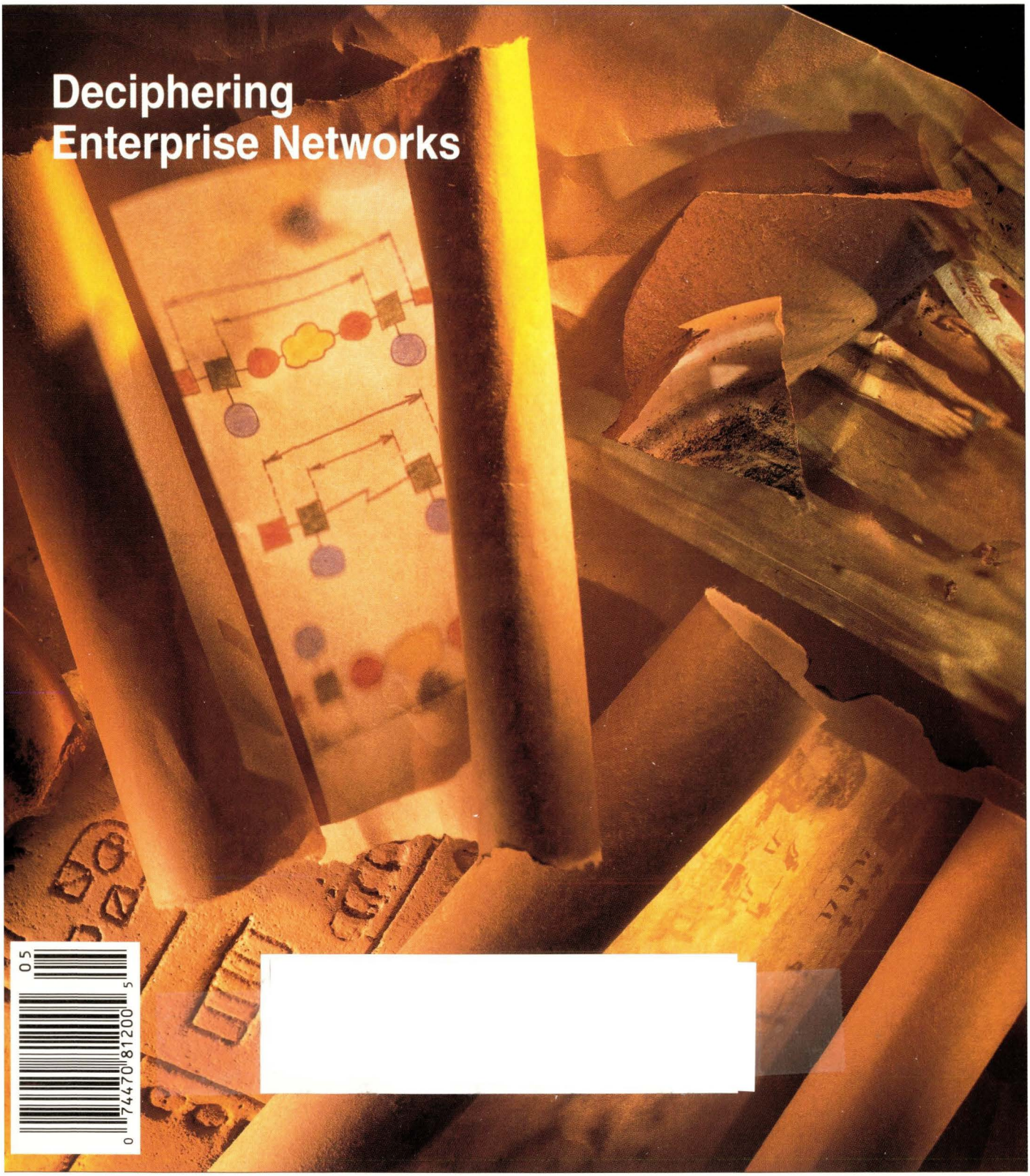
SunExpert

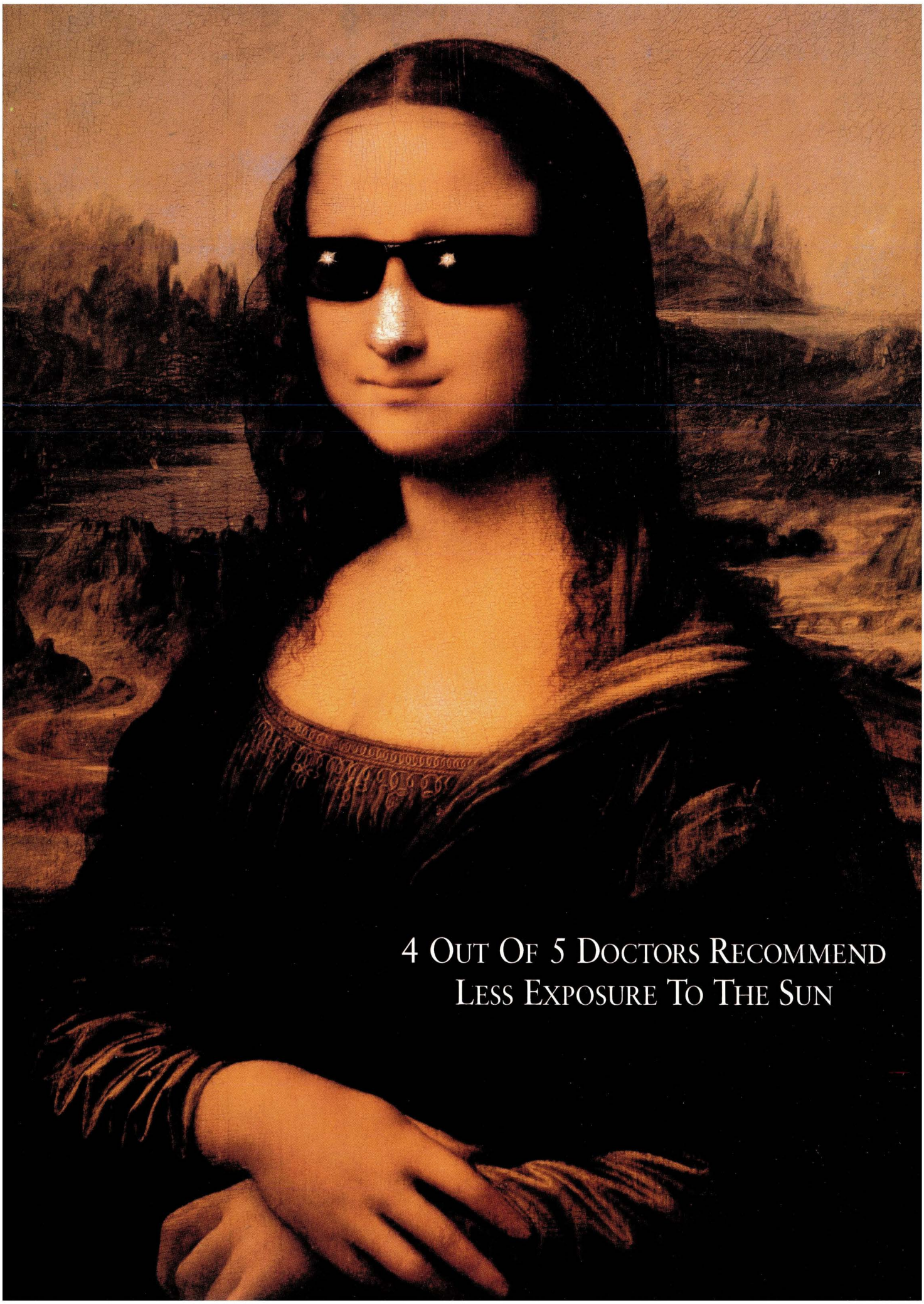
erving the UNIX Client/Server Network

MAY 1994 Vol. 5 No. 5 $5.50



ervice Mayhem

Reviews: Rapport Pro, XpressFax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GX Plus Frame Buffer
64MB
1.05 GB Disk
Floppy Disk (auto eject)
Keyboard
Mouse
Audio Kit

Axil 311

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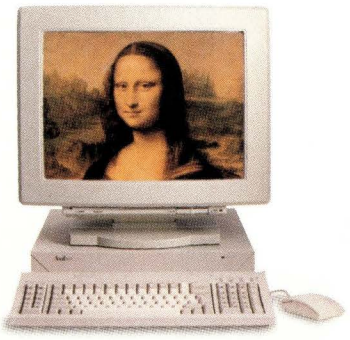

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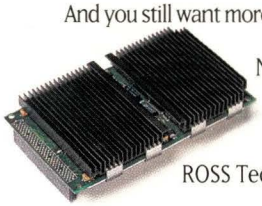

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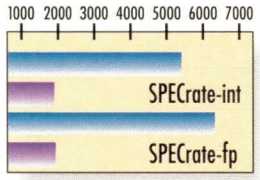

PERFORMANCE COMPARISON: hyperSPARC Quad CPU (66MHz) **vs.** Original-Equipment SPARCserver 600MP

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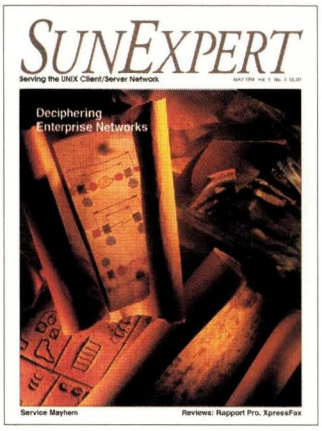

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FEATURES

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DEPARTMENTS

SUNEXPERT
serves the UNIX workstation environment, emphasizing Sun, SPARC and Sun-compatible systems.

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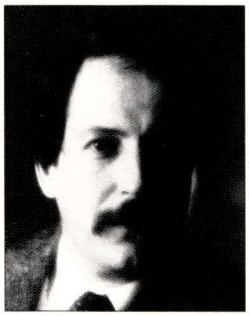
Material for publication should be sent to the attention of: Doug Pryor at the above address or electronically mailed to dpryor@expert.com. Letters sent to the publication become the property of the publication and are assumed to be intended for publication and may be used so. *SUNEXPERT* Magazine is not sponsored or endorsed in any way by Sun Microsystems Inc. All information herein is believed to be accurate to the best of our ability.

Editorial

The New Breed

If you're one of the new breed of UNIX gurus–you know, the one technical person who is part systems administrator, part network manager, part information technology wizard–you won't want to miss this month's Special Report. Netmin, netadmin, sysnet admin...whatever. If you have a suggestion for a title for this key network resident, let me hear it, but, by any title, these people no longer merely fetch tapes, establish new user accounts, monitor system performance, manage disk space and so on. Now they have more far-reaching responsibilities that extend into the bowels of the network. Oh, what a blessing is client/server mixed with LANs running some PC-based network OS or TCP/IP and WANs with multiple protocols and diverse types of media connected through dedicated or dial-up lines.



Our Special Report, affectionately nicknamed the Net Sea Scrolls after the cover illustration, is an attempt to take some of the mystery out of the PC-to-UNIX and SNA (SDLC)-to-TCP/IP connectivity enigma.

First, Mark Krieger of UniPress Software Inc. compares two ways of looking at the PC-to-UNIX problem. His discussion of the origins of UNIX/Ethernet and the migration of PCs to LANs, the economics of connectivity, as well as the technical options for bringing the two network architectures together will put you on a solid path to interoperability.

In the second section, Lionel Geretz, senior product marketing manager for Advanced Computer Communications Inc., addresses the fundamental WAN issue of the day: How to keep those legacy dinosaurs that run enterprisewide, mission-critical apps over SDLC lines up to date. Coexistence with TCP/IP seems to be the key to gracefully retiring old networks to the ash heap of history, which, if like other man-made landfills, may not be accepting deliveries.

Doug Pryor

SUNEXPERT Magazine
Serving the UNIX Client/Server Network
MAY 1994 VOL. 5 NO. 5

EDITORIAL OFFICES

1330 BEACON STREET
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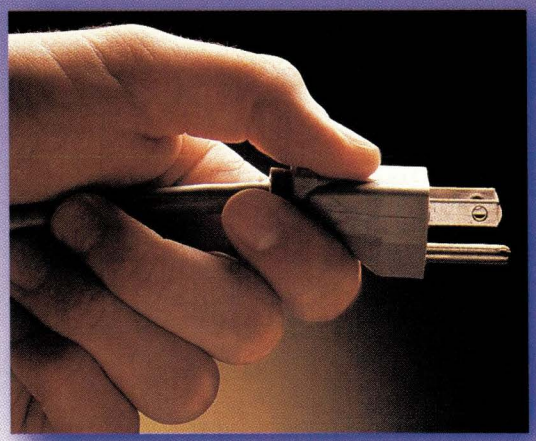

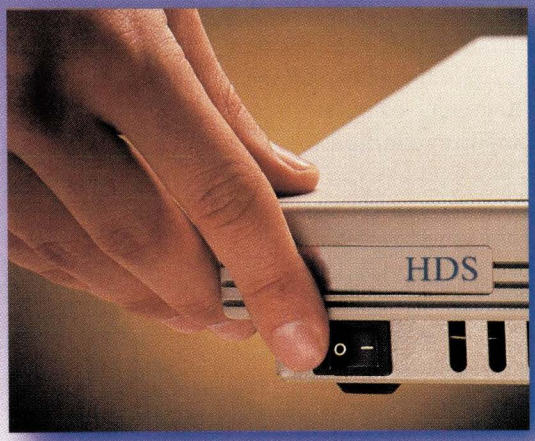

1. Plug it in
2. Turn it on

HDS X Window terminals are the easiest to install and the easiest to use. When equipped with local storage all you have to do to start using one is plug it in and turn it on. Because all of the terminal's fonts, server code and applications are stored locally there's no need to install, configure or change anything on your host computer.

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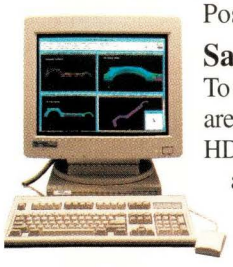

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NEWS

Graphics Market Shines

While much of the rest of the industry is cutting back or topping out, the computer animation market is growing explosively. According to market analyst Robi Roncarelli, editor of *Pixel*, a computer animation newsletter and report service based in Toronto, Ontario, the computer animation industry is now worth $3.8 billion and will be up to $20 billion in 1998.

In a new annual report, Roncarelli says that the industry is growing this rapidly because of a host of new applications. The big users of computer animation have traditionally been film and entertainment users. Hollywood and its cousins remain voracious consumers of animation hardware and software. However, in addition to films, the entertainment industry is finding new uses for computers in such places as theme parks.

Meanwhile, the other big growth areas are corporate and industrial communications, advertising, the broadcast industries, architecture, design, public relations and so on.

As usual, PCs and Apple Computer Inc. Macintoshes are the big winners in terms of units shipped. However, workstations are still in the running. In fact, says Roncarelli, even though workstations account for only 10% to 12% of units shipped, "they account for over half the total production."

He thinks his share will grow. "Workstations will always be the high-end product," he notes. "They're the powerhouses. Macs, PCs just don't have the dedicated graphics processors."

He thinks the growth of the larger market will actually force some users to workstations. "What happens," he says, "is that the user base grows. More and more people get involved with desktop computer animation, but a percentage of them begin to push up against the limits of the PCs." Eventually, he thinks, such people turn to workstations. "They get squeezed up the pyramid."

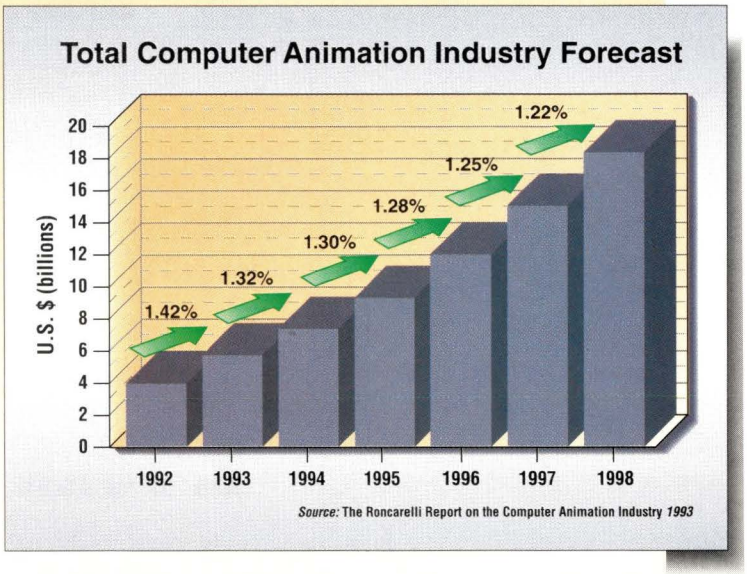
Among the workstations, he thinks Suns will have a place, even though Suns haven't traditionally had a big slice of the high-end graphics markets. "Silicon Graphics [workstations] remain the Cadillac," he says. "But I see more and more Sun workstations [in the animation market]."

He credits Sun's recent efforts in graphics for part of that success, and sheer numbers for the rest. "There are a hell of a lot of 'em around," he says. "And, for a person moving up from a PC, they seem much more reasonably priced than a Silicon Graphics."

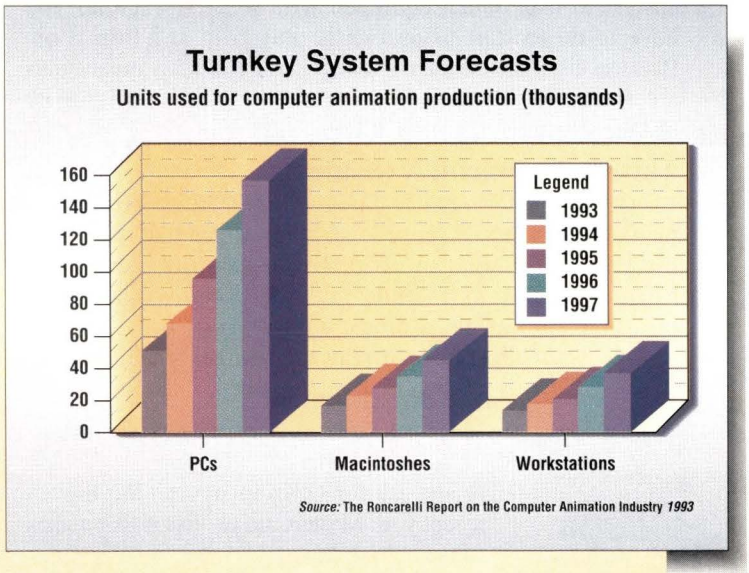
Fibre Channel Systems Initiative Adds TCP/IP Profile

A Transmission Control Protocol/Internet Protocol (TCP/IP) profile has joined the SCSI profile already developed by the Fibre Channel Systems

Over the next five years, the computer animation industry will grow to $20 billion, says market analyst Robi Roncarelli. He says a host of applications–ranging from architecture to legal–will fuel this explosive growth.



As always, the big winners will be Macintoshes and PCs, says Roncarelli. But, he thinks, the workstation component of the market will also grow. He notes that, already, workstations provide over half the production.



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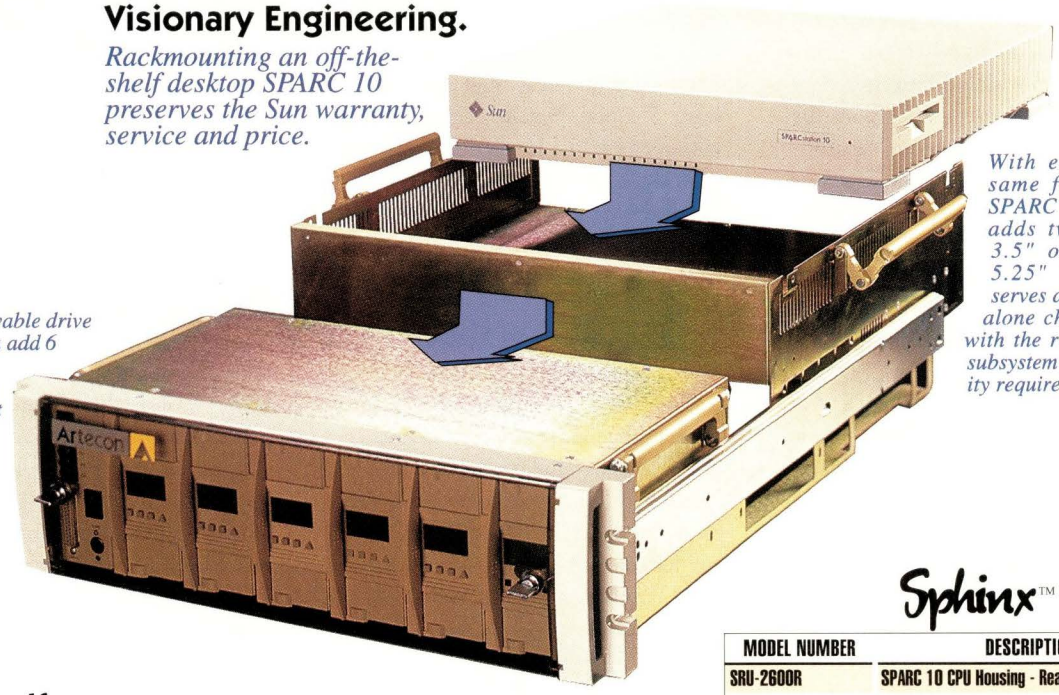

With essentially the same footprint as a SPARC 10, the Sphinx adds two additional 3.5" or half height 5.25" devices, and serves as either a stand alone chassis or mates with the removable drive subsystem for high capacity requirements.

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MODEL NUMBER	DESCRIPTION
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SRU-2200F	SPARC 10 CPU Housing - Front Unit
RRU3-SS-6S	Rackmount Removable Housing - Disk, Tape
RDU3-DSK-S-1.0GB	1.05GB 3.5" Removable Disk Module
RDU3-DSK-S-1.6GB	1.6GB 3.5" Removable Disk Module
RDU3-DSK-S-2.0GB	2.0GB 3.5" 5400 RPM Removable Disk Module
RDU3-DSK-S-2.1GB	2.1GB 3.5" 7200 RPM Removable Disk Module
RDU3-4mm-S-2.06GB	2-8GB Removable 4mm DAT Module
RDU3-4mm-S-4.0GB	4-16GB Removable 4mm DAT Module
RDU3-FLP-S-1.4MB	3.5" Removable Floppy Module

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Artecon's slender new Sphinx chassis is the only product today that allows you to rackmount an off-the-shelf desktop SPARC® 10 workstation or server. And the optional hot plug removable drive subsystem lets you add all the devices you need to build a powerful server – for thousands of dollars less than a preconfigured package.

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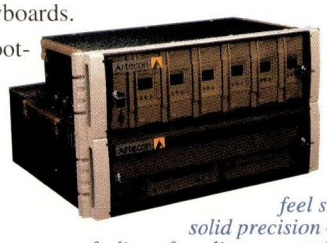

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Initiative (FCSI). Specifications handed down by the FCSI provide developers with a simplified blueprint for developing Fibre Channel products. Interoperability among Fibre Channel products will be increased when profile specifications are applied.

Fibre Channel, a high-performance information transfer technology, provides an open, standards-based infrastructure upon which distributed computing environments can be built. Its impressive bandwidth offers capabilities in excess of 1 Gb/s. The number of nodes that can be supported by Fibre Channel is unlimited. TCP/IP, a communications protocol, interconnects a wide variety of computer equipment and is the technology base for most of today's networks.

The applications that will appear from the TCP/IP-Fibre Channel bond are what's making news. Fibre Channel is ideal for building high-availability clusters composed of redundant standby CPUs used for parallel applications. Distributed databases, on-line transaction processing (OLTP) and other enterprisewide applications that normally run on mainframes will run seamlessly on Fibre Channel clusters made up of workstations and storage devices from a wide variety of vendors.

Clustering isn't the only advantage to come of this. Easy connection of workstations to established networks is something else the TCP/IP-Fibre Channel profile will provide. Storage and network data can run simultaneously, thanks to Fibre Channel's support of both channel and network traffic traveling over a single medium and a single hardware connection.

Real-time data sharing will enable designers and engineers to speed product development time. Movie studios will make use of it for production and distribution. The medical field will be computing intensive graphics applications via Fibre Channel. The financial field will use it to perform complex financial modeling applications.

Hewlett-Packard Co., IBM Corp. and Sun Microsystems Inc. allied in February 1993 to form the FCSI.

Another group championing the the growth of fiber is the Fibre Channel Association. Its 40 members represent suppliers, developers and users of Fibre Channel technology. The groups work together in hopes of rapidly developing interoperable solutions.–*mm*

NCD Buys Z-Code

Network Computing Devices Inc. (NCD), the Mountain View, CA-based X terminal vendor, has purchased Z-Code Software Corp., vendors of the famed Z-mail email software. Z-Code, Novato, CA, is itself a young company. It was a start-up less than three years ago. It says much about the pace of change in the email market that the company barely had time to be founded before someone bought it.

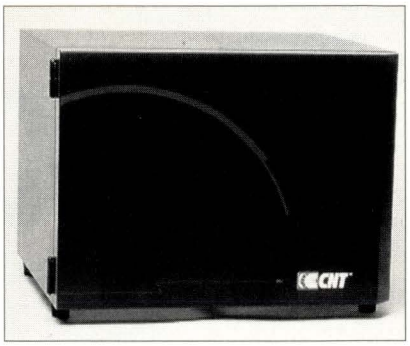
NCD says it paid $3.2 million and 1.8 million shares of its own stock for Z-Code. Z-Code is supposed to be relatively independent after the merger. Dan Heller, Z-Code's president and founder, will become an executive vice president of NCD. The company itself will remain in its Novato location, with its 37 employees, but will be rechristened the NCD Z-Code Division.

CNT Buys Brixton

Computer Network Technology Corp. (CNT) of Maple Grove, MI, has acquired Brixton Systems Inc., Cambridge MA. Both are networking companies. CNT specializes in high-speed links between data centers (i.e., mainframes and supercomputers). Brixton focuses on giving open systems platforms, like Sun Microsystems Computer Corp. workstations, SNA connectivity.

CNT says it paid $5.5 million, issued 986,094 shares of unregistered common stock, and converted each Brixton employee stock option into a CNT stock option. The company says that the total price was, then, about $14 million.

CNT products include a number of high-performance network hubs. Collectively known as ChannelLink, the products sit within networks and act as combined communications devices and network managers. A mainframe in search of a peripheral might, for example, address a local CNT box thinking that it is in fact the peripheral. The CNT system then takes the mainframe's request and routes it over whatever portion of the network seems clear to another CNT box located in whatever location has such a peripheral available.



CNT offers a line of high-speed networking hardware, like the ChannelLink boxes for large commercial installations. Traditionally, the company has been in the mainframe market. However, its acquisition of Brixton means an entry to the Sun world as well.

Brixton, meanwhile, has worked to bring IBM's SNA communication scheme into open systems. Its product allows Suns and other UNIX systems to function as though they are SNA nodes. Brixton's customers have usually been companies looking to extend the usefulness of their legacy systems.

The two companies thus believe they have considerable synergy. CNT seeks to extend itself into the UNIX environment. Brixton will find ready customers in CNT's current base.

Hot Serial

One of the oldest ways of spreading one's computer investment over as many users as possible is simply to provide more serial ports and run dumb terminals off the system. In an age of X displays, that would seem like an obsolete solution.

Yet the market for such solutions is doing just fine, thank you. Among the newest entries in the field is Parallex, from Systech Corp., San Diego. This small tower-configuration device attaches to a workstation's parallel port and provides up to 32 serial ports. Those ports could link to terminals, or modems, or any other serial device.

There are four models of Parallex, with four, eight, 16 and 32 ports, respectively. Pricing ranges from $625

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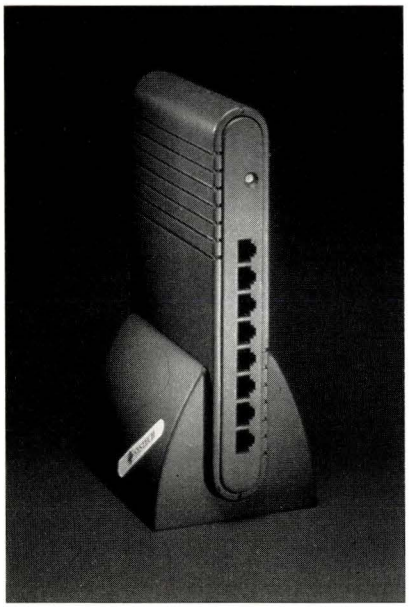


This Parallex subsystem from Systech provides a UNIX system with multiple serial ports. It is one of a host of multiport devices that can turn Sun workstations into multiuser systems.

to $1,995. The product supports speeds up to 115.2 Kb/s.

Other means of providing additional ports range from the wild to the woolly. Some companies, such as Central Data, Champaign, IL, provide additional ports through the SCSI port. In early 1990, one firm, Vector Technologies of Tucson, AZ, offered a product to give a Sun more ports through its RS-232-C. Then, of course, there are the host of multiport SBus boards available from any number of vendors.

What accounts for the continuing popularity of the serial option? "It always comes down to two factors," says Dennis Daudlin, president of Aurora Technologies Inc., "cost and convenience."

HP Shows Profits, Chips

Hewlett-Packard Co. seems to be on a roll. In March, the market research firm Dataquest Inc., San Jose, CA, proclaimed HP the number one UNIX vendor in terms of revenue and units shipped. Dataquest says, in fact, that HP increased its revenues by nearly $1 billion in 1993.

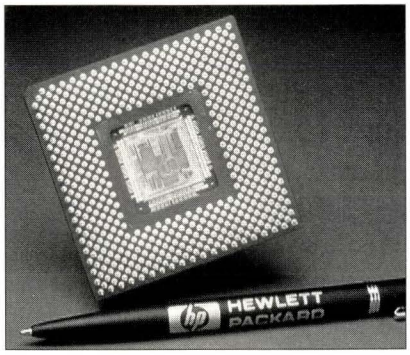
Dataquest says that HP had 19.5% of the total market in 1993, and revenues of $3.8 billion. This is up from 16.3% and $2.8 billion in 1992.

By contrast, in 1993, Sun had 18.2% of the market and revenues of $3.6 billion. This compares to 17.5% and $3.1 billion a year ago.

However, Dataquest notes that HP's midrange and server business accounts for most of its success. Sun continues to lead the pack in workstation sales.

Meanwhile, HP is itself showing a new implementation of its RISC architecture–the new PA-7200 PA-RISC processor. The new version includes a number of enhancements. Among other things, HP has given the chip access to a new bus, which provides high-bandwidth links to system memory. It will operate at up to 768 MB/s.

The chip also has what the company calls an "on-chip assist cache." This provides up to 2 KB as an overflow area for frequently accessed data. The chip also uses a new cache-management algorithm.



HP's new silicon, the PA-7200, is a single-chip implementation of its RISC architecture. The new version includes a number of new features, such as an improved cache subsystem and big- and little-endian byte-ordering support.

Finally, the chip is "bi-endian." It supports the big-endian and little-endian byte-ordering schemes.

DEC Makes Play for Embedded RISC

In other chip news, Digital Equipment Corp. is making a bid for the embedded computer market with its 64-bit Alpha processor. The company has announced that it will port its OSF/1 operating system with real-time extensions to its Alpha AXP VMEbus single-board computers.

