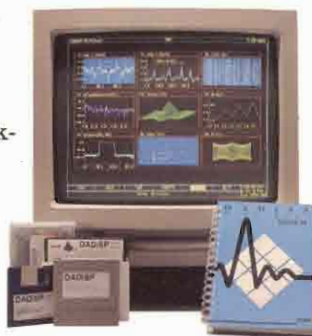
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Within **vi**, searching for text strings is not the only reason to use *REs*. *REs* are also used with the *substitute* command.

## Substitutions

By using *REs*, **vi** provides a way to search and replace characters in your text without having to retype the replacement each time you find the search pattern is matched. Before discussing how to use *REs* within substitutions, you need some background information about the *substitute* command.

The basic form of the *substitute* command is:

```
<address>s/<search RE>/<replacement text>/
```

In this command, *<address>* is the list of lines on which to operate, *<search RE>* is any *RE*, and *<replacement text>* replaces the characters matched by the *RE@*. For example, to replace the word **interface** with **interact** throughout your document, enter the command:

```
:1,$s/interface/interact/
```

Let's examine this example. The **1,\$**

**I**n general, up to nine sub-expressions, numbered from left-to-right, can be specified within a *<search RE>*.

preceding the **:s** command specifies all lines in the document from the first line (line 1) through the last line of the document (the **\$** in an *<address>* represents the last line in the document). The substitution is straight-forward: **interact** replaces **interface**.

The *substitute* command, however, normally matches only the *first* occurrence of *<search RE>* in each line checked. To replace *every* occurrence of *<search RE>* with *<replacement text>* in each line specified by *<address>* requires the **g** (global) option:

```
:1,$s/interface/interact/g
```

On completion, the *substitute* command displays the number of substitutions made on the status line.

You can specify an *<address>* string using any of the possible constructs listed in Table 2.

Specifying a single *<address>* (e.g., **.+5**) causes the *substitute* command to operate only on that line; to specify a range of lines, specify two *<address>* fields separated by a comma.

Another way to execute the above substitution example is the command:

```
:%s/interface/interact/g
```

If you need to use the slash (**/**) as part of the *<search RE>* or *<replacement text>*, precede the **/** by a backslash to prevent the substitution command from using that **/** as a command delimiter.

## Using REs In Substitutions

Now, let's get a little tricky. Suppose you create a document containing some numbers that you know are wrong. You want to get rid of your false numbers and replace each of these numbers by a **#**. To do this, we need to use a more complex *<search RE>*. The *substitute* command could be:

```
:%s/[0-9]/#/g
```

With this command, each number in the document would be replaced with a **#**. Now let's get *really* tricky. Suppose you want to include part of the text matched by *<search RE>* in your *<replacement text>*. With **vi**, although it's not simple, you *can* do it.

Let's say you have a file containing a list of the file names for your documents:

```
october.doc
november.doc1
november.doc2
december.doc
july.doc
may1.doc
may22.doc
february.numbers
```

You want to change this file into a shell script that will change the permissions for these files, permitting you to read from and write to these files and

Address	Meaning
<b>n</b>	The <b>n</b> th line in the file.
<b>\$</b>	The last line in the file.
<b>.</b>	The current line in the file.
<b>.+n</b>	<b>n</b> th line after the current line in the file.
<b>-.n</b>	<b>n</b> th line before the current line in the file.
<b>%</b>	All lines in the file. The same as the address <b>1,\$</b> .
<b>/&lt;RE&gt;/</b> <b>?&lt;RE&gt;?</b>	Search forward ( <b>/</b> ) or backward ( <b>?</b> ) for a line containing the expression <i>&lt;RE&gt;</i> . The number of that line is used as an address.
<b>'m</b>	The line in the file containing the specified marker <i>m</i> . The character preceding the marker is a single quote and not a grave.

**Table 2: Specify an *<address>* string using these constructs.**



granting read-only permission for all other users. Edit the file and execute this substitute command:

```
:%s/^(.*)$/chmod 644 \1/
```

Your file now looks like:

```
chmod 644 october.doc
chmod 644 november.doc1
chmod 644 november.doc2
chmod 644 december.doc
chmod 644 july.doc
chmod 644 may1.doc
chmod 644 may22.doc
chmod 644 february.numbers
```

Dissecting this command reveals some interesting substitution features. The *RE* `^(.*)$` performs the same search as the *RE* `^.*$`. The pair of escaped parentheses indicates that the text matched by the enclosed subexpression should be retained for use in `<replacement text>`. In the example above, the text matched by `.*` replaces the location reserved by `@` in `<replacement text>`.

