Server/Workstation EXPERT

DECEMBER 1999
Vol. 10 No. 12 $5.50
http://sw.expert.com

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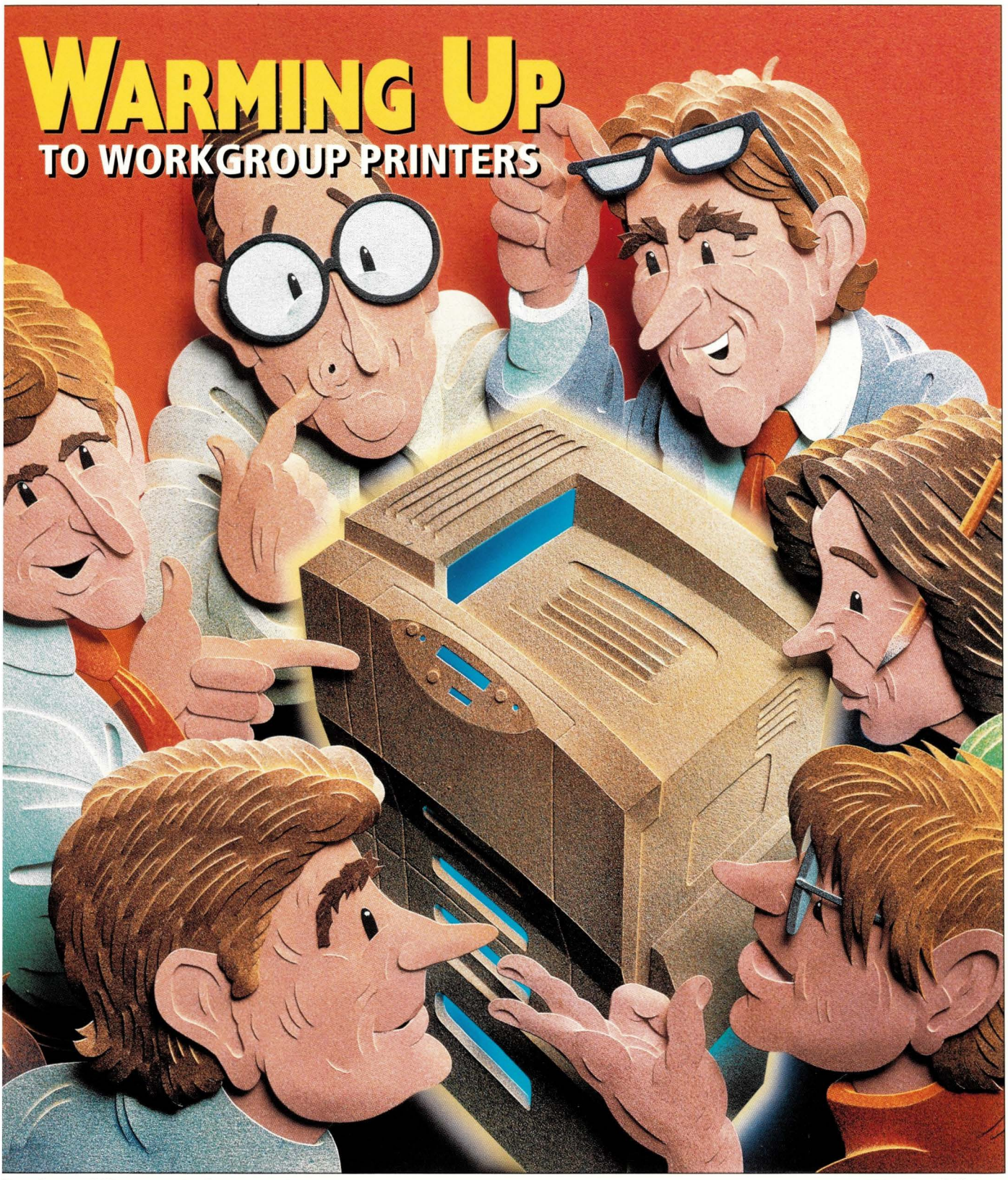

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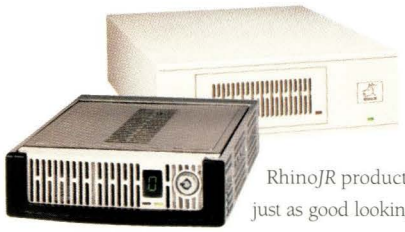

