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erving the UNIX Client/Server Network

JUNE 1994 Vol. 5 No. 6 $5.50

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Not Your Father's RPC

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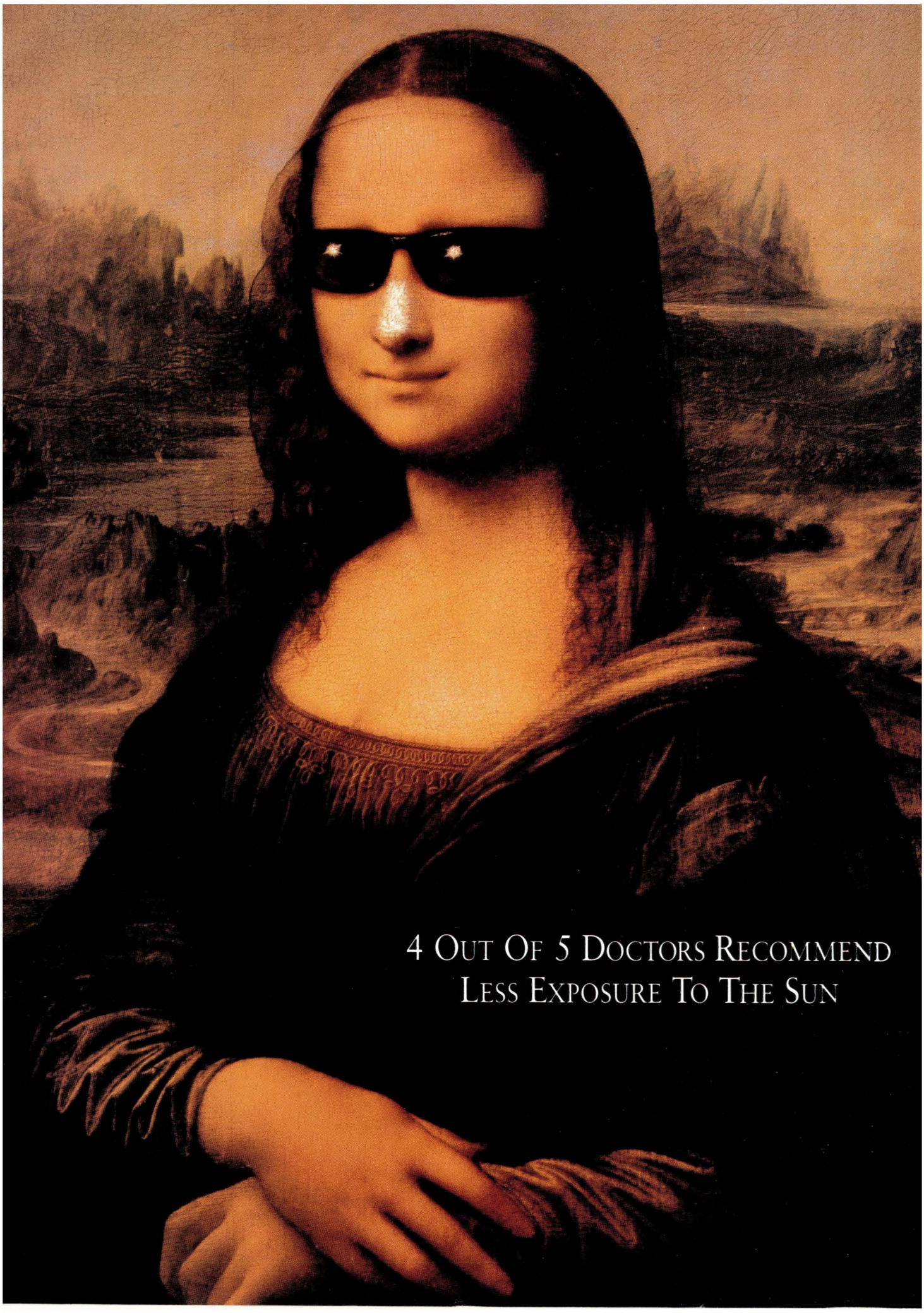
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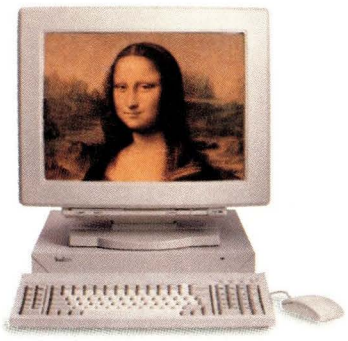

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SUNEXPERT
serves the UNIX workstation environment, emphasizing Sun, SPARC and Sun-compatible systems.

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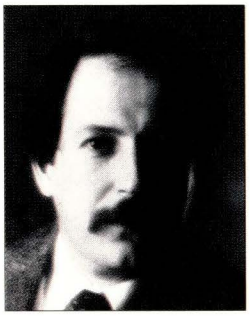
Material for publication should be sent to the attention of: Doug Pryor at the above address or electronically mailed to dpryor@expert.com. Letters sent to the publication become the property of the publication and are assumed to be intended for publication and may be used so. *SUNEXPERT* Magazine is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

Editorial

Client/Server Perception

If you listen to the marketing hype and vendor hoopla that strains, stretches and challenges credibility just for the sake of getting a reference to client/server into the mix, you're adrift in a sea of terminology. You think that working in a client/server environment requires not only hip-high waders but also an extraordinary level of mental prowess like ESP. Fortunately, all you really need is CSP, or client/server perception. At this very moment, dozens of servers are running on your machine and dozens of clients call on them continuously. It's all part of the design of UNIX from the ground up, and a thorough understanding of the operating system will eliminate CSA, or client/server anxiety. In this month's UNIX Basics column, Peter Collinson explores the principles of this design in a way that can be abstracted and applied to large-scale systems.



The News section leads with Sun's new clients and servers–the SPARCstation 5 and SPARCstation 20. These systems replace the SPARCstation LX and SPARCstation 10, respectively.

A SPARCstation 5 with a 70-MHz microSPARC II, a 15-inch color monitor, a 535-MB hard drive and 16 MB of memory is priced at $3,995. A SPARCstation 5 with a 85-MHz CPU, a 20-inch color monitor, 32 MB of memory, 1 GB of storage and the TurboGX graphics accelerator is $11,395.

Sun is proclaiming the SPARCstation 20 its new flagship product. Based on the 50- and 60-MHz SuperSPARC processors, it can be configured in six versions: the single-processor Model 50 with a 50-MHz CPU and no external cache; the single-processor Models 51 and 61, with 50- and 60-MHz and 1 MB of external cache per processor; the dual-processor Model 502 with 50-MHz CPU and no external cache; the dual-processor Model 612 with 60-MHz CPU and 2 MB of external cache; and the four-processor Model 514 with 50-MHz CPU and 4 MB of external cache. Prices range from $12,195 to $29,995.

Of course, any of the machines can be configured as servers: It's all a matter of perception.

Doug Pryor

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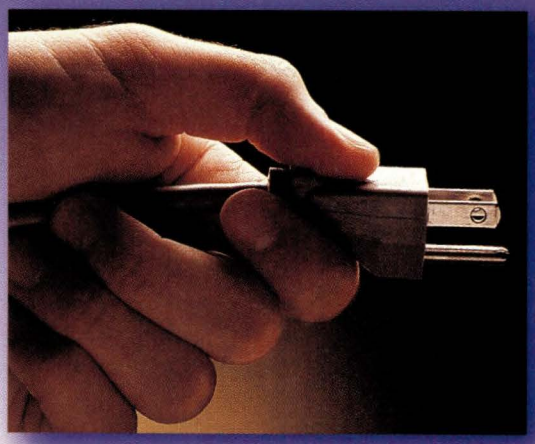

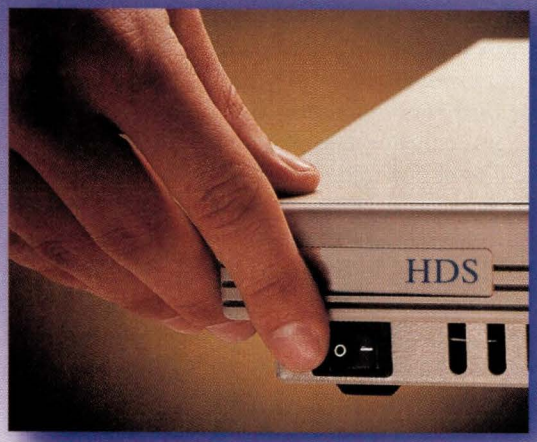

1. Plug it in
2. Turn it on

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

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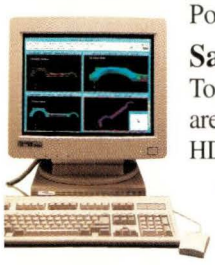

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LETTERS

"Letters to the Editor" may be edited to conform to SUNEXPERT style-guide and space requirements. The views expressed are those of the author and not necessarily those of SUNEXPERT.

Passwords Come of Age

Dear Peter Collinson:

Although I agree with much of your outline of passwords (*SunExpert*, February, Page 24), I have to take issue with your discussion about aging passwords, as well as point out a significant omission from your article.

There are three reasons to age passwords (i.e., make them expire after a certain amount of time and prompt a user for a new one):

1. Most users *never* think of their passwords. Most users, in fact, never change them unless they are made to do so. Requiring them to change them after every 60 to 90 days at least serves as a reminder that they possess a key to valuable resources and information.

2. Password cracking tools generally take some time to run. Alternatively, *all* passwords can be known given a large amount of time. Virtually all security, therefore, is in some way "security by obscurity." Changing passwords periodically makes things somewhat more secure by slightly lessening the window during which passwords might be known.

3. UNIX, unlike some systems, allows multiple logins to a single account. Users will always find it easier to "borrow" passwords than to apply for new accounts, and this is generally no inconvenience for the original account holder. Often the only way to discover that this is happening is when a user requests assistance saying "my password doesn't work anymore." Generally, some research proves that this occurred because their "friend" was forced to change it, and didn't communicate the change back to the original owner.

You also disparage messages indicating password expiration is imminent ("I am suspicious that these messages just get lost in the mess of output when you log in...") but expect users to consider the "last login" indication and compare it with their memory. This doesn't make sense to me.

But what you have omitted is the role of password security as part of the management of a integrated systems and network security policy. Your article was interesting and informative in the technical sense; however, password security is necessary but not sufficient for a secure computing environment.

This takes education, management, leadership, and planning...not just locking the door properly, but understanding the nature of the threats to security and the value of the personal and corporate assets at risk, communicating this to corporate management, and coming up with a cost-effective strategy to ensure access is protected.

K. M. Peterson
kmp@tiac.net

Mr. Collinson replies:

I think we will have to agree to differ.

I believe that password aging is a waste of time. This is from the bitter experience of being at the wrong end of such a system for some considerable period. I KNOW that my password degenerated in quality at that site because I needed to remember the algorithm that I used to generate today's version.

Yes you need to generate a security policy for your site etc., etc., etc., etc. There is a limit to what can be covered sensibly in 2,500 words.

Crufty Scripts

Dear S. Lee Henry:

We have not corresponded before, but I have enjoyed your articles in *SunExpert*. But, while reading your February article, "Backing Up to Disk" [Page 38], I, found something puzzling in your `tar2file` script.

In the line:

```
tar cvpBf - $NEWFILES | rsh $REMOTE "dd of=/backups/`whoami`.newfiles"
```

I do not understand your inclusion of the options `p` and `B`. My impression is that `p` is only useful during an (`x`) extraction and that `B` is only useful on the other side of the pipe. Additionally, since `tar` by default deals with 20 blocks, I specify `obs=20b` as an additional parameter to `dd`.

Perhaps these differences are harmless, but I thought I would check to see if I was missing something. By the way, I am using SunOS 4.1.3

Chris Johnson
cj@media.sra.com

Ms. Henry responds:

Thanks for your comments. You are correct. I throw in the parameters rather robotically because I `dd` *to* `tar` *and* `tar` *to* `dd` *a lot. Harmless, yes, but I'll go dress up my scripts!*

Which Came First?

Dear Editor:

I am writing in response to your editorial in the January issue of *SunExpert*. As a UNIX systems specialist of a major Midwestern university, I agree wholeheartedly with your conclusion that a serious dilemma exists for those wishing to bring UNIX to the forefront of the desktop software marketplace.

Volume and pricing have always been closely tied together. The first quartz watch was sold by Hamilton Beach for $2,500, the first CD players, from Sony, were $1,000 and the first hand-held calculator, the HP-35, was nothing more than a $495 "electronic slide rule."

Like watches, CD players and calculators, personal computers have become commodity items. As with any product, the pioneers paid high prices for the privilege of having the "latest and greatest," but it was the manufacturers who took the risk that they could drive demand up quickly enough to recover development costs. Some vendors made it; many didn't. Those that did were the ones that had the resources and the courage to "take a loss and make it up on volume."

Industry leaders with vision made this possible. The personal computer industry came into being because two "upstarts" and an industry giant, namely Apple (Steven Jobs), Microsoft (Bill Gates) and IBM had the vision to see what the future held.

UNIX grew out of the need for big-iron capabilities on a small scale. The

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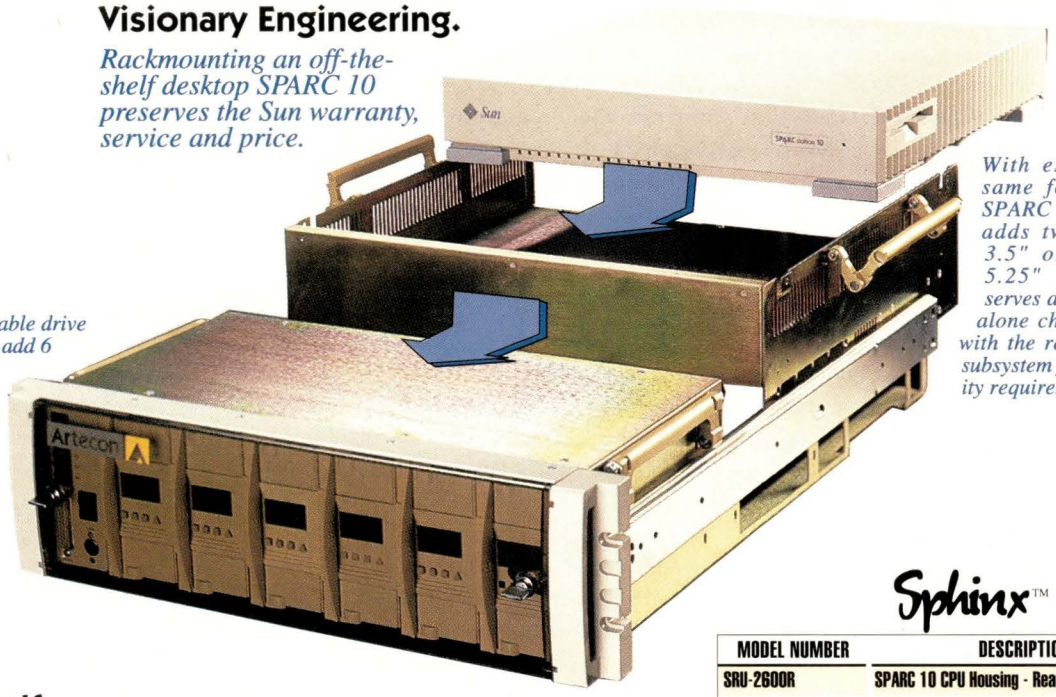

An optional removable drive subsystem lets you add 6 additional 3.5" devices, including up to 12GB of hot plug disk.

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RDU3-DSK-S-1.6GB	1.6GB 3.5" Removable Disk Module
RDU3-DSK-S-2.0GB	2.0GB 3.5" 5400 RPM Removable Disk Module
RDU3-DSK-S-2.1GB	2.1GB 3.5" 7200 RPM Removable Disk Module
RDU3-4mm-S-2.06GB	2-8GB Removable 4mm DAT Module
RDU3-4mm-S-4.0GB	4-16GB Removable 4mm DAT Module
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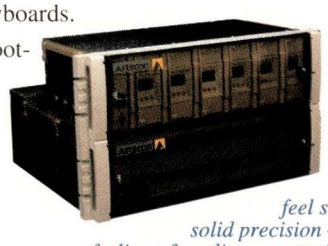

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PC grew out of the need for functionality at a small price. It's been the rapidly falling price of workstations that has brought these two, considerably different, markets together. Today, there is little difference between the cost of a fully capable DOS/Windows workstation, a similarly configured Macintosh and a comparable UNIX workstation.

This takes us back to your point. Software pricing is the key. A UNIX environment is never going to be as inexpensive as DOS/Windows or a Macintosh environment. Neither will either of these environments be as capable as a UNIX environment. Unfortunately, it is the capabilities of UNIX that lead to its greatest weakness, its complexity.

The threat to the future of UNIX lies not in either of these high-volume, entry-level performance environments. Instead, the threat comes from Windows NT and OS/2. These products promise all of the capabilities of UNIX with none of the complexities. Whether these products can live up to their promises or not is another matter and simply remains to be seen. In the meantime, more and more powerful PC platforms will be introduced and severely underutilized by DOS/Windows and MacOS.

The success or failure of UNIX in the mass market, however, depends on the actions of the industry leaders–Sun, IBM and Hewlett-Packard.

Not only must prices be brought down, but the inherent complexities of UNIX must be addressed if UNIX is ever to claim even a fraction of the 100 million or so systems now running DOS/Windows or MacOS.

Each of these giants has the resources to bring software prices down for themselves and, through incentives, for third-party developers as well. Do they have the courage?

IBM's vested interest in OS/2 places it in a unique position to "make or break" UNIX in the mass market. How it positions OS/2 with respect to AIX and how it integrates the PowerPC into the picture will have a profound effect on the marketability of AIX in the mass market.

Sun, the clear UNIX market leader, suffers from the same "mainframe mentality" that IBM has suffered with for years. Namely, aggressive hardware pricing and costly licensing practices geared toward the large central system. Even today, Sun's aggressive pricing remains geared toward a few large customers with steep discounts and many small customers paying premium prices for the same systems. This will simply not work in the mass market.

HP suffers mostly from playing "catch-up" in the UNIX market. As with the other dozen or so UNIX vendors, it has attempted to distinguish itself from the others with high-performance products at very aggressive prices for its largest customers.

The future of DEC, the other major vendor in the UNIX marketplace, is simply too uncertain to guess what impact it may have.

It appears that the mass market is being left to the public domain, small vendors and largely unsupported/user-supported UNIX flavors.

If the giants are to move UNIX into the mass market, they must revise their licensing practices in order to meet the needs of the PC user who needs more system capabilities but cannot afford premium prices. However, they must greatly simplify the "care and feeding of UNIX" as well.

COSE is a start. If these three vendors continue to cooperate, there is plenty of demand for system capabilities and performance to keep UNIX a viable environment for everybody needing more than a word processor or spreadsheet. However, if the alliance follows the path of previous such alliances (most notably, OSF), UNIX may never have the chance to compete in a marketplace for which it is a natural.

The question may simply become, "Why should anyone settle for having two workstations, one for personal productivity and one for their high-performance computing needs, when OS/2 or Windows NT promises it all on a single platform?"

Forgive the excessive length of this note. Many factors will ultimately have a profound effect on the future of UNIX. These are just a few.

C. Marc Wagner
UNIX Systems Specialist
University Computing Services
Indiana University
750 North State Road 46 Bypass
Bloomington, IN 47405

Open Immediately

Dear Editor:

I just filled out my subscription renewal form for *SunExpert*, and, since there was no space for comments on the form, I thought I'd send them in.

SunExpert is the one practical computing magazine that I read religiously. The major reason why I immediately open *SunExpert* is the Ask Mr. Protocol column. As soon as the magazine arrives, I read the latest column, then read through the rest of the magazine. It's a wonderful method for getting me to open the magazine.

Looking forward to another year of *SunExpert* and Mr. Protocol,

Robert Bowdidge
bowdidge@cs.ucsd.edu

Hold Everything

Dear Editor:

I just received my latest issue of *SunExpert* (February). As usual, I stop whatever I'm doing to scan the magazine. I saw the UNIX Basics column on passwords and I passed it to my boss. Well, he stopped what he was doing and then after a few minutes, asked me if it was legal to copy the article.

Thanks for a great magazine.

Brad Polk
polk@ece.nps.navy.mil

Would the Real UNIX Please...

Dear Peter Collinson:

I couldn't help but bite (byte :-) on your article in the December 1993 issue of *SunExpert* [Page 26]. You say, "I still like UNIX. I still avoid the need to run Solaris on my SPARC."

Perhaps it is the fault of the editorial staff, but I sure as hell thought that Solaris (well, SunOS 5.x, to be precise) was UNIX, just of the SVR4 variety. Perhaps you should have said "I still like BSD UNIX."

Sam Sangster
sam@icsea.levels.unisa.edu.au

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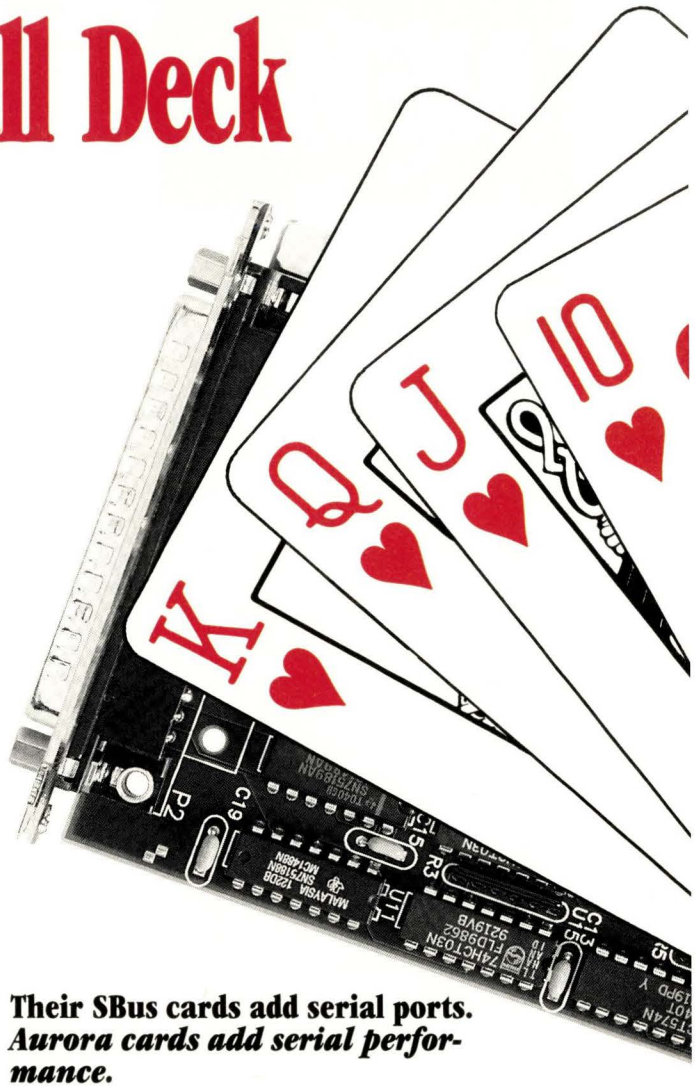
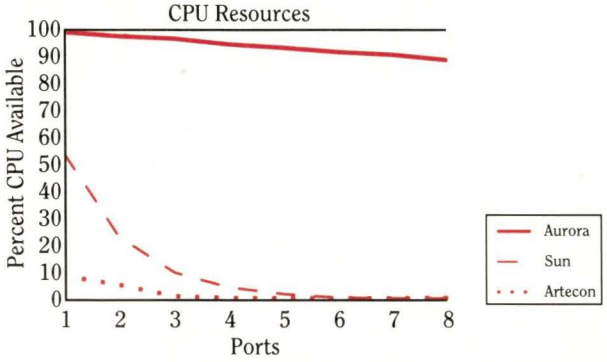
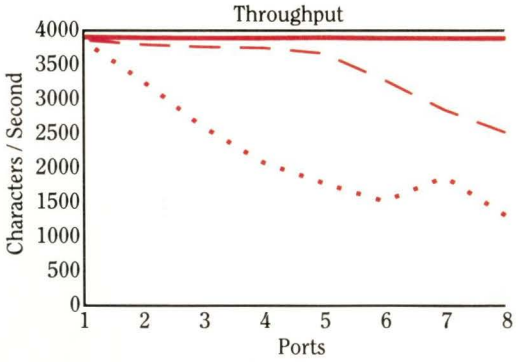
RS-485 multi-drop 'party-line' connections	Yes	No	No
RJ-45 and DB-25 interfaces	Yes	No	No
Transparent print for remote printing	Yes	No	No
ASCII terminal multi-tasking	Yes	No	No
Accelerates PPP communications to 115.2Kbps	Yes	No	No



Their cards transfer the workload to the host CPU. *Aurora cards take on the job.*



Their SBus cards add serial ports. *Aurora cards add serial performance.*



Independent third party performance benchmarks run on SPARCstation 10 model 40, single CPU with Solaris 2.3 receiving data at 38.4 Kbps using software flow control. Cards tested: Aurora 800SX, Sun X1008A, and Artecon SB-800P.

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NEWS

Sun Shows New Desktops

Calling it the most significant introduction since the original SPARCstation, Sun Microsystems Computer Corp. has introduced two new lines of workstations. These include a new lower end system, the SPARCstation 5, which replaces the SPARCstation LX, and a high-end workstation, the SPARCstation 20, which replaces the SPARCstation 10.

In addition, the company announced price reductions on the SPARCclassic. The entry-level workstation is now $2,995.

The SPARCstation 5 is based on 70- and 85-MHz microSPARC II processors. The company says this means the SPARCstation 5 offers twice the performance of the SPARCstation LX, its predecessor: 64 SPECint92 and 54.6 SPECfp92 for the 85-MHz model and 57 SPECint92 and 47 SPECfp92 for the 70-MHz model.

In terms of packaging, the 5 uses a modified pizza box design. It can support up to 2 GB of internal storage, up to 40 GB of external storage, and up to 256 MB of main memory. There are three SBus slots and options for a CD-ROM and a floppy drive.

A SPARCstation 5 with a 70-MHz microSPARC II, a 15-inch color monitor, a 535-MB hard drive and 16 MB of memory is priced at $3,995. A SPARCstation 5 with a 85-MHz CPU, a 20-inch color monitor, 32 MB of memory, 1 GB of storage and the TurboGX graphics accelerator is $11,395.

The SPARCstation 20, meanwhile, is being promoted as Sun's new flagship product. It is based on the 50- to 60-MHz SuperSPARC processors and can support one or more of them. There are six versions: the single-processor Model 50 with a 50-MHz CPU and no external cache; the single-processor Models 51 and 61, with 50- and 60-MHz and 1 MB of external cache per processor; the dual-processor Model 502 with 50-MHz CPU and no external cache; the dual-processor Model 612 with 60-MHz CPU and 2 MB of external cache; and the four-processor Model 514 with 50-MHz CPU and 4 MB of external cache.

Pricing ranges from $12,195 to $29,995. Performance, meanwhile, ranges from the Model 50's 69 SPECint92 and 78 SPECfp92 to the Model 514's 6,034 SPECrate_int92 and 6,752 SPECrate_fp92.

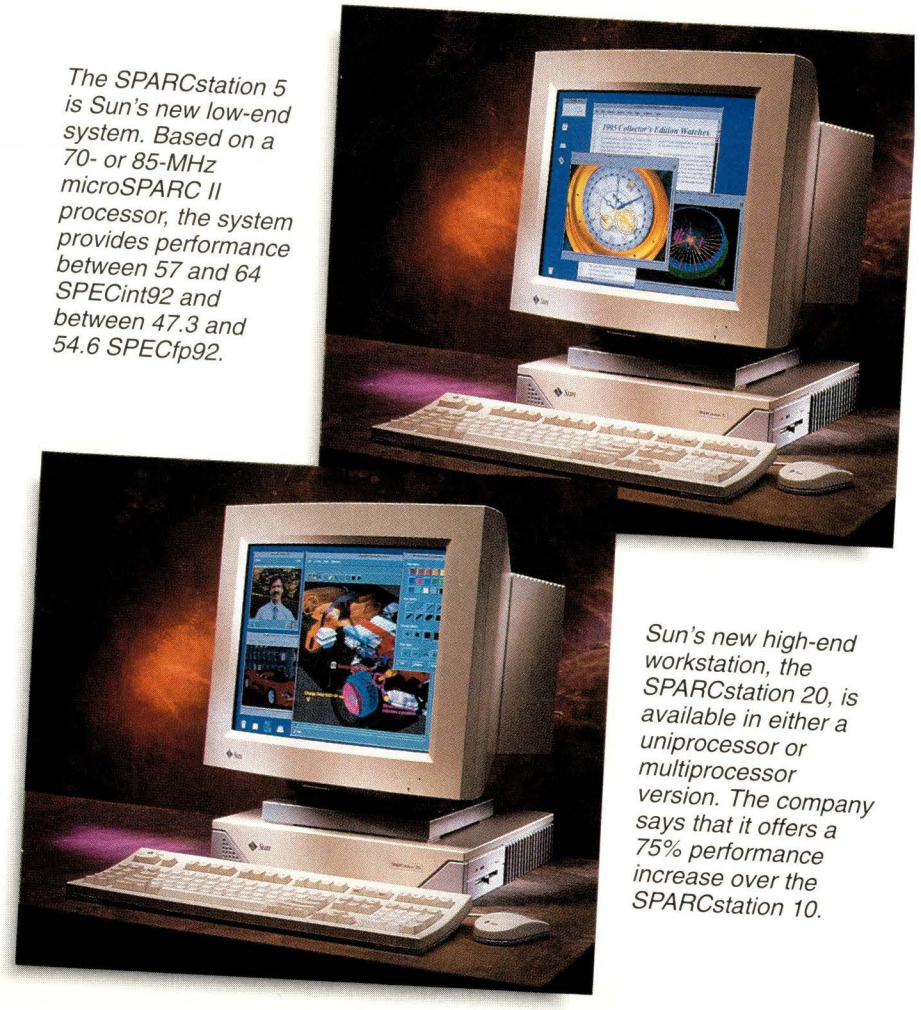
Users can upgrade the 20 by plugging in more CPUs, increasing the memory up to 512 MB or increasing internal storage up to 2 GB. The system will also support up to four SBus cards. SMCC has also been stressing the 20 as a graphics machine. It comes standard with 24-bit true color, 3D Gouraud-shaded Z-buffered graphics and accelerated video playback.

Indeed, there are multimedia versions of the 20 machines. The SPARCstation 20M comes with the 50-MHz SuperSPARC, the SunVideo capture and compression card, a video camera and SX-based accelerated video playback. It is priced at $14,590.