DEC has made it clear that it wants Alpha in the embedded market and seems to be using OSF/1 as one of its routes there. While OSF/1 hasn't been widely promoted as a real-time OS, it is said to work well in those situations where lightning fast response time isn't necessary, but a certain degree of *real-timeishness* is.

PowerHouse for PowerPC

Just another Silicon Valley start-up? Probably not. PowerHouse Systems Inc. has technology that systems suppliers will be willing to pay for. It was formed in August 1993 by ex-NeXT

The top UNIX system vendors, according to Dataquest, are headed by Hewlett-Packard. The market research firm says that HP edged out Sun for number 1 in terms of all UNIX systems, though Sun continues to lead in workstations.

Preliminary 1993 Top Five UNIX Systems Vendors by Revenue (Millions of U.S. Dollars)

1993 Ranking	Company	1992 Revenue ($)	1992 Market share (%)	1993 Revenue ($)	1993 Market share (%)
1	Hewlett-Packard Co.	2,871.2	16.3	3,834.5	19.5
2	Sun Microsystems Inc.	3,082.3	17.5	3,588.9	18.2
3	IBM Corp.	1,818.8	10.3	2,307.1	11.8
4	Digital Equipment Corp.	1,009.1	5.7	1,098.4	5.6
5	Silicon Graphics Inc.	799.5	4.5	1,087.7	5.5
	Others	7,995.3	45.7	7,707.1	39.4
	Total	17,576.2	100.0	19,623.7	100.0

Source: Dataquest (February 1994)

HANNA DYER

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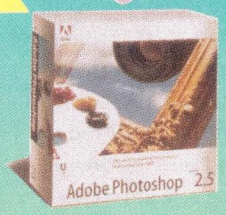

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Computer Inc. technology executives and funding from Canon Inc., which, coincidentally, also invested in the founding of NeXT. PowerHouse is the first company dedicated to providing the industry's leading computer suppliers with systems based on the IBM Corp./Motorola Inc./Apple Computer Inc.-developed PowerPC microprocessor and the PowerPC Reference Platform specification.

Jon Rubinstein, PowerHouse's chief operating officer and former vice-president and general manager of the NeXT Hardware Division, says it best: "The combination of PowerPC and the Reference Platform has opened up a new market, creating a way for computer companies to break Intel Corp.'s perceived "death grip" and innovate without risking incompatibility."

PowerHouse has been on the PowerPC scene all along. Glen Miranker, vice president of hardware engineering at PowerHouse and former NeXT director of hardware engineering, says, "PowerHouse has been working closely with IBM and Motorola in its product development, serving as an alpha test site for their PowerPC microprocessors." IBM and Apple will introduce PowerPC products this year, but PowerHouse won't show its stuff until 1995, using the next generation of PowerPC CPUs.

PowerHouse is labeling itself a "design partner," meaning it will sell to computer systems suppliers who will purchase and resell its PowerPC-based products on an OEM basis. Targeted OEM customers are a select group of major systems companies with established distribution channels. PowerHouse will cooperate and assist in defining products to meet customers' needs and provide them with the development, product marketing and manufacturing expertise to create a new product line or supplement an existing one.

The first line of desktop systems is priced from $3,000 to $6,000 with performance measuring in the range of 80 to 280 SPECmarks. The systems will be operating system-independent, meaning Microsoft Corp.'s Windows NT, IBM's AIX and SunSoft Inc.'s Solaris, among others, will run on these workstations. Products will hit the market early in 1995.–*mm*

More Rivals for Intel

When the Pentium (nee 586) was introduced by Intel Corp., it was widely seen as a RISC killer. However, the chip has had more woes than wins. The processor continues to be deviled by high prices, low availability, compatibility problems and strong competition from traditional RISC chips (like SPARC), new RISC players (like the PowerPC) and lower priced CISC alternatives (like the 486 itself).

Now, it has a new rival as well. Milpitas, CA-based Nexgen Microproducts Inc. has announced the Nx586 processor family. Meant to compete head-on with the Pentium, the Nx586 is already available in 60- and 66-MHz clock rate models.

The company says that the Nx586 will be as fast or faster than the Pentium. It will also be compatible with X86. Nexgen says the Nx586 will run at least 50,000 DOS, Windows, OS/2 and UNIX applications.

However, it will be priced in roughly the same neighborhood as the 80486. A 60-MHz Nx586 is $460 in quantities of 1,000. The 66-MHz version will be $506 in quantities of 1,000. The company says this is roughly 32% less than a Pentium. There is also a floating point processor that is available as an option.

Tangent Computer Corp., Burlingame, CA; Compu-Tek International Inc., Santa Clara, CA; Adisys Corp., Richardson, TX; and Lucky Computer Co., Richardson, TX, have announced products based on the Nx586. All are personal computers meant for the DOS and Windows markets.

Applix To Support 1-2-3 Users

Three years ago, Lotus Development Corp. introduced its 1-2-3 spreadsheet for the Sun Microsystems Computer Corp. workstation. This magazine, along with many other observers, responded with wild enthusiasm. *SunExpert* did a cover story on the introduction and hailed it as a sign the age of commercial UNIX was here.

It wasn't. In the months and years that followed, 1-2-3 for Sun simply did not sell well. For whatever reasons, Sun workstation users didn't want it. Lotus has gradually backed away from the product, and the Sun environment. It only returned (and then cautiously) to Suns with the announcement of Notes for Sun this year.

However, some users did buy 1-2-3 for Sun. They found themselves orphaned as Lotus moved away from the spreadsheet. Now, however, software vendor Applix, Westboro, MA, wants to adopt them.

Applix says that anyone who has a 1-2-3 for UNIX can trade it in for the Applix analogue, Applix Spreadsheets, for $395. Applix Spreadsheets can also be integrated with the company's other products, Applix Data, Applix Real Time, Applix Words and Applix Graphics.

The Future of UNIX

SunSoft Inc. has joined with most of the former members of the Open Software Foundation (OSF) and UNIX International (UI) to form yet another new organization to speed up the development of source-level open system software components. The companies include open systems luminaries AT&T Global Information Systems, Bull Worldwide Information Systems, Digital Equipment Corp., Fujitsu Ltd., Hewlett-Packard Co., Hitachi Ltd., IBM Corp., International Computers Ltd., (ICL), NEC Corp., Novell Inc., Sony Corp. and Transarc Corp.

The organization will carry the name OSF, although a name change is being considered. The current OSF's RFT process, Research Institute, end user and ISV memberships will continue, and support for existing OSF technologies will go on. The new organization will adopt a per-project sponsorship model that will include a new prestructured technology (PST) process designed to ease multicompany cooperative development projects.

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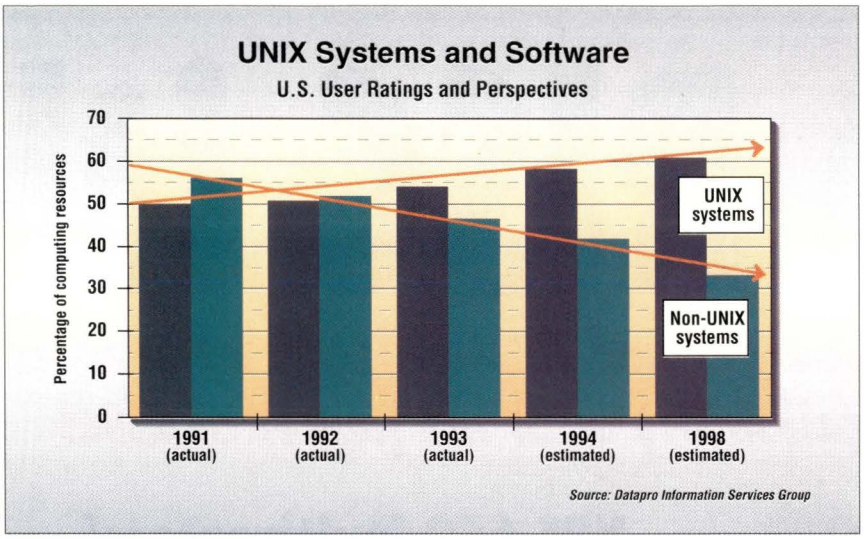

HANNA DYER

UNIX Finally Overtakes Proprietary

UNIX has, finally, overtaken proprietary systems. In yet another report, this one from the Delran, NJ-based Datapro, "UNIX Systems and Software: U.S. User Ratings and Perspectives," analyst Mary Hubley says that proprietary systems are now outnumbered by UNIX ones.

Datapro had recently surveyed 700 end-user sites. The result was that in 1993, 54% of users' resources were UNIX and 47% were non-UNIX. This is up from the 1992 survey, when 51% were UNIX and 52% were proprietary. In fact, the respondents estimate that, by 1998, 61% of their resources would be UNIX-based and 33% non-UNIX.

Sun's share of the '93 numbers was significant. Some 39% of the respondents were using SunOS or Solaris. Second was SCO UNIX or Xenix at 32%. After that came UNIX System V at 30%, IBM's AIX at 23%, HP-UX at 22%, and Berkeley UNIX at 11%.

Some 9% of the respondents said that they were planning to buy SunOS or Solaris products in the near future. Among SCO UNIX users, 5% said they were planning to phase out that operating system in the near future.

BSD Suit Ended, Port to Sun Under Way

Berkeley Software Design Inc. (BSDI) is one of the many companies that had a Berkeley UNIX for personal computers. Unlike the others, however, BSDI was one that UNIX Systems Laboratories (USL) sued. The resulting David and Goliath struggle, with the tiny company fighting for its existence against the much larger USL, has provided one of the cause celebres of the industry in the '90s.

USL was in court simultaneously with the University of California, Berkeley, and BSDI, over the issue of who owned Berkeley. It was a conflict made all the more colorful by the fact that BSDI seemed to personify the happy hacker culture from which UNIX itself sprang. USL, meanwhile, seemed to represent the suits that have gained control of UNIX since. USL's case wasn't helped by the fact that its own relevance to UNIX seemed to be steadily declining.

But all morality plays have to come to an end eventually. This one did in February. "USL lost the suit against Berkeley," said an industry source. "And then after that, the suit against BSDI just sort of came to an end."

BSDI says it is now free to do with its OS pretty much as it likes. The company's product, BSD/386, is currently available on X86 and Pentium machines. However, the company says that it is already at work on a port to the SPARC. "We hope to have exciting announcements by summer," says company President Dr. Rob Kolstad. This could prove interesting news for Sun, whose users have chaffed at the switch from SunOS to the System V-derived Solaris.

Meanwhile, USL is left to deal with the negative PR resulting from its ever bringing its suit in the first place. Indeed, there may be a larger issue that the USL/BSDI suit reflects. In the 1980s and early '90s, lawsuits were common and effective competition strategy for many companies. Now, though, legal costs and public perceptions are making that tool more difficult to use. Increasingly, companies are discovering that merely because it's possible to litigate does not always mean that it's desirable to litigate.

SPARC International: Hard Times or Just Par for the Course?

SPARC International, the not-for-profit that Sun Microsystems Inc. and other SPARC-oriented product vendors set up as a standards body for Sun-compatible computing, has downsized. "I think we are down about nine [people]," says Robert W. Duncan, chairman and CEO of SI.

"Baloney!" says Bob Duncan, CEO of SPARC International, speaking of reports that his organization has problems.

The question is why. According to Duncan and sources at Sun, the reduced head count is a perfectly healthy response to changes in direction for the organization. However, rumors circulating in the industry say SI is an organization in trouble. Some say the organization's function had been largely taken over by Sun's own SPARC Technology Business Group. There was even a report that SI was to be shut down within six months.

SI's CEO, Bob Duncan, completely

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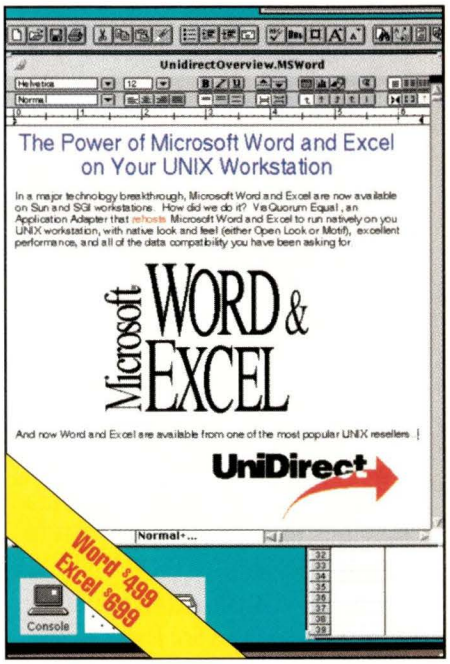

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32-bit code			●
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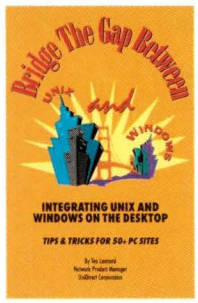

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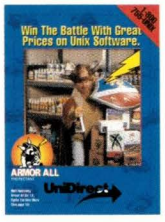

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discounts reports of his organization's death. He attributes them to rumors begun by disgruntled former employees or contractors.

He confirms that several of SI's major testing programs have shifted to vendors but says that this is in keeping with the group's charter. "We have just completed a transfer of two major programs to the vendors. One is SPARCworks, the verification and capture program, and the other is SPARCbuilders, the technology catalog. We did a lot of the end-user recognition work, the advertising and trade shows, but once that had been done, we said, 'Hey, let's put it back to the vendors.'"

He confirms that layoffs have happened but again says that they were normal and expected. "We are program-driven. When the members say that they are going to do a cooperative program, we add staff. When the cooperative program is over, the staff goes away."

He adds that the murmurings of a "blood bath," are untrue, saying that only six people had been let go. "Is that a blood bath? I don't think so. For one thing, a 'blood bath' implies that you shoot somebody, that you don't have severance packages, and no prior notice. We had all of that."

As for the six-month life span, Duncan says, "Baloney! We have a nice stable balance sheet. We can't make a profit, but that's because we are not for profit."

Sources at Sun say similar things. A highly placed source at Sun responds to queries about SI's health with "SPARC International is definitely not going away."

But, whatever the state of health at SI, the whole issue of the economics of nonprofit standards organizations in the '90s remains complex. In the 1980s, there was a boom market in such organizations–dozens were organized for various purposes. Today, it is not so clear that the money for such groups is going to keep coming. One informed source, a director for another nonprofit, explains, "The UNIX market is shrinking. There's less profit for the corporation. And there are a lot of not-for-profit standards organizations out there asking for your money."

That, says this director, could have a real impact on organizations like SI that rely on corporate sponsorship. "Those corporations are getting squeezed."

This Just In...

- ***Interleaf Inc.***, Waltham, MA, has announced that Boulder-based ***Access Graphics***–Sun's own channel partner–will be carrying Interleaf products, including WorldView and Interleaf 6.
- ***Cray Research*** says that its SPARC-based Superserver 6400 has broken the record on SPECrate92 performance. The 32-processor 6400 achieved a SPECrate92 of 54,186. The company says that this is 90% faster than any system before.
- SPARCalike vendor ***Axil Workstations***, San Jose, CA, has announced a new VAR program. The company, which is a division of Hyundai Electronics America, says it will reach out to VARs in every geographical area of the United States, Canada and Mexico. Among the first VARs to sign up with Axil is ***Andataco***, San Diego, which has signed an agreement to purchase $15 million worth of Axil products.
- Fourth-party service provider ***Apex Computer***, Redmond, WA, is expanding to ***Silicon Graphics Inc.*** The company has purchased ***Technology Logistic Inc.***, an SGI fourth party, and will be using the acquisition to move into the SGI market.
- ***Pure Software Inc.***, maker of the Purify run-time error detection package, has received $4 million in mezzanine financing. The new money will come from a variety of sources, including the venture group Chancellor Capital Management of San Francisco.
- ***Bell Microproducts Inc.***, San Jose, CA, has acquired ***UNIX Central***, formerly a business unit of ***Woodside Technologies Inc.*** UNIX Central, a reseller that publishes a quarterly catalog of UNIX products, will become a division of Bell.
- In yet more M&A activity, ***Microtec Research Inc.***, Santa Clara, CA, has merged with ***Ready Systems.*** Microtec is vendor of embedded system tools, while Ready makes a real-time OS. ⊷

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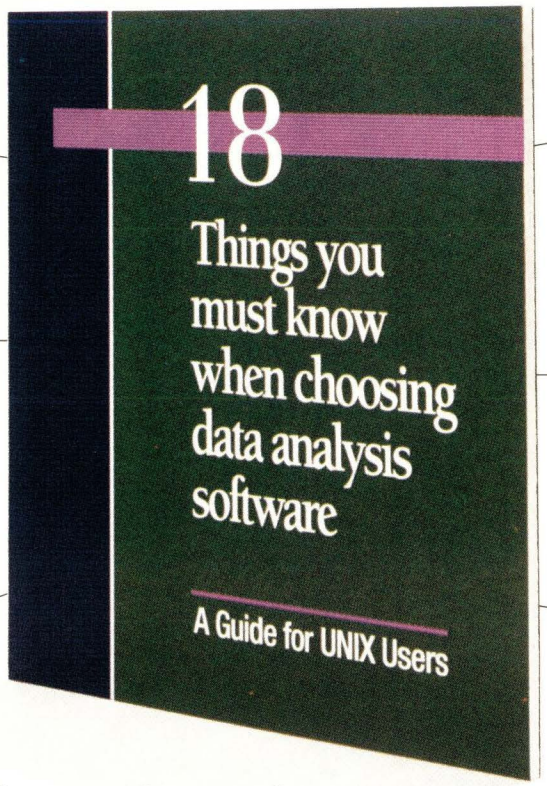

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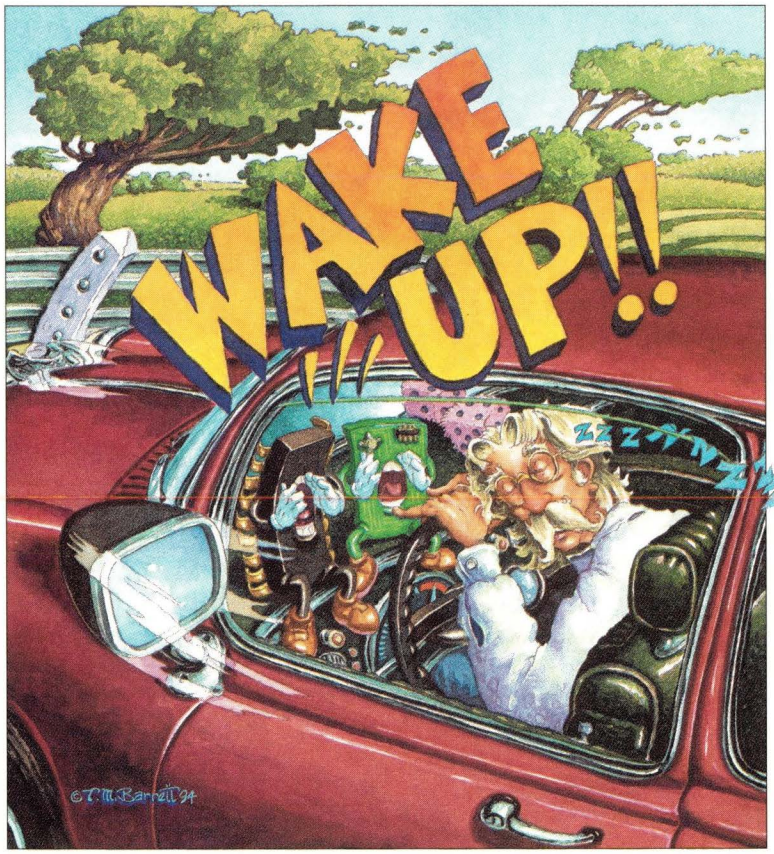

TOM BARRETT

On the Failure of Protocols

by MICHAEL O'BRIEN

"Small is beautiful."
–A sentiment from the '60s

"Peekaboo, I see you."
–Protocol between two small processors

"I think it's that gizmo next to the air cleaner."
–About as close as you're going to get to a network plan of your current car

Q: Good heavens! I don't think I've ever seen Mr. Protocol looking so upset. He's just sitting in the driver's seat of that car and crying! Whatever is the matter?

A: Well, I'll admit he's felt better. I think his main problem is that he's just learned that that car has no fewer than seven computers in it, and none of them communicate in any protocol with which he's familiar. This has left him feeling just a little devastated.

I think the real problem stems from the Internet Engineering Task Force. You see, they've been doing their work lately in such silence, and with such lack of friction, that Mr. Protocol's attention has begun to wander. And that led to disaster. He stumbled across some sales literature for an automobile: the Eagle Vision, to be exact. And therein, he read something about how "up to seven processors continually examine a stream of data from sensors throughout the car, continuously tuning your car's performance" to impress your date with your studliness, as if that and your car were somehow related, etc., etc.

At this point, Mr. Protocol started throwing old Big Stuf Ding-Dong wrappers at me. This wouldn't matter except they'd already been through the trash compactor and the actual objects he's been throwing are very solid and weigh 30 pounds. This was to get my attention. He wanted me to mention the movie *Crazy People*, and how it portrayed advertising campaigns as written by the inmates of an asylum, which actually told the truth about the

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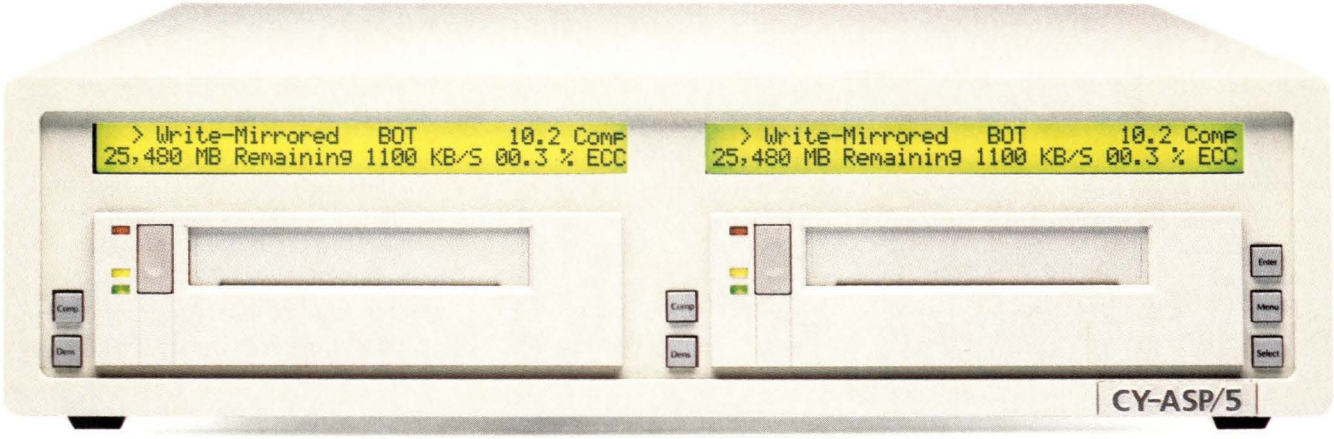

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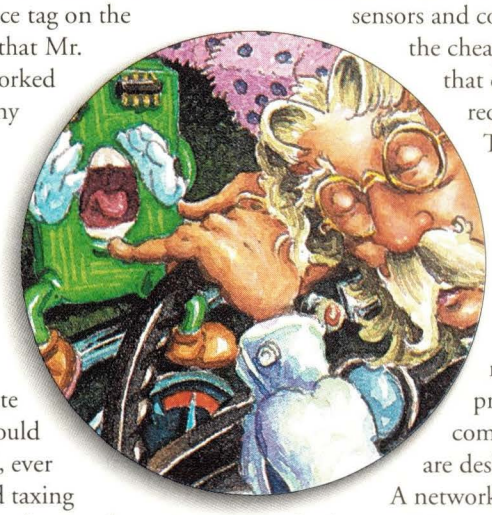
products they advertised. The plot device was that these ads were so much more popular than the standard puffery that people flocked to the products. I think he wants to see this stuff applied to protocols. Say, *TCP/IP. It's not just a grad thesis anymore.* Or, *Buy OSI. Sure, it's big and it's slow, but at least your boss has heard of it.* The one that made me throw one of these wads back was, *Kerberos: You'll still have nightmares, but your system will be safe.*

At this point, I decided it was time to see what was twisting old Mr. P.'s nightshirt, if we were ever to get any peace around here. Apparently the problem was not, as I had at first surmised, the price tag on the car. I had feared that Mr. P. had actually worked out just how many chocolate chip cookies you could buy for that kind of money, but it turns out he has never found a commercially available chocolate chip cookie he could stand to eat, and, ever since they started taxing snack foods, he can't price things in terms of Big Stuf Ding-Dongs either.



No, what had him torqued was the thought that he had absolutely no idea what kind of protocols these processors use to communicate. Factory automation is a large enough, and generic enough, industry that the Manufacturing Automation Protocol has been put forward fairly successfully as a standard in the area. But when it comes to individual products, there are no standards, at least, none of which Mr. Protocol is aware. In automobiles, which are the most complex and expensive consumer products made, the use of multiple processors is no more than 10 years old, and competitive pressures are among the highest in any industry, which works against the notion of standards (the efforts of the Society of Automotive Engineers notwithstanding).

However, this column has in the past predicted the notion of at least three aggregation layers of networking within the home, before the wide-world Internet proper is even reached. So, what are the forces driving the design of these multiprocessor systems? Mr. Protocol is glad you asked.

The computer systems in automobiles are real-time systems with specific tasks. One computer runs the fuel-injection system, one runs the air conditioning, one runs the antilock braking system, one runs the trip computer, and so forth. The same sensor may run to different computers (the speed sensor, for example). Cost is at a premium, which means the communications medium between sensors and computers must be the cheapest and simplest that can carry the requisite data rates. This means bit-serial communications. To consider the use of a network protocol in such a situation, we must consider the problems that computer networks are designed to solve.

A network protocol is a set of rules governing computer communications, designed to support the evolution of a computer system over time. The evolution may involve changes in hardware or software, and changes in size. The computer system of a car exhibits none of these characteristics.

A car, basically, is designed once, as a system composed of subsystems. The design is iterated over the life of the product line, with small or large changes made for each model year, and other changes made in mid-year as required. However, the car is still regarded as a whole, single item, and there is no chance whatsoever that other computers will be added into the car's computer "network" over the life of the car…certainly not by the car's owner! Diagnostic computers used by the dealers are proprietary devices, using interfaces not documented for the owner of the car or anybody else (which gives dealerships an edge over independent repair shops).

Computer networks, however, are devoted to change, or at least, are designed for it. Computers and applications may be added to or deleted from the network at will, and this task is made easier by the use of computer protocols, which provide a standard for communication. Cars, though, use computer systems that are designed from the ground up for a specific task, a task that never changes. Consequently, the up-front investment of designing a special-purpose system need be made only once, and the costs recouped through the sale of hundreds of thousands of identical cars containing hundreds of thousands of identical networks.

Curiously, there is an aftermarket in this stuff, which may be surprising to some. The performance of cars is no longer determined by diddling 800 tiny screws on a carburetor, but is instead determined by the ROM program running in the fuel-injection computer. In the design life of a car, several versions of this program, encompassing several different levels of performance, are inevitably developed. Some are designed to make the car scream, some are designed for sedate family use, and some are designed to optimize emissions. After the car hits the streets, there is, at least sometimes, a sort of grey market in alternative ROM programs. The classified ads in certain esoteric automotive magazines offer for sale various alternative chips for various cars, which are claimed to do astounding things to the cars. No doubt they do: Mr. Protocol has never tried one, however.

With few changes, this picture carries over into other toys and tools around the home. There is the X10 protocol for controlling household appliances, but it is a one-way command protocol, not a true peer-to-peer communications protocol. In the same ballpark are infrared remote controls. What is amusing about these is that in the last few years, memory has gotten cheap enough for "universal" remotes to be produced. Some are small, special-purpose computer systems that memorize the output of the original infrared remote for each piece of equipment.

These take a while to program (you have to press every button you want to program twice, once on the original remote and once on the learning remote) but will work with anything. More interesting are the ones that have the output codes for every function on every single remote on God's green earth preprogrammed. All you have to do is tell it which of several dozen remotes it is supposed to look like today.

Even amateur radio gets the treatment. Today's hand-held radios, both amateur and commercial, are actually microprocessor-controlled engines. They possess so many functions that the commercial units often require the intervention of a personal computer to program the radio for the customer's specific needs. And in the amateur community, where the customer is an individual who cannot be counted upon to have a PC, and where the radio is likely to be reprogrammed many times over its lifetime, the complexity of programming radios has grown to the point where radios may be "cloned" over the air. A "master" radio, set up in the correct fashion, is commanded to transmit the entire contents of its memory over the air in a digital code, which is received by one or several "slave" radios, which have in turn been commanded to listen for programming coming over the air. After the transfer, the slave and the master radios contain identical information in memory and will behave identically in all respects. In both the commercial and the amateur cases, the protocols used to program the radios are ad hoc, asymmetric and vendor-specific.

Is this state of affairs permanent? Mr. Protocol doesn't think so, but it isn't likely to change anytime soon. Despite the proliferation of microprocessor-based control systems, the software development cost of most such systems is small compared to the development cost of the overall product. Hence, the thought of developing interoperability of these dedicated processors across product lines and between vendors seems ludicrous.

And yet...

Control systems are so expensive to

design and build that economies of scale are exploited whenever and however possible. As general-purpose microprocessors become larger and more powerful, it becomes economical to use them to implement more and more of the parts of control systems that would otherwise be implemented using discrete components. For example, one very high-precision Global Positioning System navigation receiver is implemented using a SPARC processor. In essence, a Sun is built into a radio, running special-purpose code. And while admittedly this application is rather compute-intensive, it is still the case that as more and more powerful industrial controller chips are developed, new uses are found for them.

One can expect to find more and more sophisticated processors in use in embedded applications.

Therefore, one can expect to find more and more sophisticated processors in use in embedded applications. Things being as they are, software will doubtless lag the hardware in the applications, as it always has. Mr. Protocol is not sanguine about anyone actually heeding the endless calls for software engineering and software reuse techniques.

However, there will be two additional pressures. The first is in the general computerization of the environment. In almost any conceivable application, there will be the need to communicate with external computers. In the case of a car, the diagnostic computer is now the centerpiece of any automotive dealer service bay. The sophistication of this device is already growing seemingly without bound, and an increasing amount of interaction with the onboard computer network is the inevitable corollary. Since it doesn't pay to have a different computer for every model, we can expect that within a manufacturing line, at least, all of a vendor's cars will speak the same diagnostic "protocol."

The other expected pressure is more nebulous, but even more certain. The needs and desires that have moved the world of workstations and "enterprise" computing (Mr. Protocol really, really hates that usage but hasn't found a better one...yet!) toward distributed computing apply equally well to the world of embedded control systems. Many computational problems are more practical when attacked in a distributed fashion.

Consequently, in addition to seeing individual processors inserted into products to handle specific jobs, we can envision a network of tightly coupled processors being installed to handle more general, or more demanding jobs. This requires a shift of vision: When an entire network of processors is seen as a single entity credibly solving a problem that cannot be solved easily on a uniprocessor, one need only look down the road to see this solution applied to embedded control networks as well. And not just for military aircraft!

