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erving the UNIX Client/Server Network

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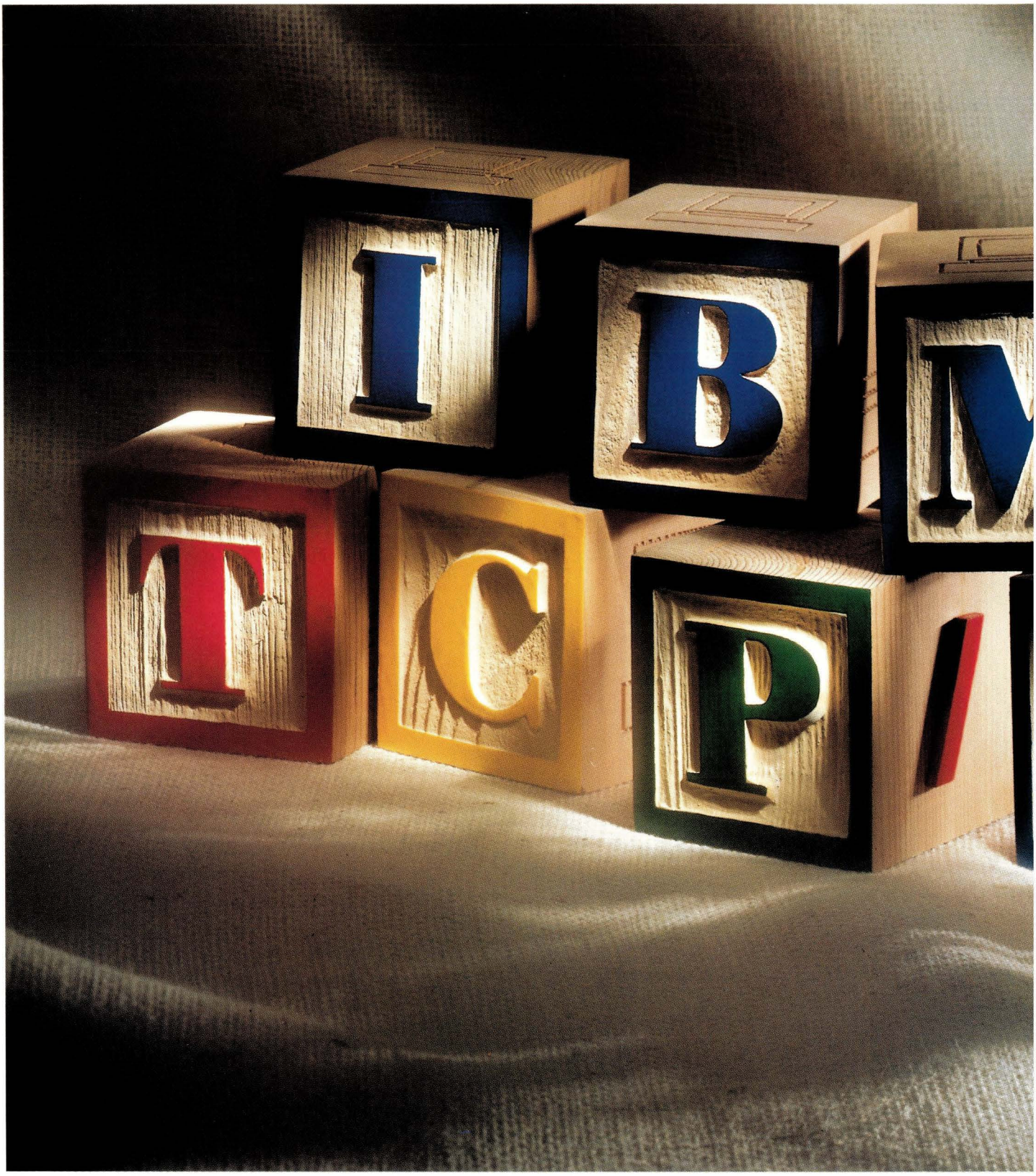

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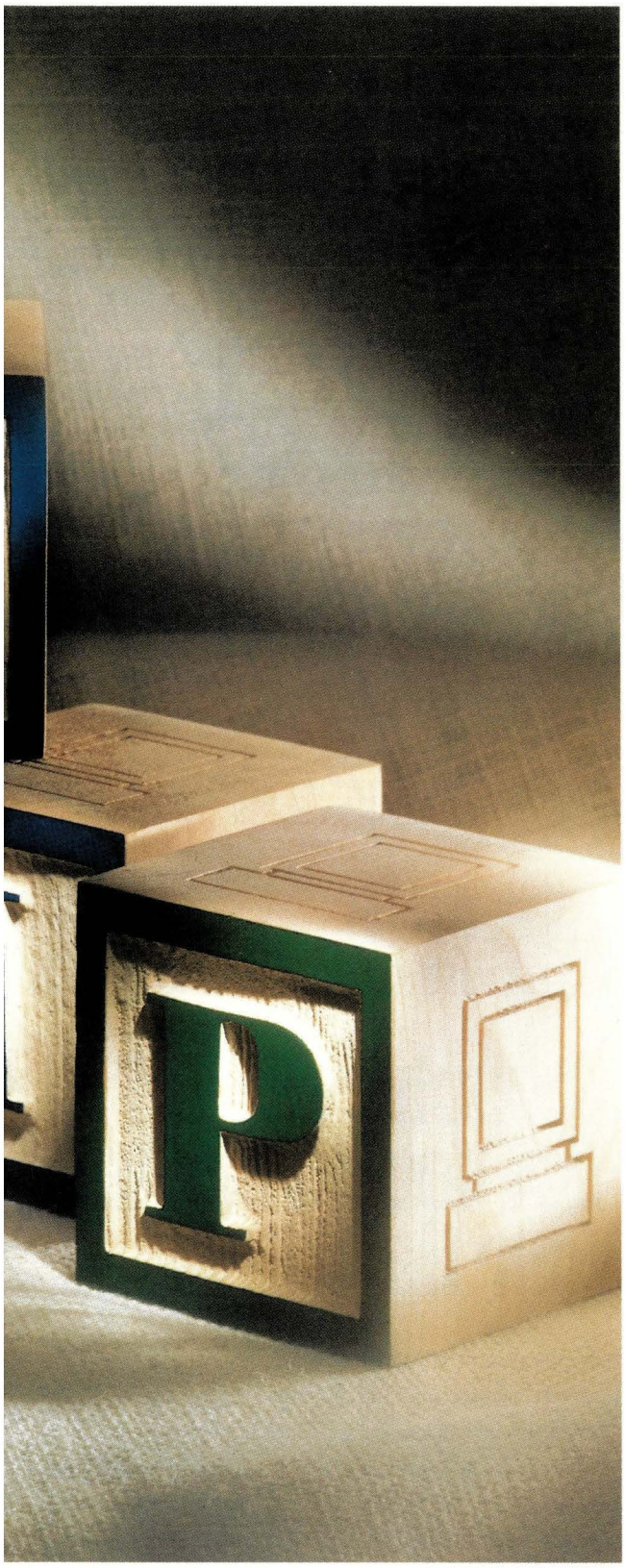

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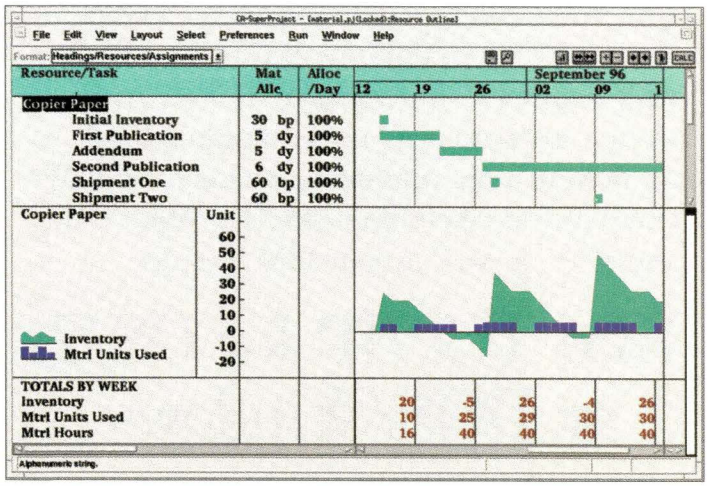

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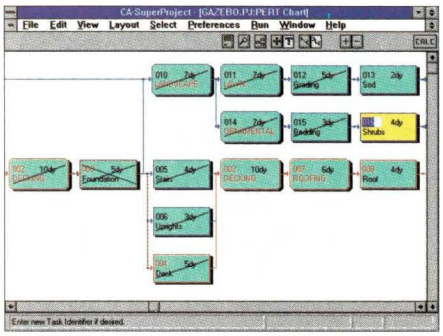

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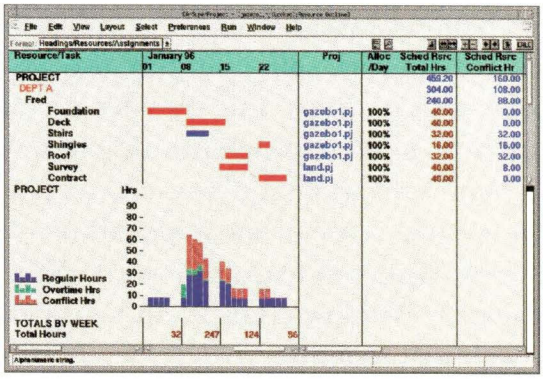

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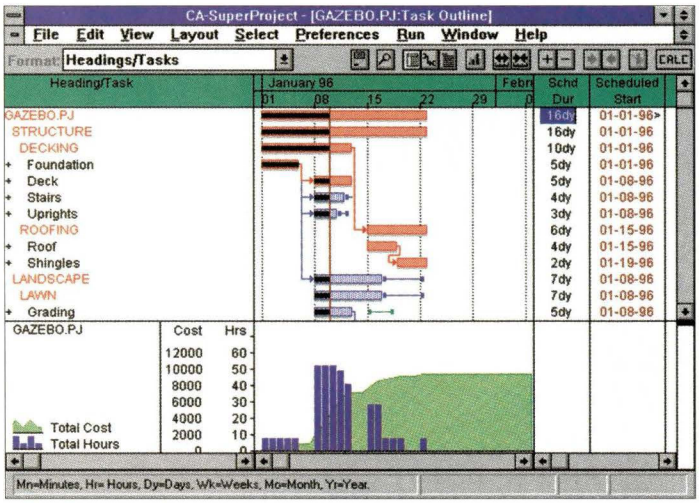

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SUNEXPERT serves the UNIX workstation environment, emphasizing Sun, SPARC and Sun-compatible systems.

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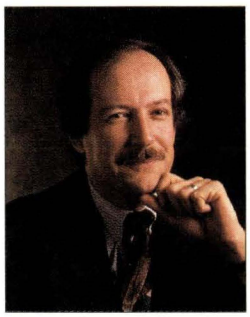
Editorial

Vital Signs

This month, Executive Editor Michael Jay Tucker and Senior Editor Simson L. Garfinkel take a look at Sun Microsystems through a slightly different filter than *SunExpert* is accustomed to–the business lens. Our special section on Sun in 1994 tries to gauge the company's competitive position in the UNIX commercial market as well as measure its customers' views of support and service.



Garfinkel also looks at the company's balance sheet and financial condition. Much to our amazement, Sun's fiscal fourth quarter shows the company setting new records for shipments–more than 80,000 hardware units and more than 100,000 Solaris licenses. This seems to belie conventional wisdom that says a hardware/software company in the throes of moving to a new OS suffers mightily. What gives?

In fact, Sun's annual report seems to be laying the foundation for lower expectations from the investment community. The report says, in what is perhaps the best candidate outside the baseball negotiations for understatement of the decade, "Adoption of a new release of an operating system, such as the Solaris 2 software environment, typically requires effort on the part of the customer as well as software porting by software vendors providing applications." It goes on to say, "Moreover, delays in adoption of a new release of an operating system by customers and software developers can limit the acceptance of hardware products tied to that release. Such delays could adversely affect the future operating results of the Company."

Frequent readers of *SunExpert* know that the magazine has chided Sun early and often for its handling of this transition, but the train seems to be steaming out of the station anyway. Our regular reader survey shows that the pace of migration has sped up. As late as mid-'94 only about 14% of you said that Solaris 2.x was your primary OS. The most recent number has swelled to 38.9%. And that should be encouraging news for SunSoft.

Doug Pryor

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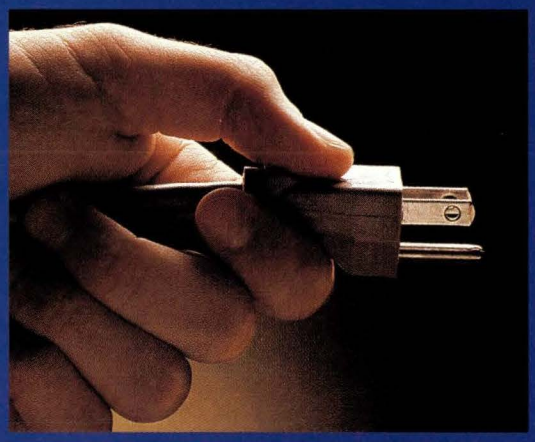

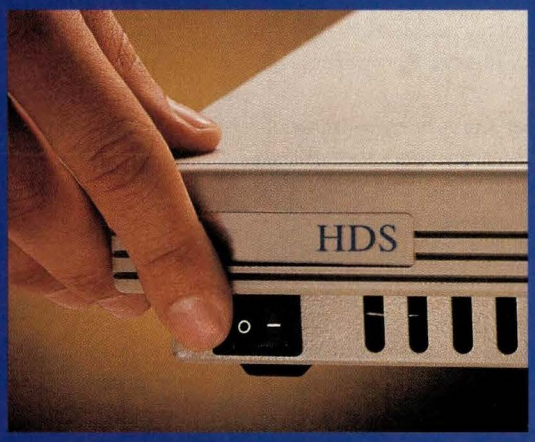

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NEWS

Network to the Sands of Time

OK. You think you know it all. You know that Sun Microsystems Computer Corp. workstations and SPARC have a big place in robotics. And you know that Suns are all over the Internet.

But how about Suns in archaeology? Or Suns running a robot archaeologist? Or how about a Sun, running a robot archaeologist...that you can control (right now) from your desktop...over the Internet?

Now *that's* new.

"The idea was to do something really cool," says Professor Michael Mascha of the Department of Anthropology at the University of Southern California at Los Angeles. If cool really was his goal, then he, Ken Goldberg of USC's Department of Computer Science and its dedicated team of volunteer graduate students have gotten to Absolute Zero.

Specifically, they have developed Project Mercury. A white paper that the group makes available over the Net describes the project as "a Mosaic server that allows users to 'leave the Web' and interact with the real world." In this case, "the real world" means a SPARCstation driving an industrial robot "fitted with a camera and a pneumatic system," sitting over a container of earth. Various "artifacts" are concealed in the loose dirt.

Users can come in over the Internet (`http://www.usc.edu/dept/raiders/story/index.html`) and teleoperate the robot. They can search for the buried artifacts by "positioning the arm, delivering a burst of air and viewing the image of the newly cleared region."

It's sort of a high-tech, teleoperated, Web-based version of one of those coin-operated arcade games where you try to get the little claw to grab a teddy bear before you run out of time–except there's real payoff here.

"We see three areas of application," says Mascha. "One is strict science." He and Goldberg hope that the Internet will eventually become a means by which researchers can share expensive equipment that would otherwise be unavailable to them.

"Second," he says, "there's education. What I call the global classroom." Students from all over world can explore with Project Mercury. Mascha says he hopes to see a day when they will be able to drop in on hundreds or thousands of other educational experiences.

"And, finally, there's entertainment," says Mascha. "That's the one I'm most interested in." He envisions a new set of Net-based amusements in which participants reach "out of" the Web to control devices remotely.

In a sense, he notes, Mercury is a big and very complex puzzle in which the prizes are concealed in loose earth. "There is also an underlying puzzle in the sand," he notes, "just as in real archaeology." But it is a puzzle of sufficient complexity that a single operator cannot solve it alone.

Instead, each operator records his or her discoveries in a ongoing log, and only by reading the log and understanding everyone's experiences can you discover the complete contents of the sand. "We would like the global community to solve the puzzle," says Mascha.

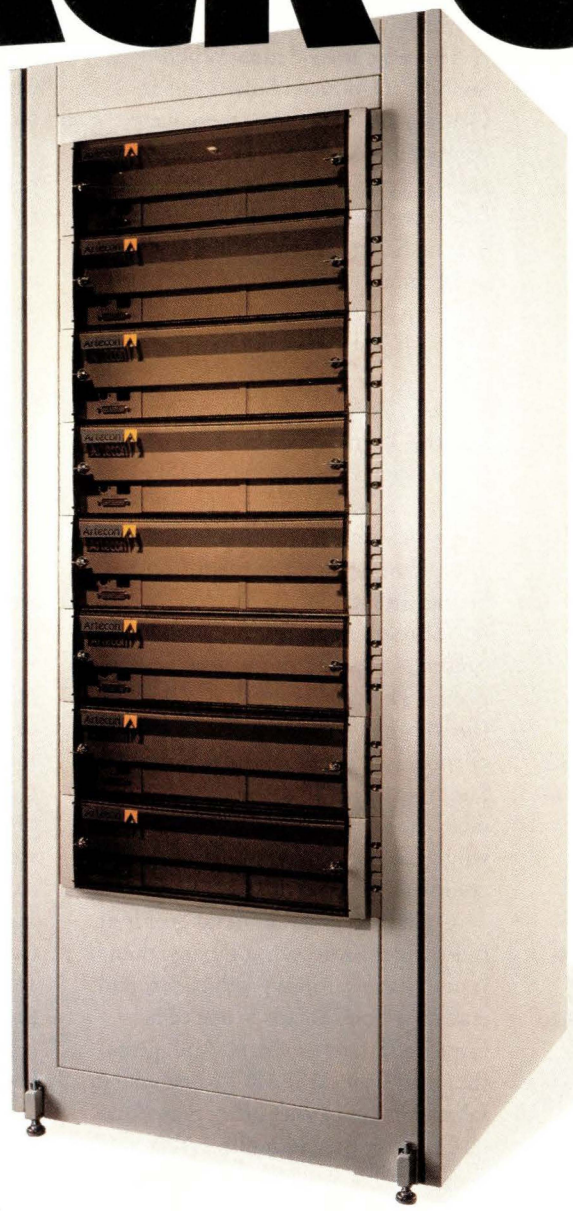
The puzzle couldn't be as complex, however, as the one facing Mascha and Goldberg when they set out to construct the system in the first place. "The whole thing was done basically on no budget," says Mascha.

Goldberg and Mascha were able to unearth an unused (and unsupported) IBM SR5427 Selective Compliance Assembly Robot Arm (SCARA) industry robot, which was built "sometime around 1980." They were also able to obtain the use of a SPARCserver 1000 running SunOS Release 5.3 from the university. This machine runs both the Mosaic server and a database of registered users. Commands from users come in over the Web to the server, which then communicates to a second device, a Pentium-based PC, that actually controls the robot.

"What we did was convince a bunch of graduate students, and our-

The UCLA Project Mercury team stand with their robot. From left to right are Professors Michael Mascha (Department of Anthropology), Ken Goldberg (Department of Computer Science) and graduate students Carl Sutter, Jeff Wiegley, Nick Rothenberg and Steven Gentner.

Rack & Roll
RACK ON.



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selves, that this was a cool project," says Mascha. "Then we all spent hundreds of hours working, for free, over the summer."

The whole system was up and running by late summer. In the next few months, more than 10,000 users had logged onto the system and given the robot a try.

Now, Mascha, Goldberg and the graduate students are trying to decide what to do next. They have agreed that, says Mascha, "the next time we do something like this, we'll have more money."

But, money or no money, they hope to give the Web what it's never had before. "This project was to give the Net an arm," says Mascha. "Our next intention is to give it a leg–or even a wing–for 3D mobility."–*mjt*

Solaris 2.4 Ships! SunSoft and Software Doing Fine!

In October, SunSoft, the software-oriented planet of Sun Microsystems, shipped the long-awaited Solaris 2.4. As expected, the new release stresses multithreading technology and improved performance. Moreover, Solaris 2.4 on SPARC is the same operating system as Solaris 2.4 for x86 machines. For the first time, Solaris on RISC will be the same as Solaris on Intel Corp. chip-based platforms.

But does anyone want Solaris on Intel?

SunSoft is one of the most aggressive and fastest-growing of Sun's assorted planets. It has been subject to occasional reorganizations–usually, though, reorganizations that are in its favor. Most recently, for instance, SunSoft was called upon to absorb most of the former Sun Technology planet, which had been broken up into asteroids.

However, SunSoft has not been without difficulties. It inherited, for example, a considerable share of ill will when, in the late 1980s, vendors of SPARC-based Sun-compatible systems complained that they could not get current versions of Sun's supposedly open operating system until long after Sun had moved on to something else. When SunSoft came into being, its claims of independence from Sun's hardware business were widely seen as being questionable at best.

Has any of that changed? "We are three years old now," says Jan Pieter Scheerder, vice president and general manager of the Solaris Products Group at SunSoft, "and I think we have made the transition. We are truly a software provider."

He can cite evidence. When SunSoft introduced Solaris 2.4 at October's UNIX Expo, there were companies other than Sun already able to show the operating system on their own SPARC-based platforms. Tatung Science and Technology Inc., in Milpitas, CA, was running Solaris 2.4 on its workstations and servers at its booth just across the hall from Sun.

Axil Computer Inc., meanwhile, was also showing 2.4 on its newly announced midrange server, the S400. "Solaris 2.4 has a wide variety of server-oriented features," says Axil's Arun Tanega, vice president of marketing. In fact, Tanega says he doesn't fear SunSoft's control of the operating system, or competition from Sun itself. "The market space is so vast [for servers], there is so much client/server activity going on, that Sun hasn't even scratched the surface," he says. "There is no reason why we couldn't get a share of that commercial marketplace."

On the other hand, if SunSoft is an independent software company, then it is one with a curious product mix and customer base. Solaris is one of its most important products. And, given the small scale of SPARC-based system sales from companies other than Sun, its customer base is dominated by a single vendor, which is also its own parent company.

So, if the SPARC market remains limited, SunSoft will have to look to other processors to expand its own market. SunSoft is pushing hard to promote Solaris x86, the Solaris for Intel. But, given the wealth of operating systems already on the PC–Microsoft Corp.'s DOS and NT, IBM Corp.'s OS/2, The Santa Cruz Operation Inc.'s Xenix and UNIX–does the world really want another one?

Scheerder says yes. He thinks that systems based on the Pentium in particular are now so powerful that they have outstripped the ability of DOS, NT, OS/2 et al to keep up. "Two years ago, I went to PC Expo," he says. "I walked the floor and I said, 'Yep, this is a PC show.' This year, I went again. And I wasn't so sure. There was a lot of very capable hardware out there, but no operating system to exploit it."

And SunSoft would be happy to help. "I think that's a huge opportunity," says Scheerder.

But where exactly is that opportunity? At one time, SunSoft talked about Solaris x86 as a desktop operating system, just as Sun Microsystems Computer Corp. talked about SPARC-based workstations as alternatives to PCs. Now, though, Sun and SunSoft are actively and openly backing away from those positions. Scheerder himself says, "We found ourselves not so much competing with Microsoft Windows as coexisting with them."

In fact, from one end of Sun to the other, there is a new attitude toward the once feared and hated PCs. Increasingly, Sun itself (at least in the commercial markets) is selling SPARC-based systems that act as servers to PCs and/or PC LANs. The recently announced Netra does nothing but ride hard on PCs, and a few days after UNIX Expo, SunSoft announced SolarNet, software to ease the job of the PC network administrator (see "SolarNet Catches PCs," Page 10).

So, if Sun systems are coexisting with Microsoft operating systems, where does that leave Solaris x86? As a server OS, perhaps, for companies that are selling in direct competition with Sun's own SPARC-based servers?