In addition, SMCC introduced server versions of both the 5 and 20. The SPARCserver 5 is $8,995 and comes with 32 MB of memory and 1 GB of storage. The SPARCserver 20 is $12,995 and has 32 MB of memory, 1 GB of storage and a CD-ROM drive.

One interesting feature of both the 5 and 20 is that they are single-motherboard systems. This means that both can be repaired with a single board swap. Moreover, a 5 can be turned into a 20 with equal ease.

Meanwhile, as the 5 and 20 were coming, SMCC was announcing a price cut on the SPARCclassic, its entry-level system. The SPARCclassic is now $2,995. This makes it, according to SMCC, the first workstation to



The SPARCstation 5 is Sun's new low-end system. Based on a 70- or 85-MHz microSPARC II processor, the system provides performance between 57 and 64 SPECint92 and between 47.3 and 54.6 SPECfp92.

Sun's new high-end workstation, the SPARCstation 20, is available in either a uniprocessor or multiprocessor version. The company says that it offers a 75% performance increase over the SPARCstation 10.

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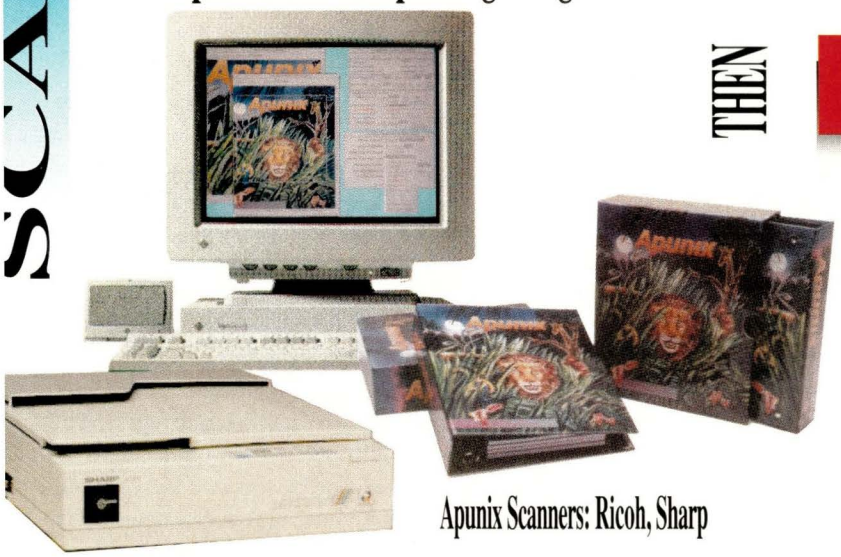

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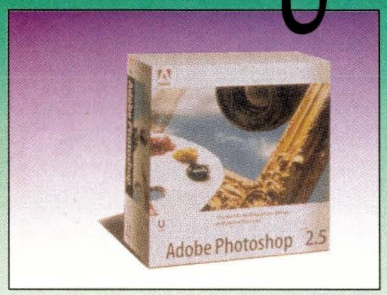

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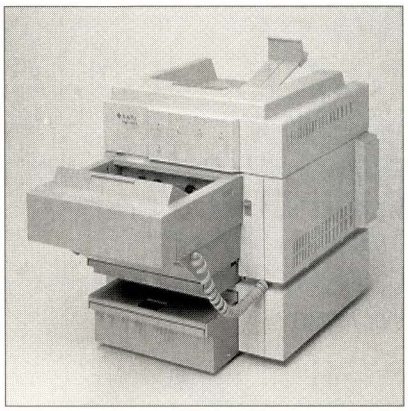
have a list price under $3,000. The company also announced a multimedia version of the system, the SPARCclassic M, which comes with a SunVideo capture/compression card and costs $14,590.

Pumping Out the Printers

Printer introductions have been fast and furious since last spring. SunPics, Mountain View, CA, announced its SPARCprinter II. Hewlett-Packard Co. introduced two laser printers, and Genicom Corp. as well came out with two workstation laser printers. Tektronix Inc., meanwhile, has acquired RasterOps Corp.'s color printer business.



The SPARCprinter II is SunPic's new entry into the printer wars. It is based on the Lexmark 4039 series laser print engine.

SunPics' SPARCprinter II is based on the original SPARCprinter design and features Lexmark International Inc.'s 4039 series laser print engine.

The standard information on the SPARCprinter II reads like this: 12 pages per minute, 600-by-600-dpi resolution, image-smoothing functions and PostScript language capability. It comes with SunReadiness, a kit that includes everything from interface cables to installation software and ensures easy installation on any type of Sun network, as opposed to competing printers, which require additional connectivity products and, therefore, add to the cost.

Interesting improvements made with this model include NPTool, a graphical user interface that provides two-way communications between users and the printer. NPTool enables all network printers to be managed from the desktop. Another new feature is a duplexer mechanism for two-sided printing. The duplexer is customer-installable and attaches without tools. When not in use, it remains attached without affecting other capabilities. These two new features work together, allowing users to activate the duplexer from the desktop through the NPTool GUI.

The SPARCprinter II is targeted at networked and client/server work groups. General office functions and graphics-intensive applications, including CASE, are ideal applications. SunPics resellers are selling the SPARCprinter II for $2,695. That price includes a one-year warranty through SunService.

Palo Alto, CA-based HP has enhanced its printer line with the LaserJet 4 Plus and LaserJet 4M Plus printers by replacing its 8-page-per-minute (ppm) printers with these 12-ppm printers. These new models have a 600-by-600-dpi resolution and come equipped with enhanced HP PCL5 with HP GL/2 and Adobe Systems Inc. PostScript Level 2 and PCL 5. The LaserJet 4 Plus is targeted at PC work groups, and the LaserJet 4M Plus suits PC work groups as well as Macintosh, networked and mixed computing environments.

HP's printers are based on a print engine with a 25-MHz Intel Corp. i960 RISC processor with cache and advanced memory management to provide faster document delivery. Improved drivers and firmware achieve faster PCL and PostScript printing.

Connectivity for PC environments is handled by both printers with HP Bi-Tronics parallel and 9-pin serial interfaces. The LaserJet 4 Plus includes an HP modular I/O slot that accommodates optional HP JetDirect and third-party network interface cards, which support most network topologies, operating systems and protocols. The LaserJet 4M Plus comes preinstalled with the HP JetDirect card to support Ethernet and LocalTalk network connections.

The JetDirect card is HP's secret weapon, allowing for concurrent support of multiple protocol stacks and 11 network operating systems over one card's Ethernet connection. The JetDirect card also provides the ability to switch among protocols on the fly, interoperability in mixed network environments and ease of installation.

The LaserJet 4 Plus is priced at $1,839, and the LaserJet 4M Plus is priced at $2,479.

Detailed graphics generally slow down PostScript and PCL printers, but Genicom, Chantilly, VA, has a series of host-based laser printers that leverage the processing power of workstations and print at true engine-rated speeds. The 9000 Series includes the Genicom 9080, an 8-ppm, 600-by-600-dpi resolution printer. The Genicom 9170 features 600-by-600 dpi, 17-ppm speed and optional duplexing.

Both models include a SCSI-2 interface that provides a built-in gateway for high-speed data transfer. All memory, processing and network connectivity functions are resident in the host workstation. The 9000 Series supports Sun Microsystems Inc.'s NeWSprint environments.

The 9080 and 9170 both list for $4,995.

Finally, Tektronix's Graphics Printing and Imaging Division, Wilsonville, OR, announced the acquisition of RasterOps Corp.'s color printer business. Tektronix will purchase RasterOps' printer inventory, support and service of its installed base of customers.

Tektronix will no longer market RasterOps' CorrectPrint 300i dye-sublimation color printer or supplies, but Tektronix will provide service and technical support to owners as if the printers were the Phaser IISDX, Tektronix's dye-sublimation color printer. Tektronix will offer an upgrade path for the CorrectPrint 300i to convert it into a Phaser IISDX. The upgrade kit will be available in July and will include full on-site technical support for the duration of the warranty for a price of $2,995.–*mm*

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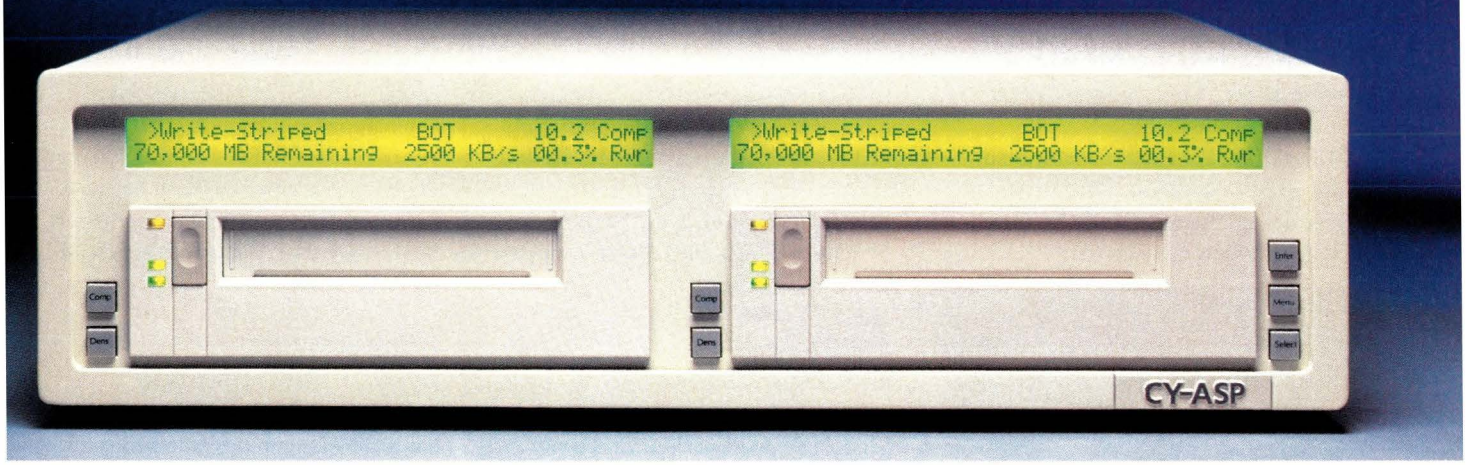

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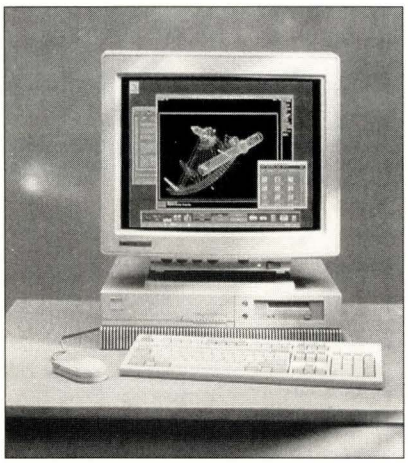
HP Drops the Big One

Hewlett-Packard Co. has introduced three workstations and discussed a fourth, all of which the company says are highly optimized for graphics tasks in the design market. They offer performance increases and price reductions, as well as a new set of graphics coprocessor options.

The machines are being targeted at Silicon Graphics Inc., which has recently been attempting to take its 3D photorealistic powers to the MCAD/ECAD market–traditionally one of HP's domains. "We intend," says one company official, "to bomb SGI back into the Paleocene."



One of four new workstation models, this HP 9000 Series 700 workstation provides 77 SPECint92 and 96 SPECfp92. Hewlett-Packard says it intends its new machines to compete strongly in the computer-aided design market.

The four systems are the HP 9000 Series 700 Models 715/64, 715/80, 715/100 and 725/100. All are based on the company's "Snake" PA100LC processor and support 256 to 512 MB of main memory, have a maximum internal disk of 4 GB and maximum total disk of 84 to 240 GB.

The 715 models are considered low-end, if not exactly entry-level. The Model 715/64 has a 64-MHz processor and offers 77.5 MIPS, or a SPECint92 of 66.6 and a SPECfp92 of 96.5. It's in graphics performance, however, that things get really interesting. In a base configuration, the workstation offers 6.55 X/mark93 and rates 16 in PLBsurf93. With 32 MB of RAM, 525 MB of disk, and a 17-inch monitor, the product costs $9,995.

The 715/80, meanwhile, comes with an 80-MHz processor and provides 97.12 MIPS, or a SPECint92 of 83.5 and a SPECfp92 of 120.9. Its X/mark93 score is 7.9, and it rates 20 in terms of PLBsurf93. A base-level machine with 32 MB of RAM, 525 MB of disk and a 17-inch color monitor is $13,600.

The 715/100 has a 100-MHz processor and provides 122 MIPS, or a SPECint92 of 100.1 and a SPECfp92 of 137. Its X/Mark score is 12.25, and it rates 89 in terms of PLBsurf93. A base-level machine, with 1 GB of disk, 64 MB of RAM and a 20-inch monitor costs $37,665.

The 725/100 is described as a midrange system. Although HP says the machine would fall directly under its top-of-the-line Model 735 and Model 755 workstations, it did not release details of the 725. It did say that its specifications and performance would be the same as the 715/100, but that it would be more expandable, with up to four empty expansion slots. The 715/100 has one.

All the computers offer a number of features that enhance graphics performance. At the processor level, all the machines can perform subword arithmetic. This means that instead of operating only on 32-bit words, the processor can load and manipulate two 16-bit subwords in the same register. The system can use these subwords in certain high-speed operations, such as integer math, which figures large in many graphics applications.

Also, the 715 workstations feature color recovery. In this process, 24-bit color is closely reproduced with an 8-bit frame buffer using a process rather like a pseudo-color or indexed color scheme. What happens is that the 8-bit frame buffer contains not the colors themselves but rather codes that correspond to a 24-bit palette. When the system encounters a code, it performs a quick lookup and "recovers" the true color. "We do dithering, but then we run it through our patent-pending process that recovers the color," explains Pierre Bouchard, product marketing manager for the Workstations Systems Group at HP. "You are able to recover almost all the colors of a 24-bit system."

In addition, HP showed four new graphics subsystems that can be had as options on the workstations. The first of these is the HCRX-8, which provides X Window System performance acceleration, hardware double buffering, and approximately eight million colors through the color recovery technique. The second is the HCRX-24, which provides 24 planes of color applications and eight overlay planes. Fourth is the HCRX-8Z, which has all the features of the HCRX-8 but with hardware acceleration. Finally, there is the HCRX-24Z, which offers full 24-bit color.

Ross Unveils hyperSPARC Upgrade

SPARC-vendor Ross Technology Inc. has introduced an upgrade MBus module that allows end users to upgrade their SPARCstation 10 and SPARCserver 600MP machines to the hyperSPARC processor. There are two versions of the product: the RT600-D-55, which has two hyperSPARCs and is priced at $5,950, and the RT600-Q-55, which has four hyperSPARCs and is priced at $9,950.

The Ross products do not compete with the Weitek Corp. Power µp products, which sell primarily to individuals and companies dealing with the older, pre-MBus systems. They are, however, competitive with Sun's own upgrade products. "Our CPU is competitive with theirs for the following reasons," says Steven Goldstein, Ross' vice president of marketing and sales. "First, we take up only a single connector slot, whereas Sun's takes two. Second, Sun requires its customers to upgrade to Solaris 2.3, where we support Solaris 1 or Solaris 2.3, and third, we're cheaper. Their upgrade was listing for $20,000."

He adds that Sun's higher price "probably reflects the fact that Sun wants to sell you a whole new workstation instead of a cheap upgrade."

Ross says that the SPARCstation with the original processor has a SPECrate_int of 1072 and a SPARCrate_fp of 1,282, but with the hyperSPARC module, the same

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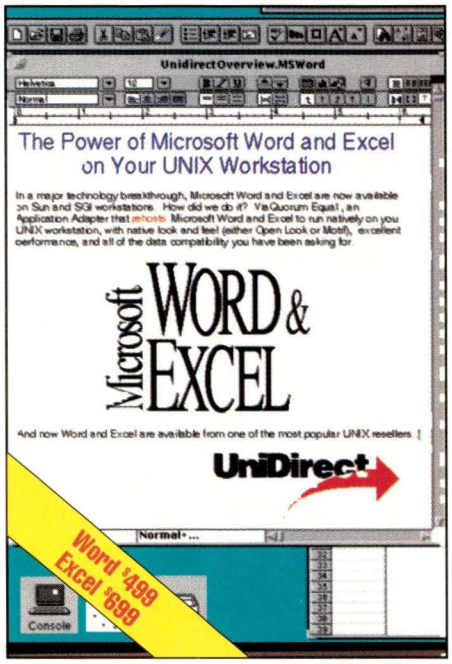

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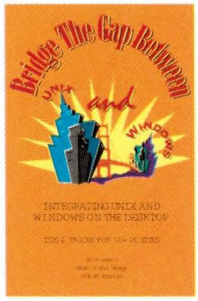

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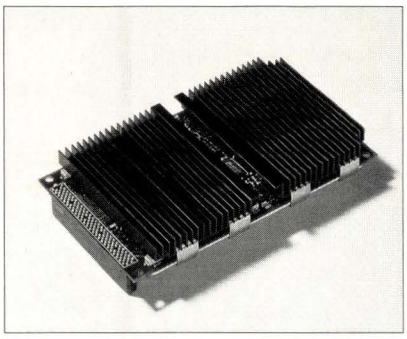

Ross Technology's upgrade MBus module allows users to replace an existing processor with two to four hyperSPARC processors. Each module occupies a single connector slot.

machine has a SPECrate_int of 4,554 and a SPECrate_fp of 5,457. A SPARCserver 690 MP, meanwhile, normally has SPECrate_int of 1,847 and a SPECrate_fp of 1,930, but with hyperSPARC, it is 4,509 and 5,402, respectively.

Microsoft Licenses Windows...to UNIX?

Microsoft Corp., the much-feared vendor of would-be UNIX-buster NT, has announced plans to license part of Windows to UNIX companies. Specifically, the software giant is providing Windows source code to companies that already provide software allowing developers or end users to put DOS and Windows onto UNIX systems. "Business runs on DOS and Windows," explains Bob Kruger, Microsoft director of systems marketing and standards, "but we wanted to give people the ability to have their applications where they want them."

Microsoft announced agreements with Locus Computing Corp., Mainsoft Corp. and Insignia Solutions Inc. Locus is known for its DOS-UNIX file-transfer facilities, Insignia for its DOS/Windows emulators that run on UNIX, and Mainsoft for its libraries that allow developers to take Windows applications and implement them in UNIX environments.

Other agreements are said to be forthcoming. Bristol Technology Inc., which has a Windows-to-UNIX porting environment, is said to have one such arrangement in the works. Other vendors indicate that there is no concern that Microsoft could play favorites. "I don't think it is an issue," notes Durgo Rao, president of Software Pundits, which also has a porting suite. "All the capable players are being considered."

The vendors generally agree that Microsoft's goal is to make its Windows API a common, cross-platform development environment. The company already has in-house development operations to put it on Macintosh systems. However, says Chane Cullens, product manager for Wind/U at Bristol Technology, "they don't have a UNIX solution. And rather than build a new group to do UNIX, they've turned to licensing, and letting other people do it for them. It makes their cross-platform story very solid without having to do any work."

Mainsoft Vice President of Sales and Marketing Jeff Elpern agrees. "They see a revenue stream either way, whether the user is on a PC or a UNIX system," he says. "I think they are serious about making the Windows API an open environment, and they are deeply engaged in making OLE an object strategy for the corporate world." OLE is an integration environment that is roughly comparable to OpenDoc. "You can't do that unless you are on all the platforms."

Similar opinions come from Bob Peterson, director of the Merge product line at Locus. "Basically," he says, "Microsoft wants to be seen as being in the open systems world. This is a step in that direction."

In addition, though, it could woo UNIX-oriented developers into the NT camp. "I think Microsoft realizes that if they get people to use the Windows API on UNIX, then UNIX programmers might decide that's where they should be." UNIX programmers, he says, might ask themselves, "Why bother with a proprietary API? Why bother with Motif?" Instead, they could have only one code stream, and one set of source code, and only one operating system–NT–to worry about, and still be able to run on UNIX when they wished to.

Meanwhile, Digital Equipment Corp. has recently announced its own set of UNIX-to-NT porting solutions. eXcursion (SDK) V1.2 for Windows NT is a PC X server that also contains a tool kit for porting applications that use the Motif GUI to NT. "Basically, it is a set of X Window client libraries," says John Freitas, principal software engineer at Digital's NT Systems Group in Littleton, MA. "They would connect to an X server, and then the server would translate the X graphics to Windows graphics."

It is not a tool for porting an entire application to NT. "We just address the user interface," says Freitas. "But, in a port like this [from UNIX to NT], that can be the hardest part." He adds that his product has several significant technical advantages. "We support the NTFS file system, which means we can support long file names, we have full support of Motif and X Window, and Digital has its own extensions to Motif."

Moreover, eXcursion SDK can port the Motif-based interface of a VMS application to NT. Might VMS-oriented developers not be tempted to take their venerable VAX applications to NT as well? Porting from VMS to NT "is a similar kind of situation," says Freitas. "But the port might not be as straightforward."

He thinks that it isn't that easy to port a VMS application to NT. "VMS does share some things with NT. It is a 32-bit OS that supports true preemptive multitasking, for instance. But NT also has similarities to UNIX. In fact, it has more in common with UNIX than VMS–porting stuff from UNIX goes fairly smooth, porting from VMS would be a lot harder."

Andataco to Resell Cray Superservers

System and peripheral vendor Andataco, San Diego, has announced that it has agreed to resell the Cray Research Superservers Inc. Superserver 6400, which is a multiprocessor system that can be configured to hold as many as 64 SuperSPARC processors.

The 6400 is the fruit of Cray's recent entry into commercial multiprocessing. The supercomputer maker had purchased the former FPS Systems, also of California, and used it as the core of a new multiprocessing division.

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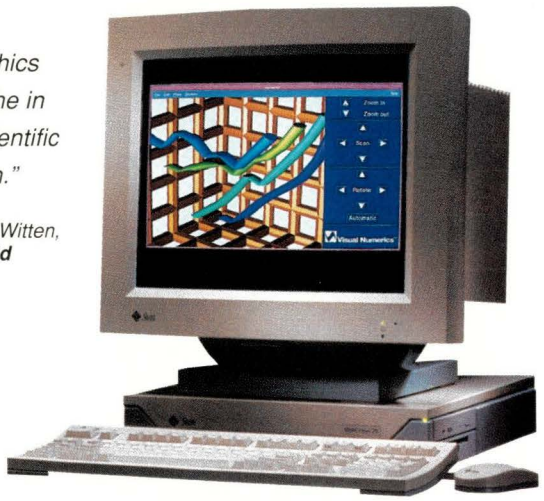

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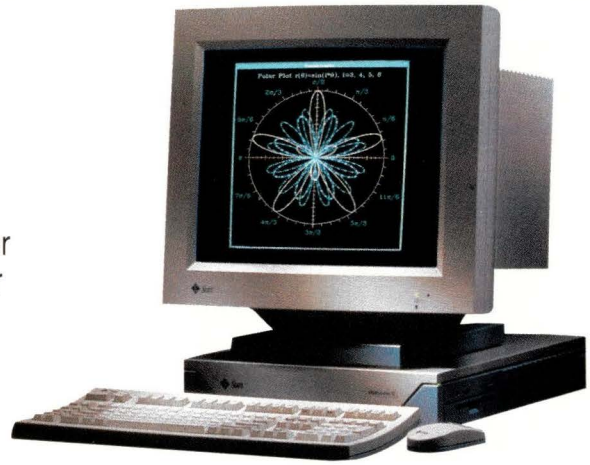

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Cray has indicated that it intends to ship its 6400 into both technical and commercial MIS markets.

Andataco thus becomes one of the first of the new system's resellers. Andataco has long carried a line of Sun workstation and server peripheral and aftermarket products. It was until recently a Sun VAR, but, following a highly publicized breakup, the company turned instead to SPARCalikes from third parties. It also sells the HP 9000 Series 700 and 800 products.

In separate news, Andataco announced a line of optical file server products. Saying it had "canceled" a contract with Advanced Archival Products Inc., whose Amass product it had formerly offered, Andataco said it would be selling instead its Ensemble/OSF solution. This is a standalone optical media device that is compatible with NFS or the Novell Inc. NetWare system. It connects to a host via an Ethernet controller.

Pricing on the Ensemble/OSF optical disk libraries ranges from $121,995 for a 20-GB system to $17,995 for a 187-GB system.

AAP Signs HP as Reseller

Advanced Archival Products Inc. (AAP) has announced that Hewlett-Packard Co. has signed on as a remarketer of the company's Amass file system software. HP will market Amass along with its own optical disk libraries and will provide technical support for customers of the combined product.

Under the terms of the agreement, HP's entire optical product line will support Amass. This includes machines ranging in size from 20 to 187 GB.

Which OS Will Rule?

Which operating system will lead the enterprise into the 21st century? That's the question Wyse Technology Inc. asked of its panelists at a recent debate held during UniForum in San Francisco. The panel made the event part comedy, part self-promotion and part system forecasting. Dave Card, UNIX analyst at International Data Corp., moderated.

To make things interesting from the start, Matt Regan, group product manager of Windows NT at Microsoft Corp., sat next to Jim Billmaier, vice president of marketing for SunSoft Inc. Rick Bohdanowicz, vice president of marketing at the UNIX Systems Group at Novell Inc. was on hand, as well as Doug Michels, chief technical officer at The Santa Cruz Operation Inc. A last-minute addition to the panel was made by IBM with Scott Handy, program manager of worldwide marketing strategies.

Representatives from the "big ones," Microsoft, Sun, IBM, SCO and Novell, went head-to-head for a debate at UniForum: The topic was "Which operating system will lead the enterprise into the 21st century?"

SunSoft cited scalability as its ace in the hole for carrying Sun's operating systems into the future. That includes performance scalability, for one, from low-end laptops to high-end Cray workstations. Sun will support all levels of computing. A second type of scalability will be cross-architecture. Sun will support all architectures from the PowerPC to RISC systems. An additional issue is scalability over time. This means support for older products while migrating to newer ones–the move from Solaris 1 to Solaris 2, for example. Scalability of networks is a natural for UNIX. "Networks built on UNIX can easily be scaled from small work groups that run 10 nodes all the way up to who knows," says Billmaier.

Novell spoke of rightsizing as its passport into the next century. Novell naturally sees networking as a fundamental part of all systems involved in the rightsizing movement. "When delivering services to each end user throughout the enterprise, you've got to be able to deliver those services right to the desks of those users but, at the same time, maintain a manageable integrated hole. And that's why the concept of networking as an inherent

principle in your operating system design must be there," says Bohdanowicz.

IBM's Scott Handy spoke of the importance of heterogeneous networks and noted that even in a company's own line of goods, i.e., OS/2 and AIX, systems must be entirely compatible. IBM is also focusing on downsizing for its customers. Handy says, "We're taking our strategic middleware products like NetView and CICS that help manage the enterprise and moving them to as many environments as we can."

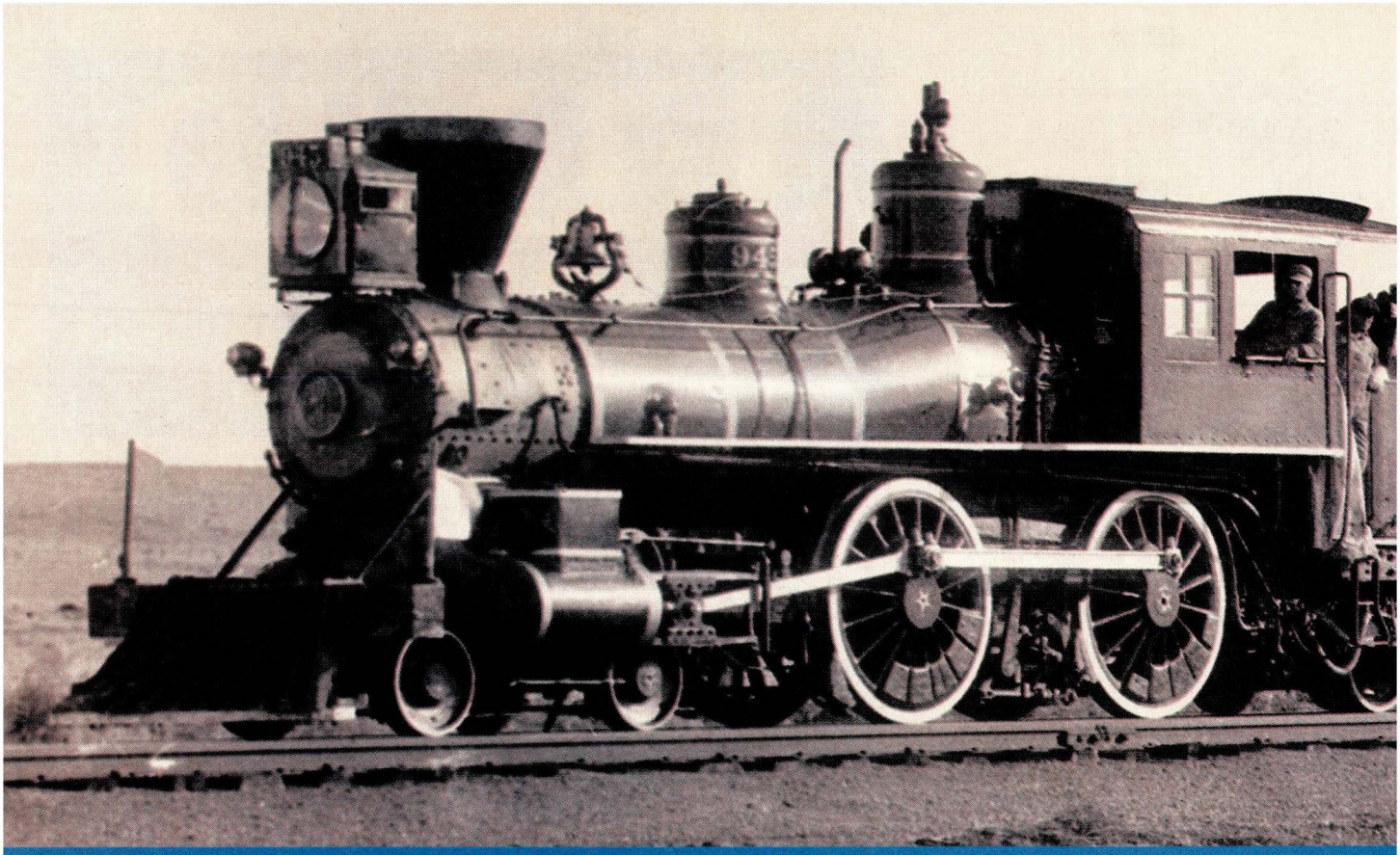
Doug Michels of SCO predicts Windows will evolve as a productivity solution for word processing, spreadsheets and other office applications. UNIX and OS/2 will remain on high-end performance systems as the company's solution. SCO's route to the 21st century hinges on Windows. Michels puts it like this: "Our answer is very simple–provide a server that's Windows friendly and network and Internet friendly and be the center of distributed data processing services. That solves an evolutionary problem that customers really have."

