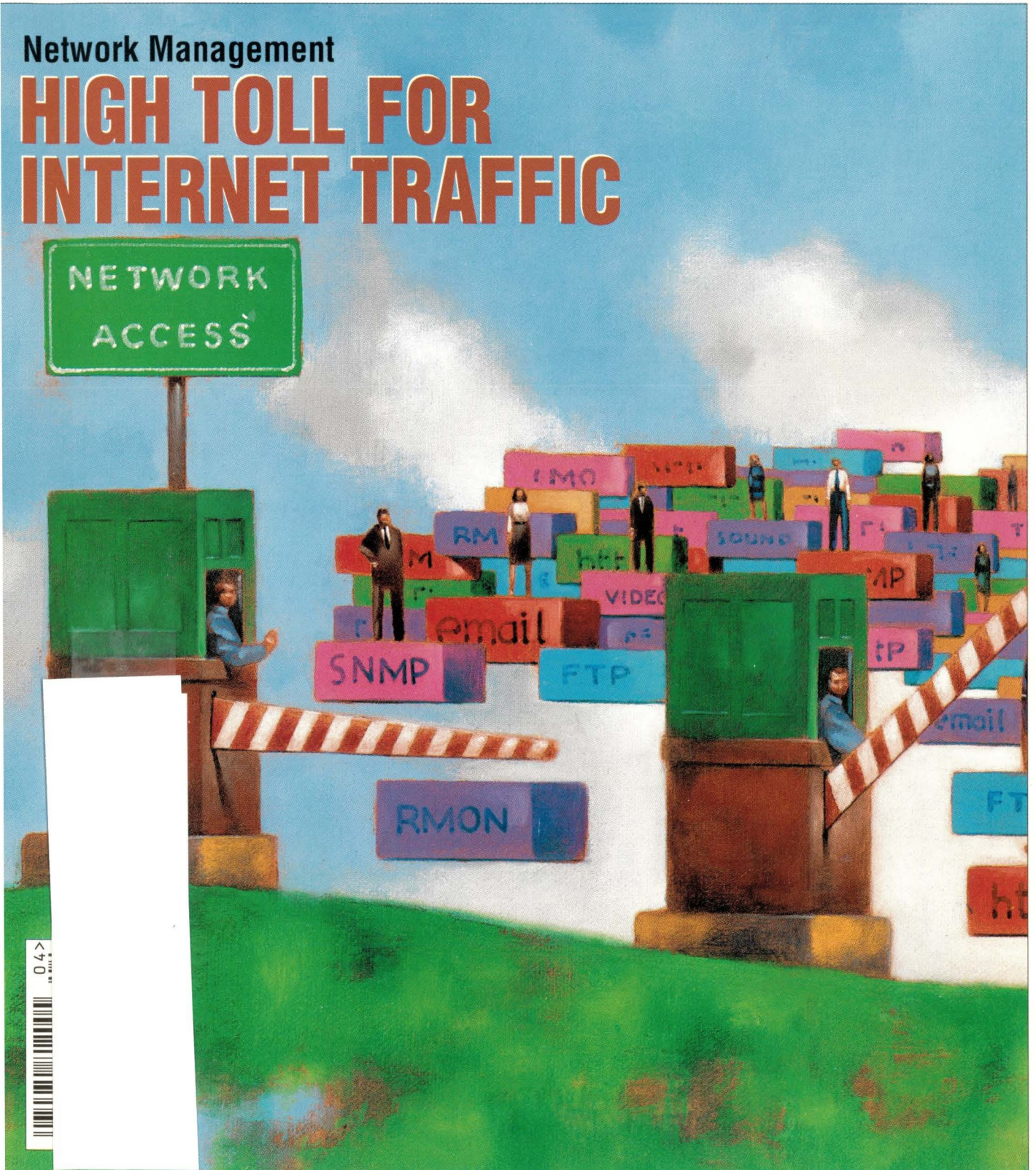


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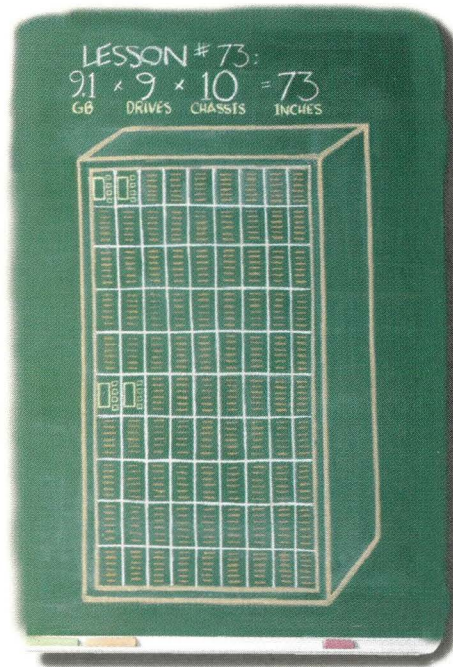
Network Management

HIGH TOLL FOR INTERNET TRAFFIC



News: Sun Chases Storage Market

Artecon's New RAID Math



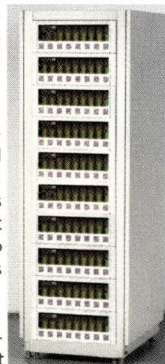
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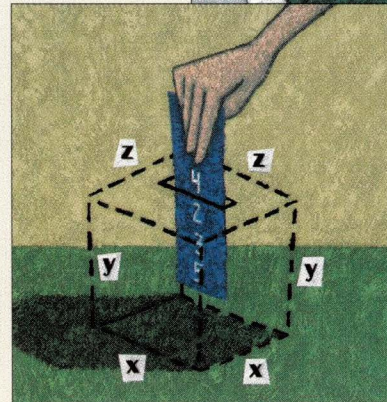
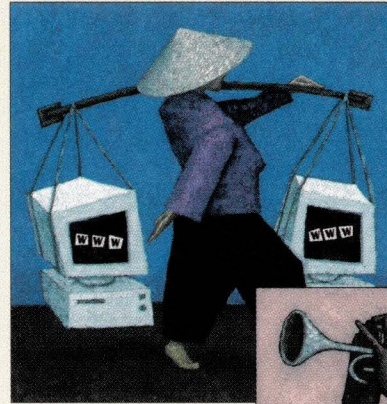
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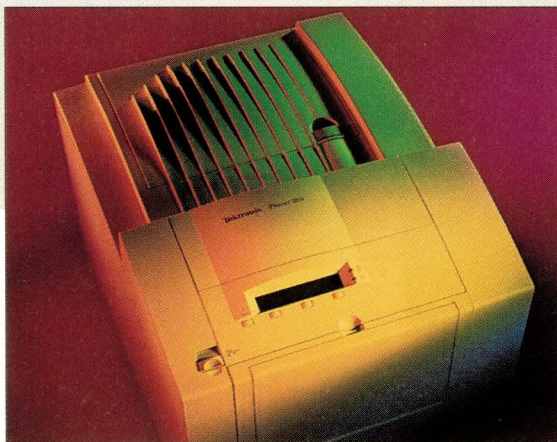
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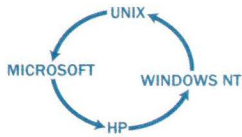
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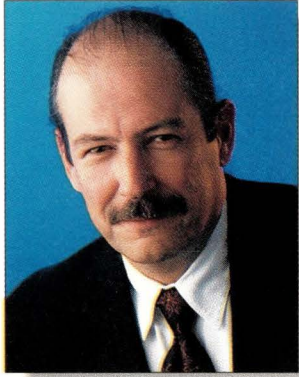
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EDITORIAL

dpryor@cpg.com



The Internet Burden

It's all well and good to talk about how the Web has changed the role of the corporate network—from e-commerce to intranets, from extranets to Java applets scurrying everywhere, and on and on. But did you ever wonder what effect all this HTTP stuff has had on the network managers who have to man or woman the battlements? That's the topic of this month's cover story by Staff Editor Alexandra Barrett. She discovers that the ground has literally shifted beneath the feet of these network warriors.

"For network managers, the day businesses opened up their networks to Internet traffic marked a new era," says Alex. "One day, the network was a self-contained circuit running database applications and toting around print jobs. The next day, the network was sagging under the load of email saddled with Microsoft Corp. PowerPoint attachments and real-time stock tickers." Add to this explosion in demand on the infrastructure the hue and cry for speed, uptime and distributed applications, and you have a totally new job description for many network managers. Alex points out that while the rest of the world was getting positively tipsy on the possibilities of the Information Age, network managers were stuck with the sobering fact that existing network management tools and techniques were inadequate or inappropriate for the job.

Her story of overtaxed networks and the people who run them offers some hope. She talks to a few managers who have balanced the need for Internet access with local-area network requirements, but Alex explains that many businesses are knee-deep in figuring out how to provide users and customers with Internet connectivity without sinking existing networks in the process.

I know this isn't a very sound segue, but at the mention of the word "sinking," I can't help but think about Java. I'm beginning to get a sense of *deja vu*. The fracturing and litigating is reminiscent of the splintering of UNIX. I would like to hear your view on how all the machinations will influence your Java plans. Send your impressions or reflections to editors@cpg.com. Thanks.

Doug Pryor

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Sun Chases Storage Market

The gauntlet has been thrown down; now let the battle commence. Sun Microsystems Inc. wants to be a major player in the storage game and intends to fight it out with the biggest in the business. Early this year, the company outlined its plan to take on the likes of EMC Corp., Hopkinton, MA, and IBM Corp. when it announced products resulting from the acquisition of technology from Ft. Lauderdale, FL-based Encore Computer Corp. last year.

At the core of the storage plan is the Intelligent Storage Network architecture, designed to enable customers to build heterogeneous storage systems with interchangeable building blocks made of hardware and software components. Sun believes its approach is a viable alternative to large centralized storage systems like the ones EMC offers. The different components would operate in an extensive network that connects storage subsystems, servers and application software. The idea is to give customers a flexible system that can grow as storage demands change.

StorEdge A7000, one of a new line of intelligent storage servers, is the first formal introduction of a product born out of the Encore deal. Built with two UNIX symmetrical multiprocessing (SMP) computers, it runs its own operating system, which allows the A7000 to "speak" mainframe and open systems I/O. Built-in software allows the A7000 to act like a disk drive from any type of host or any type of drive. Through a standard SCSI interface or a standard Block MUX and/or ESCON channel interface, the software creates a virtual disk drive. This is said to allow the A7000 to act like a drive to either a mainframe or an open systems machine.

Sun stresses that this is accomplished through software and not hardware. "It is important to realize that it is software technology," says Tim Reid, sales manager at Sun. "It's not some hardware/firmware controller gizmo."

The creation of the "virtual disk drive" also enables the running of DataShare—an application included with the A7000. DataShare is designed to be used with multiple platforms simultane-

ously and allows users to easily back up open systems data, Sun says. The benefit is that there is no need for code to be written for each system platform.

Other features resulting from Encore are phone home and remote diagnostics. With phone home, if an anomaly is detected with the system, the A7000 will place a call into Sun support, and a service representative will determine if a

person or parts need to be sent out. Remote diagnostics that monitor the health of the storage facility actually run on the storage control. Right now, phone home and remote diagnostics are only available in StorEdge A7000, but Sun plans to offer them across the entire product line over time.

The new storage systems support Solaris, HP-UX, AIX, S/390 mainframes and NT systems, offering RAID levels 1, 0+1 and 5. StorEdge A7000 supports up to 32 SCSI, Block MUX and/or ESCON host connections, with Fibre Channel connectivity slated for future versions. With an optional expansion box, the A7000 has a 2.9-TB capacity. In addition, up to 4 GB of mirrored, nonvolatile cache is offered. Pricing for the StorEdge A7000 starts at \$286,000.

Sun is positioning the A7000 squarely against EMC's Symmetrix 5700 and hopes to gain a strong foothold in a market Sun believes will exceed \$35 billion by the year 2001. Analysts agree that this approach could be successful. "On paper, they're doing all the right things," says David Vellante, senior vice president with market research firm International Data Corp., Framingham, MA. "But the delta between paper and actually making it happen is still pretty big."

Some of the additional plans on paper include expanding the StorEdge product line. Watch for the launch of the A1000 workgroup array in second-quarter 1998. StorEdge A1000 will be targeted at file

and workgroup server environments (pricing has not been set). Also, Sun has renamed the RSM Array 200 subsystem, calling it now the StorEdge A3000 array. At press time, the A3000 was priced at \$89,000 and was available only for Solaris, but Sun plans to add HP-UX and Windows NT support sometime in 1998. Also available is the StorEdge A5000 Fibre Channel array,

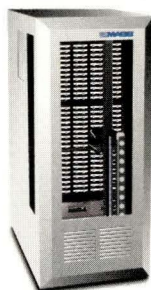


Sun's StorEdge A7000, the first in a new line of intelligent storage servers, uses built-in software to create a 'virtual disk drive' to either mainframe or open systems machines.



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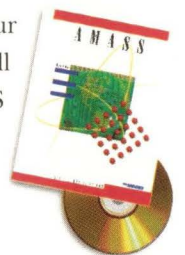


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Circle No. 5

designed for data warehouse applications that require high bandwidth. It is priced at \$35,000 and is only available on Solaris at this time.

The entire StorEdge family will benefit from the software available on the A7000. "What has impressed me is the strategy to take the A7000 software and use it on the A5000, A3000 and A1000 line," says Tom Lahive, senior analyst with Dataquest Inc., San Jose, CA. "As of January 1998, they still have some holes in the line, but January 1999 is a different story."

To compete in the storage market, Sun is beefing up its direct and indirect sales channels for the StorEdge product line. The expanded sales force, dedicated solely to selling storage, will target accounts running heterogeneous servers, reaching out to new business beyond customers already operating in Sun environments. In addition, Sun will offer consulting and integration services, education courseware and on-site support, as well as building a new manufacturing facility. Analysts have indicated there are still some issues with updating the Encore technology. "I continue to hear some feature and design problems with the present product

line," says Dataquest's Lahive. "They need some help."

IDC's Vellante adds, "Encore needs a lot of hand-holding, but clearly Sun is a company that is capable of getting it right."

Time will tell if Sun will be recognized as a storage vendor on the order of EMC. EMC officials expect the time factor to pay off for them: "Our focus on storage and storage technology helps bring those products to the market a lot faster," says Doug Fierro, manager of product marketing at EMC. "EMC has a two-year lead on Sun when you take a look at hardware and software technology."—*ptc*

A Giant Step for COM

Microsoft Corp.'s Component Object Model (COM) architecture for object-oriented programming is scoring points against rival Common Object Request Broker Architecture (CORBA), the object architecture used by most UNIX and other nondesktop developers. Recently, two traditional CORBA software developers have announced plans

to support COM, and Microsoft has laid out its plans to develop and support COM for UNIX platforms.

Kicking off the COM announcements, Iona Technologies Inc., Cambridge, MA, a maker of CORBA tools, says it will license COM from Microsoft to use in its OrbixCOMet middleware line of products, which will support both Windows NT and Solaris platforms. The first product in the series, OrbixCOMet Desktop, went into beta in February and will be available in the second quarter of 1998 for \$495 per seat. OrbixCOMet Desktop acts as a communication bridge between COM clients and CORBA servers.

The announcement signals the end of Iona's ardent pro-CORBA, anti-COM stance. For Iona and other software developers, it also signals the likely beginning of an increased emphasis on COM/CORBA interoperability.

"We're talking about a religious CORBA supporter here," says Ron Rappaport, analyst with Inter/intranet research firm Zona Research, Redwood City, CA. Rappaport says Iona had to offer COM simply because customers were demanding it. Iona "took the hint" from customers that object integration is

Sun Unveils Low-End Servers

Following on the heels of Sun Microsystems Inc.'s January introduction of its Ultra PCI-based family of low-cost workstations, Sun recently unveiled two new entry-level, PCI-based Ultra servers.

The Sun Enterprise Ultra 5S and Enterprise Ultra 10S models are aimed at small business and departmental applications such as Web servers, groupware and network services.

The Ultra 5S, starting at \$3,795, features a 270-MHz UltraSPARC-IIi 64-bit RISC processor, 256 KB of external cache, up to 512 MB of memory, a 4.2-GB internal disk drive, a 1.44-MB floppy drive and three PCI I/O slots.

The Ultra 10S, starting at \$5,995, has a 300-MHz UltraSPARC-IIi 64-bit RISC processor, 512 KB of external cache, up to 1 GB of memory, an 8.4-GB internal disk drive and four PCI slots.

The servers, which build on Sun's Ultra 5 and Ultra 10 workstations, join the Enterprise 450, the only other Sun

workgroup server to support PCI.

"I'm encouraged to see that they're expanding their workgroup server line," says Jerry Sheridan, director and principal analyst with Dataquest Inc., San Jose, CA. "And the pricing on these—under \$4,000 for the 5S and under \$6,000 for the 10S—is certainly attractive."

The fact that the servers are based on the PCI I/O bus specification, rather than on Sun's traditional SBus, is a good sign for IS managers who want to integrate Sun and Windows NT products, says Sheridan. "This gives them the capability to network in an NT environment."

The challenge for Sun now, however, will be to convince PCI peripheral makers to develop Solaris drivers for their products, according to Tony Iams, research analyst for D.H. Brown, Port Chester, NY.

Both servers come with Sun's Solaris for Intranets software and Solaris Web Start, a tool that lets network administrators install software applications on a server from any client with a Java-enabled browser.—*sjh*

The Sun Enterprise Ultra 10S PCI-based server is aimed at small business and departmental applications.



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a necessity, he says.

Iona's marketing manager, Colin Newman, confirms that feedback from customers was a key motivator for embracing COM: "Customers aren't into religious wars," says Newman. "They want interoperability."

NetDynamics Inc., Menlo Park, CA, another CORBA devotee, also recently revealed that it will work with Microsoft to integrate its NetDynamics 4.0 application server with COM.

Siby Nidhiri, senior architect for Inventa Corp., a systems integrator based in Santa Clara, CA, says a large number of his customers don't want to have to choose between COM and CORBA, but, instead, want both technologies to interoperate. "We see a lot of customers with multiple systems—such as PeopleSoft [Inc.] human resources software running on Windows NT, and Oracle [Corp.] financial systems running on UNIX. There's a big demand for integrating these systems."

But while IS managers find bridging the gap between COM and CORBA to be an attractive option for now, they will soon have to choose between the two, predicts Eric Brown, senior analyst for Forrester Research, a high-tech consulting firm based in Cambridge, MA. "There will continue

to be bridging, but it makes more business sense to simplify your computing structure around COM or CORBA," Brown says.

In a recent report, Brown notes that while 44% of IS managers surveyed today have no specific object strategy, only 4% expect to be without one two years from now. However, he says neither object model will win out. "I don't think either COM or CORBA will emerge as dominant. Instead, there will continue to be competition."

To help customers decide on COM, rather than CORBA, Microsoft is also focusing more heavily on COM for UNIX.

To help customers decide on COM, rather than CORBA, Microsoft is also focusing more heavily on COM for UNIX. At the same time as the Iona announcement, Microsoft unveiled plans to do in-house testing and development of COM for UNIX platforms. Software AG of Darmstadt, Germany, which had previously been entrusted by Microsoft to port COM to various UNIX platforms, including Solaris, will continue to do so. But now Microsoft will conduct its own testing, as well as license COM out to other companies who want to port it to their platforms. Earlier this year, for instance, Digital Equipment Corp. and Silicon Graphics Inc. reported that they were going to license COM for their respective UNIX

platforms, Digital UNIX and IRIX. Hewlett-Packard Co. is also working with Microsoft to port COM to its UNIX platform, HP-UX, according to a Microsoft spokesman.

All of this COM-on-UNIX activity is necessary if Microsoft wants COM and, by extension, Windows NT, to gain a foothold in back-office, business computing environments where midrange systems have been the traditional choice. "Everything Microsoft does is to make it easier for people to migrate to Microsoft products," observes Forrester Research's Brown. Making COM work in both desktop and midrange environments makes IS managers more willing to invest in Windows NT for some of their computing needs, even though they may have UNIX systems in the back office. "People have anxiety about using the Microsoft platform and not being able to connect to existing UNIX systems. This gives people the idea there's an escape hatch," Brown says.

What's the real upshot of all the COM-on-UNIX and COM/CORBA activity? More options for corporate software developers, according to Zona's Rappaport. "It's a steady demolition of what could have been the Berlin Wall of application development," he says. Or, as a recent Zona report has dubbed the trend toward interoperability: "One small step for COM, one giant leap for application development."—*sjh*

Tuned for Sun

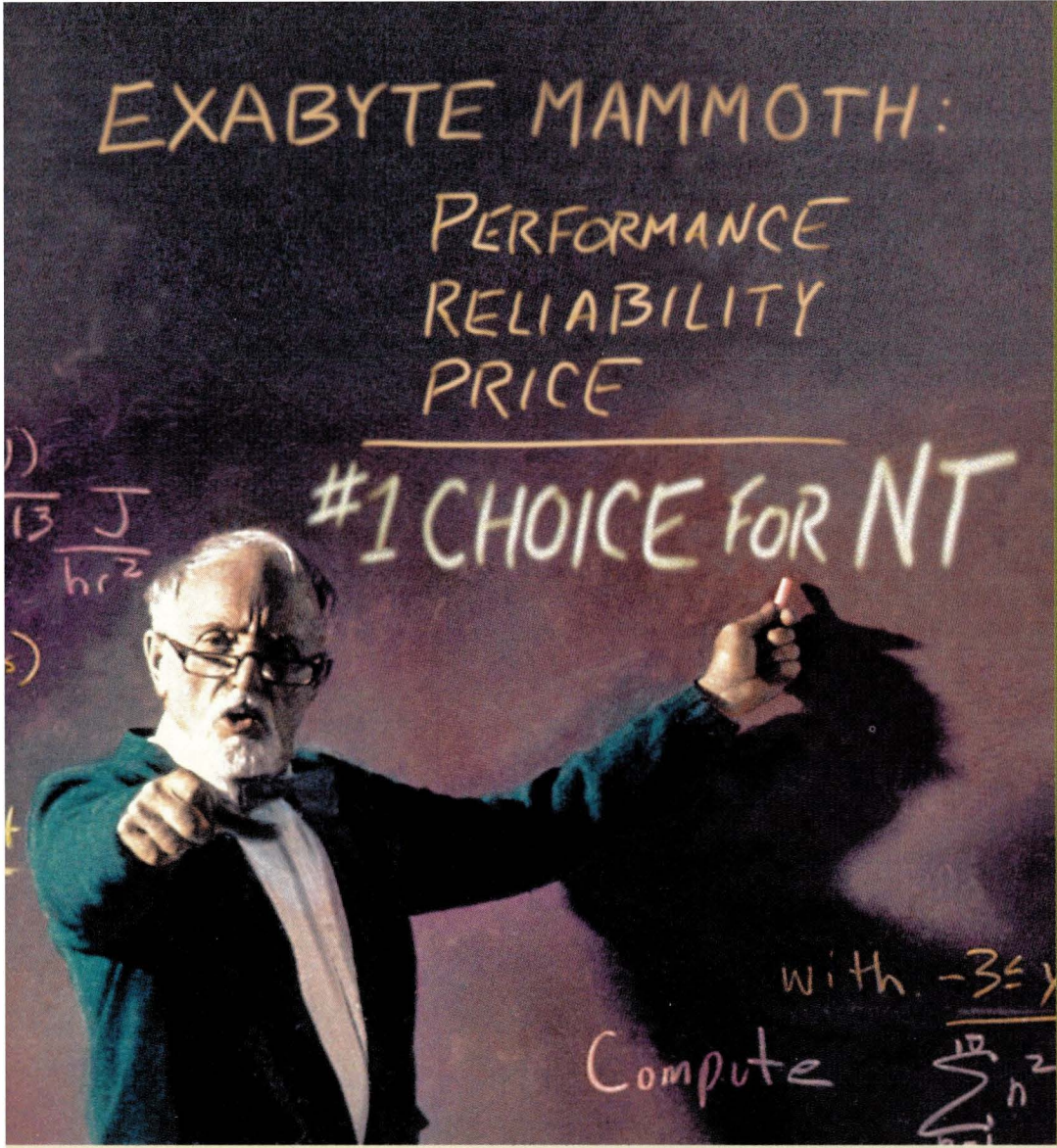
RealNetworks Inc., Seattle, WA, and Sun Microsystems Inc. announced in January an agreement to work together in tuning RealSystems, a suite of streaming media products, for Sun's Ultra desktop and Enterprise server. In addition, the two companies will work jointly in marketing campaigns for their products as well as develop a Java-based version of RealPlayer.

With Sun's support, RealNetworks will optimize RealSystems 5.0 for Sun's Solaris 2.6 operating system and port RealEncoder, which offers video management capabilities, and RealPlayer, which plays back video and audio data streams, to Solaris. "We will be able to deliver to our customers an industrial-strength, highly scalable [and] high-capacity solution for industry-leading audio and video to the Internet," says Mark Tolliver, vice president of market development at Sun. "We

chose RealNetworks because of their clear leadership. In this area, we think it's important to work with the leader—volume is critical."

Currently, RealSystems does run on Sun SPARC systems, but the hope is performance can be improved on Solaris-based servers, meaning an increase in speed and the number of concurrent streams. "Based on early indications, we're going to have very significant performance improvements in scalability, on the order of 50%," says Rob Glaser, chairman and chief executive officer of RealNetworks.

The two companies also plan to jointly develop a version of RealPlayer based on Java. The goal is to offer cross-platform access to video and audio over the Internet without having to download a plug-in. The Java version of RealPlayer is scheduled to be available by the end of 1998.—*ptc*



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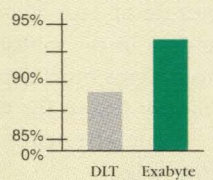
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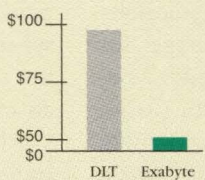
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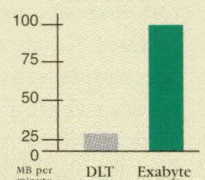
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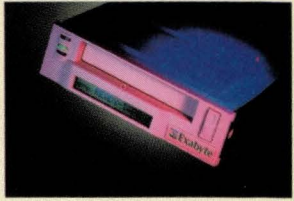
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Sun Targets Telecom Market with CompactPCI

Sun Microsystems Inc. is further expanding its menu of PCI-based products with a series of new ruggedized embedded processor boards.

In February, Sun unveiled two CompactPCI processor boards aimed at telecommunications, networking and industrial applications. The SPARC-engine CP 1200 and CP 1500 boards are the first of a family of CompactPCI products that Sun plans to roll out over the next few months.

The new boards can be used in PBX and ATM switching systems, high-capacity storage controllers, industrial automation and medical imaging, according to

6-inch board or a 6U, 6- by 12-inch board) popularized by the VME bus widely used in industrial and manufacturing systems. CompactPCI boards are able to take advantage of the many hardware and software products designed to work with the PCI specification. The boards typically come with eight slots, compared with four on a PCI board, and have a pin-and-socket connector that provides better resistance against shock and vibration than the card-edge connector of standard PCI boards.

The move into the CompactPCI market is a good one for Sun, experts say. "The technology is only a couple of years old, but it's beginning to pick up...I think it will be explosive," says Dick Somes, vice president and technical director for PCI Industrial Computer Manufacturers Group (PICMG), the

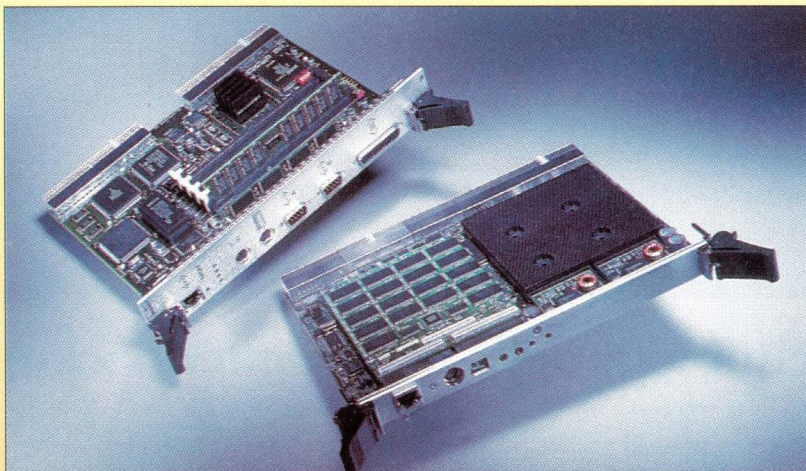
lion. "The CompactPCI marketplace is often referred to as the zero billion-dollar market, because everyone's evaluating it, but nobody's paying anything yet."

Even so, says Krasner, Sun has made a smart choice to get into the market. "They had to offer CompactPCI if they wanted to get into the telecom industry," he says, noting that the release of these boards makes Sun one of only four major players in the CompactPCI marketplace, alongside Force Computer Inc., San Jose, CA, Motorola Inc., Schaumburg, IL, and Ziotech Corp., San Luis Obispo, CA

The CP 1200 board has a 100-MHz microSPARC-IIep processor and comes with 1 MB of Openboot PROM flash memory (expandable to 8 MB), a 32-bit PCI bus, two serial RS-232 ports, one bidirectional parallel port and support for PCI 10/100-Mb/s Ethernet, 10Base-T or 100BaseTx. It will be available in May or June.

Its big brother, the CP 1500, uses a 270-MHz UltraSPARC Iii CPU with 256 KB of L2 cache, and comes with 64 MB of RAM, 1 MB of Openboot PROM and 8 MB of user flash PROM, as well as two 10/100 Ethernet channels, two RS-232 serial ports and one parallel port. To accommodate legacy systems with proprietary backplanes, the CP 1500 can be mounted as a daughterboard onto a transition board to fit onto the existing backplane.