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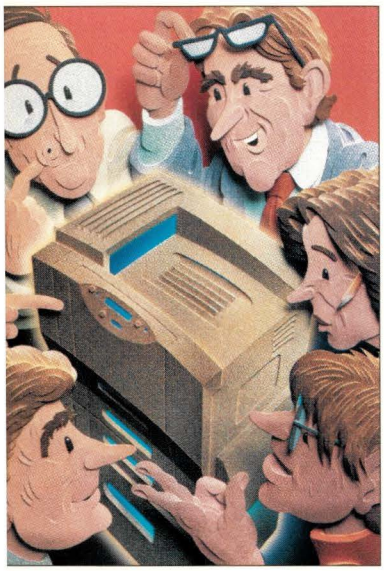

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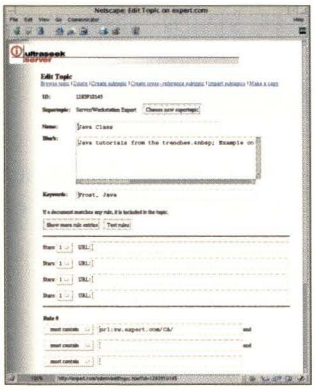

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Departments

SERVER/WORKSTATION EXPERT Magazine (ISSN# 1524-4849) is published monthly by Computer Publishing Group, 1340 Centre St., Newton Center, MA 02459. Telephone (617) 641-9101. Periodicals Postage Rates paid at Boston, MA, and at additional mailing offices. Posted under Canadian IPM #0235873. This publication is free to qualified subscribers as determined by the publisher. Subscription rates are $60 per year in the United States, and $75 (surface mail) and $125 (air mail) outside the United States. Subscription requests can be sent to Circulation Department, *SERVER/WORKSTATION EXPERT* Magazine, 1340 Centre St., Newton Center, MA 02459, or electronically mailed to circ@cpg.com.

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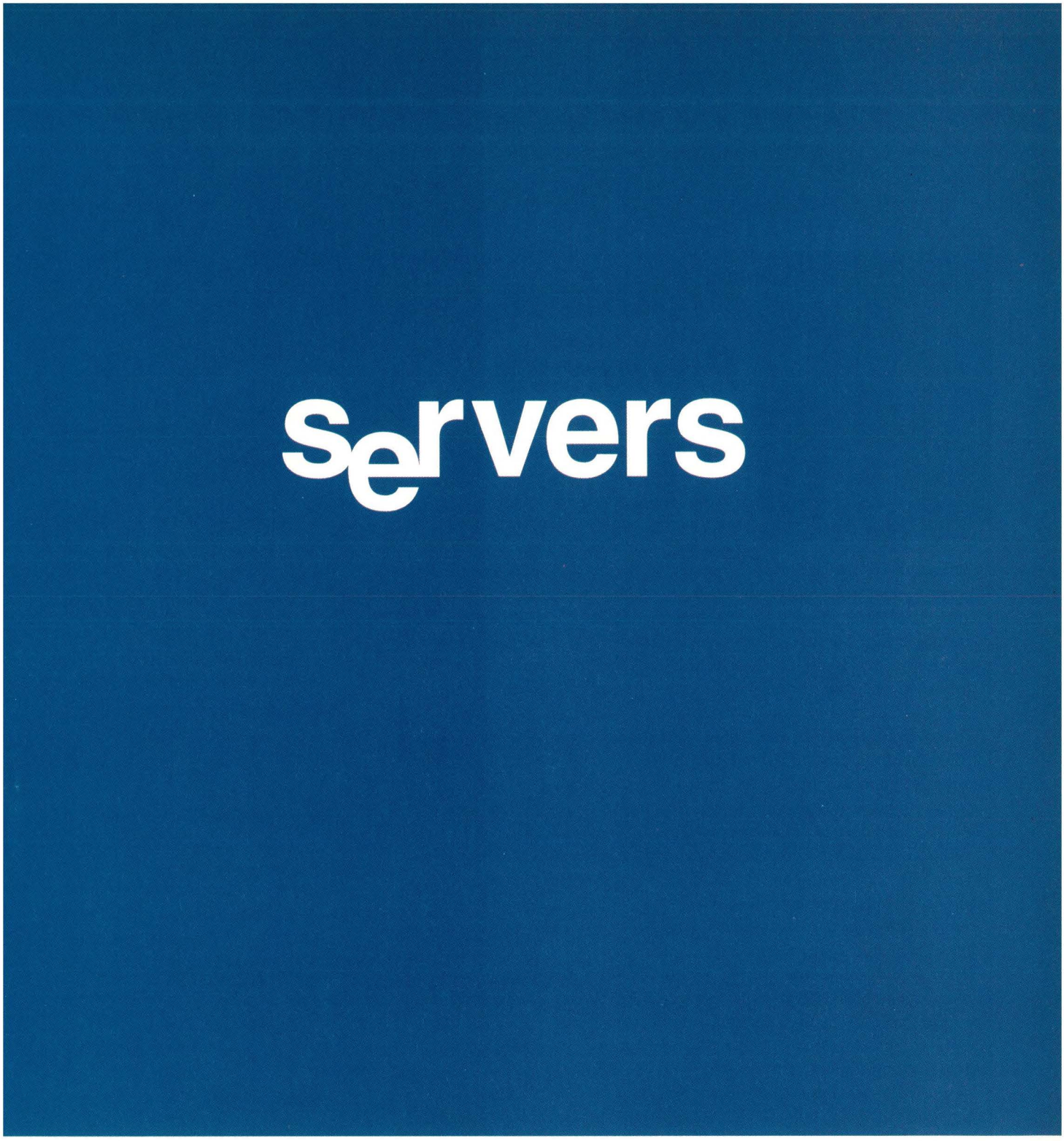