Or could there be other roles for the operating system? One company that has begun talking about Solaris x86 is Tadpole Technology Inc., in Austin, TX. Tadpole has just introduced a Pentium-based notebook that is supposed to offer Solaris x86 as one of its OS options–along with Windows and NT. "I think there is a considerable opening in the remote

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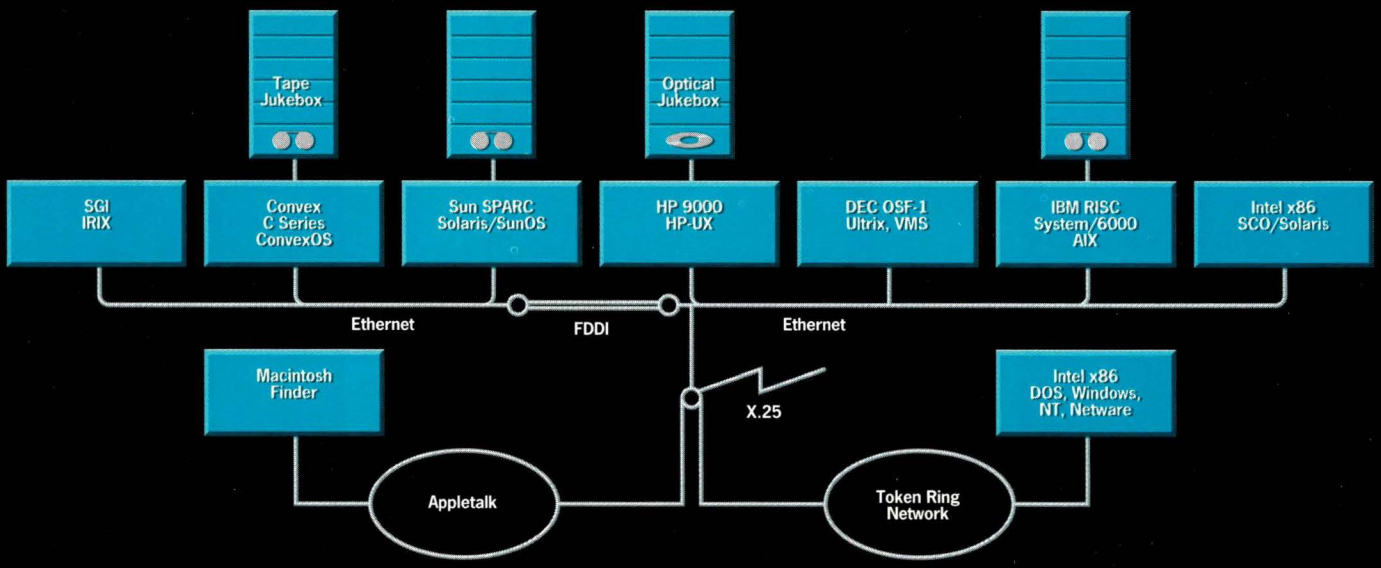

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workstation market," says Geoffrey S. Burr, Tadpole's president. Burr sees a market for his product in those settings where a highly mobile professional needs both Solaris applications and also the ability to run Windows.

Meanwhile, the other processor that has been linked with Solaris is PowerPC. There is already a version of Solaris on this youngest of the popular RISC processors. However, SunSoft isn't exactly holding its breath waiting for IBM, Motorola and Apple to remake the desktop. "SPARC has sold millions of units," says Scheerder. "Intel has sold many millions. PowerPC hasn't sold any yet."

Still, he says, if someone builds a market, Solaris will come. "It is kind of a matter of following the market," he says. "But when it kicks in, we'll be ready."

The operating system he will be ready with, Solaris 2.4, stresses symmetric multiprocessing (SMP) and multithreading and has a fully preemptible kernel. The company says that it offers significantly improved performance, "typically about 25%."

In addition to Solaris 2.4, SunSoft has introduced Wabi 2.0, an upgraded version of the Windows compatibility package for Sun. SunSoft says it features improved performance but does not cite specific benchmarks.

SolarNet Catches PCs

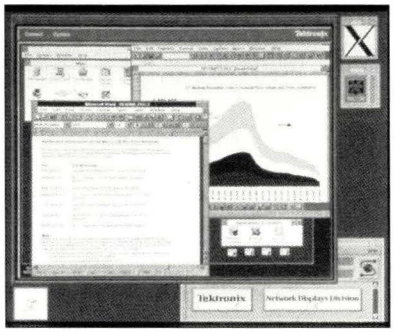
As if to announce SunSoft's increased interest in PCs, the company announced SolarNet, a series of PC networking products, just days after it showed 2.4. This is a group of what will eventually be at least five products designed to make Sun systems into the hearts and souls of PC LANs.

Two SolarNet products are available now: SolarNet PC-Admin and PC-NFSpro for Windows. PC-Admin is meant to provide integration and administration tools to a network administrator. It provides a common set of services and APIs across a network and links to PC-LANs via specialized modules, which may be purchased separately. SunSoft says there will eventually be modules for NetWare, LAN Manager, AppleTalk and remote (WAN and serial line) systems.

PC-NFSpro, meanwhile, is a descendant of PC-NFS. It gives Windows systems access to TCP/IP and NFS environments. It also features simplified installation and management and a built-in email package.

Multiuser NT, from Tektronix

Solaris and other UNIX operating systems have several advantages over Microsoft Corp.'s NT. Chief among these is that they are multiuser, while NT remains stubbornly single-user.



Microsoft Word and Excel, running under NT, are displayed here on an X terminal. Tektronix has introduced software that makes NT both multiuser and network-oriented.

Now, however, Tektronix Inc. has introduced software that makes NT multiuser and allows it to display applications on remote X terminals and X-based workstations. The product is called WinDD and consists of two individual functions–server software and local client.

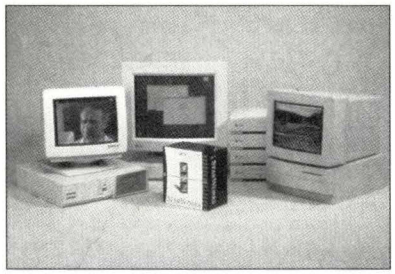
The server software resides at the NT machine and makes the operating system multiuser. Each WinDD product comes with 10 licenses. The server software then handles network transactions, compressing data for transmission and ensuring that it gets to the right place at the right time. The local client at the other end of the system decompresses the transmission and displays it accordingly.

Tektronix says it originally set out simply to find a means to display NT applications on its X terminal but decided making NT multiuser might be more rewarding.

Company officials also insist that they have had real customer pressure for such a product. "We haven't seen a lot of interest in NT as a client OS," said a spokesman, "but there is a lot of interest in it as a server."

Starlight Brightens Video Server for Sun

Sun Microsystems Computer Corp., and a lot of other people, think that corporate America needs live-action video on its workstations. The theory is that harried executives will pay to be able to do things like teleconference (and thus avoid yet another business trip) and download training films from a central server.



Starlight Networks and Sun Microsystems are cooperating to introduce a video server for Solaris. The two companies think that corporate America needs video on its workstations for everything from training to teleconferencing.

Now Sun and video expert Startlight Networks, in Mountain View, CA, have joined forces to introduce a corporate video server for Solaris. Called StarWorks for Solaris, the product will be able to provide video on demand to hundreds of users in a network. The two companies envision large enterprises in which every employee can communicate with every other (in living color) via desktop systems. They would also be able to download from the server videos from libraries of multimedia materials.

Meanwhile, in a related development, video board maker Parallax Graphics Inc., in Santa Clara, CA,

solutions

Apunix Desktop Publishing

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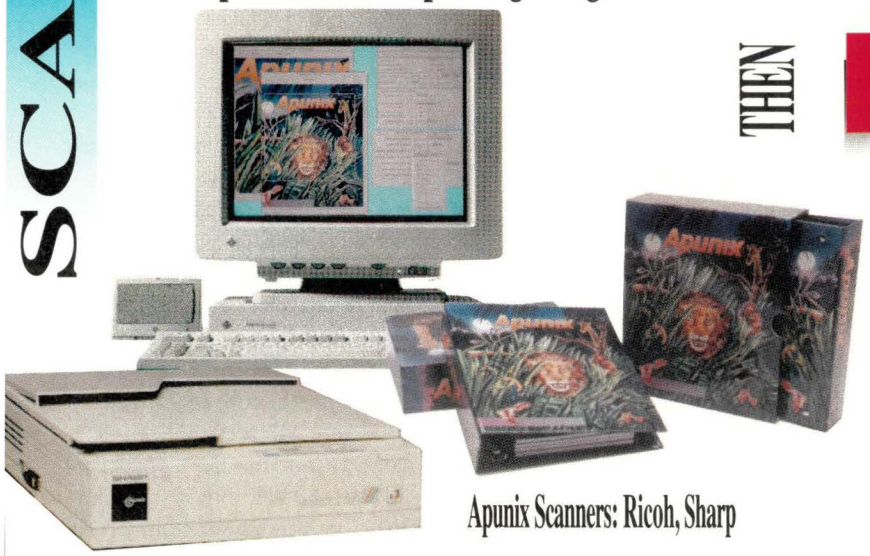
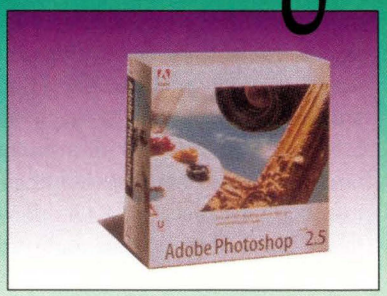


Apunix Scanners: Ricoh, Sharp

THEN



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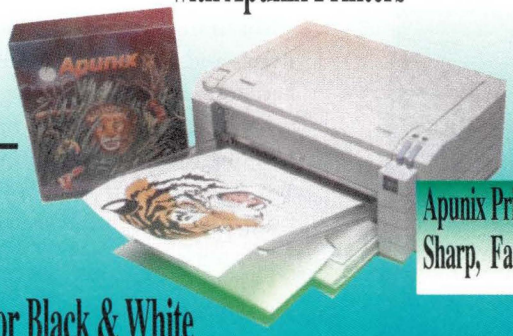

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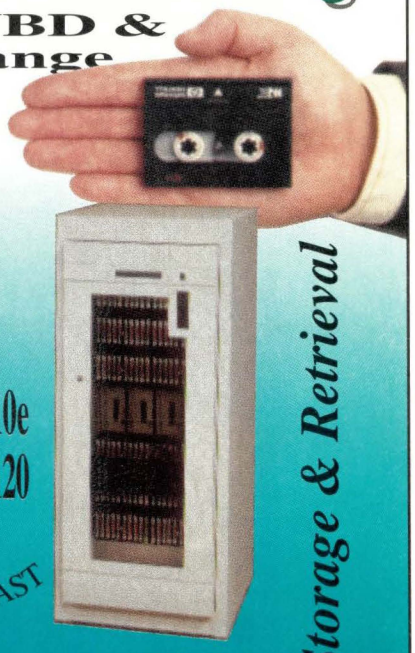

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announced that its video hardware will support StarWorks on Solaris. Parallax noted that it expects to see video-on-demand applications in places as diverse as multimedia kiosks and industry process control.

Ross Reveals Radical Recharge for SPARC

HyperSPARC, the SPARC implementation from Ross Technologies Inc., is one of those fascinating products that simply refuse to die. After Sun Microsystems moved much of its SPARC development work in-house (and thus ended the long-running fiction that the processor was indifferent to the needs of its creator), industry observers widely believed that hyperSPARC was finished. That grim prediction seemed confirmed when Ross' parent firm, Cypress Research Corp., sold the division to Fujitsu Microelectronics Inc., in San Jose, CA.

In fact, hyperSPARC cranks along quite happily, thank you very much. This fall, Ross announced the availability of 90-MHz hyperSPARC upgrades to end users of SPARCstations and other MBus systems. "We're going after all the connector slots," says Matt Gutierrez, the company's manager of product marketing.

To this end, the new hyperSPARC product is being offered in a reduced-size chip set on an MBus module. Says Gutierrez, "It's a 40% shrinkage of die space." Users can simply pull out their old CPU MBus module and install the new.

In addition, all six of the hyperSPARC's chips are now on a single silicon substrate. "What you see is a single package," says Gutierrez. "If you pulled the lid of it, you'd see six chips. Since we are now driving signals between those chips across microscopic distances, the silicon can run faster."

In fact, the user can fit more than one hyperSPARC upgrade into a system. "We can fit two CPUs on a one-MBus module," says Gutierrez. "You can get a total of four CPUs into one machine." A user could then turn a single-processor low-end workstation into a quad-CPU multiprocessing monster. "And, with the release of Solaris 2.4, the operating systems are out there to support multiprocessing."

However, neither Ross nor Gutierrez is under any illusion about the upgrade having an infinite lifetime. "Sun hasn't made any formal announcements about the long-term future of the MBus," Gutierrez says. "But they have made it clear that there aren't going to be any MBus-based UltraSPARC products. UltraSPARC doesn't even have an MBus interface."

But, there are lot of MBus-based workstations and servers out there. "We think there's a lot of life in the MBus," says Gutierrez.

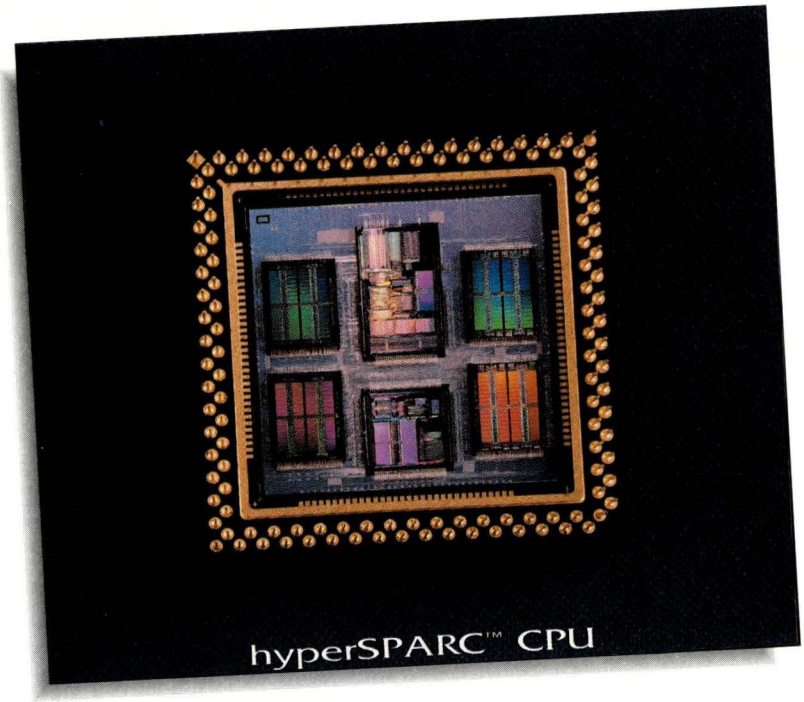
Spyglass Focuses on Mosaic

Mosaic, the graphical Internet browser that has become the default standard for World Wide Web, was originally developed by the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Champaign-Urbana. Mosaic has been available to date as either freeware or from a limited number of commercial licensees.

Now, however, the university has assigned all commercial rights to Spyglass Inc., a Savoy, IL-based software developer. Under the terms of the agreement, the university will honor existing commercial licenses and will continue to offer a version of Mosaic over the Net, but it will refer all future inquiries about commercial licenses to Spyglass. In turn, Spyglass will enhance Mosaic and provide distribution channels for the software.

Spyglass has announced a number of agreements with vendors for its Enhanced Mosaic. The company says it has signed agreements with IBM's Networking Division, in Research Triangle Park, NC; FTP Software Inc., in North Andover, MA; O'Reilly and Associates Inc., in Sebastopol, CA; and Firefox Inc., in San Jose, CA.

In some ways, the agreement continues and accelerates a process that had been under way at Spyglass for some time. The company has been stressing Mosaic for some months. Yet, not three years ago, Spyglass was firmly in the scientific visualization



The hyperSPARC CPU from Ross continues to win fans and design commitments. SuperSPARC's least favorite competitor is now available as an upgrade for MBus-based workstations.

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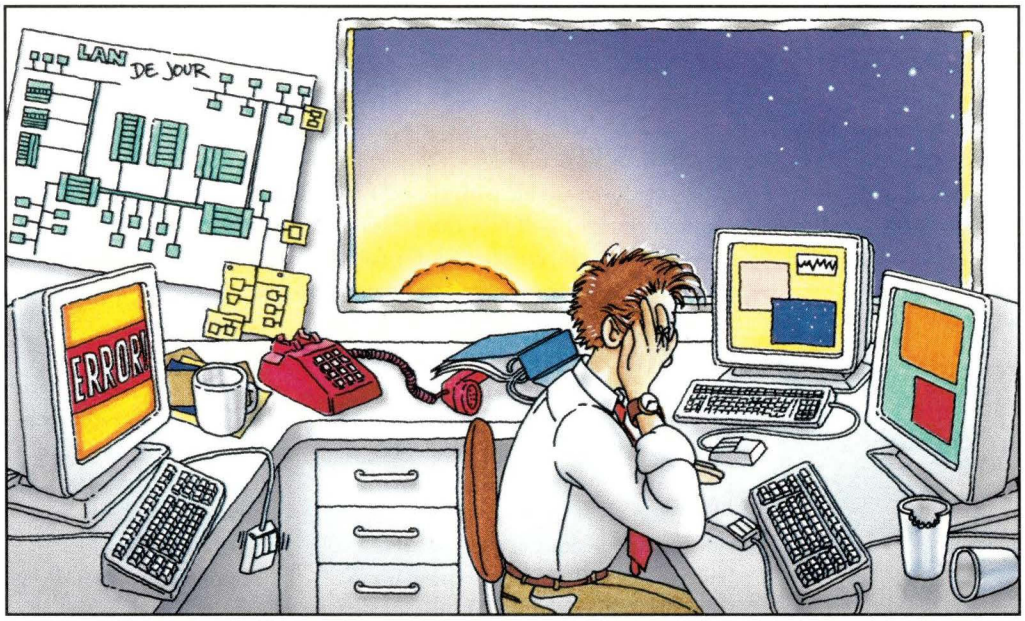

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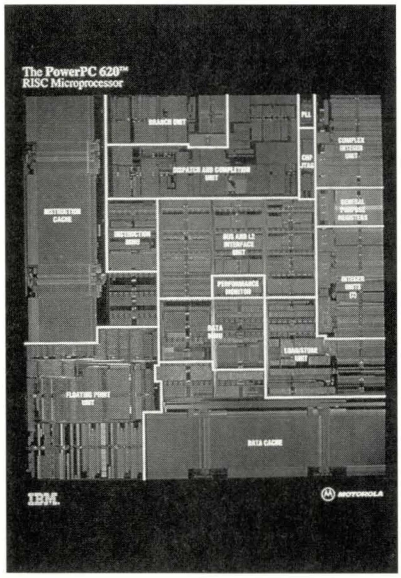
business and had been formed to commercialize scientific visualization software, which had been developed at the University of Illinois, among other places.

PowerPC 620 Launched...

UltraSPARC has gotten another competitor in the form of PowerPC 620. IBM and Motorola Inc. announced the 64-bit version of the CPU in October. The two companies say the product is fully compatible with existing 32-bit PowerPC applications, while providing headroom for future 64-bit applications.



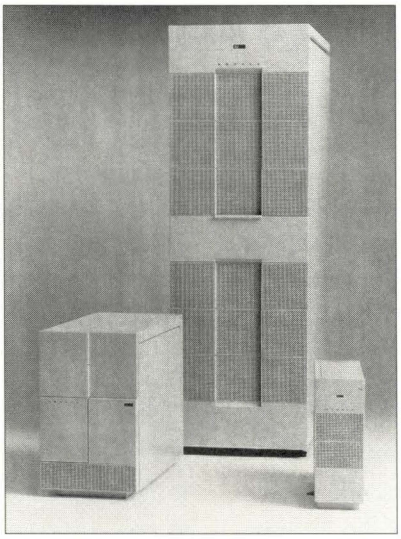
The PowerPC 620 is a 64-bit version of the PowerPC processor. It could be a significant competitor to UltraSPARC.

The chip's designers say it will probably be used first in servers and high-end products. Apple Computer Inc., the other leading member of PowerPC troika, has not announced products based on the PowerPC 620 but has said it will support the entire line of PowerPC processors.

The 620 will first be released at 133 MHz. Benchmarks remain somewhat theoretical, but the chip's creators say it will probably achieve a SPECint92 rating of 225 and a SPECfp92 rating of 300. It is designed in a 0.5-micro, 3.3-volt complementary metal oxide semiconductor (CMOS) technology and incorporates seven million transistors. It has a high-bandwidth memory interface that includes on-chip secondary cache control and a 128-bit-wide data bus. The PowerPC 620 chip can issue up to four instructions in parallel every clock cycle to six execution units.

...and Bull's On Board

Timed to coincide with the 620 announcement, Bull HN Information Systems Inc., the European information systems giant whose American office is in Billerica, MA, has announced a scalable server that will use the PowerPC. Called the Escala, the system can support up to eight processors in a symmetrical multiprocessing mode. Buyers can start with one and then move up. They can also start with lower-speed, lower-cost versions of the PowerPC, such as the 601, and then move up to the 604 and even the 620.



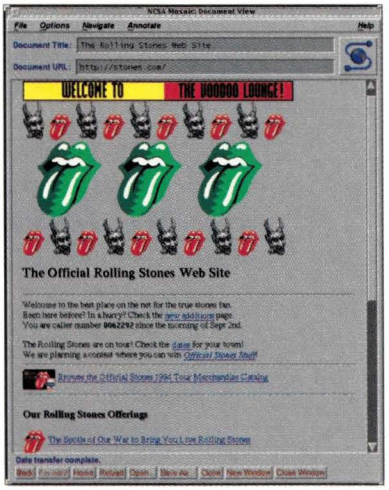
The Escala, from Bull, makes use of the PowerPC processor. Bull says the system is one of the first scalable PowerPC servers, but how committed is Bull to the North American market?

The company says this strategy will allow users to double their performance every six months. Moreover, the product will run on IBM AIX and will be offered to VARs and other resellers.

The product is formidable, but Bull cannot seem to shake questions about its long-term commitment to the American market. At the recent UNIX Expo in New York, resellers indicated an appreciation of the hardware but said they were concerned that the company might not be in the United States for the long haul.

The Rolling Stones Tour the Internet

In addition to the 90 stadium shows they're doing during the next 12 months, the ever-popular Rolling Stones are promoting their Voodoo Lounge tour on the World Wide Web (WWW). With the help of Sun Microsystems Inc. and Thinking Pictures Inc., a Massachusetts Institute of Technology Media Laboratory spin-off, an electronic "home page" has put the Stones online. A "home page" is a user-friendly graphical interface for navigating the global Internet.



According to the Internet Society, 56% of Internet traffic runs on Sun servers, and the vast majority of Internet applications were developed on Suns. Sun's own home page on the WWW is one of the most-accessed information sources, and Sun's Sun SITE information repository receives 140,000 queries a day.

Managed by Sun workstations, the Stones WWW server is connected to

the Internet, giving fans a database of Stones information. Data includes concert dates, video and audio clips from the tour and a library of band photographs. Voodoo Lounge tour merchandise can be purchased via the Internet and users can also upload their own pictures, band impersonations and software animation/graphics for Stones-related Internet contests.

To visit Sun's home page, type `http://www.sun.com` at the URL prompt in Mosaic. From there, click on the Stones icon or, for direct access to the band's home page, type `http://stones.com`.–*mm*

This Just In ...

• ***SunIntegration Services***, a division of Sun Microsystems Inc. planet SunServices, has announced its intent to resell solid-state disk emulators from Disk Emulation Systems Inc., in Santa Clara, CA. The DES products are used in database applications.

• UnixWare, the UNIX for Intel processors being promoted by Novell Inc., is being offered in Version 2.0 to members of the ***UnixWare Technology Group (UTG)***, in Summit, NJ. UTG is an organization of UnixWare users, OEMs and others with an interest in what used to be AT&T's UNIX operation.