Although they would have liked to, each representative had to admit that they really did not see their operating system as the sole operating system of the 21st century.–*mm*

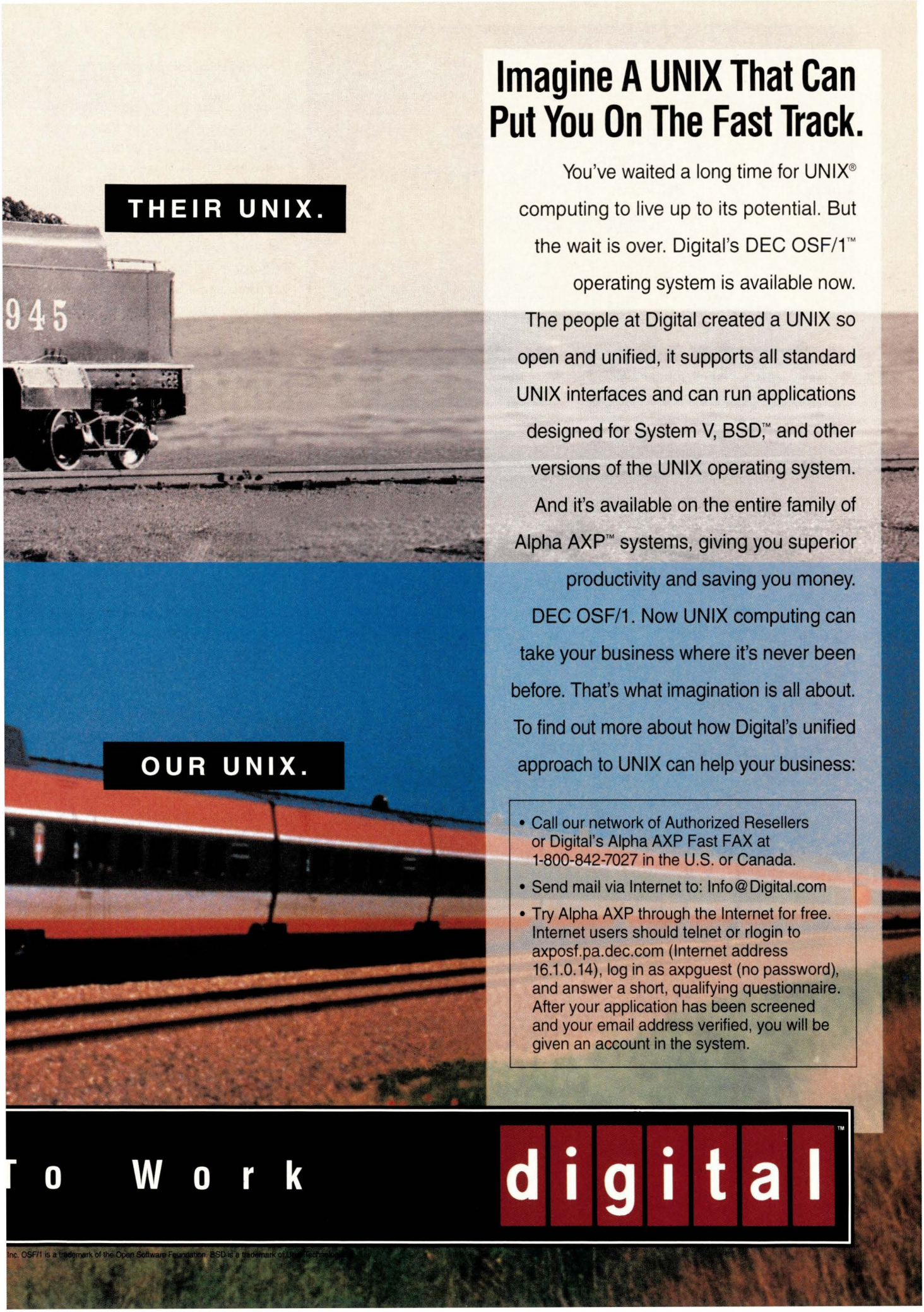
Sun Shows Integration Business

SunService, the service and support arm of Sun's business, has announced that SunIntegration services has been incorporated into its organization. The group was part of Sun Microsystems Computer Corp. SunIntegration will continue to be headed by Bill Coleman, vice president and general manager, but he will now report to Larry Hambly, president of SunService.

In addition, the newly repositioned SunIntegration has announced a series of six services that will be marketed as a portfolio to customers who are in the process of downsizing. The first of these is Open Systems Diagnostics, a service by which SunIntegration gives customers a high-level diagnosis of the business and technological aspects of client/server technology. Next is IT Competitive Advantage, under which



Putting Technology



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the organization develops a business case and lays down a technical approach for a customer to downsize.

Strategic Architecture Design maps out a high-level architecture and creates a three- to four-year plan for actual downsizing. Migration Planning provides a migration plan for the customer, including both business applications and actual staff. Rapid Prototyping, then, is meant to provide a prototype of one of the customer's key applications as a proof-of-concept. Rapid Process Re-engineering integrates the customer's business practices and processes with the newly downsized information technology.

Sun and Fujitsu Pair Up for SPARC

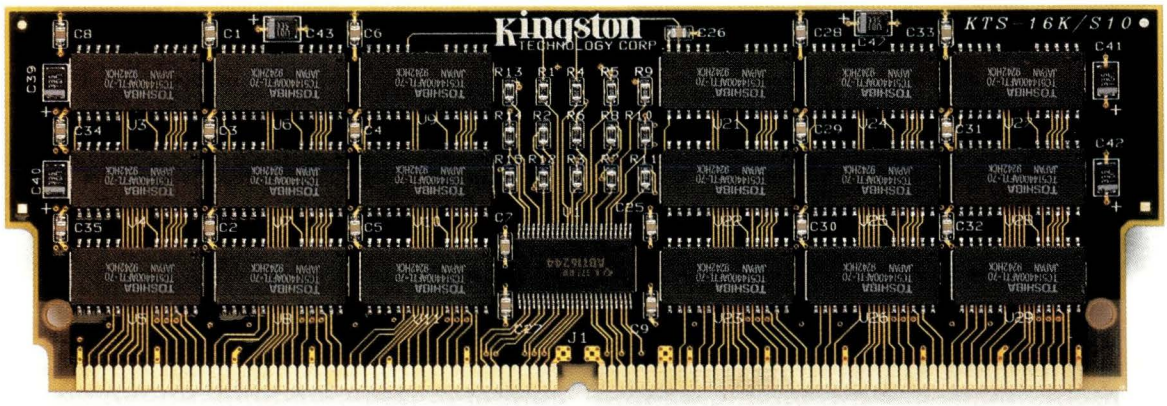
Sun and Fujitsu Ltd. have announced a de facto partnership under which the two companies will cooperate on the development of the SPARC processor. The companies will put aside their various patent, intellectual property and business restrictions so that engineers from both companies can contribute to new designs for advanced SPARCs.

The two companies say that this will not change relationships that already exist in the industry. For example, Sun will not sever its existing relationship with chip vendor Texas Instruments Inc.–which Sun now describes as a manufacturing relationship in which TI does not significantly contribute to the design of the processor.

The agreement between the two companies brings the two leaders of the SPARC world into one camp. Sun, of course, remains the single largest consumer and design leader of SPARC processors. Fujitsu, through its own efforts and those of its subsidiaries–ICL Ltd. in Europe, and Ross Technologies in United States–has emerged in the last year and a half as a close second.

This Just In...

• *Sun Microsystems Federal*, the part of Sun that handles sales to the U.S. government, has announced that it will be remarketing Tadpole Technology Inc.'s SPARCbook 3 and SPARCbook 3LC to government users in need of laptop SPARC systems.



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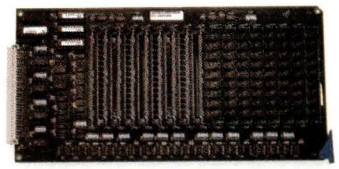

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• In a related development, *SunExpress*, the Chelmsford, MA-based direct sales division of Sun, has announced that it, too, will be selling the Tadpole SPARCbook 3. But it also announced that it would be carrying the RDI PowerLite portable computer. RDI, in turn, announced that it had an OEM agreement with SunSoft whereby it would be shipping its BriteLite and PowerLite workstations with Solaris 2.3 as well as 1.1.1, and, in March, added that its PowerLite was also to be sold by Sun Federal.

• The *Concorde Group*, Cambridge, MA, has become an Authorized Support Provider for SunSoft Inc. This means it can provide Solaris users and other SunSoft customers with telephone support, product revisions and error corrections as they become available from SunSoft.

• *SunSolutions*, the videoconferencing business of Sun, has announced that it is joining the Consortium for Audiographics Teleconferencing Standards (CATS). This group is a not-for-profit organization formed to promote international standards for teleconferencing.

• The *ASK Group Inc.*, Santa Clara, CA, has announced restructuring plans intended to bring the company back to profitability. ASK, which is noted in the industry for acquiring the former Ingres Corp. RDBMS company, says that it will take a restructuring charge of about $45 million to $47 million for the fiscal third quarter ending March 31, 1994.

• *Software Maintenance and Development Systems*, Concord, MA, and *Qualtrak Corp.*, Santa Clara, CA, have announced an agreement under which the two companies will integrate SMDS's configuration management tool, Aide-de-Camp, with Qualtrak's Distributed Defect Tracking system.

• *Age Logic*, San Diego, CA, is shipping a beta version of the X Image Extension Implementation (XIE-SI) to the X consortium. The extension is meant to bring high-performance imaging to X Windows.

• The *SPARC Technology Business* of Sun says it is sampling 85- and 100-MHz microSPARC II processors.

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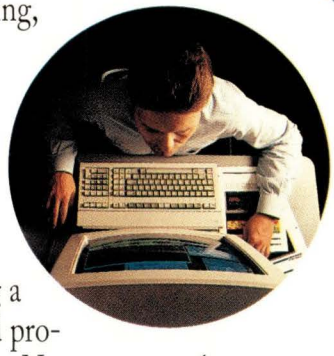

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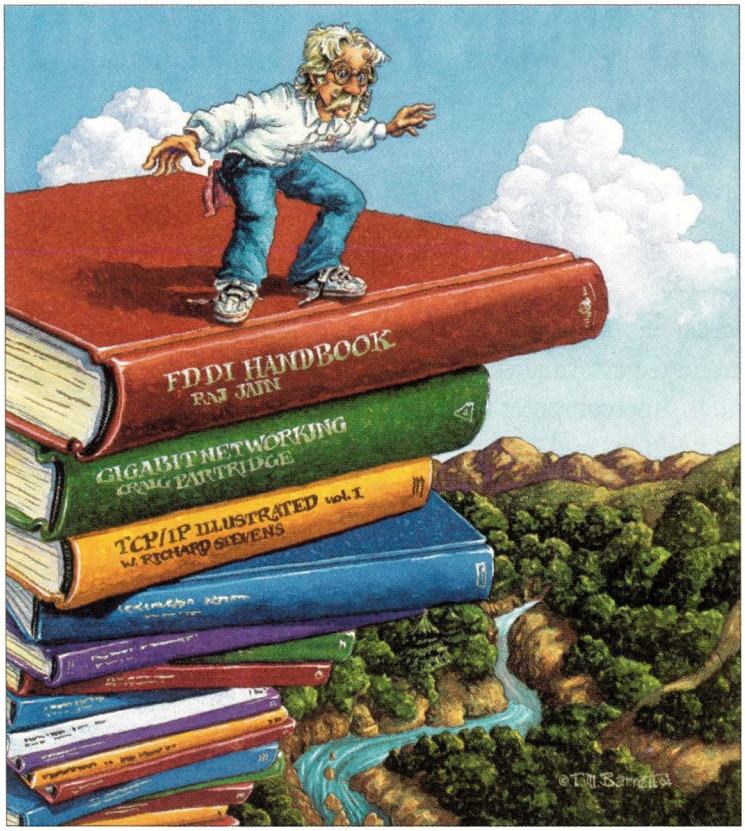


TOM BARRETT

Mr. Protocol Hits the Books

by MICHAEL O'BRIEN

"Due to the attractive bright orange color of the FDDI cables, the rats at the institute could not resist and had taken several bites."

–Raj Jain, *FDDI Handbook*

"A less pleasant side of internetworking is that the idea is so appealing that everyone seems to want to develop his or her own set of internetworking protocols."

–Craig Partridge, *Gigabit Networking*

"If you have access to a network you are encouraged to obtain the software used in this book and experiment on your own."

–W. Richard Stevens, *TCP/IP Illustrated*

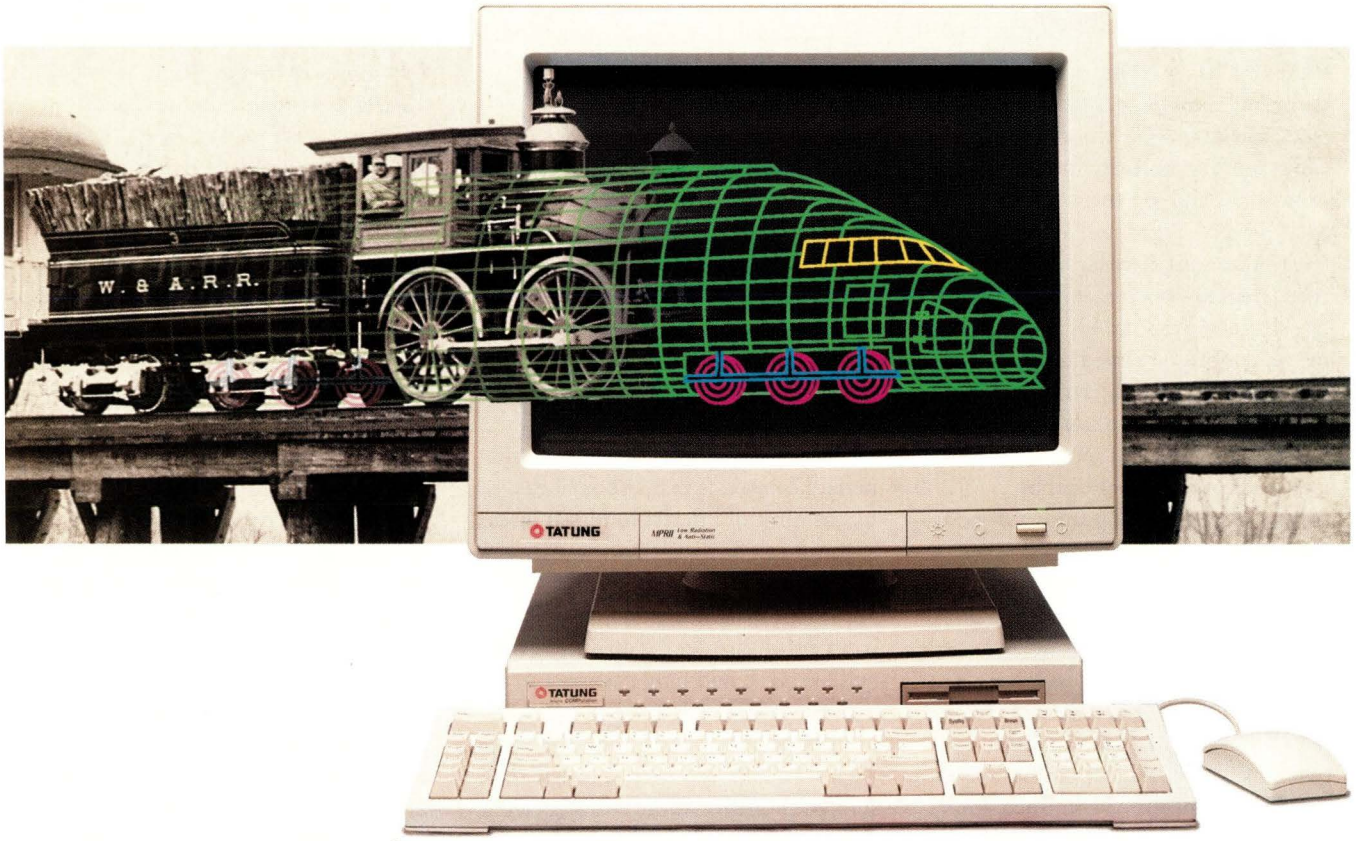
Q: Pinch me to see if I'm awake, will you? OW! OK, OK, I'm awake, so how is it that I see Mr. Protocol, the Ever On Line, actually *reading a book*?

A: You've got three guesses, and the first two don't count. That's right, it's a book about computer protocols.

Addison-Wesley has come out with no less than three books over the past few months that Mr. Protocol found noteworthy. This month we'll be taking a look at them. Let us face the fact that these will never hit either *The New York Times* best-seller list, nor the Crown Books Shelf Full of Rump Roast of Bulwer-Lytton at Seven Dollars the Pound. However, for hapless network administrators who have made the awful discovery that their network vendor sounds like they might know more than they do, these books will be invaluable. For one thing, they're heavy enough to be excellent dark-alley companions.

It may be argued that if one is forced to jump off a cliff twice, once head-first and once feet-first, one might wish to choose head-first for the first attempt, on the grounds that one might thereafter be free of any compulsion to proceed to stage two. It is for that reason that I choose first to review Raj Jain's excellent *FDDI Handbook*, subtitled *High-Speed Networking Using Fiber and Other Media*. I say this because of the astonishing depth and range displayed by this book. The coverage is at once so deep and so broad that one feels that not only could one use this book to build an FDDI net from scratch by rubbing two Coke bottles together, one would even know the best grip to use on one of the bottles to beat off an overly persistent FDDI salesman.

FDDI stands for Fiber Distributed Data Interface. It has been around for



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a number of years. Most people in the field have heard of it. Its deployment until now has been limited by the relatively high cost of the network interfaces. However, it seems due for an explosion in popularity for a number of reasons. The top three reasons are spelled ATM, ATM and ATM.

Asynchronous Transfer Mode, or ATM, represents a switching technology that is the current Holy Grail of the marketplace-minded within the high-speed networking community. It is offered for in-house sale by a number of manufacturers, but more important, it is understood and offered by common carriers and promises to be as popular as ISDN was not.

Considering that an ATM switch can actually offer gigabit networking, or at least that order of magnitude, regular old 10-Mb Ethernet suddenly seems lacking. FDDI makes a natural choice for a follow-on LAN for an ATM switch, since FDDI can run up to 100 MB/s. And once you've finished Jain's book, there's not much you won't know about FDDI.

Jain starts out by giving an overview, and the overview goes into more detail about ring architectures, station types and the like than most textbooks do throughout. Things continue from there. FDDI has several layers of its own; Jain covers them immediately. The Media Access Control protocol, the Medium Independent Physical Layer, the Physical Layer Medium Dependent, and a description of the fundamentals of optical communications.

An explanation of the sources of dispersion and the frequency windows available for use by FDDI took this reviewer back to his course in physical optics. The mathematics involved in such matters as multimode transmission are not shirked here. While no actual integral or differential equations are to be spotted, a firm grounding in analysis is nevertheless a practical necessity to follow these parts of the book.

It should be noted that Mr. Jain is not being deliberately obtuse. An actual explanation of how optical fiber does what it does, and hence an explanation of the basis of its strengths, weaknesses and general properties requires this sort of treatment. But it can be tough on the unprepared. However, sections that deal purely with protocols deal only with the mathematics of protocols, which are not so stiff as the mathematics of optical propagation. And even Mr. Jain shies away from Maxwell's equations.

The treatment continues in this exhaustive style, dealing with station management, connection and ring management, and those parts of SNMP that deal specifically with FDDI and the FDDI MIB.

One of the strange things about this book, however, is that although the recent surge of interest in FDDI owes as much to ATM as it does to the drop in price of FDDI interfaces, the *FDDI Handbook* makes no mention of ATM in an entire chapter devoted to FDDI and SONET, and only passing mention of ATM in a chapter on follow-on LANs for use with FDDI. This is perhaps too narrow a view to suit Mr. Protocol–those wishing to know how FDDI fits into a larger scheme will have to supplement this book with another (such as Craig Partridge's book, reviewed below).

An invaluable feature of the *FDDI Handbook* is the section on buying, installing and analyzing fiber cables and FDDI equipment. This stuff alone is worth the price of admission. Two more chapters on performance analysis of FDDI networks recall Mr. Jain's previous book on performance analysis in general.

Perhaps the oddest thing about this book are the humorous sidebars and (unattributed) cartoons. At first, Mr. Protocol was tempted to give Mr. Jain the time-proven advice, "Don't quit your day job, kid."

However, it turns out that the meta-humor involved is considerable. The odd parables and quirks that illustrate various points about FDDI, not exactly a laugh-a-minute subject, are indeed so very odd as to cause one to wonder just what dim inner recess they could have sprung from. These aren't cartoons. They're Rorschach blots. You will find yourself musing over each of them, "How ever could this have occurred to him?"

This is not a question likely to arise when considering the next book, Craig Partridge's *Gigabit Networking*, mainly because it covers the area in which Mr. Partridge wrote his thesis. *Gigabit Networking* is much easier going than the *FDDI Handbook*, if only because the treatment is nonmathematical and descriptive rather than derivational. This does not make it a lesser book, however. In fact, it complements Jain's book nicely, because it gives the overall treatment Jain's book lacks. Partridge's book describes FDDI (in considerably less detail than Jain, naturally), ATM, Synchronous Optical Network (SONET) and several other things, but more important, it shows how they interrelate and interact. It is the relationships between these things that make up a gigabit network.

Gigabit Networking begins with an overview of FDDI. It then moves on to the general notion of cell networking, and from there to the specifics of ATM and SONET. It then treats the problem of wide-area cell networking and the switching strategies necessary in this area, local-area cell networks, and the current state of gigabit networking (ATOMIC LAN, etc.).

If this were all that were there, the book would be no more than a fine introduction to the state of the art. What more could you ask for? Mr. Protocol is glad you asked.

Starting with Chapter 9, *Gigabit Networking* starts to get really interesting. Chapter 9 is entitled "Making Hosts Ready for Gigabit Networks." It covers the issues in processor design that most affect the transmission of data across a high-speed network, such as copying costs, processor-memory interactions, etc. Chapter 10 covers the weak areas in today's internetworking protocols, namely the places that start to spring leaks when network speeds get high. The next chapters are pure gold, for they cover the matters that are being hammered out in the various Internet Engineering Task Force working groups as this review is being written: traffic shaping, performance guarantees and flows. The final chapters on distributed systems, a current view of the state of the art, and pointers to other sources of information (a sort of narrative bibliography)


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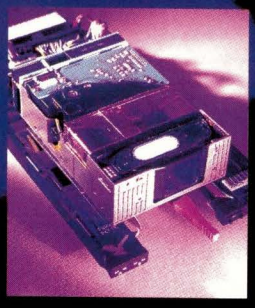

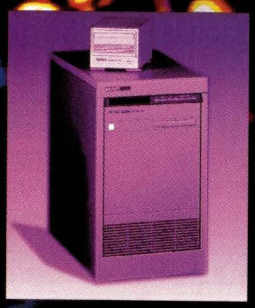

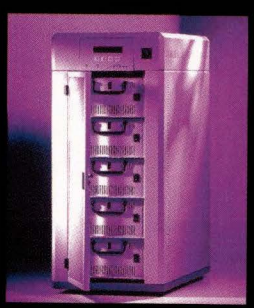

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round things out nicely, but it is the three chapters on traffic that form, to Mr. Protocol's way of thinking, the most important part of this book. These are the issues that present the greatest barriers to widespread deployment of the NII. Mr. Protocol highly recommends this excellent treatment. To lay all the cards on the table, he practically has to. Mr. Partridge was present when Mr. Protocol was born, but it's a good book anyway.

To round out the threesome, so is *TCP/IP Illustrated, Volume 1: The Protocols*, by W. Richard Stevens, whose excellent book, *UNIX Network Programming*, remains a valuable adjunct to any beginning Internet application programmer's efforts.

To be sure, Mr. Protocol is a naive reader. Given the title, he picked up the book expecting something on the order of *Prof. E. McSquared's Calculus Primer*, which was an introduction to differential and integral calculus in comic-book form, complete with cute little animals. He was sorely disappointed to learn that there weren't any cute little animals jumping around the packet headers in Mr. Stevens' book. To be sure, there aren't any cute animals of any sort in the book, but Mr. P. soon forgot his chagrin. "Illustrated," in this context, means "by examples," complete with pointers to running code you can grab off the net to try all the stuff Mr. Stevens presents.

Indeed, there are plenty of pictures in this book, of the usual sorts of packet headers if not of bunnies. More welcome are the examples. At every point, Mr. Stevens has run programs to find out what real-world systems do when their innards are poked. The results form an invaluable snapshot of the way current systems behave under a wide variety of conditions. No matter what else the book contains, this is an invaluable contribution of documentation as well as of explication.

The book takes the bottom-up approach to the seven-layer model of networking, though that model isn't explicitly used. (Good thing. For some reason, whenever Mr. P. carries on about the "seven-layer model," I'm never sure if he's referring to a chocolate cake, a network, or the old A. Merritt classic, *Seven Footprints to Satan*.) It begins with the link layer, and runs through a catalog of current suspects, ranging from Ethernet through SLIP and PPP.

It continues with a description of IP, complete with a treatment of subnet masks, and moves on through most of the things that IP can do: ARP, RARP, ICMP and routing. It introduces a couple of programs with which many will already be familiar: `ping`, used to discover approximate round-trip times to a distant system, and `traceroute`, used to discover the route followed by packets from hither to yon. Finally seeing how these things work will be refreshing to those who have not dug into this before.

A discussion of UDP follows, along with associated user-level protocols such as the Domain Name System, TFTP and BOOTP. Some may remember that Mr. Protocol slugged them with that a couple of months ago.

One interesting fact about this book, whose title starts with TCP, is that TCP isn't even introduced until Chapter 17. It sort of reminds Mr. Protocol of Russell and Whitehead's *Principia Mathematica*, which spent 300 pages or so just getting around to "one." In fact, TCP gets introduced on page 223 of a book about TCP/IP. If anything, this goes to prove that this book is not oriented toward applications. It also proves that there is a lot going on besides just TCP connections, which most people with "busy" lights on their Ethernet interfaces have probably figured out already.

The treatment of TCP, when it finally does get started, is particularly valuable, for here is an integrated treatment of such highly necessary esoterica as the Nagle algorithm, silly window syndrome, delayed acknowledgments and other major landmarks of modern network life. They don't exist in the basic protocol spec, but no biggish network can run without 'em. Behold learning by doing.

A treatment on the various timers used in TCP follows, and then a very valuable chapter on TCP Futures and Performance, in which is explained the "fat pipe syndrome," which is something to be looked for when you build something that uses FDDI and ATM and the NII and gigabit satellite links and the like. Trust Mr. P., Chapter 24 is a biggie. Some of the features mentioned in here, like the Window Scale Option, are available as drop-in optional extras from system vendors.

At this point things get puzzling. No mention is made of what Volume 2 is supposed to be. One would have expected *Volume 2: The Applications*, but in fact the last several chapters of the book are devoted to such things as SNMP, Telnet and rlogin, FTP, SMTP and the like. Perhaps Volume 2 is biographical in nature. Mr. Protocol would enjoy *Volume 2: The People*. It might make very interesting reading, indeed. ➸

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

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

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

Reading List

Raj Jain, *FDDI Handbook*, 528 pp., Addison-Wesley Publishing Co. 1994, $49.50, ISBN 0-201-56376-2.

Craig Partridge, *Gigabit Networking*, 416 pp., Addison-Wesley Publishing Co. 1994, $46.25, ISBN 0-201-56333-9.

W. Richard Stevens, *TCP/IP Illustrated, Volume 1: The Protocols*, 600 pp., Addison-Wesley Publishing Co. 1994, $47.50, ISBN 0-201-63346-9.

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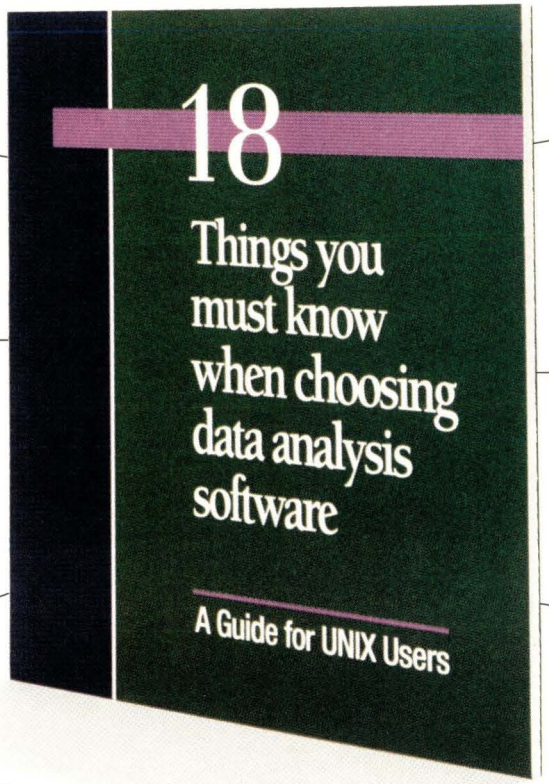

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GREG HALLY

Servers and Clients

by PETER COLLINSON
Hillside Systems

The term "client/server" seems to have come to the fore recently. It's not something that you will find me using, except perhaps with derision. It seems to have been invented by salespeople and hyped by the media. Is the intention to provide people out there in purchasing land with something to say that seems relevant? "Some Important Inc. goes Client/Server," trumpet the headlines. This is news, yet the notion of applications being broken into client/server parts is over 20 years old. Client/server applications have been going for as long as there have been networks.

There are a whole bunch of servers that are running on your machine. Later in this article, I'm going to look at one that is part of the system infrastructure. It's not particularly new. It's `syslogd` and provides a point of contact for all programs that need to log their actions.

First, here are some words about servers and clients in general. A server on your machine will sit there listening for connections from the outside world. When it gets the connection, it will do the necessary work and return its results back to the client. Preferably, the server should sleep until there is work to do. We try to avoid writing programs that wake up periodically, poke about in a number of different places for work, and then go back to sleep if there is nothing to do. We want to be sparing with CPU cycles so that we free the machine for more productive work. Also, polling like this can cause the problem of deciding how frequently to wake up.