three quarters of all internet servers are intel-driven[1]. why is intel architecture the world's e-business platform of choice? because it's technology people trust. because it continues to strike the right balance between price and performance. because it consistently offers the greatest choice of leading-vendor hardware and software solutions. and because nobody wants to be stuck with a proprietary system five years from now. e-business is growing faster than most e-business budgets. the way to be more effective is to be more cost-effective. and the way to achieve that, long-term, is to deploy your e-business on intel-based servers. this is the surge economy, and it's only the beginning. why intel architecture? ➜ *intel.com/ebusiness*

1 Based on 1999 IDC estimates of worldwide Internet server shipments.

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EDITORIAL

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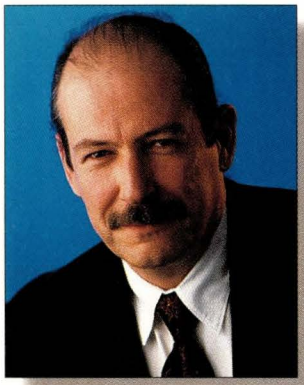

Promises, Promises

The computer business has more than a few phrases and technology promises that seem to get under your skin and become very irritating. "Millennium bug" is just the latest. Perhaps that one will be shelved in a few weeks. Not too long ago, for five or six years, every year was "the year of the LAN." A new one making the rounds for the last couple of years is "the year of SAN." But if you wanted to be a millionaire and were asked what is the most galling, most long-lasting, unfulfilled promise of the industry, what would you answer? I know my final answer would be "the paperless office." Isn't it just over the horizon? It seems to forever be just over the horizon.

For evidence, take a look at this month's cover story by frequent contributor Alexandra Barrett. In "Warming Up to Workgroup Printers," Alex finds support for the proposition that printers are churning out more paper than ever before. Contrary to popular opinion, printing is on the rise. Judging by the amount of paper we consume, it is growing by an estimated 8% every year, says James Lundy, research director at Gartner Group Inc., Stamford, CT.

Why? According to Christina Tiner, worldwide product manager for digital office solutions at Lexmark International Inc., "People are printing more because there's just so much more information out there." Whereas printing of interoffice communications such as memos might be down, other forms of printing are up. Can we blame that on the Internet?

Alex also finds that introducing higher resolution and color print systems into the average office drives up print volume. "Before, if you needed to print a brochure," she says, "you sent it out to a third-party print center. These days, you print it out yourself, on demand." To find out how these changes affect users and administrators, read Alex's story on Page 48.

If you have moved from paper to the Web, you'll want to check out Ian Westmacott's review of Infoseek's Ultraseek Server, "Any Document, Any Place, and a Place for Any Document," Page 56. The server turns out to be a superb search engine for distributed text documents. Maybe products like this one will move some businesses down the road to the paperless office.

If you have a favorite marketing phrase or industry buzzword that makes you cringe, I'd love to hear from you. Happy Holidays!