In general, up to nine subexpressions, numbered from left-to-right, can be specified within a `<search RE>`. The text matching these subexpressions can be included in `<replacement text>` by reserving a place for it with a backslash followed by a single digit (1 through 9).

Let's reverse the order for the words in each line. Enter the command:

```
%s/^(.*) \(.*) \(.*)$/\3 \2 \1
```

The file now looks like this:

```
october.doc 644 chmod
november.doc1 644 chmod
november.doc2 644 chmod
december.doc 644 chmod
july.doc 644 chmod
may1.doc 644 chmod
may22.doc 644 chmod
february.numbers 644 chmod
```

The command didn't do anything to improve this file, but it did demonstrate some of the power of *REs* and subexpressions in editing. One more feature not shown: A subexpression can be referenced more than once in `<replacement text>`.—*Andy Feibus is an interplatform systems consultant based in Atlanta, GA.*

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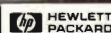
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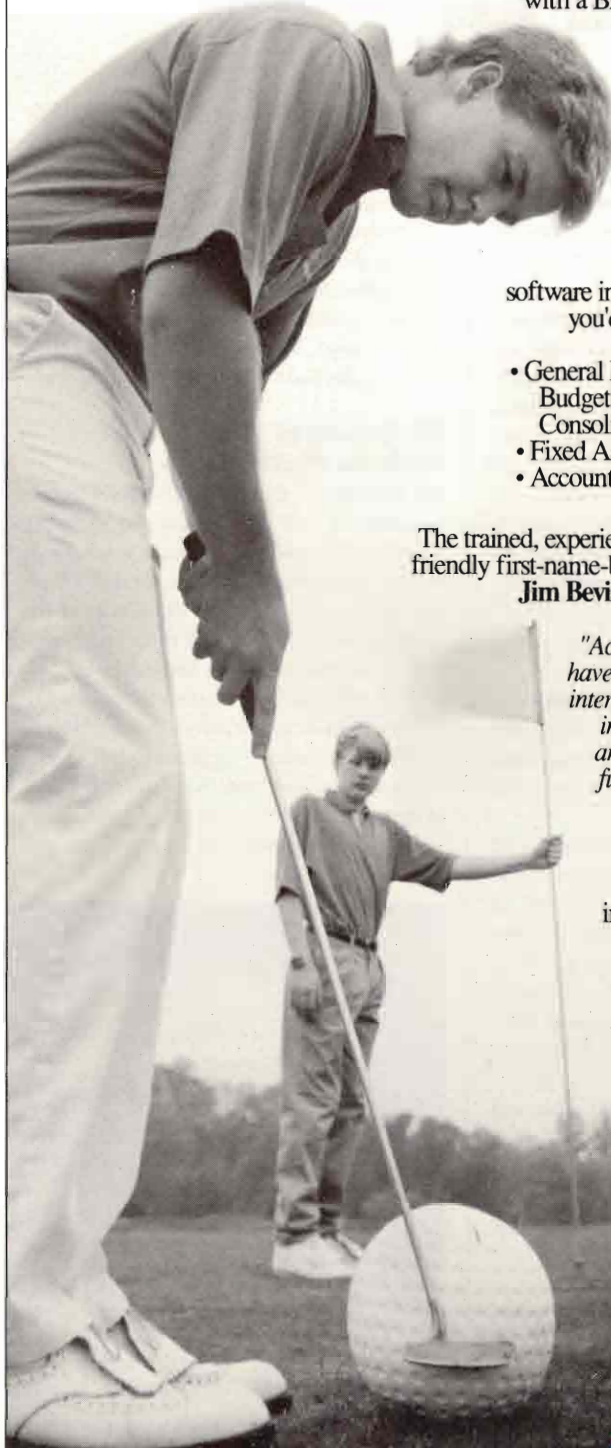
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## HP Introduces Five PC LAN Products

HP introduced five PC LAN hardware products and a new support program for dealers. The new products include a network mass-storage system, local and remote bridges and software, and a 16-bit HP EtherTwist adapter card.