The new boards are also part of Sun's overall strategy to be a one-stop-shop supplier of networking solutions: "It's a targeted piece of the Webtone umbrella," according to Sun's Veis. "Webtone" is Sun's catchword for its vision of an omnipresent, Web-based network of the future that connects all sorts of network devices—PDAs, kiosks, telephones and NCs—everywhere around the world.—*sjh*



Aimed at the telecom industry, Sun's SPARCengine CP 1200 and CP 1500 CompactPCI processor boards are designed to take advantage of the many products on the market that work with the PCI spec.

Jeff Veis, group marketing manager for the platform products group at Sun Microelectronics Inc., a division of Sun. Sun plans to sell the boards to other systems manufacturers and telecommunications companies with price tags of \$1,500 or under, depending on volume, for the 100-MHz CP 1200 and \$7,000 or under for the 270-MHz CP 1500.

CompactPCI, a specification for PCI-based industrial computers, is a superset of the desktop peripheral component interconnect (PCI) bus standard. CompactPCI uses the Euro-card form factor (either a 3U, 4- by

organization of CompactPCI manufacturers who are hammering out CompactPCI standards.

The market for CompactPCI products is estimated to reach \$1 billion by the year 2001, according to Electronic Trend Publications, a market research firm based in San Jose, CA. That forecast, however, may be overly optimistic.

Jerry Krasner, group manager for telecommunications and embedded systems at Venture Development Corp., Natick, MA, a management consulting firm for the high-tech industry, says a more conservative estimate is \$246 mil-

Sun Under Siege?

Second-quarter earnings reports may paint a pretty picture of Sun Microsystems Inc.'s standing in the industry, but news from Sun's competitors depict an increasingly murky future for this UNIX stalwart, especially when it comes to workstation sales.

Indeed, Sun's total sales for the sec-

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Circle No. 8

ond quarter came in at a record-breaking \$2.450 billion, up 18% over the corresponding quarter in fiscal 1997, Sun reported in January. Net income stood at \$223.2 million for the second quarter, up 25% from 1997, excluding onetime charges related to acquisitions.

However, a recently published report by International Data Corp. detailing the state of the 1997 workstation market casts a shadow on this sunny scene. While the Framingham, MA-based research firm's report confirms Sun's continued dominance in the pure UNIX workstation market, showing shipments of 285,815 units compared with Hewlett-Packard Co.'s 108,165, it also indicates that, in terms of total workstation sales—"traditional" workstations based on UNIX, as well as Windows NT-based "personal workstations"—Sun has lost its coveted first-place position, trailing HP by 11%.

When it comes to workstation sales, Sun seems to be getting hit from all sides. At the one end, you have Sun's traditional competitors for the UNIX workstation market—HP, Digital Equipment Corp. and IBM Corp.—who have all jumped the UNIX-exclusive ship in favor of selling workstations based on Windows NT.

Sun is also feeling the heat from vendors who originally made names for themselves selling Intel Corp. chip-based PCs, for example, Compaq Computer Corp. Following an announcement that it had shipped its 100,000th Windows NT machine, in February Compaq announced a new line of 333-MHz Pentium II-based systems, the 5100 and 6000 lines, starting at \$2,999. To make matters more competitive, Compaq's 266-MHz systems now cost \$1,999.

For its part, Sun has launched a full-scale attack on the lower-end workstation market, with its so-called Darwin line of Ultra 5s and 10s. Based on PCI

bus architecture, the Ultra features a sub-\$3,000 price point, which brings it well within the reach of consumers otherwise considering a high-end NT box. Backing up the campaign is the ever-derisive Sun chief executive officer, Scott McNealy, who scoffs at the very notion of a Wintel-based "workstation."

However, IDC's forecast for the workstation market as a whole calls into question whether the low-priced Darwin line stands a chance in the face of Windows NT-based systems. According to Laura Segervall, manager of workstation research at IDC, Mountain View, CA, unit sales of traditional UNIX workstations stand to decrease from 660,000 units in 1997 to 590,000 in 2002.

In contrast, the personal workstation market stands to grow from shipments of 1,290,000 units in 1997 to 4,800,000 in 2002.

Growth in the personal workstation market stems in part from areas where we've traditionally seen UNIX workstations, says Segervall, for instance, in

the CAD market, as well as in financial institutions. However, the phenomenal growth expected of personal workstations will come from markets that UNIX has never penetrated, she adds, citing the low-end CAD market, for example. "There is definitely a PC upsizing trend."

But if Sun's traditional workstation market is eroding, it's also true that another one of its markets is just getting off the ground. According to another IDC report, this time on the state of the high-end server market, high-end UNIX servers stand to show a compound annual growth rate of 18% until 2001, even as the overall market declines slightly. And just who are the vendors poised to take advantage of this demand, you ask? "Sun's Ultra Enterprise 10000 and IBM's large SP configurations are fueling this segment of the market," says Steve Josselyn, research director of IDC's

commercial systems and servers program. Introduced only last year, Sun's Ultra Enterprise line has managed to land Sun status as a premier high-end server vendor—a position that analysts doubt the NT camp capable of holding anytime soon.—*ab*

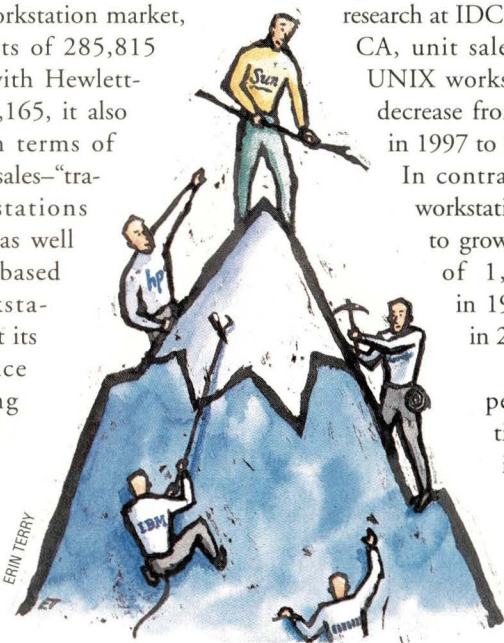
CORBA Gets QA'd

CORBA, or the Common Object Request Broker Architecture, is used widely by developers building applications for distributed heterogeneous environments. Shepherded by the Object Management Group (OMG), Framingham, MA, part of CORBA's appeal is that Object Request Brokers (ORBs) available from several vendors should, in theory, work together.

In reality, CORBA developers tend to stick to a single ORB vendor, to avoid vendor incompatibilities. To that effect, The Open Group, Cambridge, MA, has entered into an agreement with the OMG to assist vendors in certifying that their ORBs are compliant with the CORBA 2.1 specification, as defined by the OMG, and tested against a consistent set of tools. "Until now, vendors have been able to ship out whatever they want and call it 'CORBA-like,'" says John Morris, a project manager at The Open Group.

Part of The Open Group's CORBA branding project consists of a test suite called VSOrb. Made generally available in January, VSOrb has already been licensed by several key CORBA vendors, says Morris, including Sun Microsystems Inc., IBM Corp., Iona Technologies Inc., ICL Inc., Fujitsu Ltd. and Visigenic Software Inc. While Morris cannot predict which vendors' ORBs will achieve CORBA 2.1-compliant status, or when, he does expect to launch the CORBA brand, as it were, in the second half of this year.

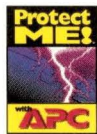
In other CORBA news, developers working with Iona's Orbix ORB can now test the server logic of CORBA components. The new testing tool, called AcquaNavio, was introduced by CenterLine Software Inc., at February's Software Development 98 conference in San Francisco, CA. The Cambridge,



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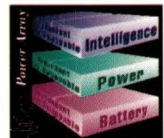
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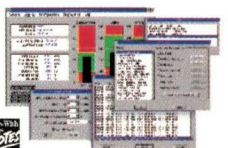
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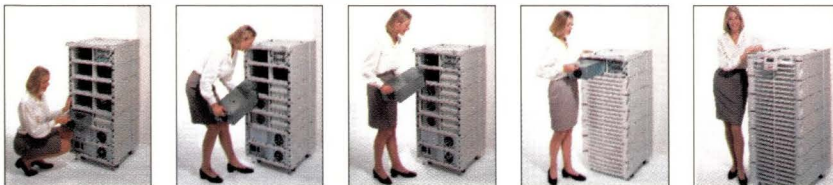
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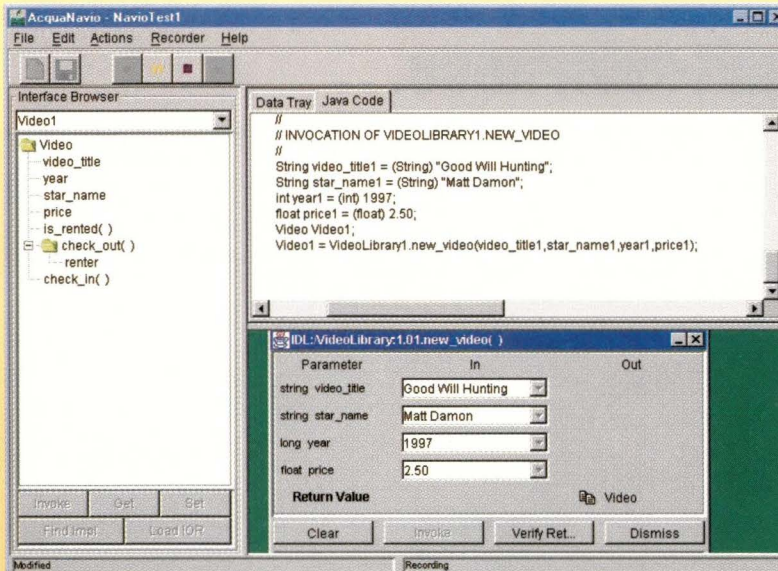
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AcquaNavio, from CenterLine Software, is the first testing tool of its kind. Using CORBA's IDL, it can expose any methods and arguments used in a given component.

MA-based company is a longtime vendor of software development and testing tools, including its Application Delivery Management System (ADMS).

According to Michael Barnes, analyst with the Hurwitz Group, Framingham, MA, CenterLine's AcquaNavio is the first tool of its kind and bodes well for the future of CORBA. "It's a chicken-and-egg thing, but the fact that there are so few CORBA tools out there definitely limits the number of large-scale—and by that I mean mission-critical—CORBA implementations out there," Barnes says.

CenterLine is quick to point out that AcquaNavio is not your standard GUI testing tool that gets used only once the components have been assembled. Instead, thanks to CORBA's Interface Definition Language (IDL) interface repository, AcquaNavio can expose any methods and arguments used within a given component. From there, it reportedly generates a Java-based test script, to which the developer simply passes any necessary arguments. The benefits of this approach, CenterLine claims, are that

tests are not limited to the capabilities exposed through the GUI, and that test scripts need not be rewritten as server functionality changes.

Developers in the business of creating component-based system software have been receptive to the idea of AcquaNavio. "There definitely aren't enough tools on the market for testing objects. Most tools stop at testing the GUI," says Nancy Jacobson, product quality team leader for Cincom Systems Inc., a Cincinnati, OH-based developer of low-level system software. "The direction they've [CenterLine] taken with AcquaNavio is very good."

AcquaNavio is CORBA 2.0-compliant. Prerequisite software includes Sun's Java Developer's Kit (JDK)

1.1 and the OrbixWeb Developer's License 3.0. Implemented in Java, AcquaNavio is supported on Solaris 2.5 and 32-bit Windows platforms, pending Java certification. Pricing is set at \$2,995 per user, plus a \$525 support fee. Evaluation copies are available from CenterLine's Web site, <http://www.centerline.com>.—ab

Thanks to CORBA's Interface Definition Language (IDL), AcquaNavio can expose any methods and arguments used within a given component.

New Rack-Drawer RS/6000

A few changes have been made to IBM Corp.'s family of UNIX servers. In February, Big Blue introduced the RS/6000 H50 and revved up the processor speed for the F50. The announcement, IBM says, underscores its commitment in servicing the small to medium-size businesses, especially in offering Internet-related business products at a competitive price.

The H50 is actually a rack-drawer version of the F50. This new model is suited to run High Availability Cluster Multiprocessing (HACMP) clustering software and is ideal for running data mart applications and being used as a departmental or Web server, IBM says. The F50, which was introduced in April 1997, received an upgrade in processor speed from 166 to 332 MHz. "The direction they're taking is positive," says Jerry Sheridan, director and principal analyst with Dataquest Inc., San Jose, CA. "It's kind of a fleshing out of the [RS/6000 product] family."

Until now, IBM didn't have a rack-drawer SMP machine. The H50 addresses that gap in the company's product offering. "[IBM] really needed this H50 product. It clearly filled a void," says Henry Wachtel, executive vice president at D.H. Brown, a research firm based in Port Chester, NY. "As far as the F50, it's a crank-up of the microprocessor that's giving them a better price/performance, which was really what they were needing."

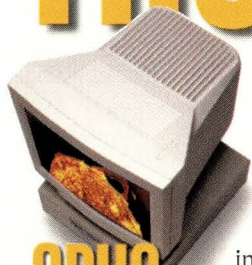
The original F50, with a 166-MHz processor, is now offered at \$19,900, a 20% price reduction, and the new 332-MHz processor version is priced at \$23,900. The H50 is priced at \$26,900. IBM believes the price is right for the small to mid-size customer. "They are very price-sensitive," says Michael Coleman, general manager of small and medium business solutions at IBM. "Every dollar must go farther."

Analysts agree that IBM has set an appropriate price point for the machines and the customers it's targeting. "It can and does satisfy the cost requirements for end users," Dataquest's Sheridan says.

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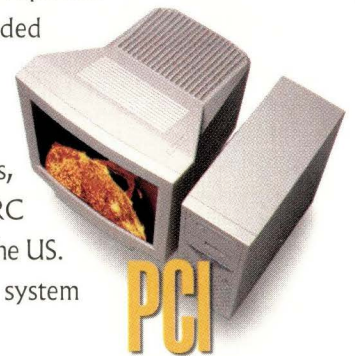
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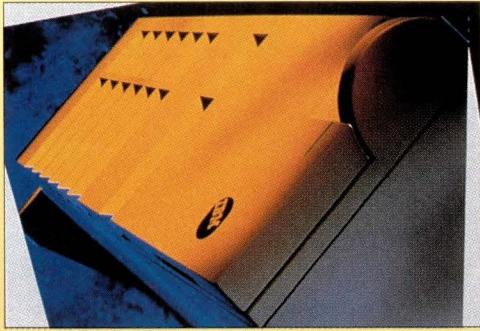


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18GDA



IBM has introduced the RS/6000 H50 server, a rack-drawer version of the F50 (above), for running data mart applications and HACMP clustering software.

This point is echoed by John Mader, MIS director with Marietta Industrial Enterprise, a Marietta, OH-based company with several divisions including one for recycling, warehousing and managing barge terminals. Mader was in the market for a server to act as a combination centralized application and database server that would support about 32 users on a daily basis. He decided on the F50 with dual 166-MHz processors. "When they came out with this box, they really

got more in line with some of the other competition," says Mader. "The price/performance point of the F50 was probably 50% of the decision."

Other features offered with the H50 include nine I/O slots, 16 disk/media bays and 12 hot-swappable disk bays. IBM recommends the S00 19-inch rack enclosure for housing. It comes with nine PCI slots, three I/O buses and a 20X CD-ROM drive. The F50 comes with either a 166-MHz or 332-MHz processor, nine I/O slots and 22 disk/ media bays.—*ptc*

Web Site Names for Sale

Setting up shop on the Internet often starts out in disappointment. One of the many setbacks Webmaster wannabees experience is the realization that not only is their first-choice

domain name already taken, but so are their fifth, sixth and seventh choices.

For some, relief may be coming in the form of seven new generic Top-Level Domains, or gTLDs. gTLDs such as .info, .web, .firm and .shop should step in to alleviate the burden borne by the overtaxed .com gTLD. Some registrars have already begun preregistering names in these domains, which will be submitted when the system is turned on (originally scheduled for March, but put on hold, according to the Internet Council of Registrars [CORE]).

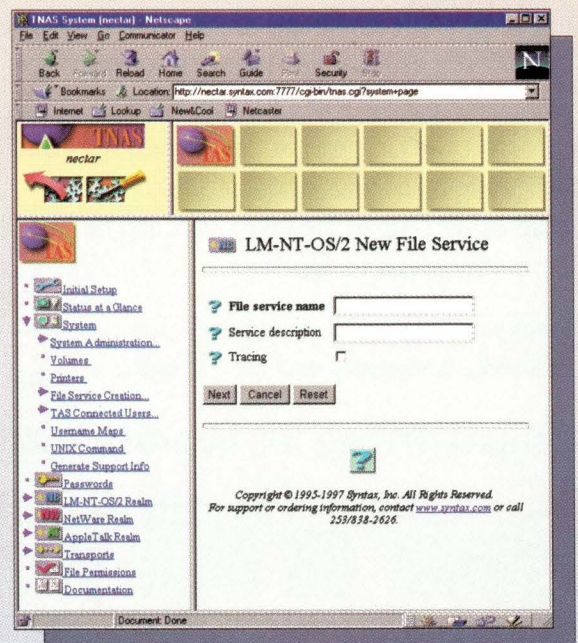
For many aspiring Web entrepreneurs, though, the cachet of the .com domain is simply too strong to ignore. Established as the only domain available to commercial interests, .com is the de facto gTLD on the Internet and will probably remain the gTLD of choice for some time to come. Some people, like Craig Landy, director of website-names.com, an online trader's forum for buying and selling domain names, think that the new gTLDs might actually bring more prestige to .com, "because everyone already has .com ingrained in their head."

TAS Ships with AIX

As the result of a licensing agreement between Syntax Inc. and IBM Corp., TotalNET Advanced Server (TAS) is now shipping with the AIX operating system. The integration of TAS with AIX furthers Syntax's attempts to bundle its connectivity software on a variety of UNIX platforms. "We have had a successful relationship with Sun Microsystems with the bundling of our product with [Solaris] 2.6," says Jack Smith, executive vice president of North American sales at Syntax. "And we're replicating that with as many of the other UNIX vendors as we can to get total coverage of the UNIX marketplace."

At Baltimore, MD-based Gilmore School, a private boys school for grades K through 12, TAS is used on two RS/6000 servers, the 550 and 43P. The school has an enrollment of approximately 1,000 students, and the network administrator, Bill Kearney, needed a file server that was a scripting environment and had quotas. "With TAS, we get everything altogether in one," he says. "I have a lot of faith in how the TAS product evolved."

IBM joins Sun and Silicon Graphics Inc. as vendors bundling TAS. The integration of TAS with the operating systems enable the UNIX servers to operate as PC-LAN file, print and application servers. Desktop clients can access the application server through various protocols and networking services for Microsoft Corp. Windows 3.11, 95 and NT, as well as IBM OS/2, Novell Inc. NetWare and Apple Computer Inc. Mac OS.—*ptc*



TAS, Syntax's connectivity software, is now bundled with IBM's AIX operating system.

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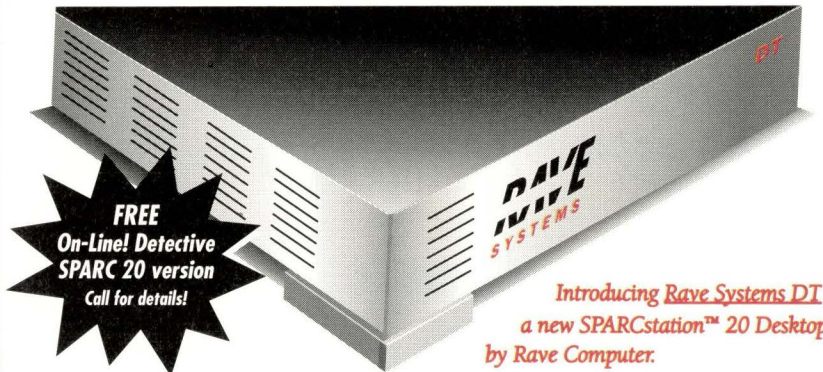
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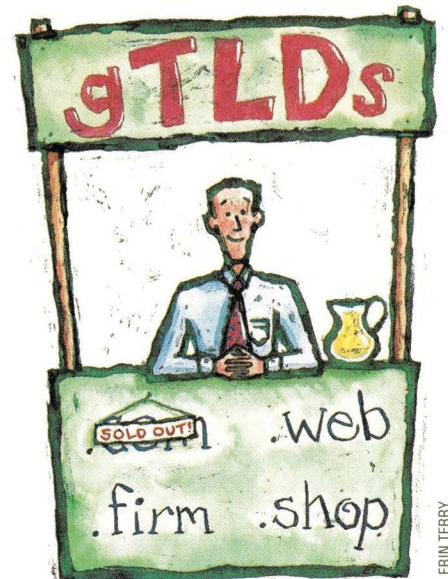
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websitenames.com is a business founded on the premise that organizations are willing to pay a premium for a memorable, generic .com domain. The site has about 850 names for sale, falling into 18 categories. A little less than half of the names the company registered itself, while the other half are sold on consignment, if you will, by outside speculators, or simply by organizations whose business plans never really panned out. Between three and five new domain names are submitted to the site every day. The names themselves tend toward the generic. "We specifically stay away from domain names that might have any sort of trademark conflicts," Landy says.

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pay for a name from the site? The minimum is \$450. "We have a \$10,000 price cap on domain names, because we don't want to be accused of price gouging," Landy says. This price cap has resulted in some domain name holders turning down the company's services, figuring that they could get a better price somewhere else. True, there have been some extraordinary domain name purchases, for example, \$100,000 for internet.com, but Landy insists that situations like that are unusual. "In general, people have unrealistic expectations as to what the market is willing to pay for a domain name."—ab

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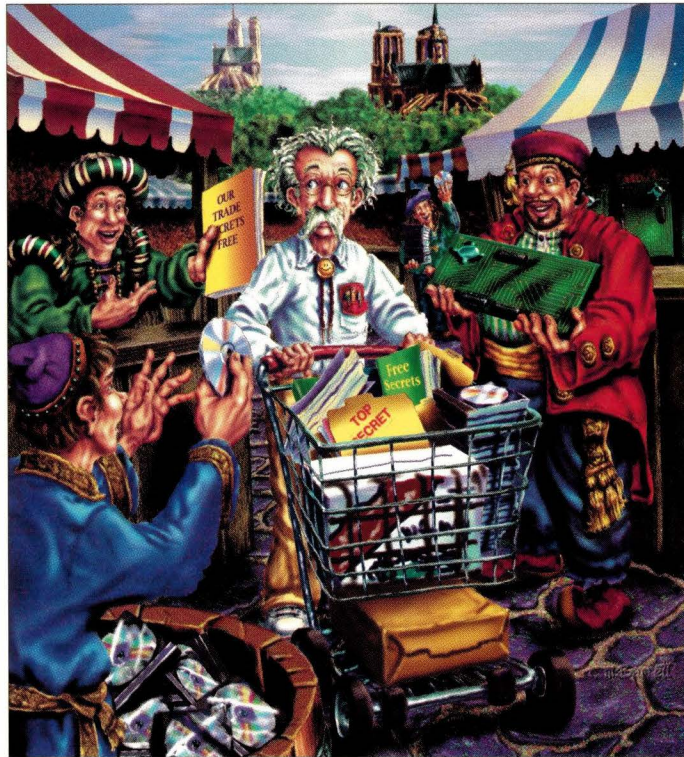
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Ask Mr. Protocol

by Michael O'Brien



TOM BARRETT

"I believed that the most important software... needed to be built like cathedrals..."
— Eric S. Raymond, *The Cathedral and the Bazaar*

"...the Linux community seemed to resemble a great babbling bazaar..."
— Ibid.

"Given enough eyeballs, all bugs are shallow." — Ibid.

The Cathedral, the Bazaar and Mr. P.

Q: *Hey, didja hear? Netscape's giving away the store! Can you believe that, or what?*

A: I'd like to hear about the "or what" part before I commit, but as far as the facts go, it seems to be believable. I won't even begin to express this the way Mr. Protocol puts it, because it would be libelous if it weren't incomprehensible (as usual). I'll have to put my own spin on it (also as usual).

Netscape Communications Corp., having gone from 90% of the Web browser market to 60% in the usual hair-raisingly short space of time, has made a bold move. Rather than forging ahead with business as usual, and continuing to have its clock cleaned by Microsoft, it has decided to radically change the way it approaches the marketplace. It has not only decided to cease charging for its browser software and begin giving it away free to all comers, it has also decided to give away the source code to its browser suite.

Most news reports on this story have

left me, at least, feeling confused. It's at times like this that I envy Mr. Protocol. He continues to believe that words on paper are so antique by the time he sees them that they couldn't possibly be of any use. Not only are the classics a closed book to him, books are a closed book to him. The sole exceptions to this are the various computer books that come out. He cackles over them the way you or I would find humor in a medical text of, say, 1887. In fact, that's a very good analogy: His mood takes on a sort of risible horror. I keep most books away from him, but I insist on my daily newspaper. As I say, he doesn't read it. He finds it useful only for lining the canary cage. This is a proceeding I can only view with wonder, because we here at Chez Protocol are blessed with neither canary nor cage. I have no idea how he makes the newspaper stay up there like that. After a while it goes away, I think by itself, because I never see Mr. Protocol touch it again. I avoid that end of the house most of the time. I'm only thankful that

his worldview tends more to Magritte than to Bosch. In fact, he's got this picture—I think it's the only one he owns—which has a single vertical black bar on it, and underneath, in script, the words, "Ceci n'est pas une pipe." I don't want to think about it.

My confusion stems in part from the confusion of some of the reporters. These people find they have no idea why Netscape would do something that no company has ever done, at least, not since the early days of computing. Source code represents the keys to the kingdom for a software company. Few kingdoms make it a practice to throw open the doors of the treasury and yell, "Having a show! Come and get it! You want it, you haul it away!"

Others thought they had an idea, but on reading the stories, the idea seemed murky at best.

It turns out that Netscape's extraordinary action was inspired, at least in part, by a paper written by Eric S. Raymond, titled "The Cathedral and the Bazaar" (see <http://www.linuxresources.com/Er>

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ic/cathedral.html). This paper was given at several Linux conferences in 1997, and it attracted Netscape's attention because it illustrated a demonstrably successful software development model that Microsoft seems unlikely ever to embrace.

Mr. Raymond took notice some years ago of a trend in certain software efforts that has been remarked upon by Mr. Protocol in past columns. Project GNU is the most visible of these. Linux is the most famous such effort in the operating system world, but the model is strong enough to support more than one fish in the pond: FreeBSD, NetBSD and OpenBSD each fill a niche. FreeBSD, for example, is most robust at supporting high-end servers on Pentium hardware, as its TCP/IP stack is derivative of the extremely mature stack developed under DARPA's aegis at Berkeley, and it has been extensively optimized for Pentium hardware. Mr. Protocol prefers it for his own desktop network system, and it makes a good liniment and furniture polish as well.

All of these efforts share a common motto: "Many hands make light work, and many eyeballs make quick work of bugs."

The title of Mr. Raymond's paper comes from an analogy of two diametrically opposed models of software generation. The first, typified by the cathedral, represents the work of a single master designer or design team, working in solitude, with new software releases every six months to a year. No software is released before its time, and it is crafted according to the design of, and under the centralized direction of, a resident genius. Source code is highly proprietary, and competing products must be created in a "clean room" atmosphere where everyone working on the competition can certify that they have never been "infected" by sight of the source code of the first product.

In the bazaar, everybody works on everything, all the time, amid great din. The source code is released to the community. Work is coordinated by a core group, but anybody can do anything to the source code at any time. The central group's only "power" is the issuance of new releases bearing the group's imprimatur...which, for the classicists, amounts to a nihil obstat.

The most noticeable difference, to the end user, between the cathedral and the bazaar is that the bazaar can result in several new interim releases per day. Unless you're among the crowd that's in the thick of things, this can get very confusing very fast. As an example, in the FreeBSD world, it is not uncommon to set up a FreeBSD machine connected to the Net in such a way that it keeps its own source code mounted at all times, and synchronizes itself with the master FreeBSD software repository on a daily basis. Such machines often take up their night hours by performing a "make world," which recompiles and reinstalls all binaries for user commands and the operating system. Such systems literally reinvent themselves completely on a daily basis. If the "make world" fails, you've found a problem. Good! Lots of other people will have spotted the same problem and can contribute as necessary to a solution.

Eric Raymond points out that the main difference between the centralized, corporate software development model, which dominates the industry (exemplified primarily by Microsoft but also by Apple, Sun and Lotus) and the decentralized model followed by GNU, the free OS consortia, and various pieces of freeware (such as Raymond's own fetchmail) is one of involve-

ment. The cathedral model, representing careful craftsmanship by a small, elite team, rarely, if ever, releases software to the general community in advance of the final release. Beta testers are carefully chosen, bound to nondisclosure, and even then only see software that its creators feel is already almost in its final form. No major changes and few minor changes are expected. Beta testing is only for bug-finding, in this model.

In the bazaar model, software spends its entire life in beta test. New versions are issued frequently, and in the case of a particularly hot development cycle, sometimes several times per day. A release is marked "stable" not just because it is stable, but to provide a point at which people who desire or require stability can cease tracking the blizzard of new releases. The user community is not only looked to for suggestions and bug reports, but for bug fixes as well as enhancements to the code itself. The advantage of the bazaar model is that it allows one person, or group of persons, to develop, maintain and extend the software code base using a development team far larger than could be afforded even by a large corporation.

So if you give the code away, how the heck do you make any money?