In this case, we are dealing with a type of distributed solution now being contemplated only in research laboratories, where projects such as Michael Gorlick's "Weaves" project envision the assemblage of unified programs dealing with data stream problems as consisting of assemblages of independent code fragments. Certainly the telemetry stream in a car counts as just such an environment. Yet such a weave consists of a network of processors speaking a definite protocol. It may be that protocols will find their way into real-time control systems not because they are necessary for system expansion, but because they were necessary for system development in the first place.

This is not to say that "old-fashioned" control systems are liable to be abandoned. Some cars are still designed with carburetors, after all! But it does mean that dumping in an entire computer network, however small, may be a viable solution to a problem that is currently too difficult for any single microprocessor to handle in real time.

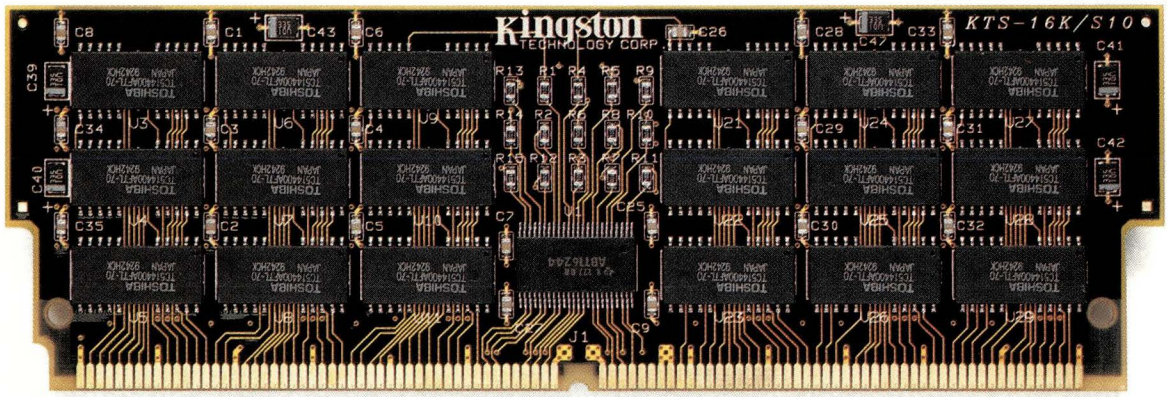
And so we see that Mr. Protocol has his limits: There are places where he is tolerated grudgingly, when he's tolerated at all. But he does have the habit of gate-crashing any party that lasts long enough, and generally winds up being the Mysterious Intriguing Guest of the Week. But if General Motors found it necessary to define MAP, an entire new language for process control, don't expect Mr. P. to make himself over into an overtly normal type. It is probable that these embedded networks will require new protocols, perhaps suited to the high-speed networks that will be used to design and implement them.

Whichever way the pendulum swings, Mr. P. figures the pictures in the back of obscure automotive magazines will continue to sell "performance" chip sets for major auto manufacturers' products for a long, long time before that market opens up. But wouldn't it be nice to really tune up your car yourself, with your trusty PC at your side telling you everything that's going on in there? ⊸

Mike O'Brien has been noodling around the UNIX world for far too long a time. He knows he started out with UNIX Research Version 5 (not System V, he hastens to point out), but forgets the year. He thinks it was around 1975 or so.

He founded and ran the first nationwide UNIX Users Group Software Distribution Center. He worked at Rand during the glory days of the Rand editor and the MH mail system, helped build CSNET (first at Rand and later at BBN Labs Inc.) and is now at an aerospace research corporation.

Mr. Protocol refuses to divulge his qualifications and may, in fact, have none whatsoever. His email address is `amp@expert.com`.



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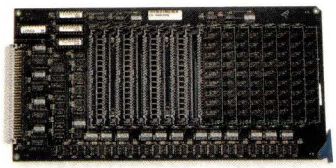

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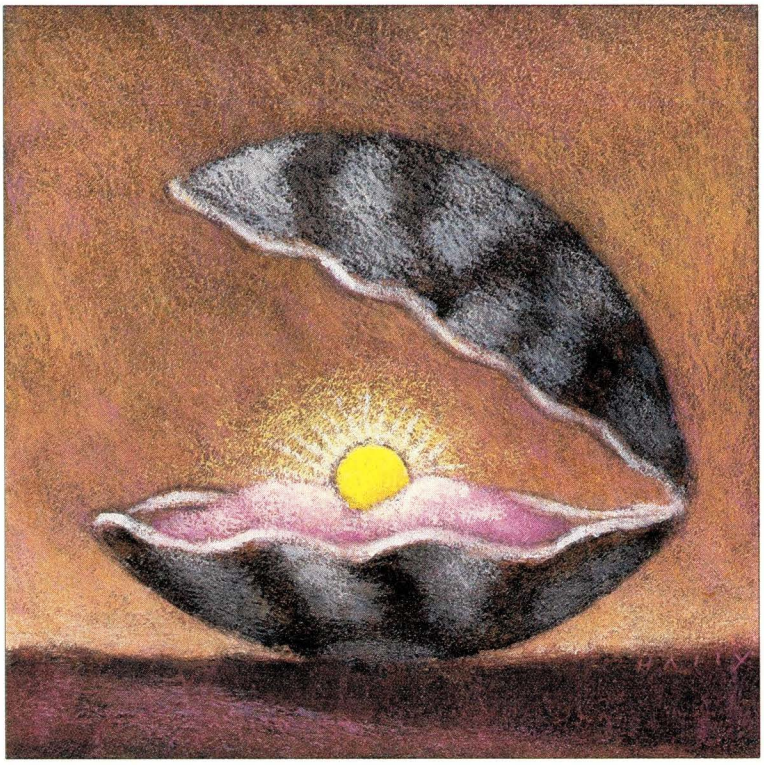
GREG HALLY

The Korn Shell

by PETER COLLINSON
Hillside Systems

I was quite surprised when Sun offered me an upgrade to SunOS 4.1.3. It's an interesting reflection of the take-up of Solaris, perhaps. I had a wonderful time upgrading my machine. I followed Sun's upgrade instructions carefully and got a nonfunctioning system. I was not that pleased. Prudently, I had done a full dump and could recover. In the end, I resorted to raw `uncompress` and `tar` to pull the bits from the CD-ROM and installed them judiciously. It was fortunate that I had a lot of disk space. I made some by junking the installed version of Solaris 2.2 that I use for testing. I put up Solaris 2.3 later.

Why am I telling you all this? Well, it had occurred to me that perhaps Solaris 1.1.1 (a k a SunOS 4.1.3_U1) would have been a great opportunity for Sun to give me a working Korn shell. I have wanted a version for a long time, since I first heard about it. Sun has given us several other System V tools over the ages. Why can't we have the Korn shell (`ksh`) too? Wouldn't it be a "migration to Solaris tool?"

Why do I want the Korn shell? Well, I have always preferred the Bourne shell to the C shell (`csh`). However, originally only `csh` supported job control. Job control was something I considered too useful to be without. When I became a C shell user, I used the Bourne shell for writing scripts and `csh` for talking to the machine. C shell was always better as an interactive shell because it has shell history, storing all the commands that you type so you can re-use them later. Because I'm a dreadful typist, this is a huge boon.

The Korn shell adds many of these good ideas into the Bourne shell, along with several others. It provides job control, giving you the ability to suspend command lines with Control-Z and then manipulate the job with `fg` and `bg` commands. People like to argue that this is not needed in these days of windows: To start a new job, you start a new window. However, they don't understand the natural reluctance of the biological organism to perform unneeded tasks. It's still easier to hit Control-Z and type `bg` than it is to remove one hand from the keyboard, find the mouse in the clutter on the desktop, select the appropriate menu item and position the resulting window.

The Korn shell has more built-in functionality than the Bourne shell. We have seen shells pull more and more programs in as built-in actions. The C shell has incorporated `echo` from `/bin` as a built-in command. The Bourne shell has moved the `test` command from `/bin` into its binary as a built-in command too. The Korn shell goes further than the Bourne shell, allowing arithmetic and string formatting to be done directly in the shell.

The Korn shell has command history, remembering all the lines that you have typed and allowing you to re-execute commands easily. You can also edit parts of old commands into new ones using a line editor. The ability to edit input

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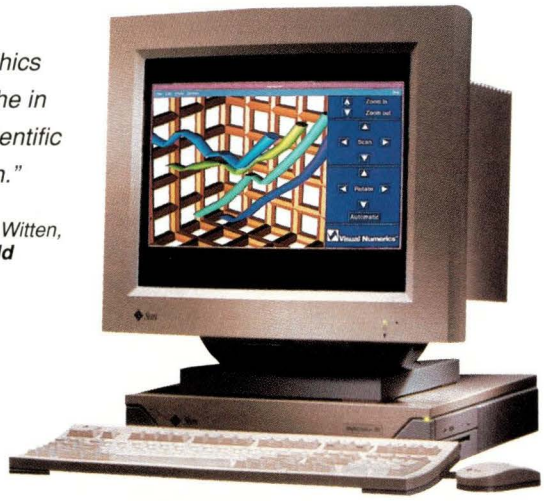

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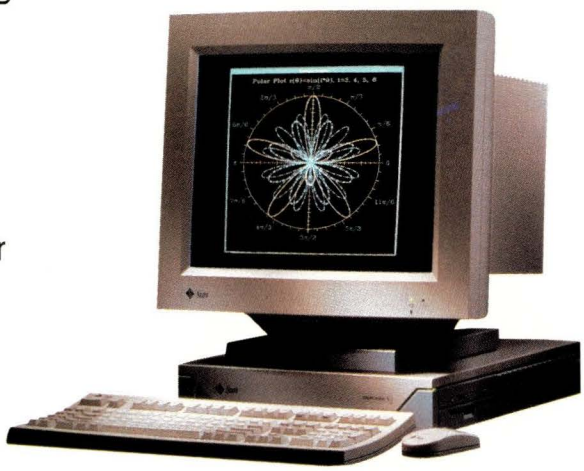

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lines as you type them is my biggest reason for wanting ksh on my machine.

Line Editing

As an admitted poor typist, I like to have some way of putting text into the machine in a way that can be easily altered without deleting the characters that I have already typed. The Korn shell treats the input line as a one-line text window that can be edited using either Emacs-style keystrokes or vi commands. You select your preferred style by saying:

```
set -o vi
```

or

```
set -o emacs
```

in your start-up file. Korn shell also notices the editor that you choose to set in your VISUAL environment variable and will turn editing on in the requested style if you say something like

```
VISUAL=`whence emacs`
```

Of course, the editor that you use is a religious issue, and I must not comment on which is better, for fear of being burned at the stake as a heretic. I use a huge mixture of editors. This document is being written using sam, Rob Pike's visual editor. I also use jove, a low-cost version of Emacs. I use vi when its global commands are convenient or when there is nothing else, and for quick edits I still use ed. I guess my religious bigotry has passed; I use what seems to be the correct tool for the job.

For some time, I have used vi edit mode with bash, GNU's shell that supports ksh-style line editing. I run this on my Sun in the absence of a real copy of ksh. However, while doing the research for this article, I decided to switch to Emacs mode largely because it needs a lower number of keystrokes to edit a line. I think that if your body is not already trained in the use of certain keystrokes to achieve editing actions, then you are probably better off using the Emacs editor mode. Also, Emacs editing is modeless, whereas vi retains the notion of *command* mode and *editing* mode.

The Emacs editing mode uses control keys for editing actions: Hold down the Control key and press another at the same time. It also uses "Meta" keys, usually printed as M-a, meaning "Meta-a." A Meta key is an Escape character followed by another keystroke, so M-a is an Escape character followed by an "a".

On a traditional terminal, the shift and control keys modify the code for the character being typed. For example, lower-case "a" has a code of hexadecimal 61. Holding down the shift key and pressing "a" results in a code of hexadecimal 41; the seventh bit is turned off. Holding down the control key and pressing "a" will return a code of 1.

The Meta key is supposed to be an extra key on the keyboard that sets the top bit in the character being sent (M-a is hexadecimal e1). ASCII code is a 7-bit code but is transmitted as an 8-bit value. Originally, the top bit was used to carry a parity check value of characters being sent on a slow line from a mechanical device. The advent of VDUs made this obsolete.

Not many terminals have an extra key that sets the top bit, and so the convention of using an Escape followed a character has evolved. Also, we have seen the rise of 8-bit codes being used to allow people whose first language is not English to represent accented characters.

So some people can use an 8-bit value to represent a Meta key and some cannot. Using bash under SunOS, Meta keys can be sent by holding down the key marked with a diamond and hitting another key at the same time. As a result, a Meta keystroke M-a is a single action with two fingers: the diamond key and the "a" key held down together.

I don't really want to list the keystrokes involved in editing in Emacs mode. If you are an Emacs user, then you will find that your fingers will operate happily for you without too much effort.

The same is true for vi users. As I said, vi has two input modes. Unlike the editor, ksh starts up in input mode, where the characters that you type are entered on the line. Hitting the Escape key sends you into command mode, where characters on the keyboard move the cursor about the line or perform other editing actions. I think that unless you are a seasoned vi user, this mode shift can be confusing when used in the shell. I think also that it's slightly more clumsy in use, especially for inserting text halfway down the line.

Anyway, whatever line-editing mode you choose is a huge improvement over the original "delete all that you have typed" method of input that you had before.

Like csh, the Korn shell provides a file name completion feature. The idea is that when you type a file name, you should type only the characters that are needed to identify the file. When you type in a few characters, you can make the shell look for matching entries in the current directory by hitting Escape-Escape (Emacs mode). If the character prefix does not exist in the directory, then the shell will beep. If there is a unique way to complete the file name, then the input line is changed to complete the name. If there is more than one way, then the name is completed to the point where the strings diverge. You can then type the distinguishing character and complete the remainder of the name by typing Escape-Escape again. Typing Escape-* lists the file names that are available to you.

History

The ability to remember and reuse the commands that you have typed in a command history was invented in csh. The Korn shell stores its history in a file, usually .sh_history in your home directory. This means that the history is preserved when you log out and in again. The file is limited in length by restricting the number of lines that can be stored.

This file is shared between all invocations of the shell, so you have the same history for every window on your screen. I like this and miss it on almost every other shell that copies this action. Some people think this is a pain. You can avoid it by setting a separate history file for every shell invocation, perhaps:

```
HISTFILE=~/.hist$$
```

the dollar-dollar here is replaced by the process ID of the shell and so generates a unique name. The disadvantage is that you lose the ability to remember history between login sessions. Note that ksh understands the "tilde" syntax, meaning the home directory of the user.

The Korn shell treats the history like a file that can be edited. If you use an editor command that moves up and down lines, then you will move up and down the history file. To repeat the last command you typed, you use Control-P in Emacs mode to move to previous line and Escape k in vi mode. You can use simple editor search commands to find a line that contains a particular character sequence you used some time in the past.

When you enter a new line, you can append the last word of the previous line using a couple of keystrokes, Escape dot (in both editing styles). This is a great help when you are doing many things to one file:

```
$ ls -l changefile
ls output
$ chmod +w Esc.
The line changes to:
$ chmod +w changefile
$ chown pc Esc.
The line changes to:
$ chown pc changefile
```

All this works well for reaccessing a single line. What happens if you type in a connected set of commands, perhaps a loop? For example:

```
$ for name in *
> do
>   mv $name $name.bak
> done
$
```

To undo this, you want to run the loop again, but change the middle line to move the files back. In csh, you could not access multiple lines of input in the history. When you step back up the history in ksh, you will see the for statement. You can then step forward to pick up each individual line.

The Korn shell also provides a built-in command, fc, that is used to manipulate the history. You can use this to list the last commands you have typed or to throw a number of commands into an editor. This allows you to edit a complex sequence of commands and execute them.

Start-Up Files

One thing that csh got right was the handling of start-up files (although this is often badly understood). Users of csh use two files: .login, which is executed exactly once when you log in; and .cshrc, which is read into every invocation of the shell. You should use .login to execute environment-dependent things like setting up terminals or setting environment variables that affect interactive use. The .cshrc file is used to set any aliases, functions and

local shell variables that you may want to use from any instance of the shell. The point is that these objects are all local to the shell invocation, so we need a way to establish their values. Look at this:

```
% set fred=jim
% csh
% echo $fred
fred: Undefined variable.
%
```

The first line sets a local shell variable. We then call `csh`. This is a new invocation, but it doesn't know the value of `fred`. Of course, you rarely start up a shell in this way, but the effect is the same as entering an editor and then starting a shell to do something. Actually, some people *do* start shells within shells. It allows them to go off to some point in the file system, do a job and return by exiting from the new shell.

The Bourne shell only allows a single set-up file, `.profile`, that is executed when you log in. This is OK because it doesn't have any local state that cannot be inherited from the environment. However, the Korn shell allows aliases like `csh` and has the same setup problems. It gets round this by allowing you to set a filename into the `ENV` variable:

```
ENV=~/.env
```

When you start an invocation of `ksh`, it looks to see if the `ENV` variable is set. If it is, `ksh` reads commands from the file named in the variable. You treat the `.profile` and `.env` files the same way you treat the `.login` and `.cshrc` files. You place all your exported variables in `.profile` and also perhaps call the `tset` command there too. The `.env` file contains all the aliases and other local variables.

If you want to start using `ksh` as your login shell, you are well advised to play with the settings in the files before you switch over. I notice that Solaris 2.3 does not provide a way for the user to switch shells themselves. You need to sweet-talk your system administrator to do this for you.

Programming

The Korn shell is based on the Bourne shell and includes all the original syntax. You can merrily use all your old Bourne shell scripts and they should work as expected. There are several new commands and features.

Some of these get around problems. For example, the back-quote operator in the older shells gets the output from a command into a variable:

```
files=`ls /bin`
```

sets the `files` variable to the output from the `ls` command. The problem here is that you cannot nest back-quoted commands because the same letter is used to start and end the backquoted sequence. The Korn shell uses a bracket sequence to mean the same thing: `$(...)`. You can now nest commands:

```
count=$(wc -l $(ls /bin))
```

giving you the number of files in `/bin` using a one-line command. You will find that `ksh` still supports the older back-quote syntax.

There is also a problem with the `echo` command. This is a built-in command in both the Bourne and C shells. However, it operates differently. The Bourne shell allows formatting characters introduced by backslash, but `csh` does not. This is a pain when you are using the `echo` command to print a prompt. In the Bourne shell, it's

```
echo 'Yes\c'
```

and in `csh`

```
echo -n 'Yes '
```

This leads to the arbitrary botch described on the manual page for `echo` in Solaris: "The `-n` option is available to `/usr/bin/sh` users only if `/usr/ucb` precedes `/usr/bin` in the user's PATH, however, then the backslash characters, described above, are NOT available. `-n` is available to `/usr/bin/csh` users, regardless of PATH:" This is truly disgusting, but convenient.

The Korn shell gets around these ambiguities by providing a new command for output: `print`. The command combines the format capabilities of the Bourne shell with the command line options of `csh`. It's the best (or worst) of both worlds. The IEEE POSIX Shells and Utilities standard, POSIX.2, has picked up both the `$(...)` syntax and the `print` statement for their shell definition.

The Korn shell also supplies you with a new command that allows easy menu construction and selection. The syntax is easy:

```
select name in list
do
   statements that use $name
done
```

This is the same syntax as the `for` statement except for the keyword `select`. Here's a script that does a menu-driven `rm`:

```
#!/bin/ksh
select name in *
do
   rm $name
done
```

If you run the code, you will see something like:

```
1) prog
2) prog.c
3) prog.o
#?
```

The prompt #? will show you that the shell is waiting for input. The prompt string that is printed is controlled by a new variable: PS3. You are expected to type a number to choose a menu item. This returns the selected string in the variable name. It also places the text you typed in the variable REPLY. The select command will loop if you reply with a value that is not in range. You can also type in a string from the selection list. It would be OK to type in prog as a response to the menu above. You'll find that name is set to the null string and REPLY contains the string you have typed.

There are great many other features of Korn shell programming that I have no space to cover here. It has much improved string handling, arithmetic in the shell, the ability to control the format of data in variables and more.

Finally

There are several publicly available shells offering similar features to the Korn shell. Please notice the careful use of the word "available" here. Some of these are controlled by the GNU license. The GNU shell sports a typically cute GNU name: "Bourne Again SHell" or bash. It is available from your local archive site. It's not a Korn shell clone; many things work slightly differently from the regular Korn shell. As I said, I am currently using this as my primary interactive shell. It just compiles and runs on my system. Its disadvantage is that it's big.

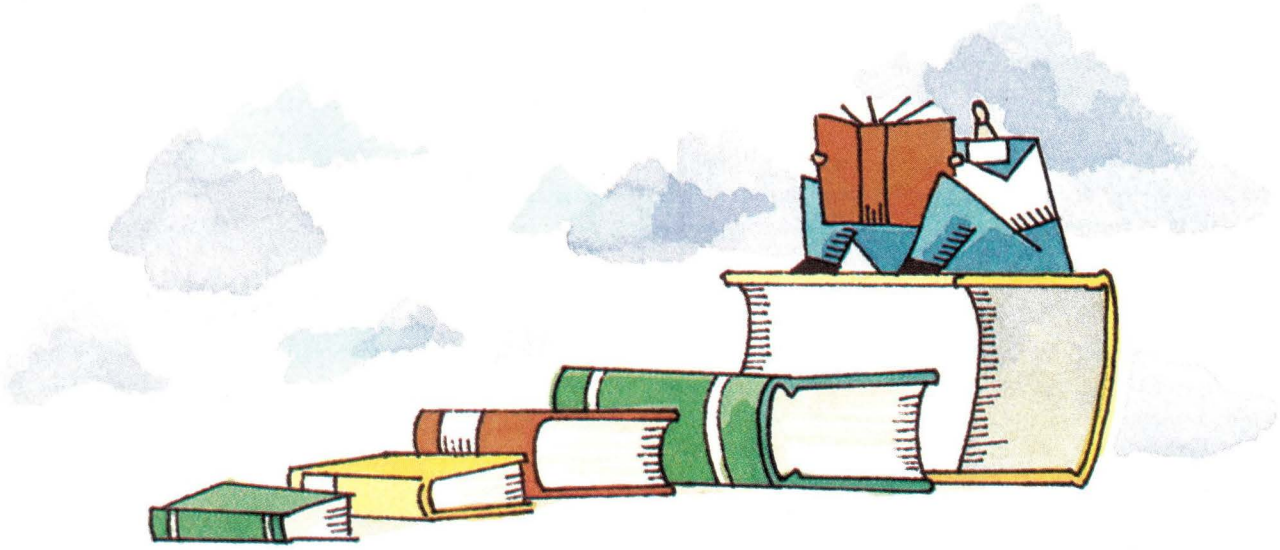
The shell tcsh is a version of csh with command-line editing and command-line completion. There are a couple of programs that mimic the Bourne and Korn shells: zsh and pdksh. I have had a hand in hacking pdksh. I feel that it's still too far from the real ksh to replace it.

The MKS tool kit contains a complete clone of ksh that will run on your DOS machine. I use this on my portable to avoid cultural shock. *(Editor's note: SunSoft has announced that it has licensed Mortice Kern System's InterOpen/XPG4 commands and utilities for incorporation into the Solaris environment.)*

There are a couple of books on the Korn shell in my possession. The best one is *Learning the Korn Shell* by Bill Rosenblatt, published by O'Reilly & Associates Inc., ISBN 1-56592-054-6.

If you haven't been using ksh, I hope I have whetted your appetite to take a look at it. And Sun, how about it? Can I have a binary of ksh for Solaris 1.1.1? While you're at it, can I have a version of OpenWindows for the same system that parallels the one that you have in Solaris 2.3? ⊸

Peter Collinson runs his own UNIX consultancy, dedicated to earning enough money to allow him to pursue his own interests; doing whatever, whenever, where ever... He writes, teaches, consults and programs using SunOS running on a SPARCstation 2. Email: pc@expert.com.



ROBIN JAREAUX

A UNIX Reading List (Take 2, Part 2)

by RICHARD MORIN, Technical Editor

Last month, I discussed a number of my favorite UNIX books but generally skipped over anything having to do with programming. This month, I will attempt to fill in that omission, covering a wide variety of programming books.

Programming

You may not think you are a programmer, but you are. In UNIXland, *everybody* is a programmer. Some are just better at it than others. UNIX was designed by and for programmers, and your facility with UNIX programming constructs will determine how powerful UNIX is for you.

The programming tools are powerful and diverse, ranging from simple tools like `grep` to complicated tools like `yacc`. The manuals offer only limited help, and *The UNIX Programming Environment*, although an excellent book, is only a starting point.

A first book in programming should tell the reader how to write clean, simple programs that work. *The Elements of Programming Style* does just that. Even experienced programmers will find useful lore in the book, and beginners could not find a better introduction.

More advanced programmers will enjoy *Programming Pearls* and *More Programming Pearls*. Jon Bentley is a very good read, and he has good things to say about proper program design. His earlier work, *Writing Efficient Programs*, is also worth a look, if you care about efficiency.

Shell Programming

Many of the above books tout the virtues of shell scripting. They are not adequate, however, as references. Instead, you should pick up *UNIX Shell Programming*, which covers `csh`, `ksh` and `sh` programming.

If you are using Solaris, you (finally) have access to the Korn Shell. If you aren't, consider getting a copy of `bash` or `zsh`. Either one is a great improvement on `sh`.

The KornShell is the definitive description of `ksh`, and it is also the most precise reference I know for `sh`. Unfortunately, the typography is a bit loud, and the indexing leaves a lot to be desired.

I therefore recommend getting one or more supplementary books. *Learning the Korn Shell* is a clean, crisp introduction. The *KornShell Programming Tutorial* divides its material into a large number of short, semi-independent sections. I think it would be handy as a quick reference, if a bit choppy for continuous reading.

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The AWK Programming Language is the definitive work on awk. Some of the described features are not provided by SunOS awk. Only a few features are missing, however, and dedicated awk enthusiasts can find them in GNU awk (FTP to /pub/gnu on prep.ai.mit.edu).

sed & awk is just what you might suppose–a book-length treatment of these two programming languages. With the regular expression-handling features that now exist in awk and Perl (see below), I'm not sure how necessary sed is. On the other hand, sed is pretty small and efficient at what it does. It's also nice to have a second reference on awk, just in case.

Learning Perl is a well-written introduction to Perl. It takes advantage of the reader's prior knowledge of Perl's ancestors (awk, C, sh, etc.) but doesn't absolutely require such knowledge. It will be hard going, however, for anyone who wants to begin programming using Perl as a first language. I would recommend that such folks start with awk, and work their way up.

Programming perl is a "must have" book for Perl programmers. Co-authored by Larry Wall, the father of Perl (is there a mother of Perl?), it is as close to a reference manual as currently exists. Unfortunately, that isn't saying as much as I'd like.

The book really needs to be split in thirds, perhaps using *Learning Perl* as the first part. The second part would be an advanced treatment of Perl programming techniques, style suggestions, etc. Finally, there should be a *real* reference manual.

Reading List

Advanced UNIX Programming
Rochkind
Prentice Hall, 1985
ISBN 0-13-011800-1

Algorithms in C
Sedgewick
Addison-Wesley Publishing Co., 1990
ISBN 0-201-51425-7

C: A Reference Manual, 3rd. Ed.
Harbison & Steele
Prentice Hall, 1987
ISBN 0-13-110933-2

Data Structures and C Programs
Van Wyk
Addison-Wesley Publishing Co., 1988
ISBN 0-201-16116-8

KornShell Programming Tutorial
Rosenberg
Addison-Wesley Publishing Co., 1991
ISBN 0-201-56324-X

Learning the Korn Shell
Rosenblatt
O'Reilly & Associates Inc., 1993
ISBN 1-56592-054-6

Learning Perl
Schwartz
O'Reilly & Associates Inc., 1993
ISBN 1-56592-042-2

More Programming Pearls: Confessions of a Coder
Bentley
Addison-Wesley Publishing Co., 1988
ISBN 0-201-11889-0

Programming perl
Wall and Schwartz
O'Reilly & Associates Inc., 1990
ISBN 0-937175-64-1

Programming Pearls
Bentley
Addison-Wesley Publishing Co., 1986
ISBN 0-201-10331-1

sed & awk
Dougherty
O'Reilly & Associates Inc., 1990
ISBN 0-937175-59-5

The AWK Programming Language
Aho, et al.
Addison-Wesley Publishing Co., 1988
ISBN 0-201-07981-X

The C Answer Book, 2nd Ed.
Tondo & Gimpel
Prentice Hall, 1988
ISBN 0-13-109653-2

The C Programming Language
Kernighan & Ritchie
Prentice Hall, 1978
ISBN 0-13-110163-3

The C Programming Language, 2nd Ed.
Kernighan & Ritchie
Prentice Hall, 1988
ISBN 0-13-110362-8

The Design and Implementation of the 4.3BSD UNIX Operating System
Leffler, et al.
Addison-Wesley Publishing Co., 1989
ISBN 0-201-06196-1

The Design and Implementation of the 4.3BSD UNIX Operating System Answer Book
Leffler, et al.
Addison-Wesley Publishing Co., 1991
ISBN 0-201-54629-9

The Design of the UNIX Operating System
Bach
Prentice Hall, 1986
ISBN 0-13-201799-7

The Elements of Programming Style, 2nd Ed.
Kernighan & Plauger
Prentice Hall, 1974

The KornShell
Bolsky & Korn
Prentice Hall, 1989
ISBN 0-13-516972-0

The Standard C Library
Plauger
Prentice Hall, 1992
ISBN 0-13-131509-9

The UNIX Programming Environment
Kernighan & Pike
Prentice Hall, 1984
ISBN 0-13-937681-X

UNIX Shell Programming, 2nd Ed.
Kochan & Wood
Howard Sams, 1989
ISBN 0-672-48448-X

UNIX System Architecture
Andleigh
Prentice Hall, 1990
ISBN 0-13-949843-5

Writing Efficient Programs
Bentley
Prentice Hall, 1982
ISBN 0-13-970244-X

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e Time

a valuable companion volume, providing annotated answers to the exercises.

I also recommend getting a few solid references on C. *C: A Reference Manual* fills the bill for C, itself. *The Standard C Library* is an excellent ref-

bit more readable than the other volume, but both books will be needed by any serious explorer of UNIX kernel code. If you plan to tackle any of the exercises in the latter book, get the companion *Answer Book*.

Advanced UNIX Programming (men-

publishes mixed-media (book/CD-ROM) freeware collections. He also consults and writes on UNIX-related topics. He may be reached at Canta Forda Computer Laboratory, P.O. Box 1488, Pacifica, CA 94044 or by email at rdm@cfcl.com.