The standards-based PC LAN products are designed to help users manage the transition from workgroup LANs to organization-wide networks. They incorporate a plug-and-play design philosophy that allows them to fit easily into existing LANs and expand to accommodate LAN growth.

The products can be purchased together or as separate components. Prices for HP PC LAN products range from \$375 to \$14,899.

## Micom Announces Marathon 5K

Micom Communications Corp. introduced a new series of products that are the first to use Fast Packet Multiplexing for integrating data, voice, fax and LAN traffic over low-cost, low-speed leased lines.

The debut of the Marathon series of Data/Voice Network Servers begins with the introduction of the 5K model. Users of synchronous or asynchronous devices or LAN bridges or routers can add voice and fax traffic to their data network and cut toll call charges. The product can be used to bring data capabilities to what have traditionally been telephone-only networks.

Pricing begins at under \$3,000. Data and voice expansion models are available for \$1,250 and \$1,400, respectively.

Contact Micom Communications Corp., 4100 Los Angeles Ave., Simi Valley, CA 93063; (805) 583-8600.

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## Disaster Recovery For HP 1000 E Series

Computer Solutions Inc. announced that its disaster recovery services are now available for HP 1000 E Series, as well as HP 3000

minicomputers.

Computer Solutions maintains multiple hot sites and cold sites and also offers portable recovery options, office space, testing and planning. Its inventory of HP 1000 systems and peripherals allows subscribers using those systems the same recovery options as Classic 3000 subscribers.

Contact Computer Solutions Inc., 397 Park Ave., Orange, NJ 07050; (201) 672-6000.

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## HP Enhances Desktop Plotter Line

HP introduced the HP 7550 Plus graphics pen plotter. HP also has begun shipping LaserTools' PrintCache software at no charge with its other desktop plotters, the HP 7475A and HP ColorPro (7440A). PrintCache allows users to regain control of their computers before plotting has been completed.

The HP 7550 Plus plotter replaces the HP 7550A plotter and features faster plotting, optional memory upgrades, backward compatibility, and more ways to connect the plotter. HP 7550 Plus is designed to be shared in a workgroup or used in environments

where many plots are created each day.

The HP 7550 Plus plotter with RS-232 serial and Centronics parallel interfaces (option 006) is \$3,995. Option 005, with HP-IB and serial interfaces, is \$4,195.

## Compact Software Releases Microwave SUCCESS

Compact Software released its new system simulator, Microwave SUCCESS, which adds top level block design capabilities to the company's series of microwave design tools.

System engineers can create proposals based on a minimum of information, import measurements and calculations from other Compact simulators and perform full nonlinear end-end system analysis for design review packages.

Microwave SUCCESS uses the "dictionary" concept, with which blocks can be calculated and stored away for future use leading to faster simulation. Input parameters can include gain, s-parameters, phase noise, 1 dB compression points, 3rd order intercept points, etc.

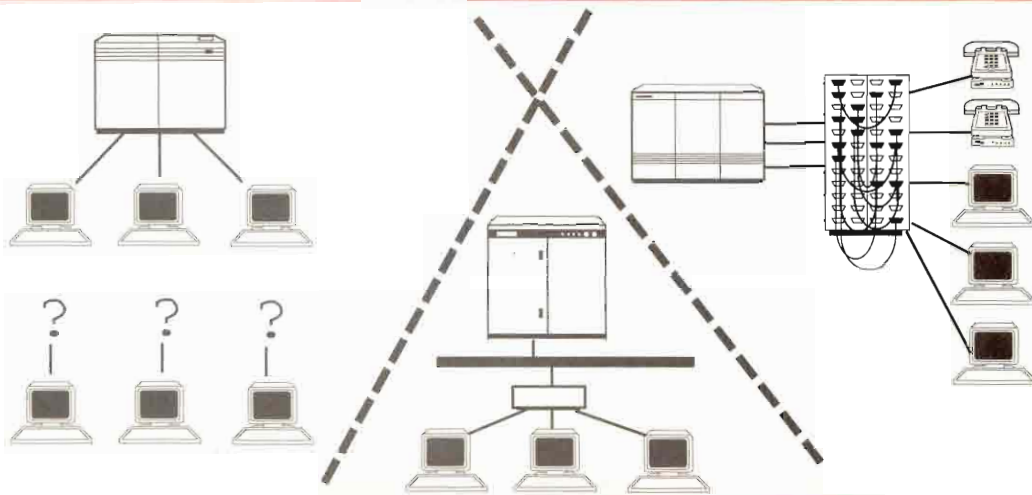
It requires an IBM PC AT or compatible operating under DOS with Microsoft