Ideally, the server should wake up when a message from the network comes in. If we think of the message as an event, then the program is driven by that event. Recall that programs get all their information about the outside world using system calls. We'd like the server to make one system call and sleep until a message comes in. When the event happens, the server will wake up and continue with its work.

This kind of mechanism has always existed in UNIX. Think about a program like a shell reading data from the terminal. We don't want the shell to keep looping, saying, "is that user back from making coffee yet?" The shell uses a `read` system call to acquire data. If there is nothing to read, then the kernel makes the `read` sleep until there is something. The user reappears, fully caffeinated, and types a line. The `read` call returns, passing the typed text into the shell. The shell is unaware of the delay. All it sees is data being returned by the system call.

A similar mechanism is used for writing programs that use the network. The kernel provides an object called a socket that is accessed by system calls to enable network communication. There are some special system calls for sockets; they are used to set up aspects of the communication that are peculiar to networking. For example, they establish a remote network address or select the protocol type. There are also a set of send and receive system calls. In addition, the normal `read`/`write` calls can be used. This is convenient for UNIX. It means that we don't have to write special programs that talk to the network, although we generally do.

A server will sit in a system call waiting for an event from the network. It will have told the kernel what type of event it is interested in by providing the kernel with a port number. When some data comes in from the network addressed to that port number, the server will be woken up and passed the message. It will do the work the caller has requested and will (mostly) return a reply. After it is done, it will go back to the system call, where it will wait for more events.

Notice that we don't have to do anything special to allow different machines to talk to our server. The main data processing loop in the server is independent of the source of the request. I'll come back to this in a moment.

The Client

At the other end of the connection, a client will use the same socket mechanism to make calls for services from servers on other machines. We want to obey the same rules of device independence that are used for writing a server. The client will need a destination address and a port number of the service it wants to use. The address is a small piece of data that is supplied from a file or the name server. The port number for "well-known" services comes from the `/etc/services` file. The key thing to realize is you don't have to change the client program to talk to a different machine. The same binary is used to talk to any machine on the network.

However, how does a client talk to a server on the same machine? The client expects to be pushing stuff out onto the network and, as we have seen, the server is listening to a socket for events from the network. We certainly don't want to have to code special bits of program to deal with local connections in either the client or the server.

One alternative is for the client to transmit a message addressed to its own machine. If the network technology permits, then the message will come back into the machine and be sent to the server as if it had come from some other system. Some technologies can do this; a machine can transmit to itself. Some can't. However, it slows down communication. It's faster if the kernel realizes that the message from the client is intended for an on-board server, catches the outbound message, and sends it back up into the server. This is the function of the loopback network driver.

The loopback driver is configured at system start-up time with the local IP address. It has sent any outbound packets destined for the local machine and diverts them internally to the appropriate waiting server. The loopback driver allows us to write clients and servers that are completely independent of their location by making the local machine part of the network too.

Logging

The `syslogd` program takes advantage of this location independence to provide a service that can be used to centralize logging of system information on one machine. First, let's talk a little about the logging of data.

Programs tend to log actions in files. If the program is interactive, then it can inform the user of any actions that it is taking. If it's a background daemon, then it's not clear who

should be told. In times past, programs have written messages to the console–and some still do. This is fine until you try to use the console for other real work or need some data that has scrolled off the screen. It's better to write actions to a file so you can look at them later.

However, even at UNIX Version 6, these log files were becoming painful to manage. People wrote programs that dropped logs all over the file hierarchy. I hated this for many reasons. It was hard to find where a log file would spring up next to fill a disk partition. Also at that time, I tried not to write to the `/usr` partition, and many of these logs lurked in `/usr/lib`. I went round making many programs write a file in `/usr/adm/log`. I still meddle with the log files of some recalcitrant programs by making their files into symbolic links pointing at `/var/log` or some such location.

What are in the logs? There's a variety of information, ranging from "I'm broken, fix me," through "Things are working fine; here's what I'm doing" to "I'm still working and, by the way, this is the time." If you have a server running in the background, then your needs from the log file vary. If you are trying to get things going, then you may need everything it can give you. That's probably the only way to find out why things are not quite working the way you expect them to. Later on, when things seem functional, you might like to revert back to less voluminous output. Later on also, you will want to spot the failure messages from the mess of trivial logging ones.

Logger Design

With all this in mind, Eric Allman decided to write `syslogd`. It was done at a time when the number of services and daemons were growing rapidly. There was a need to provide a centralized system that could cope with the increased networking capabilities of the machine.

The idea behind `syslogd` is simple. As usual, it's easy to say that now–and less easy to come up with the idea in the first place. Any program that needs to log information makes a call to a server with a message. The server decides where to write that message, depending on the contents of a control file. This divorces the action of logging from the action of storing the message. This is a good thing because it allows you to merge logs for classes of programs or to do different things with logs depending on circumstance.

Why use a server? The basic problem the server is solving is one of "rendezvous." The client just sends a message into the kernel. It's the underlying transport mechanism that makes sure the message gets to the right place. The programmer doesn't have to worry about how this rendezvous is made, it just happens. The programmer may have to worry about what happens if the system cannot find an appropriate server. This will manifest itself as a failed return from a system call allowing appropriate action to be taken.

There are likely to be many clients of the logging server, so some method is needed to identify where the logging message originated. Each message is tagged with a pair of numbers: the facility and the level. It's the facility value that is used to separate the messages depending on who sent them. There are a small number of possible values. The `user` facility acts as a catch-all for anything not fitting into the general scheme. Messages from the kernel are tagged with `kern`.

There are several facilities that are used by groups of related programs: `daemon` is used by all system daemons, e.g., `ftpd` or `xntpd`; `cron` is used by the various programs making time-managed actions, like `cron` or `at`; and `auth` by authorization programs, such as `login` or `su`.

There are also facilities used by single subsystems: `news` used by the news system; `mail` by the mail system; and `uucp` is reserved for UUCP. Finally, there are eight facility codes reserved for local use, known as `local0`, `local1`, etc.

The names represent numbers that are compiled into `syslogd` and every program that uses the client interface. The numbers are cast in stone. There are a couple of good reasons for this. First, it means that if my system is logging on yours, then your `syslogd` understands my messages. Second, it's fast. The facility values are burned into the program; no lookup is needed to obtain a value from a file, say. The numbers are just transmitted; computers handle numbers quickly and efficiently.

However, I do wonder in retrospect whether the numeric coding was a good idea. Had the facilities been strings, then perhaps we would have seen them evolve more over time. For example, I am interested in logging FTP in detail on my machine but don't care too much about `xntp`. Both share the same facility name. OK, I can do things with `grep` on the log file to find the data that I need, but that's after the event.

For each facility code, there are several possible logging levels. Again, these are fixed numeric values. In order of severity, these are: `emerg` for panic conditions that will normally be broadcast to all users; `alert` for conditions that should be corrected immediately; `crit` for critical conditions such as hard device errors; `err` for other errors; `warning` for warning messages; `notice` for bringing the user's attention to something; `info` for information messages; and `debug` for debugging messages.

The logging levels provide a way for `syslogd` to choose to store or ignore messages. Clients are written to always send logging messages to the daemon, the daemon is then instructed to ignore messages over a certain level (`emerg` has value zero and `debug` is 7). This allows you to "turn debugging on" for an application in `syslogd`. Debugging messages are always being logged, but usually messages of this priority are ignored.

The real problem with this scheme is that it's hard to know what levels of message are generated by any particular program. Sadly, the manual pages for daemons don't document this–and they should.

Client Interface

The client interface to the system is simple. First, a routine is provided to open the log. The arguments to the routine are an identifying string that is written in the log (like `ftpd`), some options controlling aspects of the logging, and a facility value. Once open, the program can write logging messages using a routine called `syslog` that

works like C's `printf`. Each call to `syslog` includes a severity value. Finally, there is a close routine that tidies up after you.

Of course, all my talk above about `syslogd` listening to one socket for messages is much too simple. There is a mechanism (the `select` system call) for looking at several open files or sockets and waiting for an event. In reality, `syslogd` listens to messages from three places: a UNIX domain socket, an IP socket and the kernel. A UNIX domain socket provides a way of communicating between two processes on the same machine. Pipes (both named and traditional) are implemented using these. This is detail really, but I include it to stop the email saying, "You've got it wrong."

The `syslog` client interface talks to a local `syslogd` server using the UNIX domain socket (`/dev/log`). The client code will write on the system console if it cannot find the local `syslogd`. This is controlled by one of the options to the `openlog` routine. The IP socket that the server listens to carries messages for logging from other systems. Messages from the kernel are conveyed by a special device entry, `/dev/klog`.

You can log messages from shell scripts by using the `logger` program. For example, my shell script that does a nightly level 5 dump of my disks does:

```
logger -p local0.err "Problem with dump"
```

This appears in my console window and also on `/var/adm/messages`.

Controlling syslogd

The daemon is controlled by a file `syslog.conf` that you will find lurking in `/etc`. Getting this file right can sometimes be an arcane art, and the `logger` program can help here. The file consists of two columns separated by tabs. Note that this is tabs and not just white space.

The first column is a selector and the second a destination. The selector is matched with the facility/severity pair of the inbound message and the message is sent to the destination if the matching succeeds. If the message is not matched by any selector in the file, it is simply junked. Multiple destinations are possible for the same message. So the lines:

```
kern.debug          /var/adm/messages
kern.debug          /dev/console
```

will write all messages from the kernel (all messages have a higher priority than `debug`) onto `/var/adm/messages` and also onto the console. You can specify wild cards:

```
*.err               /var/adm/messages
```

will write all messages from all facilities that are of severity `err`, `crit`, `alert` or `emerg` onto the file. You can group messages for one destination by using a semicolon:

```
*.err;kern.debug    /var/adm/messages
```

There's a special selector that can be used to inhibit messages

from a particular source. If the selector above read:

```
*.err;kern.debug;user.none
```

it would inhibit any user messages from being written to the file.

You can group severity levels too:

```
daemon,auth.notice      /var/adm/messages
```

sends all messages below and including `notice` for the `daemon` and `auth` facilities to the file.

Destinations can be more than just simple files. A destination can be a comma-separated list of user names that are informed of the message by scribbling on their terminal if they are logged onto the system. Beware. Don't use this lightly; it can be a pain. If the destination is a star, then all logged-in users are sent the message.

If the destination starts with an "at" symbol, then it should be followed by a host name. In this case, all selected messages are sent to the named host and will be logged there. Notice that clients don't talk directly to remote hosts for logging purposes.

Before being processed by the daemon, the `syslog.conf` file is passed through by the `m4` macro processor. This allows you to have the same configuration file on all your machines but select different actions depending on the settings of variables. Sun provides support for having one centralized logging host. If your machine has the nickname of `loghost` in `/etc/hosts`, then `syslogd` will define the variable `LOGHOST` before invoking `m4`. This variable is used to select bits of the `config.sys` file. It allows different things to be done locally and on the main host logging machine.

If you change `syslog.conf`, then you need to send a HUP signal to the running process to tell it to reread the configuration file. You can do a `ps` to find the value, but to help you, the daemon writes its process id in a file, `/etc/syslog.pid`. Then the command:

```
kill -HUP `cat /etc/syslog.pid`
```

will work nicely.

Finally

The `syslogd` daemon and client interface is central to the running of your system. A great many programs are its clients. Also, devices on your network like routers can often be configured to send it data for logging. To make things more interesting, the program will act as a client for a remote copy of itself when it is configured to do that. Life is not too simple in the brand-new client/server universe. ⊸

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

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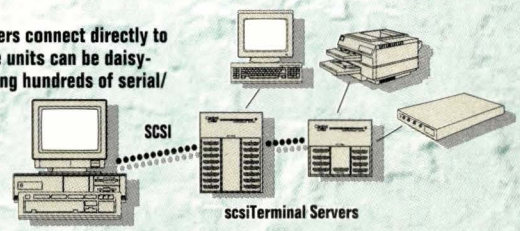

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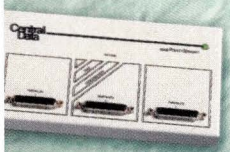

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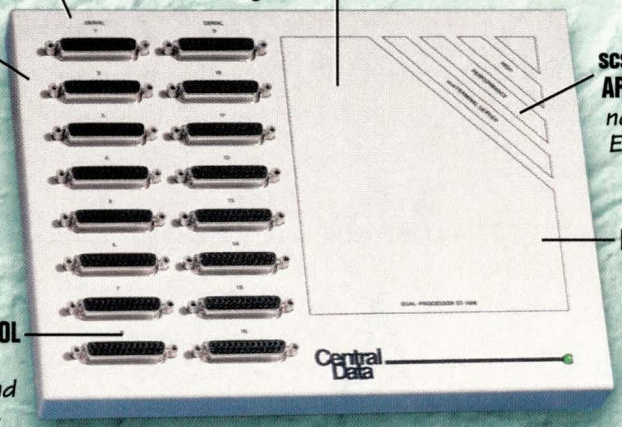

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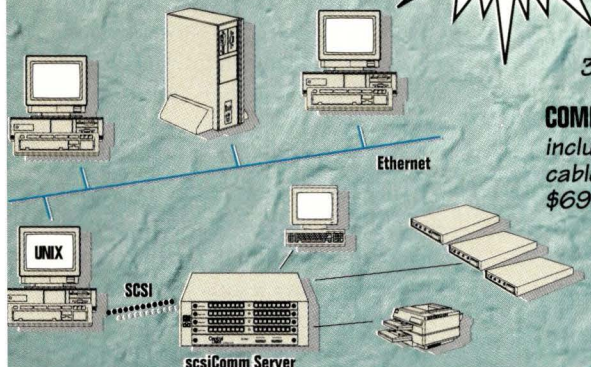

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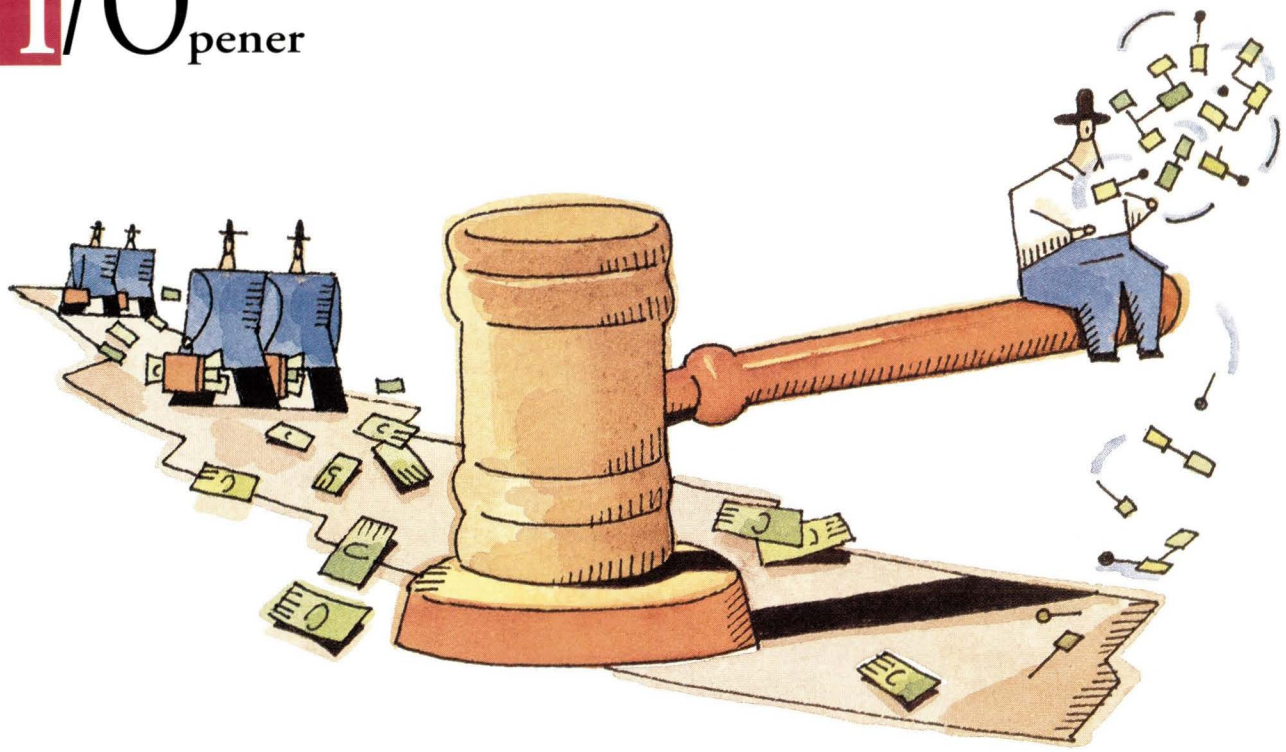


ROBIN JAREAUX

by RICHARD MORIN,
Technical Editor

Three Prayers to Bree Amal, Goddess of Keepers of Disorderly Houses:
May These Events Not Involve Thy Servant.
May These Events Not Cost Thy Servant Money.
May These Events Leave No Trace of Themselves in Thy Servant's Memory.
–*Casting Fortune,* John M. Ford

May These Events (Part 3)

According to a Berkeley Software Design Inc. press release, the UNIX System Laboratories Inc. vs. BSDI lawsuit has been settled, and all legal disagreements, suits and countersuits have been resolved. A joint press release by BSDI and USL backs up this claim. Everyone is smiling, even if their teeth are clenched a bit, and we are all free to go on about our business.

Consequently, it's an appropriate time to do a small postmortem. (Editor's note: For background information, see *SunExpert*, October 1992, Page 36, and January 1993, Page 29.) There may be some useful lessons to elicit, and we can certainly try to determine what happened and why. None of the principals are talking much, however, and most of the details of the settlement are confidential. Consequently, our resources are limited to press releases, rumors and this space's usual quota of lucid and (ahem) unbiased opinion. Nothing new there; let's get on with it. ...

Bree Amal's Scorecard

The three prayers to Bree Amal achieved a mixed showing. The events didn't involve all that many people to any strong degree. Mainly, the lawsuit cast a cloud on BSDI and its product, BSD/386. It also involved the University of California in an unwanted legal fracas. By and large, however, most of us could ignore the suit, and many of us did.

Freeware distributors were faced with a tricky decision. Should they distribute NET/2-based code, risking entanglement in the suit, or abstain, possibly losing an interesting business opportunity? A few companies chose the latter, so NET/2 and its descendants remained commercially available throughout the duration of the lawsuit.

Other companies (I don't know how many) abstained. My own company (Prime Time Freeware) certainly did, despite the fact that we had paid several hundred dollars for a NET/2 license and distribution. My guess is that some other freeware vendors made the same decision.

The events certainly cost a few folks some money. PTF's costs pale in comparison to the legal fees incurred by the lawsuit's participants. I also suspect that BSDI's revenues were greatly diminished by the chilling effect of the suit. OEMs, in particular, must have been loathe to license technology that was under legal dispute.

Finally, I wonder how much of the funds paid by Novell for USL were based on the impression that USL "owned" the UNIX source tree. System V Release 4.2 contains a lot of things that BSD UNIX does not, so Novell clearly got something for its money. It did not, however, get clear title to UNIX.

Moving on to the last prayer, I sincerely hope that at least some of us remember what happened and why. Before the advent of the NET/1 distribution, an unspoken assertion shackled and divided the UNIX community. Anything written by source code licensees was suspect as being "part of UNIX" and was subject to some rather restrictive rules.

Open exchange over the net, for instance, was illegal because unlicensed parties could not be allowed to see the code. Licensees were also required to make sure that recipients had appropriate licensing levels. The latter restriction was a major part of the reason that UC Berkeley stayed with Version 32V instead of moving to later releases such as System III, System V, etc.

Initially, however, these restrictions didn't pose much of an issue. There wasn't all that much new code, and nobody but a source licensee could make use of the additions, in any case. Over time, however, things changed. More and more code was added and modified. Whole subsystems (e.g., networking) were added.

Eventually, it became clear that the 32V tail was wagging the BSDog. So the Berkeley staff decided to challenge the restriction. They went through the source tree, flagging the code as "new," "old" or "mixed." Then they set about "cleaning up" the mixed code. About 90% of the BSD tree was ultimately certified as clean and was released to all interested parties.

This was a big win for almost everyone in the UNIX community. USL, of course, was a major exception. Faced with Berkeley's challenge to its intellectual property claims, USL had several possible options. It could, for instance, have simply ignored it, saving everyone involved a great deal of time and aggravation.

Alternatively, it could have negotiated with the Berkeley troops, working out which files were really proprietary. Berkeley and USL both claim to have attempted this, but the parties were apparently unable to reach any agreement. Consequently, USL felt obliged to do *something* about the challenge.

The Big Booboo

Unfortunately, what it did was to bring in the lawyers. This may have been motivated in part by the impending sale of USL to Novell. If Berkeley could give away roughly half of the SVR4 source tree, and BSDI could use it as the starting point for a competing product, USL's value as a property might be seriously affected. So the stakes weren't insignificant.

Some mistaken assumptions and understandings on USL's part may have clouded its judgment. USL may have thought, for instance, that BSDI and UC would fold their tents at the threat of a lawsuit or that the lawsuit would go unnoticed by the general UNIX community. Unfortunately for USL, this isn't the way it played out.

Finally, the fact that BSD and SVR4 share a great deal of code may have led some USL lawyers to assume that BSD got the code from SVR4. The dozens of assertions in the legal filings certainly point in that direction. In fact, however, the opposite was quite demonstrably true.

In the final analysis, very little source code has been removed between the NET/2 and 4.4BSD-Lite releases. BSDI's 1.1 release will omit only 16 formerly distributed source code files, all in the kernel. If NET/2 had had significant amounts of USL code in it, substantially greater surgery would have been required.

Futures

With the lawsuit settled and 4.4BSD-Lite on its way (probably released by press time), we get to think about new options. The most obvious one, in my case, is to start including 4.4BSD-Lite in my freeware releases.

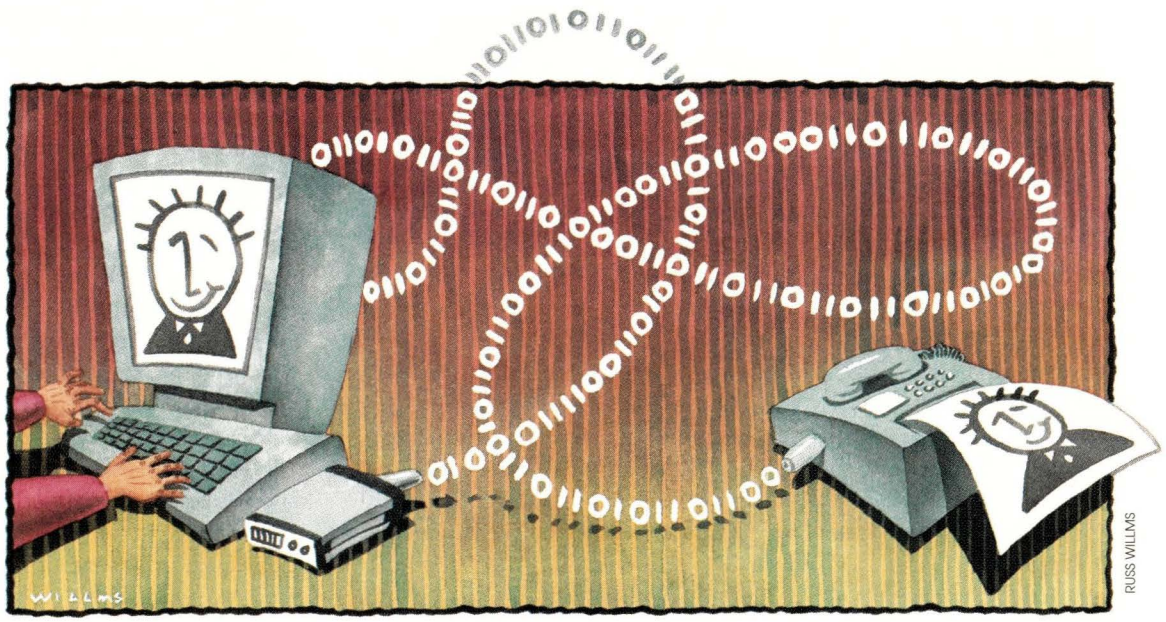
I also expect to see at least some of the UNIX cloners switching from NET/2 to 4.4BSD-Lite. The change buys them some new features and new utilities, many more bug fixes and freedom from the (fairly remote) possibility of legal action. (USL has sent letters to at least two "freeware" groups.)

4.4BSD-Lite is neither complete nor bootable as distributed so changing over will entail a lot of work. Consequently, the retrofits may take a while to surface. Some cloners, in fact, are almost certain to remain with NET/2, taking their chances on legal problems.

I hope to see several solid commercial releases based on combinations of GNU freeware, 4.4BSD-Lite and perhaps Mach. BSDI already ships a solid product; with the resolution of the lawsuit, it should be in a position to capitalize on that very profitably.

The other assorted Linux and BSD distributors face the challenge of meeting commercial-grade standards for software distribution while keeping costs low enough to attract freeware enthusiasts. I expect to see the advent of a number of freeware-based add-on packages, filling many of the gaps left in UNIX vendors' restricted distributions. ⊷

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.



Fax Modems

by S. LEE HENRY

In last month's issue, I reviewed XpressFax, a terrific fax software package. Since then, I've begun to think about fax modems and how they work. The modems themselves don't look much different from any other modems. In fact, they may or may not have the word "FAX" printed on them or evident in the name. I have the idea that the word "Plus" in the name of my Telebit QBlazer Plus indicates that it is a FAX modem. I'm really not sure. The upgrade for my WorldBlazer, after all, came as a couple of chips and didn't affect the appearance of the modem at all. Further, the fact that a particular modem is a fax modem doesn't mean it doesn't work for non-fax applications; just that it does fax in addition to data transmissions.

Before we look more closely at fax modems, let's briefly look at fax technology and what the standard "smart modems" do.

So, What's Fax Anyway?

A conventional fax is a standalone system with a control panel and a place to attach a telephone line. It has a paper feed in which you stack the pages to be transmitted and a tray of some kind to keep them from falling on the floor after they've been scanned. The scanner represents a high percentage of the electronics in the conventional fax. Like any scanner, it reads your pages (hopefully, you've put them into the sheet feeder face up or face down–whatever your fax machine expects). It usually scans a line at a time using a row of photodetectors and converts the image on the page into 1s and 0s. The fax machine compresses the image before sending it out over the phone line.

Of course, the fax machine can both send and receive faxes. Besides the scanner, it contains a modem to dial and answer the phone and a printer. Typically, fax machines use thermal printers and have rolls of paper. This means that your received faxes will feel somewhat "tacky" and they'll roll up in an unattractive way until you train them to lie flat. Some of the newer fax machines use plain paper and, therefore, are less annoying.

So, What's a Modem?

We probably all know what a modem is–a piece of equipment that takes data from an RS-232-C serial interface on our computer or terminal and sends it out over telephone wire (or vice versa). The important characteristics of modems influence how fast and how accurate they can be. In addition, it's very important that any modem we buy be able to communicate with other modems.

Modems contain a relatively small set of fairly complex electronics. They have a modem chip, some ROMs, a CPU, power supply circuitry, telephone interface circuitry and an

RS-232-C port. When we use half-duplex connections, data goes in either direction but in only one direction at a time; in other words, it's time-multiplexed. When we use full-duplex, we use two frequency bands so that the sending and receiving systems can use the line at the same time; in this case, it's frequency-multiplexed.

The modulation technique (how the modem represents its data on the phone line) is an extremely important factor in modem communications because it affects the speed as well as the reliability of the communications. After all, the telephone system was not built for computers to communicate, but to maximize the clarity of voice. Certain frequencies are attenuated, and the useful frequency range is limited to those that best transmit voice and reduce the chance of any noise that interferes with voice clarity. This means that modems have to operate under conditions that limit the frequency range over which they can operate, and that modulation techniques, as a result, have to be very "clever" to compensate for these limitations and still get the data transmitted quickly and correctly.

Modulation standards started with the old Bell 103 standard, which was used with 300 b/s modems, and now include the proposed V.FAST standard for 28.8-Kb/s transmission. The key to any of these standards is that the modem on each end of the communications link must be following the same modulation and compression rules. Otherwise, no transmission is possible.

As you might expect, the faster modems become, the more damage can be caused by noise on the line. After all, a single bit transmitted at 28.8 Kb/s goes by 96 times faster than one at 300 b/s. Noise that might not disturb a single bit at 300 b/s might clobber dozens of bits or more at 28.8 Kb/s. To compensate for the vulnerability of the fast-flying bits and make modem communications reliable over standard (often noisy) phone lines, increasingly better schemes for error control have been devised. In addition, increasingly efficient compression techniques (some giving compression as high as 4:1) have allowed more data to be sent using fewer bits.

How Smart Is Smart?

Modern modems are always referred to as "smart" because their ancestors couldn't dial the phone and didn't have their own "language" or command set. Cleverly enough, they were called "dumb." The particular name "Smartmodem" was coined by Hayes to describe its 300-b/s modem, when the idea of a "smart" modem was still fairly revolutionary. In fact, the Hayes command set is used by most modem manufacturers, so almost all modems can justly be called "smart." This makes life easier on systems administrators, who often have to configure modems for their users. It makes it *much* easier on programmers who want to build communications software with pretty front ends. In this case, *they* have to issue the setup commands to the modem.

The series of Hayes commands, all starting with "AT," allow setup of the various characteristics of the modem, for example, whether the modem will answer the phone automatically. They also allow us to control the modem. If I attach a modem to my terminal and type ATM1L1DT1234,

DIGITAL Update JUNE 1994

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$/fp92	$71	$287	$78	$119	$226
$/int92	$84	$471	$106	$98	$232
Configured Price	$5,295*	$7,670	$6,170	$5,595	$7,895
	*(16" color, 32 MB, 535 MB disk)				
Entry Price	$5,295	$3,995	$4,995	$3,995	$4,995
MB/Memory	32	16	16	16	16
MB/Disk	535	0	260	535	0

(As of April 1, 1994)

I'm telling it a number of things:

ATM1	Keep the speaker on until the remote carrier is detected
L1	Set the sound level to low
DT1234	Use tone dialing and call extension 1234

So, What's a Fax Modem?

A fax modem is virtually identical to any other dial-up modem. It can be much slower than a standard modem if we compare sending an image of a page of text to sending the corresponding text. But, its strength is that it *can* transmit images.