• Alas, poor ***Kendall Square Research Corp.***, in Waltham, MA. The supercomputer company, once among the most promising of all the young upstart companies of the '90s, has announced that it will cease the production and sale of its KSR/Series computers and reduce its workforce to 50 employees.

• ***Bolt Beranek and Newman Inc.***, in Cambridge, MA, has formed a new subsidiary expressly to market its Hark voice recognition system. The new company, which is to be called BBN Hark Systems Corp., will be headed by Julie Donahue.

• Distributor par excellence ***Merisel Inc.***, in El Segundo, CA, has announced it will carry Sun Microsystems Inc.'s Netra Servers. The Netras are meant to manage PCs and PC LANs, and to provide Internet access capabilities. ➸

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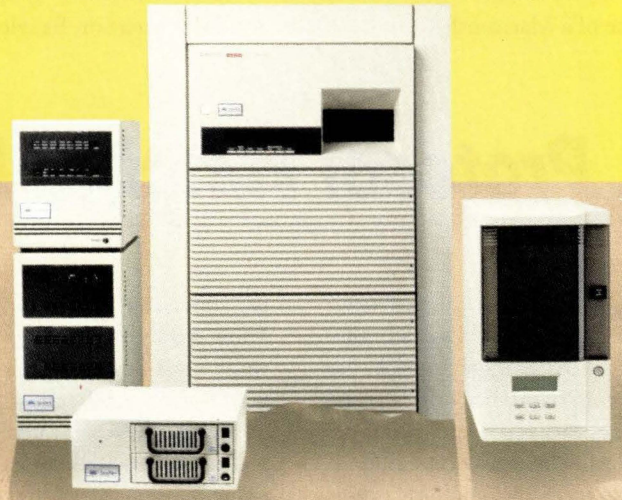

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by MICHAEL O'BRIEN

"Computer!"
–A grimly smiling Scotty, to the mouse of a Macintosh

<Dead silence>
–The sum total of people talking to computers on Babylon 5

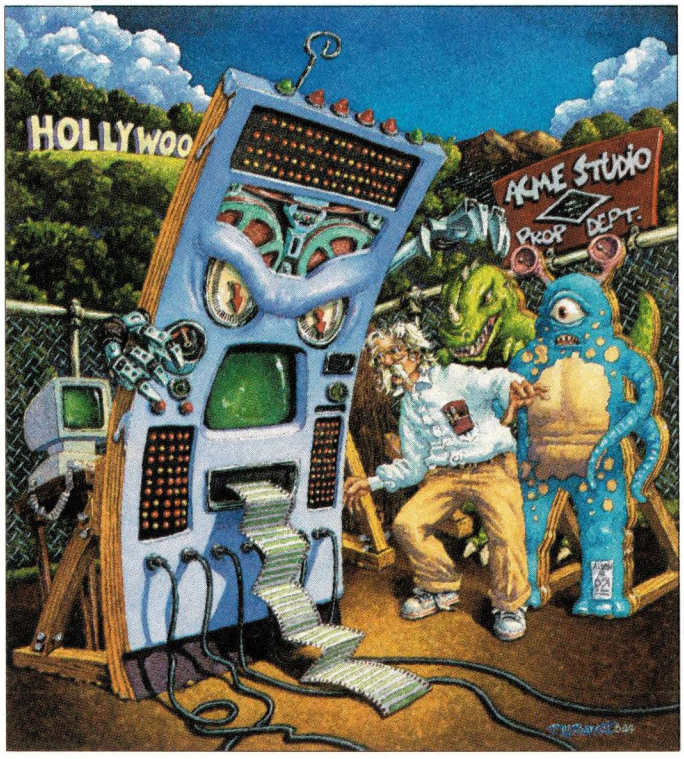
"Emergency cancellation Archimedes"
–Earliest known instance of a superuser password

Mr. Protocol Watches His Screen

Q: What is that thing? Does Mr. Protocol have a butler?

A: (savagely) I wish! No, I'm afraid that matte-black-finish can opener is another rusty relic of our dear Mr. Protocol's ever-deepening desire to understand something other than computer protocols. You'd think after all this time he'd resign himself to doing what he's good at. No such luck. So there he stands, eternal guardian of the high point of American culture…Forbidden Planet.

Now, we realize around here that large swaths of the computing infrastructure of the world are being designed and implemented by people who don't believe that Leslie Nielsen ever played anything other than comic roles. For many, many years, however, movies and television have been holding up fun-house mirrors to our lives and our society, and computers have been reflected in a lot of those mirrors, almost from the time ENIAC first converted electrons into blinking lights. And oh, how eagerly they've been used.



TOM BARRETT

Mostly, though, they've been misused. For whatever reason, most of the people who peddle scripts to the studios and the networks don't know diddly about computers, don't want to know diddly about computers, and think most other people feel the same way. In fact, for the most part, the things that have appeared on television and in the movies have had only the name "computer" to connect them with the machines with which you're familiar. This confusion has resulted in a great deal of ill-feeling between members of the computing profession and the media, mostly because both sides have thought they were talking about the same thing. They haven't been. Not even close.

And a good thing, too. If the Internet actually connected machines like the ones we see in movies and TV, we'd all be under indictment for attempted genocide. And rightly so. Frankly, any machine that can invade the power wiring of my house and make my microwave oven explode before I've even inserted the boot floppy is not something I want to be part of my life.

So just what are the things we've been seeing? Mr. Protocol isn't sure, but he's glad you asked. To simplify the terminology, we'll call them Things. Mr. Protocol does draw the distinction that the Addams Family's downstairs footman does not seem to be included, despite the unfortunate similarity of names. We can at least arrive at certain conclusions about these Things.

1) *They are more powerful than man.* Smarter, stronger, cleverer, call it what you will. Whatever people can do, they can do better. The only thing people can do that these Things can't do is fall prey to the nobler emotions. The claim is often made that all emotion is foreign to these Things, but a cursory examination of the literature turns up numerous examples of truly edifying displays of hatred, and even

the occasional bout of lust. There are some jaw-dropping scenes in *The Demon Seed* that never had anything to do with any type of computer peripheral with which Mr. Protocol is familiar. Be that as it may, they're unbeatable at chess, or any other form of strategic encounter. Any sort of paradox, however, is equivalent to a large quantity of C4 plastic explosive. Whoever built these things was not, apparently, interested in the notion of "graceful degradation."

2) *They're quite large and have large numbers of moving parts and flashing lights.* The advent of cartridge and 8mm tape drives never happened, apparently. Mr. Protocol is sure that the startling shift in our machine rooms–from row upon row of humming, blinking cabinets, in serried ranks extending to the perspective vanishing point, down to a few little racks of equipment sitting in big, lonely-looking machine rooms with useless raised floors–came as a terrifying blow to producers and directors everywhere. It also doubtless created a booming market in used computer equipment, as set decorators and production designers started buying every piece of outmoded equipment they could get their hands on, to use in the construction of adequately photogenic Things. Mr. Protocol feels that special-effects pyrotechnicians everywhere must be somberly aware that every disk and tape drive they blow up is another irreplaceable prop, never to be duplicated. Under the tenets of Point 1, every Thing ends its life at a spectacularly high temperature, with a spectral signature extending very close to the near ultraviolet.

3) *They talk funny.* Their vocabulary runs from rudimentary to impeccable, but vocal quality is terrible and intonation is worse. With one exception: HAL 9000. This Thing spoke so well it made your skin crawl, which was probably the point. Actually holding a conversation with one was almost guaranteed to be the frustrating experience of a lifetime. In this respect, Things and computers are alike: It is difficult to derail them from their hermetically sealed worlds of closed logic.

4) *They are sentient.* This is by far the largest difference between computers and Things. Things think the way people think. Their universe of discourse is the real world. They are perfectly adept at backward and forward references and disambiguation. Natural language is their natural language, even if they are communicating via punched paper tape. Things do not behave like machines. They behave like maniacal people in steel skins.

There are exceptions to all of these rules, but they are few and far between. It is interesting to note how these Things have changed over the years, and how they are portrayed today.

Things do not behave like machines. They behave like maniacal people in steel skins.

Television is and always has been a deeply conservative medium. Early television contains, so far as Mr. Protocol can tell, no references to computers...or even to Things. It also has no references to anything even slightly outlandish, outside of children's television shows on Saturday morning, like Captain Video. The movies lead television in just about every area of social exploration.

Movies began portraying Things only after computers had penetrated business to the point that ordinary people had begun to see press coverage of them. When computers existed purely as fixtures in research laboratories, there was nothing dramatic about them, and they provided no better fodder for Hollywood than did, say, plastics. In fact, plastics got better coverage, in *The Man in the White Suit.* No comparable movie ever got made about computers.

When computers did make their appearance, they were at their most Thing-ish. Their physical appearance on screen had little to do even with the rather dramatic-looking mainframes of the time. It is a matter of considerable irony, in Mr. Protocol's estimation, that when these mainframes finally began appearing on the junk market, they were acquired by propmasters for use in movies. They finally did make their appearance on screen, about 20 years late.

The art of computer programming is and has always been beyond the ability of even the most talented screenwriter to portray in a 30-second plot synopsis. As a result, the earliest Things were simple question machines. First, put in the data, usually either off-screen or by opening a large hopper and dumping things into it, rather like shoveling coal into a furnace. Then, ask the question. Any question, it doesn't matter, so long as it's in plain old massively ambiguous natural-language English. The answer will come out on something arcane, like a punch card, or blank paper tape.

Answers were generally split fifty-fifty between more plain English, or a pure mathematical formulation that had to be translated by appropriate (manual) struggling on behalf of the priesthood serving in the temple. The message was universally the same: "These things are dehumanizing, can be used and understood only by a priesthood and you personally don't stand a hope in hell of ever having any understanding or control over them, you sorry schlumpf." From that point on, the message was variable, consisting either of "These things are amazing and can do absolutely anything," to "These things are terrible and will ruin your life, you should live so long."

As computers became more intrusive into the underpinnings of modern society, there appeared a massive paranoia. The first variant message died out, and the second became almost universal. We had such lovely paeans of praise as the aforementioned *Demon Seed*, not to mention *War Games* and the denouement of the

great *Dr. Strangelove*, where the heart of the Doomsday Device was "a gigantic complex of computers."

Note that this was the point at which computers had become essential to the functioning of society. However, most members of that society had never used a computer, and a large percentage had never even seen one. As the personal computer penetrated an ever-broader cross-section of society, the portrayal of computers on the screen settled down considerably, until, in a few cases, it was actually used as a nonsentient tool, rather than as a mainstay of the plot as an uncredited character.

Mr. Protocol thinks this is crucial. Looking at things in close historical perspective, we see that the height of the anticomputer paranoia occurred at just about the time when the richest and most successful screenwriters were just beginning to be able to afford the first personal computer authoring systems to hit the market. Considering how wonderful those things were, eating scripts for breakfast with disk crashes, running software buggy enough to try the patience of a saint, it's no wonder that the poor Things took a terrible rap on screen.

Things didn't look up until computer-based scriptwriting software and hardware finally became stable and usable enough to allow screenwriters to get their work done without developing a deep and abiding personal hatred of Things. After all, it's a well-known fact that the villain in the movie who dies the most horrible death shares all the tics, mannerisms and figures of speech of the plumber who just emptied the screenwriter's bank account while laying new service to the house.

Be that as it may, the recent upsurge in science fiction on both big and small screens has left computers in a very ambivalent state. The era of the Thing is just about over, as both writers and the public have become more savvy. Actual programming, mind you, is still beyond the pale, but at least computers don't blow up quite so often, at least, in the higher class TV show or movie. Cheapie movies are and always have been as deeply conservative as television, of course, so computers are still mighty dangerous to be around as far as they're concerned. Mainframes are still alive (too much so, usually) and well, and shooting one through the console will generally destroy the console, the mainframe and most of the surrounding five-block area.

To Mr. Protocol, what's fascinating is the vision that these fantasists have of computers in the future. In general, they seem completely buffaloed. Computers are either much like today's computers, only with better interfaces (the *Star Trek* mold), or they don't exist at all (the *Babylon 5* mold). To a certain extent, this is probably deliberate. The purpose of science fiction is not to predict the future. It's to make money. Uh, well, it's more complicated than that; they say it's to hold a mirror up to contemporary society. You can see how science fiction has changed over the years as society has changed. But making money in the arts means doing something the audience can understand, which means that you don't take things too far out of contemporary societal context. Sober contemplation of the actual future of computing could lead us to wonder whether our own future might not be closer to the ideal of the Borg rather than of the Federation, for example. But in other places, even a little thought makes things break down.

Programming, mind you, is still beyond the pale, but at least computers don't blow up quite so often.

Star Wars was so much a myth rather than simply a movie that Joseph Campbell, the greatest student of mythology of the 20th century, spent much of his time in the last years of his life at George Lucas' Skywalker Ranch. Many things about the *Star Wars* universe don't bear close scrutiny, but it doesn't matter to the story. Even a moment's thought, however, makes one realize that in any future that holds the possibility of mobile, sentient robots, there are going to be stationary intelligences of at least equal power. None are in evidence.

The problem, of course, is that computers will change our lives. Our private and our social interactions will be changed so radically and so completely that it is difficult for us to contemplate how we will live.

Mr. Protocol maintains a library of imaginary books and articles, with which he informs his dreams. (It is probably maintained by a tall, thin drink of water named Lucien, but I've never dared to ask.) In it is an article entitled "As We May Dream," co-authored by Vannevar Bush and Carl Jung. This is the sort of mixture we may expect, he feels. A century and a half ago, the postal service was a godsend to families who were permanently sundered by the great westward migration of the United States. If a member of a family living in New York joined the migration to Iowa, or Illinois or anywhere in the Great Basin to become a sodbuster, it was extremely unlikely that they would ever see any other family member again. Today, not only is travel easier, but so is telecommunications. The telephone network, which is the largest computer ever built, allows a degree and ease of communication that the people of the previous century could only have ascribed to divine intervention.

As this trend continues, computers will enter our dreams.

As I sit here late at night, transcribing Mr. Protocol's scribblings (the uncharitable would say "incoherent ravings"), my computer, in addition to supporting one of those authoring programs so viciously maligned earlier, is playing a CD of Enya's music through its CD-ROM drive and sound card. It's not virtual reality, but it certainly makes life more pleasant.

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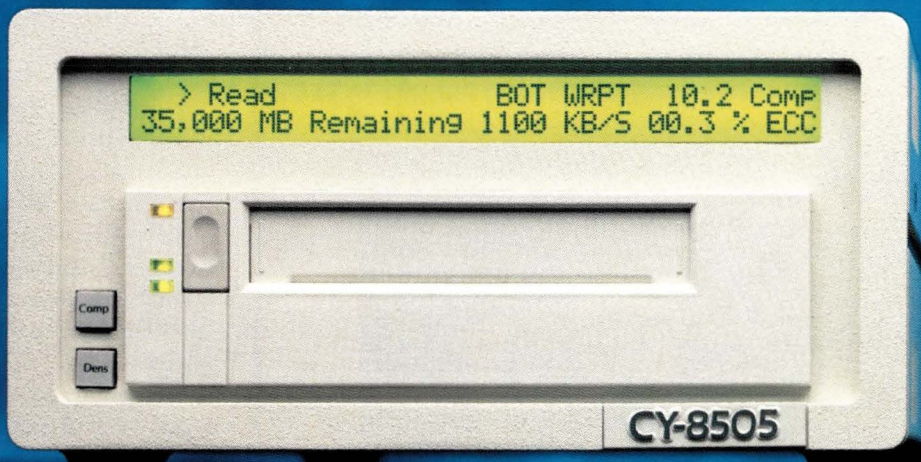

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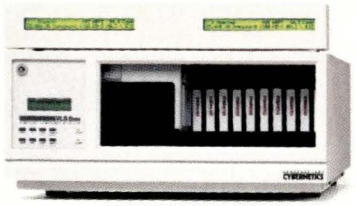

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AT&T	IBM Mainframe	Parallel Port	Unisys
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Concurrent	IBM RT	PC MS-DOS	Wang
Convergent	IBM S/38	PC Xenix/Unix	Windows NT
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And this, Mr. Protocol is certain, is the secret. Computers and computer networks will not impose changes from the outside. They will be so subsumed, so embedded in our social fabric, that we will cease to be aware of them as separate entities. We have already ceased to be aware of individual computer networks, for the most part. We do not often contemplate Los Nettos, or Nearnet, or Sprint, unless our work involves these directly. We use The Internet. Never mind that The Internet, by strict definition, is not the services that it supports, or the networks that it interconnects. We only contemplate the whole. To us, "the telephone" is not the thing on our desk, it is the whole telephone network. So, eventually, The Internet will become the internet, and then just "the computer," or even "the telephone"...again.

And our lives will be so changed thereby that we cannot even dream of it. Or, at least, we do not. ⊷

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@cpg.com`.

An Invitation

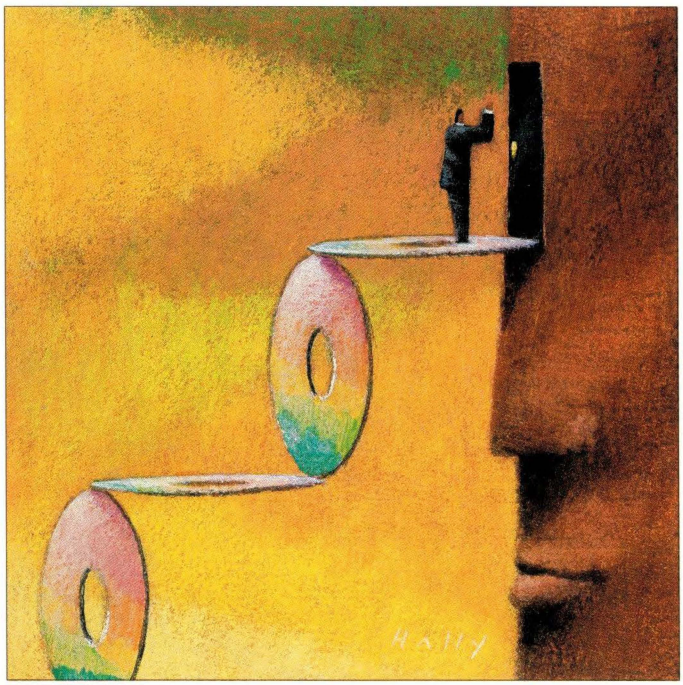
Mr. Protocol, gourmand of the late night snack buffet, requests the pleasure of addressing your network and communications questions. He can be reached at amp@cpg.com day or night, rain or shine.

by PETER COLLINSON, Hillside Systems

Disk Performance

Last month, I talked in some detail about how UNIX deals with disks. This month I thought it would be useful to expand on that. I will look at the tools that are available for disk performance analysis and discuss the pragmatic issues of laying out data on disks.

We saw that UNIX likes to split each physical disk into several sections known as partitions. Each partition becomes a "logical" disk that usually contains a file system. Actually, partitions are generally used for two types of data. Some partitions are used for holding user files in file system trees; some support the virtual memory system.



The virtual memory system allows us to squeeze more running processes in the machine than we have real memory to hold. Alternatively, it allows us to create bigger processes than we have actual physical memory. The idea is that the memory holds only the parts of processes that are needed, while unused parts are moved out to disk to make space for other work. The memory is divided into fixed-size chunks called pages, and these are also moved out to disk to make space. Early UNIX systems always swapped whole processes in and out, so we often refer to this disk space as "swap" space rather than "paging" space.

In fact, partitions are not limited to these two applications. Sometimes programs wish to manage their own file store and are just given a partition to play with. The partition does not form part of the normal file system tree but is treated as an array of sectors by the application software running as a user process. If you use `tar` to dump some data on a floppy, then you are playing this game. You are treating the media as a set of blocks that contain some data.

Database applications on earlier UNIX systems often used to grab a partition to work in. The implementors found that the UNIX filestore did not give them the necessary control on the state of the data. They often need to know that some data has safely found its way onto the disk surface. This need has been somewhat relieved by the `fsync` system call, which ensures a file is written to disk.

When Kirk McKusick developed the new file system layout that became the file system we all use today, he did it in a spare partition that was outside the normal file space of the machine. This allowed him to develop his code without having to mess with a live kernel. The code was developed in a user process and moved into the kernel after it was known to be operational.

However, disk partitions are mostly used for user files or for paging. If you take your Sun machine from its carton and install a nice new shiny operating system on it, you will find that there are a set of defined default partitions. First, both SunOS and Solaris install a small "root" partition at the start of the disk. This is used for initial bootstrap. It's small because it contains only the control files and programs that are needed to load a particular system.

A diskless workstation will require some dedicated space on a server somewhere to act as its root. All diskless workstations on the network will point to a set of shared files that

GREG HALLY

are the remainder of the files needed for general operation. Actually, the minimum size of the root partition seems to grow every time I install a new version of the system. My SunOS root uses about 3.5 MB, and my Solaris root seems to want 11 MB, although some of this is data that can be moved into another partition.

Paging Areas

The root partition is followed by a paging area. When the kernel boots, it expects to have a primary paging area. If you have more than one disk, then you augment this initial area by specifying additional paging partitions on separate disks.

I generally have a paging area on all the disks that are on the system. The system can page to many disks, and this increases the total paging space available. You will want to increase the size of the paging area to increase the maximum size of the processes that you can run or to permit more programs to be run concurrently.

These days programs "run out of memory" when there is insufficient swap space to contain the data part of their process image, rather than actually running out of machine memory. If you run out of swap space, people will start complaining that their applications are dying around them, bleating "not enough memory." We always hope that applications have been coded not to assume that memory is limitless and will die cleanly.

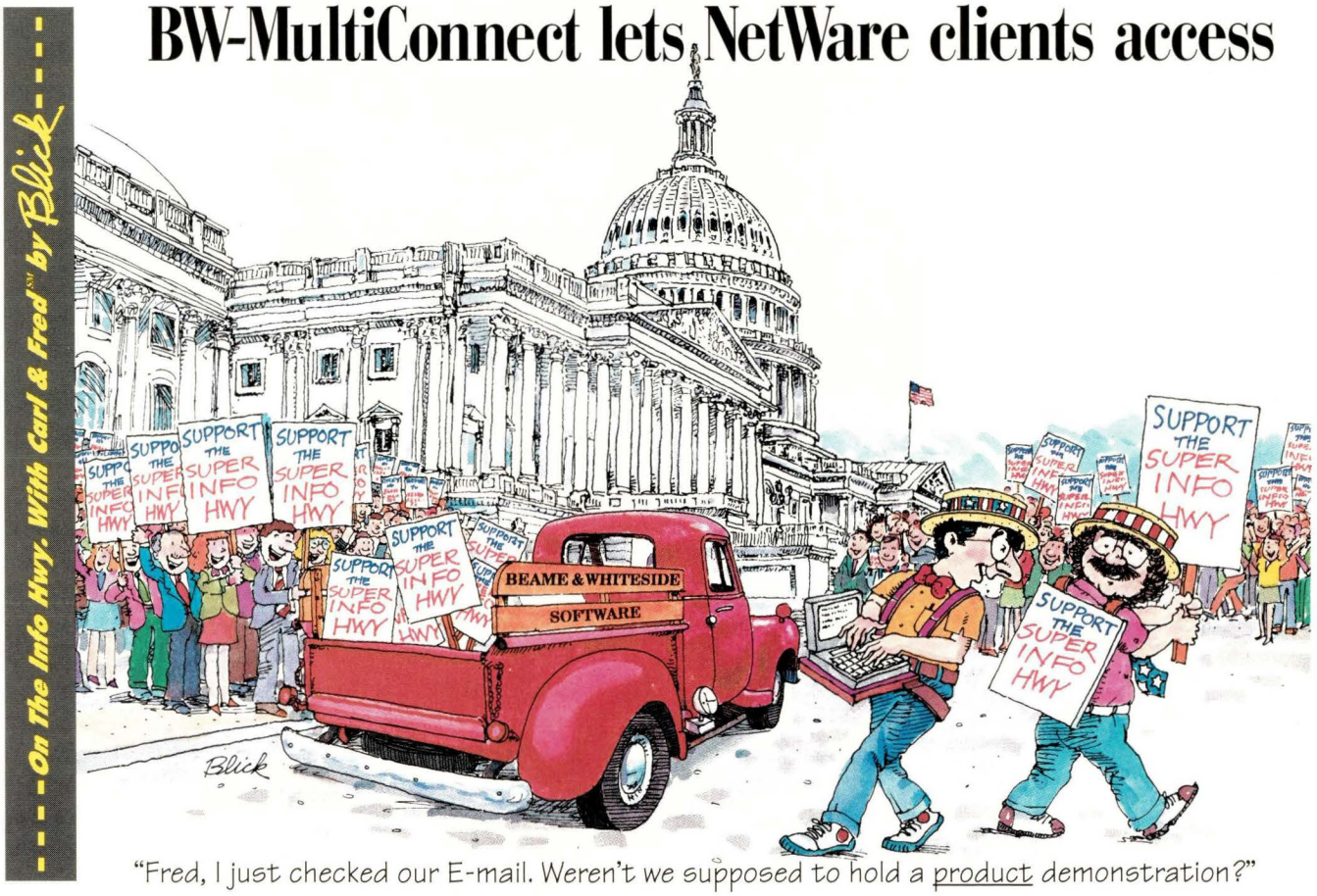
When you run out of paging space, you *can* reduce the number of processes running on the machine. Typically, though, the only real solution is to add more paging space to the system. If you can find a free partition, then it is a simple matter of telling the system to use it. You add the partition to the `fstab` file for SunOS or to the `vfstab` file on Solaris. Here are my `fstab` values:

```
/dev/sd2b  swap        swap  rw   0  0
/dev/sd3b  swap        swap  rw   0  0
```

Note that it doesn't contain the primary swap area, which is on `/dev/sd1b`. Nothing happens until the `swapon` command is run (`swap` on Solaris). This will take partition names from the control file, and the kernel will start paging there. On SunOS, once you have called `swapon` you are stuck until you reboot the system. Solaris, on the other hand, allows you to turn off swapping to a partition while the system is running multiuser.