Mr. Protocol is glad you asked.

Show Me the Money

The bazaar model of software development only works if other people actually want the software, and want it a lot. Even if it doesn't work right to begin with, it has to show promise. But once it takes off, the entire development team is also a team of advertisers, press agents and word-of-mouth promoters. The product becomes not just a marketing item, but a cultural item. This is a status that most products only dream of attaining. If you pull this off, then you own the road. You may, in fact, hold title to the entire road throughout the area covered by the product, because the "generosity" makes any competing products created by the cathedral method look like pikers. The generosity involved, of course, is the exact same generosity shown by Tom Sawyer in passing out whitewash and paintbrushes next to his own fence. All these people are working for you for free. All you pay for is coordinating their efforts, and if you're politic enough, you can even throw out the "corrections" and "bug fixes" submitted by truly clueless wieners without alienating anybody. ("We're taking a coordinated and integrated approach to development in that area, which will be moving a little more slowly toward a more general solution. Thank you for playing, and come back again soon!")

Well, this sure works gangbusters at getting the product out there, we've seen it with Linux, emacs, vi, all sorts of mail systems and goodness knows what else. There remains that question about showing me the money?

Mr. Protocol says awright, already!

In Netscape's case, the product does not exist in isolation. Web browsers need Web servers, browser plug-ins, security packages, cache management software, everything but "bit detergent." Actually, you can sell that too, if the fraud statutes are lax in your locality. In fact, you can even deliver, if it's the tax statutes that are lax. But we digress.

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Ask Mr. Protocol

Netscape expects to make its money at the big end, not the consumer end. It will act as coordinator and proprietor of its browser software. But the Web user community is now part and parcel of the development team—not even Microsoft can hire that many programmers—and their motivation is a lot higher, because they're working on something they themselves use.

Raymond points out that the cacophony and code fragmentation that would seem to be an obvious result of this software development model just don't arise. There are various reasons for this, which he goes into, but the point can be taken from the success of Linux et al that it does work...and lots of people are making money off of Linux, and FreeBSD too, by selling value-added products and services to a huge installed base.

Microsoft is giving away Internet Explorer, too...but not the source code. This means that Netscape's browser has the possibility of leapfrogging Explorer in capability and features, while having

its own probably grotty code base cleaned up (consider how fast it was developed, after all, and by how few people), all at no cost to Netscape except for the cost of coordinating contributions and making up new (and frequent!) releases.

It's a model that could work. Where else might it be applied?

Newton's Lore

Mr. Protocol could suggest one, if he weren't busy spitting nails whenever it's mentioned.

He has mentioned in times past that the Apple Newton MessagePad is a pretty neat piece of work. It's current incarnation, the MessagePad 2100, is nothing short of fabulous. It's as fast as a notebook, it fits in your hand, you can write on it in your own handwriting and it will get just about all of it right. It can browse the Net, be a personal organizer, send and receive email and has a huge base of available software. For just about every conceivable vertical and horizontal market niche, there are

several competing software packages available. The "wow" factor is high, and although Apple's marketing has been lackluster, not to say nonexistent, one-on-one demonstrations by users have sold a lot of them. Overall sales of the 2100 and the eMate 300, which sports a built-in keyboard and looks like something built by space aliens, have been strong. It's easy to sell one: Just take it on any long-haul flight, use it for two to three hours, and then when every other notebook on the plane has given up the battery ghost, you can demonstrate your Newton to the suddenly computer-devoid notebook owners for about the next 20 hours.

On February 27, Apple announced that all development of the Newton OS was being halted. Existing stock of MessagePad 2100s and eMate 300s will be sold off, and no more will be manufactured. The stated reason was that Apple was forced to concentrate all of its efforts on a single OS, namely Mac OS. The actual reason, of course, was that after five years of producing some highly bogus products, Apple had finally gotten it right, which made it too boring to continue.

It is always easy to second-guess corporate planners, especially those working for a company in trouble, but this target is too tempting to resist. Apple may opt to get out of the handheld market altogether, and leave it to the 3Com Corp. PalmPilot, which is a beautiful piece of work but far less capable than any current Newton, and the Windows CE line of machines, whose sole advantage is the lack of an initial learning curve.

If Apple remains in the handheld market, it appears that the Newton technology is being eliminated in favor of a handheld tie-in to the upcoming NetPC product line of lightweight "network" computers. It is felt that memory and processor technology have reached the point where a stripped-down version of the Mac OS, or Rhapsody, or some sort of colloidal suspension of both, can be run on a handheld device. The result would have a Mac-like interface.

Now, there are noble antecedents here. The Mac interface was stolen wholesale from the Alto user interface, which in turn was developed as the

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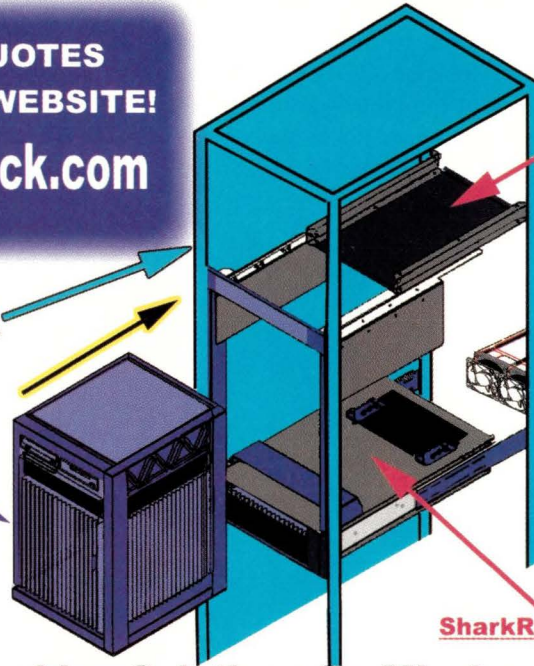
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Circle No. 37

Ask Mr. Protocol

Smalltalk user interface (well, more or less; this analysis is on the order of "and then all the dinosaurs died and made oil," but bear with me), and Smalltalk was initially conceived of by Alan Kay as being the software basis for a device known as a Dynabook, which a Newton resembles more than a little. Closure is achieved by the fact that NewtonScript borrows most of its ideas from Unger's language Self, which is in turn a Smalltalk derivative. However, the GUI part of the Mac interface has been whanged on a heckuva lot since the Smalltalk days, and the Windows interface was stolen from the Mac interface; at least as of Windows 95 it was. And most of that whanging, both on Windows and the Mac, has been to tune the GUI to a fare-thee-well as the user interface for a desktop computer.

And the only, the *only*, advantage that WinCE has, is that it can be picked up by a Windows user with little or no learning curve. Mind you, it's still a desktop interface. Uses a keyboard with keys like pastilles. But there are a lot of Windows users out there, and not all of them have been permanently turned off by the disaster that was WinCE 1.0. So although they're slower than Newtons, and harder to use than Newtons, they're selling—because they look just like a Windows desktop, so you can use them right off, and because Microsoft is no dummy when it comes to marketing. Mr. P. doesn't see many commer-

cials (and doesn't understand them when he does, which is good news for the joint credit card), but I do, and I've never seen a single commercial by Apple that really explains what a Newton is and what it can do. Not one.

Now, with 10% or less of the desktop market, Apple is thinking of coming out with a handheld device that can be used with no learning curve at all...by that 10% of the market that already uses Macs. Gah. It must be something in the water. My aunt used to chalk it up to a green spray that the Russians were using.

So what does this have to do with cathedrals and bazaars?

Well, for one thing, Mr. P. has noticed that there is a great deal to be done with public space in between a cathedral and a bazaar. It is possible to combine the two methodologies. FreeBSD already does this, essentially, as it has a "core group," which is responsible not only for arbitrating what does and doesn't go into the "official" release, but also generates a good deal of it. Membership is open, on approval, to anyone who demonstrates those qualities that make the IETF work: rough consensus and working code. This "oligarchy of the masses" takes lots of contributions from outsiders and vets them, and checks new stuff into the release tree on a more-than-daily basis, but is itself responsible for most of the deep code in the system. Anyone not a member of the core group who persists

Ask Mr. Protocol

in generating large amounts of useful code, or small amounts of critical code, is usually invited to join.

So the question is, can the bazaar method of development be applied to hardware? That is, if we have a situation where the most capable example of a given technology is assassinated by its proprietors, and if it looks like years could go by before anyone sane develops

a replacement not crippled by inheriting an inappropriate design philosophy, can a popular movement step in to fill the gap?

The first answer is, "not a chance." Well, certainly the existing system cannot be taken over. In the case of the Newton, Steve Jobs reportedly turned down an outside offer for the Newton technology before deciding to kill it. Apple owns the road and will vigorously defend its

cathedral against the infidel. So the new device would have to be a ground-up new hardware and software design.

Or would it? Actually, if it were possible to hijack an existing platform and convert it by means of new software into the desired result, there could be a chance. Prospective users go out and buy a WinWhizzo PalmPrint, then load up the new, free system from the Net. The only problem is it would probably require ROM replacements, and that's tricky enough that creating and installing new ROMs could sink the project right then and there. Not to mention the fact that the Newton hardware technology is far in advance of anything else that's even in sight on the horizon so far.

Don't count the bazaar out yet. Anyone with half a brain would have known that BSD UNIX was dead when DARPA cut off the money pipeline, and Solaris replaced SunOS. Doesn't look too dead so far. It survived by glomming onto a likely looking hardware platform and replacing all the software from the ground up. It took years to pull it off, though. And there was a much larger and more interested base of BSD UNIX users than there has ever been for the Newton.

Mr. Protocol, unfortunately, thinks it might be time to buy a MessagePad 2100 or two just to have on the shelf to get through the lean times. Some people are going to do some silly things, and it will be difficult to work around them. ➡

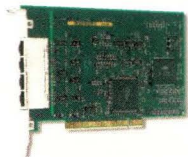
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Mike O'Brien has been noodling around the UNIX world for far too long a time. He knows he started out with UNIX Research Version 5 (not System V, he hastens to point out), but forgets the year. He thinks it was around 1975 or so.

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 working at an aerospace research corporation.

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



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Shell Control Files

My article on shells (“A Shell Road Map,” December 1997, Page 26) attracted quite a bit of email, showing that shells are still an important issue for some users, even in this pointy-clicky draggy-droppy age. Of course, the email started me thinking about what was missing from that article, so this month, I’ll look at how shells are set up and tailored for your personal use.

When you are given a login on a UNIX machine, the hopefully friendly systems administrator will allocate the shell that you will use as your login shell. Actually, this is not quite the whole story, because all shells have start-up files (usually starting with a “dot”) that lurk around your home directory. You probably know by now that the UNIX `ls` command suppresses file names starting with dot, and that many programs use this fact to place initialization files “invisibly” in your home directory. Actually, the dot files seem to breed like rabbits. I have about 60 files

starting with a dot in my home directory today, of varying antiquity.

Anyway, you’ll trot along to get your UNIX login and very probably be given the pet shell of the systems administrator along with his own start-up files, hopefully suitably amended for your use. It may be that there is some standard setup for your site, and you’ll be given that. Initially, it’s probably a good idea to ignore these start-up files. They will contain various parameter settings, file names and paths that will make your system work for you. However, later you may want to tailor things, so a knowledge of what files are used for what may be useful.

Different shells handle the start-up files in different ways, and the situation with recent shells is often complex because they have tried to maintain some semblance of backward compatibility. I always think that knowing how something has developed helps you untangle what is going on. So let’s start with the Bourne shell.

The Bourne Shell

The Bourne shell was designed to run on UNIX Version 7, and that system supported the process “environment,” which was a new idea for passing information between processes. Whenever a new process is started, it inherits a set of environment strings of the form `NAME=value` from its parent. The strings are cloned from the parent process on the `fork` operation that creates the new child process. They survive the `exec` system call which makes a running process transmute into a new program that may do something different. Incidentally, you can see the strings that are set for your shell by typing `set` into your shell if it derives from the Bourne shell (`sh`, `ksh` or `bash`) or `printenv` into a C shell variation (`csh` or `tcsh`).

Various programs use different environment strings. Some environment variables are used directly by the shell. For example, the `PATH` variable contains a colon-separated set of directories that

UNIX Basics

are searched by the shell whenever a command is typed. Some are used by application programs. For example, the `EDITOR` variable can be set to the name of your favorite editor, and this program is used by many commands that wish to start an editor on some text file.

Any process can add new environment strings, delete strings or change their value, and all of its children will inherit the new values. When you log into the system, the `login` process will establish some environment strings that are passed into the shell before it starts. A quick look at my Sun's `login` program shows that it sets `SHELL` to the name of your shell, `HOME` to your home directory, `LOGNAME` to your login name, `MAIL` to the default mail path and `PATH` to the default command search path.

However, it is convenient for you to be able to establish your own set of environment variables, in order to change the default `PATH` setting, for example. You can do this by typing commands into your shell, but this is tedious; it's much more convenient to take the "usual" setup from a control file. With the Bourne shell, the control file is called `.profile` and is stored in your home directory.

When the Bourne shell is started as part of the login sequence, it will look for a `.profile` file in your home directory and will read commands from it. This only happens when the shell is being started as part of the login sequence, and there's a small piece of magic that tells it that.

Interactive Login

It's the job of the `login` program to ask the user for a password, check it and permit the user to log in if the password check succeeds. Permitting the user to log in is simply a matter of running a shell, and the `login` program starts the shell by using the `exec` system call to overlay itself with the shell of choice for that user.

The `exec` system call establishes a set of strings that are the parameters to the command that it is invoking. The first parameter is the name of the command, usually the name of the file in which the command is stored. So if an `exec` system call is running a command such as

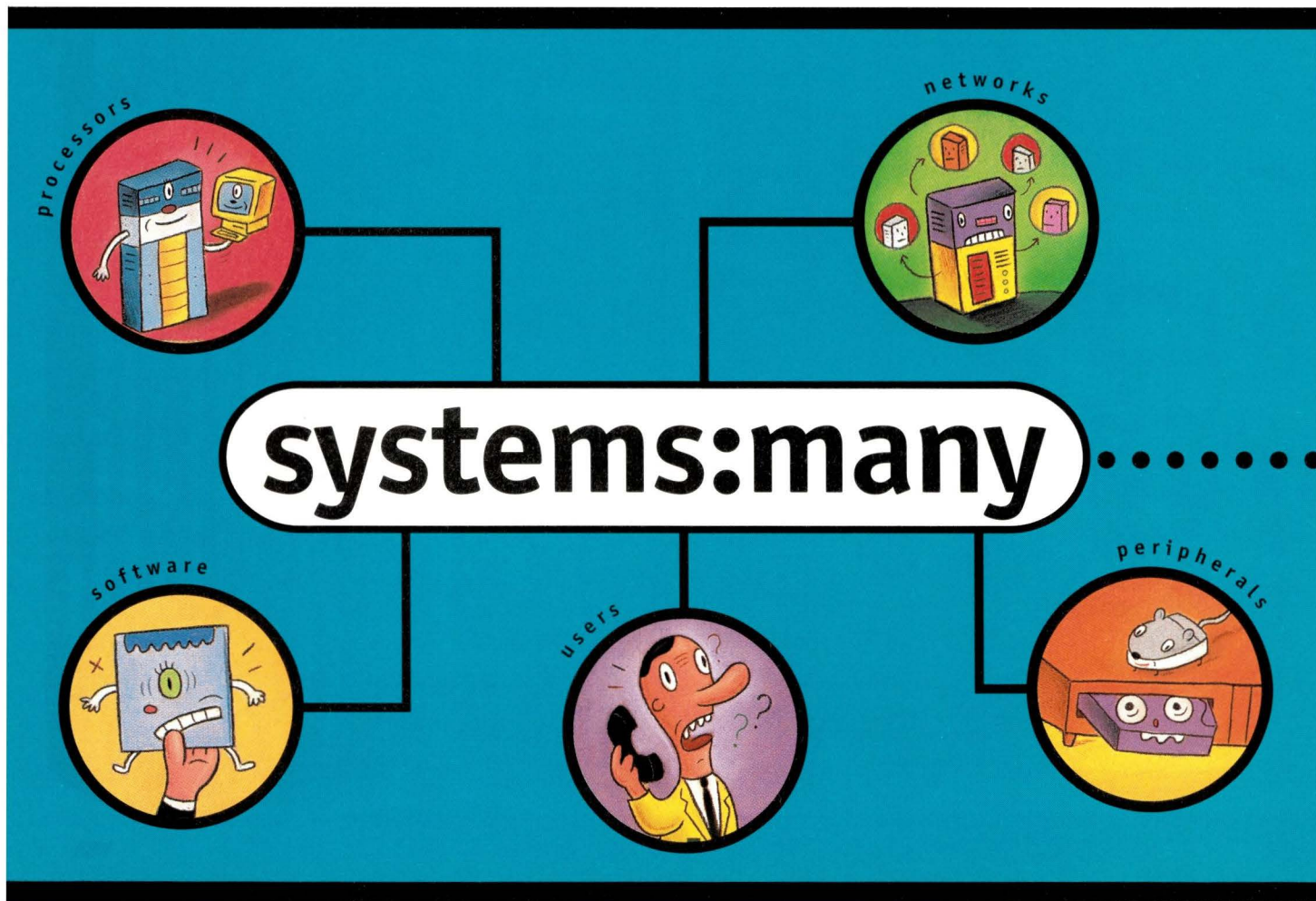
```
$ ls -l /bin
```

the `exec` system call that will be invoked will look something like

```
exec("/bin/ls", "ls", "-l", "/bin", NULL);
```

The first parameter is the address of the `ls` command in the file system; the second is the name of the command that is being invoked; all the subsequent parameters are taken from the command line; and the list is terminated by the magic symbol `NULL`, which happens to be the number zero.

When the new `ls` process begins to run, it is presented with the arguments (except for the file name), decodes them and uses the information to make things happen the way the



UNIX Basics

user has asked. The command can also see the name by which it was called. Some programmers have made use of the ability to see the name of the command. A good example is the `vi` editor family. The family consists of the regular `vi` editor, a restricted version that will not write files called `view`, an editor for beginners called `vedit`, a line-based editor called `ex`, and finally, a simplified version of `ex` called `edit`. If you look on your system, you'll find that these names appear in `/bin`, but they are all links to the same file. The program looks at the name by which this is called and changes its behavior accordingly.

To summarize this small diversion: A process that calls the `exec` system call can set up the name of the program it is calling, and the program that is called can see and decode that name. As we have seen, shells will always pass the name of the file in which the command resides into the command as its name. However, when the `login` process `execs` to the shell, it will set the first character of the command name to a hyphen. The shell will see this and will know that it's been called from the `login` process, and uses this information to run commands from a start-up file. For the Bourne shell, it will look for the `.profile` file on your home directory and read commands from there.

How Start-Up Files Are Run

It's a good idea to understand a further nuance about the way all this works. Let's say you place some commands into a file, make the file executable and type that file name as a

command. Your shell will run that new command file by starting a new shell to read the commands and execute them. Any environment-setting statements in that command file will not affect the shell to which you are talking, because they are being run in a subshell.

However, we actually want to set up strings in our shell, so the contents of the `.profile` file are executed directly by the `login` shell. Most shells have syntax that allows you to do this "by hand." There's a special command (`dot`) with the Bourne shell,

```
. file
```

that tells the shell to run the commands *in the current shell*.

Start-up files are run automatically in the current shell using the same mechanism. This is no big deal if the commands only set environment variables. However, the `.profile` file is often used to run other commands, some that establish the way you want to work. For example, I have

```
stty cs8 -istrip -parenb erase ^H
```

in my start-up files, so when I log in, my keyboard is sending 8-bit characters, and my default erase character is set to backspace. Some people also place other commands in their `.profile` file, for example, `uptime` or `who`.

However, if any of these commands fail for some reason,

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then you can be “stuck,” unable to log in. If you are messing about with login start-up files, then always make sure that the new files work before logging off completely. Using the “dot” command is perhaps one way of checking the files, but you should always try to log in with the new setup before you completely log off the system. On a workstation, you can simply start a new window and use `telnet` or `rlogin` to log into your machine again:

```
$ telnet localhost
```

This will check that the changes you have made work properly.

Actually, on most modern systems, the Bourne shell will also look for commands in `/etc/profile`, and then for your own `.profile`. This allows the systems administrator to establish settings for your system and for you to inherit the variable values. For this reason, it's always a good idea to retain previous settings of certain variables. For example, if you are adding a private `bin` directory to your `PATH`, type

```
PATH=/home/pc/bin:$PATH
export PATH
```

rather than setting up a complete new `PATH` based on what you find in that variable today.

The C Shell

When the C shell appeared, it extended how start-up files are handled. The shell supports two start-up files: `.login`, which is invoked when you log in, and `.cshrc`, which is invoked whenever a `csh` is started. It also supports a file that's called when you log out, `.logout`. Some people use this file to clean up temporary files when they leave the system. In the days of terminals, its greatest use was to run the `fortune` program to generate a pithy epithet to leave on the screen of an unused terminal.

The designers of `csh` decided to have two start-up files because they had added the notion of aliasing to the shell. A user can type

```
alias rm 'rm -i'
```

so that whenever the user types `rm`, the interactive flag is automatically added to the command, ensuring that you are asked to confirm every file deletion. Aliasing allows you to create a private command set without having to establish a private command file, and this can be useful.

However, there's no easy way of passing aliasing definitions from one shell to another. You can see this by typing

```
% alias hello 'echo hello world'
% hello
hello world
% csh
% hello
hello: Command not found
%
```

The first line establishes an alias to `hello`, which we test by calling it. Then we start a new `csh` and find that the alias has disappeared because it only exists in the login shell. The example is perhaps artificial, but the second `csh` could be invoked from inside another command, perhaps an editor. When you start a new shell, you would expect all your aliases to be established and would be surprised that suddenly your command set had changed back to what it was previously. So, if aliases are to be useful, we want them to be established automatically in every shell that we run. To achieve this, `.cshrc` is invoked every time the shell is started.

When an interactive `csh` is started at login time, the shell will execute commands from `/etc/.login`, then commands from `.cshrc`, and then commands from your own `.login` file. The original idea is that you should put your terminal and environment setting commands into the `.login` file and put any command that you want to be executed on the invocation of every shell into your `.cshrc` file.

The X Window System and widespread use of `rlogin` have caused many setup values to move into the `.cshrc` file because when you start a new window, you'll start a new shell. But it won't be a login shell, so only the `.cshrc` file will be executed when the window is opened. Many interactive control features now need to be in your `.cshrc` file so they are invoked every time you start a shell. For example, `.cshrc` should include your `history` setting command so that shell history is functional, and could include

```
set filec
```

if you want to use file name completion in `csh`. If you turn it on, you'll find that you can make the shell automatically complete file name arguments to commands for you. You type the first few letters of a file name and hit the escape key. The shell will read the directory and match the string that you have typed with the names of the files that it finds. If the name is unambiguous, the shell will supply the remaining characters. If the name isn't unique, the shell will beep you to enter some more characters to ensure a match.

You can also set the shell variable `ignore` to tell `csh` what file extensions to ignore in its file completion. For example, people commonly set this to `.o` so that object files from `compiles` are ignored. If, however, the only possible completion includes a suffix in the list, it is not ignored.

It's often a good idea to recognize that some of the commands in `.cshrc` are only aimed at supporting interactive use. You can easily code in a test that looks for the presence of the `prompt` variable and use this test to discriminate whether the shell is interactive or not.

```
# We start with commands that are
# always needed
set path = (...)
# the csh path variable is 'written
# through' to the PATH environment
# variable
#
```

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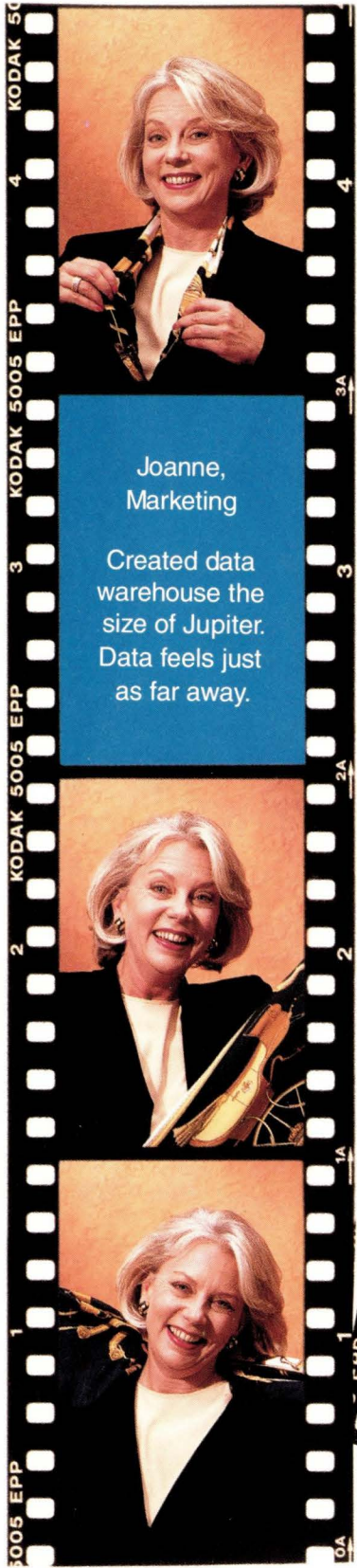
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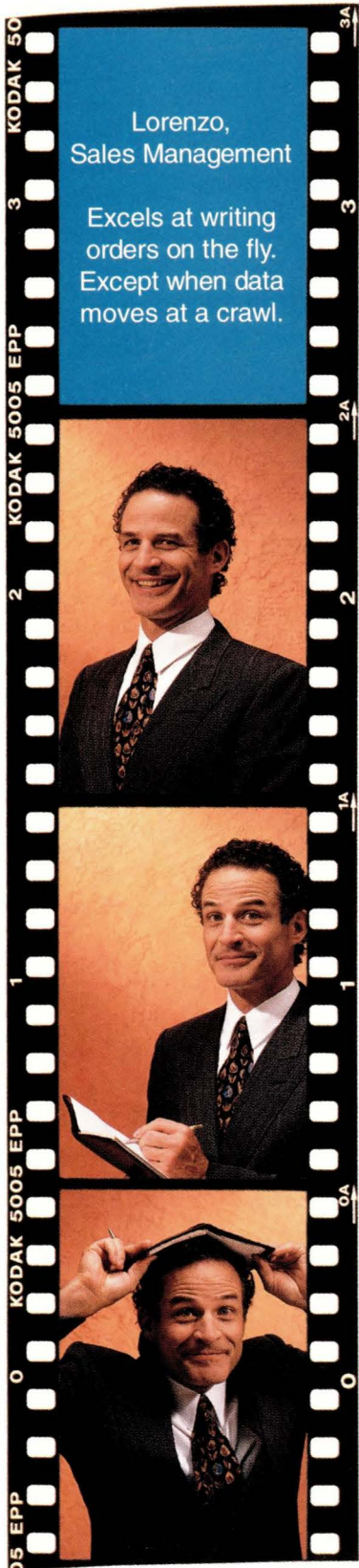


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UNIX Basics

```
# Now test for the presence of the
# prompt variable
if ($?prompt) then
# we have a prompt - put interactive
# set up commands here

    set history = 100
    set filec
    alias rm 'rm -i'
# etc etc
# end of interactive set up
endif
```

Incidentally, rather than enclosing the interactive statements in an `if` statement block, some people put

```
if (!$?prompt) exit
```

at the top of the `.cshrc` file. The *UNIX Power Tools* book (see below) points out that the action of the `exit` statement is unpredictable in different implementations of `csh`. In some cases, you'll find that you will be logged out because you've told your login shell to exit. So you should use the nested `if` structure or a `goto` jumping to a label at the end of the file.

The version of `csh` that supports line editing and command completion, `tcsh`, is designed to be compatible with the `csh` that is resident on your machine. It will read the standard `csh` systemwide files that are present on your machine. You can supply a file called `.tcshrc` that supplants `.cshrc` so you are able to add specific `tcsh` setup commands.

The Korn Shell

The Korn shell started life as a modified Bourne shell and will automatically read your `.profile` file when you log in. It will also read `/etc/profile` to permit systemwide initialization. Unlike the Bourne shell, the Korn shell provides for a file to be read whenever the shell is started. There is no well-known, default name for this file; instead the name is taken from the contents of the `ENV` environment variable. People often name the file `.kshrc`, because this name fits in with `.cshrc` and other shell start-up files.

You set the `ENV` variable in your `.profile` and ensure that it is exported to the environment. Then whenever a new shell is started, it will find that `ENV` is defined and will run the commands that it finds there. The contents of the file will be executed after the `.profile` file has been read, assuming that file sets `ENV`.

Again, these days, people find that most of their setup has migrated into the `.kshrc` file and need to find a way of distinguishing between interactive and noninteractive start-up. This can be done by checking whether the interactive (`-i`) flag is set. The Korn shell maintains a variable accessed by `$-` that contains a list of all the flags that are set. So the best way to find whether a shell is interactive is

```
case $- in
*i*)
```

```
# interactive setup commands
    ;;
esac
```

The `*i*` in the case option will be matched if the `$-` variable contains the character `i` and the commands will be executed.

Incidentally, `ksh`, `tcsh` and `bash` will only read commands from files that are owned by you, so it's harder for someone to trick you into starting a shell and then inadvertently running some commands that they have established to compromise the security on your system.

The Bourne Again Shell

GNU's Bourne Again shell (`bash`) permits several configuration options for start-up files. It's a bit of a cross between `csh` and `ksh`. For login shells, it reads systemwide initialization from `/etc/profile` and then looks for `.bash_profile`, `.bash_login` and `.profile`. It will execute the first one of these files that it finds.