Doug Pryor

SW EXPERT

December 1999 Vol. 10 No. 12

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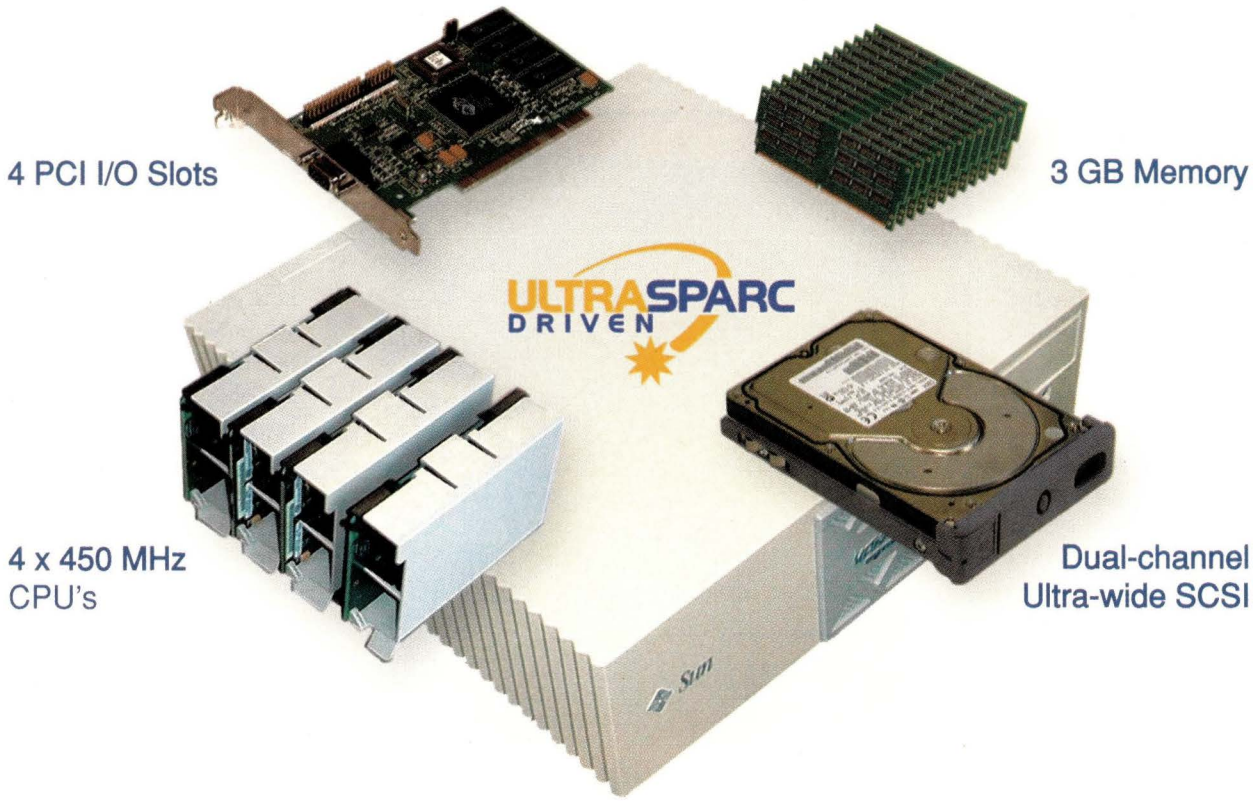

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New OSs Embrace Mainframe Capabilities

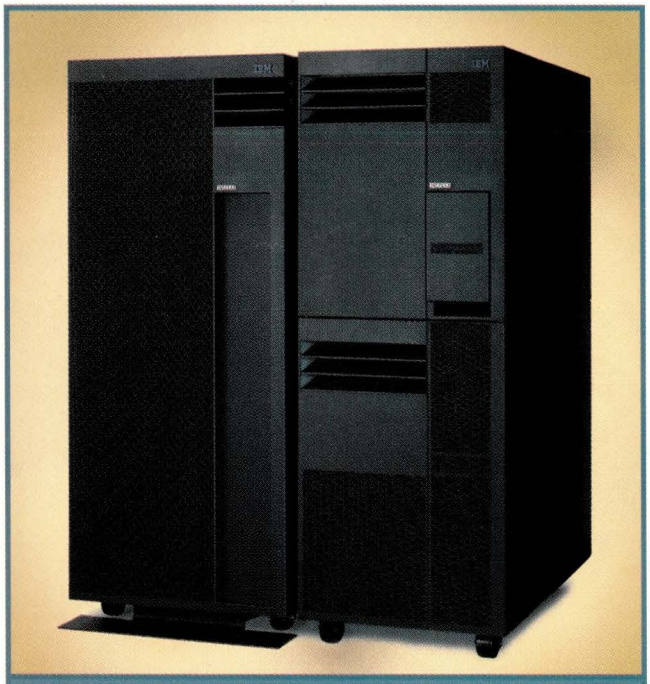
With Armonk, NY-based IBM Corp.'s release of AIX 4.3.3, the latest version of its UNIX operating system, and the start of Palo Alto, CA-based Sun Microsystems Inc.'s beta program for Solaris 8, it's clear commercial UNIX operating systems are taking on more of the functionality and features provided in a typical mainframe environment.