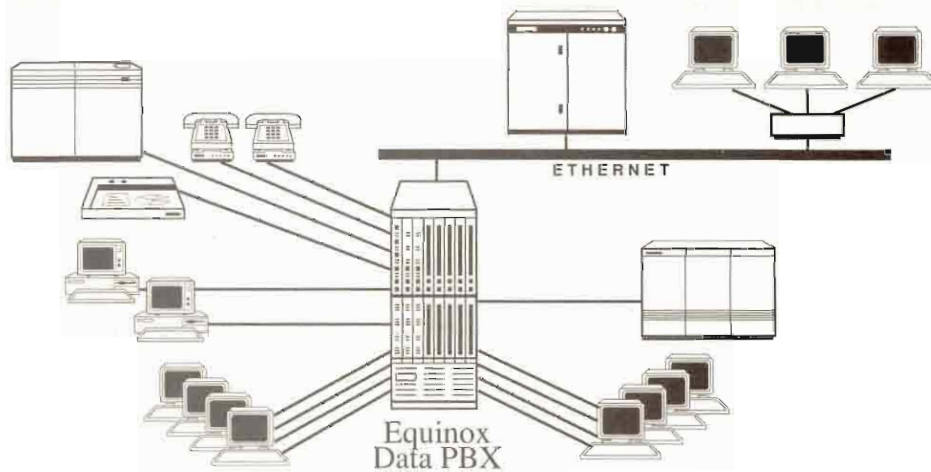
*MICOM's Marathon 5K is a Data/Voice Network Server that allows users of low-speed, wide-area communications networks to combine their data, voice, fax and LAN traffic over one line.*



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## Cadence, Analogy Unveil Mixed-Signal Simulation

The Advanced CASE Division of Cadence Design Systems Inc. unveiled an interface coupling Cadence's Verilog-XL digital logic simulator and Saber, an analog simulator from Analogy Inc. (Beaverton, OR).

Saber/Verilog-XL provides designers with the ability to accurately and quickly simulate complex mixed analog-digital ASICs and board-level systems using a wide range of modeling capabilities and multiple levels of design abstraction.

The interface between Saber and Verilog-XL, priced from \$10,000, is available from either Cadence or Analogy.

Contact Cadence Design Systems Inc., Advanced CAE Division, 2 Lowell Research Center Dr., Lowell, MA 01852; (508) 458-1900.

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## Numetrix Creates Linx Software

Numetrix Ltd. created Linx, a new workstation-and PC-based system that's designed to help companies manage their logistics demands and requirements.

Linx helps manufacturers with multiple plants and warehouses decide the quantities of each product to make at each plant and distribute to each warehouse in order to minimize manufacturing, inventory and distribution costs. It helps manufacturers solve tactical issues such as sourcing, production and distribution allocations, and time-phased inventory targets.

Linx features advanced optimization technology, the ability to balance real costs and capacity constraints and a powerful graphics interface. It is available on the HP 9000/300 Series workstations.

Contact Numetrix Ltd., Ste. 1700, 2 Bloor St. W., Toronto, Ontario, Canada M4W 3E2; (203) 847-3452; in Canada, (416) 323-3744.

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## EDI Solutions Releases EDImap 2.0

EDI Solutions Inc. released version 2.0 of the EDImap Application Interface System.

EDImap allows EDI Solutions' EDItran translation software users to create tailored mapping solutions and facilitate integration of EDI data with any application. It produces "maps," linking a user's EDI translation and application software. The application information then can flow in both directions. This integration is necessary to take full advantage of EDI. Pricing for EDImap ranges from \$2,000 to \$4,000.

Contact EDI Solutions Inc., 7760 France Ave. S., Ste. 1140, Minneapolis, MN 55435; (612) 831-9000.

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## DSP Card Designed For HP Workstations

Infotek Systems announced a digital signal processing card (DSP) for HP 9000 Series workstations. The Infotek DSP332 is a 32-bit floating-point DSP card that's suited for applications that require a large number of repetitive mathematical operations. Operating at up to 15 Mflops, the board can complete a 1024-point FFT in 4.2 ms on a Model 360 computer.