The primary differences between fax modems and other modems are in the protocols that they support. Fax modems have incorporated an additional set of protocols to handle fax transmissions. And, of course, fax modems can talk to other fax modems as well as to conventional fax machines.

Each fax transmission session involves five distinct phases, referred to as phases A through E, that involve:

A	call establishment
B	premessage procedure
C	message transmission
D	postmessage procedure
E	call release

In the first phase, the calling fax modem makes the call and the answering modem answers and identifies itself. The receiving modem (Phase B) then tells the calling modem about its capabilities (e.g., what speed it can use, what error control), and the modems exchange signals to ensure that they are synchronized and can maintain a fairly stable connection. The message is transmitted (Phase C) generally using some method of error control. If errors are detected, the receiving fax might say the fax equivalent of "come again?" or it might correct the error itself using some form of calculation against characters received correctly. Phase D might include the exchange of information about additional pages or indicate the end of the transmission. In Phase E, both modems disconnect.

The V Dots

Most of the standards that apply to modem communications were written by AT&T or the CCITT. CCITT stands for International Telegraph and Telephone Consultative Committee, but if you notice that the letters appear to be in the wrong order, it's because the committee's real name is in French (in which the order of the words is different). AT&T, of course, stands for American Telephone and Telegraph. Neither organization's role in setting modem standards is surprising.

Most of the important standards are what I like to call "V Dot" standards, like V.32, which regulate how modems communicate with each other. There are so many relevant V Dots today that it can be downright confusing when you're trying to buy a fax modem. The back of the box from the last modem I bought mentions V.29, V.27ter, V.32, V.32bis, V.42 and V.42bis. It also talks about Group 3 and Class 2

and MNP 2-4 and MNP 5. Sheeesh!

There's also a term "PEP" that you may see in reference to Telebit modems; this stands for "packet ensemble protocol" and is a proprietary form of a particular modulation technique. PEP modems can usually deal with imperfect line conditions, but both the sending and receiving modem must be able to use PEP if this is to do you any good.

Most of the V Dot standards specify modulation techniques. Some, however, specify error control or compression. In general, the more V Dots listed on the back of the box, the better off you'll be, but some are much more important than others. Among the more important V Dot standards to look for today are:

Standard	Specifies
V.32	9.6-Kb/s modulation technique
V.32bis	14.4-Kb/s modulation technique
V.42	error control (uses MNP 2-4 and LAPM error control techniques)
V.42bis	data compression based on Lempel-Ziv-Welch (LZW) dictionary-based algorithm
V.FAST (proposed)	28.8-Kb/s modulation technique

What Groups?

The CCITT's group specifications characterize fax machines according to the scanned signal type, the modulation method they use, and their communications capabilities. Groups 1 and 2 describe analog fax machines. Group 3, on the other hand, describes a digital technique. Group 3 fax systems encode images as 0s and 1s. Group 3 also specifies a minimal image resolution and higher optional resolutions.

Another fax modem designation is "class." My Class 2 modem is smarter than its Class 1 predecessors and can manage more of the communications process, including autodialing, handling the data transfer and doing a quality check on received data.

MNP Specifications

The MNP designator stands for Microcom Networking Protocol. MNP 1 through 4 are error control specifications and are in the public domain and included in some of the V Dot specifications as illustrated in the table shown earlier.

MNP 5 and higher are licensable. MNP 5 is a compression technique that uses both adaptive Huffman encoding and run-length encoding to reduce most data to about half the original size.

When my modem box says "speeds up to 57,600 bps using V.42bis," what it's telling me is that *if* it is speaking to a similar modem, I might get this magnificent throughput because my data may be compressed as much as 4:1 and transmitted at 14,400 bps. Wow. ⊸

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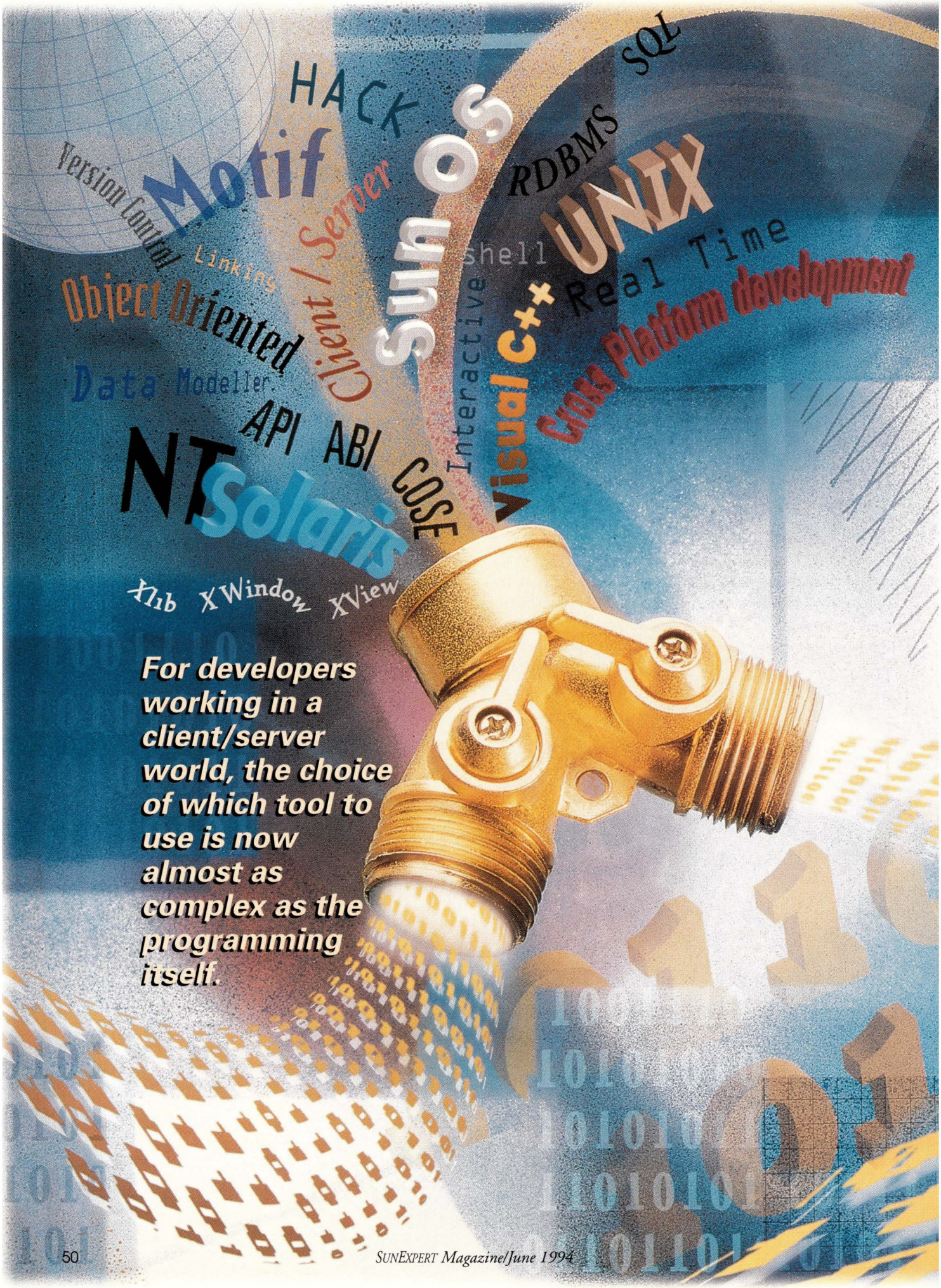
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ABI
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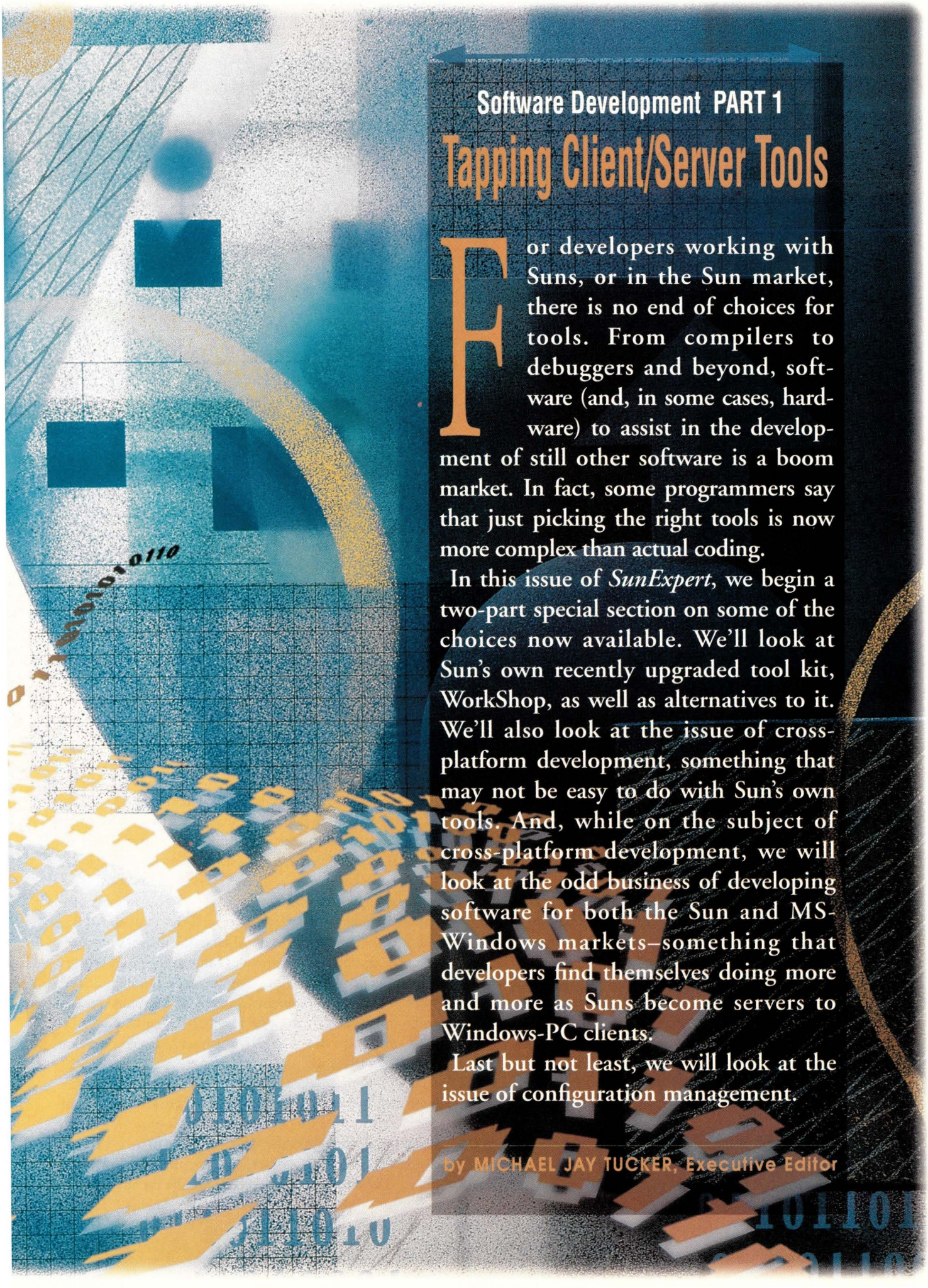
For developers working in a client/server world, the choice of which tool to use is now almost as complex as the programming itself.



Software Development PART 1

Tapping Client/Server Tools

For developers working with Suns, or in the Sun market, there is no end of choices for tools. From compilers to debuggers and beyond, software (and, in some cases, hardware) to assist in the development of still other software is a boom market. In fact, some programmers say that just picking the right tools is now more complex than actual coding.

In this issue of *SunExpert*, we begin a two-part special section on some of the choices now available. We'll look at Sun's own recently upgraded tool kit, WorkShop, as well as alternatives to it. We'll also look at the issue of cross-platform development, something that may not be easy to do with Sun's own tools. And, while on the subject of cross-platform development, we will look at the odd business of developing software for both the Sun and MS-Windows markets–something that developers find themselves doing more and more as Suns become servers to Windows-PC clients.

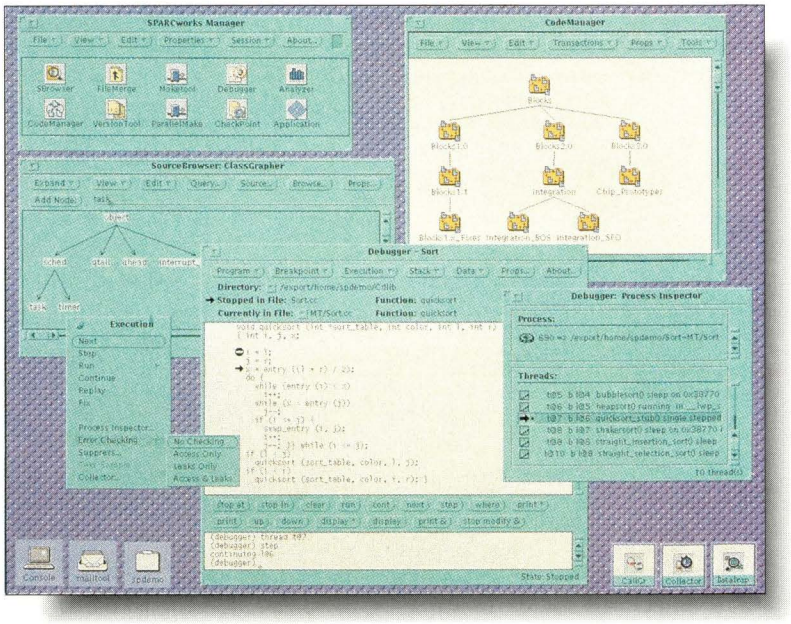
Last but not least, we will look at the issue of configuration management.

by MICHAEL JAY TUCKER, Executive Editor

SunPro's Entry

Sun Microsystems Inc. has never been known for its software, and certainly not for its software development tools. Yet, SunPro–one of Sun's many planets–has long offered its SPARCworks tool suite to the public. This year, SunPro announced a new and improved version of its tool suite, collectively known as WorkShop.

WorkShop is an integrated product suite for software developers. It comes in three flavors: one for C, one for C++ and one for FORTRAN. All three contain an enhanced version of SPARCworks, the SPARCcompiler for C, an assortment of code management tools, and SPARC/iMPact, a set of development tools for programmers working in multiprocessor environments. All these support tool integration through ToolTalk, the COSE standard for interapplication communications.



SunPro WorkShop is a collection of different developers' tools. It contains both new tools, such as a direct C++ compiler, and enhancements of older ones.

WorkShop is more than just the repackaging of Sun's previous offerings. For instance, SPARCworks has been enhanced and features, among other things, a debugger with several new capabilities. These include "fix and continue," which allows a programmer to execute a program, stop it when it encounters a serious bug, fix the bug and then continue without having to relink the program.

Another debugging feature in the new SPARCworks is runtime error checking. This allows programmers to find memory access and memory leak errors.

SPARCworks/iMPact, meanwhile, provides multithreaded development tools. It has, for example, a "thread-aware debugger" for people working on multiprocessor applications. It also extends the SPARCompiler for FORTRAN to automatically parallelize FORTRAN applications.

SunPro will not say how many copies of WorkShop it has shipped since its introduction. However, Rob Chang, product line manager for SunPro, says the product is doing well. "It's just easier to purchase because it's all in one box."

The Alternatives

SunPro's software development tools may be new and improved, but they're not the only game in town. Sun has never dominated its own software tools market. In fact, according to Mary Hubley, the associate manager analyst for market research company Datapro Information Services Group in Delran, NJ, it comes in third at its customer sites.

She notes with some amazement that Sun even trails Microsoft Corp. at its customer sites. Not that Sun customers are regularly using Microsoft tools to do development for Sun platforms–though that is possible (see "Visual C++ on Suns?" below)–but they are developing client/server applications that include Windows-based desktops. "It's kind of unbelievable," she says, "but Microsoft is actually big in UNIX in that we have a lot of mixed shops with people who are using UNIX just as the servers."

She says Sun customers' search for alternative sources of tools dates at least to Sun's decision to unbundle its compilers three years ago. "Sun used to offer its tools along with its OS," she says. "When it unbundled its tools, and increased their price, developers started to look around for other options."

And they found there were other options–including freeware and shareware. "People are very interested in the free stuff," she says, "and in what they can get off the Internet. It's hot right now."

Thus, Sun customers who don't want to use Sun's tools can take advantage of such things as the Cambridge, MA-based Free Software Foundation's various GNU tools and compilers–and many do. A recent Datapro report listed it as the number-two choice for development tools at UNIX sites.

The appeal of freeware, though, is not just its cost. "The real reason people would consider the GNU system is that it supports open systems development better than any of the vendors' own products," says Michael Tiemann, president of Cygnus Support, which provides support for Free Software Foundation code. "Sun's development environment doesn't work on Digital Equipment Corp.'s Alpha systems. DEC's environment doesn't work on Hewlett-Packard Co.'s PA-RISC machines. But the GNU software has been ported to dozens of platforms."

He shrugs off concerns about support or licensing problems with freeware, pointing out that there are several companies like his that do nothing but offer support for the code. In fact, he thinks the GNU software may be better supported, and in need of less support, than Sun's own compilers. "I've been using the GNU compiler on Suns since before you could buy SPARC machines," he says. "The

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GNU has been running on Sun machines for longer than Sun's current compilers have been."

And, of course, if a developer is leery of freeware, there are commercial alternatives. Both Lucid Inc. and CenterLine Software Inc. offer complete tool kits, including C and C++ compilers and debuggers, that compete directly with Sun's newly introduced WorkShop. CenterLine, too, argues that cross-platform availability is an important reason not to buy Sun's product. "People have heterogeneous environments," says Bob Chatham, product line manager, programming environments, at CenterLine. "They need [software development] tools that run on multiple platforms."

Which WorkShop doesn't. In fact, says Chatham, it supports Solaris 2, not Solaris 1 (a k a SunOS), which a large number of Sun customers still use. "If you've got someone shipping product on SunOS, you're not going to change compilers in midstream," says Chatham.

SunPro, however, denies that WorkShop doesn't protect customers' investments in SunOS. "They must not have read our press release closely enough," says SunPro's Chang. "We include tools for both Solaris and SunOS. Some of the capabilities may only run on Solaris, but we definitely support SunOS."

Still, Lucid's director of marketing, Jay Mellman, thinks those unsupported capabilities are significant. "They've got a new, native C++ compiler," he notes, "but it is Version 1, and it is only on Solaris 2, whereas we've had our compiler on the market for three years."

Mellman also says that his product and those of other third parties have significant technical advantages over WorkShop. "They've heavily promoted their fix-and-continue feature," he says. "And it's useful, but the fact of the matter is there are only a very, very few situations where you can take advantage of it with the WorkShop product."

Another aspect of WorkShop that draws Mellman's fire is its claim to be an integrated tool set. "All they have really done is repackage it," he says. "On my Mac, I can launch a spreadsheet without quitting my word processor. Is that integration? Well, I guess so. That's the level WorkShop has. But what's needed is really data integration, where I can look at the same piece of data with multiple tools. That's where you start getting the benefits of integration."

Meanwhile, some vendors aren't convinced that SunPro really wants to compete with the likes of Lucid, CenterLine and the other third parties. The WorkShop product suite can perform runtime error checking, for instance. Logically, this would make it a direct competitor to Pure Software Corp., which makes its living from exactly that function. Yet Rob Dickerson, Pure's vice president, doesn't feel threatened. "WorkShop is useful, but it is relatively low end," he says. "Microsoft Works is a good general-use package, but it doesn't replace a high-end product like MS Office."

He notes in particular that while WorkShop does runtime, it doesn't do so on nearly the same level as Pure. "They've got special libraries that, when you call out to them, can trap errors, and that's useful. But they can only work up to 8 MB," he says. "What we've chosen to do with Pure is deal with much larger programs."

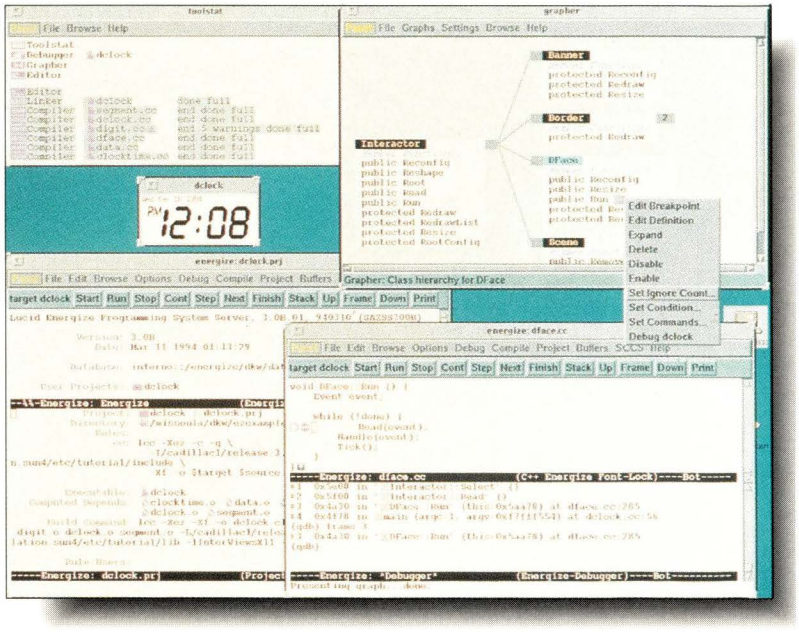
He thinks that, with WorkShop, Sun is doing exactly what it has always done: provide a good but midrange product that will meet the needs of a volume market while leaving considerable room at the top. If that is a strategy, then Sun's third-place position in the tools market is actually a delightful place to be. "Sun's bread is buttered on the side of hardware," he says. "They need to have some degree of control of the tools market, so they have to be in the tools business–but it doesn't require that they be the leader in the market."

This interpretation of things is one that shows up among developers as well. "Sun is actually a hardware vendor," says Patrick Suel, director of marketing for ILOG Inc., which markets a number of C++ tools for advanced and distributed applications. "That doesn't make the people at SunPro and SunSoft very comfortable, but I think it's true."

He argues that it really doesn't make economic sense for Sun to attempt to dominate its own tools market, particularly in the case of C++ environments. "C++ is very complex," he says. "I don't think Sun has the bandwidth to address the problems that can be attached to it. They're not going to waste the time to try to do so."

Peter Wilson, president of Integrated Computer Solutions Inc., a vendor of X-related software that uses a variety of Sun's and other companys' tools, agrees. "SunPro makes fine tools. They are competitive, cost-effective, they work…and I'm happy with them," he says. "Do they make superb, killer, best-in-class tools…which they give away for free? No.

Sun isn't the only game in town when it comes to development tools. Several other tool suites, like Energize from Lucid, provide competing products that may lend themselves particularly well to cross-platform development.



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Of course not. They're in business to make money."

He thinks that SunPro and SunSoft will be more than happy to "leave room at the top." In fact, he says, asking whether SunPro's WorkShop is going to radically change the business may not be a question worth asking. "Asking which is better, SunPro's tools or the third parties', is sort of like asking how your date was last Friday. No matter how you answer, you're in trouble," he jokes. "I would say that the SunPro products look good. And CenterLine and Pure had their greatest success when the market wasn't crowded, whereas now it is. [But], nobody blows anyone out of the water."

Adam Joseph, president of AIB Software Corp., which makes the Sentinel debugger environment, agrees that Sun is probably not trying to eliminate the third parties. "My general impression is that Sun isn't trying to get into the business of being a direct competitor with CenterLine and people like myself," he says. He thinks that SunPro is actually selling to a new class of customers–MIS officers and downsizers who want to buy complete hardware/software packages from one vendor, just as they used to buy from IBM.

"That class of customers will accept what Sun provides them because they can get it in one purchase order," he says. But that leaves the rest of the market–the more technical users who have been the traditional buyers of these products–unchanged.

If any of these scenarios is right, then the market for Sun-oriented development tools will always have room for third parties.

But that brings up the possibility that they're all wrong. Lucid's Melmann, for instance, thinks that Sun intends to compete directly with him, and other tool vendors, as fiercely as possible. The idea of developing good entry-level tools, and then leaving room above that space for the third parties, "would be a good idea," he says, "but then they would have to leave money for the independents. Their strategy in that case would be to have the best darn compiler they could, and then have so-so tools."

But, he says, that's not what Sun is doing. "They're pitching their tools," he says. "They're going after the high end of the market."

And, cautions Datapro's Mary Hubley, no matter what Sun's intention, its marketing power is great and its position is strong. "Sun is in third. And that's pretty good," she says. "They are not out of the ballpark at all."

Other Rooms, Other Windows

When Sun-oriented developers talk about cross-platform development, they frequently mean development across multiple UNIX platforms. But there's another world out there, a much bigger world–Microsoft Windows.

It's a world that many Sun developers have to enter if only because there are so many Windows PCs linked to Sun servers. For UNIX-oriented developers, that can present special problems. How do you have an application that takes

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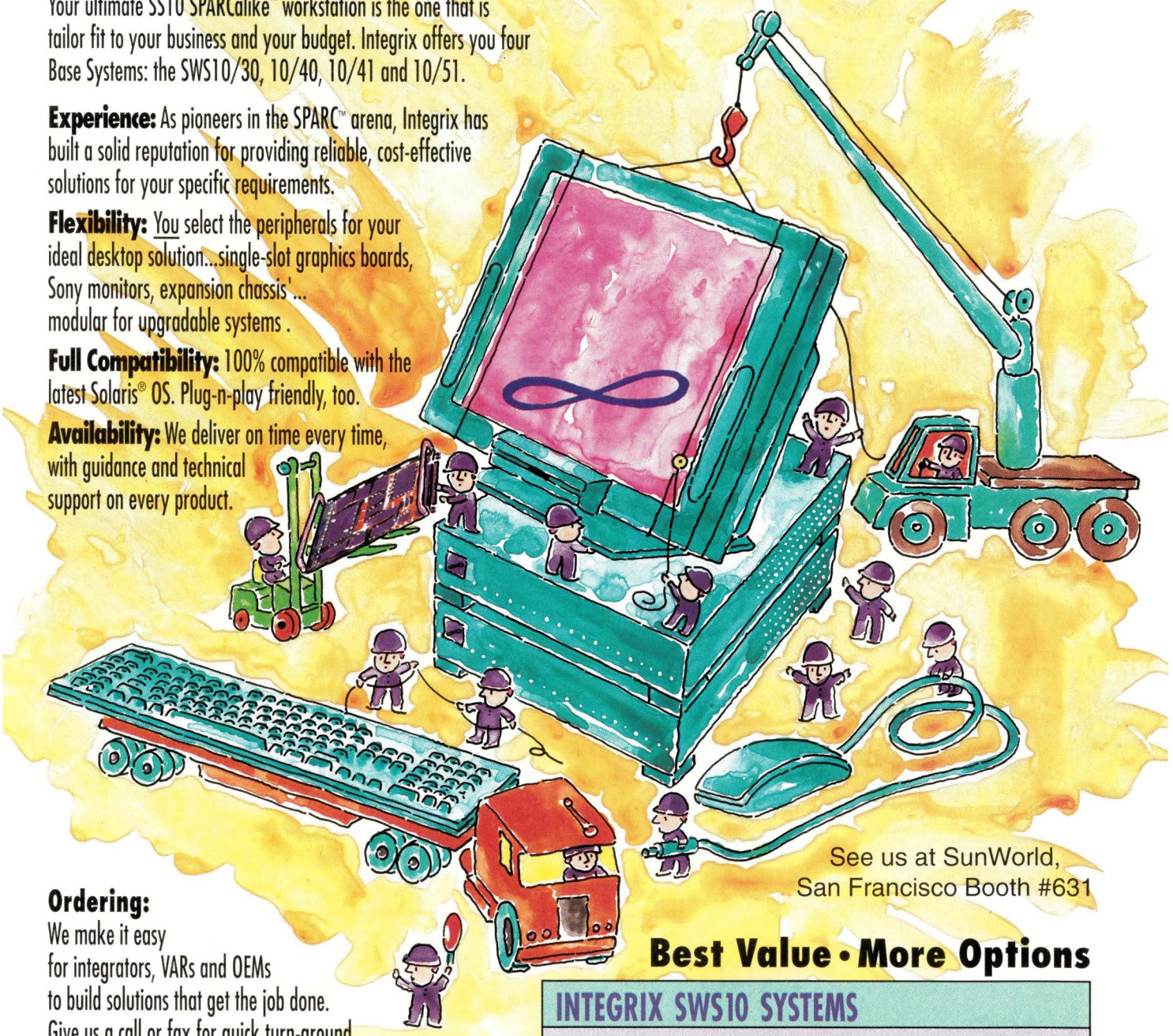

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advantage of SPARC's performance and the richness of UNIX as a development environment, while still making it available to Windows users?

One way of dealing with the PC as client is to use it as a terminal. You can do that by equipping the PC with an X Window System implementation, or you could make the UNIX application look like a Windows application when it's displayed on the PC.

IXI Corp., the interface and software vendor that sold Sun its Motif implementation, offers tools to take the latter path. "Ours is the minimum-fuss approach," says Anil Malhortra, IXI's vice president of marketing. To this end, the company offers Wintif 1.0, with 2.0 slated for the near future. With Wintif, a UNIX application can run on the server but appear to be a Windows application on the client.

How much do you have to rewrite your code? "The short answer is that you may not have to do anything at all," says Mike Moore, Wintif's product manager. "You may not even have to relink."