"UNIX is increasingly finding a home in data center deployments," says Tony Iams, senior analyst with Port Chester, NY-based research firm D.H. Brown & Associates Inc. "The functions that people expect from mainframes are now becoming necessary on the UNIX platform too."

One example of this evolution of UNIX into a mainframe-class operating system is the introduction of the IBM AIX Workload Manager (WLM) with AIX 4.3.3. With WLM, resource management capabilities are embedded directly into AIX. For instance, a server's resources such as CPU cycles can be allocated based on priorities and importance, these priorities can then be predetermined based on criteria such as type of user or application. "UNIX has been notoriously egalitarian," says Dan Kusnetzky, program director for International Data Corp. (IDC), a market research firm based in Framingham, MA. "Now, IBM has put forward a scheduler that allows you to set up classes."

IBM is a little late in providing this kind of capability, however. Sun already offers resource capabilities with its Solaris Resource Manager 1.0 (SRM), while Hewlett-Packard Co., Palo Alto, CA, offers Process Resource Manager (PRM) for HP-UX and Houston, TX-based Compaq Computer Corp.'s Tru64 UNIX 5.0 comes with a class scheduler embedded into the operating environment.

"You can't just pick up mainframe functionality and slap it down onto UNIX," says D.H. Brown's Iams. "From an operational standpoint, [UNIX] is fundamentally different from a mainframe. But IBM is in a good position to marry the two worlds because they have a lot of experience with mainframes."



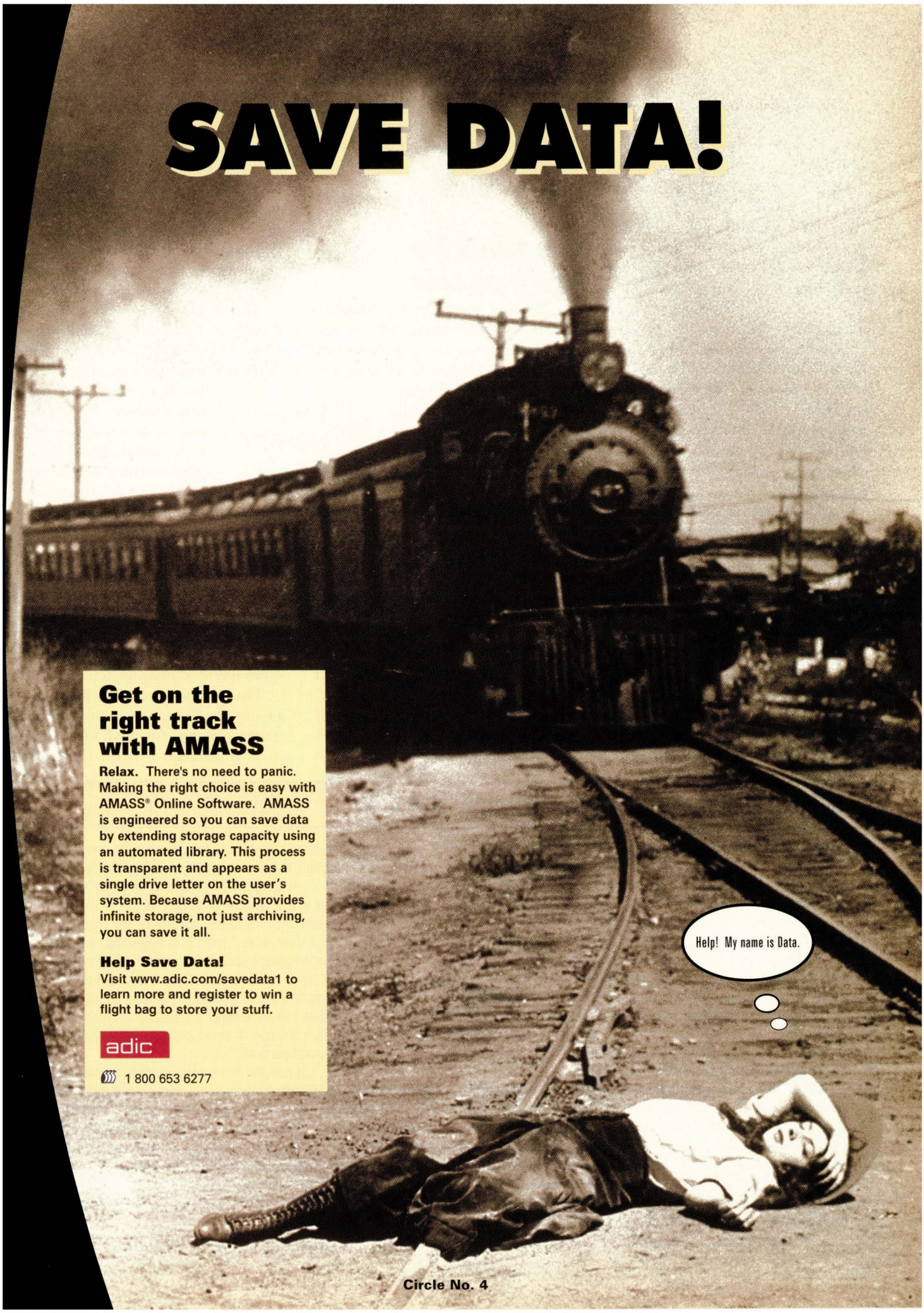
In addition to AIX 4.3.3, IBM unveils its new flagship SMP server, the 24-way RS/6000 S/80.