If `bash` is started interactively, which it knows from looking at whether or not it's talking to a terminal, then it will look for start-up commands in `.bashrc` in your home directory. Finally, when invoked from a script noninteractively, `bash` will execute commands from a file whose name it finds in `BASH_ENV`.

All this seems complex to me, and so my `.bash_profile` contains the single line:

```
. ~/.bashrc
```

which reads commands from my `.bashrc` file so all my setup commands are placed in that file. Because `bash` is compatible with `ksh`, it supports the `$-` variable and so you can use the same interactive check that was described above for `ksh`.

Actually, for some considerable time, I've maintained a file called `.set_shell_vars` that contains a set of Bourne shell environment setting commands. I place a "dot" command in the start-up files for `sh`, `ksh` and `bash` that reads commands from this file to establish my basic environment settings. These include values for `PATH`, `EDITOR`, `PAGER` (I prefer to use `less` rather than `more`), `MANPATH` and character set (I set `LC_CTYPE=iso_8859_1`) so that I can type Latin-1 accented characters easily.

Finally

UNIX Power Tools by Jerry Peek, Tim O'Reilly and Mike Loukides, published by O'Reilly and Associates Inc., ISBN 1-56592-260-3, is in its second edition and is a great source for information on the issues covered by this article.

Thanks to Garry J. Garrett and John Caruso for the email input that started me thinking about this article. ➡

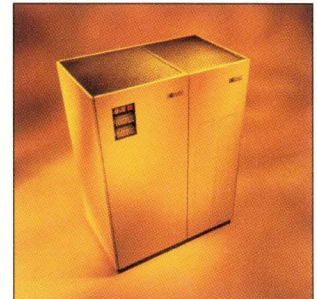
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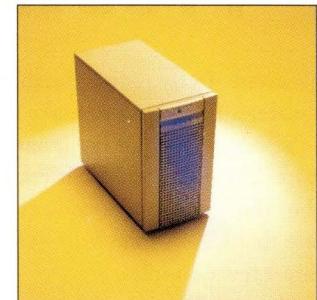
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I/Opener

by Richard Morin, Technical Editor



KEN CONDON

Freeware Goes Prime Time

Freeware—freely redistributable software—is beginning to make it into the news. Not just the binary-only “freeware” that PC and Mac users download, but the “real” source-code available freeware that UNIX folks know and love! Here are a few examples.

The Apache Web server (<http://www.apache.org>) began life, literally, as “a patchy Web server.” The authors had been distributing patches for the National Center for Supercomputing Applications (<http://www.ncsa.uiuc.edu>) HTTP daemon, `httpd` 1.3. Some users asked for a release with the patches folded into the original code, and inspiration struck. Apache is now the dominant Web server on the Internet.

Apple Computer Inc. (<http://www.apple.com>) and The Open Group (<http://www.opengroup.org>) got their feet wet with Mach 3 by creating MkLinux (<http://www.mklinux.apple.com>), a version of Linux based on the Mach 3 Microkernel. MkLinux now runs on Apple, Hewlett-Packard Co. and

Intel Corp. hardware, with more ports expected. Apple now appears to be moving its Rhapsody operating system to a base of BSD-Lite and Mach 3. Although Apple will add a great deal of proprietary software, much of the base system should be available for examination and modification. As a Mac and UNIX fan, I find this prospect very appealing.

The GNU C compiler, `gcc`, created by the GNU Project (<http://www.gnu.org>), is one of the most popular C/C++ compilers around. Commercial software developers like `gcc`'s cross-platform support, efficiency, robustness and standardization. Many other GNU tools (for example, `emacs`, `grep`, `gzip` and `tar`) are also found on otherwise “vanilla” UNIX systems. Systems administrators have begun to realize that the GNU tools often run faster, have more features and may even be more stable than the “commercial” alternatives.

Linux (<http://www.linux.org>) and the BSD tribe (<http://www.{free,net,open}bsd.org>) are being used for

many of the Web servers on the Internet. They are also finding their way into mission-critical applications. Because the source code is freely available, companies don't have to be concerned that support for the operating system might just “go away,” leaving their projects in the lurch.

Netscape Communications Corp. (<http://www.netscape.com>) recently announced its intention to release the Navigator and Communicator products as free software. The current versions are available as binaries; the upcoming versions will also be available in source code form. (The source code licensing terms are not set at this writing, but the GNU General Public License appears to be a strong contender.)

Perl (<http://www.perl.{com,org}>) dominates the worlds of CGI and UNIX scripting and is starting to invade Mac OS and Windows. Because Perl code is interpreted and uses an OS-independent set of support routines, Perl scripts can be used on a variety of platforms with no recompilation.

Reaction...

Publicity isn't always a good thing. In the early 1980s, some UNIX proponents got a lot of publicity by proclaiming that "the year of UNIX" was just around the corner. Then, when the system didn't take over the world, reaction set in. UNIX was said to be a faddish operating system used only by techies; not suitable for "real" applications.

Some of the folks dissing UNIX may have been motivated by commercial interests. Others were looking for article topics: Say something good, say something bad, but say something! Most UNIX deprecators, however, were simply reacting to a perceived conflict between the system's image and reality.

I expect to see similar reactions to the current freeware publicity, augmented by the fact that freeware is a really easy target. It's hard to claim that UNIXoids are nothing but a bunch of techies; there are too many real companies promoting and using the operating system. UNIX was seen as (and in fact was!) a threat to proprietary operating systems. How do you think commercial software publishers feel about freeware? A few may try to work with freeware, but most would rather see it go away.

Freeware, in any case, has few commercial advocates and a vanishingly small public relations budget. In addition, freeware distributors tend to be small-budget operations; it's hard to charge a fortune for software that is available for free on the Internet! Some organizations and individuals sell support, but there isn't any real money there, either. Cygnus Solutions (<http://www.cygnus.com>) is the largest commercial support organization for freeware, and it isn't all that big.

It's actually surprising how much publicity free software gets in the computer-related trade press. Although some of the big-budget magazines tend to ignore free software, I see regular coverage in magazines like *SunExpert* and *UNIX Review*, among others. In addition, there are some online magazines that are devoted to specific freeware packages. The *Linux Journal* (<http://www.ssc.com/lj>) and *The Perl Journal* (<http://tpj.com>) are

polished, if somewhat diminutive publications that do a good job of covering their areas of interest. There are also some magazines and journals published by user groups.

The mass media, however, has largely ignored freeware over the years. The attention span of the media (let alone Joe and Sally Sikspak) is very short. If a topic can't generate news on a continuing basis, it gets discarded in favor of new topics. In the process, it may get labeled as hype, fiction or worse.

...and Reality

Meanwhile, the folks who have been developing freeware all along will continue to do so, aided by an ever-increasing pool of languages, packages and tools. Users will continue to implement solutions based on freeware, hiding them if need be from their own versions of Dilbert's pointy-haired boss. They will also continue to find, report and fix any bugs they find, helping to improve the software both in features and robustness.

In short, I predict a long and healthy

life for the free software movement, fueled by the unselfish cooperation of millions of programmers and users. As Tom Christiansen, a noted Perl authority, says in his "White Hats and Black" article, <http://language.perl.com/versus/hats.html>:
"... the World Wide Web's most popular Web server, Web browser, and Web programming language are now all available for free in full source form. The synergistic interactions of these truly open systems are certain to outshine all possible closed, proprietary solutions." →

Richard Morin operates Prime Time Freeware (info@ptf.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@cfc1.com.

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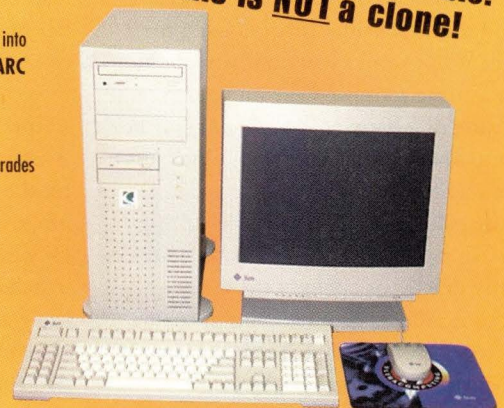
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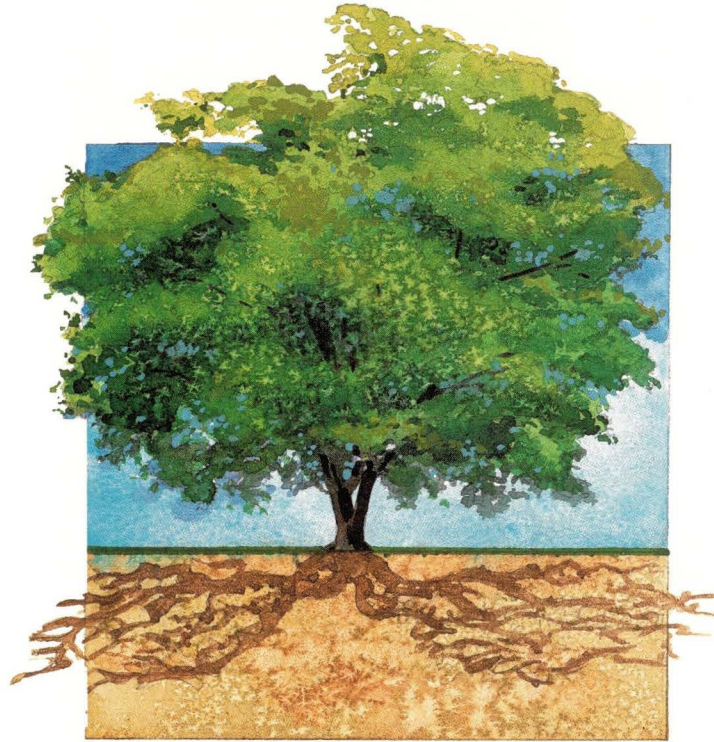


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Systems Administration

by S. Lee Henry



KEN CALL

Replicating Root

Serious problems can arise when critical files in the root file system are damaged. Protecting against root file system problems that could cause extended downtime is always a good idea. Consider the following fire drill: What would you do if you could not assume root privilege on your system because of a damaged `/etc/passwd` or `/etc/shadow` file? Let's take a look at one way this could happen.

In a slip of the finger while editing the `/etc/shadow` file, someone inadvertently deletes or changes the entry for root. When you, needing to restart a system process, try to assume root privilege, here's what happens:

```
boson% su
su: Unknown id: root
```

The side effects are far-reaching. Not only can you no longer log in as root (even on the console), but you can't su to root or run rsh commands from a trusted host. You can't even shut down

the system properly in order to fix the problem.

The typical way to get around this kind of problem is to boot off installation media. After you answer a number of questions posed by the installation script, you can choose the option to escape. Then, after you escape the script, you can `cd` to the `/etc/` directory (mounted as `/a/etc`), fix the problem and reboot. This is not an overwhelming amount of work. However, you first need to locate the installation media and go to where the system is located. For some of our systems, this can be time-consuming and costly.

The Backdoor Approach

Another way to get around this problem is to use a program like the one shown in Figure 1, which allows a particular individual, once she has been authenticated by entering the appropriate password, to assume root privilege using `login` or `su`. This

program would have to be owned by root and would require the `setuid` to be set. The restriction to a select user and the inclusion of a password check is included to limit the risk associated with any `setuid` program. Once a privileged user invokes the program and enters her password, she acquires root privilege and is able to fix the problem with the `/etc/shadow` file without having to disrupt critical system services:

```
boson% surroot
Password:
boson#
```

The Spare Root Approach

Keeping a "spare" root file system is another way of protecting against a number of root file system problems without requiring too large an expense in terms of disk space and without having to rely exclusively on installation media for good copies of damaged files. Most root file systems are relatively

Figure 1. The suroot.c Program

```
#include <stdio.h>
int status;
char exec_string[256];
char passwd[]="tlmefUcnRdths";
/* <= YOUR password from shadow */

main()
{
    system("stty -echo");
    fputs("Password: ",stdout);
    fgets(exec_string,255,stdin);
    system("stty echo");

    if(!strcmp(passwd,crypt(exec_string,passwd))){
        status = setuid(0);
        status = setgid(1);
        sprintf(exec_string,"/bin/csh");
        system(exec_string);
    } else {
        printf("\nYou cannot do this!\n");
        exit(1);
    }

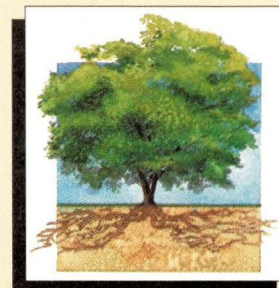
    exit(0);
}
```

Figure 2. The replic_root Script ('Full' Replication)

```
# replic_root
ufsdump 0f /backuproot/root.dump
/dev/dsk/c0t3d0s0
cd /backuproot
ufsrestore -rf root.dump
rm root.dump
```

Figure 3. The update_root Script ('Incremental' Replication)

```
# update_root
ufsdump 5f /backuproot/root.dump
/dev/dsk/c0t3d0s0
cd /backuproot
ufsrestore -rf root.dump
rm root.dump
```



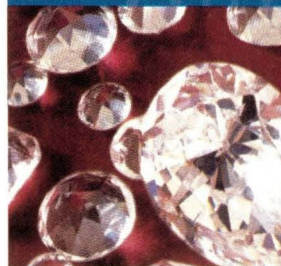
small—8 MB to 32 MB. And, except for a handful of files, the root file system is fairly static. You can “initialize” and “update” a spare root partition easily using the `ufsdump` and `ufsrestore` commands and boot off the “spare” (or simply use it to fetch saved versions of important files) anytime you have a problem.

The `ufsdump` and `ufsrestore` commands are more useful than a back-to-back `tar` command of the `tar cBf - * | (cd /backuproot; tar xvPbf -)` variety, because these commands naturally work on partitions. It would be much harder to restrict `tar` commands to the root partition. Scripts to fully copy the root file system and copy only those files that have been changed since the last level 5 dump are shown in Figures 2 and 3. Keep in mind that the contents of the incremental dump can be affected by backups run at the same level.

It is better to replicate the root file system using the dump commands when the system is quiescent. Dumping active file systems introduces a small risk of file system inconsistency. If, for example, a file is created or removed after its directory has been dumped, the file will be missing from or included in error in the directory. Though these windows of opportunity are very small, they should not be overlooked. ➡

S. Lee Henry has been managing Sun systems for the last 15 years and has had her share of slippery fingers. She'd love to hear your sysadmin horror stories. Send her a really good one and she'll incorporate it in a future column. Her email address is slee@cpq.com.

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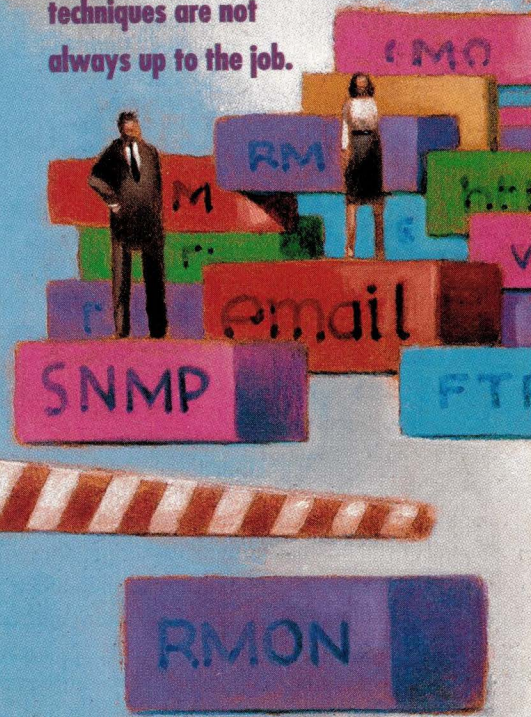


Circle No. 23

HIGH TOLL FOR INTERNET TRAFFIC

NETWORK
ACCESS

The ground has shifted beneath the feet of network managers with the coming of Internet traffic to the corporate net as they find that existing tools and techniques are not always up to the job.



Network Management

by ALEXANDRA BARRETT, Staff Editor

The day businesses opened up their networks to Internet traffic marked the dawn of a new era for office workers. Faster than you can say "Hypertext Transfer Protocol," white-collar workforces downloaded their first copies of Netscape Communications Corp.'s Navigator and set out exploring the vast unspoiled cyberterritory. Overall, they liked what they saw and, in a matter of a

few years, had thoroughly and enthusiastically integrated the Internet into their workday.

For network managers, the day businesses opened up their networks to Internet traffic marked a new era, too. One day, the network was a self-contained circuit running database applications and toting around print jobs. The next day, the network was sagging under the load of email saddled with Microsoft



Corp. PowerPoint attachments and real-time stock tickers.

Soon after, end users and management alike started clamoring for better, faster access to Internet resources. For end users, the Web's luster had started to fade in the face of slowing download speeds. Management, on the other hand, perceived the slow access and response times of their Web sites as a good indication that their online business ventures would fail.

In many ways, unleashing the Internet on the corporate world rewrote the job description of many a network manager. The job of keeping networks doing the work they were designed to do fell squarely on the shoulders of an organization's network support staff. So did the task of providing timely and cost-effective Internet access to clients and end users. So while the rest of the world was getting tipsy on the possibilities of the Information Age, network managers were stuck with the sobering fact that existing network management tools and techniques were not up to the job.

This is written in the past tense, as if the problem of over-taxed networks has been resolved—which is misleading. A few organizations have been successful in balancing their needs for Internet access with local-area network (LAN) requirements. Some organizations don't have any such problems because they haven't opened up the gates to the Internet. But the majority of businesses, however, are knee-deep in figuring out how to provide end users and customers with the Internet connectivity they've come to expect, without sinking their existing networks in the process.

Where Network Management Platforms Leave Off

If the challenge you face is managing the network, you'd think that you could turn to a network management tool for help. This is true, of course, but only to a certain extent. Network management platforms, as it turns out, are of only limited utility when it comes to proactively assigning network resources. "Network management platform" usually implies a framework for monitoring and configuring network devices such as hubs and routers, and for alerting administrators when one of them

fails. Prominent examples of network management platforms include Sun Microsystems Inc.'s Solstice Enterprise Manager, formerly known as SunNet Manager; Hewlett-Packard Co.'s OpenView; IBM Corp.'s NetView (now Tivoli NetView); and Cabletron Systems Inc.'s Spectrum. All rely heavily on the Simple Network Management Protocol (SNMP) and are used primarily by operators in the network operation centers of larger organizations.

Introduced in the late 1980s, these platforms were designed as stand-alone management consoles for environments consisting of 100 to 1,000 devices, explains Steve Borcich, director of product development for SunSoft's Network Products Group. "The pressing need back then was how to manage bare-bones basic segments." SunNet Manager, for one, has evolved quite a bit over the years, having been redesigned (and renamed) to handle more distributed environments, multiple administrators, larger networks, more diverse equipment and devices, and a larger variety of applications.

But how do these platforms address our need to keep LAN traffic in check and guarantee decent service over the increasingly important wide-area network (WAN)? Sure, SNMP traps and alarms can tell you that some device or other is failing, but how do you get a realistic sense of your network's overall performance? Do you know what levels of performance to expect? What performance you need? And once you've defined your performance criteria, how can you get the network to do what you want? In order to answer these questions, network managers are looking beyond the tools and techniques that have traditionally been available to them.

A Thirst for Knowledge

For organizations in search of a quick fix for their sluggish networks, the obvious solution is simply to buy more bandwidth. "Bandwidth has always been an issue, and buying more has always been the obvious solution," says Elizabeth Rainge, a senior analyst at International Data Corp., an industry research firm based in Framingham, MA.

It's common knowledge, however, that faster networks are often sold into organizations whose existing network infrastructure would have been quite sufficient if it were put to better use. Horror stories abound of organizations going forth with costly Asynchronous Transfer Mode (ATM) installations, only to find out later that with only 2% utilization, a Fiber Distributed Data Interface (FDDI) backbone would have been sufficient.

According to Joe Askins, director of data communications for the Telecommunications Service Department at Arizona State University, the key to avoiding costly network upgrades is to have a solid understanding of what your network is actually doing. "Vendors have been coming in here for years and telling us that there's no way that we can do X without moving to X," says Askins, whose department provides Ethernet connectivity to 20,000 nodes on four campuses, as well as Internet access to 100 nonprofit groups through a community outreach program. "Then we pull out our reports and show them that not only can we do it, but that we are doing it."

For detailed network performance information, Askins' group turns to reports generated by Network Health, a network

The screenshot shows the HP OpenView Desktop Administrator Console. The main window displays a 'License Metering Log Summary' for Microsoft Office 97.0.0. The table below is a transcription of the data shown in the screenshot.

Site Name	Start Date Time	End Date Time	Product	Version	Peak Licenses Used
Central site	7/1/97 12:00:00 AM	7/31/97 11:59:59 PM	Microsoft Word for Windows	8.0	8.0
Central site	8/1/97 12:00:00 AM	8/31/97 11:59:59 PM	Microsoft Word for Windows	8.0	8.0
Central site	9/1/97 12:00:00 AM	9/30/97 11:59:59 PM	Microsoft Word for Windows	8.0	8.0
Central site	10/1/97 12:00:00 AM	10/31/97 11:59:59 PM	Microsoft Word for Windows	8.0	8.0
Central site	11/1/97 12:00:00 AM	11/30/97 11:59:59 PM	Microsoft Word for Windows	8.0	8.0

Site Name	Start Date Time	End Date Time	Product	Version	Peak Licenses Used
Central site	7/1/97 12:00:00 AM	7/31/97 11:59:59 PM	Microsoft Office 97	8.0	8.0
Central site	8/1/97 12:00:00 AM	8/31/97 11:59:59 PM	Microsoft Office 97	8.0	8.0
Central site	9/1/97 12:00:00 AM	9/30/97 11:59:59 PM	Microsoft Office 97	8.0	8.0
Central site	10/1/97 12:00:00 AM	10/31/97 11:59:59 PM	Microsoft Office 97	8.0	8.0
Central site	11/1/97 12:00:00 AM	11/30/97 11:59:59 PM	Microsoft Office 97	8.0	8.0

HP's OpenView is one of the prominent network management platforms used in the network operation centers of large companies.

Network Management

analysis and reporting tool from Concord Communications Inc., Marlboro, MA. Askins believes that careful monitoring of the network has saved his university big in terms of network infrastructure costs. "We've saved the university millions of dollars simply by not moving to ATM out of a lack of knowledge," Askins says.

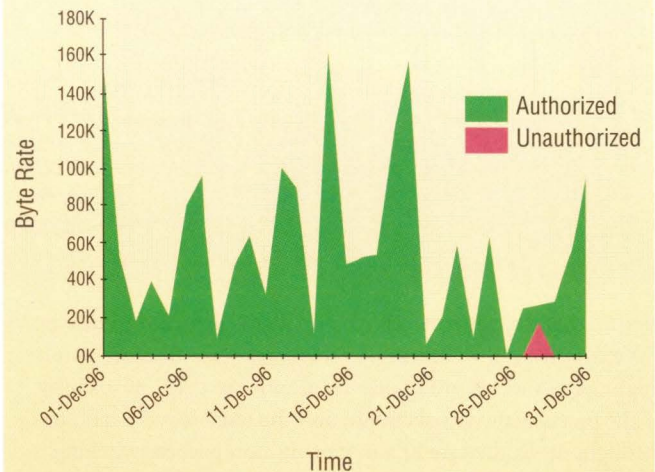
Not all organizations can boast a detailed understanding of their network, however. Most cannot. According to Cate Meyer, strategic business planner for HP's network management division, organizations are just now in the beginning phases of instrumenting their networks with the appropriate tools for collecting performance information.

When it comes to wide-area versus local-area networks, the need for detailed performance information is especially important. This is because on the WAN, you pay for your bandwidth use, whereas on the LAN, bandwidth is "free" once you've made the initial infrastructure investments. "In comparison with the LAN, wide-area links are limited in bandwidth, in capacity and are very costly," says Yoram Valent, vice president of marketing for NetReality, an Israeli start-up that recently announced the WiseWan platform for managing WAN traffic. "This has prompted people to ask how they can best monitor and control this very limited resource, in order to keep prices down."

In situations where organizations depend on third-party providers for their WAN services, the two parties will typically sign a service-level agreement, or SLA. SLAs are legally binding contracts in which the two parties set forth detailed performance

Traffic Accountant

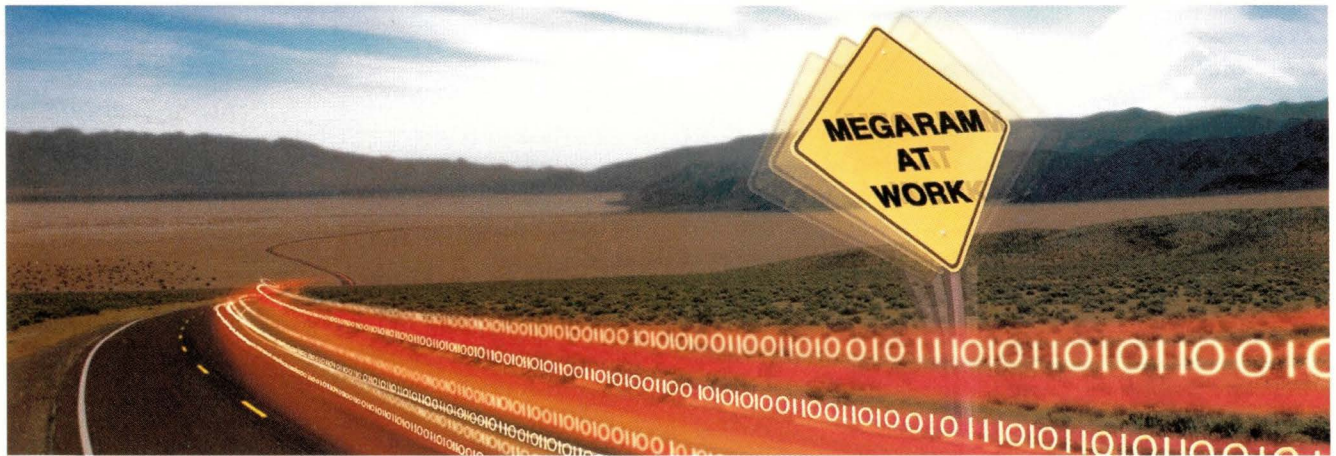
Web Traffic Audit Report for Finance Department, December 1996



Report: Web Audit Trend-Finance-Area
Start Time: 12/1/96 12:00 AM
End Time: 1/1/97 12:00 AM

Total Bytes: 144,883,647
Report Run: 1/1/97 4:30 AM
Report Period: 24 hours
For: All Days

Concord's Network Health family of Web-based software applications automate the collection, analysis and reporting of critical network data. Shown above is a sample report from Network Health Traffic Accountant, which measures the impact of business processes on the network.



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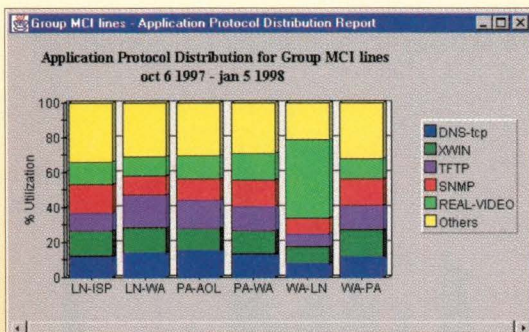
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Circle No. 24

SunExpert Magazine ■ April 1998

Network Management



NetReality's WiseWan is an RMON-based platform for managing WAN traffic.

metrics that the network service provider is expected to deliver. For example, in the context of a frame relay connection, you might expect to see provisions for round-trip delay, availability of the permanent virtual circuit, and the data delivery ratio or throughput. In the case of a more common packet-switching network, the particular service-level metrics might vary, but the underlying concept remains the same.

To be effective, SLAs must be based on realistic and quantifiable performance metrics, says HP's Meyer. When they aren't, service providers face the very real danger of not living up to expectations and may suffer the legal or financial repercussions.

"Everyone wants to move to a world of SLAs. But in the rush to get there, people tend to skip the step of assessing where they're at right now," says HP's Meyer. "Some of our larger carrier customers have come to us in confidence and admitted that they had no idea how they were going to deliver on the SLAs they had signed. From a competitive standpoint, they had to sign them, but there have certainly been cases where service providers have had to refund money because they couldn't prove that they were delivering their agreed-upon numbers."

(For anyone interested in how one goes about writing a service-level agreement, a white paper and a sample SLA for frame relay networks is available on the Web at <http://www.visualnetworks.com>, courtesy of Visual Networks Inc., Rockville, MD, a company specializing in service-level management tools.)

If network managers haven't been gathering adequate performance data, it's partly because the enabling technology hasn't been widely available. A first attempt at a standard for proactively monitoring and diagnosing distributed LAN segments came in the form of the Internet Engineering Task Force's (IETF) Remote Monitoring (RMON) standard (RFC 1251) introduced in 1992. However, the original RMON spec only defines diagnostics and monitoring through the data link layer (the Open System Interconnection, or OSI, Layer 2). For higher-level diagnostics, vendors have begun to implement the RMON2 (RFC 1757), which can be used to monitor application-level traffic—OSI Layer 7.

The RMON standard is officially only available for Ethernet and token-ring networks, but nevertheless vendors are building it into devices designed to handle WAN traffic. NetScout Systems Inc., Chelmsford, MA, a pioneer in the field, announced the first RMON-based WAN probes in 1993. Based on NetScout's EnterpriseRMON architecture, a superset

of the RMON1 and RMON2 standards, NetScout probes are available today for frame relay, as well as Ethernet, token ring, FDDI, Fast Ethernet and switched LANs. In addition, the same devices are also available from networking giant Cisco Systems Inc., San Jose, CA, which resells the NetScout line as its SwitchProbe line.