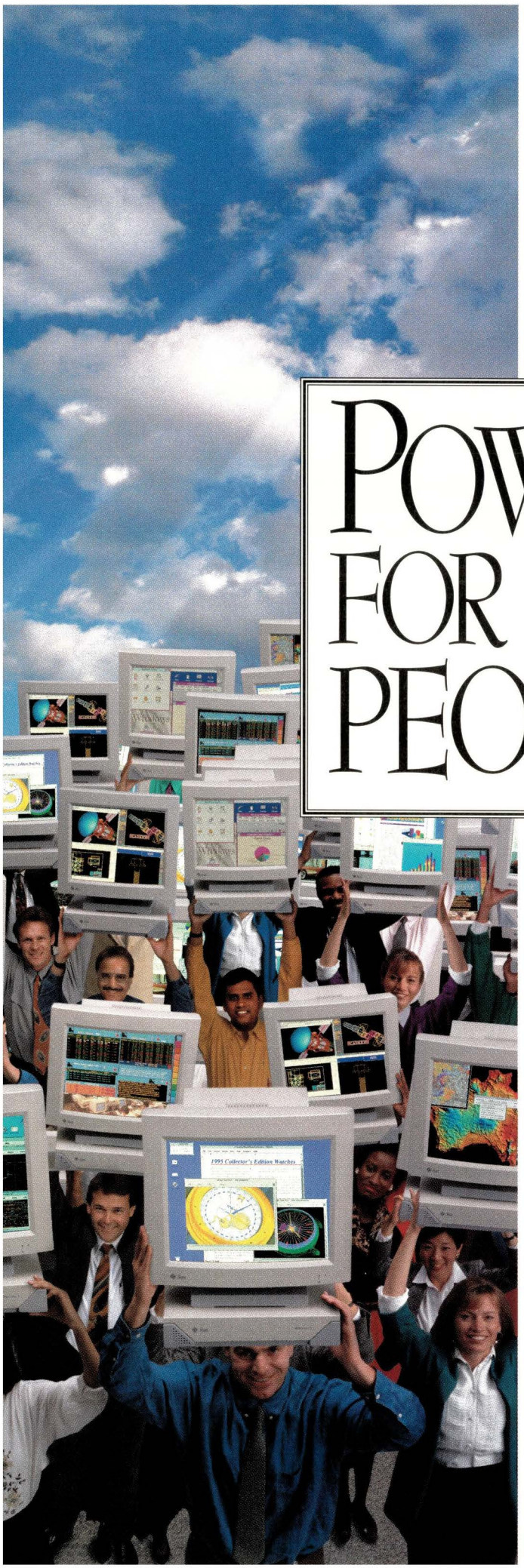
But suppose you're not just supporting a client. Suppose you're a developer and you want to support both Suns and Windows. Maybe, indeed, you are normally a Windows-oriented developer, but you want to address the Sun market. However, you don't want to pay for a whole new UNIX staff to port your code, and you decidedly don't want to support two code streams during development.

Your users could, of course, run a Windows emulator, like Wabi, but let's say you'd rather not have them do that. Perhaps you want your customers to see you as a UNIX product vendor–not a Windows company that happens to have software that performs reasonably well under somebody's emulator.

Fortunately, help is available. A number of companies sell software that assists in putting Windows applications on UNIX systems. Bristol Technology Inc., for example, offers Wind/U, currently in its 2.0 version, which is an implementation of the Windows API on UNIX. In effect, it implements Windows Win16 and Win32 APIs under Motif. The company says that developers can simply recompile their source for Sun systems and then link to the Wind/U libraries.

Wind/U also supports, among other things, a UNIX version of Microsoft's famed Visual C++. The company says this means users can do their development on the relatively user-friendly PC, with the helpful Visual C++ as a tool, and then execute on the power Sun systems. However, it also gives rise to the interesting possibility that programmers could use this ultimately PC-centric language to develop directly in Sun environments.

There are at least three types of customers for Wind/U, says Chane Cullens, product manager for Wind/U at Bristol. "The first is people who have Windows applications and want to expand their markets. The second is Windows ISVs who have had customers approach them and say, 'Hey, I'll buy a hundred copies of your product, but I want it on Sun.'"



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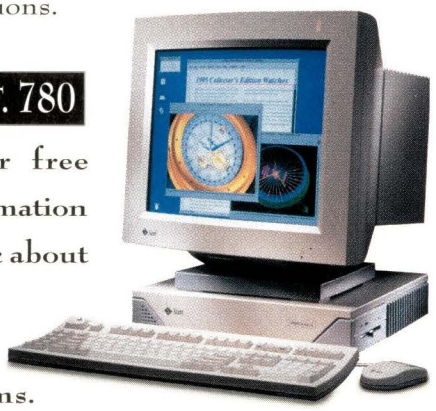

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The third group, though, may be the one that is most troubling for UNIX partisans. It's the one that is taking products back the other way. "These are UNIX houses who have been looking at NT for a couple of years," says Cullens. "They've decided they'll have to have a Win/32 port eventually"–Win/32 is the 32-bit API for Windows–"and they're doing it this way."

Bristol isn't alone in either its products or its opinions. Mainsoft Corp. too offers products that allow Windows applications to run on top of UNIX. Jeff Elpern, vice president of sales and marketing at Mainsoft, sees the same markets, with particular emphasis on UNIX companies looking to switch to NT. "It's incredibly hot," he says. "We thought our first customers would be Windows developers looking to bring their applications to UNIX…[but] the market that surprised us was UNIX developers who are now working on top of the Microsoft Foundation Library so they can get into the NT market."

In fact, he thinks that UNIX, or at least Motif, is finished as a development environment. "It's good news and bad news for UNIX," he says. "It's good news because it means applications are going to flow to UNIX. It's bad news because the Motif API is just not viable any more. It's too small and it's too expensive."

As a result, he says, there is tremendous pressure on UNIX developers to switch their R&D efforts to NT. That way, they need support only one source code stream. "They've just got to play in the NT, Chicago and Cairo areas"–Chicago is the next generation of MS-Windows, and Cairo is the object-oriented version of NT under development at Microsoft–"and once you decide that, you've got multiple platforms, but you've got to have only one source code stream."

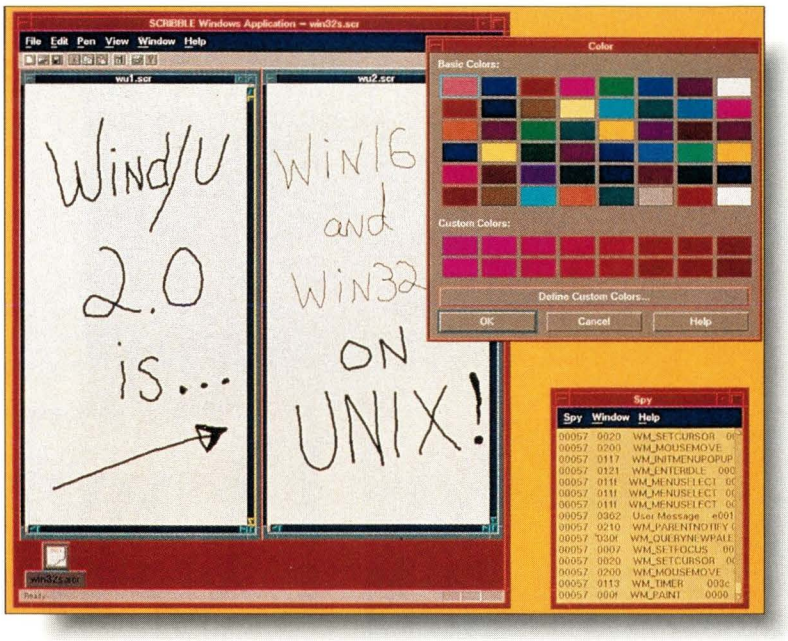
That's certainly why one developer, General Electric Industrial and Power Systems in Schenectady, NY, chose to become a Bristol customer. "We were developing a requisition system for GE," says Simon Knight, program manager of product data management systems at GE. "It was a client/server program that had to run on Windows and HP systems, and we didn't want to maintain two sets of source."

So, GE developed for Windows, and then used Wind/U to run the same applications on UNIX boxes. "The majority of our users are on Windows," he says, "but had to access UNIX." But only access it, not work on it full time.

Still, he doesn't think that developers like himself spell the end of UNIX, per se. "I don't think people will stop developing for UNIX," he says. "The situation here was that we had a few workstations, but a lot more PCs." There will be lots of other situations, he says, where the reverse will be true.

In fact, one vendor of Windows on UNIX software, Software Pundits Inc., agrees wholeheartedly. Like Bristol and Mainsoft, Software Pundits provides software that allows Windows applications to run on UNIX systems. "We have Mirage," explains company President Durgo Rao, "which is the Windows API. And we have Infinity, which is equivalent to OLE"–OLE is Microsoft's object broker technology.

These products don't, however, just reproduce the



Developers increasingly need to transport their Windows products to a Sun environment. Products like Bristol Technology's Wind/U implement the Windows API on a UNIX system. This lets the developer put a Windows package on a Sun workstation with little more than a recompile.

Windows look and feel on UNIX. "We are focused on providing UNIX applications," Rao says. "We support a Motif look and feel." In other words, with his product, a Windows application seems to be a Motif application once it is on a Sun box.

"I think people will continue to write to UNIX APIs," says Rao. "Particularly those who want to originate on UNIX." People developing for UNIX will choose to do their development on UNIX systems, like Suns, and will also choose to target their applications there. That's particularly so, he says, because there are things you simply cannot get except by going native mode. "Applications demand services that can be had efficiently only by using the native versions of those services. Mapping them to something else isn't as efficient."

Besides, he adds, "quite a lot of client/server applications demand UNIX."

But suppose the worst scenario occurred and users were determined to run NT en masse. That still might not be end of either Sun or UNIX. A few companies are, in fact, busily porting UNIX to NT.

One such is DataFocus Inc. "Our product's Nutcracker," says company President Pat Higbie. "It's an implementation of the UNIX APIs on Windows NT." It's the reverse of the products from Bristol, Mainsoft and Software Pundits. It creates a virtual UNIX on top of NT. "It looks like UNIX to developers," says Higbie, "and like Windows to end users."

He thinks that UNIX has more to bring to Windows than Windows NT does to UNIX. He doesn't buy, for instance,

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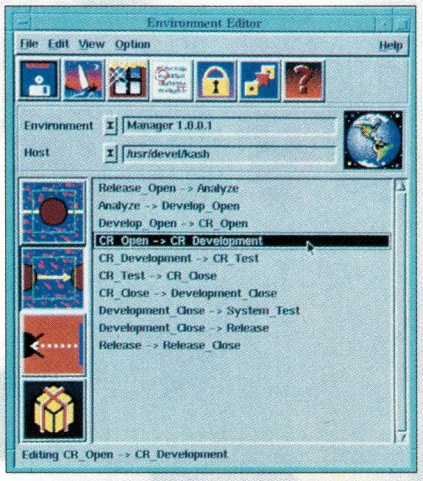
The Unknown Ideal

Even the people who are in the configuration management market have a hard time with the term. "When I first came across the term 'configuration management,' I had no idea what it was," says John Ivory, director of marketing for Tower Concepts Inc., which offers the Razor configuration management tool. "It's not a self-defining sort of term. 'Software testing' is self-defining. 'Software quality assurance' is self-defining. But not 'configuration management.'"

Generally though, configuration management is the business of managing changes to software, both during its development and afterward, during its longer term maintenance. A variety of companies offer CM tools, software that assists in this process. Players in the market range from Atria Software Inc. with ClearCase; CaseWare Inc. with its CaseWare/CM; Softool Corp. with CCC/Harvest; Software Maintenance & Development Systems Inc. with its Aid-de-Camp; Tower Concepts, which calls its Razor a low-end product offering, and so on.



Software configuration management products, like Softool's CCC/Harvest, can spare developers considerable time and effort. Yet CM remains one of the least well known of all the developer's arts.

CM would seem to be something that every programmer would know something about. "Anyone who develops software does some kind of configuration management," says Paul Levine, president and CEO of Atria. "But they don't think of it that way."

Indeed, CM remains one of the lesser known lights of programming. It is a rare developer who has heard the term at all, and among the few that have, there is often some hostility toward it. The feeling is that any system that could manage the development of software might also stifle individual programmer creativity. "The terms are scary," says Ivory. "The hardware engineers are used to having strict control over what they draw or design, but software is such a fluid medium that engineers can go from concept to revision in a matter of moments. When someone wants to restrict that, there's opposition. People don't want to play a Mother-May-I? game."

CM software vendors say this is a misapprehension of their products' aims, and one they are laboring mightily to overcome. "I think it is a labeling issue more than anything else," says Levine. "When we describe our product, we use other words entirely. We say it is a set of four things: version control, build management, workspace management and process control. Everyone understands those."

In the meantime, CM seems to be gradually seeping into the consciousness of the industry. "It is coming to light more and more," says Ivory. "There's now a CM news group on the Internet–*comp.software.configuration.management*–and CM tools as products are doing well."

What may be the best advertising for CM, though, is the ever increasing complexity of software. "A lot of people know they need to manage their software configuration," says Levine. "They may not know the words to describe it, but they know they've got the problem."

the argument that Windows applications will flood onto UNIX. "That's shortsighted. There is a lot of technology that's never been available on Windows. For instance, Windows doesn't have a lot of mission-critical applications, and it doesn't have the high-end graphics things that you can get from SGI."

He says that even if NT is every bit as successful as Microsoft's apologists say it will be, UNIX will still be there as a development and executive environment, rather the same way that Pick went from being a operating system to an environment on top of UNIX without so much as a losing quarter. "[Pick on UNIX] is a very, very good analogy," he says. "I'd say what we're doing is quite like Pick on UNIX. And one of the benefits of that is you get to run on Windows NT, but you also get your UNIX application."

Visual C++ on Suns?

"It is almost disgusting how fast you can generate an app with Visual C++," says Bristol Technology's Cullens. Visual C++ is Microsoft's answer to object-oriented programming within a graphical environment. It has a lot of advantages, at least if you're in a Windows environment. Cullens notes that Visual C++ contains much of what is needed in an application even before you begin coding.

"It's fabulous," agrees Mainsoft's Jeff Elpern. "We ship a couple of tools developed on it. We were able to put together a very sophisticated, very complex application with less than 100 lines of Visual C++ code."

UNIX people would love to get their hands on a tool that powerful. But, for the moment, Visual C++ is on Windows and nowhere else. It could be ported, says Cullens, "but the only person that can really do that is Microsoft."

Microsoft, in turn, doesn't show much interest in porting anything to Solaris. Besides which, "you can't just port Visual C++," says Bob Kruger, director of systems marketing and standards at Microsoft. "There are a lot of issues involved. The compiler is only part of the language." In other words, to get Visual C++, you would need the rest of Windows there too.

But that's not to say that people aren't try-

ing. Cullens says that he has two customers he could not identify who had purchased Win/U 32 expressly to do development on Sun platforms with Visual C++.

Meanwhile, Bristol customer Simon Knight, of GE, notes that while he is doing his development for Windows, he wanted the Bristol because of its ability to reproduce Visual C++ on UNIX boxes for those occasions when he needed his applications there. "That's the reason Win/U was attractive. Visual C++ is by no means perfect–we have very large applications and we've managed to break Visual C++ on a number of occasions–but compared to the competition, it is quite a productive tool."

GE is doing its development on PCs and then running the resulting application on Suns. But, at least one company is looking at doing the reverse–yet still using Visual C++. IQ Software Corp., San Antonio, TX, develops query and report writing products for vertical software companies. Its product, Intelligent Query (IQ), runs on everything from UNIX to VMS, though its mass market remains Windows.

But IQ likes to develop on SPARC systems because of their speed and networkability. The company's solution, then, is to implement Visual C++ on the Suns. "Our goal is portability," explains Matt Reedy, IQ's chief technology officer. "We want to do development on Suns, and run on Windows, but we want to have the same source code in both environments."

To that end, the company is experimenting with using the Mainsoft MAINWin product to run Visual C++ on their Suns. "Mainsoft appears to give us the functionality we need," says Reedy. He notes that the company has just begun development, but he expects to have developers actually producing Visual C++ code, on Suns, within six months. "Hopefully, sooner."

He adds, though, that he is going with this approach not because of any unique appeal of Visual C++. "It's primarily because the language has a MS-Windows focus," he says. "We are trying to reach the most market we can, and the Microsoft products are so geared toward meeting the needs of Windows users that Visual C++ just tends to be the place where you get the most functionality."

He does not, however, think that developing for Windows on UNIX says anything bad about the long-time viability of UNIX. "I think the future of UNIX on the desktop is questionable," he says. "I think Chicago, NT and even OS/2 will compete much more strongly there, but UNIX will be in the servers, both as database servers and networks. I think that UNIX is going to be very healthy."

Coming Soon

In Part II of this story, we will look at the issues of developing software in the space where it comes the closest to the user: GUI development environments. We will also examine portable execution environments that promise the ability to run one piece of code on many platforms, as well as the rebirth of the CASE industry. And, finally, we'll look at visual database languages, and the third wave of 4GLs. ⊷

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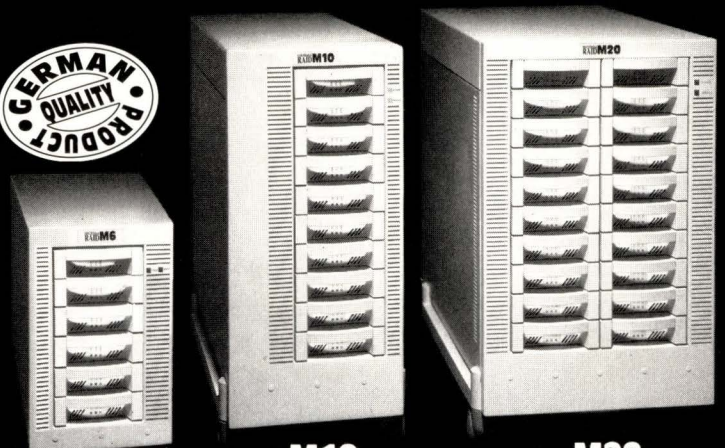

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It's Not Your Father's RPC

by **JONATHAN CHINITZ,** IntelliSoft Corp.

Remote procedure calls (RPC) are nothing new: They have been around for years. But now, with everyone looking for ways to build distributed, client/server applications in a networking environment, RPCs have emerged as the predominant communications framework. However, the mass appeal of these tools has been limited somewhat, due to the fact that they address only the communications aspect of distributed applications.

The DCE Remote Procedure Call service, which is the communications layer of the Open Software Foundation (OSF) Distributed Computing Environment (DCE), is quickly becoming the next generation of development tools designed to provide an integrated solution to distributed applications. However, every new technology requires some measure of learning and adapting to make it mainstream. DCE/RPC is no different. This article will describe some of the more interesting features of DCE/RPC, how they address the limitations of an existing RPC technology (Sun Microsystems Inc.'s ONC/RPC), and how they can be used in application development.

FROM ELLIS HERWIG/THE PICTURE CUBE.

Terminology

First, a quick tour of RPC and the client/server model is in order. RPC separates the calling program and the called procedure into two processes. The calling program is the client; the called process is the server.

To accomplish this, you need to make the call in one process, communicate the input parameters to another process and get the procedure to execute in the remote process. RPC uses stubs, which are local functions acting as surrogates for the remote procedures (see Figure 1).

The OSF/DCE's new wrinkle on remote procedure calls

The role of the client stub is to package the input parameters and send them to the remote process. This is called marshalling. The server stub unpacks the input parameters and calls the actual procedure with them. This is unmarshalling. The procedure code itself is called the manager routine. When the procedure completes, it returns to the server stub, where the output parameters are marshalled and transmitted back to the client stub. The client stub unmarshalls the output arguments and returns to the client code.

The marshalling code in the stubs handles the different representations of characters, integers and floating point numbers across different machine architectures. This enables programmers to develop RPC applications in which the client and server execute on different computers.

The collection of remote procedures that a client and server share are grouped together to form an interface. The programmer describes the syntax and semantics of the remote procedures in a special interface definition language (DCE IDL). Each procedure is defined in a C-like syntax. The IDL compiler reads the interface definition and produces the stubs from it (see Figure 2a). The programmer writes the client initialization code and calls the RPC, the server initialization code and manager routines using a standard programming language. These files are compiled and linked with their respective stubs and the DCE library to form the client and server executables (see Figure 2b).

The actual transmission, connection management and other related activities are part of the RPC runtime code. The runtime hides the details of communications between the client and the server, making the choice of protocols and the reliability of the transport used by RPC transparent to the behavior of the application.

Now that we have the terminology behind us, let's take a look at a sample application: a remote procedure call that sums two arrays of integers and returns the result to the client. To make the example as simple as possible, I have eliminated any error-code checking and just left the basics. The process is the same regardless of which RPC technology you choose. First you write the interface definition, then you develop the client and server portions. Figure 3 illustrates the sample ONC/RPC code. Figure 4 has the DCE/RPC code.

Parameters and Data Types

The first thing that might seem odd is that, in the interface definition file `arithmetic.x`, I have defined a `struct two_arrays` to include both input arrays. That is because ONC/RPC can accept only one input argument and return one output argument. This means that, for all but very simple procedures, you have to artificially define structures, packing them on the client side and unpacking them on the server side. The same definition in DCE IDL can be found in the file `arithmetic.idl`. Notice that DCE/RPC has no limitation on the number of arguments in a remote procedure call. Not only is this more natural and transparent to the developer, it requires that less code be written.

While we are on the subject of procedure call arguments, DCE/RPC addresses another fundamental defi-

Figure 1. The role of the client stub is to package the input parameters and send them to the remote process. The server stub unpacks the input parameters and calls the actual procedure with them.

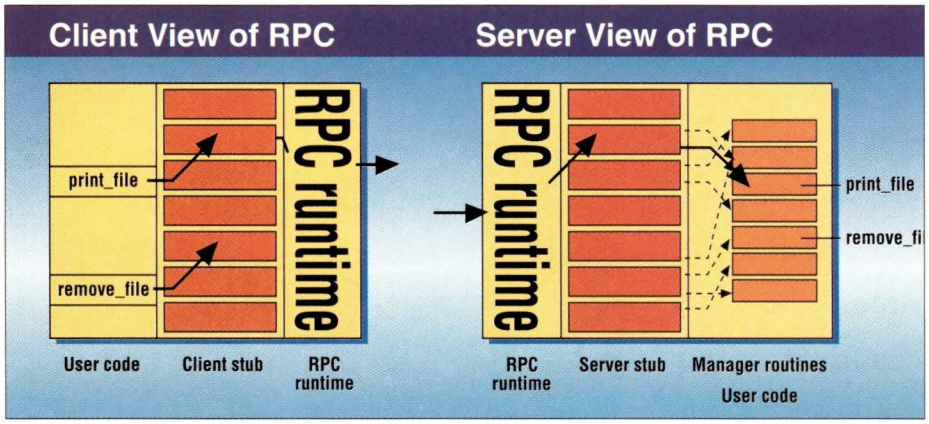


Figure 2. In 2a the IDL compiler reads the interface definition and produces the stubs from it. The programmer writes the client initialization code and calls the RPC, the server initialization code and manager routines using a standard programing language. These files are compiled and linked with their respective stubs and the DCE library to form the client and server executables as in 2b.

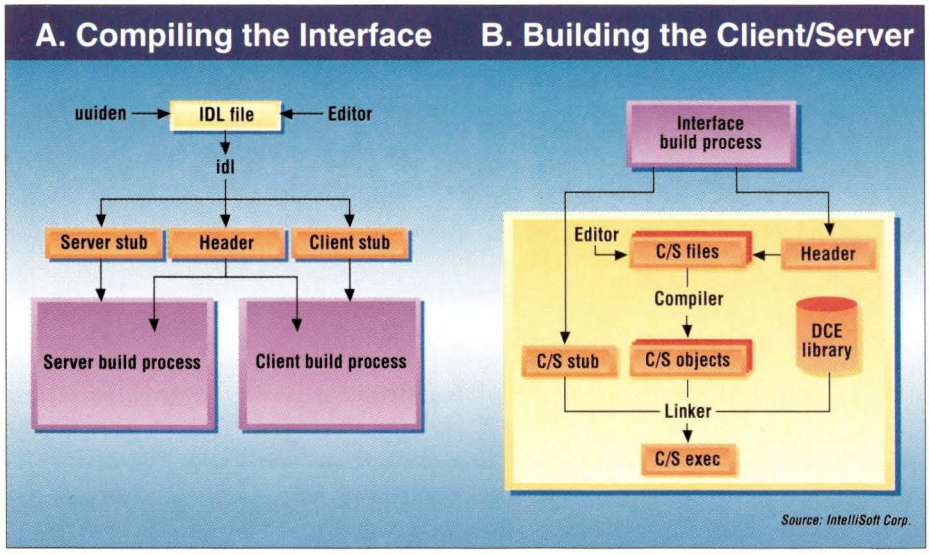


Figure 3. ONC Code

```
/* arithmetic.x */
const ARRAY_SIZE = 10;
typedef int long_array<ARRAY_SIZE>;
struct two_arrays {
        long_array a;
        long_array b;
};
typedef struct two_arrays two_arrays;
/* The RPC definition */
program SUM {
        version VERS {
              long_array SUM_ARRAYS(two_arrays) = 1;
        } = 1;
} = 0x20000001;

/* ONC_server.c */
#include <rpc/rpc.h>
#include "arithmetic.h"

/* All procedure names have the procedure number appended to their
name */
long_array *
sum_arrays_1(arg)
        two_arrays *arg
{
        static long_array res;
        long_array a,b;

        /* Unpack arguments */
        a = arg->a;
        b = arg->b;

        /* Perform the RPC */
        for (ii=0; ii<ARRAY_SIZE; ii++)
              res[ii] = a[ii] + b[ii];
        return(&res);
}

/* ONC_client.c */
#include <stdio.h>
#include <rpc/rpc.h>
#include "arithemtic.h"
long_array a = {100,200,345,23,67,65,0,4,32,11};
long_array b = {4,0,2,3,22,56,877,9,0,1};

main (argc, argv)
        int argc;
        char *argv[];
{
        char *server;
        CLIENT *cl;       /* The client handle */
        two_arrays arg;
        long_array sum;

        /* Who are we making the RPC to? */
        server = argv[1];
        /* Prepare the input argument for the RPC */
        for (ii=0; ii<ARRAY_SIZE, ii++) {
              arg.a[ii] = a[ii];
              arg.b[ii] = b[ii];
        }
        /* Establish the client handle */
        cl = clnt_create(server, SUM, VERS, "tcp");

        /* Execute the RPC and print the results*/
        sum = sum_arrays_1(&arg, cl);
        printf("sums are:");
        for (ii=0; ii<ARRAY_SIZE, ii++)
              printf("%d ", sum[ii]);
        printf("\n");
}
```

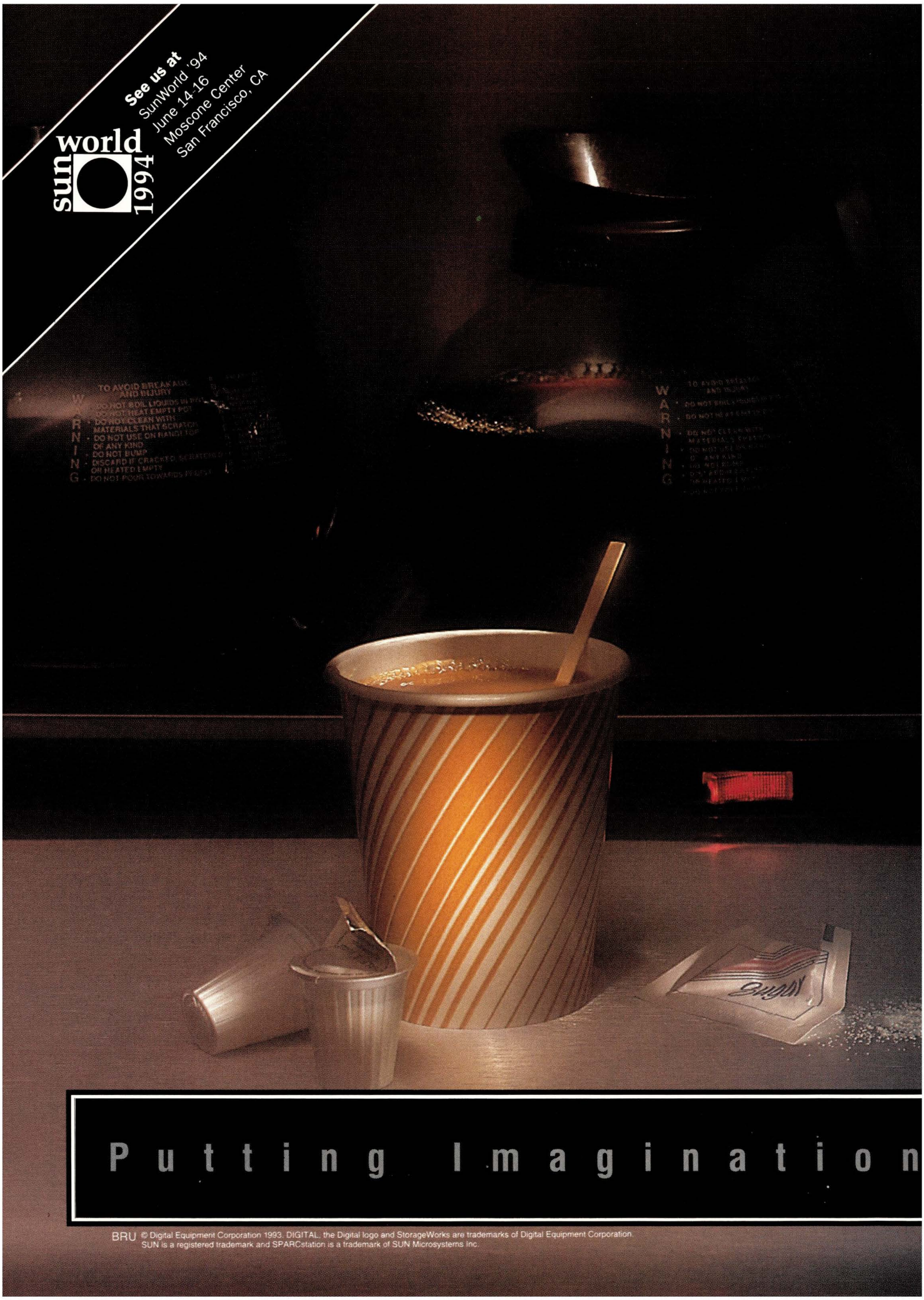
ciency of ONC/RPC. Procedure call arguments are not limited in size, regardless of the transport used in DCE/RPC. ONC/RPC running over a UDP transport has a strict limitation of 8-KB arguments. This also means that the semantics of the ONC/RPC transport are no longer transparent to the application developer. You have to know the requirements of your procedure calls to choose the right RPC. The DCE/RPC runtime guarantees reliability, regardless of the transport used.

Bindings and the Cell Directory Service

How do servers make themselves known on the network? In the past, using ONC/RPC, your choices were limited to using the local databases `/etc/rpc` and `/etc/services`. But this still meant that you had to know which machine the service resided on in order to pass this information on to the `clnt_create` call (or, using UDP, to the `callrpc` library call). You could improve on this somewhat by using ONC's Network Information Service (NIS) at the price of extra, handcrafted work.

In DCE, all the network services and machines that work together are called a cell. One of these services is the Cell Directory Service (CDS). CDS provides a cell-wide lookup service for all resources in the cell. In much the same way you would use a telephone book to look up a person's telephone number, DCE clients use CDS to locate servers. The information that a client needs to contact a server is packaged in a data structure called a binding (see Figure 5). A binding defines the RPC protocol type, the machine network address and transport endpoint used in the communication between the client and the server.