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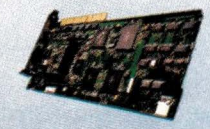

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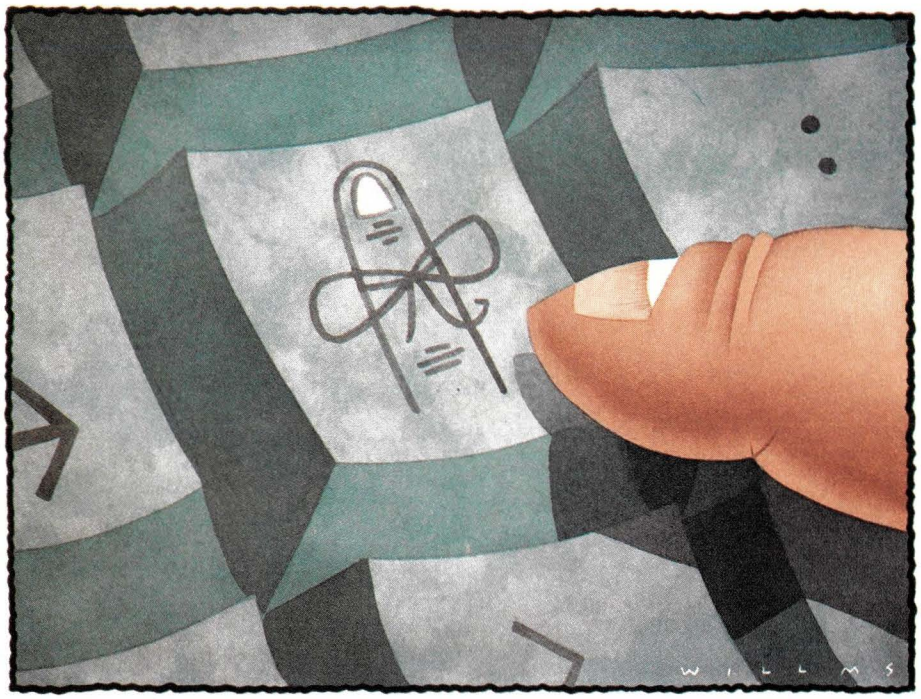

RUSS WILLMS

Remind Me

by S. LEE HENRY

For those of us who forget important things, there is hope. One of those UNIX commands that you may or may not have stumbled across, the `calendar` command, could soon become your very own personal nag.

The setup is easy. You create a file called `calendar` and put lines in it like "May 1: Vail's birthday–buy her a new car" and "Apr 28: Leave work before midnight." Then you can type `calendar` whenever you feel the need for a gentle nudge or stick the command in your `.login` file so that you're nudged only once a day (assuming you're not one of those hateful users who *never* logs out!).

Voilà! Your life is now organized and you don't forget a thing. Well, OK, so you have to remember to make entries in the file and you ought to remember to clean out old entries once in a while (or can you *afford* to buy Vail a new car on the same date every year?).

The `calendar` command will tell you what you're supposed to remember today and tomorrow. It's even clever enough to understand that for Fridays, the concept of tomorrow needs to extend through to the following Monday. However, it has no concept of holidays.

Let's Take a Peek

Let's say that you have the following lines in your calendar file:

```
#include "/usr/local/dept/cal"
--- personal entries ---
Apr 28: Leave work before midnight
May 1:  Vail's birthday -- buy her a new car
May 2:  Don't bug Steve -- he needs to work!
```

When you type `calendar`, it builds a fairly complicated `egrep` expression which it uses to pull the appropriate entries from this file and display them to you. The file `/usr/bin/calendar` is a shell script that consults `/usr/bin/calendar` for some enlightenment about dates and then creates the `egrep` command to parse your personal calendar file. If you enter the command, `/usr/lib/`

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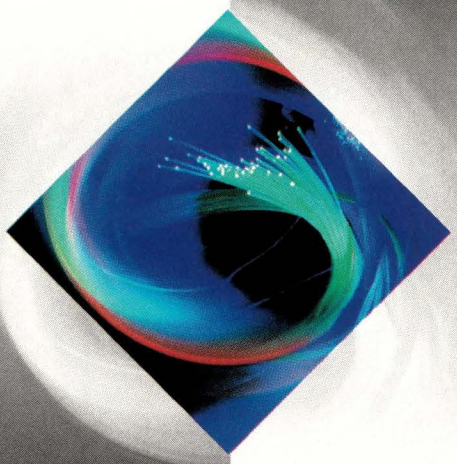

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calendar, you will see the expression that is created to look for today and tomorrow.

The Sysadmin Takes Charge

Another way to use calendar is to run it with the "-" option. This option causes calendar to look through home directories for users with calendar files and send the result of running calendar to them in the mail. Here's the message that you'd get with the calendar shown above:

```
Subject: Calendar for Fri Apr 28

Apr 28: Leave work before midnight
May 1:  Vail's birthday -- buy her a new car
```

The #include line works with the C preprocessor, cpp, to include information from other calendars (e.g., the schedule of lunchtime seminars) in your daily reminders. This feature provides an easy way to distribute information about events of fairly universal interest. If the person who schedules the lunchtime seminars keeps a file of upcoming events in the proper format, individuals can be kept informed by adding the #include line to their files only once.

Making Way for the New

One of the problems in using calendar is that you *do* have to remember to include a line for everything you want to be reminded about. This is a lot like responding to someone who asks you to remind them about something with, "OK, please remind me to remind you." You have to remember to edit the file and add the line in the correct format. There isn't much you can do about this.

Another problem is that you easily end up with deadwood. Past events will sit in your file and, even if there is some *other* thing that makes you realize that you don't *really* want to buy Vail a new car *every* year, the extra clutter of all that old information will get in your way. One relatively easy way around this is to use grep to get rid of last month's information at the beginning of every month. Commands like these:

```
boson% cat calendar | grep -v ^Apr > newcal
boson% mv newcal calendar
```

would do the trick in May. A better alternative might be to create a script that throws out the old month and runs through cron on the first of every month.

A limitation of the calendar command is that it uses calendar dates only. If you want to remember to leave before midnight *every* Friday, you would have to specify the date of each Friday and the "Leave before midnight" mandate over and over again.

One alternative to this problem would be to add an entry to your personal `cron` file to update your `calendar` file very early every Friday morning. If you ran this command every Friday, for example:

```
date | awk '{print $2,$3": Leave work before
midnight"}' >> ~/calendar
```

you'd create a line like "May 6: Leave work before midnight" and append it to your calendar file. That would work, of course, but it would also give you the message on Thursday (and we don't want you to slough off, now do we?).

Another Tool

Similar to calendar, the `remind` program uses a user-maintained file of events–`~/.remind`–and a `remind` command to nag you about all the things you're *supposed* to be doing. Unlike `calendar`, however, it allows you to enter weekdays, so you can leave before midnight *every* Friday and *not* every Thursday (sorry, guys). It's not as forgiving about the various ways that dates can be specified (e.g., 5/5 works with `calendar`, but not with `remind`) but has some other useful options. These include ways to specify the second Tuesday of the month, the last day of any month, and *n* days before the end of every month. It also lets you specify a number of days in the past or in the future with numbers like -3 and +2.

Given the `.remind` file shown below:

```
#include "/usr/local/dept/cal"
--- personal entries ---
Friday: Leave work before midnight
Tuesday: Don't bug Steve -- he needs to work!
May 1:  Vail's birthday -- buy her a new car
```

running remind on Friday, the 28th of April produces:

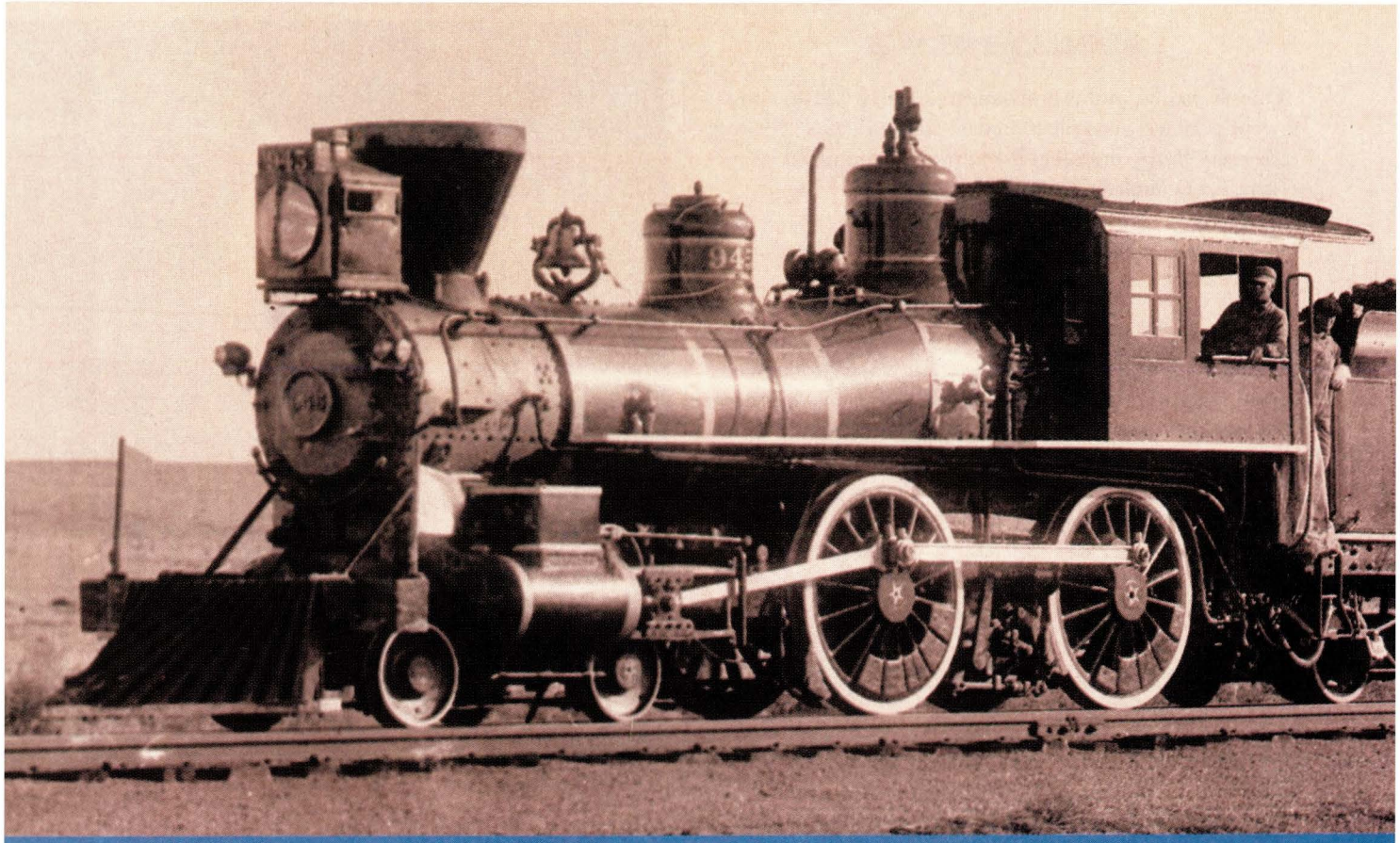
```
boson% remind
Reminders for Fri, Apr 28, 1994:

        Leave work before midnight
```

The `remind` program doesn't use `egrep` and doesn't offer the "-" option to send mail to all users. It also doesn't have an include file feature. The choice, therefore, depends on which features are most important to you. If you'd like to try the `remind` software, I can email you the source. The `calendar` command is in SunOS 4.1 and many other flavors of UNIX as well.

Well, what are you waiting for? You need a gentle nudge now and then, and Vail needs a new car. ⊸

S. Lee Henry is on the Board of Directors of the Sun User Group and manages computer and networking services for the Physics and Astronomy Department at Johns Hopkins University. Send mail to `slee@expert.com`.



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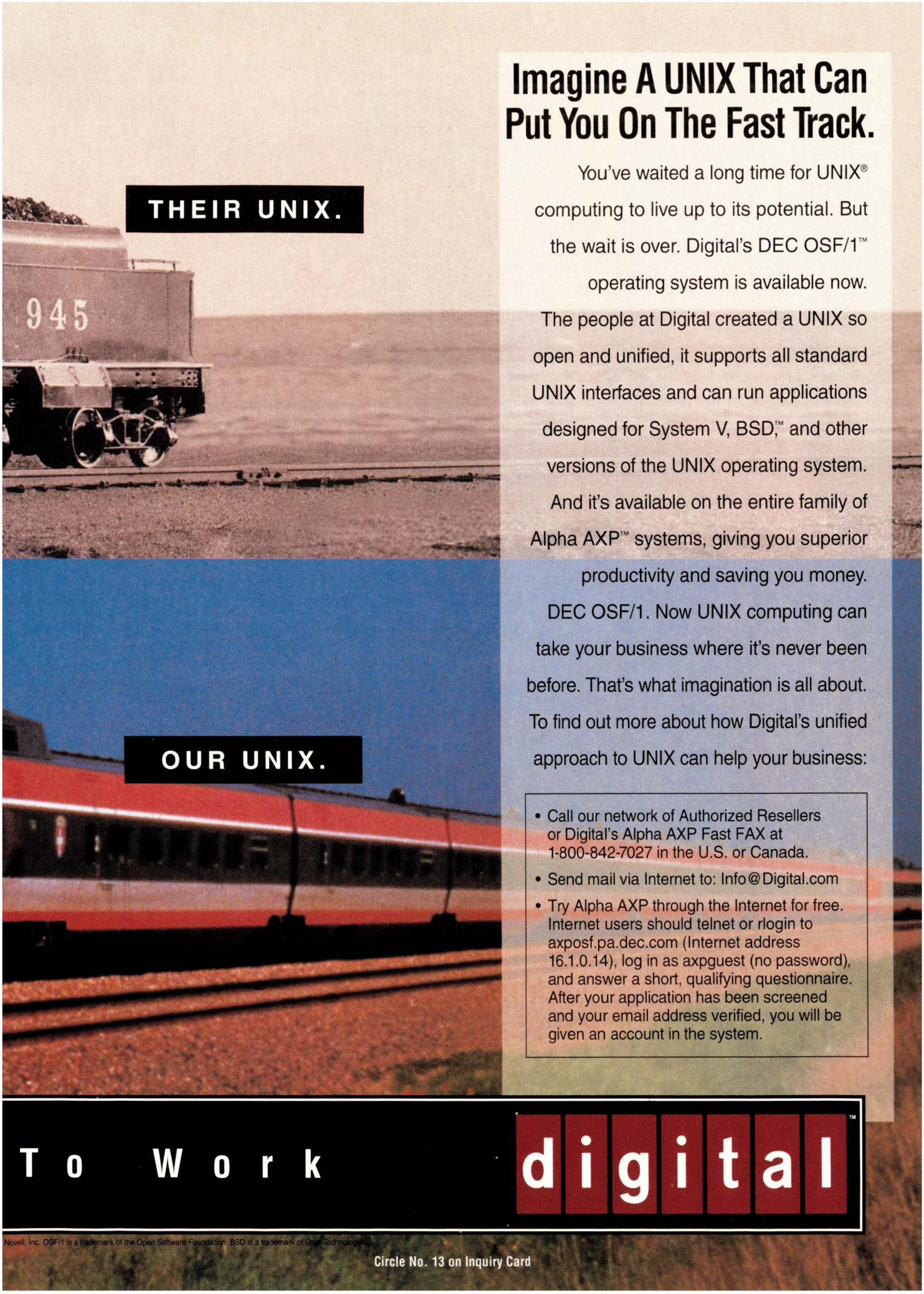

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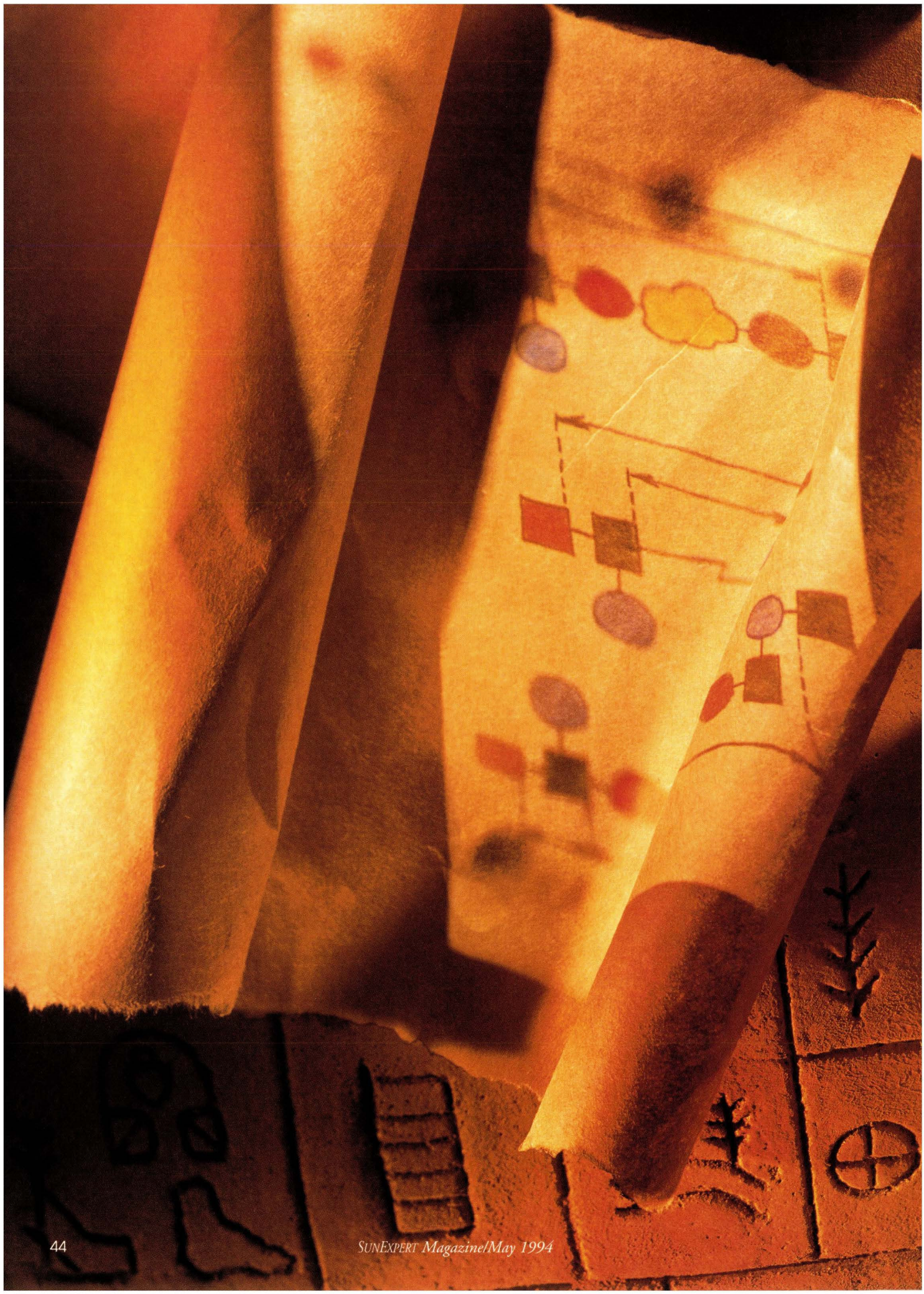


CONNECTIVITY

SPECIAL SECTION

This month, SunExpert invites two experts to explore the technical considerations necessary to piece together enterprisewide networks.

The Enterprise Network

In the last decade, distributed computing has gone from being a theoretical paradigm for how information systems might work in a remote future to a reality for many, many users. Increasingly, both technical and commercial installations are practicing the art and science of coordinating multiple systems, and indeed, multiple networks. It's not the network that's the computer, but the internetwork.

But just as this has created new opportunities for network managers and systems administrators, so too has it created a host of new and sometimes intractable problems. It can, in fact, be difficult to tell the two apart.

This issue of *SunExpert* offers some pointers on turning internetworking troubles into triumphs. In "PC-to-UNIX Networking," Mark Krieger of UniPress Software Inc. looks at the issue of combining UNIX-oriented networks and PC LANs. His conclusions about which network should be dominant may surprise some Sun users. And in "A Primer: Integrating SDLC into LAN Architectures," Lionel Geretz of Advanced Computer Communications Inc. looks at the issue of integrating TCP/IP networks with legacy, SNA-based systems, or, in some cases, making them coexist.–*Michael Jay Tucker*

Photo by Logan Seale. Image courtesy of the AA Photo Library, England.

CONNECTIVITY

SPECIAL SECTION

There's more than one way the Sun network manager and systems administrator can embrace PC networks. In fact, there are two.

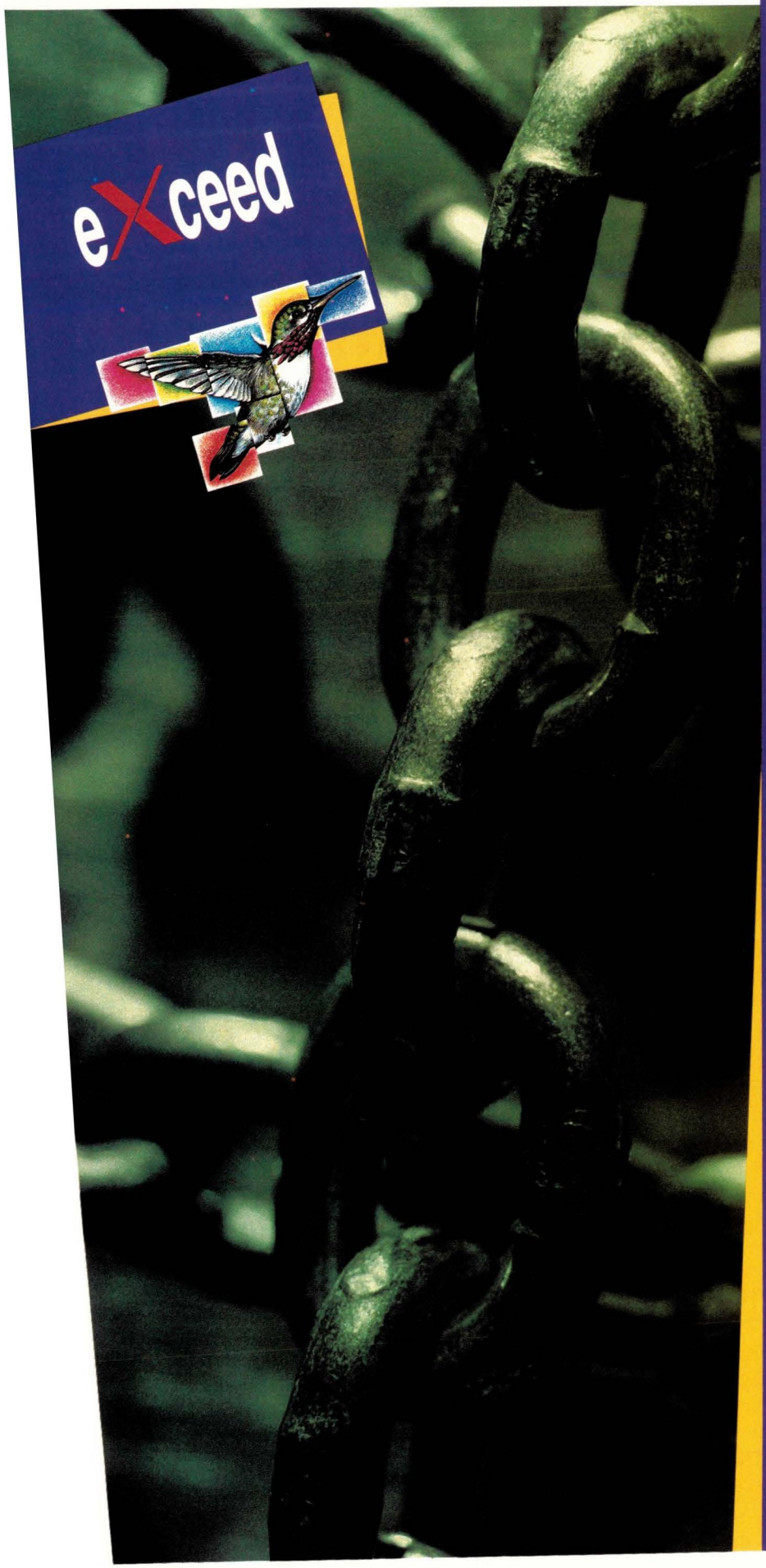
PC-to-UNIX Networking

UNIX has had TCP/IP networking software built in from its early days, but PC networking solutions have typically been diverse and aftermarket. The PC-based networking models, with both a PC client and PC server, have now been extended to offer UNIX servers. So, for example, a PC LAN Manager or NetWare user can now use disks and printers not only on his PC server, but also on his Sun Microsystems Computer Corp. SPARCstation or server.

This article reviews these two alternatives of PC-UNIX connectivity: the UNIX-centric, based on the UNIX TCP/IP model; and the PC-centric, based on one of several widely used PC models.

All Sun machines, and virtually all other UNIX systems, are factory configured with networking hardware. Certainly, this is true for SunOS and Solaris 2 systems. The included TCP/IP software includes kernel-level code to transmit and receive packets with the Ethernet-based network interface card, and also application-level code that lets users access other systems' resources.

by MARK KRIEGER, Unipress Software Inc.



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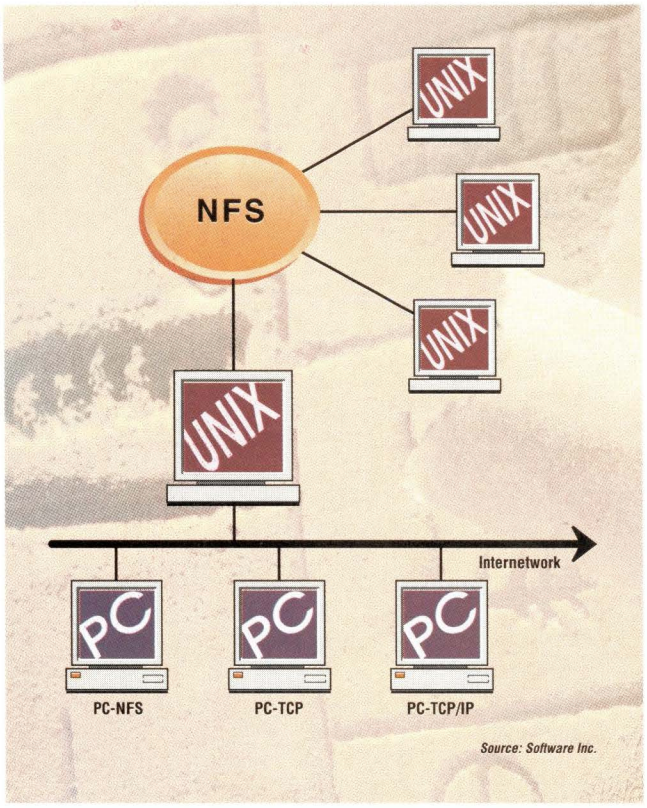

HANNA DYER

Figure 1. A UNIX-centric approach to integrating UNIX systems and PCs

Among the suite of standard UNIX networking programs are applications to exploit network resources: `telnet` and `rlogin` let users log in to other machines; `ftp` allows files to be copied back and forth among machines; `smtp` can deliver mail to and from machines; `rsh` makes it possible to execute a command remotely. Other utilities make remote printing practical while still others make the network a workgroup system, e.g., `ping` to find other machines, `finger` to locate other users and so on.

For example:

```
> telnet sparc
Trying 128.1.1.1...Open

SunOS sparc(sparc)

login: guest
```

will give the user `guest` a session on the machine `sparc`.

Sharing disks is one of the most apparent benefits of networking, and in the early '80s Sun developed the standard for shared disk: Network File System (NFS). NFS, which is now a standard part of almost all TCP/IP-based networks, allows UNIX systems to share hard drives that are physically located on different machines. The `df` command indicates how much free disk space is available on the network of mounted and NFS-mounted disks, and displays any local and remote disk drives connected via NFS.

For example, a `df` command issued on the "sparc" machine might show the free disk on three drives: two on the local machine and one on the remote machine, saturn.

```
% df

Filesystem     kbytes  used    avail  capacity    Mounted on
/dev/sd6a      15367   10950   2880   79%         /
/dev/sd6g      92698   80345   3083   96%         /usr
saturn:/prod   336770  288732  14368  95%         /prod
```

The UNIX TCP/IP networking standard is the basis for one of the most exciting current developments in computer use in the '90s: the Internet. The flexibility and standardized networking software of UNIX allows the Internet to be the backbone of this information superhighway supporting millions of users.

PC Networking

PC-to-PC networking has had a very different history than the UNIX-to-UNIX networking described above. First, neither the networking hardware nor software has been a standard part of the MS-DOS PC as shipped from the factory. Users have to purchase networking hardware, and then–perhaps in conjunction with the hardware–the software. Furthermore, the software choices are "aftermarket," and networks from Novell Inc. (NetWare), Microsoft Corp. (LAN Manager), Banyan Systems Inc. (Vines) and others vie for the PC network market.

Another distinction is the diversity of network protocols among these aftermarket solutions. For example, Novell's NetWare uses the IPX protocol to communicate between PCs. Microsoft LAN Manager 2.2 has had two standards, initially NetBIOS–network basic I/O system–and more recently NetBEUI, an extended NetBIOS protocol. NetBIOS uses TCP/IP, so communication with other, typically UNIX, environments, is reasonably straightforward; NetBEUI is more efficient, since the packets need less processing, but it is not very portable because NetBEUI is hardly commonplace in the UNIX environment.

Still another great difference is the sharp delineation between "client" and "server." A PC acting as a NetWare server, or an OS/2 machine acting as a LAN Manager server, performs as a repository for disk space or printers. PCs running the client side of these products then "use" the shared resource.

For example, a LAN Manager client accesses a disk directory (called a "share") by typing:

```
C:> net use g: dosutils
C:> g:
G:>
```

In this case, the `dosutils` share, containing a number of DOS utilities, located on a server, will be available to the PC as its G: disk. Other PC users can also access this `dosutils` share. In fact, the MS-Windows "command" equivalent to "net use" is the standard FileManager Network Connection pull-down menu.

This is, however, a one-way solution. The LAN Manager user at the client can access disks or printers physically located on the server, but not vice versa.

Contrast this with a typical UNIX NFS setup. With NFS, users on both "sparc" and "saturn" in the example above can easily access the other machines' disk drives and printers. Standard UNIX remote printing capabilities allow users to print locally and remotely in a peer-to-peer setup.

In the marketplace, while Novell has gained the widest market share, LAN Manager is in wide use in the large PC networks. Its capabilities to control large networks with security at the file and directory level; its concept of domains including primary and back-up servers; its ability to use both PCs and UNIX machines as servers; and its inclusion on Microsoft NT as well as its recent availability on Sun systems have made it a strong contender for the future.

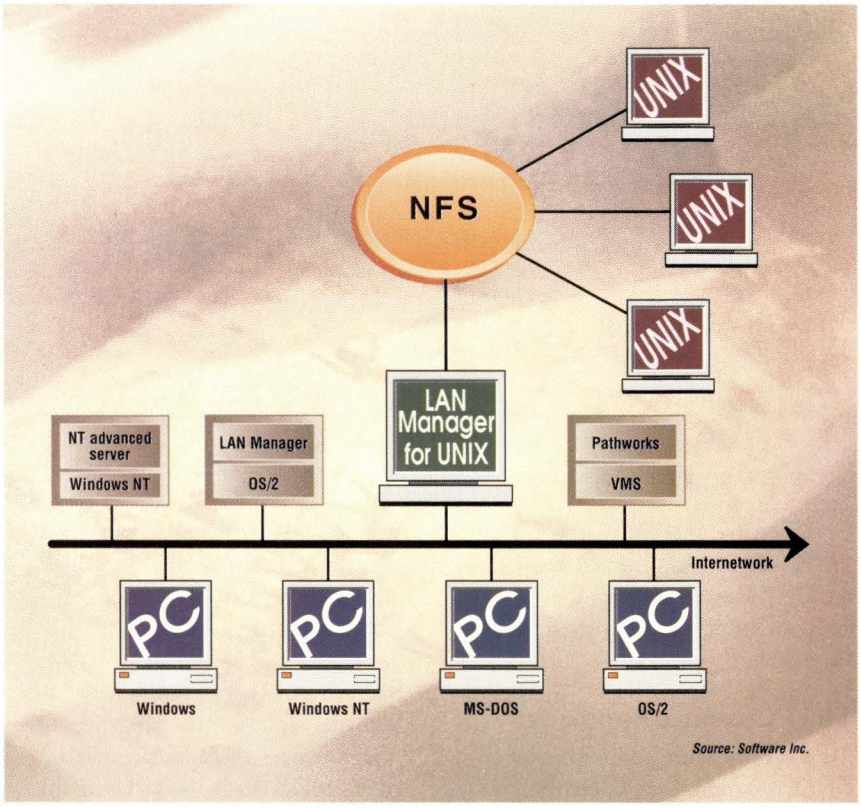

Figure 2. A PC-centric method for integrating PCs and UNIX systems

The UNIX-centric Approach

With that brief look at UNIX-UNIX and PC-PC networking out of the way, let's explore two different models of UNIX-PC networking. The first of these, and the most widely used today, is what we'll refer to as the UNIX-centric approach: The standard UNIX networking programs, such as `ftp`, `telnet`, `ping`, `rcp`, etc., are placed on the PC (see Figure 1).