Paging activity is interleaved across all the partitions in use; it is also shared across all drives. There is a strong assumption that the partitions are all on separate drives. If you are going to use two adjacent partitions, then it's prudent to combine them into one. This is a simple matter and can even be done while the system is live, using the `format` program. I tend to worry about using this program on live systems, though, because it's too easy to make a bad mistake.

Another alternative is to page into a file. This is more often used to support diskless clients, but sometimes you still need to increase swap space when you have no spare partition. You make a paging file with the `mkfile` command.



This just seems to create an appropriately sized zero-filled file. I am a little queasy about swapping to a regular file that is spread out all over a file system using the linking approach that I described last month. I admit I have never used this method. I have always made new system swap space as a partition on every new disk that I have added to the system.

To see how much swap space your system uses, you can use the `pstat` command on SunOS. I generally use the table printing option:

```
$ pstat -T
218/582 files
310/336 inodes
 59/138 processes
15832/82852 swap
```

This also prints a little about the demands made on some other system resources. The last line tells me that my system is using 15,832 KB from a total 82,852 KB available. Another `pstat` option gives me a breakdown of the space (I've wrapped the output):

```
$ pstat  -s
12832k allocated + 2844k reserved =
          15676k used, 67176k available
```

This gives four numbers: *allocated* is the amount of swap space allocated to private pages; *reserved* is the number of swap space bytes not currently allocated but claimed by memory mappings that have not yet created private pages. The kernel always allocates all the space that a process needs so that once the process has started, it can run to completion. The last two numbers are computed from the space available. On Solaris, you can get this output from the `swap -s` command.

You will think that perhaps I have more swapping space than I need. This is because I use `tmpfs`–the file system that is run in memory. This builds a file system on a virtual disk that is paged out to swap space like the memory used for regular processes. I mount this file system on `/tmp`. Both Solaris and SunOS provide `tmpfs`.

The `tmpfs` system is a win when used for programs that create many short-lived files, such as the C compiler. It is supposed to mimic the standard file system exactly. Its ability to do this was not present in early versions, though, and I tend to distrust it a little. My version of SunOS, 4.1.3_U1, still does not implement file locking using the `lockf` function. This seems to be fixed on the Solaris 2.3 system that I looked at.

Since the contents of `tmpfs` are effectively in memory–albeit virtual memory–the files disappear on system reboot. This has meant that the temporary files used by programs like editors have been moved from `/tmp` to a place where they will be preserved in a system crash.

Using this space effectively, though, calls for users to be educated. People who leave litter on `/tmp` are an unwelcome system hazard. If someone comes along and creates a big file in `/tmp`, they can adversely affect the paging performance of the machine. They can grab all the swap space to the detri-

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Figure 1. `df` *on My System*

```
$ df
Filesystem kbytes    used   avail  capacity Mounted on
/dev/sd1a    7508    3299    3459     49%    /
/dev/sd1g   80259   69737    2497     97%    /usr
/dev/sd3g  275824  209932   38310     85%    /usr/export/home
/dev/sd2g  323383  140222  150823     48%    /t
swap        64412     100   64312      0%    /tmp
/dev/sd2a   19095   11101    6085     65%    /s5
```

ment of the other users. I note that the 4.4BSD version of `tmpfs`, called `mfs`, allows a limit on the amount of virtual memory that the file system can consume.

Other Partitions

The other partitions on your machine will contain both system and user files. As I said last month, I like to keep the files from the standard distribution and my own files on separate partitions to make it easier to upgrade the system. I generally split my disks into three sections: a root partition, some space for swapping and "the rest." When I installed Solaris, I resisted its desire to have a separate partition for `/var` (this contributes about an extra 2 MB to the 11 MB I noted earlier). A small root partition on a second or third disk can be used for `/tmp` if you don't want to use `tmpfs`.

My system is atypical because it consists of three wildly different size disks of various antiquity. As new operating system releases have come along, I have been forced to grow the original root partition on my tiny internal disk to cope with the ever increasing need for files on the root. I have stolen blocks from the swap space on the small disk.

I have two root file systems, one for SunOS and one for Solaris. I can boot Solaris by telling the boot program to load from the second disk. The third disk contains only two partitions–one for swapping and one for user files.

Before the days of CD-ROMs, it was prudent to allocate a "spare" root. Then, if for any reason you lost your root partition, you had an alternative partition that you could use as root to recover the system. The notion of having a spare root is much less useful these days because many of the programs that you need in a disaster reside on `/usr`. I rely on being able to boot a system from CD-ROM in an emergency. This has happened a couple of times too.

What's on Your System?

The basic tool for seeing what disks are on your system is the `df` command. Figure 1 shows the output on my system, and I've mounted the Solaris root so you can see it.

If you use Solaris, then you can get this style of output by giving the `-k` switch to its `df` command. SunOS uses somewhat arbitrary names for disk partitions, while Solaris uses names that reflect the hardware locations of the disks. I find them hard to remember and type, but I guess my resistance to Solaris is showing there.

You can see from my layout that the root of the system has about 3 MB free. I need this when I install a new kernel so that I can have the old one available in case of a problem.

Because I have a small root disk, I've been forced to move the `openwin` subsystem and the `/var` subtree onto my main user disk. This is simple to do–perhaps too simple. You just copy the tree to a new partition using `tar`, delete the old one and replace its top-level directory by a symbolic link.

Because it's easy, you find this is what people do when a partition suddenly fills up. The system administrator identifies some likely subtree and moves it to a less empty partition on another disk. Systems in this way degenerate quickly into snake pits of intertwined links. Luckily,

```
% cd somedirectory
% df .
```

will tell you what partition you are currently sitting on. This is useful when you are engaged in system housekeeping. When you delete a file, you can check that it is actually on the partition that you need to make space in.

On a system with more than a couple of disks, it is a good idea to keep a map of what resides on what partition. Print some long rectangles on paper, split these into partition-sized blocks and write a guide of what lives where. Keep this up to date.

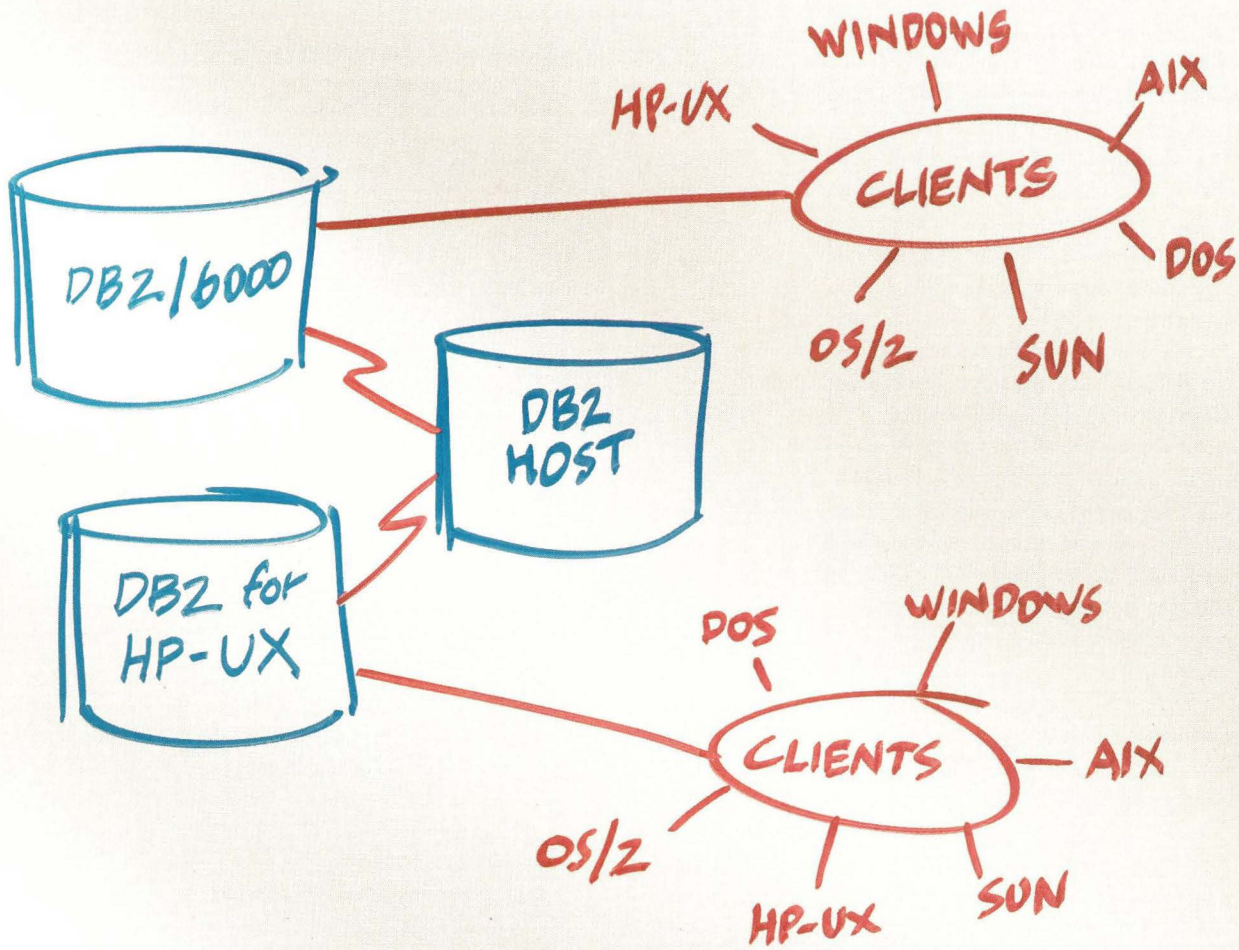
Speed

Knowing what space is available is not the only worry when deciding where to put files on your system. You may wish to make some partitions "mostly" read-only. I certainly have tried to do this for root and `/usr` partitions for some years. I try to write rarely to these partitions. I aim, at least, not to have anything writing to them regularly: no log files, no temporary files and no user files. This makes them much less prone to have problems. You are less likely to have a system crash or a power failure while these partitions are being changed. This helps them come back up in a consistent state after an unwanted stoppage.

On busy systems, I try to balance the disk load across the several drives. Last month, I enthused about the design of the file system, showing how hard it works to minimize disk head movement. Well, on a busy system, disk I/O requests are probably fairly random and the heads are always moving across the surfaces seeking the correct cylinder. It's a good idea to try to balance your disk load across the available drives, especially if the disk activity is high.

There are a couple of tools that will help you measure this. One is `vmstat`. Here's a partial output from a `vmstat` on a busy SunOS 4.1.3 system that's handling news:

```
% vmstat 5
 . . .       disk       . . .
 . . .srd0 d1  d2  d3   . . .
 . . .4   2  19  41  58  . . .
 . . .0   2   9  48  53  . . .
 . . .0   2  15  38  56  . . .
 . . .0   0  19  40  55  . . .
```



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The vmstat command has many more columns of information, but I have deleted some to focus on the items I am interested in. The vmstat command always devotes four columns to disk information. This system happens to have four drives, which is convenient for our discussion. If your machine has more than four drives, then the output is perhaps less useful.

The first line of the output is the average of all actions since system bootstrap time. This is useful because it gives you a general view of the activity on the system. Subsequent lines show what happened in the interval picked on the command line–here set at five seconds. This is a good choice for printing because these statistics are only sampled in the kernel every five seconds.

Figure 2. iostat on My News System (running SunOS)

```
% iostat -d 5 5
          dk0             dk1             dk2             dk3
bps tps  msps  bps  tps  msps  bps  tps  msps  bps  tps  msps
 17   2   0.0  174   19   0.0  242   41   0.0  203   58   0.0
 28   2   0.0  115   16   0.0  251   44   0.0  200   62   0.0
 23   3   0.0   78   11   0.0  266   46   0.0  198   62   0.0
 10   1   0.0  102    9   0.0  331   56   0.0  195   62   0.0
 13   2   0.0  112   14   0.0  225   38   0.0  192   57   0.0
% iostat -D 5 5
          dk0             dk1             dk2             dk3
rps wps  util  rps  wps  util  rps  wps  util  rps  wps  util
  1   1   3.8    9   10  27.1   30   10  61.1   44   14  89.2
  1   1   3.8    5    8  21.4   34   14  73.5   51   11  93.7
  1   2   4.8    2    7  14.3   36   15  72.7   51   16  96.2
  0   0   0.6    4    6  13.4   30    1  49.0   41    1  63.8
  2   0   4.6    8    5  19.7   39    7  68.2   48    9  90.7
%
```

Well, what can we see? I have retained the sr column because it is a measure of paging activity on the machine. This number shows the number of times per second that the paging system kicked in to get some free pages to fulfill demand from running processes. A zero value here is good; gloom sets in for higher numbers. On balance, this machine could do with a little more memory.

The remaining columns show the disk activity per second for each drive. You can see that d0 (the root of the file system) is used very little in comparison with the remaining disks. The second drive, d1, is not used a lot either. The other two drives are working flat out but are reasonably balanced. Actually, I looked at this two days ago and d3 was working much harder than d2. I suggested that paging be removed from d3, and now activity is spread more evenly. Perhaps this system needs a new drive to spread the load a little more.

You can examine disk activity more closely by using the iostat command. This has the same action as vmstat, first printing a line that contains cumulative statistics and then printing a summary of activity in the last time period. Again this will default to look at four drives, but you can give it an argument to make it examine more.

Figure 2 shows two runs of iostat–again on the SunOS news machine. I am running these every five seconds as before, but have also added an additional "5" to make it loop five times. The first run has a flag that limits output to disk analysis only. Three columns are shown for each disk: bps gives the number of kilobytes transferred per second and tps the number of I/O transactions per second. The msps column is intended to show the average milliseconds per seek on this disk. This is dependent on the disk hardware and has never been operational on Sun systems. It's a holdover from the old 4.2BSD VAX systems, where it was used to measure the overlapped seek performance of the disk drivers.

The -D flag gives you a slightly different output: the number of reads and writes per second and the disk utilization. You can see from this that d3 is working at close to full capacity. This value was between 98% and 100% two days ago before the swap space was moved.

The output for the corresponding Solaris command is more detailed. Specifically, Sun has implemented "service time" reporting that indicates seek performance on the disks. The system also monitors the length of the queue of blocks waiting to be serviced so you can get a better indication of the load that is being demanded from the disk.

There is always something to be gained in making your system work optimally, and one part of that is to make sure that you use your resources sensibly. It makes no sense to have one disk working hard when others are sitting around doing little. Occasionally, it's worth asking these questions about your system and moving things about if necessary.

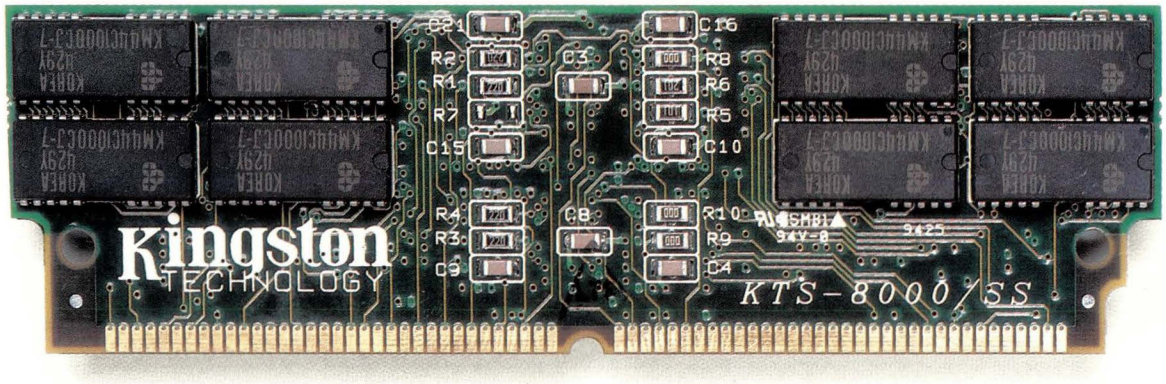
September's Attributions

The article in September about World Wide Web and Mosaic raised enormous interest. Many of you dropped in to my server and filled in the Visitors Book page to say hello and how much you enjoyed the article. Thanks to all who did.

Peter Salus emailed to chide me, quite correctly, about attributions. I had failed to recognize that the WWW is the brainchild of folks at CERN in Switzerland, and I should have specifically mentioned the work of Tim Berners-Lee.

Peter was quite right that they should be mentioned. Let's hope this footnote puts that right. ➸

Peter Collinson runs his own UNIX consultancy, dedicated to earning enough money to allow him to pursue his own interests: doing whatever, whenever, wherever... He writes, teaches, consults and programs using SunOS running on a SPARCstation 2. Email: pc@cpg.com. WWW: http://www.hillside.co.uk/



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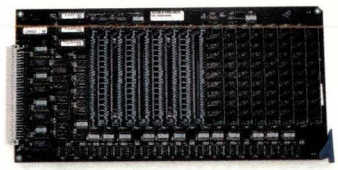

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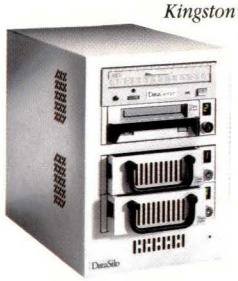

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by RICHARD MORIN, Technical Editor

TeX, ReDuX (Part II)

"TeX is primarily concerned with high-quality technical manuscripts... If you merely want to produce a passably good document–something acceptable and basically readable but not really beautiful–a simpler system will usually suffice. With TeX the goal is to produce the finest *quality; this requires more attention to detail, but you will not find it much harder to go the extra distance, and you'll be able to take special pride in the finished product."*

–Chapter 1, *The TeXbook*

Intimidating as the above quote appears at first glance, it is ultimately pretty comforting: TeX is intended to help you produce beautiful documents, and it won't let you down when the going gets rough. The TeX system (TeX, LaTeX, Metafont and their many friends) can handle problems in mathematical typesetting, text positioning and even font design with an aplomb that can only be envied by users of less flexible systems.

Just don't expect everything to be done for you. TeX documents are *programmed*, as well as written. The TeX language has a consistent block structure, very much like C. In fact, indenting habits borrowed from C can produce TeX documents whose structure is clear at first inspection. (Would that all TeX documents were so transparent!)

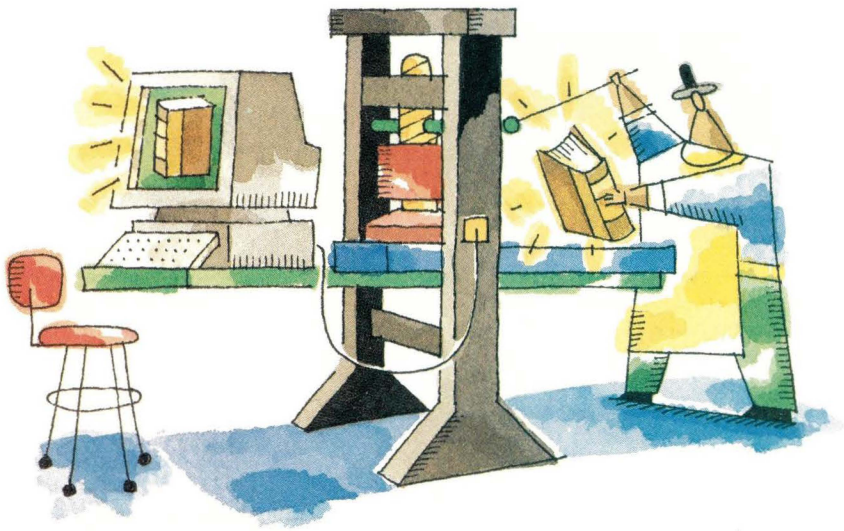
Getting TeX

TeX is available in both commercial and freeware flavors. I haven't spent much time with the commercial flavors, so I'm not prepared to say too much about them.

The commercial offerings range from font sets to complete plug-and-play systems. Here are a few, to tweak your interest.

Contact ArborText Inc. (313-996-3566) for information on complete TeX systems. The Kinch Computer Co. (607-273-0484) sells TurboTeX, a PC-based TeX system, along with PostScript-emulating font sets and more. Micro Programs Inc. (516-921-1351) sells a variety of TeX-related tools. MicroPress Inc. (718-575-1816) sells a system named Vector TeX (VTeX). Y&Y Inc. (800-742-4059) sells TeX font sets in Adobe Type 1 format.

Blue Sky Research (800-622-8398, `sales@bluesky.com`) sells Textures, a valiant and largely successful attempt to merge the TeX and Macintosh paradigms. The system's continuous feedback and mouse-driven operations provide many of the benefits of WYSIWYG word processors, while retaining the full capabilities of the original TeX system.



ROBIN JAREAUX

TeX Freeware

The Comprehensive TeX Archive Network (CTAN), as noted in previous columns, is the definitive source of freeware TeX materials. It contains perhaps 2 GB of TeX-related documentation, filters, fonts and even complete systems.

CTAN is available via FTP as

`/tex-archive` on `ftp.dante.de` (Germany), `ftp.shsu.edu` (Texas) and `ftp.tex.ac.uk` (England). CTAN is also mirrored, in part or in full, by a variety of sites around the world. See the file `CTAN.sites` on a primary archive for more information.

If you balk at trying to download a monster like CTAN, relax. First, you don't need to grab any more than you are ready to use at any given time. CTAN's stalwart administrators will keep the rest on-line for you, updating it as needed, until you ask for it.

Or, if you are willing to get your TeX freeware via CD-ROM, you can try:

Prime Time TeXcetera
Vicki Brown, ed.
Prime Time Freeware, 1994
ISBN 0-881957-10-1

This collection contains an essentially complete snapshot of the CTAN as of late Spring 1994. An updated collection is planned for January 1995. Contact Prime Time Freeware (408-433-9662; `ptf@cfcl.com`) for more information.