Other companies focused on WAN service have taken a similar RMON-based approach. Visual Networks, whose Visual Uptime service-level management system has been licensed by national carriers AT&T, MCI Telecommunications Corp. and Sprint Communications Co., is one example. Visual Uptime relies on an RMON-based Analysis Service Element (ASE), a data collection device that is integrated into frame relay Data Service Unit/Channel Service Unit (DSU/CSU) devices, to transmit data performance back to its Performance Archive Manager, an NT database application that generates reports on the status of the WAN link.

NetReality has introduced a WAN management platform based entirely on RMON called WiseWan. In its initial implementation, WiseWan can be outfitted with applications for troubleshooting real-time network traffic, for analyzing longer term statistics and for shaping WAN bandwidth on the fly.

Network managers want more than just knowledge of what's going on with their networks; they want to be able to control them. For these administrators, the networking industry has developed a new product category, that of bandwidth management.

If the market at large has been reluctant to adopt RMON and RMON2, it's in part because of RMON's reputation for proprietary add-ons and incompatibilities among vendor implementations. Vendors concentrating on the WAN market, however, defend the practice of going beyond the standard's definition, citing the fact that, as it stands, RMON2 cannot deliver what they need it to do.

A NetScout Systems white paper entitled "RMON, RMON2, and Beyond," available from the company's Web site (<http://www.netscout.com>), lists two major categories of support as being necessary if RMON2 is to be effective as a troubleshooting and network management platform for distributed environments: advanced client/server support, in order to reduce the bandwidth overhead inherent in network monitoring; and advanced network topology support, that is, support for FDDI, Fast Ethernet and ATM networks, and for switched environments.

The Shape of Traffic to Come

Ultimately, network managers want more than just knowledge of what's going on with their networks; they want to be able to control them. For these administrators, the networking industry has developed a new product category, that of band-

Network Management

width management. Sometimes referred to as traffic shaping, the bandwidth management discipline takes many forms. Bandwidth management functionality can come as a software-only solution, or it can be integrated into a network device. It can refer to the process of allocating bandwidth resources for a given group of applications, or it can imply the more meddlesome approach of controlling data flow at the application level.

Check Point Software Technologies Inc., Redwood City, CA, is one vendor that offers a software-only bandwidth management product. Called FloodGate-1, the bandwidth manager is based on the company's Stateful Inspection technology, which allows the software to look into packets and determine not just what kind of packet it is—let's say a TCP/IP packet—but what specific sort of TCP/IP packet it is. For example, FloodGate-1 can differentiate between an ordinary HTTP packet and a PointCast Inc. PointCast packet, says FloodGate-1 product marketing manager Greg Smith. This way, the bandwidth manager can classify traffic based not just on network protocol, but on application. Other criteria by which FloodGate-1 can classify traffic include user group and direction, that is, whether the traffic is inbound or outbound.

Once the traffic has been classified, FloodGate-1 assigns it a priority according to rules specified by the administrator. "You can manage traffic by setting limits and guarantees," explains Smith, "for example, the maximum bandwidth you want to assign to a class of traffic, or the absolute minimum." Another approach is to weight traffic classes, that is, ratio them out. "For

every 10 FTP packets, let one PointCast packet through," suggests Smith. This approach is reportedly the most popular of the bunch, because it permits mission-critical traffic to get through but doesn't completely starve out lower priority traffic.

Check Point's reasoning for why it offers FloodGate-1 as a software-only application is so that bandwidth management functionality resides on the same server as the organization's security software. In Check Point's case, security is handled by Firewall-1, the company's firewall product, which performs the black and white task of letting traffic through, or not. The bandwidth management software, thus, performs the comple-

Rule Name	Source	Destination	Service	Control	Install On
Inbound Web	Any	Web_Server	http	Weight 50	All
Outbound Web	Local_Net	Any	http	Weight 25	All
PointCast	Any	Local_Net	PointCast	Weight Limit 10000	All
Video Conference	Ramote_Office	Management_Group	netmeeting	Weight 30 Guarantee 30000	All
Sales VP Exception	Sales_VP	Sales_Server	ftp	Weight Exception 40	All
Field Sales	Field_Sales	Sales_Server	Any	Weight 10 Guarantee 5000 Limit 20000	All
Default				Weight 10	All

Check Point Software's FloodGate-1 bandwidth management software can classify network traffic by protocol, application, user group and whether the traffic is inbound or outbound.

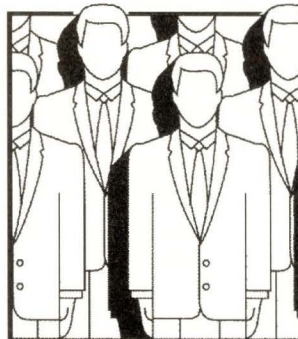
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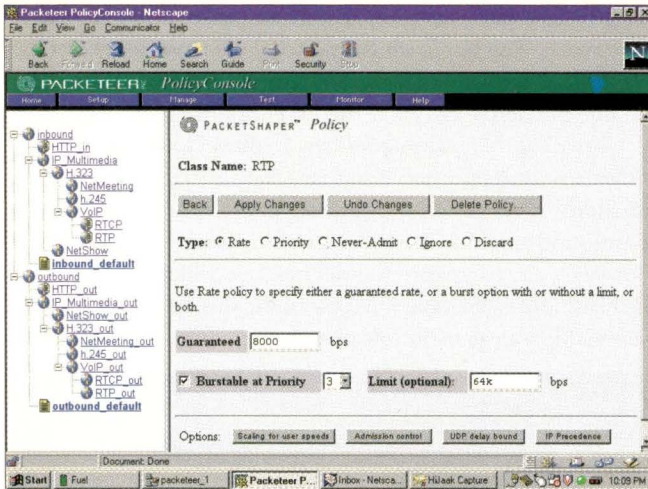
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Network Management



PacketShaper from Packeteer manages bandwidth using TCP rate control, by detecting real-time flow speed, delaying acknowledgments and modifying packet window sizes sent to the transmitter.

mentary task of assigning priority to the approved packets.

Packeteer Inc., Cupertino, CA, another bandwidth management vendor, is an ardent proponent of bundling bandwidth management into a dedicated hardware device. "When you're dealing with mission-critical traffic, the last thing you want is to have to compete for CPU cycles," says Bob Quillin, Packeteer's vice president of marketing.

Packeteer's PacketShaper family also illustrates another debate within the bandwidth management community:

whether to queue traffic or engage in TCP rate control. "Our motto is rate control when you can, queue when you must," Quillin says. In the context of TCP/IP, explicit rate control (as opposed to flow control) should have the effect of minimizing the burst and delay quality of Internet traffic. This is achieved by controlling the end-to-end TCP connection, that is, detecting the real-time flow speed, then delaying acknowledgments back to the receiver, as well as modifying the window size of the packets sent to the transmitter.

In a sense, TCP/IP is a victim of its own success, and bandwidth management products are there to compensate for perceived shortcomings of the protocol. Originally designed for applications such as telnet and FTP, TCP/IP was never equipped to handle users' expectations of high-speed transmissions, interactive network applications or applications that demand consistent quality of service such as streaming video. That's what ATM was supposed to do.

There are efforts under way to remedy some of the problems TCP/IP is facing in light of staggering Internet growth. In particular, the IETF has proposed a slew of new protocols under the IP Multicast heading, which it would include in the next version of IP, IPv6. Together, protocols such as the Resource Reservation Protocol (RSVP) and the Real-Time Transport Protocol (RTP) should help alleviate congestion on the Internet and improve quality of service, particularly when it comes to multimedia applications. In the meantime, however, network managers should not be surprised if they must resort to proprietary, nonstandard ways of meeting their wide-area performance needs. ➔

Companies Mentioned in this Article

Cabletron Systems Inc.

35 Industrial Way
Rochester, NH 03867
<http://www.cabletron.com>
Circle 150

Check Point Software Technologies Inc.

400 Seaport Court, Ste. 105
Redwood City, CA 94063
<http://www.checkpoint.com>
Circle 151

Cisco Systems Inc.

170 W. Tasman Drive
San Jose, CA 95134
<http://www.cisco.com>
Circle 152

Concord Communications Inc.

33 Boston Post Road
West Marlboro, MA 01752
<http://www.concord.com>
Circle 153

Hewlett-Packard Co.

3000 Hanover St.
Palo Alto, CA 94304
<http://www.hp.com>
Circle 154

NetReality

4 Rojanski St.
Rishon LeZion
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<http://www.netreality.com>
Circle 155

NetScout Systems Inc.

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<http://www.netscout.com>
Circle 156

Packeteer Inc.

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Sun Microsystems Inc.

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<http://www.sun.com>
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Austin, TX 78759
<http://www.tivoli.com>
Circle 159

Visual Networks Inc.

2092 Gaither Road
Rockville, MD 20850
<http://www.visualnetworks.com>
Circle 160

doesn't do so well with more complex mathematics.

When I first ran TtH on a sample document, it didn't actually get all the way through. That's not a good sign, but some simple changes fixed the problem. I tend to stray from simple LaTeX style, and that's where TtH gets into trouble. With more ordinary LaTeX code, it works fine.

If you'd like to give TtH a try, get the source code, `tth_C.gz`, from <http://hutchinson.belmont.ma.us/tth/tth.html>. This is a GNU compressed file; decompress it using `gunzip`, `gzip` or `zcat`. The result is an oddly named tar file. Extract the contents with `tar` and compile the program using `make tth` (no Makefile is necessary). Install the binary in `/usr/local/bin` and you're all set. TtH runs as a filter, translating TeX input to HTML output. An example use looks like this:

```
tth < xxx.tex > xxx.html
```

What could be easier?

latex2html – LaTeX to HTML

If you have a more complex document, one with lots of chapters or mathematics, you should go with `latex2html`. It is the most capable of all LaTeX-to-HTML translators. Make sure you have the latest version, which is 97.1 as of this writing. There are many improvements with the 97 release.

`latex2html` usually formats mathematics using TeX itself. The math source is TeX'd (or LaTeX'd). That output, a DVI file, is converted to PostScript, then to a graphics metadata format and, finally, to a GIF or JPEG image. This image is then incorporated into the Web document. The process sounds complicated but has the advantage that the equations you type are the equations you see. Because of all the conversions, there are some extra programs you need along with `latex2html`. You should acquire and install all of the programs listed in Table 1.

`latex2html` comes with an excellent user manual. It's in LaTeX, of course, and comes with the distribution. Given the inherent difficulty of emulating a complex text formatter, `latex2html` works remarkably well. It will do a good job on all your documents. But be sure to include a link to a formatted PostScript or DVI copy of the document somewhere on your Web pages.

Table 1. latex2html Programs

- `latex2html`
Get Version 97.1 from <http://cbl.leeds.ac.uk/nikos/tex2html/>. This is Perl code, so there's not much to the installation.
- `perl`
Get Version 5 from <http://www.perl.com/>. `latex2html` is written in Perl.
- `latex`
Of course, you already have this. `latex2html` uses the LaTeX program to format mathematics. Any recent version of LaTeX will do.
- `dvips`
You probably already have this as well. It comes with most LaTeX systems. `latex2html` uses `dvips` to convert formatted mathematics from DVI to PostScript.
- `ghostscript`
Get Version 5 from <http://www.cs.wisc.edu/~ghost/>. `latex2html` uses GhostScript to convert PostScript to the Portable Pixmap (ppm) format.
- `netpbm`
This graphics package hasn't changed in years. One source is <ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM>. `latex2html` uses `netpbm` to convert the ppm files to GIF.

Q: Your article in *SunExpert* ("LaTeX, the Old and the New," November 1997, Page 72) was timely. I have been desperately trying to become TeX literate, but failing miserably because I cannot for the life of me figure out how to acquire the software from CTAN (Comprehensive TeX Archive Network) sites. I would like to acquire the TeX program and LaTeX macros along with the DVIwares such as `dvi2ps`, `xdvi`, `latex2html` and so on for my Silicon Graphics Inc. system running IRIX 6.2. Which packages should I download? 🐞🐞

Anantha Prasad
USDA Forest Service

A: Hey! This is Q&AIX, not Q&SGI. Fortunately, TeX is very portable. Whatever applies to UNIX in general applies to AIX and Silicon Graphics' IRIX. There is indeed a bewildering mass of TeX source at the distribution sites. It can be difficult to decide what is necessary.

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Table 2. TeX Software at /pub/tex/ctan

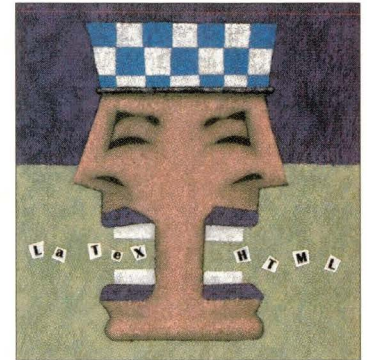
- /systems/web2c/texmflib.tar.gz
This is a collection of fonts and macro packages. It includes LaTeX.
- /systems/web2c/web.tar.gz
These are the TeX source files. Don't confuse this "web" with *the* Web. This web is a programming language developed by Don Knuth, TeX's author. The web source translates into Pascal.
- /systems/web2c/web2c.tar.gz
These programs convert web to C, instead of the original Pascal.
- /dviware/dvipisk/dvipisk.tar.gz
This is the DVI-to-PostScript converter. DVI files are TeX's metadata output.
- /dviware/xdvik/xdvik.tar.gz
This program displays DVI metadata files on an X server.

You have a couple of choices: Get what you need off the Web or get a CD with the basics and use the Web for updates. Everything is available via FTP. You want to find a CTAN directory; one is `ftp://ftp.cdrom.com/pub/tex/ctan`. In that directory, you'll find all the TeX software (Table 2 shows what you will need).

Some of these files include precompiled binaries for several UNIX systems, but there are still a lot of files. You might find it easier to get a CD with everything on it. There are several available to make your installation easier;

check out <http://www.tug.org/tex-live.html> or <http://www.cdrom.com/titles/prog/tex.htm>.

Regardless of how you acquire a basic system, you'll want to go to the CTAN site to get occasional updates. TeX has a very active user and developer community. ⇔



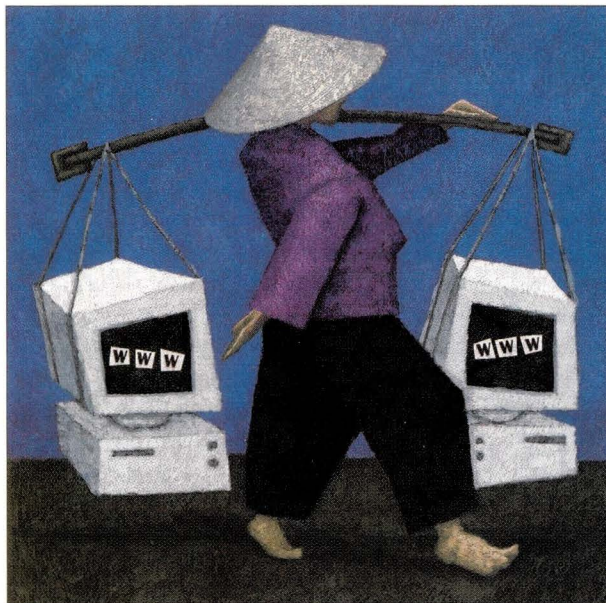
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Datagrams

by John S. Quarterman



The Internet in Vietnam

John S. Quarterman is president of Matrix Information & Directory Services Inc. (MIDS), which publishes Matrix Maps Quarterly, Matrix News (monthly) and the MIDS Internet Weather Report (daily). John has written or co-authored seven books, but the best known one is still The Matrix. For more information, see <http://www.mids.org>. He can be reached by email at jsq@mids.org, by voice at (512) 451-7602 or by fax at (512) 452-0127.

Back in August 1993, I started hearing that networking in Vietnam was going to boom when the United States finally dropped sanctions against that country—70 million people who want modern communications, and many prospective funding agencies wanting to pay for it. The government of Vietnam had made telecommunications a priority. This sounded like a very attractive picture.

Of course, at the time, there was only one UUCP link into the country, between Hanoi and Karlsruhe, Germany. This link had been operational since 1992. It worked in the same manner as the UUCP link from Beijing to Karlsruhe. The Internet was only a rumor in Vietnam, and the Internet is different from traditional telecommunications. How would a nominally Communist country react to a technology that permits unfettered local, national and international communications on a one-to-one, one-to-many and many-to-many basis? Judging by how China reacted, the obvious prediction would have been not favorably. Or would a better analogy be Russia, where there was a huge IP network with not much outlet to the world until U.S. policy changed? Perhaps. Vietnam had a policy of *Doi Moi* (literally, “renovation”),

an open door to the outside world for purposes of economic development. It had recognized information technology as part of this opening and as a driver of economic development.

By April 1994, there were a dozen IP nodes in Vietnam, organized as VARENET, Vietnam Academic, Research and Educational Network. It used domain names under the top-level domain `VN`, with subdomains `ac.vn` and `gov.vn`, in an interesting mixture of European- and U.S.-style names. Also projected were `edu.vn`, `com.vn` and `org.vn`. There was a UUCP link to Australia (`coombs.anu.edu.au`), transporting electronic mail to the outside world. The top-level domain `VN` was itself registered with the outside world on April 14, 1994.

There were other means of networking from Vietnam, but they were limited. CompuServe users could reach the CompuServe Information Systems (CIS) node in Hong Kong. The United Nations Development Program (UNDP) network had a node in Vietnam. And, of course, sufficiently motivated, rich and connected people could telephone internationally, but that was expensive.

Meanwhile, numerous academics in

Vietnam were quite aware of the Internet, and some were corresponding with the outside world, as were Vietnamese expatriates. And there was an annual national informatics conference held in Hanoi. This seemed quite promising.

Not unexpectedly, in April 1994, the Ministry of Science, Technology and the Environment (MOSTE) released guidelines for information technology that included import restrictions on related equipment. According to the guidelines, equipment must be selected "on the basis of quality and of capability for connecting to local and national networks," or standards. This seemed innocuous enough.

Or it would to most people who didn't remember GOSIP, the infamous U.S. Government Open Systems Interconnection Procurement standard, which attempted to force all U.S. government agencies to buy OSI software when TCP/IP was clearly the technical and market winner. So was MOSTE trying to impose OSI at such a late date? Could be. GOSIP only finally bit the dust on September 16, 1994, when the U.S. National Institute of Standards and Technology (NIST) entered a notice in the Federal Register for a FIPS 146-2 that renamed GOSIP to Profiles for Open Systems Interworking Technologies (POSIT) and removed the requirement to procure only OSI protocols (see "The Demise of GOSIP," <http://www.mids.org/mn/410/gosip.html>, *Matrix News*, 410, October 1994).

But the text of the MOSTE document seemed to carefully define open systems in generic terms, not as ISO-OSI. The biggest concern seemed to be in trying to get the market to settle on a single character code for the Vietnamese alphabet. As someone remarked, it's difficult for an elephant to dance, but this one seemed to be trying to do so.

Meanwhile, in May 1994, a Sun SPARC 5 UNIX workstation and related

equipment to serve as an X.25 packet assembler/disassembler (PAD) was placed at the Institute of Information Technology (IOIT) in Hanoi by the Australian National University (ANU) in Canberra. This was used to connect through the X.25 networks Vietpac and Austpac. It permitted an actual IP connection, not just UUCP.

I'm not clear on exactly when IP over X.25 was first used between Vietnam and Australia; as might be expected, there were delays in delivery of the equipment, and the IP connection was still not up in July 1994. The X.25 link itself appears to have been working by June 1994.

It's interesting to see how quickly related technology changes. Not only was UUCP still in use in Vietnam in 1994, but Waffle (a USENET-compatible bulletin board system (BBS) system that supports UUCP, UUCP mail and USENET news) was still in widespread use there. This was a BBS that ran under MS-DOS and was a popular setup in many developing parts of the world. I'd almost forgotten about it until I was reading through my files about Vietnamese networking history.

Invisible Network

By July 1994, there were 35 registered DNS node names in Vietnam. All of them apparently could exchange mail via the international UUCP link, but none of them were interactively visible to the outside world. Some of them were interconnected within Vietnam via IP, especially in Hanoi, but apparently many of them were still using UUCP as late as the end of 1994.

Meanwhile, a southerly gateway into Vietnam, from Ho Chi Minh City (Saigon) to ANU, was planned to be demonstrated by August 1994, using UUCP over X.25, like the northern gateway in Hanoi. I'm not sure it was actually in place by then.

In December 1994, another network started in Vietnam, called NetNam. It

was dedicated to nongovernmental organizations (NGOs), and was mostly UUCP-based, emphasizing electronic mail. Vietnam had begun to look like Europe circa 1988 or Latin America circa 1991 as far as its networking structure. Independent schemes for further network development similar to those that came out of those other regions in those periods started to appear in Vietnam, as well.

By January 1995, the main drawback of X.25 became evident. X.25 had been chosen over telephone modem dial-up because of higher reliability. Unfortunately, as network traffic increased, so did costs, because X.25 is volume charged. Alternatives to X.25 were sought, just as they had been sought in Europe for the same reasons about 1989. And the same solutions were found: fast (9.6 Kb/s) modem dial-up connections. The X.25 link was phased out completely by the end of January 1995.

This cost problem arose just as the original Australian government grant that had been paying for the international VN-AU link for years expired. The costs were left to be shared among the network sites in Vietnam, again reminiscent of the EUnet method of dealing with international link costs between Europe and the United States (and Australia) around 1989. And, similarly, the Vietnamese limited themselves as to how much traffic they were willing to send over the link, because of the cost.

The same solution was proposed as had been floated in Europe: commercialization. Note that this is more than a year since the first big talk about Internet commercialization in Vietnam. An impetus to actually do it had finally arisen.

These events bring two thoughts to mind. First, volume charging adversely affected the poorer users (the Vietnamese), not the richer ones (the Australians). This is the opposite of the effect predicted by those who advocate charging on the Internet. Second, government subsidy of the international link helped in the early days by making the link possible, yet that subsidy also had the contrary effect of suppressing commercialization until the subsidy ended. Government involvement in networking doesn't always have the intended effect.

By January 1995, there were about

Government subsidy of the international link helped in the early days by making the link possible, yet that subsidy also had the contrary effect of suppressing commercialization until the subsidy ended.

Datagrams

130 VARENET nodes, still mostly in Hanoi. There were even some commercial users of VARENET.

In February 1995, a three-tier pricing structure was announced for use of the international link, with gov.vn, ac.vn and edu.vn users paying 20 U.S. cents per kilobyte, other Vietnamese (apparently a polite way to say "commercial" users) paying 21 cents and everybody else (foreigners) paying 22 cents. These prices were for mail and files. Evidently, the dial-up connections were still effectively prohibiting use of IP.

Also in February 1995, the Department General of Posts and Telecommunications (DGPT) announced, including in electronic mail to the people already doing networking in Vietnam, its interest to set up permanent Internet connections to Vietnam, first by satellite, then by fiber-optic leased line. This was something that had not happened in the European analogy back in 1989. European governments at the time had still been pushing OSI, so the Internet mostly happened in spite of them, especially beginning in 1991. So here we have a case of Vietnam being more enlightened technologically in its time than Europe had been. The fiber-optic links were expected to connect with Thailand and Hong Kong.

In the same month, February 1995, NetNam was going well enough to start advertising rates. Its international per kilobyte charges were only 15 U.S. cents. These rates were partly subsidized by fixed monthly charges, for which NetNam recognized three tiers of pricing. The three recognized tiers were different than those for VARENET. They were "normal" at \$30 U.S. dollars per month, "NGO and charity" at \$20 and "very low income" at \$10 per month. Registration fees were similarly tiered (\$20, \$10 and \$0). There was also a one cent per minute connection charge. This rate structure bore some resemblance (monthly fee plus connect time charges) to the rate structures being adopted by U.S. commercial Internet service providers (ISPs) at around the same time. By May 1995, this originally nominally NGO network was openly calling itself a commercial ISP.

By April 1995, there were proposals

from Telstra, a large Australian ISP, to handle a 64-Kb/s leased line to Vietnam (agreement signed June 1995), and from the Vietnamese PTT, Vietnam Posts and Telecommunications Corp. (VNPT), to develop commercial IP infrastructure in Vietnam. A few months later, the predictable confusion between these two projects occurred, when Vietnam Telecommunications International (VTI),

the Vietnamese provider of the leased line, decided to get involved in the value-added service of IP provision. This was all normal, judging by what had previously happened in other countries. Unfortunately, this time the governmental supplier actually refused to supply the leased line to its competition (Telstra and IOIT). Sprint Communications Co. L.P. was even heard to be

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planning a Vietnamese service, which is usually a sign that a country is ready to join the Internet. In fact, it turned out that Sprint was planning to do this with the Vietnamese government.

In May 1995, Ha Hoang Hop, announced he had completed a bilingual Vietnamese and English booklet on the Internet in Vietnam, aimed at end users, not technical people. This means there must have been enough end users to make such a project worthwhile by then.

In July 1995, the United States finally announced a decision to establish full diplomatic relations with Vietnam.

Somewhat surprisingly, it wasn't until August 1995 that the first rumors began to circulate regarding the Vietnamese government's concern about Internet content. Or maybe not so surprisingly, because until this time, networking in Vietnam was mostly limited to academics and government agencies and was unlikely to affect the public. But with the relaxation of U.S. government restrictions, an Internet boom could finally be expected. And, certainly not surprisingly, it was about the same time that VNPT was

reputed to be trying to monopolize all telecommunications value-added services, which would include the Internet. In September 1995, VNPT made this attempt explicit, asking the Vietnamese government to let it control electronic mail and the Internet, on grounds of "national security." This was in conjunction with a deal with Sprint to supply an international leased line.

Copyrighted 1996, a book about the Internet in Vietnamese appeared: *Cam Nang Len Luoi Internet (The Guide to the Internet)*, by Vu Quo'c Dung. See "Vietnamese Internet Guide," <http://www.mids.org/mn/704/vn.html> in *Matrix News*, 704, April 1997.

Regarding VNPT's request for control of the Internet in Vietnam, DGPT finally made a decision in May 1996. ISPs were tasked with protecting both national security information and private information, plus culture, morality and traditions. And ISPs were required

to be licensed. Licensing required review of their proposed fees by DGPT. Apparently, even users were required to register with DGPT. Penalties could include up to three years in jail. Thus, DGPT effectively granted VNPT's request for control of the Internet. This control was even more draconian than that passed by the U.S. Congress the same year in the form of the so-called "Communications Decency Act," and finally torpedoed by the U.S. Supreme Court in June 1996 (see "CDA Buried," <http://www.mids.org/mn/707/cda.html> in *Matrix News*, 707, July 1997).

By July 1996, MIDS saw 26 Internet nodes in Vietnam, although only five were under the VN top-level domain. Most of the nodes in Vietnam were either still using UUCP or were not even routing DNS to the outside world. It's not clear that there was IP connectivity to Vietnam yet; just some DNS visibility.

In August 1996, the long-standing mail link from Hanoi to Canberra was disrupted by poor telephone service in Hanoi. VNPT claimed to be aware of the problem but was slow to fix it. These unexplained outages continued into September.

In September 1996, China had moved as far as real IP connectivity, together with governmental blocking of selected Web Servers. Vietnam, meanwhile, had governmental restrictions but not even any international IP service yet. This was because VNPT had

refused to let either NetNam or VARENET buy an international leased line over which to run IP.

By March 1997, there was *still* no international Internet access to Vietnam, although there was quite a bit of Vietnamese information available on Web servers based in other countries, particularly in Australia and the United States. The Vietnamese government elephant had meanwhile lumbered as far as starting to establish a control board to monitor the Internet. Even Cambodia had already signed a definite agreement (with Telstra) to start Internet access, but Vietnam was still dragging its feet. The Vietnamese government was, that

is. Vietnamese people had already set up cybercafés in Saigon, and numerous groups were forming local ISPs. Electronic mail traffic through the IOIT link with ANU was doubling about every six months. Sales of PCs and other computers in Vietnam were exploding. VNPT was even offering ISDN but not yet permitting international Internet access.

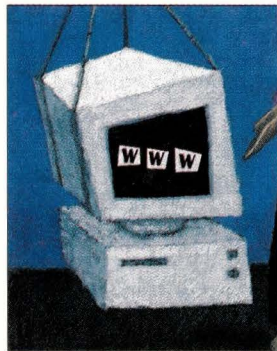
As late as May 1997, the Vietnamese government was still issuing directives containing the national security line. Meanwhile, VNPT was trying to control other information access, by banning callback telephone connections.

So when did Vietnam finally have IP connectivity to the outside world? This is a difficult question to answer. VNPT had it in one form or another for quite some time, apparently. The prime minister was supposedly going to announce some form of access for everyone else in September 1997, but didn't. Then November was rumored. The formal announcement finally came on November 19, 1997. Licenses for ISPs were finally permitted on that date, and four ISPs signed up: Vietnam Data Transmission, Saigon Postel, Finance Promoting and Technology Company, and the IOIT. Actual end-user use was to start on December 1, 1997. It didn't, of course. The real start date appears to have been January 1998. This is for ISPs using firewalls to limit traffic content. Real unfettered access is still not permitted.

By reviewing this history, I have been confirmed in repeating what I usually say when asked what governments should do about the Internet: "Stay out of the way!"

This has been only a sketch of the history of the Internet in Vietnam, mostly taken from my files. Most of my information came from people who have been discussing Vietnam and the Internet for some years now—too many to name. In this historical overview, I have hit the high spots and discussed mainly points that have been publicly revealed long ago in other forums; I have merely brought them together in one chronology, with commentary.