Two products that enable PC resource-sharing with UNIX networks are FTP's PC/TCP and SunSelect's PC-NFS. Both of these products, which function under either MS-DOS or Microsoft Windows, allow PCs to share files with UNIX systems, transfer files among machines, print files on network printers, remotely log into UNIX machines, and give a full complement of network commands equivalent to those found under UNIX.

Once either of these products is installed on the client PC, the PC user has a TCP/IP kernel combined with the normal DOS or Windows kernel, and TCP/IP messages can be transmitted and received by this PC. At this point, many included applications, like `ping`, `ftp`, `telnet`, `rlogin`, etc., can be run on this PC as if it were an integral part of the UNIX-UNIX TCP/IP network.

In addition, other useful applications make use of the TCP/IP protocol. For instance, you might want to run the X Window System on your PC, and a number of products exist which do just that. (An example of a popular X Window server for PCs is Visionware's XVision.)

Both PC/TCP and PC-NFS give PC users the capability to access remote file systems as if they were physically connected to the PC; in other words, as NFS volumes. This is extremely useful. Not only can widely used PC applications be kept on one central UNIX volume, but both the application and any other files owned by a group of PC users can be backed up by standard high-capacity UNIX backup methods.

Another product, NetManage Inc.'s Chameleon, allows the NFS to go both directions. The UNIX system can "mount" a PC disk drive as an NFS volume for use by UNIX users. This product, which is for MS-Windows only, has one other very nice feature: It is written as a Windows Dynamically Linked Library (DLL) and thus uses only a tiny bit of memory. Of course, since it's a Windows-only program, it's not for everyone.

This UNIX-centric method has a number of obvious advantages for PC users: They can access files on large drives and know they'll be backed up; they can print to the fast, high-quality printer down the hall; and they can use their fast SPARCstation 10 through a `telnet` or `rlogin` session for added computer power. Also, their PC can double as an X terminal.

There are however, some disadvantages. First, the installation of these products, particularly by a UNIX system administrator, can be confusing. Making changes to `autoexec.bat`, `config.sys` and `protocol.ini` and worrying about Ethernet board addresses or NDIS drivers can be a frustrating experience for the Sun-trained network manager or systems administrator.

Another factor to consider is cost. Each PC system requires a copy of one of these products. While site-licensing is generally available, when 500 or 1,000 PC users must be supported, not an uncommon situation, this

```
Sharename   Resource                        Remark
-------------------------------------------------------------------
-
ADMIN$      C:\VAR\OPT\LANMAN               Remote Admin
IPC$        IPC Share
            C$ C: \                         Root Share
ADMIN       C:\VAR
DOSUTIL     C:\VAR\OPT\LANMAN\SHARES\DOS    DOS Utilities
LIB         C:\VAR\OPT\LANMAN\SHARES\LIB    Programming Aids
NETLOGON    C:\VAR\OPT\LANMAN\REPL\IMPOR    Logon Users Directory
OS2UTIL     C:\VAR\OPT\LANMAN\SHARES\OS2    OS/2 Utilities
USERS       C:\HOME\LANMAN\LANMAN           Logon Users Directory
IPR         ipr                             Spooled
The command completed successfully.
```

Figure 3. Discovering Resources

UNIX-centric method can get costly.

A PC-client-included system, with the UNIX server as the only pay-for item, might be a more cost-effective alternative.

The PC-centric Approach

Instead of creating a PC copy of a UNIX program, the PC-centric approach (see Figure 2) puts software on both the PC–the client–and on the UNIX, PC, OS/2 or NT server. The PC-centric philosophy is to hide the PC client function as if it were an integral part of MS-DOS or MS-Windows. The server portion operates in the background, so end users never need to learn new commands.

Many PC-PC networks use LAN Manager, NetWare or other PC-centric solutions. With the increased use of Sun and other UNIX workstations in large commercial and educational institutions, the PC community could profitably access resources on these workstations, particularly disk and printer resources.

While a technical description of either LAN Manager or the NetWare-based UNIX add-on servers would be equally useful, I've chosen to describe the Microsoft LAN Manager server for a few reasons. Most important, it is the system in use at many larger PC sites for whom the UNIX server/PC-centric approach is best suited, since it has many facilities that match well with the UNIX workstation model. In addition, Microsoft's NT operating system, as well as Windows for Workgroups, includes the LAN Manager client; and MS-DOS and Windows users get copies of the LM client, which can be well integrated onto their system. Also, Microsoft's NT networking product, NTAS, is based on, and is a superset of LAN Manager, and coexists well with LAN Manager servers in the same network.

So how does LAN Manager as a UNIX server really work? Using the Sun as an example, consider the PC shop already using LAN Manager. (The PCs will typically already have the LAN Manager client software running, so the only necessary step will be to install LAN Manager server on the Sun.) The Sun will act as a file and print server for PC users, and coexist in a network that typically already has a LAN Manager server on some other machine.

First, the Sun systems administrator installs LAN Manager on the Sun. The installation process automatically adds NetBIOS and/or NetBEUI drivers to the Sun kernel. (These drivers are added as loadable drivers on some versions of SunOS/Solaris. They require a kernel rebuild on others.) In either case, the NetBIOS module will work in conjunction with the standard Sun TCP/IP and NetBIOS packets from PC clients, and other LAN Manager servers will be read and written. The NetBEUI module will work directly with the Sun Ethernet board, using LLC protocol alongside of the standard Sun TCP/IP stack. In fact, while each PC must choose either NetBIOS or NetBEUI, the Sun server can run both protocols simultaneously, supporting a PC network of mixed NetBIOS and NetBEUI users.

The Sun LAN Manager server runs as a set of UNIX daemons that are started with the LAN Manager `net start server` command. The `lmx.srv` daemon is the server: It controls access to the disk and print services. The `lmx.dmn` process controls access to the LAN Manager user accounts database. The `lmx.repl` process controls access to the LAN Manager file replication services. And the `lmx.ctrl` process controls communication between the other daemons. The `net` program to control LAN Manager, and the LAN Manager API library–`liblmx.so`–to write LAN Manager-compliant applications, are also provided.

One question not yet answered: Why use a UNIX server at all when PC, OS/2 and NT servers are available for these PC-centric systems? First, many PC-based networks already have large UNIX systems installed with fast disk drives, high-performance printers and excellent backup strategies. In addition, UNIX hardware may offer the best price-performance compared with PC-based server solutions. When given the choice of purchasing a PC with sufficient hard-disk space, printer, memory and backup tape to act as a server, versus a Sun SPARC, the Sun solution is likely to be cheaper, more reliable, and support more simultaneous PC users.

Once LAN Manager is installed, the PC client user accesses Sun disk drives, including NFS volumes, and Sun printers, through standard DOS or MS-Windows commands. Because the LAN Manager client is integrated with DOS/Windows/NT systems, very little extra learning is needed on the PC side, and Sun drives and printers look like any other disk or printer on the PC desktop.

For example, the administrator can make a UNIX disk resource available to the PCs with the `net share` command.

```
# net share mark=omeark /add
```

Once this is done, PC users can access the disk directory as if it were simply another local disk.

Because the command links the symbolic name mark to the volume /home/mark, the volume is now available to PC users as their G:, H: or other PC drive. The net share command (See Figure 3) shows shared resources.

In addition to disk and print services, the LAN Manager administrator has a number of advanced services he can provide to the LAN Manager users. All services can be controlled from the Sun via the net command or a menu-type interface; additionally, the administrator can control the services from a standard MS-Windows application called NetAdmin.

Among these services are:

• **Domain control**: PCs and servers can be grouped into domains, with a Primary Domain Controller Server, Backup Controllers and Member Servers. This mechanism allows logon account validation comparable to UNIX's NIS, and resource-level access permissions.

• **Replication**: Allows replication of files across multiple clients and servers. For instance, you could use this service to maintain identical logon scripts on a group of servers that are logon-servers in a domain.

• **Netrun**: Using the netrun service, a client user can start a server process, input data to it, and specify the location of the process' output.

In addition, LAN Manager comes with facilities for monitoring activities from the UNIX system, alerting PC users to specific events, auditing and logging, synchronizing network clocks, and running a built-in Sun SNMP agent.

Conclusion

So, what are the advantages and disadvantages of using a PC-developed networking model like LAN Manager versus the UNIX TCP/IP model? To begin with, the people really using the network don't care which model they are using. They simply want access to their files and printers quickly, easily and with great reliability. Whatever solution is chosen must therefore be easy to install and use, transparent to the end users, and reliable on a day-to-day basis. Both the PC- and UNIX-centric approaches described above meet all of these criteria.

Obviously, then, an institution that has already made a large commitment to LAN Manager or NetWare will want to add the UNIX machine as a server; this offers low cost, low effort and low training compared with a UNIX-style networking model like PC/TCP or PC-NFS. In addition, all network administration can continue to be done by a PC administrator working from a well-known, easy-to-use Windows tool. The cost factor should not be overlooked: A UNIX server supporting dozens or hundreds of PCs can cost as little as a $10 to $20 per PC, since the only cost is the UNIX server itself.

In an installation where UNIX is the accepted networking solution and PC users will be added, the PC/TCP or PC-NFS solution has great merit. The PC user can access UNIX disks and printers reasonably easily, site licenses can hold costs down–although not to the low levels of the other PC-centric solution–and the installation networking strategy can be continued.

In installations with no prior experience, such as an organization that is downsizing from mainframes, the choice may simply boil down to the question of the systems management and administration and the networking strategy. If these people have experience on PC networks, or, for instance, the VAR helping to set up the network has LAN Manager or NetWare experience, that might be the choice. If, on the other hand, the network is being set up with Sun workstations as the central workstations, with PCs peripherally used, then PC-NFS might be the choice. All of these solutions have merit. The choice is one of cost, perspective and experience. ⊸

Mark Krieger is president of Unipress Software Inc., which he cofounded in 1983. Also, he cofounded Whitesmith's Ltd., a compiler development company. He was a visiting computer scientist at CERN in Geneva, Switzerland, and has worked at several universities. He holds an M.S. in computer science.

CONNECTIVITY

SPECIAL SECTION

Bringing legacy SNA network traffic into the world of LAN protocols isn't difficult, but it's important to recognize potential pitfalls.

A Primer: Integrating SDLC into LAN Architectures

There is no doubt that, in today's computer market, the local-area network is the king of computer communications and LAN protocols are proliferating throughout every enterprise. But what about users who still have that old, reliable IBM mainframe technology? Even though the number of mainframe systems being installed today is declining, IBM did a wonderful job marketing its Systems Network Architecture (SNA), and there is still a lot of SNA "iron" out there performing mission-critical computing functions. Much of this SNA hardware is being phased out and replaced by client/server systems that take advantage of distributed processing power. But on many networks, the legacy of SNA lives on. A question frequently heard these days is, Can the SNA legacy network be successfully merged with the LAN network?

by LIONEL GERETZ, Advanced Computer Communications Inc.

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SNA-to-LAN Migration

In environments merging existing SNA systems with new and evolving LAN architectures, the integration strategy typically takes one of two directions.

First, a company could be decentralizing its MIS management and installing token-ring and Ethernet networks to support different departments. This MIS group is probably still responsible for maintaining mission-critical applications, such as accounting and sales support, on SNA-based mainframes, but a lot of the word processing and office automation functions are migrating to departmental workgroups.

In this case, what ultimately happens is co-evolution. The SNA network continues to operate, probably either on a token-ring network or in a traditional SNA Synchronous Data Link Control (SNA/SDLC) environment with direct links between front-end processors that interconnect cluster controllers. At the same time, the LAN-based work groups continue to proliferate. These work groups are probably being set up as Ethernet LANs–Ethernet is relatively inexpensive to install–or as token-ring networks that coexist with the SNA token-ring systems.

In a company headed in the second direction, management is looking to replace some of the remote cluster controllers in an SNA environment with LANs running PCs, Sun workstations and other desktop computer systems. The objective is to create a decentralized computing environment and offload non-mission-critical applications. The challenge, then, becomes integrating the remote Ethernet environments so they can communicate with each other and still support SNA traffic.

In the first case, evolution is more organic, and in the second case it is planned; however, in both cases, SNA is the legacy system and the faster, client/server LAN technology is the newcomer. All these systems have to be interconnected in order to reduce wide-area connectivity costs. So MIS management starts to look for the best way to create a single, cohesive network infrastructure that can handle both SNA/SDLC and LAN protocol traffic.

SNA versus LAN

So which protocols should be used to support connections across the enterprise, SNA or LAN? To answer this question, you have to consider your motive for integrating SNA and LAN. Is it to reduce the cost of your wide-area connections? Is it to create a less expensive path for your token-ring-to-SNA connection? Is it part of a strategy to move away from SNA in favor of a new technology? Or is integrated network management part of the goal? More than likely, you are seeking a combination of these objectives, and the answers must take into consideration the strengths and weaknesses of both technologies.

Legacy SNA typically runs on either point-to-point or multidrop SDLC lines. Multidrop lines, like the old telephone party lines, are a shared connection between multiple sites. The mainframe at the central site polls for data, first sending a request to remote Site A, then Site B, Site C and so on, repeating the cycle over and over again. The same principle applies with point-to-point connections, where the mainframe periodically polls a single remote site looking for data.

This approach cuts WAN connectivity costs; it requires fewer telephone lines than supporting multiple connections. Also, with either a multipoint or point-to-point connection, it is easy to support terminal controllers at remote

Figure 1. Mapping Bridge

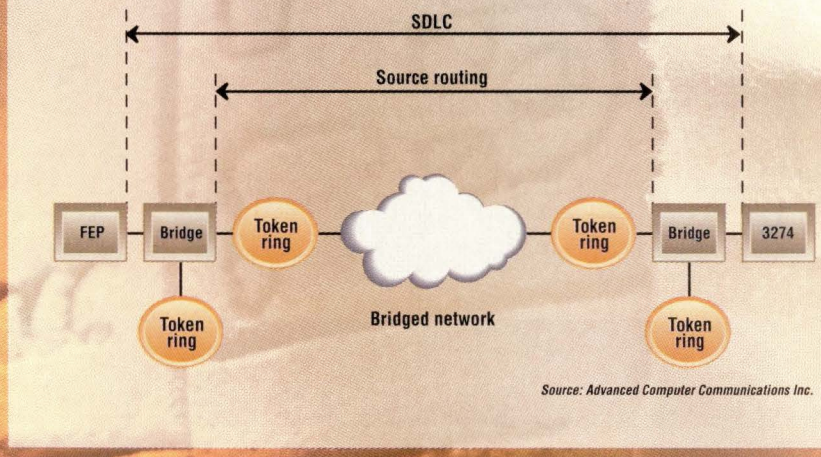
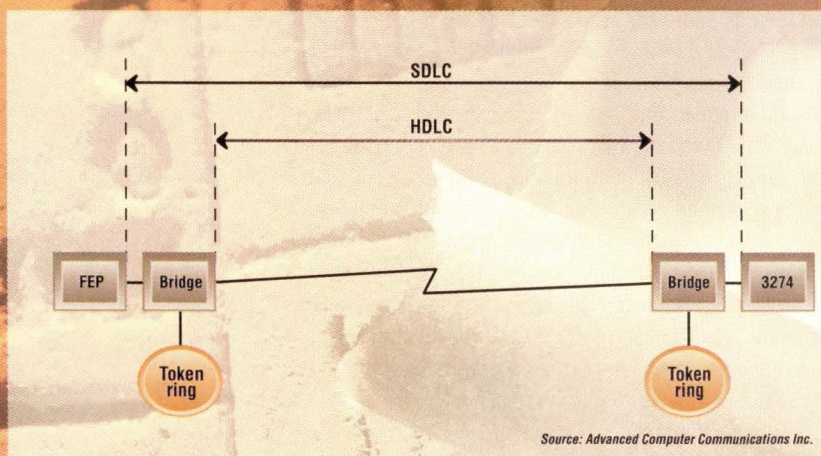


Figure 2. HDLC Multiplexing



sites using a communication processor to provide the interface between the mainframe and the cluster.

This tried-and-true SNA-over-SDLC architecture is alternately primitive and sophisticated. It's primitive in that SDLC operates at very slow speeds compared with many of today's communications standards. A typical multidrop connection operates at maximum speeds of 9.6 Kb/s. And the equipment that supports these connections is usually quite old and rather expensive for the service it delivers. But, SNA over SDLC is sophisticated in that it is highly reliable and uses bandwidth very efficiently. This reliability and efficiency explains why SDLC is still used to support mission-critical applications.

In contrast, much of today's LAN technology is faster, but less efficient and less reliable for certain applications. Running Novell Inc. NetWare applications over Ethernet, for example, theoretically allows you to transfer data at rates up to 10 Mb/s, but the effective throughput is always much lower and varies with the amount of LAN traffic. LANs work on a completely different paradigm than SDLC. They are "bursty" by nature, they use larger packet sizes, and they rely on faster transmission rates to make up for inefficiencies in bandwidth use.

So where LAN infrastructures can be very efficient at moving large blocks of data from point to point for desktop processing, SDLC continues to be an efficient technology for transaction processing. Even though SDLC is slow, it's predictably slow. The key word is predictable.

Imagine you are running a large data processing center, such as a hotel reservations operation or telephone sales center. Customers are calling in on toll-free lines, and hundreds of operators are seated at keyboards, entering data. Network response time is a critical factor here. With SDLC, you have a predictable response time, so a salesperson can enter customer information on a terminal and expect a response within a fixed period of time. The response time in a LAN infrastructure varies with the amount of traffic. If the LAN traffic is light, that same salesperson can enter customer data without worrying about network lag time, but if LAN traffic increases, the response time starts to lag. This can be an important consideration with customers waiting on the phone.

Figure 3. TCP/IP Tunneling

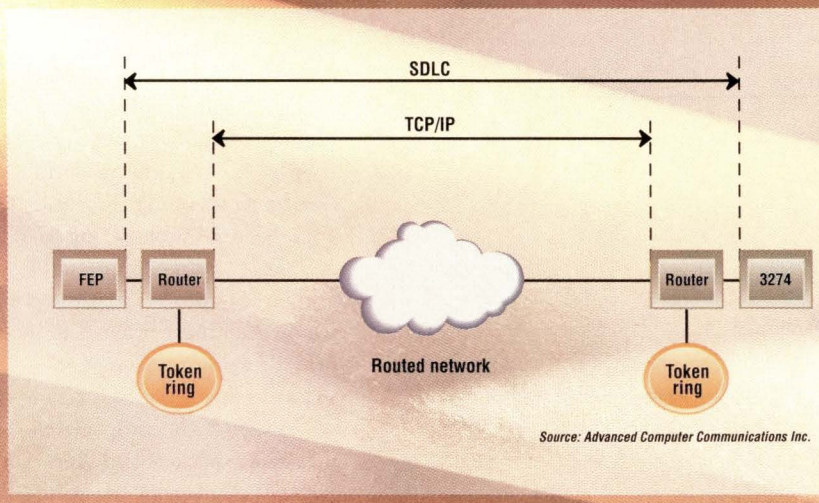
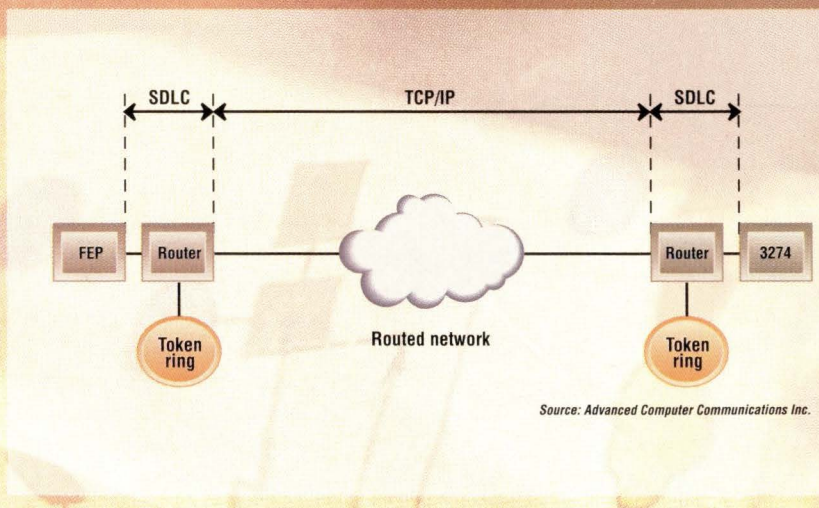


Figure 4. DLS with Passthrough



HANNA DYER

To SNA or to LAN? That is the Question

To intermix SNA/SDLC and LAN protocols, reconciling the speed mismatch between the two technologies becomes the principal consideration. Basically, you are faced with three transport choices. They include SNA-centric nets, third-party transport and LAN-centric environments.

- **An SNA-centric transport system.** If you already have a legacy SNA/SDLC infrastructure, you could use SNA as the transport for LAN traffic, but that means you will have to bring the speed of the LAN traffic down to match the SNA system, which runs at 9.6 Kb/s. There are a few vendors that offer products that encapsulate LAN protocol traffic to run over SNA. Example products include IBM's LAN-to-LAN Wide Area Network Program, Novell's SNA Links and Computer Communications Inc.'s Eclipse. However, this is seldom the preferred approach since it means you have to encapsulate connectionless packets in an SNA session-oriented scheme. It also limits you to IBM hardware with no possibility for open systems support.
- **Third-party transport of both**

SDLC and LAN protocol traffic. Multiplexing, X.25 and frame relay are the most commonly used approaches, but each of these techniques has its own set of problems. Multiplexing doesn't take full advantage of network bandwidth, nor does it support a unified infrastructure for network management. Further, X.25 is generally too slow to readily accommodate LAN traffic, and frame relay is not yet widely available. Pick your favorite switch vendor for product examples.

• **A LAN-centric transport system.** This approach demands that you increase the speed of the SNA traffic to match that of the LAN. This is the preferred technique for most environments, because it provides a scalable approach that can accommodate future expansion, and because it also paves the way for open systems support and integrated network management. This is the most popular technique for merging SNA and LAN traffic. All of the major router vendors provide solutions. Nonrouter solutions are also available from Advanced Computer Communications Inc., NetLink Inc. and Sync Research.

In LAN-centric systems, SDLC traffic can be transported over the LAN in several ways, but these can be summarized under two basic approaches: passthrough and conversion. Passthrough techniques carry SDLC traffic end-to-end between two SDLC devices. The principle is to create a "virtual wire" between SNA devices over which SDLC traffic can travel. Common passthrough techniques include using a mapping bridge, HDLC multiplexing, TCP/IP tunneling and Data Link Switching (DLS) with passthrough.

In contrast, conversion techniques transform the SDLC data packets into LLC2 packets so the SDLC device can communicate with an LLC2 device. Conversion has some distinct advantages over passthrough, principally higher performance and greater reliability over multihop WANs. Conversion techniques include both DLS with conversion and SDLC conversion.

In all cases, the SDLC protocol dictates that the primary link station, which has control of the data exchange, must be able to poll the secondary link station to see if there is data to exchange. Polling activity can consume significant internetwork bandwidth, so SDLC polling has to be an important consideration when evaluating SDLC transport techniques.

Figure 5. DLS with Conversion

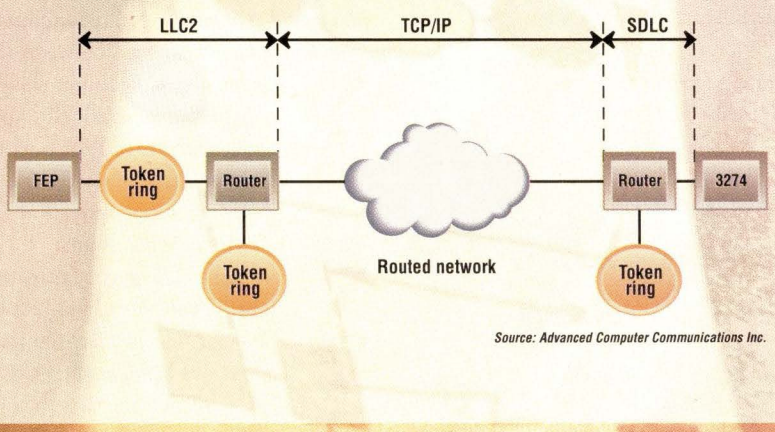
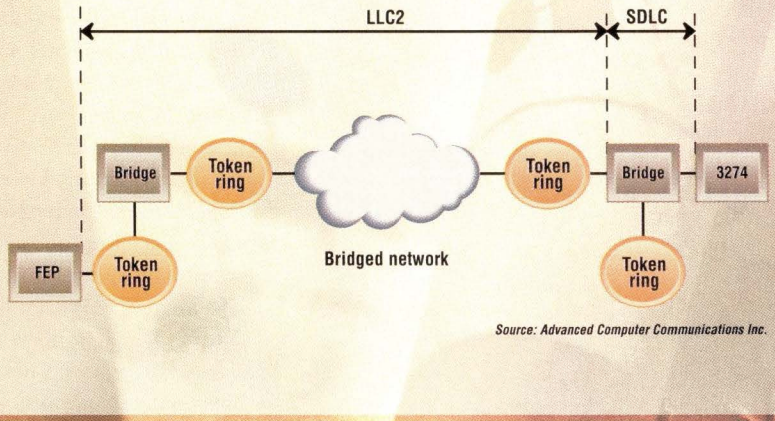


Figure 6. SDLC Conversion



Passthrough Techniques

The mapping bridge (see Figure 1) approach uses SDLC over LAN MAC encapsulation, essentially mapping an SDLC circuit for each token-ring MAC address. (This technique can also be applied over Ethernet where the Ethernet MAC is bridged using a transparent spanning tree algorithm.) The SNA packets are encapsulated into 802.5 packets and sent across the internetwork using source routing.

Although this is a fairly straightforward way to run SDLC traffic through the internetwork, it has at least three serious drawbacks. First, the traffic consumes a significant portion of the available bandwidth. The mapping bridge has to run all the SDLC traffic through the internetwork, including control frames such as Receiver Ready and Keep Alive. If you are planning to use this approach, SDLC frames should make up an insignificant portion of internetwork traffic.

A second drawback is scalabili-

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ty. The internetwork structure can't be too large because source routing bridging can only support a maximum of seven hops. Furthermore, every time you restart a connection, the bridge will flood the network with discovery packets, which consumes network bandwidth.

A third drawback is performance. You need to have a trunk connection between bridges that is fast enough to simulate the original dedicated SDLC link speed of 9.6 Kb/s. The trunk speed will be affected by the size of the SNA packets and the amount of LAN traffic, but normally the internetwork will need to maintain a link speed from 512 Kb/s to 1.5 Mb/s to avoid problems.

Another passthrough alternative, HDLC multiplexing (see Figure 2) can be used to encapsulate SDLC frames into HDLC (High-level Data Link Protocol) for transmission over WAN links. Not only does this approach have the same performance drawbacks as the mapping bridge, but it is also completely unscalable. HDLC can only handle one internetwork hop, and two additional hops to get into or out of the local-area network.

A popular approach among router vendors is TCP/IP tunneling (see Figure 3): SNA packets get encapsulated and carried across the internetwork as a TCP/IP session. All the SDLC exchanges are encapsulated in the full 40 bytes of the TCP/IP headers. The approach is called tunneling because it encapsulates a lower-layer protocol (SDLC operates at Layer 2, the Data Link layer) onto a higher layer service (TCP/IP is a Transport Layer, Layer 4 protocol). The same tunneling approach can be applied to other protocols as well, such as Novell's SPX/IPX.

An often cited reason for its popularity is scalability. Certainly, TCP/IP tunneling is more scalable than MAC or HDLC encapsulation, and simple implementations can be readily passed over an internetwork. However, the tunnel must be twice as fast to match the performance of a dedicated SDLC line. And the 40 bytes required by the TCP/IP headers adds overhead to the relatively small SDLC packets.

If scalability is your primary concern, DLS with passthrough (see Figure 4) actually decouples the end-to-end timing and synchronization of the connection. As a result, it expands the potential scale of your internetwork. As happens in TCP/IP tunneling, the SNA packet is encapsulated within TCP/IP for transmission across the internetwork. However, only the SNA layers above SDLC are encapsulated. Two separate SDLC sessions are terminated at either end of the TCP/IP tunnel, and polling is handled locally, so no polls have to be sent across the internetwork. This technique is called poll spoofing.

The greatest challenge in implementing DLS with passthrough is keeping the SDLC sessions at both ends synchronized, because there are no polling messages to maintain the virtual circuit. Although this approach is scalable, synchronization will become more of a concern as the number of hops increases.

Conversion Techniques

If none of the passthrough methods fit your needs or you want to convert all SDLC traffic for transport over the newer, higher speed internetworks, you should explore the two types of conversion. One, DLS with conversion (see Figure 5), is similar to DLS with passthrough. Using this technique, the SDLC frame is converted to a TCP/IP packet for transmission across the internetwork. When the packet approaches its front-end processor destination, the SDLC header is converted to LLC2 for transmission over the local token-ring (or Ethernet) LAN. Although a promising approach, DLS with conversion is very complex and the technology is still immature. It still suffers from the inefficiencies of encapsulating SNA packets in TCP/IP headers for transport over a WAN.

An alternative to trying to encapsulate SDLC data traffic, SDLC conversion (see Figure 6), actually dynamically translates the DLC (Data Link Control) headers that are part of the SNA traffic between SDLC to LLC. This is similar to translation bridging in the LAN world, where, say, an

Ethernet header is replaced by a token-ring header. Because SDLC is a Link Layer protocol, you can install a bridging device that swaps the SDLC header for an LLC2 header, which is the Layer 2 protocol for token-ring and Ethernet. The SDLC packet is thereby converted to a token-ring (or Ethernet) packet containing SNA data.

The hardware setup for this kind of environment would require a bridge to be connected to the transmitting cluster controller using a token-ring adapter board. The SDLC adapters in the front-end processor are replaced with token-ring adapters as well, and the bridge converts the SDLC headers to LLC2 headers so packets can be handled as native token-ring traffic. At the receiving end, a second bridge is installed between the receiving front-end processor and the cluster controller. This bridge handles header conversion from LLC2 to SDLC. A similar configuration could be used to support Ethernet.