Servers make themselves known to the clients in the cell by exporting the interfaces they listen on along with their bindings to an entry in CDS. The API that accomplishes this in `dce_server.c` is called `rpc_ns_binding_export`. Clients will search for compatible servers in CDS by looking up their name using the `rpc_ns_binding_import_`*{begin, next, done}* calls. These calls are not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present in `dce_client.c`. They are automatically generated by the IDL compiler in the client stub. The client stub reads the environment variable RPC_DEFAULT_ENTRY to learn the server entry name. The programmer sets this variable to the CDS entry name. This type of client/server binding is called automatic binding. DCE/RPC also supports implicit and explicit binding methods, which give more control over the choice of bindings to the programmer. The set of library calls that provides the interface between DCE/RPC and CDS is referred to as the Name Service Independent (NSI) API.

Because CDS is central to the development of DCE/RPC applications, it was designed as a replicated service. Information that applications need to function (in our case, binding information) can be replicated on any number of CDS server machines, thus providing higher availability and a better chance that clients will be able to locate servers.

Note the significance of the phrase "compatible servers" mentioned above. DCE/RPC encapsulates the transport and network details of the RPC inside the binding structure. A server that can accept DCE/RPC calls over UDP/IP, TCP/IP and DECnet will export three different bindings. When a client using a DECnet transport, for example, imports a binding from the same CDS entry, it will find only the DECnet binding. This is the only binding that is compatible with its own network architecture. The same is true of a TCP/IP client. This highlights another important feature of DCE/RPC: Clients never have to see (or know) which network and transport their RPC is running over.

There's an obvious advantage to using a directory service to store binding information–location independence. Servers can change their network location without having to change their network name. Clients will always locate servers by name. CDS also provides a mechanism for structuring the namespace, so that servers can be grouped together under a single name. Using the same API mentioned earlier (`rpc_ns_binding_import_begin`), a client can search a group of servers until it finds one that it likes.

Finally, the NSI API supports searching for servers not just by the interfaces that they listen on (what the server does), but also by which objects the servers manage (what the server does to whom). Servers that manage different objects will export their object information along with their bindings to the same CDS entry. This provides an excellent basis for designing object-oriented distributed systems using DCE/RPC.

Threads and Their Use in DCE/RPC

The sample ONC/RPC application in this article suffers from another limitation: It can only accept one RPC at a time. While the server is executing an RPC for one client, all other client requests are queued, and when the queue fills up, the rest are denied. Why? Because ONC/RPC servers are single-threaded. The solutions for this are not pretty. You could duplicate the server on many machines, at the expense of additional hardware, or duplicate the server process on the same machine at the expense of increasing process overhead on a single machine. Barring this, your only alternative is to write your own dispatcher routine (the `svc_run` library call) and start playing around directly at the socket level, either by explicitly forking processes to execute the RPCs, or by using ONC's lightweight processing library (`lwp`). Not a pretty picture by any stretch.

Figure 4. DCE Code

```
/* file aritmetic.idl */
[
uuid(001279ec-1eff-1cbc-ab59-08002b13ca26),
version(1.0)
]
interface arithmetic
{
   const long ARRAY_SIZE = 10;
   typedef long long_array[ARRAY_SIZE];

   /* first 2 parameters are input, the last one is output */
   void
   sum_arrays (
   [in] long_array      a,
   [in] long_array      b,
   [out] long_array     c
  );
}
/* file arithmetic.c */

#include <stdio.h>
#include "arithmetic.h"      /* created by IDL */

/* This is the server manager code that is executed in the RPC */
void
sum_arrays (a, b, c)
   long_array a, b, c;
{
   int     ii;

   for (ii=0; ii<ARRAY_SIZE; ii++)
      c[ii] = a[ii] + b[ii];
}
/* file dce_client.c */

#include <stdio.h>
#include "arithmetic.h"      /* created by IDL */

long_array a = { 100, 200, 345, 23, 67, 65, 0, 4, 32, 11 };
long_array b = { 4, 0, 2, 3, 22, 56, 877, 9, 0, 1 };

main (argc, argv)
   int          argc;
   char         *argv[];
{
```

The DCE/RPC runtime is multithreaded (see Figure 6). It runs over a POSIX 1003.4a Pthreads library. When a server calls `rpc_server_listen`, the server runtime allocates a pool of threads to accept incoming procedure call requests. In addition, a runtime call queue is created to buffer incoming requests that need to wait for a thread to execute them. The server developer determines the number of threads in the pool and depth of the waiting queue in the call to `rpc_server_listen`.

Another nagging complaint about RPC in general is that it is synchronous. Clients have to wait for servers to return the results of the RPC. DCE client libraries are also integrated with threads, thus allowing clients to execute multiple RPCs in parallel. The integration of the RPC runtime with threads is such that clients can interrupt a remote procedure call while it is executing in a server thread on a completely different machine!

Security

A distributed application has to concern itself with the security of the application and the data that it transmits across the network. Clients and servers must be capable of proving their identities to each other. This is called authentication. Servers also need to enforce some means of access to the information that they manage, based on the identity of the user. This is called authorization. Finally, the communication mechanism must be able to satisfy various degrees of data protection. These should include integrity checking of the data as well as complete data privacy.

To keep matters simple, the sample code in this article does not include any of the following security library calls.

ONC/RPC uses three levels of authentication: AUTH_NONE, AUTH_UNIX (the default) and AUTH_DES, which is a combination of public key and secret key encryption. The process credentials (`uid` and `gid` list) are encrypted in the RPC. Adding authentication on the client side is not that difficult (one call to `authdes_create` to annotate the client handle), but there are separate APIs for each of the three authentication schemes. On the server side, you need to add the code that checks the authentication.

DCE/RPC supports secret key encryption. Unlike ONC, there is only one call on the client side that converts a regular RPC into an authenticated one: `rpc_binding_set_auth_info`. The client determines which security name (of the server) it is going to talk to, what level of authentication to use and what type of authorization to use. Unlike ONC, DCE supports five security levels, ranging from connect level (just authenticate when you connect to the server the first time) to packet-level integrity (perform a cryptographic checksum on each packet) and all the way up to complete data privacy (full encryption of the data on the wire). The default security level for all RPCs is integrity checking.

On the server side, all the programmer has to do is register the authentication information with the runtime using the following call:

`rpc_server_register_auth_info`

This tells the runtime which authentication scheme to use to validate the client and where to find the server's key. Once inside the manager routine, a call to:

`rpc_binding_inq_auth_client`

will extract the security information

```
    long_array      res;
    int             ii;

    /* Execute the RPC */
    sum_arrays(a, b, res);

    /* Print the results */
    for (ii=0; ii<ARRAY_SIZE; ii++)
                    printf("%d ", res[ii]);
                    printf("\n");
}
/* file dce_server.c */

#include <stdio.h>
#include "arithmetic.h"         /* created by IDL */

/* This is the name of the server's CDS entry */
#define SERVER_ENTRY "/.:/subsys/dce/arithmetic_server"

main (argc, argv)
    int             argc;
    char            *argv[];
{
    rpc_binding_vector_t    *binding_vec;
    unsigned32              st;

    /* Register the interface with the runtime */
    rpc_server_register_if(arithmetic_v1_0_s_ifspec, NULL, NULL, &st);

    /* Tell the runtime to use all supported RPC protocols */
    rpc_server_use_all_protseqs(rpc_c_protseq_max_reqs_default, &st);

    /* Construct bindings from the information in the runtime */
    rpc_server_inq_bindings(&binding_vec, &st);

    /* Register interface and bindings with the endpoint mapper */
    rpc_ep_register(arithmetic_v1_0_s_ifspec, binding_vec, NULL, NULL, &st);

    /* Export the bindings to CDS for clients */
    rpc_ns_binding_export(rpc_c_ns_syntax_dce, SERVER_ENTRY,
                    arithmetic_v1_0_s_ifspec, binding_vec, NULL, &st);

    /* Go to sleep waiting for incoming RPCs */
    rpc_server_listen(rpc_c_listen_max_calls_default, &st);
}
```

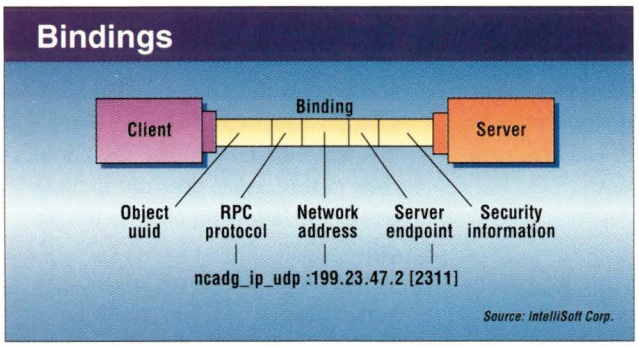

Figure 5. The information that a client needs to contact a server is packaged in a data structure called a binding.

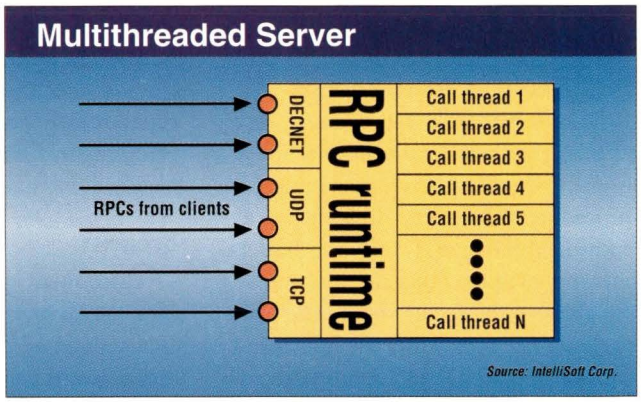

Figure 6. When a server calls rpc_server_listen, the server runtime allocates a pool of threads to accept incoming procedure call requests.

from the binding structure. The server will use this information to perform the necessary authorization checking. The server runtime is also designed so that if authentication fails, an error is returned to the client directly from the runtime. The server manager code is never awakened.

The authorization information that a DCE server manages is based on POSIX 1003.6 access control lists (ACLs). The authorization data that a DCE client presents to a server is called a Privileged Attribute Certificate (PAC). A PAC contains the client's cell name, principal (user) name and the list of all the group names that the user belongs to. This mechanism is far more powerful than just standard UNIX credentials used in ONC. First, programmers can provide individual access control rights to authenticated users from the local cell as well as from other cells. The same is true for groups of users from foreign cells.

Second, procedure calls are authorized based on the client's PAC at the time of the call. The PAC information is obtained when the client runtime contacts the DCE security server to construct this list. Finally, the PAC is sealed by the security server in the client's binding structure. This guarantees that no one can forge a user's credentials.

Error Recovery and Cleanup

One of the more complex issues in distributed applications is error recov-

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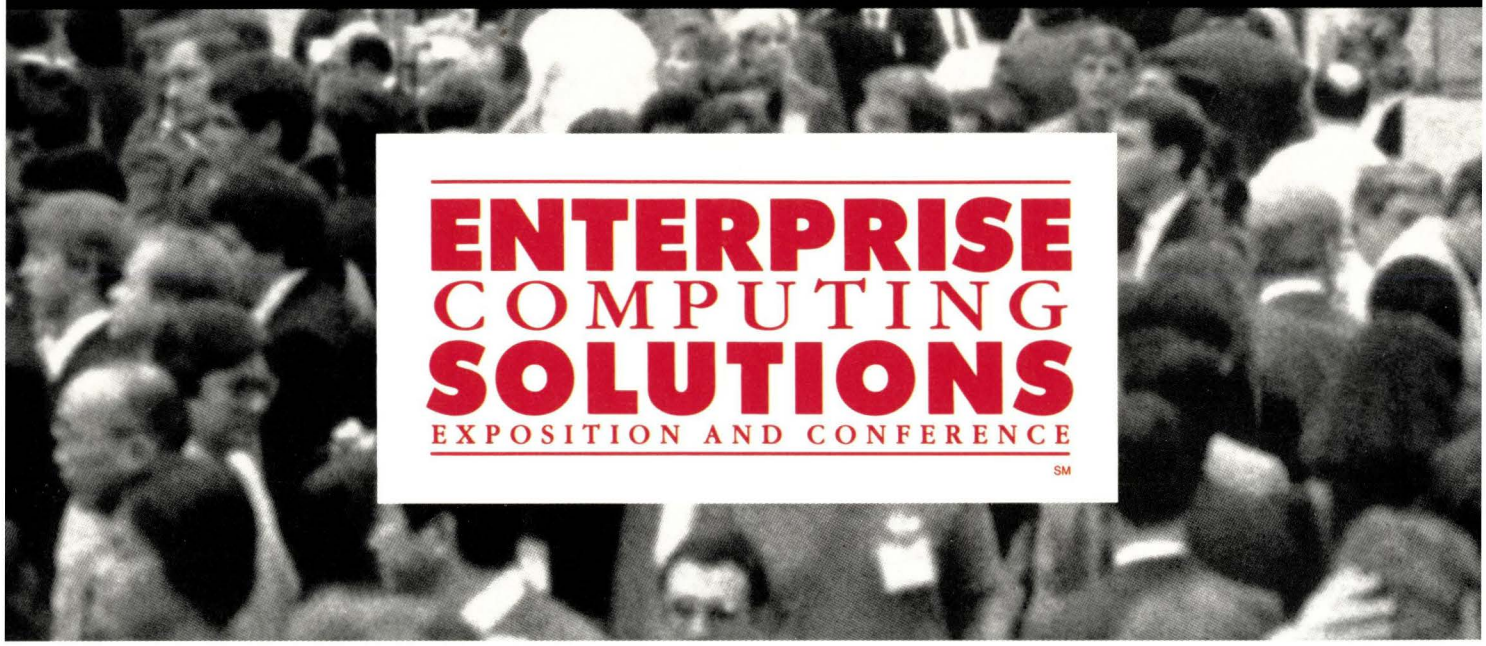

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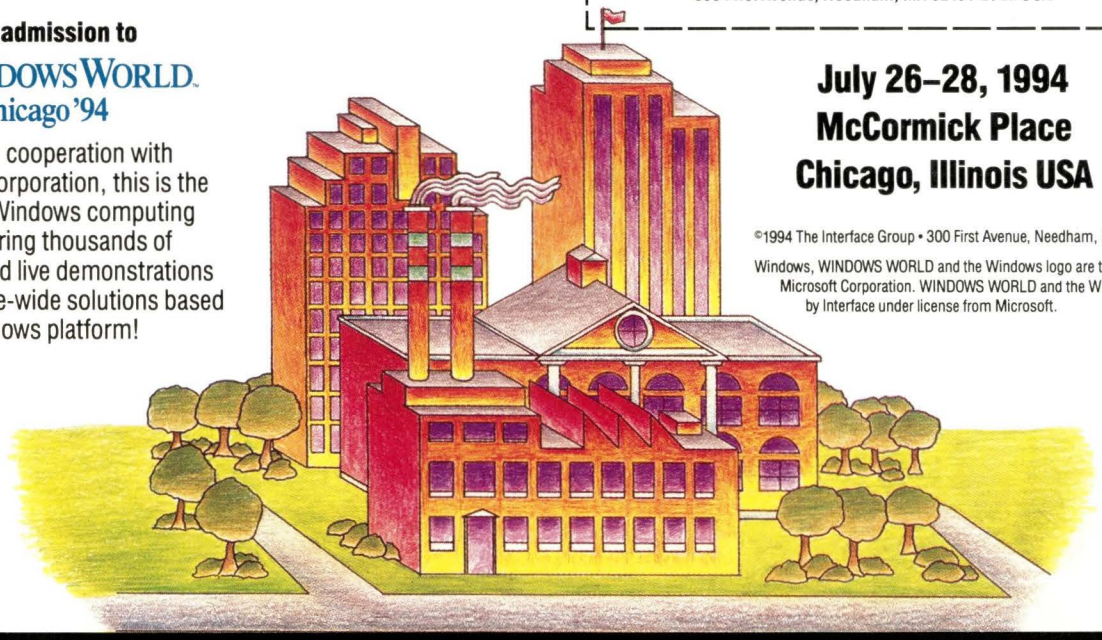

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ery and cleanup. The issue is complicated by the fact that errors, which before were all localized to one process on one machine, can now occur in multiple processes on different machines. This issue is handled in DCE/RPC through the use of exception handlers. Exceptions are part of the DCE threads library. Each thread has its own exception context, which records all the synchronous and asynchronous events that occur while a program is executing. The notion of an execution context is extended to encompass both the client thread (the caller piece) and the server thread (the callee piece). This transparency is provided by the RPC runtime and the stub modules. Currently, an exception can occur on the server side (e.g., divide by zero), and if the server manager code does not have a handler to deal with this (or any other type of) exception, the server stub code will return the exception to the client to be handled there.

Another important feature of DCE/RPC are context handles. Programmers can now develop applications that enable clients to store persistent state information about themselves with servers, across multiple RPCs. This provides a mechanism for designing an application-level session, a sequence of RPCs that have a relationship between them. The DCE IDL supports a context handle data type, which a programmer can use to refer transparently to this state information. When the client is done with the information (the session has ended), the context is automatically released at the server. The RPC runtime guarantees that, between calls, a connection between the client and the server is maintained. If the connection is severed, the server runtime automatically cleans up any state left behind. This feature is only possible with RPCs that can guarantee a reliable connection. ONC/RPC is limited to a TCP transport to provide this level of service. DCE/RPC provides the same semantics across all transports that it supports, even those that are not reliable (e.g., UDP).

The features above are just some of the new and interesting development techniques that DCE/RPC provides to programmers today. There are quite a few more that I haven't mentioned in this article. My goal was to entice you into learning more about DCE/RPC. I hope I succeeded.

Jonathan Chinitz is president of IntelliSoft Corp., a software engineering firm based in Acton, MA, specializing in distributed computing. For the past three years, he has conducted DCE training and consulting worldwide on DCE application development, internal architecture and systems administration. Jonathan has also developed a number of DCE training courses, the latest focusing on using DCE security in distributed applications. In his spare time, Jonathan is coauthoring a book on DCE systems administration for O'Reilly & Associates Inc. He can be reached at jec@isoft.com.

Data with a View

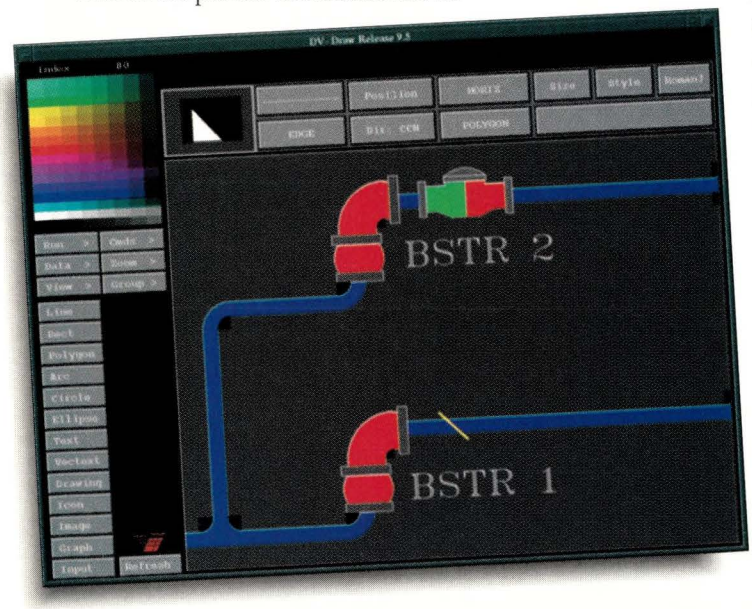
by **BARRY SHEIN**, Technical Editor

This month, *SunExpert* test-drives a data visualization and simulation tool that is loaded with power.

DataViews

DataViews 9.5 from V.I. Corp. is certainly a tried-and-true data visualization product, but it's a whole lot more. Beyond the graphs and 3D wire meshes is a very interesting software simulation builder. A quick tour of the supplied demos gives you a feel for the intended users of the product: scientists, engineers, financial modelers, designers and their ilk. For example, colorful process control diagrams respond to mouse clicks that open and close valves; vats fill with liquid and steam pressure builds as alarms go off and on. Graphs showing the current state of the process simulation can be called forth to examine and continuously update.

DataViews models a project in three basic parts. First, you use the DV-Draw program to create the graphical objects that are to appear on the screen. The object types in the DV-Draw tool box panel are the expected line, rectangle, arc, text and so forth as well as graphs (more than 60 different styles), bit-mapped images in GIF, TIFF and other formats, input objects such as toggles and sliders, etc. Once you place these objects on the screen, you can edit them in various ways, e.g., the object's color, size, style. Think of this as building the basic layout of a control panel. Next you would use DV-Tools to link C code to these objects. For example, if you have created a dial to display a particular data value, DV-Tools provides the subroutine calls to move the hands on the dial face. Finally, you develop your application software around this interface. You don't have to perform these steps in this order either. Your application may already exist, so you would use DataViews to retrofit it to a graphical interface.



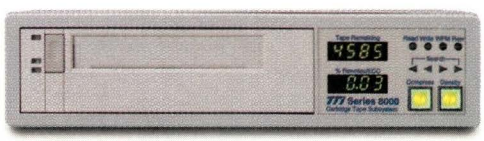
With DV-Draw you place and edit objects on the screen. The tool box panel includes the expected line, rectangle, arc, text and so forth, as well as graphs (more than 60 different styles), bit-mapped images and input objects such as toggles and sliders, etc.

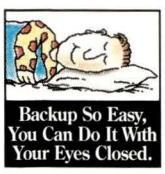
Creating a Project the DataViews Way

To get a feel for this process, let's step through a simple example. I open the DV-Draw tool and choose the GRAPH button, which tells me to describe a rectangle in the drawing area with the mouse. This is the bounding box of the graph I've just created. Next I click EDIT while the graph is still selected and a panel appears for specifying details of the graph. I click the graph object in the panel and I'm presented with a screen full of bar, impulse, scatter and other graph types. On the bottom is a button labeled NEXT, which steps me to another screen full of dials and meters

The 3 Biggest Lies In Computing.

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





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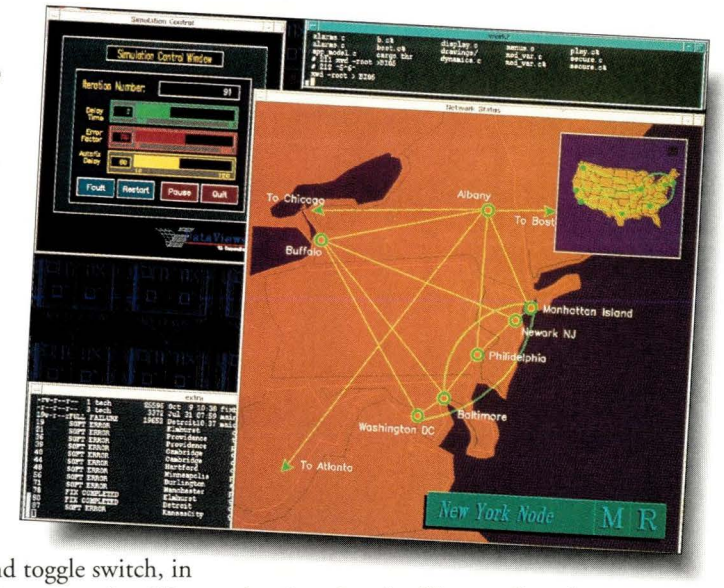
and so on. I choose a dial and hit the right mouse button to return to drawing. Around the graph I place an unfilled rectangle and from the color palette make the rectangle's edge bright green. Just a decoration. Under the dial I place some text, "This is a Dial." I choose the INPUT menu item, describe another rectangle to the left of my dial and again choose EDIT while the input object is selected. In the edit panel, I select a two-way toggle switch from the many choices presented. Other choices include a slider, text entry, Motif- or Open Look-style button, radio buttons, etc. As I edit each object I might use in the program–the dial and toggle switch, in this example–I give it a name that I'll later be able to use to reference them in subroutine calls. I save this effort away into a file.



DV-Tools allows you to link C code to the objects you've created. If you create an element to display a particular data value, DV-Tools provides the subroutine calls to link the two.

Next I create the basic program skeleton to control the graphical objects. First I choose some boilerplate, initialize the display, tell the package that I will be using the mouse for input and connect to the objects. Then the program goes into the familiar (to GUI programmers) event loop, interacting with the objects on the screen and input devices (mouse, keyboard). You would also add code to gather the data that drives the display. Compile and link it all together, and your application is done.

Look Ma, No Code!

There's another way to approach a project in DataViews. Each graphical object can be controlled by various values you can set within DV-Draw. One interesting item you can set is a rule. A rule consists of three parts: an event, a condition and an action. An event might be moving the mouse cursor over the object. A condition might be a mouse button click. Finally, an action could be changing to a different view, erasing the object, changing its color, issuing a UNIX command or several other possibilities. Dynamics can also be added at this stage in DV-Draw. For example, you could change the color of displayed objects or their position on the screen based upon the changing values of data being read from a source. Motion can be implied by changing the fill area of an object on the screen, to simulate a vat filling with liquid, for example.

In DataViews applications, source data can come from files or programs that are run as the display is made active. DV-Draw lets you specify data input formats: floating point, integer, byte, etc., as well as text vs. binary.

You can select the RUN button within DV-Draw to run your creation as a prototype. Or you can save your work away and rerun it with another utility called DVplay.

By now you should be getting the idea that you can do some very sophisticated simulation and visualization without any programming at all. Many of the demos supplied with the package proudly display a label explaining that this was done without any programming, entirely within DV-Draw. In case the point doesn't hit home, V.I. Corp. adds a little international "no" sign (a red circle with a diagonal bar) with the word CODE through the middle. No code, get it?

What Else?

There's a lot in DataViews. It's a large software package. The sheer weight of the manual set that comes with the software gives you a hint that this may be the case. The reference manual fills one three-inch and a one-inch binder. The User Guide fills another two-inch binder. You also get a box of spiral-bound tutorial and step-through guides and instructions for installation and administration, printing and other

DataViews 9.5

Company
V.I. Corp.

Address
47 Pleasant St.
Northampton, MA 01060

Phone
(413) 586-4144
Europe: +44 734 892111

Fax
(413) 586-3805
Europe: +44 734 892090

Email
vi@vicorp.com
Europe: viesales@eurovi.uucp

Best Feature
It is a highly engineered data visualization and simulation package capable of serving many different applications areas.

Worst Feature
Its interactive style takes some getting used to.

Price
Development license, $17,700; additional license at same site, $3,000; each additional heterogeneous platform, $3,000, DV-Draw only, $6,700; DV-Tools runtime copies start at $3,000 for a single copy

Circle 141

topics. My impression is that none of these are fluff. They are all full of useful information, and they are well written and organized.

I would guess that it will be easy for people with some technical orientation to get started with and begin getting some useful work out of this package; however, it will also take a while to master all of its intricacies. While playing with the package and its various components, I had that good feeling that I could focus on one aspect of the package without feeling like I had to understand several other pieces to make progress. I didn't find myself racing to the index, three fingers holding places in the various manuals trying to understand precursors to something I was trying to do right now.

The use of a graphical interface to build graphical interfaces is well done. It's sophisticated and not quite in the style of most other programs, but it's reasonably easy to get the hang of it after playing around with the tutorials and demos for a short while. One way the look and feel is different from other graphically oriented packages is that choosing a menu item often causes a panel to come up that completely obscures the work area (i.e., not a separate window). Then you interact with that panel for a while and finally dismiss it and your work area returns. It takes a little getting used to on first encounter. What should occur to someone using DV-Draw is that it appears to be built in DV-Draw itself. So once you get comfortable with the style of the package it all becomes intuitive.

I will confess that there were a few points with DV-Draw when I was stumped and had to break down and study a section of the User Guide. (Oh the horror, driven to the manual!) In a few instances, a better designed interface might have led me along a bit further. For example, when I first created a graphing object, I knew I could change it from the default bar chart but never stumbled upon how to get the choices displayed. A minute with the manual solved the problem, and on reflection, perhaps I was being a little thickheaded. But suffice it to say that if you decide to use DataViews, you will do a little work in the beginning to figure it out. I think that's fair enough. After all, it's not a package for entirely nontechnical people–that doesn't mean you need any computing sophistication to make use of it. Unless your project requires programming (and you don't have access to a programmer–there is no reason the interface designer and programmer must be the same person) anyone who can figure out how to use a microwave oven or VCR should be able to figure out how to make use of these tools. And the manuals are much better than ones that come with consumer appliances.

About the only palpable criticism I could make about the product was that the font set (both raster and vector fonts are supplied) seemed a little primitive. This is not a problem for work intended to be exploratory with data. But for setting up demonstrations to wow others, particularly nontechnical types, one might find that the text quality occasionally distracts from the overall look of displays. This is really a minor criticism.

Summary

DataViews is a powerful data visualization and simulation software package intended to cover a huge range of application domains. Most any project that might benefit from graphically displaying and interacting with data would be well served by DataViews. The addition of animation and prototyping that is powerful enough to build applications requiring no programming at all is attractive. Its rich programming environment and other tools make DataViews' potential utility nearly limitless, especially for engineers, scientists, data analysts in general, financial modelers, process control engineers and designers. Perhaps the one most useful thing I can say about this package is that I doubt you will find more than one or two other packages that are at all comparable for this sort of work. ⊸

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.

ODBMS Improvements

By joining forces with ProtoSoft Inc. and CenterLine Software Inc., Servio now provides enhanced CASE and C++ support for its GemStone object database management system. C++ developers will have an object environment that encompasses application analysis and design through ProtoSoft's Paradigm Plus, development through CenterLine's ObjectCenter and scalable deployment through Servio's GemStone ODBMS.

The tools support UNIX systems from IBM Corp., Sun and Hewlett-Packard Co. as well as IBM's DOS/Windows and OS/2. The price is $20,000 for a four-user developer license.

Servio Corp.
2085 Hamilton Ave., Suite 200
San Jose, CA 95125
Circle 101

Island Information Management

Island Software has introduced the Island Information Management Series, a suite of information and document management products. The suite enables users to search, retrieve, skim-read and manage electronic documents. The Information Management Series will eventually contain many different products. The initial product is called InText, which Island developed along with its new parent company, InText Systems. InText, which will come in both Windows and UNIX versions, is meant to provide a variety of document management functions. These include a natural-language capacity to search for and retrieve documents. There is also a "native file viewer," which allows users to view Word, WordPerfect and Ami Pro documents without having those packages on their systems. InText also provides users various hypertext capabilities.