Infotek's DSP card is based on the AT&T DSP32C chip and provides 512 KB of static RAM for instructions and data. Price is less than \$3,000.

Contact Infotek Systems, 1045 S. East St., Anaheim, CA 92805-5700; (714) 956-9300.

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## CLAS/SL Designed For MRP Work Orders

Peripheral Software Concepts Inc. designed the CLAS/SL Finite Capacity scheduling

module to provide detailed MRP work order-based production schedules for shop floor operations. With its ability to address discrete MRP work orders and the CLAS/SL Finite Capacity Advanced Scheduling Logic (ASL), your production planning function now can allocate shop floor resources and personnel in a manner that respects real-life constraints and real-life production optimization.

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**Circle 396 on reader card**

## Reflection Shrinks Memory Requirements

Walker Richer & Quinn Inc. unveiled a new DOS version of its Reflection Series software. Reflection 4.0 offers the end user more capability and flexibility while requiring even less memory than the previous version.

Both products in the Reflection Series for HP have lowered their memory requirements. Reflection 1 PLUS, which emulates the HP 2392A, will run in less than 100 KB. Reflection 7 PLUS, which emulates the HP 2627A, HP 2623A and Tektronix 4010, will run in less than 230 KB with graphics and less than 110 KB without graphics.

The most-enhanced feature of version 4.0 is Reflection's proprietary file transfer. In the new version, Reflection recognizes the standard wildcard characters used for speeding up and simplifying the transfers of multiple files.

Effective with version 4.0, the price of Reflection 1 is \$299; Reflection 1 PLUS is \$369; Reflection 7 is \$399; and Reflection 7 PLUS is \$469.

Contact WRQ, 2815 Eastlake Ave. E, Seattle, WA 98102; (206) 324-0350.

**Circle 390 on reader card**



**STR Broadens FAX/3000 Product Line**

STR Software announced Version 4.1 of FAX/3000, a combined hardware and software product allowing users to send faxes directly from an HP 3000.

Version 4.1 offers new, lower-cost hardware options and increased flexibility with distribution lists, while also supporting the new MPE XL Version 2.1.

Contact STR Software Co., 3133 Briarmoor Ln., Midlothian, VA 23113; (804) 330-0666.

Circle 389 on reader card

**EESof Offers Solutions For Silicon Circuit Designer**

EESof's Bipolar Junction Transistor (BJT) model offers a software solution for the silicon circuit design engineer. The model simulates both the small-signal and large-signal performance of microwave silicon devices.

The model is shipped with current versions of EESof's Libra, Touchstone, and Microwave SPICE simulators. It's also featured in Xtract for model parameter extraction and model analysis. A new library is available that provides model parameters taken from commercial BJT devices.

The product is available on IBM PCs and compatible computers using OS/2 and on Apollo, HP and Sun workstations using UNIX.

Contact EESof Inc., 5795 Lindero Canyon Rd., Westlake Village, CA 91362; (818) 991-7530.

Circle 395 on reader card

**Infocentre Introduces SpeedLedger 3.01**

Infocentre introduced SpeedLedger Version 3.01 the latest release of its software application developed for accounting professionals.

SpeedLedger is a mini-computer-based system running on HP systems. Features include easy-to-use menus and function keys with online help, user-defined application security system, audit control and immediate data validation. SpeedLedger's database design allows for fast improvements and changes.

Enhancements to SpeedLedger Version 3.01 include even more flexible reporting, improvements to standard reports and new selection and sorting criteria options.

SpeedLedger Version 3.01 offers greater flexibility with allocator and two additional journal entry batch types: current period

reversal and prior period, with extra room for descriptions of the journal entry transactions. Contact Infocentre, 7420 Airport Rd., Suite 201, Mississauga, Ontario L4T 4E5; (416) 678-1841.

Circle 376 on reader card

**CCWORD 3.1 Features Robots, Undelete, X Windows**

Interactive Computer Technology released CCWORD Revision 3.1 for HP 1000 and HP 9000 computer systems.

CCWORD is a structured technical documenting package that provides a full-function, infinite-screen word processor and the ability to combine text with graphics. It works with ordinary HP terminals and does not require a PC.

Revision 3.1 also includes Robots (self-recording macros) for repetitive operations, undelete for both the Delete Line and the Clear Line keys, X Windows (and HP Windows) and bitmapped screens on HP-UX computers and more.