I expect there are many interesting current developments in Vietnam, and I may follow up in a later column on those. ➤



AIXtensions

by Jim DeRoest



RS/6000, Still Rockin'

Jim DeRoest has been involved (for better or worse) with IBM UNIX offerings from the IX/370 days, through PC/IX, AIX RT, AIX PS/2, AIX/370, PAIX, AIX/ESA and AIX V3. He is employed as an assistant director supporting academic and research computing at the University of Washington, and is the author of AIX for RS/6000—System and Administration Guide (McGraw-Hill). He plays a mean set of drums for the country gospel band Return. Email: deroest@cac.washington.edu.

It has been a number of years since I've written a column about electronic music and AIX. This is largely because the road to squeezing an audible chirp, squawk or bang out of an RS/6000 hasn't always been easy. My old system disk has made all kinds of noises for years, but I've never been able to orchestrate them into anything pleasing to the ear. Considering what goes for "music" these days, maybe I should record it. I could start a whole new genre, "Techno Compu Grunge, the new Seattle sound." I could even set up an audition with Bill Gates and get him to play it on the Microsoft Network. Maybe I've got something here!

Back to planet Earth. Early on, if you wanted to synthesize audio on a UNIX system, you got yourself a NeXT Computer Inc. or Linux box. The only synthesis options for the POWER Micro Channel musician was wrestling with IBM's Multimedia Audio Capture Playback Adapter (M-ACPA) or with a third-party Digital/Analog Converter (DAC). The problem with these devices was they didn't support many standard sound formats and there wasn't much in the way of available software to drive them.

Times and technology have changed over the last two to three years, and things have

gotten much better. Enter Ultimedia Services for AIX and the Ultimedia Audio Adapter for Micro Channel. These provide the basic tools needed to record, play and sequence most audio formats on a POWER architecture computer. Yet, as nice as the Ultimedia system is, it is still limited compared with the audio resources available in the Intel Corp. x86 and Apple Computer Inc. Macintosh worlds. This void has partially been filled by a crafty fellow, Dev Mazumdar.

Mazumdar started by coding an AIX Micro Channel driver for Creative Labs Inc.'s Sound Blaster MCV adapter (<http://www.soundblaster.com>). With the advent of PCI and ISA support in the PowerPC line around 1993 or 1994, Mazumdar's company, 4Front Technologies, Los Angeles, CA (<http://www.4front-tech.com/index.html>), has since developed drivers for most of the popular sound cards on the market. More about this later. First, let's take a look at the basics of computer audio and music synthesis.

Computer-Generated Music

Computer-assisted audio synthesis and compositional techniques have been explored since the mid-1950s. Initially, composers such as Iannis Xenakis used computers to

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generate statistical distributions of patterns for musical compositions. The composer would plan the general flow and shape of a piece and then use random distribution techniques to construct sound patterns and sequences that may not have otherwise been envisioned. Audio synthesis algorithms were later added, which allowed a composer to incorporate unimagined sound textures into a composition. The duality of computer audio synthesis and composition fit well with the standard notion of orchestration and composition and, thus, influenced the development of new synthesis and composition languages such as Max Mathew's "Music" and Barry Vercoe's "Csound."

The advent of personal computers brought similar computer synthesis techniques into the home studio. Although the market is essentially directed at the audio requirements for computer gaming, the resulting components can often be used to manipulate and orchestrate musical compositions on a PC. The

development of the Musical Instrument Device Interface (MIDI) specification, which was introduced in 1983, provided a means for using a computer to sequence wave forms and manipulate more advanced audio devices such as synthesizers, samplers and other computers. The neat thing about audio processing on a computer is you are not restricted by the interfaces hardwired into more advanced devices like synthesizers and samplers. Because you have programmatic control over wave timbres and orchestration, you can bend the rules a bit: explore new sound synthesis algorithms, develop new tools and protocols. After all, this is what creative expression is all about.

Computer music is created by first generating or sampling digital audio wave forms. Sampling is the process of recording discrete snapshots of an analog signal. The frequency of snapshots to

Example 1. Typical MIDI Sequence

Performance Action	MIDI Message
1. Select Harpsichord Voice	(PROGRAM CHANGE)
2. Forte Attach	(VELOCITY)
3. Play Middle C	(NOTE ON)
4. Release Slowly	(AFTER TOUCH)
5. Release C	(NOTE OFF)

wave frequency is carefully controlled to render an accurate digital representation of the input signal. This is all handled by the analog-to-digital encoder on the computer's sound card. Digital wave forms may also be constructed using algorithmic methods to create yet unheard sound palettes. The resulting wave forms can then be acoustically rendered from a digital signal processor on the sound card or synthesizer. Keep in mind that there are a large number of wave form formats; the format generated by one tool may not be compatible with other tools or signal processors. IRCAM, the European Institute for Acoustic and Music Research based in France, has made some headway in defining standard formats. An audio format guide is available via anonymous FTP to [ftp.cwi.nl/pub/audio](ftp:cwi.nl/pub/audio). Once a sound set has been created it can be sequenced into a nice melody using a compositional language or a MIDI sequence.

A Word about MIDI

MIDI is a somewhat standardized protocol that allows computers, electronic musical instruments and effects processors to share control information. MIDI messages passed between these devices indicate the what, when and how of the nuances and gestures that make up a musical performance. In a sense, it is similar to an elaborate master-slave remote control network. A MIDI message does not contain the audio signal itself, but rather the control information that specifies how and when to create a particular event on the sound generator.

MIDI messages are transmitted at up to 31.25 Kb/s over five-wire DIN (stands for Deutsche Industrie Norm) cables between devices. A message may be sent or received on one or more of 16 data channels. Each message is made up of 8-bit bytes and will usually consist of

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Circle No. 29

AIXtensions

a combination of one to three status and/or data bytes. Status bytes direct actions such as note on, note off, velocity (attack), controller position, program change, after touch (key or pad pressure) and pitch bend. Data bytes specify things such as the note number (0-127) or the position number of a controller wheel or switch. An example MIDI message might select the actions on a keyboard synthesizer as shown in Example 1.

MIDI is an excellent protocol for collaboration and sharing between composers over a network. Even with a slow modem connection, it's possible to generate MIDI sequences for a remote sound device. Web pages do it every day. Imagine jamming with a group of musicians scattered around the world. When participating in a remote jam session, care must be taken to ensure that everyone sharing MIDI data files is not using system-exclusive commands. System-exclusive commands are parameters that have been added by the vendor to take advantage of some proprietary feature.

Also, some agreement must be made as to what voices and channels will be used. In 1991, the General MIDI (GM) specification was defined for just such a purpose. GM is a refinement of the Standard MIDI specification, which didn't guarantee interoperability.

Another specification, dubbed Extended MIDI (XM), was introduced in 1995 by Eric Lukac-Kuruc, an engineer at Digital Design and Development, and is gaining wider attention in the MIDI community, primarily in Europe. The XM specification defines more channels, more parameter types and higher speed than the existing specification. The idea is to realize denser transmission of messages. I play MIDI-controlled electronic drums and can vouch for the fact that MIDI messages can be dropped when you've got a lot happening over a thin 31.25-Kb/s bandwidth. Other MIDI extensions have been implemented by Yamaha Corp. (<http://www.yamaha-xg.com>) and Roland Corp. (<http://www.rolandus.com>), the XG and General MIDI Stan-

dard (GS), respectively, that are directed at enriching and broadening the MIDI sound set. The MIDI Manufacturers Association (MMA) was founded in 1984 to assist in defining this evolving standard. In that the MMA is made up of vendors all competing to have their own extensions included in the specification, this is often an uphill battle.

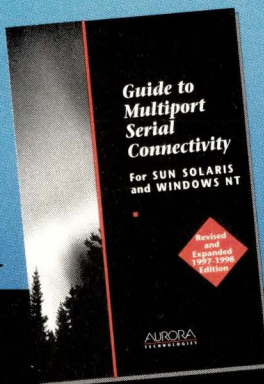
Sound for the RS/6000

So you want to make your PowerPC sing like a bird? On the software side, the easiest way to get started is by installing Ultimedia Services for AIX (see Table 2). What you'll get is a set of multimedia tools integrated into the AIX Common Desktop Environment (CDE). Using the Ultimedia tool set, you can record, play, edit, compress and convert most standard audio formats—this includes 8-bit and 16-bit PCM, wav, snd, au, Mu-law and A-law formats. There's a nice object programming API that can be used with the IBM System Object Management (SOM) architecture and it is callable by

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TECHNOLOGIES

Table 1. Music and Audio Software

Chord	Lyrics and chord formatting program	Wave	Sound-generation program
Csound	Audio synthesis composition language	Xcmf	Creative music format player
Jam	XView MIDI keyboard program	Xdrum	Drum sequencing program
Karalin	MIDI-based karaoke application	Xfmedit	Editor for controlling FM synthesizer registers
MiXViews	UNIX-based digital audio processing program	Xmidi	MIDI player
Sigen	/dev/dsp signal generator	Xmuseq	Piano-roll-style MIDI editor
StudioSound	Multitrack recorder, mixer for X11 Motif	Xsynth	Keyboard synthesizer interface
Tclmidi	Tcl/MIDI editor, sequencer	Xwave	Audio editor, player and recorder for X11
TiMidity	MIDI-to-Wave converter		

Note: A larger list is available at 4Front Technologies' Web site (<http://www.4front-tech.com/index.html>).

Table 2. Useful Electronic Music Resources

AIX Ultimedia Services http://www.austin.ibm.com/hardware/adapters/ultimedia.html	Keyboard Magazine http://www.keyboardmag.com
Audio Engineering Society http://www.aes.org	Keyboards Online http://www.keyboards.de
Bibliography of computer and electronic music http://alpha.science.unitn.it/~oss/bibliographye.html	Mix Magazine Online http://www.mixmag.com
ChipChat Technology Group http://www.chipchat.com	MIDI Manufacturers Association http://www.midi.org/
Computer Music Journal http://mitpress.mit.edu/e-journals/Computer-Music-Journal/	Music & Computers Magazine http://www.music-and-computers.com
Digital Music Newsletter http://pages.prodigy.com/digitalmusic/	Society of Motion Picture and Television Engineers http://www.smpete.org
Electronic Musician http://www.cardinal.com/publications/index.htm	Sound Advice newsletter http://www.soundav.com/index.html
EQ Magazine http://www.eqmag.com	Timara computer music links http://timara.con.oberlin.edu/resources/links/links.html
id Software Inc. http://www.idsoftware.com	Worldwide Internet music resources http://www.music.indiana.edu/music_resources/
IRCAM http://mediatheque.ircam.fr	XM http://ourwold.compuserve.com/homepages/eric_lukac_kuruc/xmenu1.htm

C and C++ programs. Ultimedia also provides similar capabilities for video, but that's a topic for another column. Ultimedia-compatible sound cards include IBM's Ultimedia Audio Adapter and ChipChat Technology Group's Micro Channel Sound Board.

If you're not opposed to porting, there are a growing number of public and shareware packages available that have been written for the Open Sound System (OSS) device driver and Direct Music (DM) API specifications (see Table 1). Much of this code is courtesy of the continuing efforts of the legions of Linux programmers. In fact, OSS was derived from Linux (the OSS specifica-

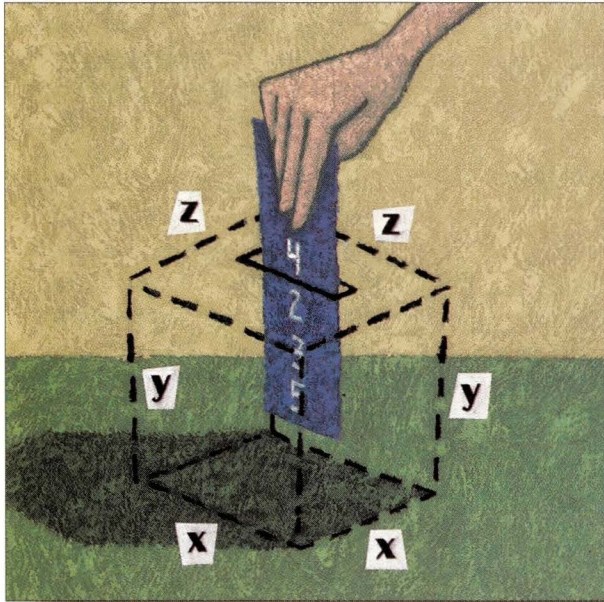
tion is described in Jeff Tranter's *Linux Multimedia Guide*, O'Reilly & Associates Inc., 1996, ISBN 1-56592-219-0). All you need to do is get the OSS driver from 4Front Technologies. 4Front has OSS drivers for AIX and other popular UNIX implementations to drive everything from Gravis Ultrasound (<http://www.gravis.com/>) and Turtle Beach Systems' sound cards (<http://www.tbeach.com/>) to Creative's new AWE64. OSS software from 4Front contains the first commercial implementation of the DM API.

Computer music possibilities have really opened up in the last two years for the RS/6000. Although still lagging

behind the Microsoft Corp. Windows world when it comes to full-feature music sequencing and notation software, POWER architecture brings some heavy processing capabilities to the table that are ideal for wave form manipulation. If computer music isn't really your bag, you still might want to try out the voice-processing features available with Ultimedia services. How about a game of *Doom* complete with sound? Yes, id Software Inc.'s *Doom* has been ported to AIX using OSS drivers. For more information on audio-processing software and hardware, take a look at the Web sites in Table 2. Now that it has finally started to get its sound gear together, the RS/6000 is definitely rockin'! ➡

Work

by Jeffrey Copeland and Haemer



Refinement for Efficiency's Sake

Jeffrey Copeland
(copeland@alumni.caltech.edu) lives in Boulder, CO, and works at Softway Systems Inc. on UNIX internationalization. He spends his spare time rearing children, raising cats, and being a thorn in the side of his local school board.

Jeffrey S. Haemer
(jsh@usenix.org) works at QMS Inc. in Boulder, CO, building laser printer firmware. Before he worked for QMS, he operated his own consulting firm, and did a lot of other things, like everyone else in the software industry.

Even though we never do anything but read and write code, we're surrounded by people who have other interests. Copeland's wife, for example, has been a long-standing member of a group of fellow southerners who share an interest in science fiction. It's an amusingly diverse group, including lawyers, government bureaucrats, technology people, editors and writers. This past year, it was her turn to take the post of the group's secretary, and among her responsibilities is to conduct a poll that determines the group's mostly ceremonial president. Because nothing in such an offbeat group is simple, the poll has a complicated ballot, and she turned to us to write some software to tally the results.

This isn't the most complicated ballot we've ever seen in terms of just determining the winner of an election. (For that, we turn to the preferential ballots used for selecting winners of the Hugo Awards, and seats on

the Cambridge, MA, city council.) The interesting feature of this ballot is that it gives everyone a chance to rank everyone else's performance over the past year in a number of categories suggested by the secretary and even some she hadn't thought of. For example, this year's ballot included a half-dozen categories—for argument, let's call them congeniality, talent, swimsuit, sex, drugs and rock 'n' roll—and then the kicker, a large blank space called "roll your own," in which the voter gets to suggest a category (usually amusing, and at the expense of someone's dignity) undreamt of by the secretary. Each voter assigns points to each member in each category, including the invented ones, according to some limits. (The limits aren't important, but you can think of the obvious schemes: distribute a total of 200 points across all members in all categories; give no more than 20 points to an individual; rank each category for each

Note: The software from this and past Work columns is available at <http://alumni.caltech.edu/~copeland/work.html>.

Example 1. Sample Ballot File

Brown	5	5	5	5	5	5	A most professional amateur	5
Hlavaty	4	5	4	2	5	4	Cannot be second-guessed	5
weber	4	2	2	1	4	4	Irregular but persistent	4
Wells	5	5	4	1	5	5	Old but large cheerleader	5

Listing 1. Our First Shell Script

```

1  #! /bin/sh
2  # $Id: tally,v 1.1 1997/12/19 15:56:01 jeff Exp $

3  # first get a list of the victims from the ballots
4  ls ballots/* | xargs cut -d " " -f 1 | sort -u >/tmp/$$.names

5  # now for each category, total 'em up
6  # (categories start in field 2 on the ballot)
7  fld=2
8  for category in Congeniality Talent Swimsuit Sex Drugs Rock-n-Roll
9  do
10     echo "\\\category{$category}"
11     cat /tmp/$$.names | while read who
12     do
13         cat ballots/* | egrep $who |
14         cut -d " " -f 1,$fld |
15         awk ' { name=$1; total=total+$2 }
16             END { printf "\\nm %s: %d.\n", name, total } '
17     done | sort +2rbn
18     echo "\\\endcat"; echo
19     fld=$(expr $fld \+ 1)
20 done

21 #     roll your own is a special case
22 #     (fld now points at the stuff trailing off the end)
23 echo "\\\rollyourown"
24 cat /tmp/$$.names | while read who
25 do
26     cat ballots/* | egrep $who |
27     cut -d " " -f $fld- |
28     awk -v who=$who '
29         BEGIN { total = 0; }
30         { for(i=1; i<=NF; i++) total+=$i; }
31         END { print who, total } '
32 done | sort +1brn |
33 while read who total
34 do
35     echo "\\\roll $who: $total."
36     cat ballots/* | egrep $who |
37     cut -d " " -f $fld- |
38     sort -fd | grep . |
39     sed -e 's/[0-9]$/(&);/' -e '$s;/$/./'
40     [ $total -eq 0 ] && echo "\\\sorry"
41 done
42 echo "\\\endcat"; echo

43 # grand totals
44 echo "\\\category{Grand Totals}"
45 cat /tmp/$$.names | while read who
46 do
47     cat ballots/* | egrep $who |
48     awk ' { for(i=2; i<=NF; i++) total=total+$i; name=$1; }
49         END { printf "\\nm %s: %d.\n", name, total } '
50 done | sort +2rbn
51 echo "\\\endcat"; echo
52 echo "\\\bye"

53 rm -f /tmp/$$.names

54 exit

```

member from zero to five.) In other words, every member is both a candidate and a potential voter.

From our data-munging point of view, the important thing is that you begin with a stack of ballots with some points assigned to each member in a number of categories. In practice, we need to report the results of each category separately, and especially to individually report each made-up category in order to puncture inflated egos and ladle abuse back on the practical jokers. What we want to show you today is the process we used to develop code for the main task of tallying all the votes.

Why are we looking at this particular problem? Because we got it wrong the first couple of tries. Once we had correct code, we turned it into elegant code, and once we had done that, it turned out to be pretty efficient, too.

First Try

First, we need to talk about the structure of the input. For convenience, think of the ballots as a three-dimensional array. The categories run along the x-axis, the members (as candidates) run along the y-axis and, finally, the members (as voters) run along the z-axis. We enter each ballot into a new file in a subdirectory, `ballots`. Each file consists of a line for each member, with the vote for each category, followed by the made-up categories, with their totals. A ballot file might contain lines such as those shown in Example 1. The whole of our first version—a shell script—is shown in Listing 1.

We begin with the usual shebang and IDs in lines 1 and 2. Normally, we'd follow these with a short description of what the program does, but we've removed it to save space here. On line 4, we gather a list of the names on the ballots. This list will be used later to drive the totals by category.

The next block of code (lines 8 through 20) is a `for` loop that runs across all the categories, totaling that column of the ballots by name. Inside the loop, we start by printing

the category name—note that we’re producing output interspersed with TeX macros, pushing the formatting off onto a program that’s geared for that task. Line 11 starts us looping over the names, cutting the given column and totaling it with `awk`. We finish the inner loop by sorting the results top-to-bottom, and inserting a macro to end the category. Our output consists mostly of lines using a macro for printing pairs of names and points, thus:

```
\nm Lillian: 39.
```

We begin the complicated roll-your-own processing on line 23. By the time we get here, we’ve counted up the number of simple columns in the variable `fld`. Again, we loop over the names (lines 24 to 32), totaling the points for each of the invented category names for each person. We sort those totals top-to-bottom on line 32.

Now that we have the totals, we want to print them out, but also to print out the invented category names. So, we read the categories again in a second loop, which prints not only the totals, but the invented category names themselves. For grins, we add parentheses around the one-digit number of points assigned on line 39, and replace the terminal semicolon with a period. We also have a way of handling the case where someone ends up with no invented categories, on line 40. (Notice that we provide some randomizing while printing out the categories: We sort them on line 38, so that they are not in the order of the ballot files, and the identity of the person who called Brown “a most professional amateur” is somewhat obscured.) This double loop—one feeding into the next—is inefficient, but necessary, because we need to collect the totals and sort them before we can print the names of the invented categories themselves. Perhaps there’s another way we can collect the totals before printing? We’ll explore this in a later version.

We finish this version by collecting the grand totals. Lines 44 through 50 are fairly straightforward. Again, we loop through the names in a `while` loop, adding together all numeric fields using `awk`.

Note that we’ve introduced a bug in the way we total the roll-your-own votes. The bug exists on lines 30 and 48. In the case of a line such as

```
Weisskopf 3 4 4 2 4 5 Back to the Motherland 3
```

the code will work, but given the line

```
Simon 5 3 4 3 3 5 50 ways to leave your lover 4
```

Simon would find himself with an extra 50 points.

Abortive Second Attempt

Occasionally, we try to make something smoother and fail miserably. Our first thought is to clean up the loop for totaling the categories. If we use `bc` instead of `awk` to total the ballots, the code may be simpler. We replace lines 13 to 16 of our original with the following:

```
total=$(cat ballots/* | egrep $who |
  cut -d " " -f $fld | fmt |
  sed "s/ / + /g" | bc)
echo "\\nm $who: $total."
```

We take a vertical slice through ballots, and end up composing a line like

```
4 + 3 + 5 + 2 + 4 + 5
```

which is then fed to `bc`.

Dutifully, we test this modification with `time`, and discover that the new version is 20% *slower* than the previous one. We remind ourselves that we can’t be right all the time and toss this attempt overboard.

Third Try

We have two bottlenecks in the previous versions. The first involves reading each ballot from each ballot file to total each of the known categories—that’s voters *times* ballots *times* categories reads. The other, of course, is the double loop to total and then enumerate the made-up roll-your-own categories—notice that it reads all the ballots in both loops, for voters *times* ballots *times* 2 reads.

We can fix both problems at once by doing a bit of pre-processing. If we make a single pass through all the ballots, totaling each column for each member, we can cut out all of the repetitive data shuffling. We will only need to read each ballot a single time for the main categories, plus another time to collect the names of the roll-your-own categories. To do this, we extract the ballot data into a file named `totals` with the following code fragment:

```
# total up everything in the
# ballot files in a big loop
sort ballots/* |
sed "s/ */ /g" |
awk -v categories=6 '
function showtotals()
{ # print out this guy's totals
  printf "%s", lastname;
  sum = 0;
  for(j=1; j<=(nc+1); j++)
  {
    printf " %d", total[j];
    sum += total[j];
    total[j]=0;
  }
  printf " %d\n", sum;
}
BEGIN {lastname = "zzz"; nc = categories; }
{ split($0, input);
  if( lastname != "zzz"
    && input[1] != lastname )
    showtotals();
  for(j=1; j<=nc; j++)
    total[j] += input[j+1];
```

```
# now cut off the fixed categories,
# and split the rest
roll = substr($0, length(input[1])+1+nc*2);
n = split(roll, inputb, ";");
for(j in inputb) {
    nn = split(inputb[j], words);
    total[nc+1] += (words[nn]+0);
}
lastname = input[1];
}
END {showtotals(); }
' >totals
```

Notice that we don't hardwire the number of categories into

Listing 2. Extract from Our Perl Program

```
1  #!/usr/local/bin/perl -w
2  @category = ( 'congeniality', 'talent', 'swimsuit',
3    'sex', 'drugs', 'rock&roll', 'misc' );
4  while (<>) {
5    $voter = $ARGV;
6    ($candidate, @score) = split /\s+/, $_, @category+1;
7    # initialize the total the first time we see this candidate
8    if( ! grep /$candidate/, keys %total ) {
9      $total{$candidate} = 0;
10   }
11   {
12     local @category = @category;
13     while (@score) {
14       $category = shift @category;
15       $score = shift @score;
16       %rankings = (%rankings, $category => $score);
17     }
18   }
19   $v->{$voter}{$candidate} = {%rankings};
20   $y = $v->{$voter}{$candidate}{misc};
21   @miscslist = split /;/, $y;
22   $miscsum = 0;
23   while( @miscslist ) {
24     $item = shift @miscslist;
25     $item =~ s/.*\s+(\d)/$1/;
26     $miscsum += $item;
27   }
28   foreach $cat (@category) {
29     $total{$candidate} += $v->{$voter}{$candidate}{$cat}
30     if( $cat ne 'misc' );
31   }
32   $total{$candidate} += $miscsum;
33   }
34   foreach $cand (sort { $total{$b} <=> $total{$a} } keys %total) {
35     print "TOTAL: $cand $total{$cand}\n";
36   }
```

the script, but provide it as a variable in a command-line argument. We use a function `showtotals()` to print out the total when the name on the ballot changes. This function also conveniently prints a grand total of points.

The body of the `awk` program is a fairly straightforward loop through the ballots. Once we have totaled the fixed columns, we use `substr` to collect the text of the roll-your-own votes at the end of each line. We `split` on semicolon so that multiple votes like

```
Best of the Year: Chall 3; Missing Turkey 2
```

are put into separate elements of the array `inputb[]` array. We then carefully extract the last item—the points—from each element and add it to the total array. (This solves the bug we introduced in our original version, in which we tallied an extra 50 points for Mr. Simon.)

Given a `totals` file, containing a summary of all the ballots, the rest of the task is simple. We simply `cut` and `sort` for each fixed category. Using a pipe such as

```
cut -d " " -f 1,$fld totals |
sort +1bnr |
sed 's/(.*) \\(.*\\)\\/\\nm \\1: \\2./'
```

We eschew our roll-your-own double loop for a similar `grep`, `cut` and `sort`, except that this one is driven by the sorted totals for the invented categories. To end up with the grand totals, we need only sort the output from our earlier `awk` program: The totals are already done for us!

Is it faster? Much: `time` shows us that this version executes about six times faster than the first version.

But There's More

A speed increase of six times is nice, but in this case, it's at the cost of a pretty complicated supplementary program in `awk`. We can perhaps do a little better by recoding the whole exercise in Perl. We won't develop the whole tally program here but will just show the code for the hard part: extracting and totaling the points, and printing the sorted grand totals (see Listing 2).

We begin our task by naming the categories in the `@category` array. While reading each ballot line in the loop, beginning on line 4, we split up

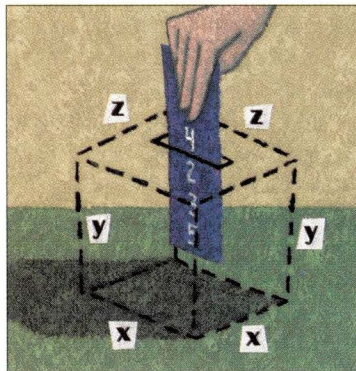
the input lines, as we did in the previous versions. Here, we also make sure to initialize the associative array of totals by candidate (see line 9). This is partly why we use the `-w` flag to Perl: It allows Perl to warn us that we are adding to an uninitialized variable. We loop through the point scores for each category, putting them in associative array rankings in the `while` loop on line 13.

We insert these rankings into a massive three-dimensional associative array, `v` (line 19), representing the three-dimensional data structure we discussed earlier. In lines 21 through 27, we carefully extract the points for the roll-your-own categories and total them. Given the data in this array, we can gather a running total of points for each candidate, as shown in lines 28 through 32.

Once we've fallen out of the main reading loop at line 33, we can sort and print the totals. We loop over the sorted keys to the associative array, `totals`, using a technique explained on the `perl-func` man page.

By this point, you know what we're going to ask. How much faster? If we strip out everything from the last shell script except gathering and printing the grand totals, the new Perl version runs at about the same time as the shell version. By now, the

time for our code to execute is swamped by the time to get the ballot data off the disk and write out the results. So, at this point, it's a judgment call whether you want to use the Perl code or the `awk` version. Two considerations that may come into play in that decision are the relative sizes of the code (the shell version is a bit longer, but it could be made a little shorter) and the debugging facilities (Perl's are better).



Conclusions

It's possible to write tricky code that doesn't work, or worse, is less efficient than the simpler version. Our code, like our theories, should follow Occam's razor.

We ran across a program fragment by an eminent coder the other day. In it, he'd done a time conversion in a nonobvious way, which took us half-an-hour to untangle. In his defense, he had intended the code to be a throw-away, but we should

remember that clear code needs to be one of our goals, too.

It is possible to write code that's elegant, correct, clear and efficient. Sometimes, we can achieve another of these goals by reworking our algorithms, or by recoding in a different language. Like any good worker, we need to know what we have in our toolbox, and which tool is appropriate for which job.

Until next time, happy trails. -o-

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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 this issue.

Fault-Tolerant Disk Array

Unison Information Systems has introduced the RAID-I/O Flyer RF-6010 Fault Tolerant Disk Array. According to Unison, the RF-6010 is designed to offer fault-tolerant storage of programs, files, records, graphics and other data where RAID levels 3 and 5 are necessary.

RF-6010's RAID controller communicates with the host via a Fast Wide SCSI interface, while the drives in the RAID system are Enhanced Intelligent Drive Electronics (EIDE). The RF-6010 is a

10-drive system, with nine hot-swappable drives and one drive in reserve as a "Hot-Standby" spare, which will automatically take over in the event of a drive failure, the company says.

The RF-6010 provides up to 32 levels of Tagged Command Queuing. This is said to reduce seek time by pipelining multiple commands across a SCSI interface. Also, it is designed to automatically detect and repair bad data before it is read by the host system using its Background Media Scan feature.

Other features include Visual and Audible Status Indicators for notifying users of situations that require attention, and the RAID-I/O Manager, which is said to offer remote monitoring of the RF-6010 via a RS-232C port and PC/modem. The RAID-I/O Manager monitors system status, error logs and performs diagnostic tasks as well as configuring the RF-6010, Unison says.