If you would like a plug-and-play TeX system for MS-DOS, ask NTG (the Dutch TeX Users Group) about *4AllTeX*. NTG can be reached by email, care of Erik Frambach (`e.h.m.frambach@eco.rug.nl`) or by snail mail at:

NTG
P.O. Box 394
1740 AJ Schagen
The Netherlands

And Now, TeX Books

As promised, here is a rundown on the TeX-related books that have crossed my desk since I wrote the last survey. I'm certain to have missed a few, but these should be representative of the breadth of works coming out. As before, let's start out with general and introductory works.

Making TeX Work
Norman Walsh
O'Reilly, 1994
ISBN 1-56592-051-1

TeX: Starting from Square 1
Michael Doob
Springer-Verlag, 1993
ISBN 0-387-56441-1

The TeXbook
Donald E. Knuth
Addison-Wesley, 1986
ISBN 0-201-13447-0 (hard)
ISBN 0-201-13448-9 (soft)

Making TeX Work belongs on the bookshelf of every TeX enthusiast. It *certainly* deserves a spot near the desk of any neophyte. The book ranges over most of the major portions of the TeX system, including both the original and popular add-on programs. It tells the readers which programs do what, and even a bit about how.

Nonetheless, the book has taken some hits in `comp.text.tex`, perhaps because of its too expansive title. *Making TeX Work* is *not* an instruction manual for setting up a TeX system. No such book exists, unfortunately, and this lack is a severe obstacle to aspiring TeX users.

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Circle No. 17 on Inquiry Card

Assorted FAQs and other useful documents help, but TeX can still be a real challenge to set up, particularly if anything unusual is desired in the way of package locations, etc. (My own recipe involves a simple combination of `web2c` and `dvipsk`, both of which can be obtained from CTAN.)

Michael Doob's *TeX* is a slim but tasty volume containing a nice selection of motivation, explanation and exercises (with answers!). Extending the book's range and utility, he supplements his own text with frequent pointers into Donald Knuth's definitive reference, *The TeXbook*.

Macro Packages

A Guide to LaTeX: Document Preparation for Beginners and Advanced Users
Helmut Kopka, Patrick W. Daly
Addison-Wesley, 1993
ISBN 0-201-56889-6

LaTeX: A Document Preparation System, 2nd ed.
Leslie Lamport
Addison-Wesley, 1994
ISBN 0-201-52983-1

The LaTeX Companion
Michel Goossens, et al.
Addison-Wesley, 1994
ISBN 0-201-54199-8

LaTeX Concisely
Adrian Johnstone
Prentice-Hall, 1992
ISBN 0-13-524539-7

LaTeX Notes: Practical Tips for Preparing Technical Documents
J. Kenneth Shultis
Prentice Hall, 1994
ISBN 0-13-120973-6

Math into TeX: A Simple Introduction to AMS-LaTeX
George Grätzer
Birkhäuser, 1993

Modern TeX and Its Applications
Michael Vulis
CRC Press, 1993
ISBN 0-8493-4431-X

TeX & LaTeX: Drawing & Literate Programming
Eitan M. Gurari
McGraw-Hill, 1994
ISBN 0-07-911616-7

LaTeX is the dominant macro package for general TeX use. It is easy to use, well-documented and produces very clean results. A recent version (LaTeX2e) integrates several years' worth of ad hoc additions and modifications into a clean, consistent release. Consequently, unless you have a good reason to use something else, you should probably be using LaTeX2e.

Michael Doob's TeX is a slim but tasty volume containing a nice selection of motivation, explanation and exercises (with answers!).

Because LaTeX2e is very new, only a few books have information on it. Fortunately, LaTeX2e is mostly an expansion of LaTeX, so the existing books will not lead you far astray. In the following notes, I will flag any books that cover LaTeX2e. By getting one or two of them, you can fill in any gaps left by the others.

A Guide to LaTeX is an expanded translation of Helmut Kopka's German language original, *LaTeX, eine Einführung*. It appears to be a substantial and thorough introduction to LaTeX, with a nice complement of examples. Although it does not cover LaTeX2e, it does spend some time on International LaTeX, the New Font Selection Scheme and other recent developments.

Leslie Lamport has updated his pleasant and readable introductory book, *LaTeX*, to cover the changes made in LaTeX2e. The second edition is perfect bound, rather than spiral bound, but there are few other substantive changes. I would strongly encourage any LaTeX user to have a copy of *LaTeX*. If you already have the first edition, however, you probably don't need to get the update.

The LaTeX Companion is *the* book to get if you are planning to move to LaTeX2e. The authors see it as a companion work to Lamport's *LaTeX*. It fills in many details missing in Lamport's introduction, including a great deal of information on using popular "style files."

Although I would like to see a new edition, I am still quite a fan of *LaTeX Concisely*. It covers most of the essential details of using LaTeX and doesn't waste a bit of the reader's time. If you want a jump start on using LaTeX, get this book.

LaTeX Notes bills itself as a "collection of proven tricks, techniques and recipes." I can't disagree, and I'm glad to have a copy of this slim volume. On the other hand, it is not a substitute for a real introductory or reference work on LaTeX.

Historically, the American Mathematical Society has requested that submissions be formatted using AMSTeX. Recently, however, they released AMS-LaTeX, which folds the needed AMS formats and features into a LaTeX base. *Math into TeX* looks like a well-written introduction to AMS-LaTeX. For convenience, it includes a floppy disk containing a copy of AMS-LaTeX.

Modern TeX and Its Applications is somewhat mislabeled. It is really a book about "Vector TeX" (VTeX), a commercial variant of TeX. If you are interested in the capabilities of VTeX, you'll need this book. Otherwise, I would pass it up.

TeX & LaTeX provides (on an included floppy disk) and introduces the (Al)DraTeX and (Al)ProTeX macro sets for LaTeX. The macro sets support drawing and literate programming (see below), respectively. They look like a lot of fun, and the book is full of intriguing illustrations and example code.

Intermediate Books

Writing with TeX
Eitan M. Gurari
McGraw-Hill, 1994
ISBN 0-07-025207-6

I wouldn't recommend *Writing with TeX* as a first book on TeX. It's a bit too cryptic and tries to cover too much ground. On the other hand, it looks like a wonderful reference into some of the more obscure corners of TeX. I'll certainly keep *my* copy handy!

Literate Programming

The CWEB System of Structured Documentation
Donald E. Knuth, Silvio Levy
Addison-Wesley, 1994
ISBN 0-201-57569-8

The Stanford GraphBase: A Platform for Combinatorical Computing
Donald E. Knuth
Addison-Wesley, 1993
ISBN 0-201-54275-7

Literate Programming
Donald E. Knuth
CSLI, 1992
ISBN 0-9370-7380-6

Donald Knuth is a polymath: He ventures into areas of learning, conquers them and moves on. He is also a good writer, though his books on computer science can be challenging, and I have very little patience for his penchant for describing algorithms in assembly language.

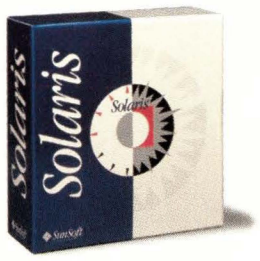
Knuth started on the TeX and Metafont effort as a way to get clean typesetting for his computer science texts. Along the way, he gave considerable thought to the problem of how computer programs can be constructed so that they can be read and understood, as well as run.

The results of this effort are known as "literate programming." *The CWEB System of Structured Documentation* describes the latest incarnation of the literate programming effort, applying Knuth's techniques to the C language. *Literate Programming*, in contrast, is a memoir of sorts, detailing some of Knuth's experiences in applying literate programming to substantial programming problems.

Although I have not yet become a convert to literate programming, I enjoyed the latter book tremendously. I consider the chapter on "The Errors of TeX" to be a classic study in enlightened error tracking and analysis.

The Stanford GraphBase provides dozens of examples of literate programming, coded in CWEB. It also provides a standard set of data and programs in the area of combinatorical computing (graphs, networks, etc.). ⊸

Richard Morin operates Prime Time Freeware (`ptf@cfcl.com`), which 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`.

Run 

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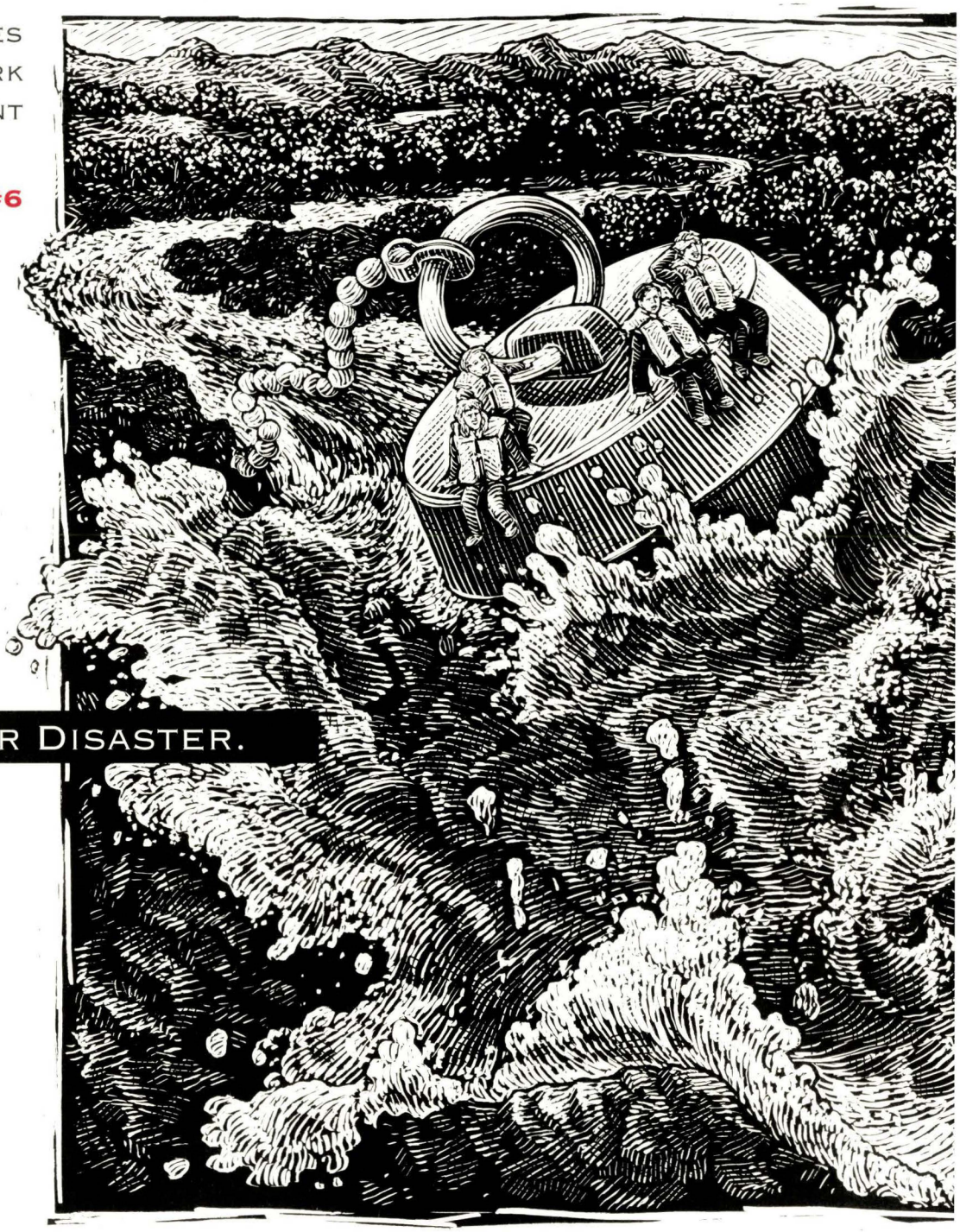
#6



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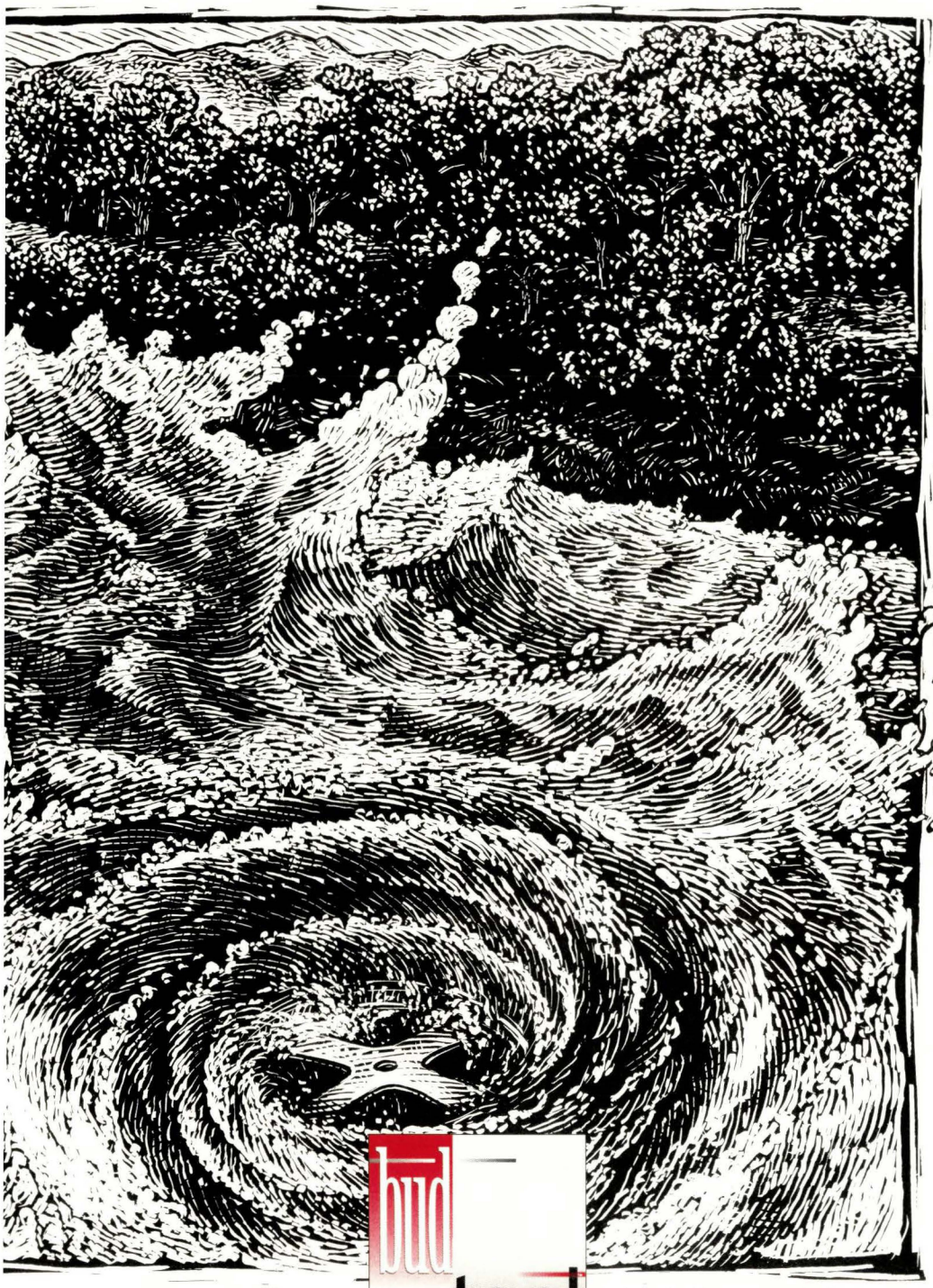

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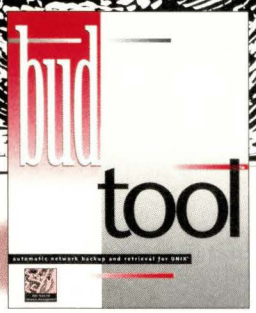

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Circle No. 15 on Inquiry Card

by S. LEE HENRY

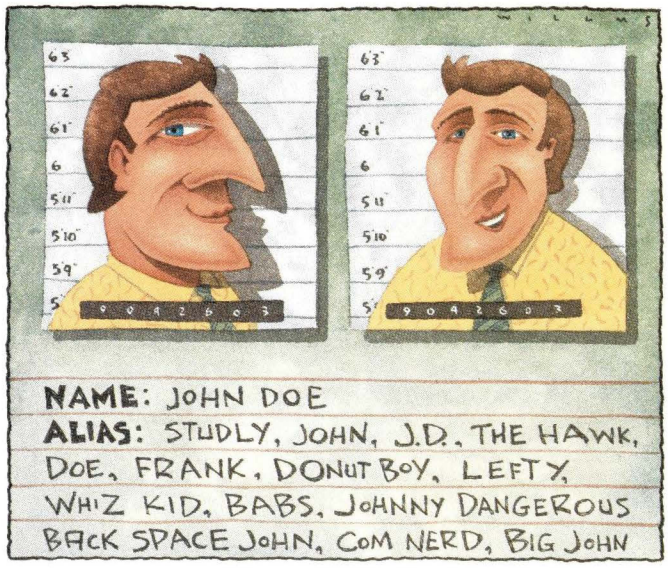
Managing Aliases

The process of managing mail aliases for an organization involves keeping on top of everyone's "comings and goings" as well as making sure your users understand how to address their email. Here are some tools and tips for keeping mail bouncing to a minimum.

Why Email Addressing Is Confusing

I used to have problems remembering my own phone number. Simple enough to understand–I never call myself. After several dozen people gave me that "Are you on drugs or something?" look, however, I quickly learned the number and now know it well.

In similar fashion, many of the people that you support may not know the best email address to give out–when to use just their login name and when to qualify it with some part or all of their host-qualified address. They don't send mail to themselves. Sooner or later, though, they'll be asked for their address by friends and colleagues who want to send them mail.



Knowing what address to use can be difficult and confusing in a multivendor network where not all systems are running NIS and where a person's mail file is stored on a different system than the one where they log in. If your organization has multiple domains, and secretaries and computer nerds maintaining their own aliases, you might indeed have any number of mail aliases for the same person, each of which works for different users on different systems.

Let's say that John Doe has an account on a Sun system named `confuse`. His mail directory, however, is NFS-mounted from a system called `profuse`. His login name is `doe`. When someone down the hall wants to send mail to John, he may be able to address it simply to `doe`. Somebody upstairs is complaining that unless she uses the address `doe@confuse`, the mail bounces back with an "unknown user" message. When John's sister, Jane Doe, who works for an international law firm, tries to send her brother a document, she sends the message to `doe@whatever.com`, and it gets there just fine. Poor John isn't sure when he needs to include `confuse` in the address and when he doesn't. He also isn't real sure where his mail file is or whether `doe@confuse` and `doe@profuse` are both him. He's also very miffed when he logs into `refuse` and his mail is gone.

How Addressing Works

Let's step back a minute and look at how addressing works. Obviously, an email address has both a local (user) part and a domain (host/network) part.

```
doe@confuse.whatever.com
```

In this example, `doe` represents the local (user) part and `whatever.com` is the host/network part or the location of the mailbox.

The local part is all that is required for local users, and users defined in the local `/etc/aliases` file or the aliases NIS map, through which the simple form of an address is

RUSS WILLMS

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replaced with a complete and fully qualified address (e.g., `slee@diffuse.whatever.com`).

The domain part may be an actual hostname where sendmail will try to deliver the mail. Or it may be the name of a mail domain for which a host provides mail exchange services, receiving mail for the domain and forwarding, when necessary, to other hosts.

It is almost impossible to guess a person's mailbox name unless your site follows a good naming convention. One increasingly popular convention is to take the full name, with dot-separated parts, and make this into an alias. So since you know that I'm S. Lee Henry, you can try sending mail to me as `S.Lee.Henry`. It's also helpful if you don't want to have to guess a machine name. Sites that support addressing by domain provide a much easier way for outsiders to get mail to the intended recipients. If you mail to `slee@jhu.edu`, your mail will bounce or go to the wrong person. Mail sent to `slee@pha.jhu.edu` or `S.Lee.Henry@pha.jhu.edu`, on the other hand, will reach me. A lot of mail gets "lost" because it is too easy to assume that a user's username will be his or her last name or a first initial and last name combination.

Figure 1. add.alias Script

```
#!/bin/csh
#       add.alias
#
echo -n "User's full name> "
set FULLNAME = $<
set DOTNAME = `echo $FULLNAME | tr " " "." | tr -s "" "."`
echo $DOTNAME
echo -n "User's username> "
set USERNAME = $<
echo -n "Mail server> "
set MAILHOME = $<
set EXISTS = `grep ^$USERNAME":" /etc/aliases`
if ("$EXISTS" != "") then
        echo "Username already exists in /etc/aliases"
        echo "=> " $EXISTS
else
        echo "Adding to /etc/aliases..."
        echo "#" >> /etc/aliases
        echo $DOTNAME":"$USERNAME"@"$MAILHOME >> /etc/aliases
        echo $USERNAME":"$USERNAME"@"$MAILHOME >> /etc/aliases
        cd /var/yp;make aliases
endif
```

Turning full names into this dot convention is a cinch with the `tr` (translate) command. Below, we change spaces to dots, and then squeeze multiple dots down to a single dot.

```
echo S. Lee Henry | tr " " "." | tr -s "" "."
S.Lee.Henry
```

Group aliases give a name to a group of users so that mailing to a number of people at once can be done easily. Groupnames should be simple and meaningful, but you should make sure that they do not conflict with usernames. Be careful that you not set up an alias DOE for those guys working on that hush-hush Department of Energy project; NIS will think DOE and doe are the same.

There are a number of users that should be defined on every system. Here is a list of useful ones:

postmaster
MAILER-DAEMON (usually set to postmaster)
info
system
help

The `info@whatever.com` convention is also becoming fairly standard for organizations that want you to be able to ask about their products.

You can usually count on finding the address in the Return-Path line of an incoming message to send mail back to that person or use the reply function. However, this is not always the case. How the sending host is represented in an outgoing message is determined by its sendmail configuration file, `/etc/sendmail.cf`.

A BSD sendmail does a `gethostname` system call and picks up the local host's name, which it then assigns to a variable called `$w`. This may not be included correctly in the sendmail configuration file, and mail may go out with only the username. When you reply to a message that includes only the sender name in the Return-Path line, sendmail assumes your intended recipient is local and, likely, the mail will bounce back to you right away.

Figure 2. mk_alias awk Script

```
#
BEGIN { print GROUPNAME }
{
if ($1 != "lost+found")
    if (LIST == "")
        LIST = $1
    else
        LIST = LIST","$1
}
END { print GROUPNAME": " LIST }
```

Creating Aliases

Helping users understand their own addresses and how to compose addresses for other users will certainly reduce the number of bounced mail messages and the degree of frustration that your users feel.

Managing user and group aliases will also greatly simplify distribution of email and may even be possible if you

- find out when people arrive and where their mail should go
- find out when people leave
- are able to distribute aliases to other systems or maintain them all from a single host on your network.

It also helps to have

- a quick way to add/remove users from individual and group aliases
- a quick way to create new aliases from a list of users
- a reliable way to distribute alias lists.

I provide a couple of scripts in Figures 1 and 2. Figure 1 shows a shell script for defining mail aliases in both the dot convention and in the simple `user@host` form as shown below.

```
#
John.R.Doe:doe@confuse
doe:doe@confuse
```

Figure 2 shows a simple `awk` script for taking a list of users and creating a mail alias from it. The output from the script and an example of how to use it is shown here. Notice that we are passing the group name as a parameter to `awk`.

```
diffuse# ls /export/home | awk -f mk_alias
GROUPNAME="CONFUSE"
CONFUSE: adams,allex,berry,brian,chadd,doe,slee
```

Keep in mind that there is an alternate way to define group aliases via the `/etc/aliases` file. The line:

```
students: :include:/etc/students
```

defines a list of users that is read in when the alias "students" is used. The benefit of this way of creating an alias is that any ordinary user can maintain the list. The disadvantage is that it is not distributed by NIS. Unless the `/etc/students` file exists on a host that can access the "students" alias in the aliases map, students will be an unknown user.