Contact ICT, 2069 Lake Elmo Ave. N., Lake Elmo, MN 55042; (612) 770-3728.

Circle 374 on reader card

**Dataram Unveils Memory Expansion Boards**

Dataram Corp. introduced new memory expansion boards for HP workstation users — the DR-9370P and DR-9370E for HP 9000 Model 350 and 370 workstations.

HP 350 and 370 workstations come with two types of memory, a parity memory module and an ECC memory module. The DR-9370P is a 12-MB board that mates with the 4-MB parity module, thus bringing total memory up to a capacity of 16 MB. The DR-9370E replaces the 8-MB RAM add-on board for the ECC controller and increases capacity to 16 MB of memory.

Dataram is offering the boards at \$500 per MB, or \$6,000 for the DR-9370P and \$8,000 for the DR-9370E.

Contact Dataram Corp., P.O. Box 7528, Princeton, NJ 08543-7528; (609) 799-0071.

Circle 388 on reader card

**Printools Improves HP Printer Useability**

Insight Development announced Printools a toolbox that incorporates several key printer utilities for HP printers. Printools saves users time, simplifies printing and improves the useability of HP LaserJet and HP DeskJet

**Real Time Video On Workstation Displays**



**RGB/View**

The RGB/View™ video display controller integrates real-time video with computer generated text and graphics on high resolution displays.

The RGB/View accepts composite video (NTSC or PAL) or RGB component signals from a camera, tape recorder or video disc. Full motion video is displayed as a window on the workstation screen.

- Supports all displays from 768 x 1024 to 1280 x 1024 pixels
- Frame buffer independent
- Output to the computer monitor or to a high resolution projector
- No processing burden on the computer
- 100% software compatible
- Full 24-bit color; highest quality video image
- Text and graphics overlays on the video using a chroma keyer
- Standalone and board level models available
- Made in the USA



**SPECTRUM**

2550 Ninth Street Berkeley, CA 94710  
TEL: (415) 848-0180 FAX: (415) 848-0971

printers. HP has joined with Insight Development to include a help utility that offers online HP printer information and troubleshooting checklists for HP printers.

Printools consists of six integrated utilities that are managed by a TSR menu. The six utilities include a high-speed spooler; capture and screen dump utilities a laser setup utility; and PT-Plot, a program that allows you to print HP-GL, HP/GL/2 or PCL output on a HP LaserJet III printer and PT-Help.

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

Circle 375 on reader card

## ERDAS GIS Available On HP Workstations

HP and ERDAS Inc. have announced that ERDAS geographic information systems (GIS) and image processing software, Revision 7.4, now is available on the HP 9000 Series 300 and Series 800 workstations.

ERDAS Revision 7.4 software features a new GIS modeling module and enhancements to its image processing and 3-D modeling capabilities. Its image-analysis tools are designed for applications in remote sensing, forestry and agriculture, mineral and oil exploration, environmental and resource management, terrain analysis, urban and regional planning and defense.

The software for the HP 9000 Series 300 and Series 800 workstations features the ERDAS ARC/INFO Live Link and provides users true raster-vector integration. Also featured are topographic and data-conversion modules; a range of I/O devices; the CORE, Raster GIS modeling, image processing and tape modules; a software subscription service; and a software toolkit.

## O'PIN Systems Announces Enhance REVEAL Version

O'PIN systems announced Version 2.4 of REVEAL, its report access and distribution software for the HP 3000. O'PIN also unveiled an optional security module that enhances the systems-level security currently available for end-user report access.

REVEAL is a utility that allows end-users the view, search and print reports from any PC or terminal on the system. Version 2.4 includes several enhancements: no page limit for reports, automatic naming and linking of multiple generations of reports, listing of reports catalogued in REVEAL's database and

the ability to purge reports and cleanup database entries using one command.

Version 2.4 is available free of charge to all clients with valid software licenses under maintenance contract. The security module is available for an additional license fee.

Contact O'PIN Systems, International Plaza, Suite 635, 7900 International Dr., Bloomington, MN 55425; (612) 854-3360.

Circle 367 on reader card

## Auto-Shutdown Unit Initiates Proper Shutdown Process

ISA Co., Ltd., (Tokyo, Japan) introduced the HP-UX Auto-Shutdown Subsystem Model 7000 Series.

As more "turnkey" systems are built using UNIX-based machines, more non-technical users are expected to understand the rudiments of UNIX operation in order to operate those systems. But turnkey system users are only interested in the application software of the system and not the operating system on which the application software is built.