The RF-6010 is priced at \$8,995 and comes with a formatted capacity of 84 GB, Fast SCSI-2, Fast Wide SCSI-3 and RAID levels 3 and 5. In addition, the RF-6010 supports Solaris, AIX, HP-UX, NetWare, Windows NT/95, OS/2

and MS-DOS. The RAID-I/O Manager runs on Windows NT and 95.

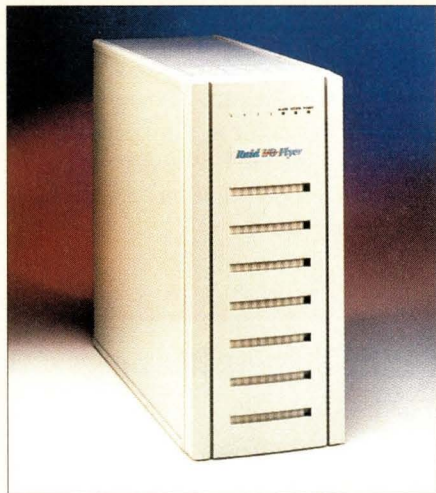
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Circle 101



Fibre Channel Hub Out

Atto Technology has introduced the AccelNet FC Fibre Channel hub, the first release in a new line of Fibre Channel solutions. Intended for data-intensive workgroup and enterprise environments, AccelNet FC is a stackable, five-port device that reportedly provides 1.0625-gigabit signaling speed with a 200-MB/s transfer rate.

Ports on the AccelNet FC are compliant with the Media Interface Adapter (MIA) industry standard, which allows for copper cabling as well as low-cost conversion to optical cabling, the company says. Each port can be individually configured to support either copper or optical technologies.

AccelNet FC also features Atto's Fibre-Chain expansion ports, which enable the hub to be interconnected to the Fibre

In Living Color

Tektronix has announced the Phaser 360 workgroup color printer, which prints at 800-dpi resolution and uses solid inks. Also, Phaser 360 comes with Adobe Systems Inc. PostScript 3 software, Tektronix says.

Built into the printer is a 10BaseT Ethernet network interface that is upgradable to 100BaseT. The Phaser 360 comes with 24 MB of RAM to provide enhanced color features and a 100-MHz RISC processor. The printer can reportedly produce six full color pages per minute or 5.5 transparencies per minute.

The Phaser 360 printer is priced at \$3,695 and comes with an unlimited supply of free black ink. In addition, Tektronix is offering its Phaser 350 600-dpi workgroup color printer at a reduced price of \$2,495.

Tektronix Inc.

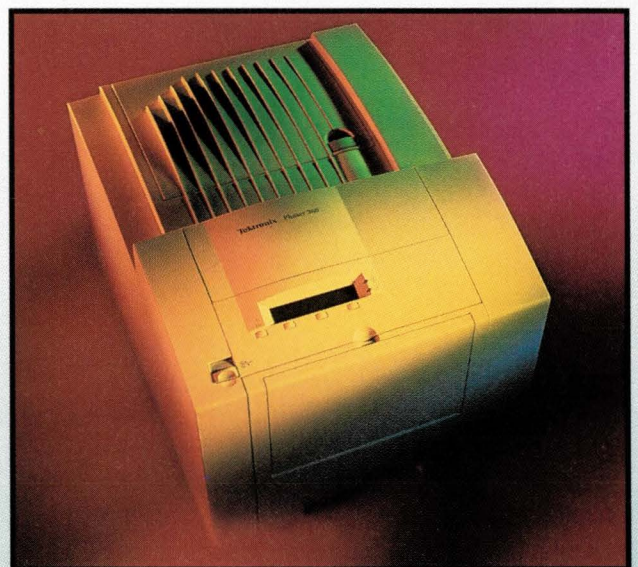
26600 S.W. Pkwy.

P.O. Box 1000

Wilsonville, OR 97070

<http://www.tek.com>

Circle 100



New Products



Channel Arbitrated Loop (FC-AL) limit of 127 devices, without consuming valuable FC ports.

To ensure the reliability of the Fibre Channel signal, AccelNet FC reportedly regenerates and retimes them, removing any extraneous signal noise. Also, Atto's exclusive Intelligent Port Management feature allows the AccelNet FC hub to detect loss of FC-AL nodes due to faults, MIA failure and power-down of devices, and to reconfigure the loop dynamically when nodes are added or removed, the company says. Management can be performed remotely with Universal Serial Bus (USB) or via the front-panel LEDs. The AccelNet FC hub is priced at \$1,195.

Atto Technology Inc.

Audubon Technology Park
40 Hazelwood Drive, Bldg. 106
Amherst, NY 14228
<http://www.attotech.com>

Circle 102

Automated Analysis of Performance Stats

Loan System, a French software company that specializes in network performance management software, has announced that its Sysload family of performance management products is now available in the United States. Sysload, designed for distributed client/server systems, is said to let network managers track real-time network system performance to troubleshoot bottlenecks and optimize overall performance. In addition, Loan System has introduced the Sysload Advanced Expert System, or AES, the latest member of the Sysload family, which allows users to automate the analysis of historical performance statistics via network servers, the company says.

Sysload AES resides on a single server and creates a knowledge base of historical data gathered by Sysload agents from any number of servers. From there, it can pro-

vide detailed summary reports, audits of events and filtering for predetermined incidents, the company says. Sysload AES is able to digest huge quantities of data quickly, before the data becomes obsolete.

Sysload relies on two sorts of daemons: a collector daemon, which analyzes real-time activity and stores it into historical databases; and a file-server daemon that reads the database information back to the Sysload console. Agents are optimized to report on specific systems or databases, for example, SunOS, Solaris, AIX, AS/400, HP-UX, IRIX, Digital UNIX, Windows NT and NetWare.

Sysload AES is based on C Language Integrated Production System (CLIPS), an inference engine designed by NASA that includes true maintenance, dynamic rule addition and customizable conflict resolution strategies, all of which are specific to the platform being monitored, the company says.

Sysload AES is scheduled to ship this month on UNIX, Windows NT, NetWare and AS/400 platforms. Pricing starts at \$15,000 per site and is available from Loan System's American distributor, Software Diversified Systems Inc.

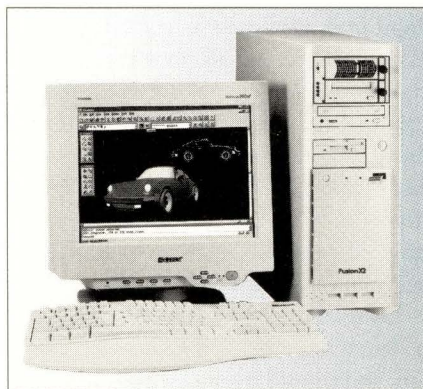
Software Diversified Systems Inc.

5155 E. River Road, Ste. 411
Minneapolis, MN 55421

Circle 103

Windows NT/Solaris Workstations

FusionX2 is a family of Windows NT/Solaris workstations and servers from Western Scientific. The machines offer one or two 200-MHz, 32-bit Pentium Pro-based processors and come standard with a built-in Ultra Wide SCSI-3 port (40 MB/s), 100BaseTX Ethernet port (100 MB/s), Matrox Millennium II 2D/



3D 64-bit video graphics card and 15X-speed CD-ROM. Industry-standard PCI and ISA bus slots reportedly enable users to take advantage of low-cost, third-party add-in boards. A removable single-connector (SCA-2) disk and tape devices allow for easy upgrades, serviceability and security improvements, the company says.

Base systems ship with 128 MB of ECC memory, upgradeable to 512 MB, using standard 168-pin DIMMs. All systems include four 32-bit PCI and three ISA bus slots. Base systems also include a 4.5-GB 10,000-RPM Ultra Wide SCSI-3 system disk and a 4-GB DDS-2 removable DAT for system backup. Pricing starts at \$9,985.

Western Scientific Inc.

9445 Farnham St.
San Diego, CA 92123
<http://www.wsm.com>

Circle 104

Wireless Backbone Out

RadioLAN has introduced Wireless BackboneLINK, a network traffic bridging product that connects RadioLAN's 10-Mb/s wireless LANs with Ethernet 10BaseT LANs. Wireless BackboneLINK is designed to maintain a network speed of 10-Mb/s through either the wired or wireless segment of the LAN.

In addition to being a bridge for wireless traffic to a wired network, and supporting active wireless connections from up to 128 desktops and laptop PCs, it also works as a wireless transceiver, the company says. As a transceiver, it reportedly allows workstations, printers, bridges and routers to work as part of the wireless network. BackboneLINK comes with one wired IEEE 802.3-compliant Ethernet 10BaseT interface and one RadioLAN wireless interface. In addition, it supports the IEEE 802.1d spanning-tree protocol, which is said to allow redundancy without overloading the network, and filtering by source, destination or protocol.

Wireless BackboneLINK comes with the RadioNet Backbone Manager software, an HTTP-based configuration and management interface accessible via a Web browser. The network manager is said to perform all configuration and management tasks such as automatically discovering network connections, configuring user names and passwords and

New Products

linking to RadioLAN's customer support organization. In addition, Backbone-LINK's IP address and subnet masks can be configured via the Dynamic Host Configuration Protocol (DHCP).

RadioLAN wireless LAN technology uses narrow-band signal frequency transmission in the unlicensed 5-GHz radio band, including the three Unlicensed National Information Infrastructure (U-NII) frequencies (5.775, 5.2 and 5.3 GHz). Transmission range is 120 feet in most office environments and up to 300 feet in open, unobstructed areas. Wireless BackboneLINK is a stand-alone device measuring 7 by 4 by 1.5 inches and is priced at \$999.

RadioLAN Inc.

455 DeGuigne Drive
Sunnyvale, CA 94086
<http://www.radiolan.com>

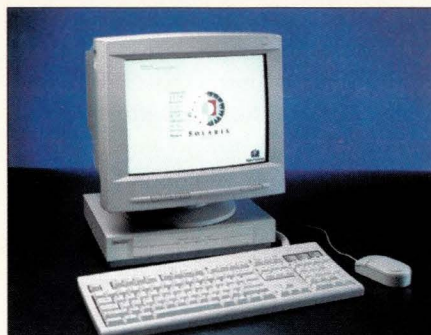
Circle 105

Versatile NC Unveiled

Sherwood Network Division, a division of Inkel Corp., has announced the Sherwood 8000PT Network Computer (NC). According to the company, the 8000PT incorporates the use of thin client technology and, thus, is not dependent on proprietary software to enable it to run in most network environments. This allows the NC to run multiple operating systems designed for the x86 architecture, including Solaris, UnixWare, Open Server, Interactive UNIX, Microport System V, BSDI UNIX, Java OS, RedHat Linux, Caldera Open Linux, QNX RTOS, X Window, Windows 95/NT, Citrix Win-Frame 2.0, WebTerminal and Network Terminal Emulation.

Using a preloaded boot ROM and by downloading client operating software from the server to the 8000PT, the NC is recognized by the server as a client. The 8000PT retrieves files from the server, processes data locally and stores files on the server, while providing the user with features and advantages similar to that of a point-and-click GUI. These features reportedly allow network managers to provide a secure and controlled work environment for all their clients.

The 8000PT is powered by a 486 DX2/DX4 microprocessor, with up to 64 MB of RAM (8 MB standard) and a GUI accelerator video controller. Enhanc-



ed I/O ports include a bidirectional parallel port, two RS-232 serial ports, keyboard and mouse port, as well as a video port.

The NC can connect to a Windows NT, NetWare, UNIX or any current NC network environment host server through the use of industry-standard networking protocols. Key features include multiple operating system support, remote booting, heterogeneous network support, server-based management and the ability to run existing applications.

Pricing ranges from \$450 to \$650, depending on configuration; quantity discounts are available.

Sherwood Network Division

21056 Forbes St.
Hayward, CA 94545
<http://www.sherwoodterm.com>

Circle 106

SCO Ships NC Application Broker

Looking for a cross-platform solution that doesn't require you to rewrite all your software? Tarantella, SCO's application broker for Network Computing, promises to deliver just that. It reportedly allows any user with a Java-enabled client to access Solaris and other UNIX applications, as well as Windows and mainframe-based applications, without requiring the reengineering of original programs.

Tarantella sits between the Java-based client and applications residing on the server. It carries out all emulation processing on the server, posing as a display terminal, and sends the display to the real client. Tarantella communicates with client devices via SCO's Adaptive Internet Protocol (AIP), and with applications via standard protocols such as rcmd, Telnet or X, the company says.

Using AIP, Tarantella is reportedly able to detect the type of device and connection, and adjust how much data to send to

the client and how much to retain and process on the server. That is said to allow clients to access corporate applications over low-bandwidth, dial-up lines without suffering a reduction in performance. To the user, the application interface appears the same as if they were accessing the program natively. Any type of Java-enabled client—palmtops, Network Computers, desktop PCs and UNIX workstations—are supported on Tarantella.

It is available for Solaris and UnixWare, with versions for AIX, HP-UX and Windows NT expected later this year. Tarantella costs \$395 for a single-user license, \$245 per user for a 100-user license and \$200 per user for a 500-user license.

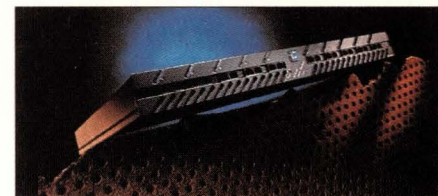
The Santa Cruz Operation Inc. (SCO)

400 Encinal St., P.O. Box 1900
Santa Cruz, CA 95061
<http://www.sco.com>

Circle 107

10-Port Fibre Channel Hub

G2 Networks, a developer of gigabit-speed networking technologies, has announced the 2x5 Hub, a dual-loop 10-port Fibre Channel hub for cluster and network environments.



The 2x5 Fibre Channel Hub supports either two five-port loops or 10 ports in a single loop. Multiple hubs may be cascaded to support larger configurations of up to 126 Fibre Channel nodes.

A switchable dual-loop technology is said to enable parallel access to Fibre Channel drives supporting dual connections. This means that if one loop fails or becomes unusable, the remaining loop can take over for fail-safe networking. Other features of the 2x5 Hub include dual internal micro controllers for redundancy and reliability, forced-air cooling and a high-reliability power supply, the company says. The 2x5 Hub costs \$4,995.

G2 Networks Inc.

16780 Lark Ave.
Los Gatos, CA 95032
<http://www.g2networks.com>

Circle 108

New Products

Tandberg's Latest MLR Tape Drive

Expanding its MLR (Multichannel Linear Recording) family of tape drives, Tandberg Data has unveiled the MLR3 tape drive. This 50-GB drive is said to offer transfer rates of 240 MB per minute.

MLR technology is designed as a tape storage solution for midrange server backup and competes with DLT and 8mm technologies. According to Tandberg, MLR offers the reliability of tape at a lower price.

The MLR3 is available as either a stand-alone drive (internal or external) or as a complete tape storage solution. The latter version comes with Seagate Software Storage Suite for Desktop and Servers, a 25-GB MLR tape cartridge, a cleaning cartridge and all the necessary cables for connection to 16-bit Ultra Wide SCSI interfaces. The Seagate software includes single-server support for NetWare, DOS, Windows 3.1, 95 and NT. Legato Systems Inc. Legato Data Backup Utility (LDBU) software is also included and provides single-server backup for SunOS, Solaris and AIX. A stand-alone internal drive is priced at \$2,749, and a stand-alone external drive costs \$1,209 (\$3,169 with software).

Tandberg Data Inc.

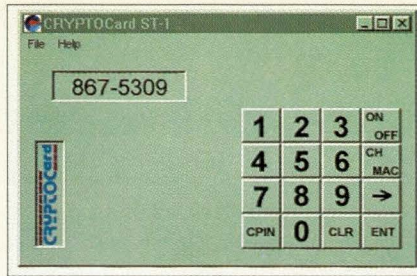
2685-A Park Center Drive
Simi Valley, CA 93065
<http://www.tandberg.com>

Circle 109

Tokens Boost Security

The ST-1 Java authentication token from CryptoCard is a cross-platform product that is said to offer organizations a higher degree of security for remote users. The Java token reportedly permits companies to provide onetime password access security for remote access to the network without requiring the purchase of specialized client hardware or software. The ST-1 can run as an applet in a Web browser, or as a stand-alone application for clients not equipped with browsers, the company says.

The token applet—which looks like an on-screen calculator—generates a random password for each network entry attempt, making it more secure than static password systems where a hacker can steal a user's password to gain access to the net-



work, the company says. The tokens use the Data Encryption Standard (DES), according to the requirements of ANSI X9.9. In addition, the user must enter a Personal Identification Number (PIN).

The ST-1 works in conjunction with CryptoCard's CryptoAdmin token administration software for UNIX and NT systems. The network manager enters the license number for ST-1 into CryptoAdmin, which then creates and dispenses the licensed number of soft tokens. CryptoAdmin is compatible with security products from Cisco Systems Inc., Raptor Systems and Trusted Information Systems, as well as CryptoCard.

Pricing for the ST-1, which comes with

a free copy of CryptoAdmin, ranges from \$20 to \$50 per desktop, depending on the size of the installation.

CryptoCard

1 First Canadian Place, Ste. 5100
Toronto, Ontario
Canada M5X 1K2
<http://www.cryptocard.com>

Circle 110

Stand-Alone Automated Tape Library

The DST 712 automated tape library from Ampex is said to provide a maximum storage capacity of 5.8 TB in 7.5 square feet of floor space—or 770 GB per square foot. The stand-alone system can use up to two tape transports for a combined rate of 40 MB/s, uncompressed, the company says. By the end of first-quarter 1998, Ampex will reportedly offer an expansion module to provide indefinite expansion of the system in 3.2 TB to 6 TB increments.

DST tape systems are designed for a variety of data-intensive applications, such as archive and retrieval for data

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Circle No. 35



New Products

warehousing, backup and restore of very large databases (VLDBs), hierarchical storage management (HSM) of network file systems, as well as storage of multimedia content and high-bandwidth data acquisition, Ampex says.

The 712 joins the existing DST product line, which includes the 312 stand-alone tape drive for 50 GB, 150 GB and 330 GB cartridges; the 412 automated tape library for up to 2.4 TB of data; and the 812 automated cartridge library, which can store up to 12.8 TB of data.

The DST 712 costs \$150,000 for a single-drive configuration and \$240,000 for a dual-drive configuration.

Ampex Corp.

500 Broadway
Redwood City, CA 94063
<http://www.ampex.com>

Circle 111

Multihost Storage Device Out

Retrieve has unveiled a new storage appliance that is said to give dissimilar hosts the ability to dynamically access and share data and storage. Pacemaker reportedly allows users to share data on a RAID device between Solaris and Windows NT computers. Data can be accessed directly from either computer, without having to be copied via a network, Retrieve says.

Pacemaker connects to the host computers via a SCSI or Fibre Channel interface using the existing host disk driver, the company says. The system is administered from a built-in Web management interface, allowing most computers on the network to control and monitor the device. Pacemaker offloads the time-consuming process of data compression and decompression to the storage subsystem. The server transfers the data and goes on to process other functions and then Pacemaker does the compression for the host server.

Exact pricing has not yet been determined, but a version of Pacemaker with two SCSI front ends, two SCSI back ends and 256 MB of cache is expected to cost around \$18,000.

Retrieve Inc.

3080 Valmont Road, Ste. 220
Boulder, CO 80301
<http://www.retrieveinc.com>

Circle 112

UNIX-Based Jukebox Management Software

KOM has announced OptiServer 5.0, an advanced optical storage manager designed for UNIX platforms. The OptiServer software is said to emulate a magnetic storage interface, making optical drives and jukeboxes appear and behave like magnetic hard drives. A new GUI makes for simplified installation, and a robust "power failure safe" interface allows for remote administration and offers a full suite of library functions for software developers, KOM says.



One important feature of the OptiServer 5.0 is that it supports all major brands of 3.5-, 5.25-, 12- and 14-inch magneto-optical rewritable, ablative WORM and CD jukeboxes, as well as stand-alone drives. OptiServer 5.0 supports all UNIX native file system attributes, including security features, and supports most versions of UNIX, including Solaris, HP-UX and Digital UNIX. Pricing ranges from \$500 to \$20,000.

KOM Inc.

4019 Carling Ave.
Kanata, Ontario
Canada K2K 2A3
<http://www.kominc.com>

Circle 113

Low-Cost UltraSPARC Unveiled

EIS Computers has announced the Fusion-iX UltraSPARC/PCI server based on Sun Microsystems Inc.'s new UltraSPARC II CPU. Available in a desktop or rack-mount configuration, the Fusion-iX comes with either a 266- or 300-MHz version of the PCI-enabled UltraSPARC module.

The system features 100BaseT Ethernet and Ultra Wide SCSI, six PCI slots, 64-MB RAM (expandable to 1 GB), 2-GB SCSI hard drive and Solaris 2.6.

Most of the accessories offered for the

EIS Fusion-1 computer are also available for the Fusion-iX. These include connectivity add-ons, Ethernet, ATM, FDDI and audio and video enhancements such as multimonitor video support. In addition, EIS offers a selection of preinstalled software options such as Sun WebServer, Solaris Mail Server, Oracle Corp. Workgroup and Application Servers, and Netscape Communications Corp. Fast Track and Enterprise servers. The entry-level 266-MHz version costs \$3,950, and the 300-MHz version costs \$5,000.

EIS Computers Inc.

207 W. Los Angeles Ave., Ste. 303
Moorpark, CA 93021
<http://www.eis.com>

Circle 114

Java-Based Mobile Agent Framework

Mitsubishi Electric Information Technology Center America has unveiled Concordia, a new technology framework designed for the creation and deployment of mobile agent programs. Concordia is targeted at programmers who develop applications for electronic commerce, sales force automation, utilities and health care, the company says.

Concordia can be used to provide application access to multiple databases in a dynamic environment (one in which the location and address of other services is constantly changing), to enable mobile users to access legacy applications or to provide cross-platform operability, such as applications that need to access or deliver information via a combination of devices (laptops, PDAs, smart phones, etc.).

Concordia consists of a Java Virtual Machine, Concordia server and one or more mobile agents residing on a network node. Specifically, Concordia includes the following components: an Agent Manager, which provides the communications infrastructure that allows agents to travel; a Security Manager, which protects resources and ensures the security and integrity of mobile agents and their data; a Persistence Manager, which maintains the state of mobile agents and objects in transit around the network; an Inter-Agent Communication Manager, which handles the registration, posting and notification of events to and from mobile agents; a Queue Manager, which is responsible for the

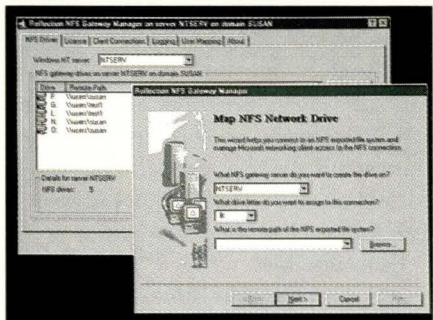
New Products

scheduling and guaranteed delivery of mobile agents between Concordia servers; a Directory Manager, which provides a name server for applications and agents; an Administration Manager, which provides remote administration of Concordia; and an Agent Tool Library, which is a set of development tools, including APIs and agent classes, needed to develop Concordia mobile agents. Pricing for Concordia ranges from \$5,000 to \$50,000.

**Mitsubishi Electric Information
Technology Center America**
5665 Plaza Drive
Cypress, CA 90630
<http://www.meitca.com>
Circle 115

Gateway Provides NT/UNIX Integration

Reflection NFS Gateway 7.0 is WRQ's latest addition to its family of NT/UNIX integration products. NFS Gateway runs on a Windows NT server and gives Windows desktops access to NFS file and print resources on UNIX machines. Because it eliminates the need to install individual NFS clients on each PC, the gateway also lowers the cost of NT/UNIX integration, WRQ says.



Key features include a gateway manager for the centralized control and monitoring of NFS resources; remote management of NT servers; seamless integration of resources, which means the NFS drive appears as just another shared resource to end users; automatic file name resolution between Windows and UNIX; easy integration of UNIX and Windows users and names; centralized monitoring of NFS resource usage; and centralized administration of NFS via the Network Information Service (NIS) developed and licensed by Sun Microsystems Inc., WRQ says.

In addition, Reflection NFS Gateway includes debugging tools designed to

allow the product to be customized to match the requirements of a particular environment. The tools include an NFS API, which allows an application to log onto an NFS Authentication Server, establish connections to exported file systems and/or NFS printers, disconnect and log off; a Remote Procedure Call (RPC) API, which allows an application or DLL to generate RPC request packets; and an NFSnet utility, which provides more extensive options for mapping NFS resources than Windows' NET USE command. With NFSnet, users can automate logons and map drives, the company says.

Reflection NFS Gateway 7.0 costs \$1,800 for a 10-user license; additional user licenses cost \$180 each.

WRQ
1500 Dexter Ave. N.
Seattle, WA 98109
<http://www.wrq.com>
Circle 116

Bridging the Java, SQL Gap

A new application from Software Tree reportedly offers a cost-effective solution for integrating Java objects with relational data. JDX is said to bridge the gap between the Java object model and the SQL relational model by providing an object-oriented interface to store and retrieve Java objects.

JDX exploits the standard JDBC interface to link to various relational back-end systems, including Microsoft Corp.'s SQL Server and Access, Oracle Corp.'s Oracle, IBM Corp.'s DB2, Sybase Inc.'s Sybase and Borland International Inc.'s Interbase, Software Tree says.

JDX can reportedly handle complex object structures and supports one-to-one and one-to-many relationship models. JDX is available for free evaluation from the company's Web site.

Software Tree Inc.
650 Saratoga Ave.
San Jose, CA 95129
<http://www.softwaretree.com>
Circle 117

Gigabit Link Extender

The FLX-2000 family of serial Gigabit-rate link extenders is now available from Finisar. The FLX-2000 link extenders reportedly allow the distance be-



tween multimode optical or copper connections to be extended from 50 meters to more than 60 kilometers. In addition, the FLX-2000 product family supports data rates of 2.5 Gb/s over Gigabit Ethernet, Fibre Channel, FDDI, ATM and SONET, the company says.

The FLX-2000 Optical Link Extenders are designed to convert short-distance serial electronic 800-nm optical or other input signals to long-distance 1,310-nm single-mode optical signals and vice versa, the company says. The 1,310-nm long-distance link reportedly provides a minimum 35-dB optical power budget for operation over 60km via single-mode fiber.

In addition, the FLX-2000 link extenders offer commands that can perform self-testing, and a front-panel LED display shows the status of the link, power and operating mode. Multiple FLX-2000s can be daisy-chained for group monitoring via a single RS-232 connection, and remote link administration can be performed via a modem. The FLX-2000 link extenders require less than 15 watts of power, supplied by dual, hot-swappable external power supplies, Finisar says. A typical unit supporting Fibre Channel costs \$7,500.

Finisar Corp.
274 Ferguson Drive
Mountain View, CA 94043
<http://www.finisar.com>
Circle 118

Quality Manager for SAP

For companies setting up an SAP America Inc. R/3 System installation, Prism Solutions has introduced the Prism Quality Manager for SAP, a stand-alone environment for evaluating, cleansing and preparing legacy data to be loaded into SAP systems. It is especially useful for companies migrating multiple source systems onto the SAP system, and if

New Products

used early on, can reduce the time and effort required for a successful migration, Prism says.

To ensure that data has been properly cleansed, conditioned and prepared for loading, Prism Quality Manager for SAP uses SAP metadata, IDOC Inc. data model templates, automated data quality measurements and reports, and integrated utilities, Prism says.

The Prism Quality Manager for SAP comes with a set of Master Data Projects for SAP and costs \$110,000, depending on the number of data sets required. It runs Windows NT/95.

Prism Solutions Inc.

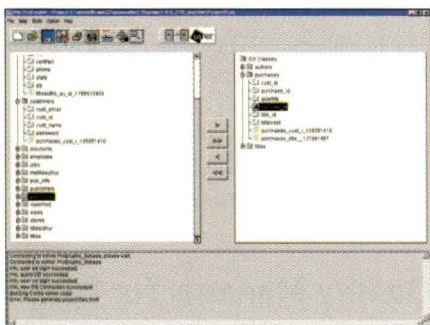
1000 Hamlin Court
Sunnyvale, CA 9089

<http://www.prismsolutions.com>

Circle 119

Object Mapping with PRO/Enable

Black & White Software has introduced PRO/Enable, which the company describes as a "Persistent Relational to Object (PRO) mapping product." PRO/Enable is designed to enable users to take existing data from relational databases and automatically map it to middle-tier objects that are accessible via Common Object Request Broker Architecture (CORBA). The software provides a way to migrate monolithic and two-tier relational systems to object-oriented three-tier systems capable of supporting corporate intranets and the Internet, Black & White says.



PRO/Enable delivers relational schema to object mapping, runtime object loading, concurrency control and performance optimizations. It does not interfere with legacy applications or change the existing structure of a database. The relational-to-object mapping tool uncovers the underlying structures stored in the relational

database and exposes them with CORBA, providing a technological bridge between the relational database and object model, the company says.

PRO/Enable runs on Solaris and Windows NT. Contact company for pricing.

Black & White Software Inc.

1901 S. Bascom Ave., 7th Floor
Campbell, CA 95008

<http://www.blackwhite.com>

Circle 120

UNIX Video Training Offer

KeyStone Learning Systems has announced a six-video training course for programmers and engineers on the UNIX operating system. Each video is two hours long for a total of 12 hours of UNIX instruction. In addition, the training course includes a free instruction book, *UNIX in a Nutshell*, by Daniel Gilly et al, O'Reilly & Associates Inc., 1992, ISBN 1-56592-001-5. The course is led by Hany Greiss, a professional instructor in UNIX for PEAC Inc. Greiss has 16 years of experience as a software developer, senior analyst and consultant. In fact, Keystone likens its video training course to having a personal tutor. A complete course outline is available on Keystone's Web site, <http://www.klscorp.com/cat/>.