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@cpg.com`.

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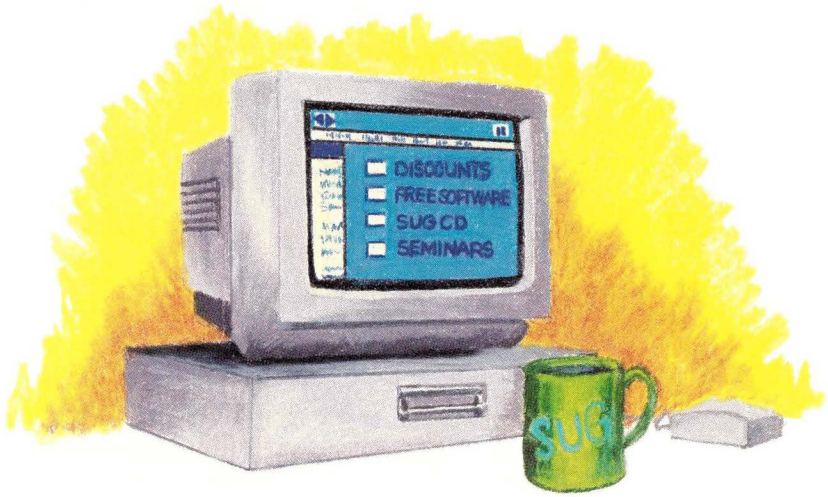
Circle No. 20 on Inquiry Card

by ALEX NEWMAN

Ask Not...

One of the questions I face daily as executive director of the Sun User Group is, "Why should I join SUG? What can it do for me?" After all, this is the Silicon Age, and there are a dozen good ways to communicate with people without having to deal with them face to face: fax, telephone, email, IRC, FTP and videoconferencing, to name a few. So why do people insist on spending hundreds of dollars to attend conferences and workshops, or dozens of hours to make it to their local user group meetings? Just who needs a Sun/SPARC user group anyway? Well–*you* do.



If you're reading this, you're interested in what's going on in the Sun/SPARC community–whether the activity is in Palo Alto or at the next terminal. You want to get the most from your machine of choice, and the most out of yourself. And to do that, you want to get the most out of any organization you're affiliated with.

The Sun User Group (SUG) brings people together to share information and ideas about using Sun equipment. You can discover new ways to save time and money in the pages of *Readme*. You can get quick answers to specific questions on our electronic mailing list. By attending SUG seminars, you can learn more about the capabilities of your workstation. At our conferences, you can meet other people who are doing innovative work with their Sun equipment.

Like any user group, SUG provides discounts (e.g., on books from technical publishers such as Addison-Wesley Publishing Co. and Prentice-Hall and software from Cybersoft Inc., Dux Software Corp. and others), a newsletter and a range of other goodies. We also bring people together through Local User Groups (LUGs) scattered throughout the world. Currently, there are LUGs in 25 states and 15 countries. The Sun User Group supports these local groups with listings, literature, an electronic mailing list and organizational assistance. SUG works closely with the local groups to help meet the needs of the entire Sun/SPARC community. If you are a Sun User Group member and are interested in finding the LUG in your area, or if you would like to start a LUG, contact SUG at (617) 232-0514 or via email at `office@sug.org`.

The Security CD

The question "What can you do for me?" is frequently followed by, "Yeah...well what have you done for me lately?"

SUG is always looking for ways to increase our benefits and services, as well as ways to improve existing products and projects. In November, we had our first technical symposium in three years and introduced our first specialized software library.

In my last column, I discussed some of the risks associated with UNIX and the Internet, as well as some of the people who exploit those risks ("The Information Superboogeyman," *SunExpert*,

JOHN W. KELLEY JR.

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Circle No. 12 on Inquiry Card

October 1994, Page 42). SUG's "UNIX & The Law" symposium was an effort to educate people about those risks and what can be done to minimize them. Of course, not everyone could attend the symposium, so we decided to bring the symposium, in part, to our members. In the Sun User Group's Security CD-ROM, editor Joseph Pietras combined some of the talks with many of the tools presented at the symposium to create a valuable resource for any security-minded systems administrator.

The Security CD-ROM is valuable for another reason, as well. When we were first designing it, we faced a tough question. While a lot of our members have made the change to Solaris, many haven't. Since we like our CDs to be plug-and-play (that is, containing source code and binaries), how were we going to make the disk useful to as many people as possible? The answer was simultaneously simple and complicated: We put binaries for both operating systems on the CD.

Some of the highlights include tcp-wrapper, the COPS package, TIS' Firewall toolkit, Tripwire, Swatch, Trojan, Zap, patches for Solaris 2.2 and 2.3, and the proceedings from the "UNIX & The Law" symposium. A complete listing is available by contacting the Sun User Group office.

Advanced Solaris Systems Administration

In February 1995, we'll offer the best tutorial for Solaris systems administrators in the industry. The Sun User Group has a long tradition of providing informative and timely tutorials as part of our technical conferences. That expertise went into developing our program of intensive one-day seminars taught around the country.

We offered this course, Advanced Solaris System Administration, in March 1994 and, to date, it remains our most popular seminar. Its first run sold out in weeks, despite the added sessions, so we're pleased to be offering it again. The tutorial is designed to meet the needs of the systems administrator who has experience in managing systems but has not had extensive experience with Solaris 2.x. Areas of focus include differences between Solaris 2.x

SUG Footnotes

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Circle No. 14 on Inquiry Card

and older operating systems, and migrating from those older operating systems to Solaris. The course also includes details of Solaris 2.4.

A complete registration package is available from the user group offices, but here's some of what is covered: Installation and Configuration of Solaris 2.x, Managing Solaris 2.3, NIS+, Kernel Configuration, Networking, Tools, Performance and Security.

The course is taught by SUG's Peter Galvin. Peter is systems manager for Brown University's Computer Science Department and a member of the board of directors of the Sun User Group.

The Board of Directors

November saw our annual elections come to a close. Four candidates were running for three seats on SUG's board of directors. Each director holds office for three years, and this year's candidates were running to fill the seats vacated by Stan Hanks, S. Lee Henry (who is running for reelection) and Barry Shein. The four candidates were: S. Lee Henry (Johns Hopkins University), John McLaughlin (Sun Microsystems), John Mangrich (University of California, Irvine) and Rick Thomas (Rutgers University). The user group is grateful to all the candidates who ran, and I'd like to encourage those who didn't make it onto the board this year to try again next year. Having more qualified people than open seats is a problem I'd like to be faced with every election.

This December marks the last board meeting for longtime board members Stan Hanks and Barry Shein, who were instrumental in making the group what it is today. In addition to serving as board members, both men served as officers of the group, Hanks as president for the past two terms, and Shein as treasurer. I'd like to say thank you to both Stan and Barry for all of their contributions to SUG over the years. You'll both be missed.

Looking forward, the user group would like to welcome John McLaughlin and John Mangrich to the board and welcome back S. Lee Henry for her second term. John Mangrich manages the Response Center of the Office of Academic Computing at the University of California at Irvine, and is a member of the steering committee of the Orange County Sun User Group. John McLaughlin is familiar to many of you because he is the editor and publisher of *SunFlash*, an electronic journal for users of Sun computers. S. Lee Henry, of course, has been conference chair for the SUG annual conference, a tutor and is a contributor to a variety of technical journals–including *SunExpert* and the user group's magazine, *Readme*. ⊸

Alex Newman (troll@sug.org) is the executive director of the Sun User Group and was conference chair for the "UNIX & The Law" symposium. He is currently working on a book on the history of computer crime.

Circle No. 18 on Inquiry Card

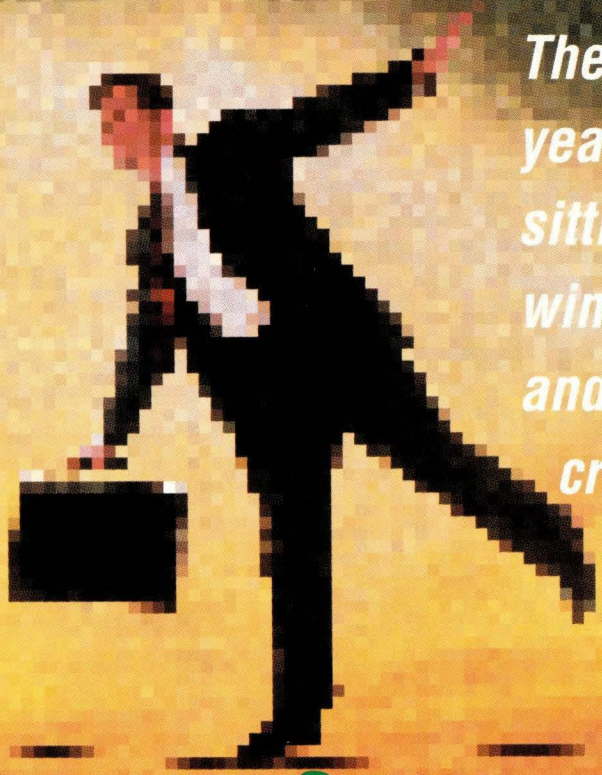
The State of the

Sun Microsystems Inc. ends 1994 as a happy, healthy and prosperous computer maker. Once again, it has confronted, and confounded, predictions that it was about to "hit the wall." Once again, the long-foretold threat from Pentium-based PCs running NT failed to materialize. Once again, the much-publicized shortcomings of its processor and operating system did not lessen the appeal of its products' price/performance ratios.

But where does this healthy, happy, prosperous Sun go from here? For that matter, is today's corporation even the same Sun it was before?

Silver Bullets, Missed Ears

Like all companies, and particularly companies in high tech, Sun has had its ups and downs. However, Sun hit more straightaways than glitches in 1994. (For a fuller picture of Sun's recent financial history,



The end of the year finds Sun sitting pretty, winning friends and wowing the critics. But where does it go from here?

Company

see "Financially Sun," by Senior Editor Simson L. Garfinkel, Page 47).

For a quick glimpse of just how well the company is doing, consider its fourth-quarter numbers. Revenues were $1.4 billion, up from the $1.26 billion reported for the corresponding period a year ago. Also in the fourth quarter, Sun reported record net income of $77.9 million, or $0.82 per share. That compares with $76.1 million, or $0.72 per share, for the corresponding period last year.

---

by MICHAEL JAY TUCKER, Executive Editor

UNIPHOTO

For the quarter, Sun also says it shipped 82,000 systems, and SunSoft distributed 111,000 Solaris/UNIX licenses.

Any company would be happy with those figures. Computer vendors–many of whom are posting record losses–would be delirious. And the usually critical market and industry analysts are impressed. Even industry gadfly William F. Zachmann, president of Canopus Research, in Duxbury, MA–the man who once jokingly called RISC "another bubble memory" in comparison with the mountains of CISC processors being shipped–now says that Sun doesn't look that bad. "Sun is always in a position where you can look at them and see plenty to worry about," he says. "But they keep rolling in those great numbers."

What accounts for Sun's continued success? Partly, it's the company's traditional strength of providing a good, middle-of-the-road product at an affordable price. "Sun has distinguished itself by delivering a product that basically does the job," says Zachmann.

But then there's Microsoft Corp., the Redmond, WA, software giant. In 1994, Microsoft inadvertently helped Sun by failing to provide an NT that was a viable alternative to UNIX. "It was thought that a Pentium-based machine running NT was going to have a lot of the capabilities of a Sun system," says John R. Logan, executive vice president of the Aberdeen Group Inc., a Boston-based consulting firm. "But now, that's basically just gone by the wayside."

Whatever the fate of Solaris x86, SunSoft is emerging as the Jupiter in Sun's "solar system" of semi-independent operating companies.

The critics had thought Sun was going to perish from NT. But, says Logan, "the silver bullet passed by Sun's ear."

Furthermore, NT's advertising had whetted users' appetites for a multitasking, multiuser, networked technology. "The buyers can't wait, and Microsoft has lost its credibility," says Logan. Sun is happy to step in and pick up where Microsoft left off.

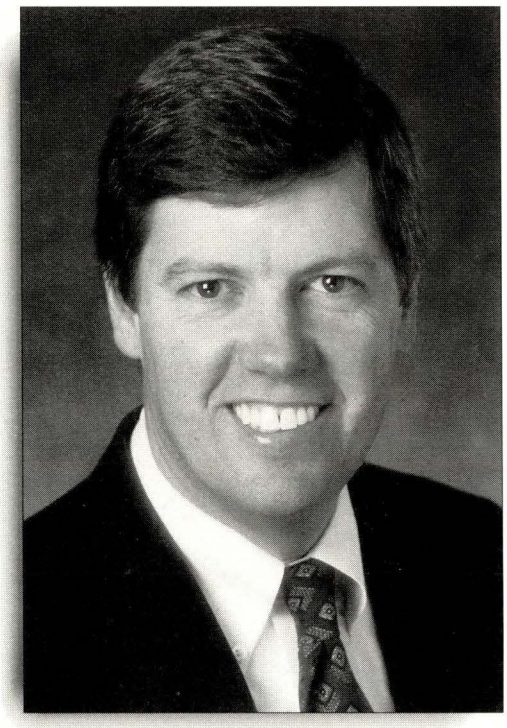
In addition, Sun has recently enhanced several of its more strategic offerings. Its processor family now includes UltraSPARC, a 64-bit version of the CPU, which will keep the company's machines competitive with the PowerPC and Alpha. The UltraSPARC's operating system, Solaris, still rankles some users (who much preferred the BSD-derived SunOS), but it is slowly being accepted. "In the last six months, there have been signs that [users] are over the dilemma of the transition to Solaris 2.x," explains Dominic Ricchetti, director of the advanced desktops group of market research firm Dataquest Inc., in San Jose, CA. "They've won the hearts and minds of the developers."

Solaris is, in fact, under the jurisdiction of SunSoft, the Sun "planet" responsible for almost everything to do with Sun's software. Solaris 2.4 is already winning converts. However, this is not to say SunSoft has everything going its way. The company stubbornly continues to promote Solaris as an operating system for Intel processors. And, with equal stubbornness, the market continues to decline the offer.

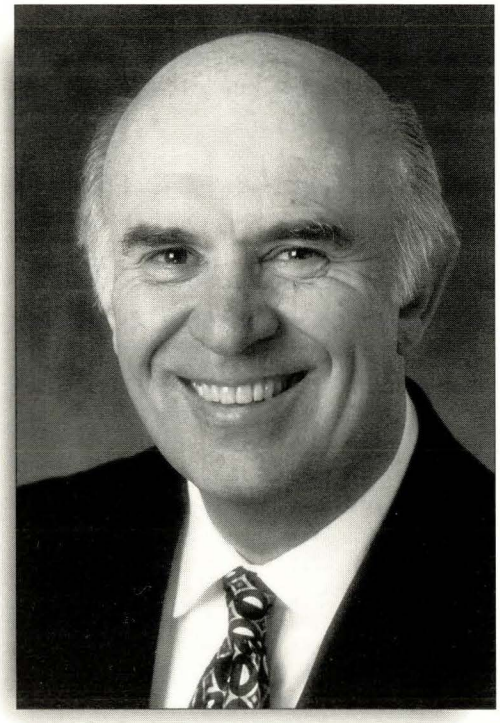
Still, whatever the fate of Solaris x86, SunSoft is emerging as the Jupiter in Sun's "solar system" of semi-independent operating companies.

"Do you want to know the single most important thing that Sun did all year?" asks Mary Hubley, associate managing analyst of research firm Datapro, in Delran, NJ. "It was when they combined all those operating units back together. Before, you had Sun-this, Sun-that and Sun-the-other-thing. Now, you just have SunSoft, and everyone knows where to go for what."

There have also been changes on Sun's hardware side. Early this year, for instance, J. Phillip Samper became president of Sun Microsystems Computer Corp. (SMCC), reporting directly to Scott McNealy. Samper had previously been at Eastman Kodak Co., most recently as vice chairman, and is widely viewed as a solid businessman. Public relations people gushingly describe him as "the man best able to lead SMCC away from



Scott McNealy, Sun's chief executive officer, finds himself at the head of a company that is well-positioned, well-funded and highly aggressive. The question he faces, however, is whether Sun can continue to win customers in the commercial sector, and how Sun's customer base in the scientific and technical markets will react to those changes.



J. Phillip Samper is the newly named president of Sun Microsystems Computer Corp., Sun's hardware arm. A former Kodak executive, Samper is described as a solid businessman, eager to make Sun a business computing company.

being just a provider of the hottest to being a real corporate computing vendor."

Good Margins in Big Boxes

There's another reason for Sun's excellent year-end numbers. There are good margins to be had in server products, and Sun is increasingly selling them. "But a large part of that is in the machines," says Alex Newman, executive director of the Sun User Group, in Brookline, MA. "The machines they're selling are more expensive."

Similar words come from Dataquest's Ricchetti. "[Sun managers] are trying to improve their revenue by expanding their server products," he says. Moreover, he notes, those servers are going into "commercial settings."

Quite simply, Sun is moving fast to provide commercial computing, at least at the departmental level, if not in the MIS glass house. Notes Aberdeen's Logan, "It's now being taken seriously in the commercial marketplace. It's seen as a supplier that can be trusted. Quite frankly, that is a big change for Sun."

Logan sees Sun scoring particularly high with its database-oriented servers and clusters. "[Sun is] riding the wave of the demand for relational database technology," he says. "All the RDBMSs are growing, and it is one of the leading RDBMS platforms. The rising tide raises all ships, and Sun is being raised."

That's good news for Sun, which has been trying to break into mainstream commercial computing since the late 1980s. But is it good news for Sun's users? After all, the company has grown from the scientific and technical markets. Significant percentages of its customers are still in those markets. What does Sun's role as a commercial computer company mean for it?

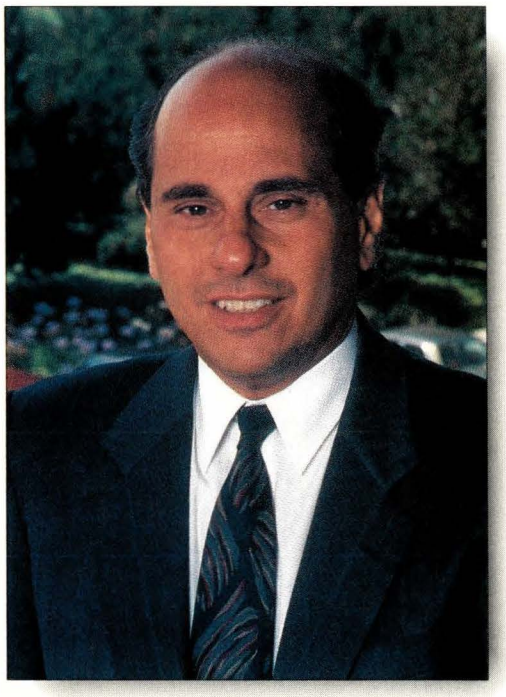
Night Call from a Distant Time Zone

Even while reporting Sun's successes–the new systems, the new users, the new customer sites with thousands or even millions of Sun nodes–you don't have to look far to find unsettled Sun customers. And almost all of them are in the scientific or technical markets.

Consider, for example, Harvard University, in Cambridge, MA. "We must have 800 Suns at the university," says Robert Kuhn, who is now director of information technology at Radcliffe College, but who, until recently, performed a similar function for Harvard's math department.

Kuhn, who notes that he speaks only for himself and not for the university, says he likes working with Sun. The company has "been very good for me," he says. He was involved in various programs with Sun that explored innovative ways for educational institutions to buy software. At one time, he considered his Sun representative almost a coworker. "We had a salesperson who was very, very good and very responsible," he notes. "One felt that he was working for Harvard as well as for Sun."

But then things began to change. The salesman went elsewhere. As Sun broke up into planets, Harvard began to experience problems with the relationship. "I think planetization was a communications disaster," says Kuhn. "We felt that things were odd. It was hard to get answers to questions." Pricing on software sales to schools was restructured, so it was more difficult for Harvard to buy. "Sun has begun to move to



Edward Zander is president of SunSoft, Sun's software-oriented planet and one of Sun's largest subdivisions. His organization led the transition to Solaris 2.x from SunOS, but it continues to face stiff resistance to its efforts to promote Solaris x86.

something much more like DEC had," Kuhn notes. That "something" was requiring the school to purchase individual licenses for some of its software. "And individual licenses can be a real pain in a large environment."

As Sun moved from SunOS to Solaris 2.x, Kuhn found that he was forced to work with an operating system that made far less sense than the old. "In some ways," he says, "I think they had the better UNIX before." And, moreover, he began to have some concerns about the SPARC processor's ability to keep up with its rivals.

Still, Kuhn remains a Sun customer, and he says he prefers Sun to the alternatives. "I still, albeit a little grudgingly, prefer to deal with them," he says. But he also worries that the company has lost touch with users like himself. "I think they're trying to have their cake and eat it, too." Sun, he says, wants to keep technical users, but those users are not "a large market. And the commercial market looks so much more lucrative."

No Small Sites

Is Sun abandoning the technical user, the individual who formed Sun's business in the first place?

"Sun has partially abandoned them," says SUG's Newman. "The scientific/technical market is on a much tighter budget [than commercial sites]. Sun simply doesn't seem to be interested in those small sites–and by small, that's to say sites that spend less than half a million dollars a year on equipment.

"In 10 years, if Sun does its job right," Newman continues, "no one is going to know or care that Sun once serviced the educational [i.e., scientific and technical] markets." Instead, the company will be "the provider of the workhorse computers of the business world."

Can Sun really make that sort of transition? History has not been kind to computer makers that have tried to make the jump from the lab to the glass house. Digital Equipment Corp., for instance, also lusted after the commercial site and now fights for its life in the middle of reorganizations, abandoned products and lost divisions.

"Well," says Newman, "hopefully the people at the top of Sun will learn from DEC's example."

Dataquest's Ricchetti is less sanguine. "If they remain positioned as they are today," he notes, "they're vulnerable."

Sun enters 1995 as a well-positioned, well-funded and highly aggressive organization that knows what it wants and how it intends to get there.

Datapro's Hubley, meanwhile, thinks that Sun should seriously reconsider its commitment to the technical market, which she calls Sun's best "niche" market. "There is a danger in losing a niche market," she notes. "You may need it someday. And Sun may need its niche market to fall back on if ever the commercial world decides it doesn't like UNIX any more."

The Aberdeen Group's Logan agrees. "Now that they've got their commercial group hitting on all cylinders, they need to look at their roots, and give them a refresh."

Something Right

Does Sun need a refresh? "[Logan's] absolutely right," says Vicki Brown, director of technical systems marketing at SMCC. Ten months ago, former IDC analyst Brown was recruited by Sun as a director of entry desktop product marketing. Her title has recently changed to reflect the technical market.

Brown acknowledges that there are problems with Sun's relationship with its traditional users. "I'll be frank," she says. "We really did not do a good job in making sure we were competitive." In particular, she cites concerns about SPARC's ability to keep up with other RISC architectures. "We're fixing that," she says–via UltraSPARC.

In addition, Brown says, "we did not do a good job of talking to people about what we're doing in the technical market." She acknowledges that the company has allowed its technical users to feel a little ignored. "Our customers have said, 'Gee, I haven't heard Sun talking about anything but the commercial markets for a long time now. I wonder if they're still interested in the technical world.'"

Brown says that her job is designed to mend a few fences with Sun's traditional customers. "That's why I'm here," she says.

Brown also views Sun as being in both camps–a supplier of both technical computing and commercial solutions, much like Sun's chief rival, Hewlett-Packard Co. "It's important that Sun does both," she says.

SUG's Newman, though, isn't so sure that Sun can maintain itself in both markets. "Sun sees itself as being all companies to all men," he notes. "They can't go that route much further. I think they're going to have to abandon something."

Still, if anyone can make the leap from engineering desktops to MIS, it is Sun. The company enters 1995 as a well-positioned, well-funded and highly aggressive organization that knows what it wants and how it intends to get there.