Like DLS with conversion, SDLC conversion terminates SDLC polls locally so polling across the internetwork is eliminated. It also has the advantage of eliminating the performance problem, since SDLC traffic actually becomes LAN traffic and is transparent to the higher layers of SNA.

Any of these techniques can be applied to handle SNA traffic, depending on your network infrastructure, but SDLC conversion continues to be the most popular and the most robust approach for integrating SDLC traffic into LANs. In all, SDLC conversion offers the best combination of IBM compatibility, reliability, response time and scalability.

Lionel Geretz is senior product marketing manager for Advanced Computer Communications Inc., manufacturers of wide-area networking solutions, including the Ring Access SDLC-to-LLC Converter, the ACCess 4500/4400 enterprise hub, the Amazon regional bridge/router system, the Nile bridge/router, and other WAN connectivity products. Send mail to `lionel@acc.com`.

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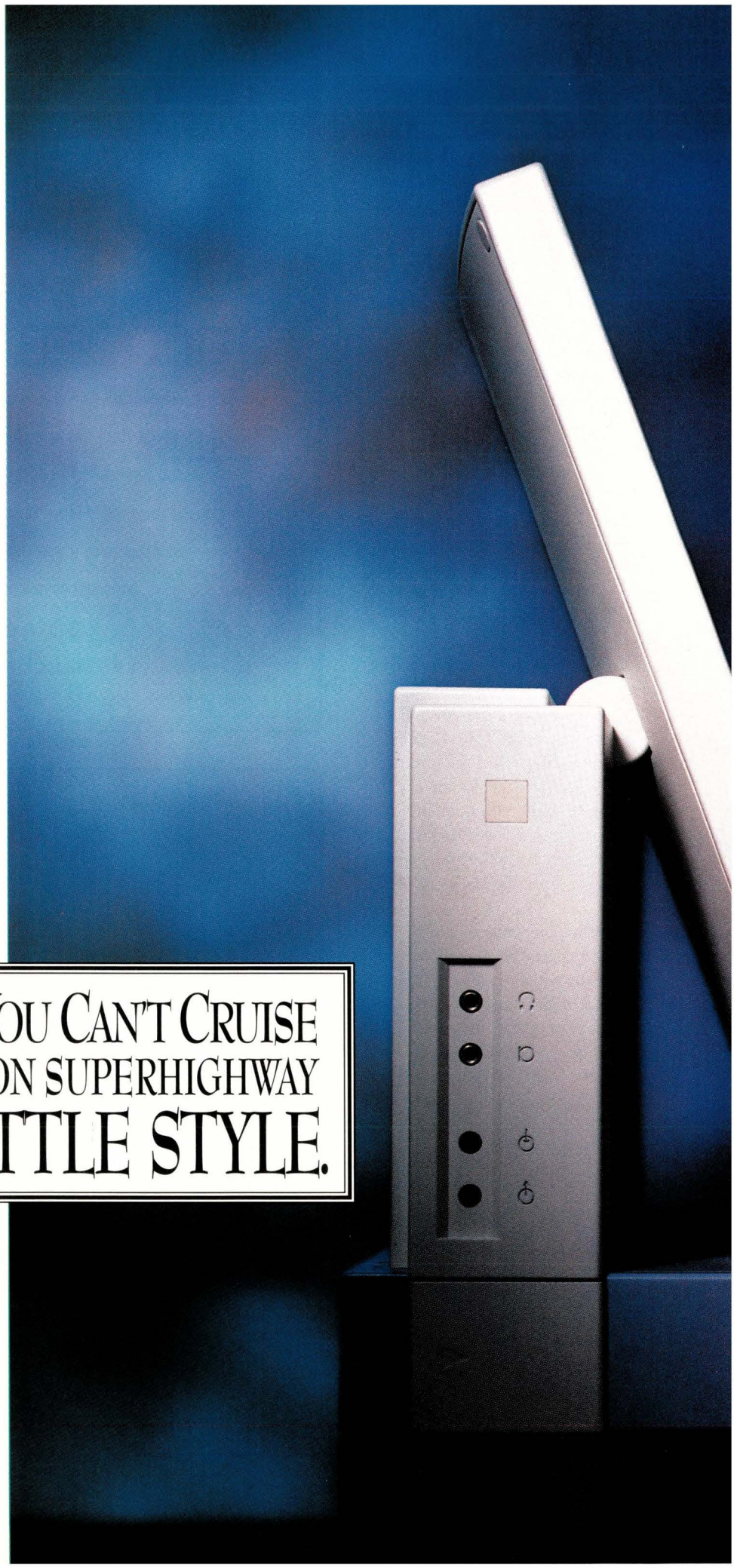

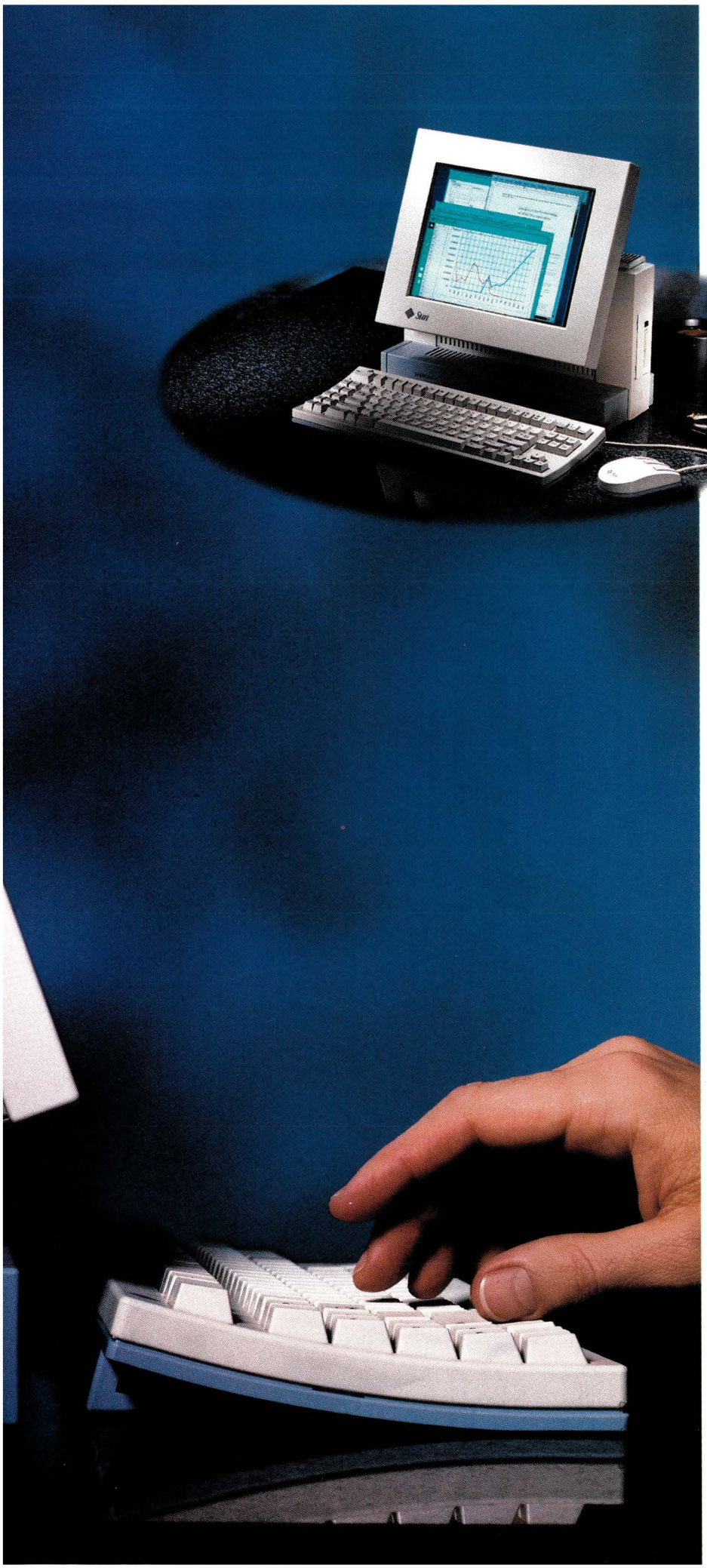

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In less than three years, Sun's service, support and maintenance organization has gone from laughingstock to formidable competitor.

Duking It Out in the Service Business

Not three years ago, Sun Microsystems Inc. was known as the company with the worst service and support organization in the business, bar none. A phone call to Sun's service organization might or might not even be answered. Hot-line support was mythical. Repair personnel appeared late, if at all, and might not be able to fix what they found if they did.

Today, all that has changed. With amazing speed, Sun has crafted a powerful and well-designed service organization that has become its own planet within the corporation–SunService. The transformation of the company's service organization could be a model for business reengineering, and SunService is now one of the most formidable competitors in the service and maintenance market.

But are customers really getting a better deal? Moreover, is Sun really playing fair in its competition with the third-party service providers that grew up, with the company's blessing, in the days before SunService?

by MICHAEL JAY TUCKER, Executive Editor

The Spectrum Explosion

The one thing that everyone agrees on is that the formation of SunService and the development of its SunSpectrum service contract are the two most important things to have happened to the workstation service market in years. "We have seen a tangible improvement in customer satisfaction," says Alan Hu, director of marketing for SunService. "It's gone up in part because Sun has a more friendly face."

SunService's prime product is SunSpectrum. This combines hardware and software support into one line of business and then offers varying levels of support depending on the customer's need. In brief, the "Platinum" level, which offers such things as 24-hour, seven-day-a-week support (so-called 7x24 service) is at the top. Then, there is "Gold," which offers similar levels of support but during regular office hours, and hot-line support on a 7x24 basis. "Silver," meanwhile, provides on-site and telephone support during business hours. And, finally, "Bronze" offers assistance, depot service and other services that would be most appropriate to companies doing some self-maintenance.

"We've got nothing but good feedback on SunSpectrum," says Hu. "The key point has been the contract simplicity...the ease of buying and keeping track of service." Quite simply, customers like to be able to specify exactly what level of support they want, and do so without negotiations as to what's covered and what isn't.

SunService has not, however, abandoned what has worked well for Sun in the past. In particular, it has not hired an army of field technicians. Rather, it does what Sun has always done–outsource. It uses a number of third-party contractors–Eastman Kodak Co. in the western United States, Bell Atlantic Business in the eastern United States, and other vendors in other parts of the world.

This strategy has proved one of Sun's most successful. It has allowed the company to provide service without paying for field engineers. And it has allowed the company to bring in expertise when necessary–as in, say, multivendor environments where a repair person may be asked to deal with very un-Sun equipment. "The use of partners was very controversial when we first decided on it," says Hu. "But, in today's environment, it has been accepted. It doesn't make sense for us to try to be good at everything in an open systems environment. We will do what we do well, and for what we don't, we'll find someone who does."

So, all in all, SunService and SunSpectrum have been successes. But the rub is in SunSpectrum's integration of software and hardware support. That's where things get complex.

The Great Divide

SunService is a fearsome competitor. Already, the new planet is putting significant pressure on some of the third-party maintainers (TPMs) that have traditionally supplied service and support into the Sun market. "I think the TPMs have found it hard to respond," says Karl Laubscher, vice president of TPM Polaris Service Inc. "We see some players consolidating." Polaris itself, he notes, has recently acquired a smaller TPM, ASJ Support Services.

"It has had a profound effect on the TPMs," adds Clint Morse, president of fourth-party service company Apex Computer. (A fourth party provides parts, support and training to TPMs and sophisticated self-maintainers.) "It didn't affect us directly, since our customers are either self-maintainers or resellers, but it shook a lot of people up. They're having a hard time competing against it."

In fact, some of those shaken people are crying foul. Their complaints have to do with the fact that SunSpectrum packages software and hardware service.

"What they [SunService] have done is bundle more tightly the hardware

What Can You Expect to Pay?

What is the going price for maintenance these days? To find out, *SunExpert* went to several vendors and asked what they would charge on a monthly basis to a site containing 300 SPARCstations 2s, each with GX graphics, a 19-inch color monitor and 32 MB of RAM. We are assuming that none of them are servers. Keep in mind that our hypothetical site of 300 workstations is simplistic and homogeneous. Any real site would be much more complex.

Each vendor was asked to provide a price to maintain this site at levels comparable to SunService's Bronze, Silver, Gold and Platinum.

Approach the chart with caution. The intent is to show the pricing a user can expect to find in the market, and not to show how one vendor is cheaper or better.

Both Hardware and OS Support–per unit/300 units (per month)

Company	Platinum	Gold	Silver	Bronze
ComputerVision Services	207/62,100	171/51,300	147/44,100	93/27,900
ManTech Systems Corp.	61/19,901.25	61/15,921	61/11,940.75	n/a
NCE Computer Group	120/36,600	85/25,500	74/22,200	66/19,800
Pinnacle Data Systems Inc.	60/30,500	60/24,250	60/22,166	60/18,000
SunService	259*/82,700	185/55,500	148/44,400	121/36,300

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and software support. That makes it more difficult for end users to get independent support," says Laubscher.

A user can still buy software service from Sun, independent of hardware service. But it is not as easy as it once was. That means, say the TPMs, users are increasingly locked into Sun's own offerings.

"Sun has leveraged against its customers the whole area of software support," agrees Rick Meetz, national account manager for service supplier Pinnacle Data Systems Inc. "Under the Spectrum program, Sun has bundled hard and software support in such a way that it is almost impossible to separate them...and that, quite honestly, is a direct attack on depot people like ourselves."

Adds Apex's Morse, "I think it hasn't been good for the customer. It gives Sun a competitive advantage, but they are not competing on price or service...they are competing on their control of the operating system."

There are, however, still ways around SunService, and the TPMs are hoping that Sun customers will find them. For one thing, says Apex's Morse, "Most companies don't really need Sun's software support."

There are a variety of reasons for that. One is that operating systems tend to fail fairly infrequently. Customers' real software support issues have to do with applications, and networking, support for which they may be able to get elsewhere.

Second, there are some alternatives. "There are a variety of places that customers can go for software support," says Polaris' Laubscher. "And some self-maintainers don't purchase a software support contract at all. They can, for instance, take advantage of our software advisory service, which we maintain for customers at no cost."

Then there are companies like Digital Equipment Corp., which also supplies hardware and software service. DEC does not currently offer Solaris 2 support but says there isn't a demand for it. "Did you know that 80% of Sun's customer base is still using SunOS?" asks Dennis Brosnihan, DEC's U.S. Multivendor Services business manager for Sun. That means they don't particularly need Solaris support. They do need SunOS support, and that's something DEC can provide.

And it is possible to buy software support from companies other than SunService, even if the buyer wants a full-fledged maintenance contract for Solaris 2. SunSoft, the division of Sun that is responsible for the operating system, has signed contracts allowing some remarketers to sell Solaris support. Companies like ComputerVision Services have this unique relationship with SunSoft.

"We are are one of the few companies that can offer both hardware and software support for Suns," says Kathleen Cote, president and general manager of ComputerVision Services. That puts her into the interesting position of being the head of one of the few companies that directly competes with SunService. "I am not going to kid you," she says. "We expect that they [SunService] are going to be very aggressive in the market."

She doesn't think that SunSoft will ever yank her company's right to do Solaris support. "SunSoft is distinct from SunService," she says. "In a lot of ways, we are just another customer to SunSoft, just as SunService is."

Other TPMs, however, are not so sanguine. One individual, who asked not to be identified, said bluntly, "My guess is that one planet didn't know what the other was doing. When SunSoft sold Solaris service, it created a hole in SunService's wall. Will they plug it? Probably."

This individual suggested that *SunExpert* not do a maintenance article this year. He expressed the belief that such an article would alert Sun to the existence of alternative sources of Solaris support, and that this would hasten the day that the "hole" was "plugged."

Flexible Flyer

If the "hole" is no more, does that put the TPMs out of business?

Perhaps not. The TPMs hope to take advantage of what they see as other weaknesses within SunService's offerings. One of these is the very feature that has made SunService a success–that is, the use of contractors to perform actual field maintenance.

"I don't have an ax to grind with Sun," says David Shepard, director of sales and marketing for TPM Man-Tech Systems Corp. (Not to be confused with Maintech, the noted service provider in New York.) "They do a fine job at what they do, but they cannot get away from the fact that they're really subcontracting."

He thinks users are willing to pay for service from someone who isn't a subcontractor, and who is going to be around long enough to learn the ins and outs of a customer's installation. "You don't see us beta-testing engineers on your site," he says. "You'll know these people. You won't see a bunch of new blood trotting through your site."

By like token, he wonders if Sun really has a product line, or just one product. "Bronze is really just depot assist," he says. "No one is going to really want Platinum, because no one–with a few exceptions–needs that kind of service. And Gold is pretty much the same thing. What they're really selling is Silver."

Then, too, there is the issue that no matter what the metal of the product, SunService's offerings are chiefly end user. That has left, at least for the moment, an opportunity for TPMs to sell to VARs and other resellers. "The SunSpectrum program has had very little effect in the more niche-oriented accounts," says Jerry Puda, vice president of corporate sales and marketing at TPM NCE Computer Group. "That is because Sun is not the dominant name in the account. It is simply one component of an application system delivered by someone else."

Another possible market for the larger TPMs is multiple platform service, particularly in multinational corporations. "What we're offering is flexibility," says DEC's Brosnihan. He argues that a large corporation may not be particularly eager to engage a small, localized TPM to provide service to sites that may circle the world, but may not trust SunService to arrange service with yet another third party for maintenance of both Sun and non-Sun platforms. DEC, by contrast, spans the globe, and

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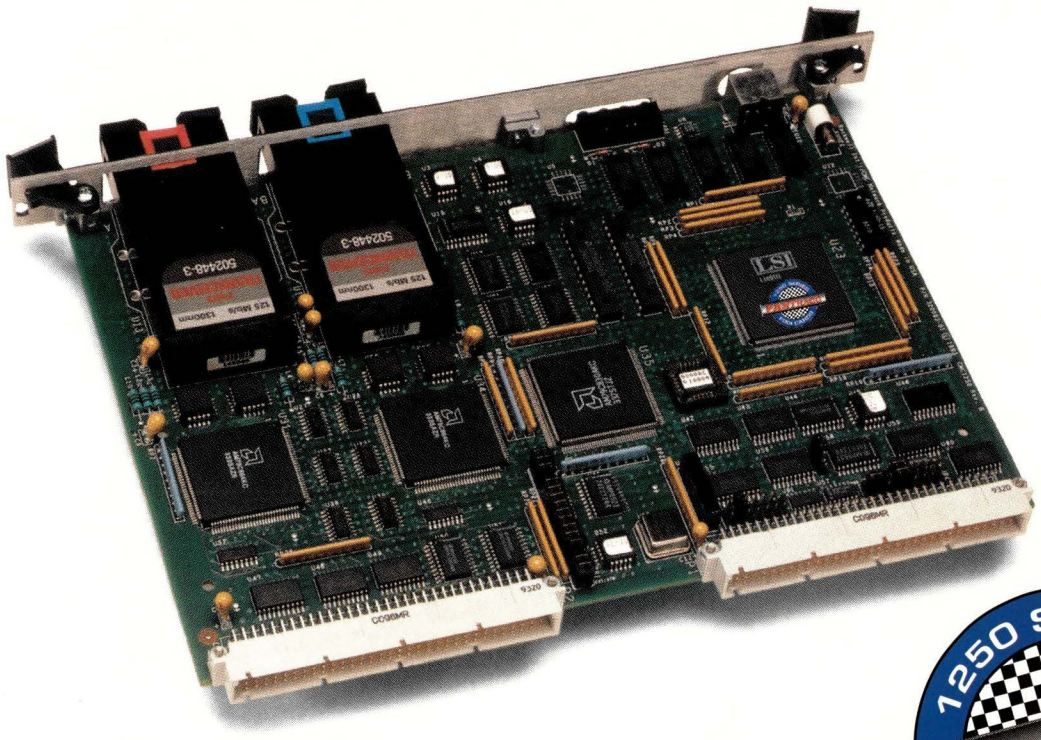

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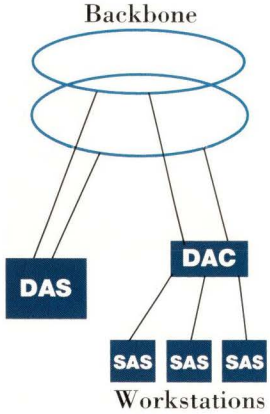

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Where Does Service Make Sense?

What level of maintenance do you need? When is simple depot assistance more than enough for your needs, and when is SunService's Platinum the only possible choice?

The answer to that can be hard, because user requirements (and indeed, user perceptions of the importance of their work) vary from site to site, and even from individual to individual.

One fairly common way of trying to establish one's maintenance needs is to talk about it simply in terms of numbers. Thus a site that has only one or two workstations may require no service contract at all. Meanwhile, one with many thousands would need 24-hour service, on a level of SunSpectrum's Platinum.

It is possible to chart this simple model (see Figure 1) with the number of systems to be maintained on the vertical axis, and the level of support (represented by SunSpectrum's four support levels) on the horizontal.

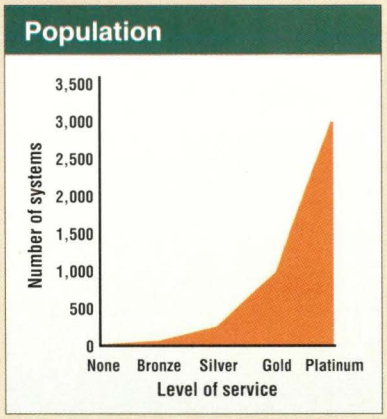

Figure 1

Near zero, casual maintenance, where the user does all his or her own repair work and buys parts as needed, is fine. At 20 systems, says David Shepard, director of sales and marketing at ManTech Systems Corp., some sort of relationship with a parts depot becomes increasingly attractive. We'll say, then, that from 20 to 300, Bronze or some similar program is the best bet.

But, by the time you've reached 300 units, perhaps it is best to move to Silver. Gold and Platinum follow closely at, say, 1,000 and 3,000 units.

The chart is easy to do, but does it fit every site? For one thing, it may not be clear that very small installations want to do their own maintenance. They may be small, but their tasks may be mission-critical. Then, too, small installations may not be able to afford the expertise or systems necessary to do self-maintenance. "The small customer may not have any spare units," says NCE Computer Group's Jerry Puda, vice president of corporate sales and marketing. "They may not have a network-based environment where swapping a unit makes sense."

Meanwhile, a larger installation may actually be better suited for self maintenance. Thus, Shepard thinks that this chart should instead be "a bell curve, because at the high end, you get people who will be doing self-maintenance easily."

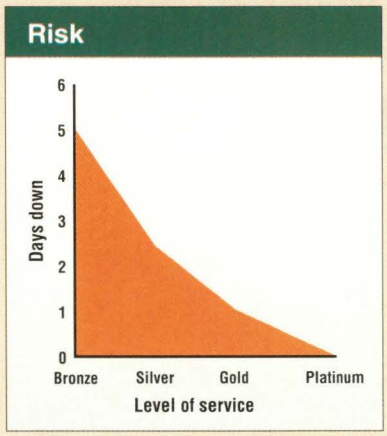

Figure 2

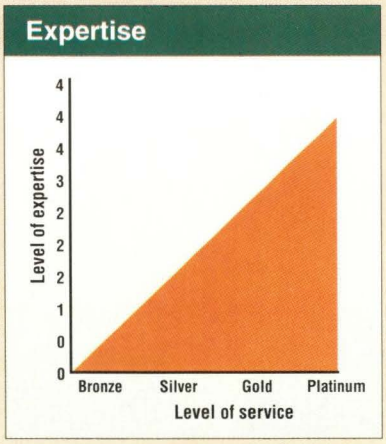

Figure 3

So if mere numbers aren't the best or only gauge, how about mission criticality? Let's have a second chart (see Figure 2) with the same horizontal axis, but with the vertical axis measuring the length of time that any individual system in your installation can be down without affecting your business. At zero, for one's mission-critical servers, Platinum is the order of the day.

However, notes Pinnacle Data System Inc.'s national account manager Rick Meetz, "If your machine can live with being down for five days, you should go with depot repair." We'll assume half that, or two and a half days, for Silver, and a day for Gold.

This too is easy to chart. But does *it* make any sense? SunService's director of marketing, Alan Hu, suspects that it may not. "I applaud the effort [to set up such charts], but I think the vertical axis may not represent the only factors you need to think about."

He notes that both Figure 1 and Figure 2 assume that maintenance means fixing things that are broken. In fact, he notes, "If you look at the calls to our support centers, only 14% of them have to do with broken parts." The remaining 86% are calls about "how do you do something." In other words, they're training calls. The users need to learn how to perform some tasks with a machine that is new to them.

"For me," he says, "the relevant function is skill." So, let's have a third chart, this one reflecting the user's familiarity with UNIX in general, and Suns in particular (see Figure 3). This time, on the vertical axis, we'll track the sort of regular assistance that your company might need. Our reference points will be 1) hot-line support, during business hours, but not much else; 2) occasional on-site assistance; 3) access to video and hard-copy training libraries; and, finally, 4) actual classes and "coaching" (SunService's Platinum, for example, offers 15 days of training).

Being a simple 45-degree line, this chart is easiest of all to draw. The problem, though, is that it, like all these charts, may not reflect anyone's actual situation. "Take a site with 300 seats," explains NCE's Puda. "That would seem like a perfect candidate for Bronze level service. But, here come the caveats–is it all in one location? One building? One department? Is it all one network? Does that company have a technical staff? And on and on."

Thus, the only individual who can accurately judge a specific site's need for support is the person who must actually manage it. These charts, however, can provide a rough framework for making choices.

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2,3,4

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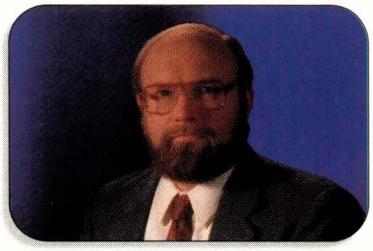

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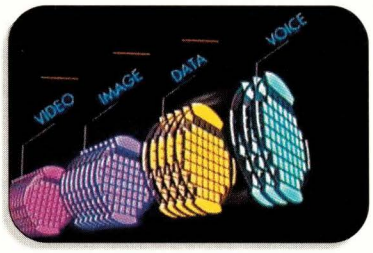

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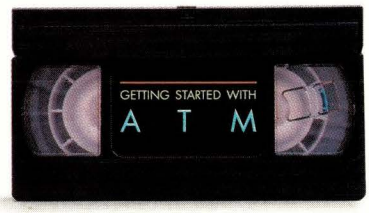

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11. International Carriers
12. Host Channel Attachment

can deal with a wide variety of different machines and networks. "We eliminate the finger pointing," he says.

But what could be the most important market for TPMs is in the Sun machines that Sun itself doesn't care to support any longer. "Sun is cranking out new products faster and faster," says Pinnacle Data's Meetz. "They are obsoleting product at great speed. They'll never stand up and admit that they don't want to service those machines, but they've taken steps in that direction. Those older machines are an obvious target for the depot business."

New Boxes to Break

Whether these strategies will prove effective remains to be seen. Already, SunService is responding to some of them. The reseller market and some of the larger niches, for instance, may not be safe havens for long. "We are going to improve SunSpectrum," says Sun's Hu. "We are going to focus on the kind of niches that didn't exist a year ago, for example, high-end commercial systems, and we'll be targeting resellers."

The larger maintainers, like DEC, will be able to compete with Sun head-to-head. The smaller TPMs, though, clearly have a fight on their hands. They are suddenly in competition with the very company whose products they maintain, and which dwarfs them in size and resources.

But that is not an unusual scenario in third-party markets. VARs, resellers, peripheral makers, board makers and so on all traditionally coexist quite happily with their vendor–until their market becomes large enough to attract the attention of that vendor.

The traditional response of VARs, resellers, peripheral makers and so on is to then fly ahead into still newer, more niched, and smaller markets that their vendor has either not yet discovered, or into which it cannot fit. That may be what happens to Sun TPMs.

There are some companies, after all, who feel ill at ease dealing with an entity as large as Sun. "Certain sizes of companies tend to feel comfortable dealing with the same sizes of business," explains NCE's Puda. "As Sun's product line moves into the smaller companies, they will seek to deal on a more personal level with other small companies."

And besides, he notes, with a market as varied as the one presented by Suns, there will be always be something to fix. "As long as Sun moves boxes out," he says, "there will continue to be new opportunities." ➸

Companies Mentioned in this Article

Apex Computer
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Redmond, WA 98052
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Bell Atlantic Business
Systems Services
50 East Swedesford Road
Frazer, PA 19355
Circle 141

ComputerVision Services
ComputerVision Corp.
201 Burlington Road
Bedford, MA 01730
Circle 142

Digital Equipment Corp.
3 Results Way
Marlboro, MA 01752-3082
Circle 143

Eastman Kodak Co.
Customer Equipment
Service Division
343 State St.
Rochester, NY 14650
Circle 144

Maintech
1133 Avenue
of the Americas
New York, NY 10036
Circle 145

ManTech Systems Corp.
7161 Columbia
Gateway Drive
Columbia, MD 21046
Circle 146

NCE Computer Group
9717 Pacific Heights Blvd.
San Diego, CA 92121
Circle 147

Pinnacle Data Systems Inc.
1350 W. Fifth Ave.
Columbus, OH 43212
Circle 148

Polaris Service Inc.
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Multimedia and Fax

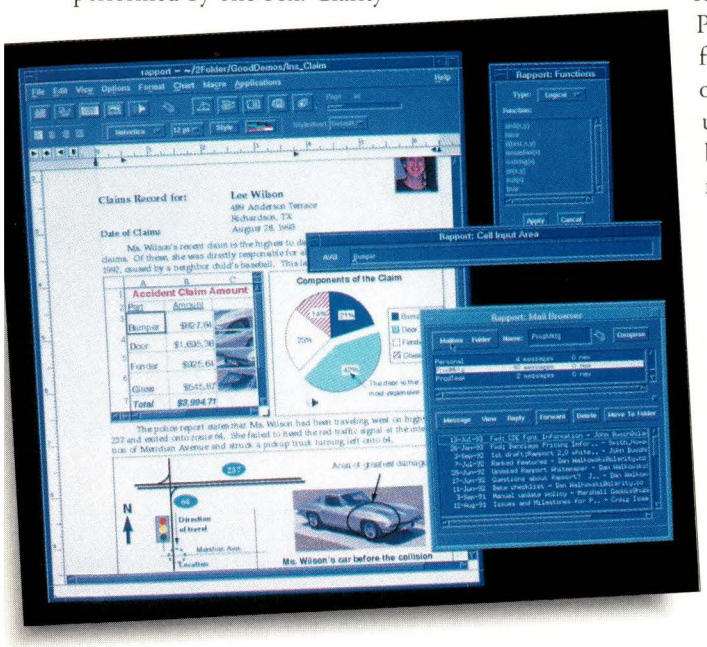
This month *SunExpert* explores a path to app integration–Clarity's latest version of Rapport–and a handy tool for managing faxes–Andataco's XpressFax.

Finding Rapport

by BARRY SHEIN
Technical Editor

The new theme of the computer age appears to be convergence of technologies. Soon, no doubt, we'll be talking to our TV sets, flipping channels on our phones and receiving electronic mail via our radios. Sounds odd, but someday all these functions may be performed by one box. Clarity Software Inc.'s Rapport multimedia software fits right into this theme. A Rapport document can include text, art, spreadsheets, images, charts, tables and even audio. And the tools for integrating the different data types by incorporating word processing, audio, graphics, electronic mail and other functions come in one package–Rapport Pro.