With the Auto-Shutdown Unit installed, you no longer have to worry about shutting down the system by executing the proper shutdown procedure. With one switch the Auto-Shutdown Unit automatically communicates with the system to initiate the proper shutdown process.

The basic Auto-Shutdown Unit supports two A.C. outlets for the host system and other supporting peripherals and comes with communication system software. Together with the basic unit, two floppy options are also available and both emulate the HP 9122 floppy disk drive and are media compatible with the HP unit.

Contact ISA Co., Ltd., 1-1-5 Sekiguchi, Bunkyo-KU, Tokyo 112 Japan; 03 (5261) 1160.

Circle 366 on reader card

## HyperWrite Improves NFS Write Rate

Epoch Systems announced two software options for the Epoch-1 InfiniteStorage family of servers.

HyperWrite NFS write software increases performance by as much as 250 percent over traditional file servers. HyperSave high-capacity backup software performs full system backups up to 2,000 percent faster than traditional servers.

Also announced is Release 4.0, an enhanced version of Epoch's network storage

management software and the platform for HyperWrite and HyperSave.

HyperWrite is available for \$3,900 and HyperSave starts at \$5,000.

Contact Epoch Systems Inc., 8 Technology Dr., Westborough, MA 01581; (508) 836-4300

Circle 385 on reader card

## SL Corp. Enhances GUI Development System

SL Corp. announced SL-GMS 4.0, an object-oriented graphical modeling system used to develop dynamic graphic screens for real-time applications.

SL-GMS 4.0 offers Xt widget integration, Hypercard-like screen management and a Data Source Manager for codeless connection between screen objects and data sources. It also includes Graphic Interactive Screen Management Objects, which are "super-widgets" capable of complex behaviors beyond Xt widgets.

SL-GMS supports major UNIX, VMS and ULTRIX workstations, including HP/Apollo, Sun, DEC, IBM and MIPS platforms. It is priced at \$12,500 for the development package and \$1,500 for the runtime module (quantity 5).

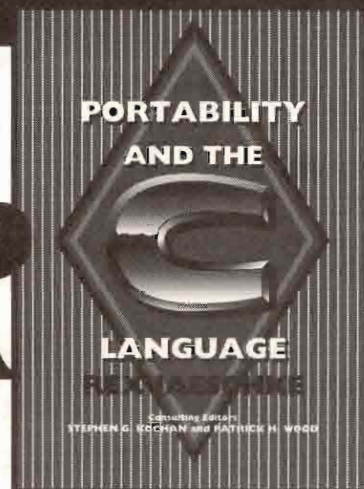
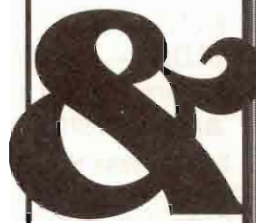
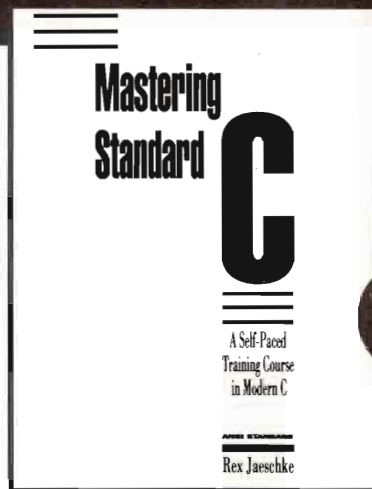
Contact SL Corp., Ste. 110 Hunt Plaza, 240 Tamal Vista Blvd., Corte Madera, CA 94925; (415) 927-1724.

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EDITORIAL BOARD: Richard G. Malley, 101 Wilmore Road, Bensalem, PA 19004			
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270. STATE OF ORIGIN OF THE EDITOR: PA			
271. STATE OF ORIGIN OF THE BUSINESS MANAGER: PA			
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273. STATE OF ORIGIN OF ALL OTHER PERSONS WHOSE NAMES ARE LISTED ON THE FRONT COVER OF THIS PUBLICATION: PA			
274. STATE OF ORIGIN OF THE PUBLICATION: PA			
275. STATE OF ORIGIN OF THE PUBLISHER: PA			
276. STATE OF ORIGIN OF THE EDITOR: PA			
277. STATE OF ORIGIN OF THE BUSINESS MANAGER: PA			
278. STATE OF ORIGIN OF THE EDITORIAL BOARD: PA			
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# ADVERTISERS INDEX