The company faces challenges, of course. Even as this issue of *SunExpert* goes to press, more grim rumors about the company are making the rounds. Articles in the Wall Street press have cited lost sales to HP and IBM Corp. and foretold hard times to come.

"Every year, they face new challenges," says Canopus Research's Zachmann. "And every year, they do a solid chunk of business. They've gotta be doing something right." ⊸

Financially Sun

Although Sun Microsystems Inc. had a profitable bottom line in 1994, its SuperSPARC technology base continued to slip against the onslaught of high-end challengers Digital Equipment Corp. and Hewlett-Packard Co. and, at the lower end, the PowerPC alliance and even Intel Corp. Next year promises to be a new ball game, however, as Sun unveils its UltraSPARC while it continues to consolidate its base as the leading supplier of UNIX workstations.

Sun is now 14 years old and has been profitable for the last 12. The company's annual revenue for 1994 rose to $4.7 billion, a 9% increase over last year. Sun's income increased by 25% to $196 million ($2.02 per share). Sun stock earns 12% (up from 10% in 1993), based on the year's $17.35 average stock sale price (up from $16.09), although the company pays no cash dividends on its stock. (The company cannot pay cash dividends without the consent of its lenders.) Sun closed the 1994 year with 13,282 employees, just 29 more than year-end 1993. The company has $850 million in cash on hand. *Fortune* magazine ranks Sun number 337 on its "Fortune Global 500."

by SIMSON L. GARFINKEL, Senior Editor

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S. Henry Sacks

S. Henry Sacks
Publisher

Nevertheless, says Jeffrey Canin, a technology analyst at New York-based stockbrokers Salomon Brothers Inc., Sun's 1994 performance fell short of what the company expected. "They were looking for a growth of about twice as much. I think you could say that their top line was 10% short of what they were expecting."

Sun's UltraSPARC promises to make the company competitive once again in the world of high-performance desktop computing.

"One of the positive attributes of Sun's past financial management is that they have kept a tight rein on expenses," adds Canin, noting that Sun's biggest rivals, IBM Corp. and DEC, have suffered major layoffs during the past few years.

Hardware

Investors have been encouraged by Sun's strong sales of its major new hardware products, especially the SPARCstation 5 and 20 machines. In the fourth quarter, Sun's net bookings (machines that have been ordered) increased by 40% to a record level of more than $1.5 billion. "In addition, Sun's server line continued to show excellent gains with particularly good momentum seen for the company's SPARCserver 1000," reads a Merrill Lynch report on the company. Merrill Lynch predicts good sales for Sun's new 85-MHz SPARCstation 5 series machines. "Sun's backlog stood at $337.8 million, approximately double the level of the prior year," the report adds.

While Sun's top-of-the-line performance continues to lag behind rivals HP and DEC, its multiprocessor systems are making strong inroads into the commercial markets, where raw speed is less important than software availability, reliability, service reputation and price. Salomon Brothers' Canin estimates that roughly 15% to 20% of Sun's income comes from servers for the commercial market. "That number will probably go up to 25% to 30% over the next couple years," he says.

But despite the strong commercial showing, says Canin, Sun should accept the fact that "the battle for the commercial desktop has already been won by Intel and Microsoft." Canin doubts many commercial accounts will be interested in putting SPARC-based workstations on their desks unless those computers are running Microsoft's Windows NT operating system. "There is a big pill that they will have to swallow. They are going to have to...do everything in their power to encourage Microsoft to consider porting the NT operating system to SPARC." There was talk of a preliminary porting effort "by Intergraph, of all places" says Canin, but that effort has been disbanded.

"Microsoft is a factor that can't be ignored. Some of the very cavalier statements that the Sun management team has made vis-à-vis Microsoft have damaged a potential relationship between the two companies," says Canin, although he does not think that the relationship is "beyond salvage."

UltraSPARC

Sun's UltraSPARC promises to make the company competitive once again in the world of high-performance desktop computing. The single-chip microprocessor, expected to be shipping in volume by third-quarter 1995, is projected to be a 167-MHz superscalar part issuing as many as four instructions per cycle. UltraSPARC will feature a 64-bit design implementing the full SPARC Version 9 architecture and will include many instructions specially designed for graphics and multimedia applications. The chip will be fabricated by Austin-based Texas Instruments Inc.

The UltraSPARC chip will include two 16-KB on-board caches (one for instruction, one for data), which are

smaller than Sun's current SuperSPARC devices. To make up for the small on-chip cache, UltraSPARC will connect to a high-speed, off-chip SRAM cache, which will boost both performance and overall system cost accordingly. External cache size can range from 512 KB to 4 MB.

"The design avoids SuperSPARC's fatal flaws, but it remains to be seen whether Sun can deliver on its promise and turn a paper tiger into a real man-eater," writes Linley Gwennap, editor of *Microprocessor Report*, the microprocessor industry's most respected newsletter.

Sun is going to have a challenging time making inroads to mainstream desktop environments.

Sun claims that UltraSPARC will deliver 275 SPECint92 and 305 SPECfp92 at 167 MHz, making the chip 20% slower than DEC's 21164 Alpha, but placing it roughly on par with next year's MIPS, PA-RISC and PowerPC offerings. Sun expects that UltraSPARC will be able to decode MPEG-2 video at 30 frames per second, allowing the company to build desktop video and conferencing equipment with little or no additional hardware. UltraSPARC will also offer "glueless multiprocessor capability," says Gwennap, allowing Sun to offer low-cost MP upgrades for its UltraSPARC-based systems.

"If Sun can deliver on its promise, it spells bad news for other workstation vendors," concludes Gwennap. "But if UltraSPARC's performance is significantly below target, the SPARC chip could get gobbled up by Intel's P6."

"I think that the company has headed in the right direction," says George Elling, first vice president at Merrill Lynch. "They are working on UltraSPARC, and that will put them back, from a competitive standpoint, on a more level playing field."

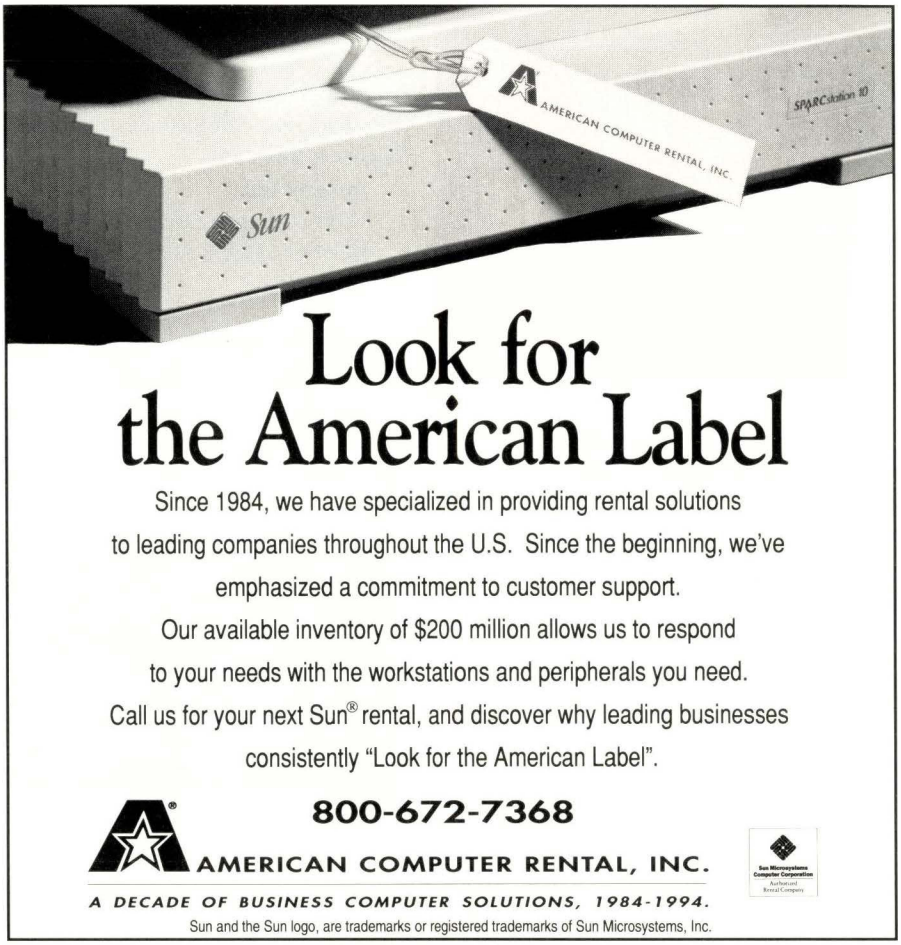
Nevertheless, Sun's recent history with SuperSPARC–promising a high-performance microprocessor but being unable to deliver on performance claims–might make one take the company's figures with a grain of salt until prototype systems are demonstrated.

Solaris

Meanwhile, Sun's Solaris operating system continues to make inroads on the commercial UNIX market and, perhaps more importantly, on Sun's own SunOS installed base. Solaris captured 26.8% of the worldwide UNIX market in calendar year 1993, according to International Data Corp., a market research firm in Framingham, MA. According to Sun, more than 9,300 third-party software and hardware products are now available for SPARC, although less than a third of the software products have been ported to Solaris for Intel.

One of Sun's potential problems, Elling says, is that its low-end products are "bumping heads with high-end Pentiums." With next year's debut of Windows95 from Microsoft, an even stronger Windows NT and even faster Pentium processors, Sun is going to have a challenging time making inroads to mainstream desktop environments. That spells continued trouble for Solaris running on Intel processors.

Analysts also applaud Sun's consolidation of various Sun planets under the SunSoft umbrella. "I think that the initial planetary structure was more of an asteroid belt," says Canin. Now the company needs to create better brand identification for its various parts and needs to work harder at establishing SPARC as an industry microprocessor apart from Sun. "They have announced and continue to promote SPARC, but you haven't the sense that the entire company is behind it." For example, says Canin, "Sun does not allow resellers to carry non-Sun clones, and that is a challenge" to the idea of openness.



Circle No. 1 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.

SPARC-Based High-Availability Server

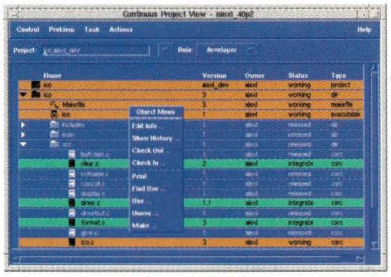
A high-availability server based on the SPARC processor has been introduced by Integrix. Called the HA1000, the device consists of two complete systems–each with its own motherboard, power supply and storage. In the event of a failure, the surviving half of the system can carry on.

The HA1000 is based on a SPARCstation 20-compatible design, Integrix's own SWS20 multiprocessing system. It comes in a 12- by 20- by 21-inch enclosure and can be used as a stand-alone device, or fit into a 19-inch rack. Pricing on an HA1000, with software, chassis, dual power supply and two SWS20 main boards, begins at $24,995.

Integrix Inc.
1200 Lawrence Drive, Ste. 150
Newbury Park CA 91320-1316
Circle 101

Configuration Management Tools

The former CaseWare Inc., now Continuus Software, has announced Continuus 4.0, a configuration management and code development tool suite. It enables developers and teams of developers to manage change tracking, task management, code development tasks, testing, documentation and maintenance.



In addition, the product provides facilities to handle geographically dispersed development centers and to incorporate code purchased from third parties into an organization's ongoing product. Continuus 4.0 can be used with the company's Team Engineering product suite for software developers. Pricing begins at $4,000.

Continuus Software Corp.
108 Pacifica
Irvine, CA 92718
Circle 102

Sybase Service Soars

RDBMS vendor Sybase has announced expanded customer service and support programs. Collectively called SupportPlus, the service comes in four plans: Standard, Advantage, Preferred and Desk Top.

Standard provides telephone support during the work day, access to a BBS, CD-ROM-based reference systems and early access to new maintenance

Photo Retoucher

ISTR is now shipping the Magic Inkwell, a photo retouching program usable on any SPARC SX platform running Solaris 2.3 or higher. With it, the user can alter and retouch color or black and white scanned images to create original artwork. The company says the product differs from products such as Adobe Photoshop in that it was designed to work in UNIX and Sun environments rather than being ported from a competing platform. The company is now offering Magic Inkwell at a one-time price of $399.

ISTR Inc.
360 Delaware Ave.
Ste. 300
Buffalo, NY 14202-1610
Circle 100

nance programs. Advantage offers all the features of Standard but on a 24-hour, seven-day-a-week basis.

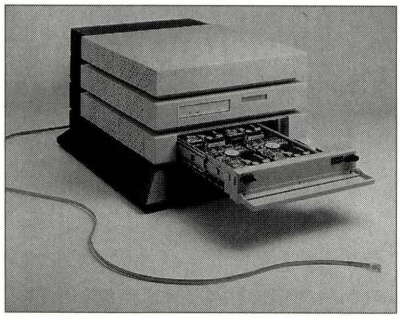
Preferred offers all the features of Advantage, plus the attention of a designated field account manager from Sybase and a variety of other enhancements. Desk Top, finally, is described as a low-cost option for small installations. It provides telephone hot line support, software maintenance and access to a BBS.

Pricing on the programs is based on a percentage of the list price for the Sybase software at the customer's site. This is 16% for the Standard plan, 18% for the Advantage plan and 22% for the Preferred plan. Desk Top plan pricing is $4,000 or 30% of the software's list price, whichever is higher.

Sybase Inc.
6475 Christie Ave.
Emeryville, CA 94608
Circle 103

Midrange Server

SPARCalike vendor Axil Computer has unveiled a midrange, multiprocessor server. Called the AxilServer S/400,



the device uses one to four SPARC processors and is meant to compete with Sun's SPARCserver 1000 line. The user can choose either the 50/60-MHz SuperSPARC or the 80/100-MHz hyperSPARC.

An S/400 with one 50-MHz SuperSPARC scores 69.2 SPECint92. Axil compares it with a SPARCserver 1000, which provides 60.3 SPECint92. A four-processor version of the S/400, again with 50-MHz SuperSPARCs, would offer 6,034 SPECrate_int92.

The S/400 is made up of individual, stackable boxes. Axil says a typical configuration would be one CPU box containing four SPARC processors; one media box with a CD-ROM drive and a 4mm, 5-GB DAT tape drive; and a disk box with up to four 4.2-GB drives. The price for this configuration would begin at $36,600.

Axil Computer Inc.
3151 Coronado Drive
Santa Clara, CA 95054
Circle 104

Tadpole Shows Pentium-Based Laptop

Tadpole Technology has introduced its first Intel Corp. processor-based laptop, the Tadpole P1000, which the company says is the first notebook system with the 100-MHz version of

the Pentium microprocessor. The UK- and Austin, TX-based vendor of boards and laptop systems is best known in the Sun community as the maker of a SPARC-based notebook system. The company also OEMs a laptop RISC System/6000-compatible for IBM.

The P1000 comes with 8- to 128-MB system memory, a 256-KB secondary write-back cache, a 64-bit memory interface and a 810-MB removable SCSI-2 disk storage system. Moreover, the product features an innovative modular design in which the system as a whole uses PCI technology. The system board is, in effect, a PCI board. The processor and associated logic then sit aboard a daughtercard, which attaches to the system board. The company says this makes the P1000 one of the first processor-upgradable notebook systems. The user can simply pull the daughtercard and replace it with one using a faster Intel processor, or a SPARC, PowerPC or other CPU.

One of the chief problems facing

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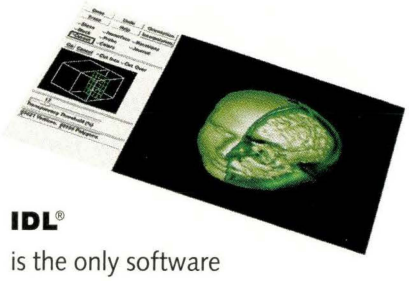

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Research Systems, Inc.
2995 Wilderness Place
Boulder CO 80301

IDL

*based on a survey of IDL users

Circle No. 19 on Inquiry Card

designers of notebook systems who wish to move to the Pentium has been the chip's infamous heat. To deal with this problem, Tadpole's designers have attached the Pentium to a circular "cooling tower"-style heat sink that passes through an opening in the system board and rests on a cushion of heat-conducting foam. This, in turn, attaches to the notebook's magnesium alloy case. In effect, the device's entire enclosure can act as a heat sink.

The P1000 has a 10.4-inch active matrix color TFT display, providing 640-by-480 VGA resolution in up to 64 colors.

The product includes a PCMCIA slot, an external 3½-inch floppy drive and an internal battery. Buyers can also get a mini-docking station with an external hard disk and an external battery pack. The company says it plans to bring out a larger docking station with a CD-ROM drive, an external keyboard and other features sometime in early 1995.

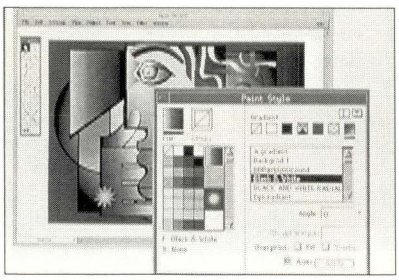
Currently, the P1000 runs DOS/Windows. However, the company says Solaris x86 will be available by the first quarter of 1995.

The product measures 11.8 by 8.5 by 2.0 inches. It weighs 7.5 pounds with the internal battery installed. Pricing begins at $7,495.

Tadpole Technology Inc.
12012 Technology Blvd.
Austin, TX 78727
Circle 105

Adobe Illustrator for Sun

Adobe Illustrator Version 5.5 is now available for Sun workstations. A product of Adobe Systems, Illustrator is an illustration and page design tool



for producers of high-end documents, such as service bureaus. Adobe Illustrator 5.5 had been previously available only on Apple Computer Inc.'s Macintosh.

The product's new version allows users to work in a networked environment and access several hundred fonts as well as large clip-art libraries. The update also features enhanced text-handling facilities and a simplified user interface.

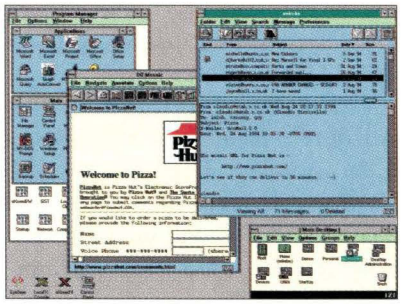
Illustrator for Sun is compatible with the same software on Mac and PC platforms. Files can thus be transferred from one system to another without undue difficulty.

Pricing on the product varies according to the number of licenses. A single-user license is $995, a five-user license is $3,995 and a 10-user license is $6,995.

Adobe Systems Inc.
1585 Charleston Road
P.O. Box 7900
Mountain View, CA 94039-7900
Circle 106

XI Sees Eye2eye

Software that allows PC users to access applications on UNIX systems without leaving their Windows-style environment has been announced by IXI. Called Eye2eye, the product runs on a UNIX server that supports PC clients. When a client accesses the



server, Eye2eye determines if the user is on a PC or a UNIX system. If it is the former, it then displays UNIX facilities and applications on the PC as though they were Windows applications and facilities.

By contrast, when the user is on a UNIX system or X terminal, Eye2eye leaves them alone. It provides a standard GUI derived from IXI's X.desktop environment.

To provide its links to Windows, Eye2eye incorporates Wintif 1.2 and provides additional Windows compatibility features, including automatic format conversions between UNIX and Windows data, preference handling and Intelligent Agent Extensions, which allow improved interoperability between UNIX and Windows applications.

Eye2eye is initially available on The Santa Cruz Operation Inc. and Sun platforms. Ports to IBM Corp., Hewlett-Packard Co., Digital Equipment Corp. and Silicon Graphics Inc. platforms are said to be in the works. Pricing begins at $595.

IXI Corp.
400 Encinal St.
P.O. Box 1900
Santa Cruz, CA 95061-1900
Circle 107

NCD Unveils 64-Bit X Terminals

X terminal vendor Network Computing Devices has introduced a line of 64-bit X terminals. Called the HMX family, the machines are based

on the 64-bit R4000 MIPS processor. NCD says the new processor provides performance of 200,000 Xstones and 4.0 Xmarks. The terminals have resolutions of up to 1,600 by 1,200.

There are three models in the HMX series: the HMX17, with a 17-inch monitor, at $3,495; the HMX20, with a 20-inch monitor, at $4,495; and the HMX21, with a

21-inch monitor, at $4,795. There is also a monitorless version, the HMX1, at $2,895.

All three HMX terminals come with 8 MB of DRAM (expandable up to 136 MB), 2 MB of video RAM, one parallel port, two serial ports, a twisted-pair Ethernet interface, a mouse and a keyboard. There are also a variety of optional network interface cards available.

Network Computing Devices Inc.
350 North Bernardo Ave.
Mountain View, CA 94043-5207
Circle 108

Wyse Serial X Terminal

A serial X terminal has been introduced by Wyse Technology. Serial X terminals are devices that provide X displays but link to their hosts via traditional serial line technology, including telephone lines. Wyse's new product is the WX-15. It has a 14-inch monochrome display and is meant to take the place of traditional ASCII terminals.

The WX-15 connects to a network via standard serial line, a terminal server or a MUX/Switch. It requires the host to run a serial X server software module. The company says this software is based on standard X11 and can be installed relatively easily. The WX-15 then provides 800-by-600 resolution.

The WX-15 comes with a choice of PC or ANSI keyboards. Pricing begins at $695.

Wyse Technology Inc.
3471 N. First St.
San Jose, CA 95134
Circle 109

Storage Dimensions Offers UNIX Support

SuperFlex, Storage Dimensions' disk, tape and RAID system, now supports a variety of UNIX systems. Cross-platform, host-independent support for IBM Corp. RISC System/6000, Sun workstations and servers and Hewlett-Packard Co. workstations and servers is provided. The system delivers 16-bit Wide SCSI performance.

SuperFlex incorporates the RAIDFlex I/O module, which allows for RAID 0, 1, 1+0 or 5 support. The system enclosure has seven drive bays, each capable of housing a Wide or Fast SCSI-2 disk module or DAT drive module. It uses one 2.1- or 4-GB drive to support single-enclosure capacities from 1 to 28 GB.

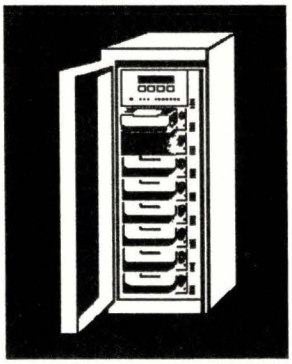
Prices range from $6,185 for a 1-GB entry-level system to $39,920 for a complete 24-GB RAID 5 solution.

Storage Dimensions
1656 McCarthy Blvd.
Milpitas, CA 95035
Circle 110

UNIX CAD/CAM at PC Prices

Tatung has teamed up with Cimlinc, a developer of drafting and manufacturing software, to introduce two affordably priced CAD/CAM workstations. The first offering, priced from $6,585, consists of Tatung's microCOMPstation II-385, a SPARCstation 5-compatible system, bundled with Cimlinc's ExpertCAD software. The second product starts at $5,786 and combines ExpertCAD with Tatung's LC/LX workstation, which is compatible with a Sun SPARCclassic.

RAID SUBSYSTEM FROM UNI SOLUTION, INC.



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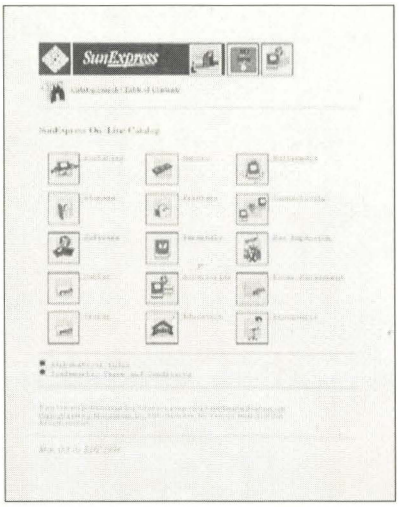
Circle No. 23 on Inquiry Card

Entry-level configurations for both include a 17-inch monitor, a 520-MB hard drive, 16 MB of RAM and a GX graphics accelerator. In addition to bundled ExpertCAD, Tatung includes Solaris 1.1.B and OpenWindows as standard offerings.