The complete six-video training course costs \$569.95. Any of the six videos can be purchased for \$99.95; volume discounts are available.

Keystone Learning Systems Corp.

2241 Larsen Pkwy.
Provo, UT 84606

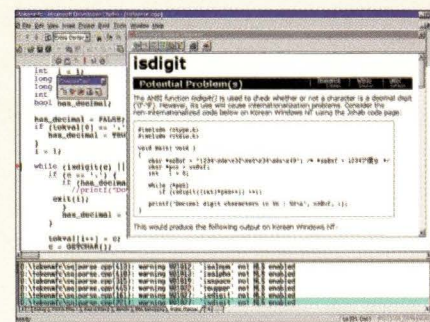
<http://www.klscorp.com>

Circle 121

Multibyte Quality Assurance

Helping independent software vendors bring multilingual products to market is the aim of a new multibyte-enabling utility, Global Checker from Uniscape. Global Checker can reportedly assist with both software localization—the process of translating an application's interface into a target market's spoken language—as well as internationalization—the reengineering of the application to support input, display and manipulation of the extended "multibyte" character sets employed by Asian languages.

Global Checker works by scanning any C/C++ source file, then identifying



and reporting on code that is noncompliant under National Language Support (NLS) standards. An extensive online help system supplies suggestions of how to fix the errors it encounters, Uniscape says.

Specifically, Global Checker performs the following functions: checks C/C++ code to isolate multilingual support problems; identifies noncompliant string manipulations; ensures that string-related function calls are multibyte-enabled; identifies nonportable function calls to streamline porting; and identifies hard-coded strings to streamline the localization process.

Uniscape Global Checker is available in three versions: Global Checker QA, for locating NLS errors; Global Checker Developer, which adds a knowledgebase; and Global Checker Enterprise, which includes a Uniscape Global C license. The product runs on Windows NT but can scan source files from any platform. A UNIX version is scheduled for release this month. Pricing ranges from \$400 to \$1,500 per unit. A free demonstration is available at Uniscape's Web site.

Uniscape Inc.

303 Twin Dolphin Drive, Ste. 510
Redwood Shores, CA 94065

<http://www.uni-scape.com>

Circle 122

Configure Used Suns, RS/6000s Online

If you're in the market for a used and refurbished Sun Microsystems Inc. or IBM Corp. workstation, Sun Data is now offering Matchmaker, an online systems configuration application that allows customers to interactively configure and order systems. The new service, which can be accessed from the company's Web site (<http://catalog.sundata.com>), enables customers of varying technical expertise to make informed decisions

New Products

about purchases, the company says.

The kinds of systems that can be configured and ordered online include, on the Sun side, SPARC-5, 10, 20, 1000, 1000-E, 2000 and 2000-E; as well as Ultra SPARC-1, 1E and 2 systems. IBM RS/6000 systems include the 7012-390X and 380X, and the 7013 58HX and 590X. Also available are a variety of CPUs, internal disks and tape drives, CD-ROMs and input devices, Sun Data says.

To ensure that customers end up with a valid configuration, Matchmaker performs rule-checking on customer configurations. Pricing for a custom system is calculated dynamically, taking into account labor costs associated with building the system and delivery expenses. Once a system has been configured, an order can be placed directly with Sun Data's Federal Express Virtual Order e-commerce system (<http://www.fedex.com>). The Matchmaker application is written in client-side JavaScript and takes about 30 seconds to download.

Sun Data Inc.

One Sun Data Court
P.O. Box 926020
Norcross, GA 30010
<http://www.sundata.com>
Circle 123

Extend Bandwidth via Single Fiber Pair

Telebyte has introduced a product that enables fiber cable bandwidth to be expanded using Wavelength Division Multiplexing (WDM). Model 381 is a passive, single-mode wavelength division multiplexer that reportedly doubles the data capacity of a fiber pair. Individual wavelengths can be either combined or separated, so that two channels are transmitted simultaneously. WDM is protocol- and speed-independent and can transmit either analog or digital



simultaneously, Telebyte says.

Model 381 contains two separate WDM modules, helping it achieve full-duplex operation for the two different data sources. WDM's so-called fused biconic taper concept allows for high isolation, low insertion loss and back reflectance over a range of mechanical and temperature stresses.

Model 381 comes with a choice of either ST, SC or FC connectors. Pricing starts at \$495 per unit, with volume discounts available.

Telebyte Technology Inc.

270 Pulaski Road
Greenlawn, NY 11740
<http://www.telebyteusa.com>
Circle 124

Ethernet Switches Enhance Network

Allied Telesyn has announced three Ethernet switches, AT-RS710TX, AT-RS718TX and AT-FS708, that are said to enhance network productivity by providing a full 10-MB/s or 100-MB/s link to an attached PC or hub. Improved network performance enables high-bandwidth applications such as multimedia, imaging and video to be sent between workgroups, the company says.

The AT-RS710TX and AT-RS718TX switches support eight and 16 switched 10-Mb/s ports, respectively, and feature two 10/100 TX uplink ports that automatically negotiate the 10-Mb/s or 100-Mb/s speed and determine half- or full-duplex mode with the remote end. One fast port can be attached to a server and the other to a Fast Ethernet switch for connection to other workgroups.

The AT-FS708 switch has eight 10/100-Mb/s speed-sensing ports. By offering autonegotiation, the switch provides an easy migration path from existing 10-Mb/s shared environments to 100-Mb/s switched environments. All three switches feature a 13-inch metal case design or can be rack-mounted, and support IEEE 802.3, 802.3u, 10BaseT and 802.3i 10BaseT industry standards.

The AT-RS710TX and AT-RS718TX switches cost \$895 and \$1,350, respectively, and the AT-FS708 switch is priced at \$1,450. All units include free technical support and come with a one-year

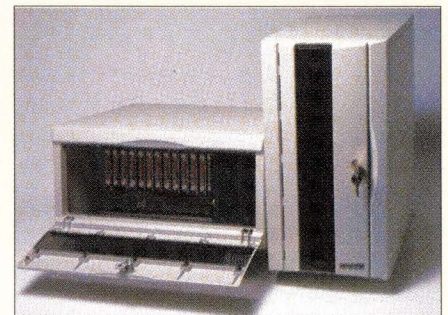
warranty for the power supply and fan and a five-year warranty for the unit.

Allied Telesyn International Corp.

950 Kifer Road
Sunnyvale, CA 94086
<http://www.alliedtelesyn.com>
Circle 125

Tape Library Uses AIT Technology

Spectra Logic has unveiled the latest member of its TreeFrog tape library family, the AIT TreeFrog. Advanced Intelligent Tape (AIT) technology was introduced by Sony Electronics Inc. in 1996 and offers greater capacity and higher transfer rates than other midrange tape drive technology. The AIT-1 tape drives lower the cost of full-featured, robotic computer backup for entry-level users, Spectra Logic says.



The AIT TreeFrog design features an integrated picker and unibody chassis, a removable cartridge pack and an integrated dust cover to protect tapes throughout media rotations. Electronic bar code scanning is standard on all TreeFrog models, Spectra Logic says. The library offers an uncompressed capacity of 375 GB (975 GB compressed). In addition, it is capable of backing up 3 MB/s native data (7.8 MB/s compressed). Pricing is around \$6,500 for a single-drive AIT TreeFrog. It runs in UNIX, Windows NT and NetWare environments.

Spectra Logic Corp.

1700 N. 55th St.
Boulder, CO 80301
<http://www.spectralogic.com>
Circle 126

Data Highway from Mainframe to UNIX

Bus-Tech, a provider of data center connectivity solutions, has come up with a faster way of transferring data from IBM

New Products



System/390 mainframes to UNIX and Windows NT servers. DataBlaster 2 offers systems and database administrators the ability to move, load, back up and restore gigabytes of data in minutes rather than hours, the company says.

DataBlaster 2 is a family of high-performance ruggedized, rack-mounted control systems, differentiated only by port configuration, that reach their high throughput levels by emulating industry-standard tape drives at each side of the connection. On the mainframe side, they connect up to two Enterprise Systems Connection (ESCON) or Bus and Tag channels, providing throughput speeds of up to 32 MB/s. On the server side, up to four Ultra Wide SCSI connections attached to enterprise servers provide data movement at speeds of up to 40 MB/s. No additional software or high bandwidth adapters are required on either side, Bus-Tech says.

DataBlaster 2 is certified for use with Solaris, Digital UNIX, HP-UX, AIX and Windows NT platforms. Pricing ranges from \$12,000 to \$35,000, depending on port configuration.

Bus-Tech Inc.

129 Middlesex Turnpike
Burlington, MA 01803
<http://www.bustech.com>
Circle 127

Tools to Speed Java Development

ParaSoft, a provider of software development tools, has released jtest! and CodeWizard for Java. jtest! uses ParaSoft's patent-pending Test Generation technology to analyze Java programs, automatically finding all uncaught runtime exceptions that can arise from invalid HTML, GUI or data input, ParaSoft says. To use jtest!, a user supplies the classname of a program by typing `jtest [ClassName]`. jtest! will then execute the program's byte code, testing the program and reporting the sequence of

events that may cause an error. Once identified, this sequence of events may then be examined using jtest!'s graphical playback interface, the company says.

CodeWizard for Java uses ParaSoft's patent-pending Source Code Analysis technology to automatically enforce coding standards. CodeWizard is a set of software-validated rules or "items" designed to help developers avoid common pitfalls and create more effective programs, ParaSoft says. The product reportedly helps developers learn the tricks of experienced programmers and improve their code writing skills. More than 60 items are enforced automatically by CodeWizard, any of which can be suppressed. In addition, developers can write their own rules to add to the CodeWizard's list.

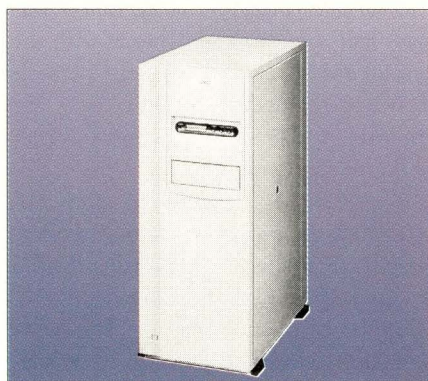
CodeWizard and jtest! cost \$549 and \$495, respectively, and can be downloaded from the company's Web site.

ParaSoft Corp.

2031 S. Myrtle Ave.
Monrovia, CA 91016
<http://www.parasoft.com>
Circle 128

CD-ROM Library for LANs

JVC has introduced Model BC-MC-1110-AI, a 100-disk capacity CD-ROM library with 65 GB of storage for LAN users. This model is a lower cost addition to JVC's line of CD-ROM jukeboxes, which include 200- and 600-disk data storage libraries.



Model BC-MC-1110-AI comes with iXOS Software Inc.'s Jukeman software, which provides high-speed disk caching and intelligent load scheduling capabilities. The jukebox reportedly offers users high-capacity CD-ROM storage and data retrieval for archiving, secondary storage, Computer Output-to-LaserDisc (COLD)

storage and imaging applications.

Model BC-MC-1110-AI features two 50-disk removable magazines, one CD-ROM drive and a SCSI-2 interface. The unit's disk-handling mechanism is said to provide an average disk load time of three seconds and an average disk exchange time of six seconds. It has a data transfer rate of 1.2 MB/s, an average access time of 150 msec and a buffer memory capacity of 256 KB, JVC says.

Model BC-MC-1110-AI functions transparently on a multiplatform network, with the management software providing access to the unit via both UNIX or Windows NT. It costs \$8,995 and includes a two-year parts and labor warranty. The 100-disk library is fully upgradable to a 200-disk capacity; the upgrade kit sells for \$5,900.

JVC Professional Computer

Products Division

5665 Corporate Ave.
Cypress, CA 90630
<http://www.jvc.net>
Circle 129

Access Win95 Apps from UNIX Workstations

Tera Technologies has introduced a product that allows UNIX users, including X terminal users, to remotely run Windows 95 and DOS applications and to share PC peripherals over a network. EZ-Win can also be used to administer Windows 95 machines over the network and can function as a virtual docking station for UNIX users who also use Windows 95 laptops, allowing users to connect their full-size UNIX screen and keyboard to their laptops, Tera says.

According to Tera, most end users will be able to install EZ-Win without assistance from their systems administrator. It runs on any Windows 95 machine and uses Windows' TCP/IP stack. Using the X Window protocol, EZ-Win reportedly sends keystrokes and mouse events from the X display to the Windows 95 PC, where execution takes place and sends the display output to a window opened on the X display. EZ-Win is priced at \$395.

Tera Technologies Inc.

3859 S.W. Hall Blvd.
Beaverton, OR 97005
<http://www.terainc.com>
Circle 130

Upgrades, Enhancements, Additions...

- ▶ TriTeal has announced the latest version of its UNIX-to-Windows integration product, WinTED 2.1. With WinTED, a Windows 95 or NT client can access, execute and display a UNIX application as if it were a native Windows application, the company says. WinTED features front-panel control for deployment and administration, drag-and-drop functionality and an on-demand PC X server. Also included is the TriTeal Graphical Workspace Manager (GWM), which allows users to visually monitor and navigate multiple workspaces simultaneously; automatic application gathering; and an ICA client for access to remote NT applications and services. WinTED 2.1 costs \$99 per seat and supports UNIX applications running on SunOS, Solaris, AIX, HP-UX or IRIX. **TriTeal Corp.**, 2011 Palomar Airport Road, Carlsbad, CA 92009, <http://www.triteal.com>. **Circle 131**
- ▶ Secure Computing is now offering the SafeWord Starter Kit to users of the Cisco Systems Inc. CiscoSecure Access Control Server (ACS) 2.2 for UNIX. SafeWord Starter Kit is being offered to promote the use of SafeWord with ACS, a software security suite designed for authentication, authorization and accounting. The two products working together are said to allow organizations to integrate the administration of secure access control. CiscoSecure centralizes the individual access control of network access servers, firewalls, routers and switches. SafeWord provides strong authentication with onetime, encrypted password protection, the company says. SafeWord Starter Kit comes with a 10-user SafeWord Authentication Server license and 10 SafeWord Platinum tokens, and is priced at \$1,200. **Secure Computing Corp.**, 2675 Long Lake Road, Roseville, MN 55113, <http://www.securecomputing.com>. **Circle 132**
- ▶ The 7700 Scalable Array from Hitachi Data Systems now offers storage management capabilities and a greater number of choices to implement strategies for critical applications that require high-speed duplication of large amounts of data. The addition of the Hitachi Remote Copy Semi-Synchronous Option (HRCSSO) allows an organization to maintain duplicate copies of data at remote locations to protect against data loss, the company says. Also, HRCSSO can assist in the migration of data and applications from one computing site to another and provides users with a choice of synchronous, asynchronous or semisynchronous remote copy. Other features include enhanced capabilities to HRCSSO as well as the addition of Storage Technology Corp.'s Iceberg to the list of systems supported by Hitachi Online Data Migration (HODM), an HS-DataPlex storage management solution for testing applications. The 7700 runs on Solaris, AIX, HP-UX and Windows NT. Contact vendor for pricing. **Hitachi Data Systems Corp.**, 750 Central Expwy., Santa Clara, CA 95050, <http://www.hds.com>. **Circle 133**
- ▶ Precise Software Solutions has upgraded Precise/SQL Version 2.5, a performance-tuning tool that enables database administrators and application developers to diagnose and fix performance problems for Oracle database applications. This latest release includes features for data warehousing, historical performance trending and analysis, security and a secure log-on feature. Precise/SQL 2.5 supports Oracle running on Solaris, AIX, HP-UX, Digital UNIX, Sequent Dynix/ptx and Windows NT (analysis capabilities only). A single-server license costs \$14,995, plus \$495 per user; quantity discounts are available. **Precise Software Solutions Inc.**, 50 Braintree Hill Office Park, Ste. 110, Braintree, MA 02184, <http://www.precisesoft.com>. **Circle 134**
- ▶ LAND-5 is increasing the memory on its ICEbox Pentium Pro servers from 512 MB to 1 GB. In addition, an enhanced motherboard now provides seven PCI slots for I/O expansion and on-board SCSI RAID support. The rack-mountable plug-and-play network servers reportedly offer versatility and fault tolerance for businesses that require 24-hour access to stored information. Three hot-swappable disk drives provide 13.65 GB of internal RAID storage. The servers come standard with either a single or dual 200-MHz Pentium Pro processor, as well as an on-board Ultra Wide SCSI controller and an integrated video controller. Pricing for an ICEbox Pro 1 single-server version starts at \$6,885, and at \$7,719 for a dual-processor version. **LAND-5 Corp.**, 9747 Business Park Ave., San Diego, CA 92131, <http://www.land-5.com>. **Circle 135**
- ▶ SoftTech Solutions has released two new versions of its On-Line! Detective for Sun servers and workstations. Version 7.0 for workstations and Version 4.0 for servers are said to provide online documentation for the troubleshooting, repair and maintenance of Sun machines via a user-friendly GUI with pop-up screens and full-color photos. These latest versions also include a comprehensive database of Sun and third-party parts. Pricing for the software ranges from \$1,995 for a single-user license to \$995 per user for a 49-user license. **SoftTech Solutions Inc.**, 3525 Elizabeth Lake Road, Ste. A, Waterford, MI 48328, <http://www.stsolutions.com>. **Circle 136**
- ▶ Symantec's Visual Cafe for Java now fully integrates with Black & White Software Inc.'s OrbixBuilder, giving Java developers an easy path for developing CORBA-based Java enterprise applications, Symantec says. Developers use visual tools and drag-and-drop functions to automatically generate code that is CORBA IIOP-enabled. For Java-based development on Windows platforms, OrbixBuilder reportedly installs itself as an integrated extension to Visual Cafe for Java, extending graphical Java development capabilities to CORBA-based distributed objects. Visual Cafe for Java costs from \$99.95 to \$499.95, depending on the edition. OrbixBuilder for Visual Cafe costs \$1,495. **Symantec Corp.**, 10201 Torre Ave., Cupertino, CA 95014, <http://www.symantec.com>. **Circle 137**

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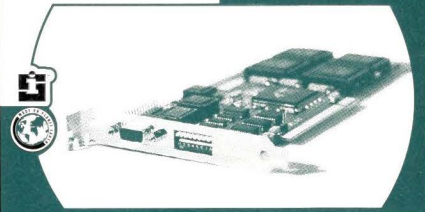
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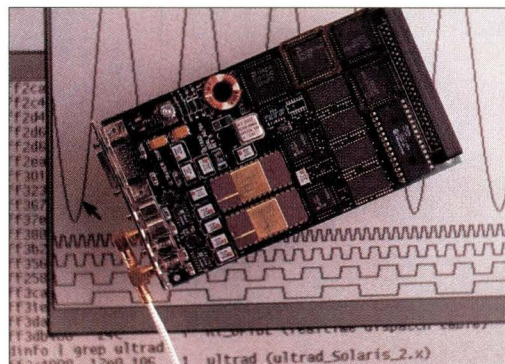
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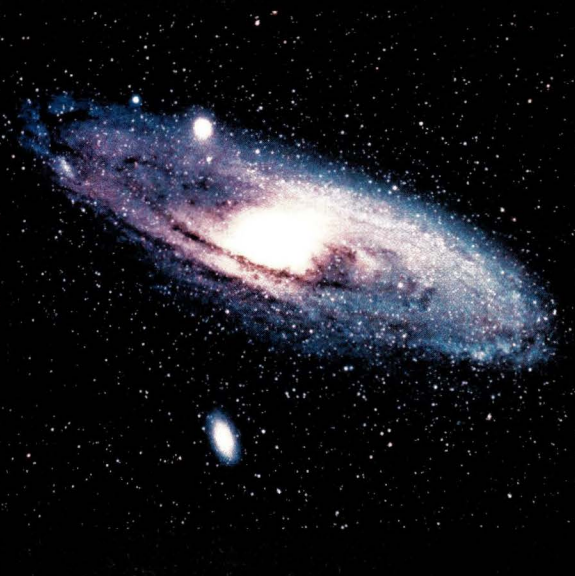
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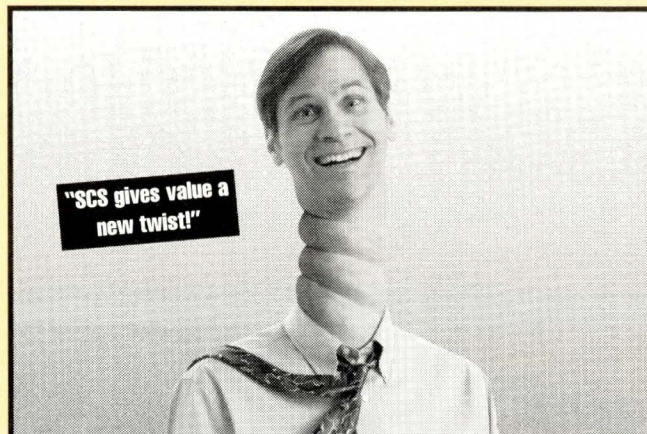


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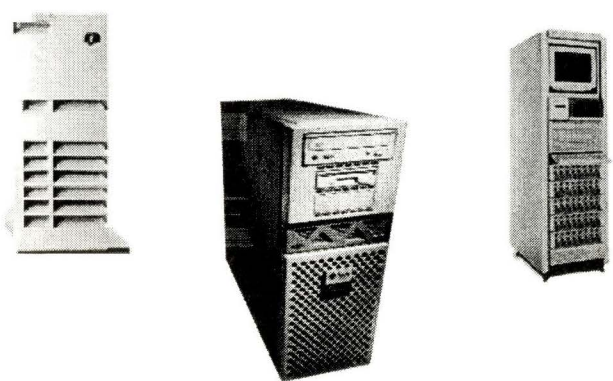
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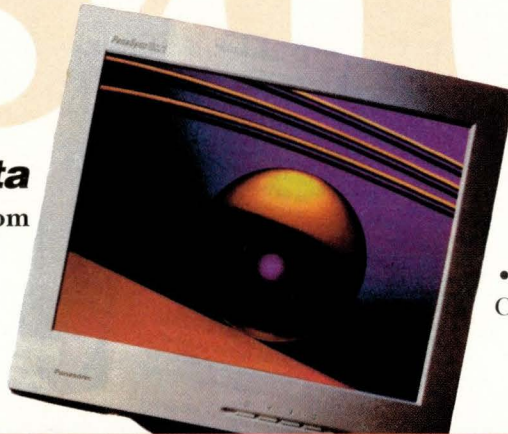
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
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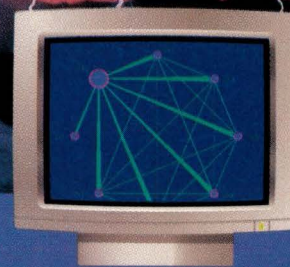
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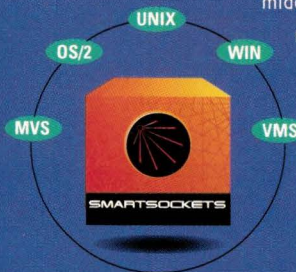


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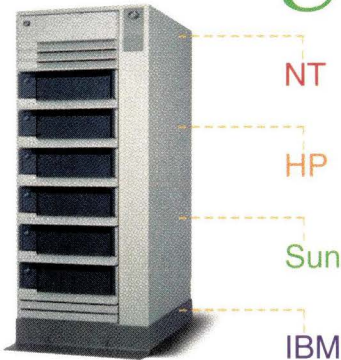
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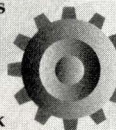
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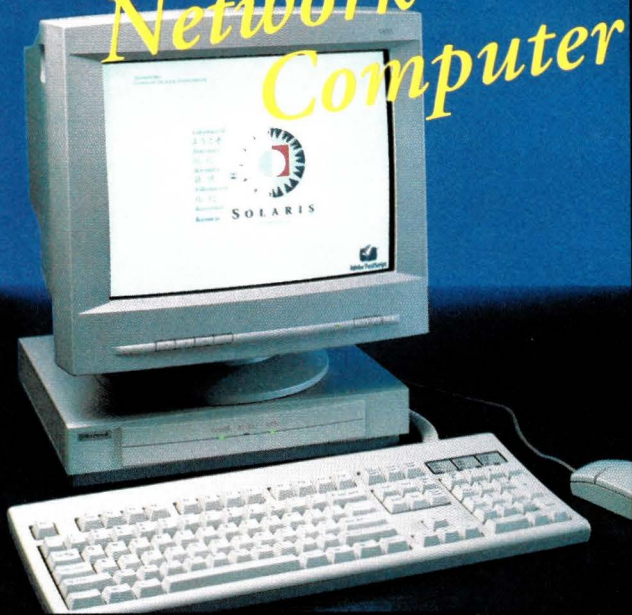
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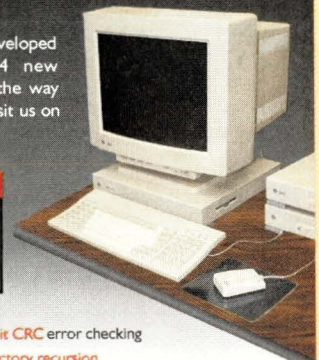
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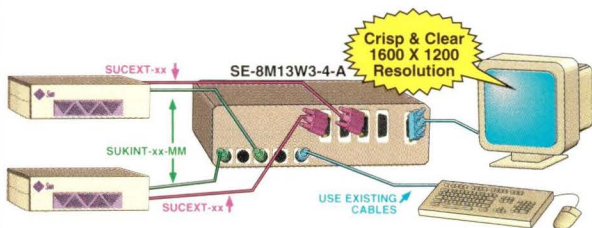


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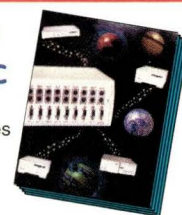
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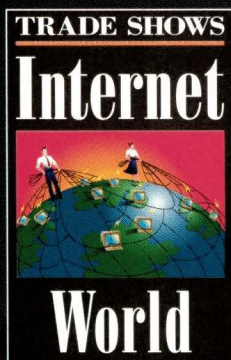
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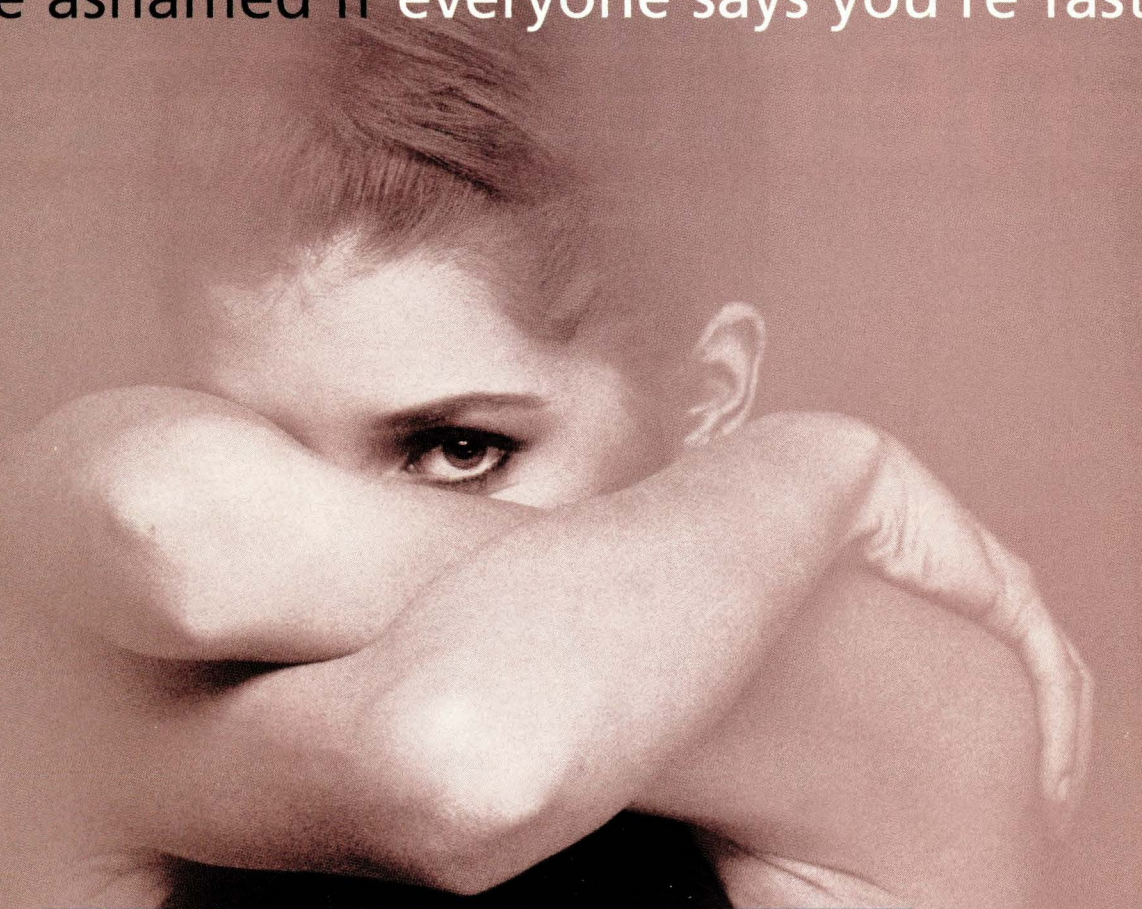
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