Reader Service Number		Page
158	Access Data .....	85
104	Adager .....	39
105	Bering Industries .....	43
108	Bradmark Computer Systems, Inc. .... I.B.Cover	
109	Bradmark Computer Systems, Inc. ....	36-37
151	Clearpoint, Inc. ....	45
111	Collier-Jackson .....	25
101	CompuTech Systems Corp. ....	65
160	Cort Directions .....	33
159	Data Based Systems .....	34
240	Dataram Corporation .....	11
191	De Rex, Inc. ....	47
166	Digital Products, Inc. ....	4
112	DSP Development Corp. ....	83
113	Dynamic Information Systems Corp. ....	61
115	Equinox Systems Inc. ....	87
262	Gandalf Data, Inc. ....	13
164	GBS Consultants .....	75
119	Herstal Automation Ltd. ....	60
147	Hewlett Packard (Customer Support) .....	48
	Hewlett Packard (Worldwide Customer Support) .....	5
120	Hi-Comp America .....	35
122	IEM, Inc. ....	2
247	Information Builders .....	63
181	Infotek Systems .....	I.F.Cover
245	ISA Co., Ltd. ....	49

Reader Service Number		Page
189	LXE, Inc. ....	71
155	M.B. Foster & Associates .....	12
168	M.B. Foster & Associates .....	79
130	Martech .....	53
154	Mitchell Humphrey & Co. ....	73
267	National Instruments .....	55
246	Newport Digital Corporation .....	9
173	Northgate Computer Systems .....	21
173	Northgate Computer Systems .....	22-23
152	NSD, Inc. ....	1
161	NSD, Inc. ....	17
260	Oak Grove Systems, Inc. ....	56
162	Operations Control Systems .....	19
195	Oregon Software .....	12
134	Paul W. Miller, Inc. ....	4
169	Precision Visuals, Inc. ....	57
268	Quest Software .....	15
137	RGB Spectrum .....	89
190	Smith Dennis & Gaylord .....	67
148	SOTAS International .....	51
141	Tymlabs Corp. ....	6-7
243	Tymlabs Corp. ....	31
140	Tymlabs Corp. ....	69
183	Unicom Electric .....	81
142	Unified Software Systems .....	70
146	Walker Richer & Quinn, Inc. ....	27
145	Walker Richer & Quinn, Inc. B.Cover	
186	Wavefront Technologies .....	59
237	Zubair Interfaces .....	33

## [ CALENDAR ]

### [ JANUARY ]

**16-18:** The 13th Annual Strategic Conference: Computer Graphics '91, Hardware and Software Assessments and Forecasts, will be held at the Hyatt Regency Hotel, Monterey, CA. Call (212) 233-1080.

**22-24:** The eighth annual UniForum, International Conference of UNIX Operating System Users will be held at INFOMART, Dallas, TX. Call (800) 323-5155 or (708) 299-3131.

### [ MARCH ]

**18-20:** The Sixth International Conference on Multimedia and CD-ROM has been rescheduled and will be held at the San Jose Convention Center, San Jose, CA. Call (203) 964-8287.

**26-28:** The National Database Exposition and Conference (DB/EXPO) will be held at the Moscone Convention Center, San Francisco, CA. Call (800) 2-DB-EXPO or (415) 941-8440.

### [ APRIL ]

**22-25:** The 12th Annual Conference and Exposition sponsored by NCGA will be held at McCormick Place North, Chicago, IL. Contact Sharon Sutton, (703) 698-9600.

### [ MAY ]

**8-10:** DesCon is sponsoring The Twelfth International Computer Management Show for the Design And Construction Industry, (A/E/C Systems '91), Washington Convention Center, Washington, DC. Call Sharon Price, (800) 451-1196.

**13-16:** The Fifth HP User Group Conference for the South Pacific and Asian region will be held in Melbourne, Australia. Conference theme is "Riding The New Wave." Contact Mandy Bromilow (613) 429-4322.

### [ JUNE ]

**11-14:** NECRUG is holding its Twelfth Annual Eastern American HP Users Conference at Trop World Hotel and Casino in Atlantic City, NJ. Call Randy Kaufheil, (215) 251-0736.

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