Rapport Version 2.0 has been rechristened Rapport Pro. Pro is the name for the combination of two Clarity products which can also be purchased separately: Rapport Multimedia Mail and Rapport Script, a WYSIWYG word processor. If you do a full installation, the software requires a lot of resources. On our Sun Microsystems Inc. SPARCstation, the package needs 45 MB of disk space, 16 MB of RAM–the more the merrier–and 15 MB of swap over and above the current space. Clarity assumes your swap is double your memory. Rapport does run on other platforms, among them the Hewlett-Packard Co. 700 series, Silicon Graphics Inc. Iris, Digital Equipment Corp. DECstation 5000. It also supports X11R4 X terminals. (Check with Clarity to see when Rapport will be available on particular hardware.)



Jack of all trades: Rapport brings together words, pictures and sound into one tightly integrated applications suite.

Let's start with the word processor, Rapport Script. This is a richly featured WYSIWYG word processor using a Motif or Open Look look and feel. Across the top are the familiar File, Edit, Options and other menu items. Below this is a palette area of buttons for quick access to common features. Beside the text entry button there are also buttons for entering drawings, spreadsheets, images and audio into the document. Alongside these, further to the right, are send mail, read mail, an electronic address book, fax and create-a-new-document buttons. Just below these are several text-attribute buttons such as left, right and center justify paragraph, font and font style selection, a color choos-

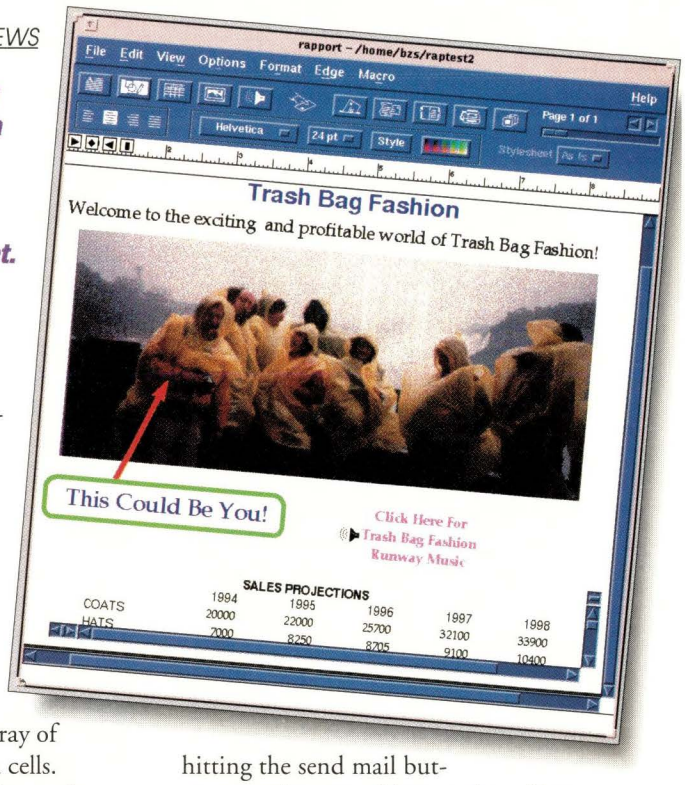
er and a pull-down menu of prepared style sheets. Although Script is not a page layout package, the word processor includes automatic tables of contents, index generation, multiple columns, multiple text flows on a page as well as hyphenation, kerning and smart spaces. In fact, improvements to Script account for most of what's new in Version 2.0.

To try out Rapport Pro, I created a new document, typed in some text, changed its format, font sizes and styles, color of text and other features. This all worked well and, having used various other WYSIWYG editors, seemed intuitive to me. Now, on to some fun stuff...

Now, the Fun Begins

Hitting the drawing tool button creates a box within your document to draw into and pops up a tool palette window with an assortment of line, polygon, circle, lozenge, text and other choices along with an array of fill patterns. Again, if you are familiar with this sort of software paradigm, you immediately know how to use it. I doodled a bit and went on.

This email document has WYSIWYG text, a spreadsheet, a color image of the author and friends, and an audio accompaniment.



Next, the spreadsheet button inserts a box into the document which was, surprise, a spreadsheet! I played with this a little and it worked (and looked) just like spreadsheets I'm accustomed to using, with the usual array of text, numeric and formula cells. Rapport can import files from other UNIX, PC and Macintosh spreadsheets (see Conversions). Within the spreadsheet is a charting menu that allows you to create business graphics (bar charts, pie charts, etc.) from selected areas of your spreadsheet.

To try out the image features, I opened a GIF color bitmap file, which Rapport recognized without my having to explain what it was, and imported the image into my document. (Pro accepts images in GIF, TIFF, raster, PICT and PICT II, Silicon Graphics Inc.'s .rgb, and FrameMaker MIF formats.) So, we now have a document with some fancy WYSIWYG text, a little drawing, a spreadsheet and a photographic-quality color image of me and a few friends at Niagara Falls in those silly yellow raincoats. Finally, clicking the audio tool added a little box with one of those speaker icons in the document and popped up a window offering to record, play, adjust the volume and so forth.

Nothing left to do but mail this to myself, which I did by hitting the send mail button, entering my address and a subject line and away it went. I waited a moment, hit the read mail button and was presented with a list of messages waiting for me. These included both regular, boring ASCII mail and my new and improved multimedia message. I read through some mail messages and then jumped to the multimedia message. Double-clicking on this message opened a new window looking exactly like the one I had composed it in originally; full color bitmap, audio, spreadsheet and all. My very first attempt at sending a multimedia message resulted in a plain text message with lines embedded explaining that some audio might have gone here and a picture might have been here had they been sent. To send a document as a multimedia message I had to try again, selecting "Clarity" format for the send. Not a problem, and it's nice to know that you can easily send off a text-only version of a document to a poor cousin with the click of a button.

One caveat: If you use Rapport as a mail reader, the mail is converted to the Rapport data stream format. As a result, the mail can't be read again in any other reader. You can get around this by having your current reader move messages into a file or files dedicated to Rapport. Also, Rapport 1.0 files, and this applies generally, need to

Conversions

A key strength of Rapport is its ability to handle diverse file formats, allowing users to work toward an integrated data-handling environment.

Mail Systems
cc:Mail
GatorMail-M
GatorMail-Q
UNIX Sendmail
Sun Mailtool
HP OpenMail

Macintosh spreadsheets and text editors
ASCII text
MS Word
FrameMaker MIF
Lotus 1-2-3 .WK1 and .WK3
(or any other that supports these formats)
ASCII tab- or comma-delimited files

PC spreadsheets and text editors
ASCII text
WordPerfect 5.1
MS Word 5.0
MS Word for Windows 2.0
FrameMaker MIF
Lotus 1-2-3 .WK1 and .WK3
(or any other that supports these formats)
ASCII tab- or comma-delimited files

be converted to 2.0. So, if you are upgrading a number of users, it would be a good idea to upgrade them all at the same time.

One interesting feature in the mail reader is the ability to create filters to be applied to your incoming mail. A filter has two elements, a pattern to compare mail against and an action to take if the pattern matches. For example, you might want to ignore all email from your ex-spouse, or even just send back a canned response ("You know my attorney's phone number, love and kisses...") To do this, you would enter his or her email address in the From: section of the pattern dialog box and choose the appropriate action to take. Rules can have names and you can create many rules if you like (not limited by the number of ex-spouses you have). Patterns can be matched on either the From, Subject, Cc, To, Title, Date or Other fields. The pattern can either be an exact string to match, a substring or a pattern in the UNIX regular expression sense with wildcards and other fuzziness.

Some of the action possibilities offered are to move the message to a specific folder, forward it to someone else (perhaps your attorney), reply to the sender or all addresses in the message with some specific text or the contents of a prepared file, reject the message (silently or otherwise), or run some arbitrary program of your own choosing whenever a message is received that matches the pattern. Very powerful stuff.

Just Showing off

Rapport also has a built-in slide manager for creating overheads or other slides. I tried this and, like everything else in the package, it worked smoothly and integrated with other parts of the package. For example, you can stick a spreadsheet or raster image right into a slide, just as you would with a multimedia document. I'm not sure what it means exactly to put an audio attachment into an overhead slide, but it can be done. I suppose when preparing slides with a group it might be handy to be able to annotate slides as an editing tool. (You can then, of course, mail off the audio-annotated slides to the group.) The lesson here seems to be: Given a set of powerful tools, you will find a use for them.

There are a lot more features in Rapport Pro, such as tools for creating tables, sorting tables of data, making slides and overheads, etc. The mail tool can sort mail by subject, date, sender and other attributes. Within the word processor, there is also the notion of a frame, which can be used to create multicolumn documents, text flows and other effects.

Last but not least, you can use Rapport to integrate a number of applications. Clarity provides a facility called FLEX (Facility for Linkage and EXtension), which lets you link Rapport Pro to other applications such as Autodesk Inc. AutoCAD, Lotus Development Corp. 1-2-3 and Island Graphics Corp. IslandWrite, Draw and Paint. FLEX also includes a macro language and programming interface standard to help you integrate your own applications into Rapport.

On the downside, the help facility is average at best. There's something a little bit clunky and uninviting about it. It's hard to put my finger on exactly what the problem is, perhaps poor organization and a tendency for it to give me canned text by major topic which often looks more like a tutorial when what I really want is a power-interface to a reference manual. This is not a serious criticism. It also beeps every time a new email message arrives, which in my case is usually more than once per minute; this can be distracting. To turn the chiming off, you can run to the Mail Browser, click on the Mailbox option, then under Mail Properties click Ring bell on mail arrival. Silence.

Overall I liked Rapport Pro a lot. It seems like a very useful tool for many office and business tasks. Gluing together multimedia document creation and editing with multimedia electronic mail really makes this product unique. Rapport Pro covers a wide range of needs: spreadsheets, electronic mail, multimedia documents, groupware, general word processing, etc., all in one neat and easy to use package.

Rapport Pro

Company
Clarity Software Inc.

Address
2700 Garcia Ave.
Mountain View, CA 94043

Phone
(415) 691-0320, (800) 235-OPEN
Fax: (415) 964-4383

Email
info@clarity.com

Best Feature
A very richly featured multimedia document and mail composition product available on several platforms.

Worst Feature
The help facility could use a little work, but overall the software is very intuitive to use.

Price
Rapport Pro: $895
for floating license;
Script: $695 for
floating license;
Multimedia Mail: $3,750
for a minimum of 25 licenses;
Fax Server: $1,095,
unlimited license

Circle 151

XpressFax is Xcellent

by S. LEE HENRY

No more waiting for my printouts, standing in line for the fax machine, or making face-up/face-down decisions for me! I'm switching to purely digital faxing. The application that I've been trying out over the past month is XpressFax from Andataco. I think it's got everything I could want in a fax application, but let me tell you about it and you be the judge.

For starters, there was the installation. The slick little GUI tool that popped up on my screen allowed me to do everything, from configuring my modem for both send and receive

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operations, to setting up my `/etc/printcap` entries so that I could fax from any application on my system, with just a few clicks and a few easy answers. I was happily surprised at how little I had to do to set things up and make sure that received faxes are routed to the right people.

To send a quick message, I select the Send button from the tool's menu and type my message into a nice-looking form. XpressFax creates a smart-looking cover page (which by the way, can be replaced with a more personal PostScript file), containing the message. I also fax with the application's command line interface and find it about as simple as sending a file to a printer with lpr. The one-line command:

```
sendfax -n "Larry McQueary" -o
"University of Maryland" -p
"301-474-8213" -v "301-422-
6539" -f ~slee/personal/
slee.pix
```

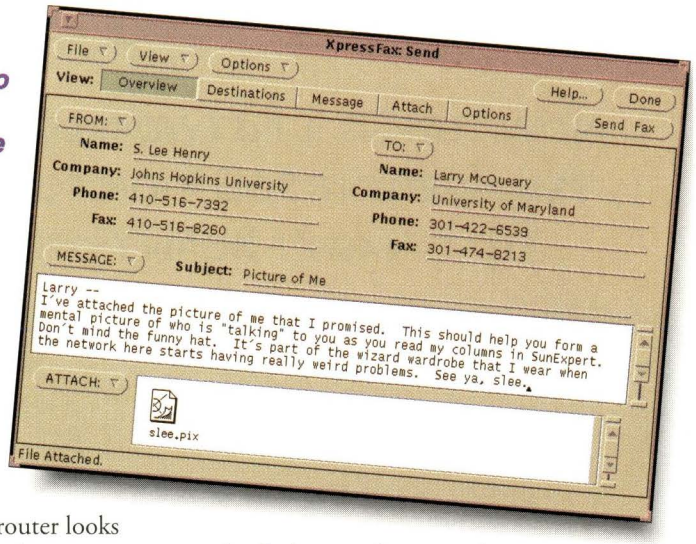
will send my friend Larry a picture of me (we've only met electronically). I even get mail when a fax I've created has been transmitted successfully.

I can fax from other applications on my Sun by "printing" to the "printer" (`xprfax`) that was set up during installation. Some applications can be customized so that this operation opens up the XpressFax Send screen with the current document already attached–real slick. Some of my users prefer the email interface. They just send email to the pseudo-user "fax" specifying the recipient as subject line and off it goes.

I tried setting up recipient lists using the built-in database and found it was trivially easy to send faxes to whole groups of people whether they were in my department or "in the real world." The "Phonebooks" provide room for snail mail addresses and notes as well as the information (e.g., fax number) that the application requires; this allows me to annotate my fax recipients and helps me stay organized.

I tried adding attachments to a fax and have to admit to doing it wrong at first (I'm a die-hard dragger and dropper); I figured it out pretty quickly though. Attachments are sent out as separate pages following the cover page in the transmitted fax.

Some applications can be customized to open the XpressFax Send screen with the current document already attached–real slick.



I was especially impressed with the autorouting of my incoming faxes. The autorouter looks for "To:" followed by a user's name (after running the document through the Xerox/ScanWorX ICR engine) and matches the names with users on my system using a simple ASCII file that I maintain. I could turn this feature off, but I like it too much. I can also configure what autorouting does by altering the script that it uses.

I can also edit and/or forward faxes that I receive to other people.

XpressFax keeps detailed logs of activity. If you need to charge accounts within your organization for use of your fax resources or just keep track of where you've sent what, these logs have plenty of data for you. They capture the date, time, duration, sender and receiver, as well as connect activities. Messages like "940410 17:34:36 modem1 Generating Server Banner Page to Larry McQueary of University of Maryland at fax 301 474 8213 voice 301 422 6539", "301 474 8213 failed. (Busy)", and "301 474 8213 answered" are easy to understand and extract for billing or other purposes. By the way, I never had to requeue my fax request if the receiving modem was busy. XpressFax took care of this.

XpressFax

Company
Andataco

Address
10440 Mesa Rim Road
San Diego, CA 92121

Phone
(800) 443-9191

Email
inquire@andataco.com

Best Feature
Autorouting and email notification.

Worst Feature
Can't drag and drop attachments.

Price
$695 for five-user floating license.

Circle 152

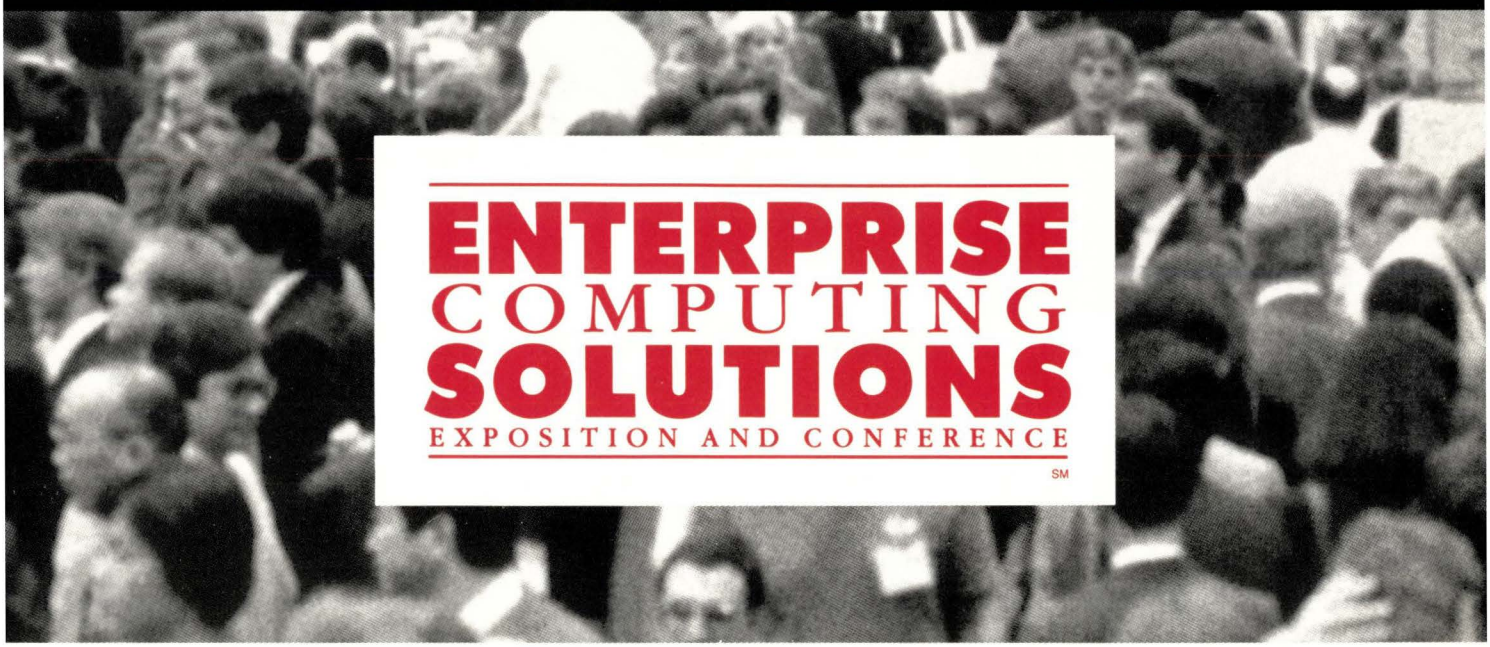
The user's guide is excellent. It goes from a simple tutorial through to debugging hints, and also contains good explanations of how the application works and how you go about changing configuration options. There is also a very useful on-line hyperhelp tool that you can quickly consult at any time.

You might want to check the list of modems that XpressFax has been tested with before signing off on your PO. The modem driver customizes itself based on which modem it detects, and it may not work with yours. I went ahead and bought one of the amazing little Telebit QBlazerPlus fax modems.

XpressFax can be used from any X11 host on your network so that people with PCs, Macs or other systems can use it as well as the lucky people with Sun systems.

A very nice application. A reasonable price. I'll be saving myself some time and the world, well, maybe a couple trees. ⊸

ANNOUNCING A MAJOR NEW EVENT.



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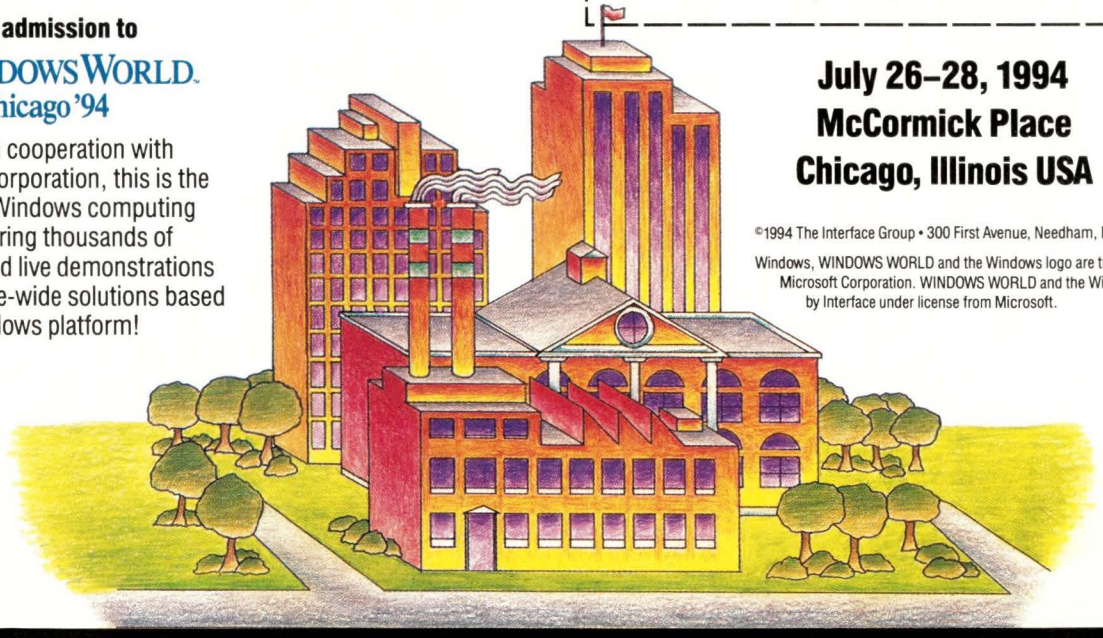

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Circle No. 16 on Inquiry Card

NEW PRODUCTS

The product descriptions are compiled from data supplied by the vendors. To contact them for more detailed information, circle the appropriate reader service number on the card located elsewhere in the magazine.

Brixton Ports to Solaris X86

Brixton Systems has ported its networking software to Solaris 2.x for Intel. The company offers products that give open architecture networks ways to link with legacy IBM SNA networks. Specifically, the company has an SNA server that allows Solaris-to-SNA connectivity; a 3270 and 5250 device emulator that allows a PC running Solaris to emulate a IBM terminal; and internetworking software for routing over local- and wide-area TCP/IP networks. Pricing begins at $375.

Brixton Systems Inc.
125 Cambridge Park Drive
Cambridge, MA 02140
Circle 101

Network License Manager

A network license management tool kit for software developers that works across UNIX, PC, Macintosh, Windows and NetWare systems has been introduced by Viman Software. LicenseServ is bundled with nearly 20 different licensing options designed to reduce piracy, bring down production costs and ease management. Developers can send out "time-bombed" demo copies of their software and offer floating licenses, concurrent licenses, node-locked licenses, site licenses, personal/group licenses, component licenses, version control and so on.

A LicenseServ server located on a machine on the network supervises access to the software. Each time the software is run on a machine, it obtains a key from a pool of keys held by the server. When it terminates, it returns the key to the server. The key can then be issued to another requester, thereby enabling networkwide licensing.

LicenseServ conforms to the Licensing Service Application Programming Interface (LSAPI) supported by the Software Publishers Association and the Microcomputer Managers Association. It is available for standalone and network use on a variety of platforms, including Suns. LicenseServ Standard lists at $2,000 for the first platform and $1,000 for each additional platform. LicenseServ Extended, which adds such features as site licensing and preemptive licenses, lists at $5,000 for the first platform and $2,000 for each additional platform.

'Tower Of Power' Hubs

Racal-Datacom has announced 10 standalone stackable hubs. The SNMP-manageable INXLink hubs are low-end complements to the company's INX5000 token-ring and Ethernet hubs. The new products are priced from $2,395 to $45,195, depending on configuration.

The 10 products break up into three major groups. The first of these is the token-ring group. These provide 10- or 26-lobe connections with RJ-45 connectors, ring-in/ring-out (switchable UTP/STP) and an on-board SNMP agent. There are four models in the group, one with 10 UPP lobes, one with 10 STP lobes, one with 26 UTP lobes, and one with 26 STP lobes; all four have copper ring-in/ring-out.

The second grouping contains Ethernet versions. These are standalone network repeaters for small work groups and remote offices. Again, there are four models in the group: 12-port and 24-port AUI/10Base2 backbone models, and 12-port and 24-port AUI/10BaseFL backbone models.

The final group, the INXLink NTS, is composed of standalone network terminal servers that supply serial ports. There are two products in this group: one with 16 ports and AUI/10Base2 backbone and the other with 16 ports and AUI/10BaseFL backbone.

Racal-Datacom Inc.
LAN Internetworking Division
155 Swanson Road
Boxboro, MA 01719
Circle 100

No run-time fees or royalties are charged.

Viman Software Inc.
1320 Mission St., Suite 5
Santa Cruz, CA 95060
Circle 102

Aries Shows New SPARCalikes

SPARCalike vendor Aries Research has introduced two systems. One is a deskside work-group device; the other a four-processor machine meant for high-performance applications.

The desk-side work-group system is the Marixx SI, which comes with two Texas Instruments Inc. Viking 50-MHz SuperSPARC processors, two fast and narrow SCSI channels, twin Ethernet channels, two 2-GB internal hard drives, an internal Sony CD-ROM, and a 2-GB DAT drive. The system has two MBus connectors supporting up to four CPUs, either Ross/Fujitsu hyperSPARC or TI Viking processors, and six SBus slots. The system also comes with 16-bit on-board audio, ISDN, a 19-inch Hitachi color monitor, a floppy disk, keyboard, optical mouse and Solaris 1.1.1 or 2.3 preloaded on the hard drive. Pricing begins at $36,895 for a base system with two 50-MHz CPUs, 64 MB of main memory, 2 GB of internal storage, a 644-MB CD-ROM and a 4mm DAT.

The four-processor machine is the Marixx ds, a desk-side SPARCstation 10-compatible. With a performance of SPECrate_int 4554 and SPECrate_fp 5457, the base desk-side unit is configured with 32-MB RAM, a 2-GB internal hard drive, 150-MB tape drive, CG3 frame buffer, the Solaris operating system, keyboard and optical mouse. List price is $26,643.

Aries Research
46791 Fremont Blvd.
Fremont, CA 94538
Circle 103

New Prime Time Freeware

Software, CD and book publisher Prime Time Freeware has announced three new software CDs. The first is Prime Time Freeware for UNIX, Issue 3-1, Richard Morin, Editor. This product is a mixed-media (book/CD-ROM) collection of UNIX-related source code and documentation. The book contains 100+ pages of introductory and index material; the two CD-ROMs contain 5 GB of selected, organized and annotated freeware. The price is $60.

Among many other things, Issue 3-1 contains such packages as ALLIANCE, Andrew, Arjuna, ASpecT, AudioFile, E/Exodus, GAP, GMT, GoPATH, GRASS, the GNU suite, ICOT, ISODE, InterViews, Magic, MAEstro, Netlib, Oberon, OCEAN, Ptolemy, POSTGRES, Self, SML/NJ, Statlib and X11R5.

The second collection is Prime Time SDK for UnixWare, Issue 2-1, Steve Zwaska, Editor. This Software Developer's Kit, priced at $60, is a stand-alone development system based on popular freeware components including InterViews, the GNU tool suite, Perl, Tk and XFree86-2.0, the fast new set of X servers and clients. The issue contains a Rock Ridge CD-ROM and a 100+-page manual.

The company says that Prime Time SDK for UnixWare is suited to

UnixWare PE, but it can also be used to supplement the "official" Uxivel SDK with GUI builders, a windows-based C Development Toolkit and more.

Finally, Prime Time is releasing XFree86-2.0 for UnixWare, Steve Zwaska, Editor. Priced at $40, XFree is an X11R5 for UNIXware. XFree86-2.0 for UnixWare is a Rock Ridge CD-ROM, containing binaries (`pkgadd` format) and source code.

Prime Time Freeware
281 Amador Ave.
San Bruno, CA 96066
Circle 104

Fiber-Optic Bus Extender

A bus extender that allows SCSI devices to be located up to 6,000 feet (2 km) away from a host has been introduced by Applied Concepts. The

Lazer Link III, Model ACI-2003AD, connects to the computer or peripheral via a single-ended SCSI connector. It supports Fast SCSI data rates of 10 MB/s. Pricing begins at $1,895.

Applied Concepts Inc.
9130 SW Pioneer Court
Wilsonville, OR 97070
Circle 105

Little Glass House

A "Little Glass House," an enclosure to protect network electronics, has been introduced by Liebert. The enclosure houses LAN or WAN components, such as modems, routers, hubs and bridges. It comes with its own air conditioner and filter, a UPS and a locked plexiglass door.

The box is lined with closed-cell foam insulation, which also provides some soundproofing. The current version offers 52 inches of vertical rack space. It can accommodate either 19-inch or 23/24-inch rack-mounted equipment, or non-rack equipment on shelves. Pricing ranges from $8,011 to $9,425.

Liebert Corp.
P.O. Box 29186
1050 Dearborn Drive
Columbus, OH 43229
Circle 106

AlmondSeed Puts Norton on Suns

AlmondSeed Software has announced plans to put the Norton Utilities onto Sun and other UNIX systems. Symantec Corp. had sold the famed utilities on UNIX platforms briefly but ceased to do so in 1992. AlmondSeed has taken the product and will be selling it as the Almond Utilities for UNIX. Among other things, these will include Almond Disk Explorer, which allows a user to explore any area of a disk and make repairs to damaged file systems, Almond ScrubDisk, which protects confidential data by wiping an entire logical disk to U.S. Department of Defense standards.

There is also an Almond Change Directory, which displays a full-screen graphical image of the directory tree, as well as Almond Text Search and Almond File Find, which search for user-specified text or files. Pricing for the Sun version of Almond Utilities is expected to be under $500.

AlmondSeed Software Inc.
444 Castro St., Suite 400
Mountain View, CA 94041
Circle 107

LoadRunner for Software Developers

Mercury Interactive has introduced a product that allows software developers to emulate large numbers of users running in parallel to stress-test and tune client/server applications. Based on the company's existing XRunner tool, the new product is called LoadRunner and runs many virtual users on each test machine. The company says that this allows a developer with a small population of Suns or other client/server machines to emulate very large networks.

Each virtual user performs like a real one. The company says that a virtual user is independent of the other virtual users around it and runs its own test script. Then, LoadRunner collects the results and displays them as graphs. Pricing for a base package starts at $70,000 for one controller and 25 virtual users.

Mercury Interactive Corp.
3333 Octavius Drive
Santa Clara, CA 95054
Circle 108

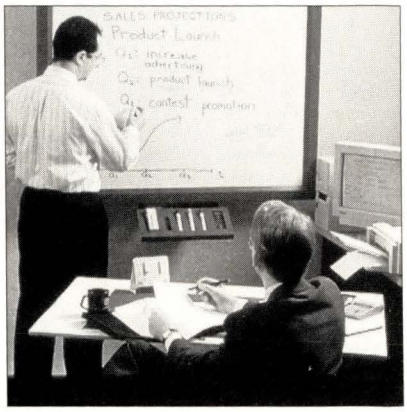
Utility Troubleshoots Remote Networks

FTP Software has announced LANCatch, a new utility that monitors network traffic and sends results to a `trace` file. It provides background filtering, allowing packets to be isolated by address, protocol and content. It can be preconfigured to accommodate specific network configurations. The product works with the company's LANWatch network analyzer and uses the other product's `trace` file format. LANCatch will also support other network analyzers. Pricing is a yearly license fee of $5,000.