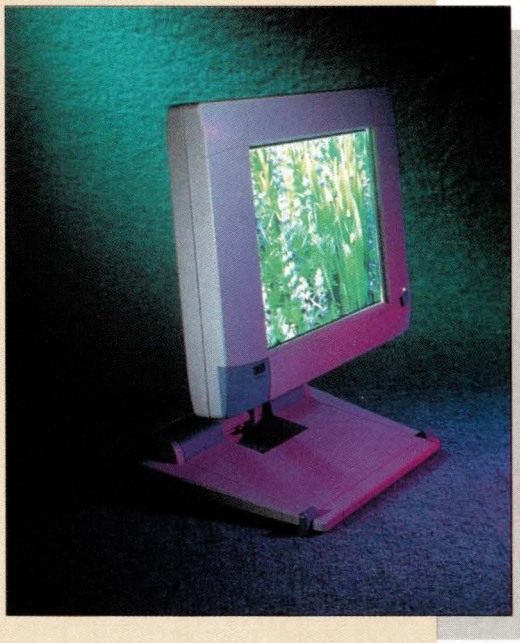
However, the most dramatic claim for InText is its ability to analyze documents on its own. The two companies say that InText has a "heuristic architecture" that allows it to "understand patterns of written communication and...quickly find and analyze key information." The product could thus take a large email document, boil it down to essentials and present an abstract of the document to the user.

InText for Windows, working with Word, WordPerfect and Ami Pro for Windows, is priced at $395. InText for UNIX, meanwhile, is planned for the end of 1994. It will work with IslandWrite, Draw and Paint, as well as other word processors.

Island Software Corp.
400 Civic Center Drive
San Rafael, CA 94903-4178
Circle 102

Flat-Panel Display for SPARC

A color active-matrix TFT flat-panel display subsystem for SPARC-based workstations has been announced by Integrix. The subsystem includes the S20VGA, a single-slot SBus color frame buffer, and a 9.4-inch diagonal LCD monitor, the C5020. The S20VGA has register compatibility with Sun's CG3 driver and is programmed to support the C5020.



The C5020 operates with a workstation at resolutions of 640 by 480 pixels at a refresh rate of 60 Hz. It can display 256 colors from a palette of 16.8 million. Pricing on the subsystem begins at $4,295. Individually, the C5020 is $3,995 and the S20VGA is $395.

Integrix Inc.
1200 Lawrence Drive, Suite 150
Newbury Park, CA 91320-1316
Circle 100

ISDN Bridge

Combinet has introduced a bridge product that allows high-speed remote network access over ISDN. The Everyware 160 provides ISDN to remote users and comes with its own NT1 interface. An NT1 is the interface between conventional telephone lines, which have two wires, and ISDN, which has four. The company says that, to date, even those customers who did have ISDN service from their telephony supplier frequently had to spend $300 to $400 just to buy the converter nec-

essary to link one set of wires to the other. The Everyware 160 eliminates that purchase.

Everyware 160 is meant to provide remote users, small-business owners, branch offices, telecommuters and so forth with an easy, ISDN-based means of accessing Ethernet-based LANs. It is compatible with all ISDN telephone switches that support the 2B1Q interface standard. It also allows the addition of other ISDN equipment, such as telephones and G4 fax machines. Pricing begins at $1,190.

Combinet Inc.
333 W. El Camino Real
Sunnyvale, CA 94087
Circle 103

Trakker Take Two

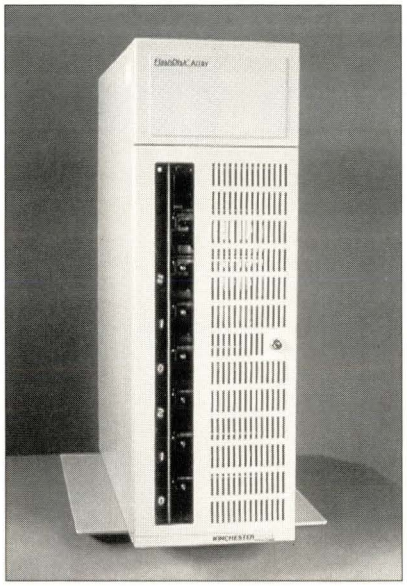
It sounds like a series pilot for syndicated TV, but it's actually an enhanced network management platform. Concord Communications has announced Trakker: The Next Generation, an upgrade of the company's existing Trakker product. The original Trakker was meant to manage multiplatform networks and had as its claim to fame the ability to monitor both lower and upper layer communications protocols.

Trakker part 2, meanwhile, has an object-oriented C++ framework that allows the product to support a number of new features. These include support for an integrated relational database, specifically Ingres, that allows users to manage and analyze network data. There is also an improved GUI, an improved ability to communicate with other applications and support for multiple management platforms–such as SunNet Manager and Hewlett-Packard Co.'s OpenView. Pricing begins at $20,000 for the base console software and $6,000 for each segment or ring monitored.

Concord Communications Inc.
753 Forest St.
Marlboro, MA 01752-3044
Circle 104

RAID 5 Disk Array

A disk array rated at RAID 5 has been introduced by Winchester Systems. The FlashDisk Array offers hot-swappable 3½-inch disk drives on



EISA boards that can fit into an existing EISA chassis device or into the company's own EISA chassis. The result is a system that offers a capacity of up to 400 GB per server.

It has a Fast SCSI-2 controller and delivers up to 6,000 I/O operations per second and up to 24-MB/s data transfer rate in a RAID 5 array. In addition,

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FlashDisk Array features a spare drive whose controller automatically detects, replaces and rebuilds failed drives without operator intervention. Pricing on a 4-GB machine is $17,395, plus $1,577 for a "hot spare" option.

Winchester Systems
400 West Cummings Park
Woburn, MA 01801
Circle 105

Codonics Network Printer

The NP-1600 photographic network printer is a 300-dpi color and monochrome printer specifically designed to

work with any homogeneous or heterogeneous TCP/IP or EtherTalk-based network. Dye-sublimation technology with 16.7 million simultaneously printable colors allows continuous tone prints.

The NP-1600 has five output formats, ranging from 8½ by 11 inches to 9½ by 12 inches. Paper and transparency material can be used interchangeably. The company's CorrectImage technique reduces artifacts such as "ghosting" and "color shifting."

Files originating from DOS, UNIX and DEC VMS systems are printed through TCP/IP and EtherTalk protocols. The product works with such image file formats as TIFF, GIF, PCX, Macintosh PICT, Sun raster, Portable Pixmap (PPM), X11 bitmap and PostScript Level II. Its price is $9,995.

Codonics Inc.
17991 Englewood Drive
Middleburg Heights, OH 44130
Circle 106

Remote Networking Server

Xylogics has introduced a dual-port server for linking PC-oriented LANs and providing dial-up routing. The MicroAnnex NCS server is geared particularly for system and network administrators who must manage multiple NetWare installations. It comes with fax and modem software. The dual port, meanwhile, means that some users could be dialing in while others are dialing out. This also allows two NetWare LANs to connect without leased telephone lines.

The product supports Novell Inc. NetWare and Microsoft Corp. Windows 3.1. It connects to Ethernet (AUI, BNC, TWP) and supports user-supplied modems at 57.6 KB/s. There's also a token-ring version. Pricing begins at $995.

Xylogics Inc.
53 Third Ave.
Burlington, MA 01803
Circle 107

Work-Group Libraries

If you like tape library storage but don't need a massive silo, Spectra Logic has stepped in to offer three new units for work-group and departmental storage needs. The Spectra 4000/20, 4000/40 and 4000/60 house

4mm DAT cartridges (the model number indicates how many cartridges are included) offering up to 240 GB of uncompressed data storage. (You can usually double that with compression, says Spectra.)

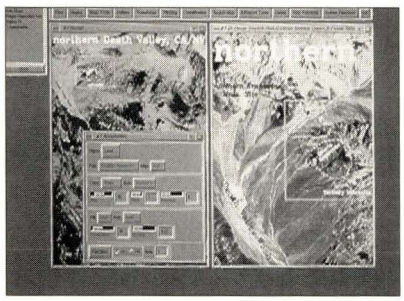
The libraries use a motionless carousel with a robotic device to move cartridges between slots. The libraries can hold up to four DDS-2 format tape drives, which can be snapped in and out of the unit. The slots are designed to accommodate future formats such as DDS-3 when they become available.

The libraries come in either a vertical or horizontal chassis with a touchscreen for diagnostics and monitoring. The hardware works with several software packages for backup, archiving and hierarchical storage management. Among the software supported is Spectra Logic's Alexandria, along with software from Cheyenne Software Inc., Legato Systems Inc. and Palindrome Corp. Prices start at $9,175 for the 20-cartridge unit.

Spectra Logic
A division of Western Automation
1700 North 55th St.
Boulder, CO 80301
Circle 108

Environmental Image Processing Suite

A new suite of image processing software tools for remote sensing applications has been introduced by Research Systems. The Environment for Visualizing Imagery (ENVI) package is



meant for such tasks as analyzing geographic, land-form and environmental data from such sources as satellites and airplanes.

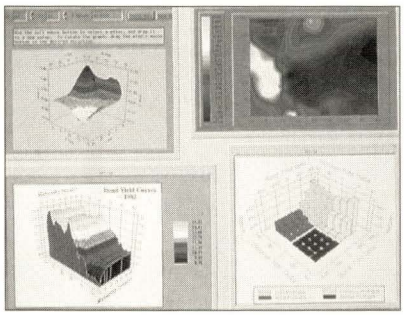
The company says ENVI includes a number of features not readily available elsewhere. These include linked dynamic image overlays, comprehensive array-based image math, routine handling of hyperspectral imagery and advanced analysis of reference spectral libraries.

ENVI is available for UNIX systems, including Sun workstations, as well as PCs, and a Macintosh version is under development. Pricing for the Sun version is $10,000.

Research Systems Inc.
2995 Wilderness Place, Suite 203
Boulder, CO 80301
Circle 109

3D Graph Widget

An enhanced version of the XRT/3d graph widget tool kit for the X Window System has been released by KL Group. XRT/3d can represent 3D



data in a variety of graph types, including surfaces, bar charts and contour graphs. XRT/3d 2.0 features 3D bar charts and histograms and supports interactive rotation of the objects displayed.

Other features include enhanced axis labeling and new data formats, including irregular data sets. XRT/3d is available for Sun systems, as well as Digital Equipment Corp. DECstations and DEC Alpha products, the Hewlett-Packard Co. 200/400 and 700/800 systems, The Santa Cruz Operation Inc. and Silicon Graphics Inc. machines. Pricing begins at $2,495.

KL Group Inc.
134 Adelaide St. E, Suite 204
Toronto, Ontario
Canada M5C 1K9
Circle 110

Fonts for UNIX

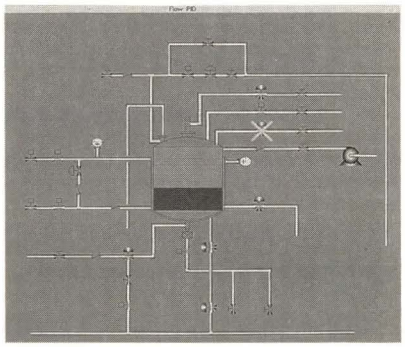
The font selection that PC and Macintosh desktop publishing users are accustomed to is now available for UNIX workstations, thanks to Gallium Software. The company released the FontTastic family of font-management software, including a font server, application programming interface and manager.

Gallium's software supports TrueType, Type 1 and Speedo fonts, which have previously been either unavailable or limited in the X11R5 windowing environment. This will make it possible to use a standard set of fonts across platforms, says Gallium. The API provides a library of Xlib-compatible routines to give developers more control over font display than what is allowed in X11R5. The FontManageMotif utility lets developers create new font directories and add them to the X11 font path. FontTastic is PC-priced at $249 per copy and runs on major UNIX platforms including AIX.

Gallium Software Inc.
303 Moodie Drive, Suite 4000
Nepean, Ontario
Canada K2H 9R4
Circle 111

Visual Edge, Adobe Show Tool Kit

Visual Edge Software and Adobe Systems Inc. have announced a software developer's tool kit for UNIX and Motif. The product, Visual Action



Toolset, combines technology from both companies, including Adobe's Display PostScript and Visual's UIM/X GUI builder. The result is a suite of libraries, widgets, fonts and sample programs that assist programmers in the development of applications using active graphics, such as smart documents, which the companies call "live documents."

Pricing on the tool kit begins at $2,500. At introduction, it was avail-

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able on SunOS 4.1.2 (that is, Solaris 1), and is now on Solaris 2.3. Other platforms supported include IBM Corp. AIX, Silicon Graphics Inc. Irix and Hewlett-Packard Co. HP-UX.

Visual Edge Software Ltd.
3950 Cote Vertu, Suite 100
St. Laurent, Quebec
H4R 1V4 Canada
Circle 112

SBus Head Start Kit

Troubador Technologies has introduced an SBus Head Start Kit for developers of SBus add-in products. The company says the product provides information to make PLD- or FPGA-based SBus slave interfaces and includes a PC floppy with the source code for an assortment of devices. The product also includes application examples. Pricing begins at $159.

Troubador Technologies
P.O. Box 2606
Santa Clara, CA 95055-2606
Circle 113

Multimedia Workbench

Multimedia has maintained a predominant role in the PC world without making much headway in UNIX. Cincom's Multimedia Workbench,

which combines several tools, is designed to help bring multimedia into the realm of client/server computing for UNIX servers and PC clients. The solution will help developers create applications designed for training, information kiosks and product catalogs, among other areas.

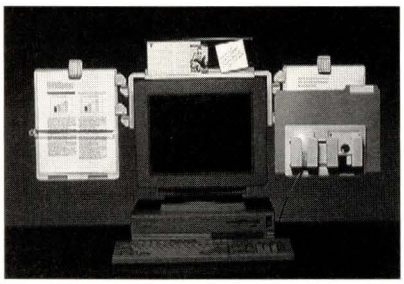
Cincom describes its Multimedia Workbench as an integrated, networked environment for multimedia application development. It combines Cincom's Supra Server relational database, which runs on multiple UNIX workstations and the mainframe, along with tools such as file transfer utilities, authoring software, a Windows C precompiler for embedded SQL and networking software. The environment also provides extensions for the Microsoft Corp.-developed Media Control Interface (MCI), enabling the database to access audio and video-based data through a number of MCI-supported tools.

The multimedia solution is currently available for UNIX platforms including AIX, HP-UX and Sun OS. Cincom is providing training and support through its recently established Multimedia University. Contact the vendor for pricing.

Cincom Systems Inc.
2300 Montana Ave.
Cincinnati, OH 45211
Circle 114

Ring King is inView

A stand that holds documents for computer users has been introduced by Ring King. The InView workstation organizer sits on top of a monitor



and supports two panels that flank the computer's screen. The panels can hold documents that are up to 100 pages thick.

The panels can be configured to hold folders, disks or odd-sized papers. InView comes in three models to fit monitors from 12 inches to 22 inches in width. Suggested pricing is $49.95.

Ring King Visibles Inc.
2210 Second Ave.
P.O. Box 599
Muscatine, IA 52761-0599
Circle 115

ICL Shows Servers

ICL has introduced a set of server systems, which they refer to as the teamserver and superserver machines. The series is meant to provide workgroup-style computing to small to medium-size networks. The two types of servers are unusual in that the buyer can choose either SPARC or Intel Corp. processors.

The Intel-based teamserver products range in price from $7,900 for the E180i (a single i486-based device), to the $10,000 for the E480i (a 90-MHz Pentium). The teamserver line also includes two SPARC-based machines. These are the E370s, with a 40-MHz SuperSPARC at $10,470, and the E420s, with a 50-MHz SuperSPARC for $15,520. Both machines support up to eight users.

The superserver line, meanwhile, has two Intel processor machines, the dual-Pentium K432i at $59,950 and the quad-Pentium K434i at $103,800. The rest of the line is made up of SPARC machines and ranges from the K420s, with a 50-MHz SuperSPARC at $44,600, to the K474s, with four 60-MHz SuperSPARCs at $125,100. The K474s supports up to 256 users.

ICL Inc.
11490 Commerce Park Drive
Reston, VA 22091
Circle 116

Solaris Laptops

Two Intel Corp. X86-based laptops that run Solaris X86 have been released by SiO Technology. The SiO FT-500 and FT-501 each weigh 6.5 pounds yet come with a 486DX2-

66-MHz processor and support Solaris, as well as other operating systems. Both have a 9.5-inch TFT

active-matrix color screen, two PCMCIA slots, 8 to 20 MB of RAM, and a choice of 340- to 520-MB hard drives.

The machines support 14.4 fax modems and Ethernet cards and have one parallel port and two serial ports. Both are delivered with either BSD, Interactive UNIX, Solaris, SCO, UNIXware, OS/2 or Windows NT already installed. Pricing begins at $3,850.

SiO Technology Inc.
380 Lafayette St., Suite 304
New York, NY 10003
Circle 117

Embedded Systems

Integrated Systems has introduced a visual applications development and debugging tool for embedded systems. Called ESp, for Embedded System profiler, the product allows developers working with the company's pSOS+ and pSOS+m real-time kernels to view and diagnose faults in multitasking applications. ESp displays pSOSystem configuration, memory stack usage and errors, kernel object inventories, user-specified events and CPU use graphs. Its main display shows context switches, task state transitions, interrupts, system calls and so on.

In addition, ESp provides data-wrap-around capabilities, collecting data until a prototype program crashes, thus allowing a postmortem analysis. It also provides board-sharing, so that a development team can work on a single target system even if that target is in another office or in the field.

ESp runs on Sun hosts connected to Motorola Inc. 68000-based boards. Pricing begins at $995.

Integrated Systems Inc.
3260 Jay St.
Santa Clara, CA 95054-3309
Circle 118

DTK's Latest, Greatest SPARCs

DTK Computer has two more SPARC workstations to add to its line. The Station Classic+ II/LX+ II and the Station M514/M61. Both models run on SPARC CPUs and the Solaris operating system.

The Multiprocessor Station M514 runs on four Texas Instruments Inc. 50-MHz SuperSPARC+ processors. Each processor includes 36-KB internal cache and 1-MB external cache per CPU. Each processor ships with 64 MB of RAM, a 1-GB hard drive, a 1.44-MB floppy drive, a GX graphics accelerator, a 20-inch color monitor, ISDN with 16-bit audio, two MBus and four SBus slots and Solaris 2.3. It costs $33,789.

The Station Classic+ II/LX+ II runs on a TI 70-MHz MicroSPARC II processor with 24 KB of internal cache memory. It ships with 16 MB of RAM, a 525-MB hard drive, a 1.44-MB floppy drive, CG3/SVGA frame buffer, 10-MB/s SCSI, one 8-bit audio port, three SBus expansion slots. The product operates on Solaris 1.1.1B and 2.x. The price is $5,199.

DTK Computer Inc.
770 Epperson Drive
City of Industry, CA 91748
Circle 119

Lucid Compilers

Lucid has announced C and C++ compilers for Solaris 2.x. It has also ported its Lucid Common Lisp envi-

ronment to Solaris 2.x. The C++ product provides direct compilation of C++ code. Both the C and C++ products support automatic precompiled header files. Lucid C sells for $495; Lucid C++, $1,095; and the Common Lisp environment is $4,950.

Lucid Inc.
707 Laurel St.
Menlo Park, CA 94025
Circle 120

Video X Terminal

Human Designed Systems has added full-motion video capability to its line of RISC-based X Window System terminals. HDS Video is based on industry standards, supports analog and digital video with on-board compression and decompression, and enables users to display full-motion video in up to four windows on their HDS X terminal screens.

Either a camera, video CD-ROM or VCR can be connected to the terminal. The window can be moved or resized up to full screen. The terminal supports full-screen display of video at a 30 frame-per-second rate with broadcast quality.

Teleconferencing will be a useful application of HDS Video. Two HDS X terminal users can set up a teleconference over Ethernet and see each other in windows on their screens. HDS Audio, which allows recording and playback of stereo sound, can also be configured for X terminals and allows connection of stereo CDs, microphones or tape recorders.

The HDS Conference application sells for $199 per user, the HDS Stereo Sound and Digital Video each sell for $199, and the Analog plus Digital Video sells for $499.

Human Designed Systems Inc.
421 Feheley Drive
King of Prussia, PA 19406
Circle 121

QNX Gets X

QNX is a well-known, real-time, POSIX-compliant operating system. It had modularity and micro kernels long before those became buzzwords in the rest of the UNIX community. However, QNX has had two serious drawbacks: First, it was not on SPARC processors (the Intel Corp. X86 has been its home), and it did not have an X Window System implementation. The latter problem has been taken care of. At UniForum 94, QNX Software Systems announced a port of the X Window server to the QNX OS.

The server is the joint work of QNX and Metro Link Inc. It offers 155,000 Xstones on a 486 system. It supports Motif, scalable fonts with a font server, Xems, Xie, PEX and so on. Pricing is tentatively set at $295 for the development system, while the runtime system will be $295 and the Motif license, $195. Development documentation, meanwhile, is $215, and runtime documentation is $65.

QNX Software Systems Inc.
175 Terence Matthews Crescent
Kanata, Ontario
Canada K2M 1W8
Circle 122

Cray Unwraps Superserver

Cray has introduced the Cray Superserver 6400, a SPARC/Solaris-compliant symmetric multiprocessing system. Shipments of systems with up to 32 processors are available now, and shipments of 64-processor systems are scheduled for later this year.

On the SPECrate_int92 benchmark, a 24-processor CS6400 system had a rate of 41,967, and a 32-processor system had a rate of 54,186. CS6400 systems available with four to 64

Upgrades, Enhancements, Additions...

• Aurora Technologies has made its DataMaster series of SPARC system external floppy drives compatible with Solaris 2.x. The DataMaster products support 3½- or 5¼-inch floppies with direct Solaris and PC media and format compatibility. **Aurora Technologies Inc.**, 176 Second Ave., Waltham, MA 02154. **Circle 123**

• X terminal vendor NCD has announced an Adobe Display PostScript extension for its products. This allows NCD's X terminals to support PostScript language-based applications that before had been restricted to workstations. **Network Computing Devices Inc.**, 350 N. Bernardo Ave., Mountain View, CA. 94043-5207. **Circle 124**

• Sun's SPARC Technology Business group has upped the power and lowered the price of its SPARC-engine motherboards. The SPARCclassic engine is now less than $2,000. STB says that the boards also perform up to 100% faster than previous versions. **SPARC Technology Business,** 2550 Garcia Ave., MS UPALI-415, Mountain View, CA 94043-1100. **Circle 125**

• Network Peripherals has announced a field-upgradable FDDI expansion module for its EIFO client/server switching hub. This allows additional network servers to share the EIFO's FDDI network. **Network Peripherals Inc.**, 1271 McCarthy Blvd., Milpitas, CA 95035. **Circle 126**

• Working from its extensive background in video, Tektronix has brought digital video to its X terminals. The company has announced that the release of its X server software, XpressWare Version 7.0, will support networked digital video. **Tektronix Inc.**, 26600 S.W. Parkway, P.O. Box 1000, Wilsonville, OR 97070-1000. **Circle 127**

• Tower Technology has released Version 1.2 of its TowerEiffel System, a development environment for programmers working with the Eiffel language. The new release will support C++. It will allow developers to invoke C++ objects from Eiffel and vice versa. **Tower Technology Corp.**, 3300 Bee Caves Road, Suite 650, Ausin, TX 78746. **Circle 128**

• Release 5.0 of IDE's Software Through Pictures/Structured Environment (StP/SE) is now available. The new release puts StP/SE into the same architecture as the company's other products and includes an assortment of upgrades to improve project communications. **Interactive Development Environment Inc.**, 595 Market St., 10th Floor, San Francisco, CA 94105. **Circle 129**

SuperSPARC processors start at less than $400,000.

Cray also announced a new version of its UNICOS 8.0 operating system. UNICOS 8.0 features enhanced scalable parallel processing and security functions, while centralized resource management facilities have been improved. This latest version of UNICOS is available on Cray's commercial supercomputing product line and starts at $150,000.

Cray Research Inc.
655 Lone Oak Drive
Eagan, MN 55121
Circle 130

Multiprotocol Integrated Modems

Cabletron Systems and Xylogics Inc. announced an in-the-hub remote access module that provides up to 12 integrated V.32bis modems for dial-in/dial-out network users. It allows terminals and serial devices to be connected directly to Ethernet, token-ring and FDDI networks through Cabletron's Multi Media Access Center (MMAC) line of intelligent hubs.

Based on Xylogics' Annex software, the Modem Module (MODMIM) is a single-slot solution that offers 20 ports of connectivity including four modems and is also available as a two-slot module for the MMAC with an additional board and eight modems. Price is $1,495 per port, which includes 16 local ports.

Cabletron System
35 Industrial Way
Rochester, NH 03867-0505
Circle 131

CD-Recordable Jukebox

Optical jukeboxes and tape libraries aren't the only choices for backup and archiving, according to Young Minds. The company recently teamed up with Logical Engineering to integrate Young Minds' CD-ROM mass storage server software and CD recording system with Logical Engineering's 300-disk ROMWriter 300 CD-Recordable jukebox. The result is a device that lets users record and store up to 195 GB of CD data.

Young Minds' UltraCapacity software is installed on a file server to let users access CD-ROM-based data without requiring any modifications to existing applications. UltraCapacity works with Windows NT and 24 UNIX operating systems, including AIX. CD-ROM file formats supported include ISO 9660, High Sierra and Rock Ridge. The base price for the jukebox starts at $34,000. The Ultra Capacity software and drivers start at $11,750.

Young Minds Inc.
P.O. Box 8130
1910 Orange Tree Lane
Redlands, CA 92375
Circle 132

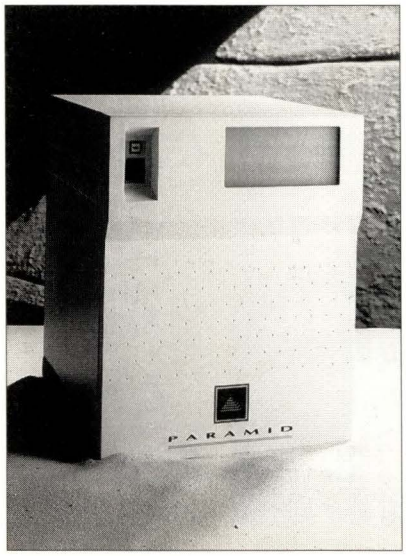
Visual Tool for VR for ZX

Sense8's WorldToolKit virtual-reality software-development tool is now available for the Sun SPARCstation ZX. The product allows developers to rapidly design interactive, 3D graphics applications. It had previously been available on DOS and Windows platforms, and applications written with it for those platforms will compile on the ZX. Pricing for WorldToolKit for Solaris 2 on the ZX begins at $7,500.

Sense8 Corp.
1001 Bridgeway, #477
Sausalito, CA 94965
Circle 133

Personal Supercomputer

A parallel-processing "super computer resource" that can provide performance up to 6.4 GFLOPS has been introduced by Transtec Parallel Systems. Called the Paramid, the product can support between four and 64 Intel Corp. i860 processors. Each node has up to 32 MB of RAM and its own communications subsystem.



The Paramid connects to a Sun workstation via a SCSI 2 interface and can be equipped with up to 16 separate file systems, and thus can be accessed by up to 16 users from a network. The system supports ANSI C and FORTRAN 77, and a variety of other software is available for code development. Pricing begins at $50,000.

Transtech Parallel Systems Corp.
20 Thornwood Drive
Ithaca, NY 14850-1263
Circle 134

CD Studio for Solaris 2

Young Minds has ported CD Studio, its CD-ROM production system, to Solaris on X86. CD Studio allows users to produce CD-ROM disks on their UNIX workstations. It consists of the MakeDisc premaster software, an intelligent controller and a CD-recordable unit. It is compliant with such disk formats as ISO 9660 and ISO 9660/Rock Ridge.

CD Studio is available on 22 different UNIX platforms, including Sun, Hewlett-Packard Co. and the IBM Corp. RISC System/6000. The price is $18,250.

Young Minds Inc.
P.O. Box 8130
Redlands, CA 92375
Circle 135

Correction

StorNet Inc. was inadvertently omitted from our April 1994 RAID Buyers Guide. StorNet's products range from its Model SNR-1600-3 with 2.65 GB of storage to its Model SNR-3500-5 with 11.62 GB. RAID Level 0 with 475 I/O-per-second performance, RAID Level 3 with 195 I/O-per-second performance and RAID Level 5 with 625 I/O-per-second performance are all supported. StorNet can be reached at (215) 692-8400.

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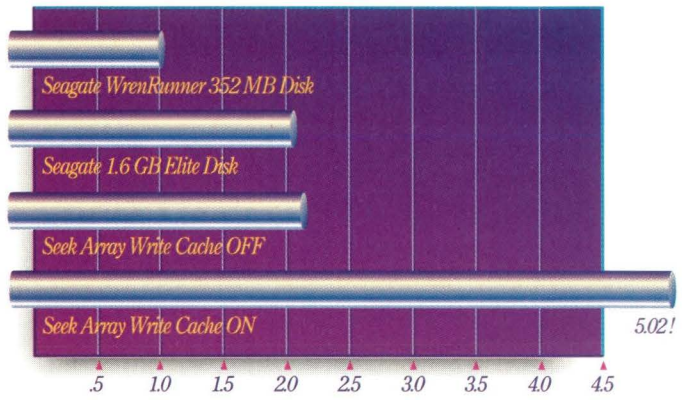

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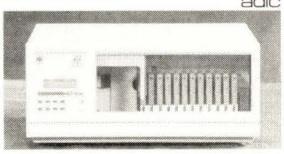

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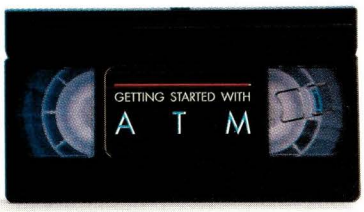

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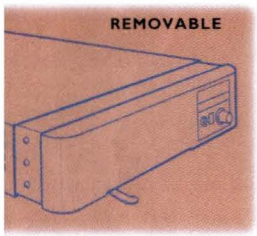

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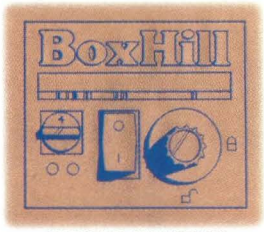

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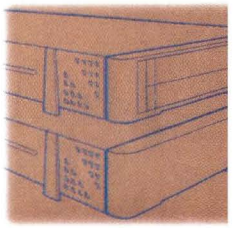

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