Tatung Science and Technology Inc.
1840 McCarthy Blvd.
Milpitas, CA 95035
Circle 111

Sun Markets on the Net

SunExpress, the direct marketing subsidiary of Sun Microsystems, has put its catalog onto the Internet.



Customers can now obtain information on Sun products via the World Wide Web. SunExpress says that information on the entire 2,500 products in its catalogs will be available via the Net, though ordering will still be done via traditional channels.

As with many things on the Net, there is no charge to read the service. It will be accessible via Sun's home page at `http://www.wsun.com/` and via SunExpress' URL at `http://www.sun.com/sunexpress/`.

SunExpress Inc.
Five Omni Way
Chelmsford, MA 01826-4141
Circle 112

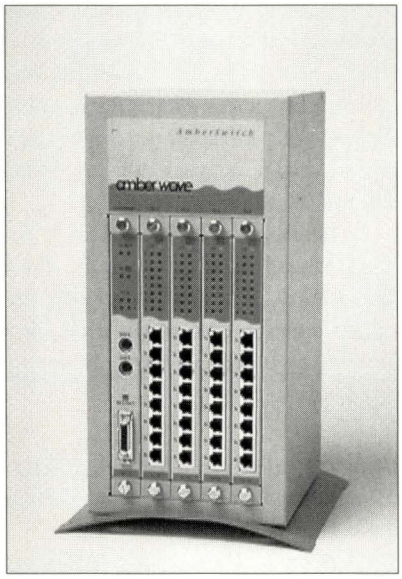
Graphics Accelerator Card

Antares Microsystems has added the TurboGX Graphics Accelerator to its line of Graphics SBus cards. The TurboGX accelerates 2D/3D vector rendering and windows. It supports resolutions of 1,152-by-900 at 60 Hz and 77 Hz, and 1,024-by-768 at 66 Hz and 76 Hz. Applications that run on the earlier GX cards will also run on TurboGX. Pricing begins at $1,495.

Antares Microsystems Inc.
160B Albright Way
Los Gatos, CA 95030
Circle 113

LAN Switching Platform

Amber Wave Systems has introduced a LAN switching platform for workgroups. Called AmberSwitch, the



product supports 10Base-T and 100Base-T. It can provide up to 32 ports of switched Ethernet on 10Base-T, though users can start at 8 ports and work up. The product uses a high-speed packet bus that supports sustained throughput of 600 Mb/s, or 700K packets per second. Pricing on an eight-port system is $1,995.

Amber Wave Systems Inc.
403 Massachusetts Ave.
Ste. 202
Acton, MA 01720
Circle 114

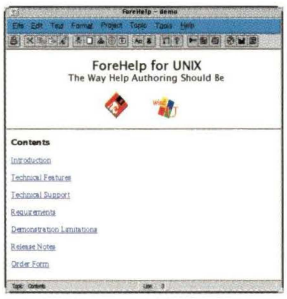
Motif Widget Collection

The ICS EnhancementPak, a set of widgets for Motif, has been shown by Integrated Computer Solutions. The set provides 16 widgets: Button Box, Color Selector, Combination Box, Internationalized Extended List, Font Selector, Hierarchy, Icon Box, Icon Button, Outline, Paned, Panner, Pixmap Editor, Porthole, Stretch, Toolbar and Tree. Pricing begins at $2,495.

ICS Inc.
201 Broadway
Cambridge, MA 02139
Circle 115

Help Screen Assistant

Bristol Technology has announced ForeHelp for UNIX. ForeHelp software assists in writing help screens and other on-line documentation. A



product of ForeFront, in Boulder, CO, ForeHelp had previously been available only on Microsoft Corp. Windows. Bristol, however, has made the product available for UNIX, and especially Sun, systems.

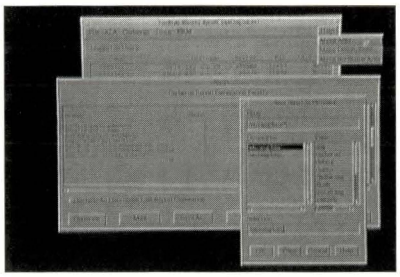
ForeHelp comes with a WYSIWYG word processor. It can also import RTF or TXT files from existing documents, and bit maps and image files from stored images. There are also project management tools to help users keep track of intertopic relationships.

Documents developed with ForeHelp can then be used with on-line help systems, such as Bristol's HyperHelp. Pricing on ForeHelp for UNIX will begin at $495 per copy.

Bristol Technology Inc.
241 Ethan Allen Hwy.
Ridgefield, CT 06877
Circle 116

Internet Security

Taft Street Software and Atlantic Systems Group have released TurnStyle, a UNIX security system designed to protect corporations from unauthorized access from the Internet.



TurnStyle, originally developed as a UNIX security product, now includes an Internet Module that monitors all services started by the `inetd` program to determine the location of the requestor. Once located, TurnStyle checks the information against its user-defined authorization criteria to ascertain access permission. Version 2.2 supports the grouping of hosts and the use of Internet domain names.

An additional ERM facility provides protection against the danger of deleted files. ERM can easily retrieve files that are erased or purged and restore them to any directory the user has permission to use.

TurnStyle is available for HP-UX, AIX and SunOS, with future plans for DG/UX, Silicon Graphics Inc. and OSF/1. The price for a two-user license is $395.

Taft Street Software
502 Main St.
Farmingdale, NY 11735
Circle 117

Network-Attached Storage Management

Network Imaging Systems has introduced StorCom, an intelligent LAN- or WAN-attached storage management controller. StorCom allows any PC, workstation or mainframe to store and readily access information simultaneously and can provide direct access to WANs including fast Ethernet, ATM, Synchronous Optical Network (SONET) and frame relay networks.

StorCom supports all platforms using NFS, IPX/SPX, TCP/IP and other common network protocols. It also supports all magneto-optical, CD-ROM, WORM and tape drives and features hierarchical storage management (HSM).

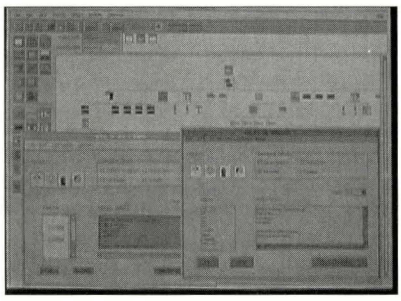
Installation is easy because no loading of drivers or library management software is required. Its object-oriented storage administration does not require specific operating system experience.

The product's price ranges from $15,000 to $80,000, depending on configuration.

Network Imaging Systems
500 Huntmar Park Drive
Herndon, VA 22070
Circle 118

Cross-Platform GUI Builder

Imperial Software Technology has announced a cross-platform GUI builder that programmers can use to develop code for Motif and Windows platforms. Called X-Designer 4, the product operates in Motif or Windows mode. In the latter case, it targets the Microsoft Foundation Class Library



Upgrades, Enhancements, Additions...

• SAS Institute has announced Release 6.10 of the famed SAS System, an integrated business analysis software package. The version includes imaging capabilities, a new volumetric data analysis and modeling tool, and new interactive reporting objects. **SAS Institute Inc.**, SAS Campus Drive, Cary, NC 27513. **Circle 119**

• PeopleSoft and Informix Software Inc. are working together to put PeopleSoft's financial and human resources software on the Informix database. Specifically, they will put PeopleSoft Financials, PeopleSoft HRMS and PeopleTools onto Informix's Informix Dynamic Scalable Architecture (DSA). **PeopleSoft Inc.**, 1331 N. California Blvd., Walnut Creek, CA 94596. **Circle 120**

• AIB Software has announced Sentinel II, a software developer's tool that can detect memory access errors and memory leaks. The new version of Sentinel uses a process known as Object Module Transformation (OMT), which converts object code into a system-independent representation of the program being tested that can be searched for problems before they occur. **AIB Software Corp.**, 46030 Manekin Plaza, Dulles, VA 20166. **Circle 121**

• MapInfo has announced Version 3.0 of its MapInfo product, which combines GIS facilities with database search tools. The update offers enhanced visualization and is easier to use, the company said. **MapInfo Corp.**, One Global View, Troy, NY 12180-8399. **Circle 122**

• For those in need of GUI development tools, Non Standard Logics has introduced Version 3.0 of its XFacemaker product. The new version now features C++ class generation. **Non Standard Logics Inc.**, 99 Bedford St., Boston, MA 02111. **Circle 123**

• Island Software says that IslandOffice is now available for Solaris 2.3 systems. IslandOffice is a personal productivity software package that includes IslandWrite, Draw and Paint, IslandPresents and IslandCalc. **Island Software Corp.**, 4000 Civic Center Drive, San Rafael, CA 94903. **Circle 124**

• Blueberry Software has added Interleaf 5 and Word 6 filters to its Filtrix-UNIX package for Sun. With the product, users can convert Interleaf 5 and Word 6 documents into other formats, notably FrameMaker, WordPerfect and IslandWrite. **Blueberry Software**, 260 Petaluma Ave., Sebastopol, CA 95472-4222. **Circle 125**

(MFC) as its Windows interface. The company says this means that users can develop under UNIX but then also generate MFC code that can be compiled with native Windows tools, such as Visual C++.

There are, of course, features in Motif that are not available in Windows, and thus they cannot be ported with a Motif application. To address this problem, X-Designer automatically tags those Motif features present in code that have no Windows equivalent. Developers can then either eliminate those sections, if they don't really need the Motif features, or at least be aware that they are in for some hand-coding when they make the transition to Windows.

X-Designer 4 is available on Sun, Hewlett-Packard Co., Silicon Graphics Inc., IBM Corp., Digital Equipment Corp. and The Santa Cruz Operation Inc. platforms. Pricing begins at $3,500. It will be available from ISI in Europe. In the United States, it will be carried by ISI's distributor and developmental partner, VI Corp.

Imperial Software Technology
95 London St.
Reading Berkshire RG1 4AQ
UK
Circle 126

VI Corp.
47 Pleasant St.
Northampton, MA 01060
Circle 127

Storage Management

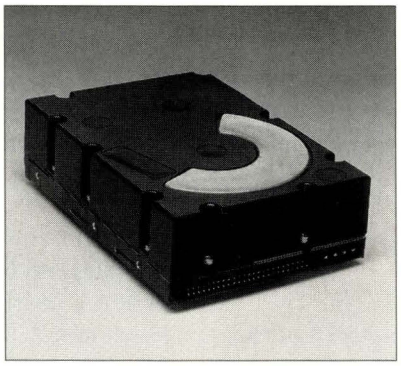
DynaServe from Fujitsu Computer Products is an intelligent storage server that combines the advantages of Fujitsu storage management software and disk arrays, Hewlett-Packard Co.'s optical libraries, Storage Technology Inc. tape libraries and Sun workstations in one solution. Corporate data stored locally in individual user workstations, departmentally in servers and centrally in a corporate repository are automatically migrated among the media to ensure cost-effective storage management. DynaServe is easy to install and administer and arrives configured with the desired hardware and software options.

Fujitsu's DynaRAID disk array provides 7.4 GB of on-line storage. Hewlett-Packard Co.'s Model 40T optical libraries give users up to 40 GB of capacity. Up to 255 GB is provided by StorageTek's 9708 8mm tape library. DynaServe comes preinstalled and pre-configured with Fujitsu Storage Manager software, based on Solaris 2.3 and a Motif GUI. Suggested price is $190,000.

Fujitsu Computer Products of America Inc.
2904 Orchard Pkwy.
San Jose, CA 95134
Circle 128

Multigigabyte Drives from Micropolis

Micropolis has announced two new multigigabyte 3½-inch Fast SCSI-2 hard disk drives. The Capricorn Model 3243 provides 4.29 GB of formatted capacity, and the Taurus Model 4221 drives offer 2.1 GB. Both are available with a Fast SCSI-2 or Fast Wide SCSI-2 interface providing a



data transfer rate of up to 20 MB/s. A 7,200-rpm spindle speed reduces the average rotational latency to 4.17 ms. Mean time between failure is rated at 650,000 hours, and the products are backed by a five-year warranty.

Capricorn Model 3243 lists at $3,765, and the Taurus 4221 is $2,320.

Micropolis Corp.
21211 Nordhoff St.
Chatsworth, CA 91311
Circle 129

Eliminate Downtime

The SafeNet Message Bus from Appleby Technologies is designed to eliminate application downtime caused by hardware, network or application failures. By monitoring and switching client/server processes in real time, SafeNet transparently distributes all clients of the failed component to the remaining instances of the same service without loss of data or transactions in flight. When the failed service is restored, the clients are switched back to their original service to maintain load balancing.

Access to the bus is provided by a simple function call interface designed to replace or supplement existing client/server calls. SafeNet is an open architecture that supports all major UNIX platforms using TCP/IP.

Pricing depends on configuration.

Appleby Technologies Inc.
55 Liberty St., 31st Floor
New York, NY 10005
Circle 130

New Books and Literature

• Need info on PGP, the shareware/freeware encryption program? O'Reilly has published what it says is the first guide to the program. Called *PGP: Pretty Good Privacy*, the book is written by science journalist and computer consultant (and sometime contributor to *SunExpert*) Simson L. Garfinkel. O'Reilly & Associates Inc., 103 Morris St., Ste. A, Sebastopol, CA 95472. **Circle 131**

• If you write code for the oil and gas industry, or would like to, you may want to consider *Basic Computer Standards, Version 2.0* (BCS). The book, published by Prentice Hall, is a guide to open systems as envisioned by the Petrotechnical Open Software Corp., a nonprofit established by five major oil and gas companies to establish common industry standards. **Prentice Hall**, Paramount Publishing Education Group, 113 Sylvan Ave., Rte. 9W, Englewood Cliffs, NJ 07632. **Circle 132**

• For C hackers who now may need to develop some code for PCs, IDG Books has just published *Heavy Metal Visual C++ Programming*, by Steve Holzer. The book is a guide to using Visual C++ and comes with a disk of programming examples. Holzer teaches classes in physics and Buddhism at Cornell University. **IDG Books Worldwide Inc.**, 155 Bover Road, Ste. 310, San Mateo, CA 94402. **Circle 133**

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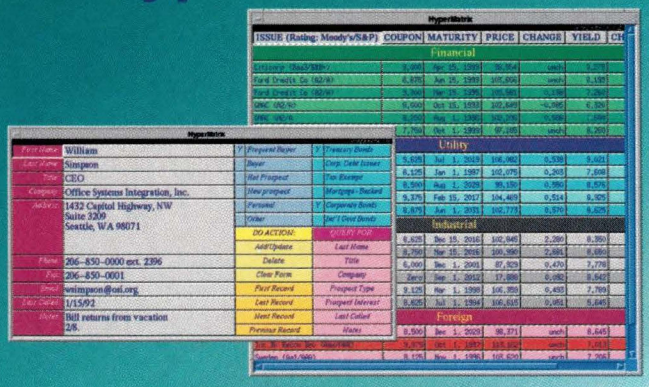

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New York, N.Y. 10027, (212)-939-7034.

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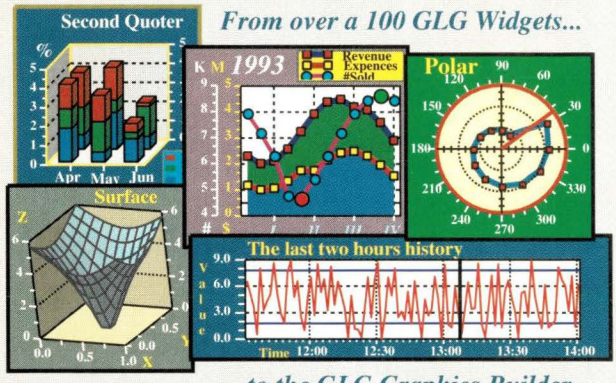
PRODUCT SHOWCASE

Generic Logic Toolkit



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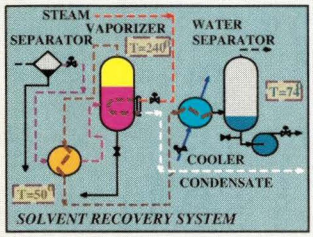

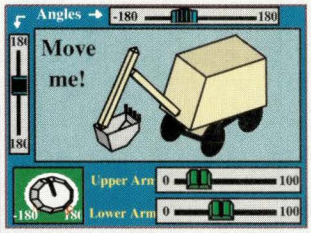

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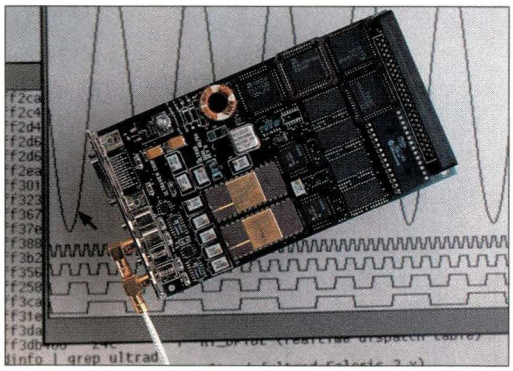

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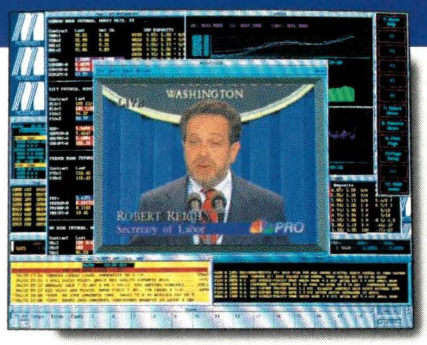

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PRODUCT SHOWCASE

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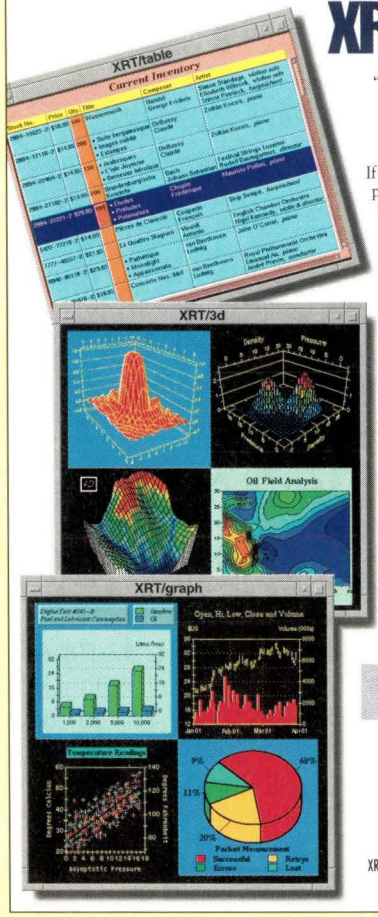

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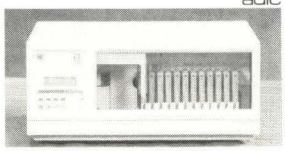

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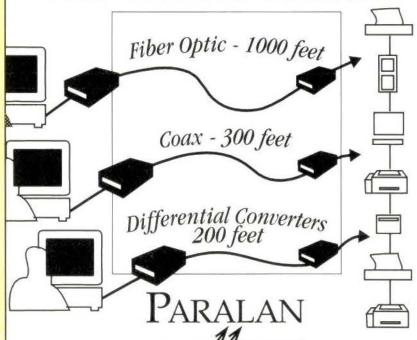

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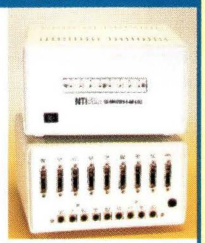

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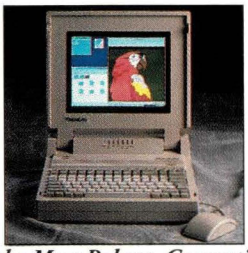

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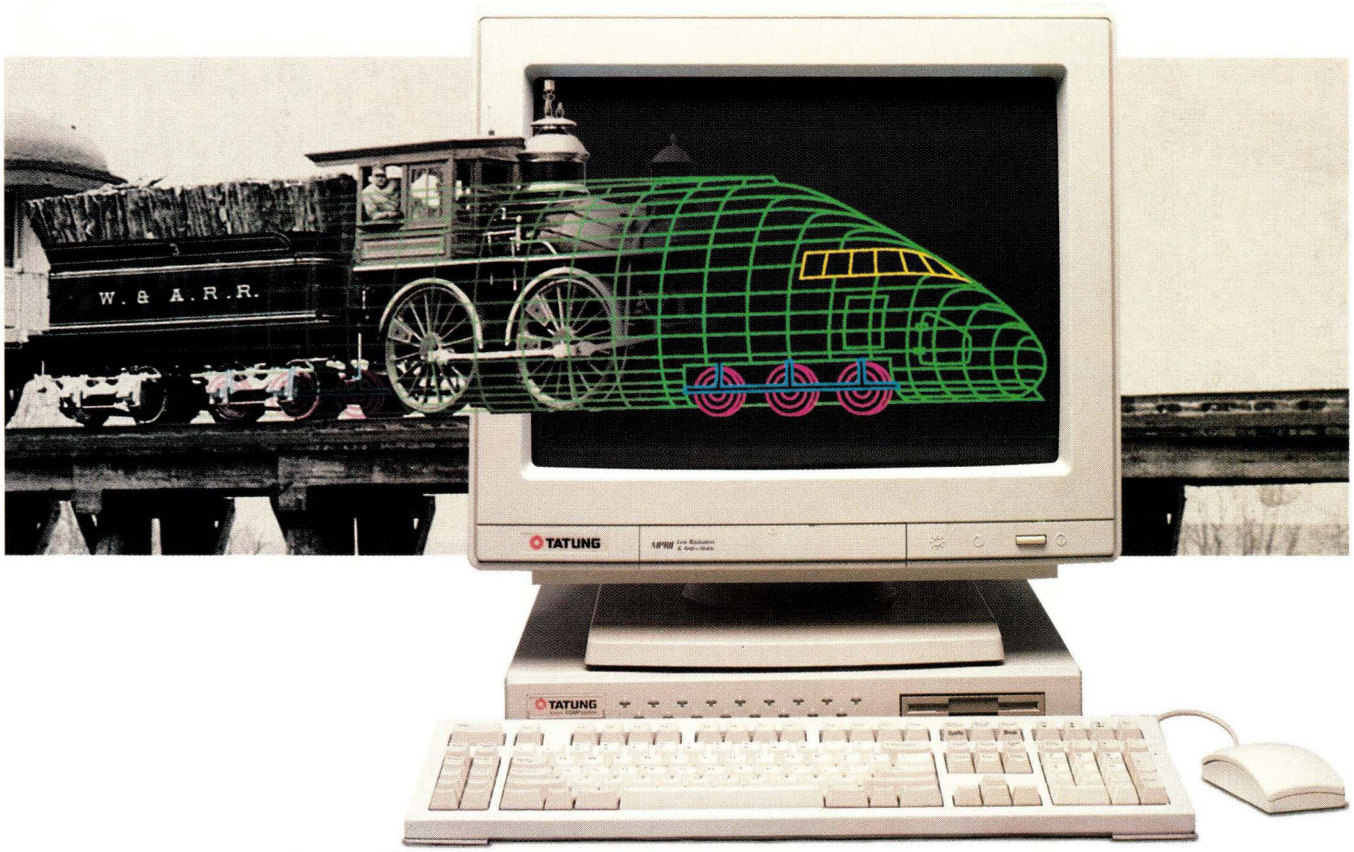

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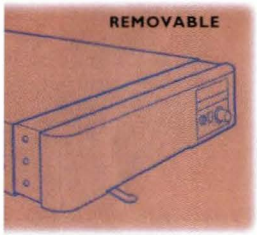

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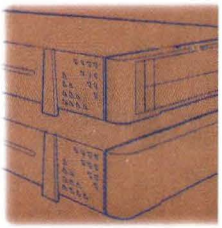

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