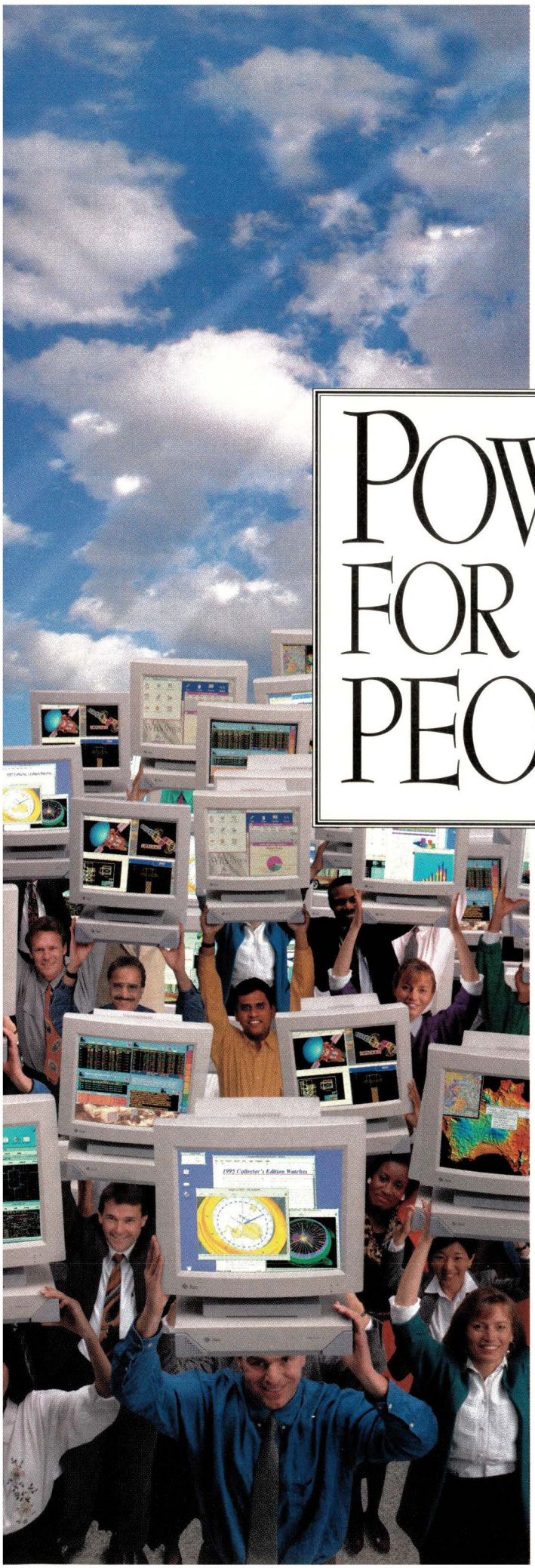
FTP Software Inc.
2 High St.
North Andover, MA 01845-2620
Circle 109

Whiteboard for SPARCstations

SMART Technologies has announced the SMART WriteBoard, a low-cost, touch-sensitive electronic whiteboard. The Writeboard allows users to automatically enter information written on



it to Sun SPARCstations, where it can be printed, saved or incorporated into other documents or presentations. Macintosh and PC versions are also available.



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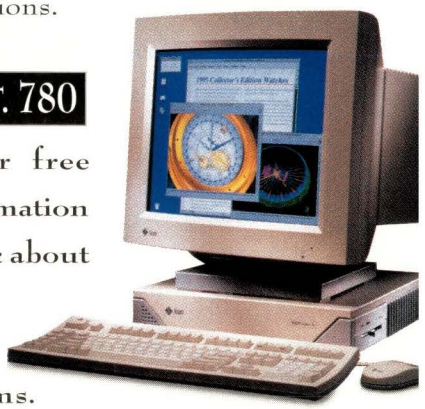

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Sun

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Circle No. 36 on Inquiry Card

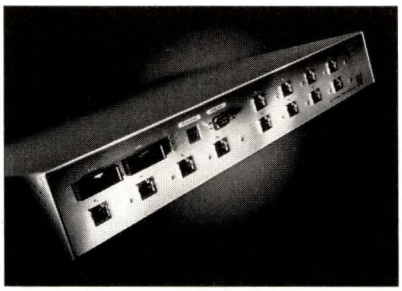
The WriteBoard uses standard dry erase markers and erasers; no specialized pens are required. It mounts on a wall and connects to the SPARCstation through the serial port. Everything written or drawn on the WriteBoard is automatically entered into the computer, where it can be stored at any time as a bit-map file.

The WriteBoard comes with the SMART Pen Tray, which has built-in switches that recognize the color of the pen selected from the tray and communicate to the computer what color is being used. The WriteBoard recognizes blue, black, green and red pens. Pricing begins at $2,995.

SMART Technologies Inc.
240 11 Ave. SW, Suite 599
Calgary, Alberta
Canada T2R OC3
Circle 110

Stackable FDDI Hubs

Network Peripherals has announced a series of stackable FDDI hubs for client/server networks. The company's Client/Server FDDI Hubs support either fiber-optic or unshielded/shielded twisted-pair (UTP) cabling. Each



has 14 ports and is rack- or wall-mountable. Each has an SNMP agent.

There are three models. The NP-NFC-D11-300 is an all-UTP version at $9,095. The NP-NFC-D15-300 has two fiber-optic ports and 12 UTP ports and is priced at $10,495. Finally, there is an all-fiber version, the model NP-NFC-D55-300, at $15,795.

Network Peripherals
1371 McCarthy Blvd.
Milpitas, CA 95035
Circle 111

Hughes Hub

A stackable hub for remote offices and departmental LANs has been released by Hughes LAN Systems. The Hughes Enterprise Stackable Hub 1300 is a chassis-based system that provides 12 or 24 ports using standard RJ-45 Ethernet ports or transceiver modules. Up to four Enterprise Hubs can be stacked together for a total of up to 96 user connections.

The product can be managed through a hub console port via remote Telnet session, or by an SNMP network management station. Each hub has its own dedicated network management processor and an embedded SNMP agent. Pricing begins at $1,995 for the 12-port model and $3,795 for the 24-port model.

Hughes LAN Systems
1225 Charleston Road
Mountain View, CA 94043
Circle 112

VT420 Terminal Emulation for UNIX

Thursby Software Systems has announced TSSterm 420 software, which allows a Sun system to emulate a DEC VT420 terminal within an X Window environment. The product allows users to customize their keyboards while retaining the GUI of the UNIX system on which the TSSterm 420 is running. The product is available for Suns under Solaris 1.x and 2.x. Pricing begins at $495.

Thursby Software Systems Inc.
5840 W. Interstate 20, Suite 100
Arlington, TX 76017
Circle 113

Every App and the Kitchen Sink

Later this month, U.S. start-up Ramco Systems, whose parent company is based in India, will introduce a series of management software applications for client/server environments.

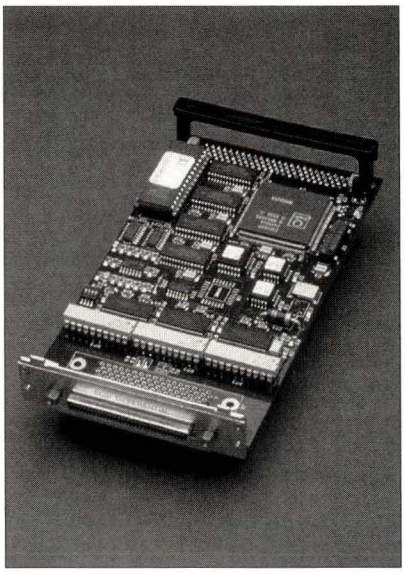
The company calls its suite of 12 products Marshal Enterprise Management Software, which "marshals" a company's resources into an integrated management solution. The Marshal EMS software components comprise several categories that cover the whole nine yards of office automation software: financial, including general ledger and accounts payable; distribution, including sales order management; materials, including inventory management and purchase order management; manufacturing, including maintenance and production management; personnel, for human resources and payroll; and productivity tools, including an SQL query builder and report writer. The products will be rolled out this year, with maintenance management being the first available.

Marshal products run on Windows-based PC clients attached to server environments including UNIX, Novell Inc. NetWare, Windows NT, VMS and OS/2. Supported databases are Sybase, SQL Server and Oracle. Pricing varies according to configuration; for example, the Marshal Maintenance Management system for five users is $40,000.

Ramco Systems Corp.
1290 Oakmead Pkwy., Suite 101
Sunnyvale, CA 94086
Circle 114

Wide/Fast SCSI-2

A second-generation Wide/Fast SCSI-2 host adapter for Suns and SPARCalikes has been introduced by Performance Computer. The PT-SBS440A adapter uses a high-speed



processor to supervise operation and minimize overhead. It also has an intelligent SCSI controller and a high-speed DMA. The company says this design reduces interrupt latency from an average of four to five interrupts to one interrupt during a SCSI transfer.

The PT-SBS440A comes with a plug-and-play driver and installation software. The product's software has been written to conform to the Sun Common SCSI Architecture (SCSA) to ensure compatibility with other Sun-oriented SCSI devices. Pricing begins at $995.

Performance Computer Corp.
315 Science Parkway
Rochester, NY 14620
Circle 115

Maintenance Management System

Project Software and Development announced Maximo Series 5 as a major upgrade to its client/server-based maintenance management system. With Maximo, a company's maintenance operations can be dealt with on a preventive rather than corrective basis.

Series 5 integrates with financial and manufacturing systems in addition to add-on products such as imaging, touch screens, bar coding and condition monitoring. It also offers fully scalable client/server architecture, SQL database and a GUI. A resource manager enables users to track inventory, company resources and labor.

Maximo runs on DOS, OS/2, NLM and UNIX platforms. Supported LANs include Novell Inc. NetWare, Banyan Systems Inc. Vines, Microsoft Corp. LAN Manager and IBM Corp. LAN Server for OS/2. Clients run on 486 and above PCs, running Microsoft Windows 3.1. LAN pricing, including five clients, starts at $39,800.

Project Software and Development Inc.
20 University Road
Cambridge, MA 02138
Circle 116

Ethernet Pocket Print Server

Axis Communications has announced an Ethernet pocket print server for multiprotocol network environments. The company says the palm-sized NPS 530 is the first print server based on 32-bit RISC technology. Attaching the server to a desktop printer allows access to the printer by all network users. Network print speeds of up to 1.2 Mb/s are supported.

Axis promises "plug-and-print" operation. Within TCP/IP environments, an auto-installation script prompts the user with several questions about the network environment and subsequently downloads a specific configuration file via a transfer protocol. The print server is shipped ready to support Novell Inc. NetWare, Microsoft Corp. LAN Manager, IBM Corp. LANServer, TCP/IP and Apple Computer Inc. EtherTalk. The price is $599.

Axis Communications Inc.
99 Rosewood Drive, Suite 170
Danvers, MA 01923
Circle 117

WAN Connectivity

Brixton's next generation of internetworking software enables what the company calls "routerless" routing for enterprisewide TCP/IP networks. Rather than installing additional internetworking hardware, Brixton's solution turns a UNIX or Windows NT-based system into an IP router that links to dial-up phone lines.

The software supports point-to-point

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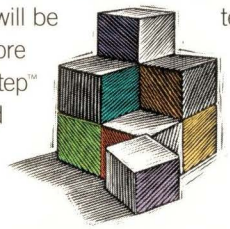

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BRCZX00

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protocol, frame relay or X.25 networks, with each package named accordingly: BrxPPP, BrxFR and BrxX25. The software runs on UNIX workstations including those from Sun, IBM, Hewlett-Packard Co. and others, as well as Intel Corp. microprocessor-based PCs running UnixWare, SCO UNIX or Solaris X86. Brixton says its software runs in the kernel to exchange data between an application and an operating system. Pricing starts at $495.

Brixton Systems Inc.
125 Cambridge Park Drive
Cambridge, MA 02140
Circle 118

LAN Performance Optimization

Segmenting Ethernet LANs has become a popular alternative for companies that need a performance boost without the added cost of higher speed networking technologies such as FDDI. ACC's Tahoe bridge/router is designed to help users segment heavily loaded Ethernet networks. The two-port bridge/router supports multiple protocols including TCP/IP, IPX, AppleTalk, DECnet and XNS. Protocols that can't be routed, such as LAT and NetBIOS, are instead transparently bridged. Tahoe also includes a MIB I or II SNMP client for local or remote management.

Two Tahoe configurations are available: the bridging/IP routing model and the bridging/multiprotocol routing model. Prices range from $3,450 to $3,950.

Advanced Computer Communications
10261 Bubb Road
Cupertino, CA 95014
Circle 119

Packaging Simulation Package

Fluid Dynamics recently introduced IcePak, a modeling and simulation tool to help design engineers create, test and revise designs involving thermal dynamics.

The graphical CAD-like thermal management software is equipped with a library of objects including printed circuit boards, blocks, fans, vents, walls and others. The software is based on finite element analysis and includes model creation, mesh generation, an integrated solver and 3D visualization.

IcePak runs on UNIX workstations from IBM Corp., Hewlett-Packard Co., Sun and others. Licenses are $18,000 for a single user, $6,000 for two to five users, or $4,000 for six to 10 users.

Fluid Dynamics International
500 Davis St., Suite 600
Evanston, IL 60201
Circle 120

ECCS Tabletop RAID

The MicroDFT-1E is ECCS' latest addition to its RAID storage line. Its external, compact, tabletop design provides fault-tolerant, hot-swappable storage for Sun and Hewlett-Packard Co. workstations aand servers as well as for smaller local-area networks.

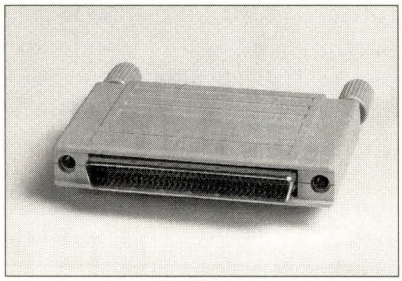
In its base configuration, the unit is a 5¼-inch RAID module that contains two 3½-inch disks and fits directly into a 5¼-inch drive bay. Multiple units can slide into ECCS' Expansion Disk Tray for further storage.

The device is based on RAID 1 technology and offers SCSI bus isolation to ensure data integrity. The MicroDFT-1E is available in 500-MB, 1-GB and 2-GB capacities. Prices start at $4,995

ECCS Inc.
1 Sheila Drive, Building 6A
Tinton Falls, NJ 07724
Circle 121

Wide SCSI Terminators

A series of wide SCSI terminators has been introduced by Aeronics. The FPT-27 Platinum Series terminators terminate all 27 lines of the wide SCSI



bus using the company's own forced perfect termination (FPT) technology. The company says this gives users the ability to run the SCSI at its maximum lengths, and support the maximum number of devices, without common glitches. The product corrects, for example, the inherent impedance mismatch problems that are the frequent bane of wide SCSI. Prices range from $12 to $26.

Aeronics Inc.
12741 Research Blvd., Suite 500
Austin, TX 78759
Circle 122

Remote Routers

Two remote routers have been shown by Network Systems. The fixed-port 6200 and the modular 6300 are meant for remote or regional offices that may be physically removed from a network administrator. The 6200 features eight fixed-port models that provide one or two Ethernet or token-ring connections coupled with one or two WAN connectors.

The 6300 router is a modular eight-slot chassis with two serial WAN ports. It can support a variety of LAN and WAN interface cards. Both routers support TCP/IP, IPX/SPX, DECnet, AppleTalk and XNS. Pricing on the 6200 is $3,000 to $9,000; the 6300 is $9,000 to $25,000.

Network Systems Corp.
7600 Boone Ave. North
Minneapolis, MN 55428-1099
Circle 123

DataTools for Database Backup

DataTools has announced its product, SQL-BackTrack for Sybase, now supports Sun Solaris and Hewlett-Packard Co. 9000 HP/UX platforms. SQL-BackTrack provides database-aware backup and recovery for the Sybase SQLServer database and is currently used in financial services, telecommunications and retail environments.

This database utility allows both physical and logical format backups. Physical backups enable disaster recovery and include support for incremental backups, data compression and encryption, and object-level recovery. Logical backups provide long-term data archiving and data migration.

SQL-BackTrack is currently available on the RS/6000 and SunOS platforms and sells for $4,595 per single-server license.

DataTools Inc.
750 Menlo Ave.
Menlo Park, CA 94025
Circle 124

PC-Like UNIX Presentation

Visual Engineering announced Ovation, a PC- and Mac-like presentation graphics software package for UNIX systems. Ovation offers presentation graphics capabilities on the same UNIX workstation as the user's core applications. Features allow users to create and edit presentations and integrate material from their own applications.

Special features include built-in outlining, a graphical slide sorter, on-screen slide shows, extensive drawing and charting tools and a library of editable clip art. Ovation is available on all major UNIX platforms including Sun, Hewlett-Packard Co., Digital Equipment Corp., IBM Corp. RS/6000 and Silicon Graphics Inc. It is also available on PCs running SCO OpenDesktop or UnixWare. The price is $795.

Visual Engineering Inc.
2025 Gateway Place, Suite 318
San Jose, CA 95110
Circle 125

Power for Multimedia

A power protector and manager for the multimedia markets has been announced by American Power Conversion. The SurgeArrest PowerManager provides centralized power

management for clustered systems including computers, CD-ROM drives, monitors, printers and so on. It can control power for up to five computer peripherals. Pricing begins at $89.

American Power Conversion
132 Fairground Road
P.O. Box 278
West Kingston, RI 02892
Circle 126

Total Backup

ONEAC, Exabyte Corp. and Systems Enhancements Inc. have combined forces to provide the backup community with a fully integrated security backup system for Novell Inc. NetWare servers. Included in the system are a UPS, and a tape backup and restore package.

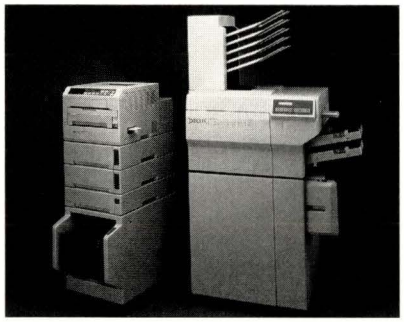
ONEAC's ON Series UPS with premium grade power conditioning, HotSwap battery pack and SNMP intelligence features is integrated with Exabyte's 2500 series DC2000 quarter-inch minicartridge tape system available with either 1 or 2 GB of native capacity. The file backup and restore software is where System Enhancements comes in with Total Network Recall, a server-based, SMS (Storage Management Service) compliant package for

NetWare that provides full backup and restore of server and client to hard drives. Pricing starts at $2,400.

ONEAC Corp.
27944 N. Bradley Road
Libertyville, IL 60048
Circle 127

Olympus Deltis Printer

Olympus Image Systems has introduced the PagePlex 24, a member of the Deltis family of PagePlex printers. The PagePlex 24 is a 24-ppm printer



that features heat fusion electron imaging technology and a RISC-based programmable controller. An Olympus engine incorporates a five-step, 300-dpi electron imaging process.

An internal SCSI hard disk ranging from 52 to 270 MB enables such applications as spooling and mass storage of data and fonts. This printer is targeted at higher production, networked printing environments for larger work groups. The price is $6,295.

Olympus Image Systems Inc.
15271 Barranca Parkway
Irvine, CA 92718-2201
Circle 128

SPARC Communicates with Token Ring

Aurora has added Solaris 2.x compatibility to its SBus token-ring adapter list of features, allowing Sun users to communicate over 4/16-Mb/s token-ring networks. The card provides SPARC system users local network access as a peer and allows the system to serve as a gateway between Ethernet and token-ring networks using built-in TCP/IP support. It supports multiple protocols including SNA and is compatible with Novell Inc. file servers.

Features include support for multiple token-ring cards in a single SPARCstation, which permits a seamless connection between departmental networks. On-board LEDs provide board, network and software monitoring for system diagnosis. RJ-45 UTP and DB-9 STP interfaces allow for greater connection flexibility.

A local ring addressing priority scheme is built into its source routing support that reduces network traffic by minimizing the need to broadcast frames to all networked system nodes. An on-board 512-KB buffer minimizes system load and boosts transfer rates. The card conforms to the IEEE 802.5 token-ring standard and includes both Solaris 1.x and 2.x software drivers. Price is $1,099.

Aurora Technologies Inc.
176 Second Ave.
Waltham, MA 02154
Circle 129

Magnetic Jukebox

A storage jukebox that uses magnetic rather than optical media has been introduced by JEMS Data Unlimited.

The Marquis series of subsystems are RAID devices the company says can outperform optical jukeboxes in terms of performance and price. The products offer storage costs of between $1 and 71 cents per megabyte.

There are three versions of the Marquis: 12 GB, 21 GB and 63 GB. The smallest of the three, the 12-GB, has a Fast SCSI-2 interface and a host transfer rate of 10 MB/s. Its average seek time is 10 msec. It comes with a standard cable length of 10 feet with a differential interface, or three feet with a single-ended interface. It measures 11 by 10.5 by 16 inches and weighs 79 pounds. Pricing begins at $11,995, or $1 per megabyte.

The 21- and 63-GB machines, meanwhile, also have Fast SCSI-2 interfaces, a host transfer rate of 10 MB/s, and an 11-msec average seek time. Both come in deskside and desktop versions. The deskside version of the two machines is 26.5 by 12.5 by 26 inches and weighs 127 pounds. The desktop version, meanwhile, is 18 by 14 by 16 inches and weighs 133 pounds.

Pricing on the 21-GB machine is $20,995 (or $1 per megabyte). Pricing on the 63-GB model is $44,995 (or 71 cents per megabyte).

JEMS Data Unlimited Inc.
300 Ballardvale St., Suite 204
Andover, MA 01810
Circle 130

PCMCIA Ethernet Adapter

Boca Research has announced a 10BASE-T Ethernet PCMCIA adapter known as the BEN1PA. This adapter allows reliable connection to IEEE 802.3 networks and was designed for units with a PCMCIA Type II slot. It has an operating distance of 328 feet and includes a 10BASE-T twisted-pair transceiver with RJ-45 connector.

The adapter is easy to install and configure and comes with software driver support for Novell Inc. NetWare and DOS ODI client drivers and NDIS driver support for Microsoft Corp. LAN Manager, Windows for Workgroups and most other NDIS-supported applications. The BEN1PA is priced at $229 and comes with a five-year warranty and free technical support.

Boca Research Inc.
6413 Congress Ave.
Boca Raton, FL 33487-2841
Circle 131

Upgrades, Enhancements, Additions...

• Release 2.2 of PV-Wave Point and Click has been announced by Visual Numerics. The new version of the visual data analysis package will be able to link to another Visual Numerics product, PV-Wave Advantage, a visual-analysis fourth-generation programming language. **Visual Numerics Inc.**, 6230 Lookout Road, Boulder, CO 80301. **Circle 132**

• OpenService SJI has announced several new applications for its systems-administration product, SystemWatch AI-L. The new applications include a file-system and disk manager, a swap and memory manager, a CPU and resource manager, and a daemon manager. **OpenService SJI Inc.**, 3 City Square, 1st Floor, Albany, NY 12207. **Circle 133**

• For those in need of project management software, Version 2.0 of AutoPLAN II is now available. The new version of the project-management tool includes a GUI that uses object-oriented design, a shared calendar and a bulletin board that lets project members exchange information. **Digital Tools**, 18900 Stevens Creek Blvd., Cupertino, CA 95014. **Circle 134**

• A 4GL-to-C converter has been added to Four Seasons Software's SuperNova product. SuperNova can now contain a module that translates SuperNova 4GL code into C with minimal assistance from a programmer. **Four Seasons Software**, 2025 Lincoln Highway, Edison, NJ 08817. **Circle 135**

• In January, Sun announced it would include Lotus Notes with its servers. In February, the details of the arrangement were announced. SMCC will be bundling with its servers a coupon for Lotus Notes software plus six licenses, which the company says has a retail value of $2,770. **Sun Microsystems Inc.**, 2550 Garcia Ave., Mountain View, CA 94043-1100. **Circle 136**

• Kalpana has announced a software/firmware product that provides multiple 10- or 20-Mb/s connections between two EtherSwitches or between a NetWare server and a Kalpana EtherSwitch. Called SwitchBalance, the product is a NetWare-loadable module that allows network traffic between a NetWare server and a Kalpana 15-port EtherSwitch EPS-1500 to be evenly distributed across multiple half- or full-duplex Ethernet controllers. **Kalpana Inc.**, 1154 Arques Ave., Sunnyvale, CA 94086-4602. **Circle 137**

• Wind/U, the portability kit from Bristol Technology that allows developers to port UNIX applications to Windows, is now available in Release 2.0. The new version now supports Microsoft Corp.'s Visual C++, among other Windows development environments. **Bristol Technology Inc.**, 241 Ethan Allen Highway, Ridgefield, CT 06877. **Circle 138**

• For developers who need to combine C++ with the Eiffel object-oriented programming language, Tower Technology has announced Release 1.2 of its TowerEiffel System. The new version allows developers to incorporate Eiffel into their C++ projects. **Tower Technology Corp.**, 3300 Bee Caves Road, Suite 650, Austin, TX 78746. **Circle 139**

• Bluestone Consulting is shipping db-UIM/X.25, a new release of its front-end development tool for RDBMSs. The product now includes improved object handling and management, as well as new local data caching and widget support. **Bluestone Consulting Inc.**, 1200 Church St., Mount Laurel, NJ 08054. **Circle 140**

• Peregrine Systems has ported OpenSNA to Sun workstations. The product allows Sun workstations running HP's OpenView to manage SNA networks. **Peregrine Systems Inc.**, 1959 Palomar Oaks Way, Carlsbad, CA 92009. **Circle 153**

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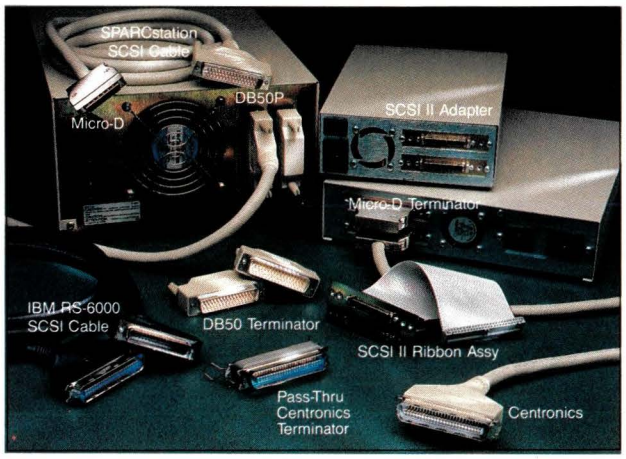

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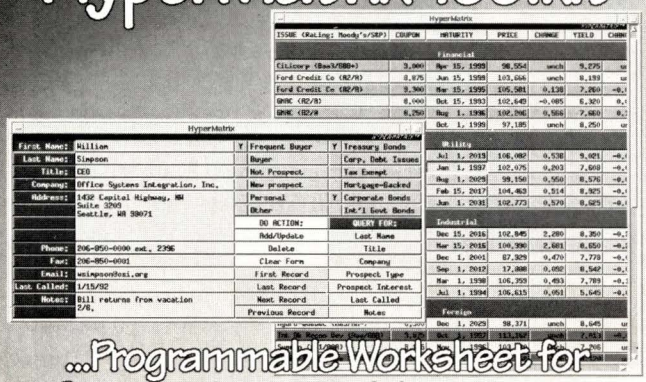

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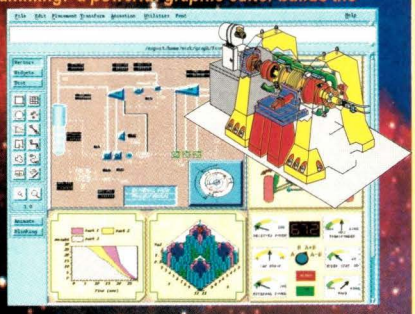

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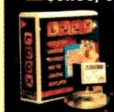

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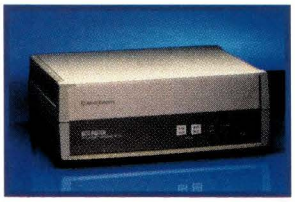

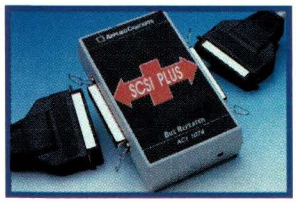

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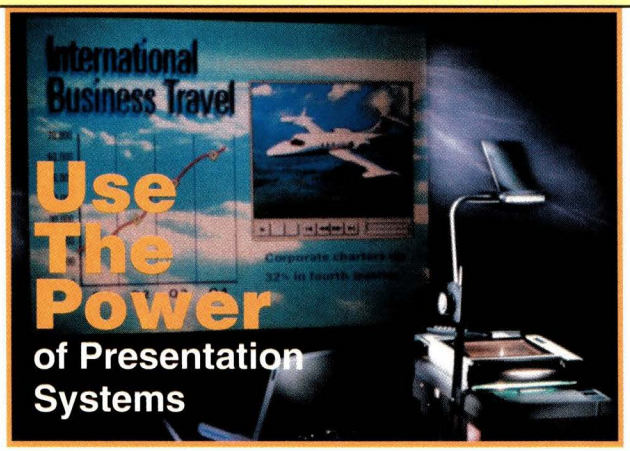

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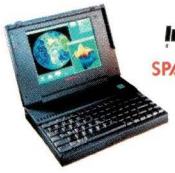

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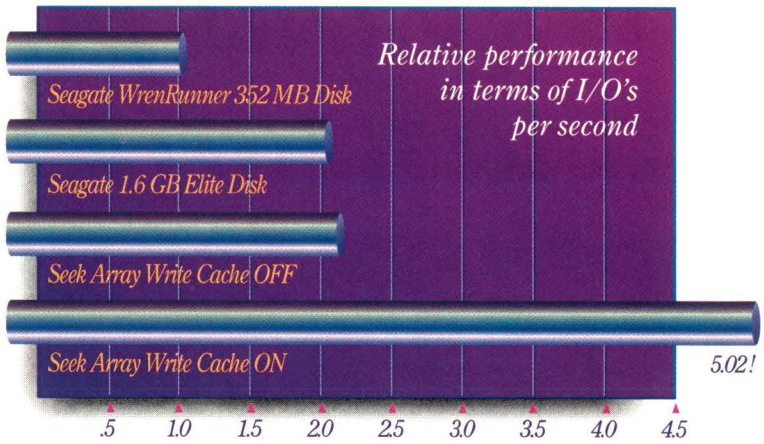

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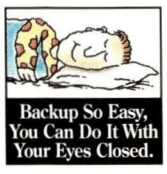
2. "It's got to be a hardware problem."
3. "Don't worry, we can always do a backup in the morning."



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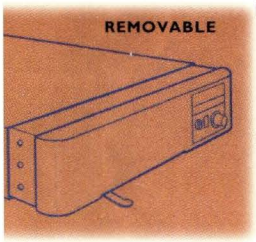

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- The RAID Box 530: R.A.I.D. level 0, 3, or 5: dual-porting, dual controllers, hot-sparing and Super-Fast Cache: 4 GB to 216 GB
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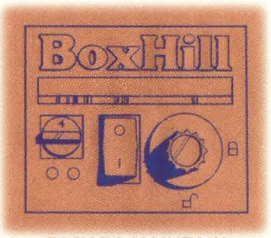

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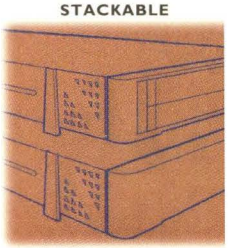

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