Because mainframe capabilities can't just be "slapped" onto UNIX, as Iams points out, Sun has put a great deal of effort into promoting its Solaris 8 beta program in order to thoroughly test the new operating system. "It is a little unusual that they made some news about [the beta version]," says Iams. "But getting a well-tested product is more important now than ever before."

Solaris 8 is scheduled to ship sometime in first-quarter 2000 and reflects this trend of adding mainframe capabilities to UNIX. The new operating system will include the next generation of SRM, but according to Sun, the key aspect will be its enhanced clustering capabilities. "Clustering is going to be the biggest factor in moving into the next generation," says Jeff Bernard, director of marketing for Sun Solaris software. "We are handling clustering support in the operating environment and that is a big part of how we are adding mainframe attributes to our systems."

Solaris 8, which will be available for both SPARC and Intel platforms, will be able to spread the workload across an eight-server cluster instead of its current limit of four. It will continue to provide features such as the ability to add or remove nodes online and mix and match servers.

In addition, Sun says Solaris 8 will come with the AppCert testing tool, which is designed to verify whether existing Solaris applications will run unmodified on the new operating environment, and Live Upgrade, a feature for evaluating updates to Solaris. Users will reportedly be able to save the state of their current operating environment onto a disk drive, then after a reboot, the new revision of Solaris can be invoked into their system. If the user is unhappy with the new version, Sun says a simple reboot to return the operating environment to its original state is all that is needed. "This is tremendous progress in taking some mainframe-like features



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and building them into the Solaris environment," Bernard says.

In addition to releasing AIX 4.3.3, IBM also unveiled its latest symmetric multiprocessing (SMP) server, the 24-way RS/6000 S/80. The S/80 is IBM's new flagship SMP server and Big Blue is aggressively positioning it against other vendor SMP offerings, including Sun's Enterprise 10000. "For the first time in a couple of years, we are clearly the one to beat in terms of performance, with Sun and HP chasing us," says Mike Maas, manager of enterprise server product marketing for the IBM RS/6000. "The data bandwidth inside the S/80, compared to the E10000, has two to four times more capacity to transmit from memory, processor and I/O."

The S/80, like the existing RS/6000 S/70, is designed with the processors in one cabinet and the I/O in another. This means an S/70 can be upgraded without disturbing a user's I/O, network or disk connections, IBM says. The S/80 is also the first RS/6000 to use copper in its microprocessor. The new chip, RS64-III, operates at 450 MHz and, with the new version of AIX, shows vast improvement over the S/70, which originally shipped with 125-MHz processors, IBM says. "In a 12-month window, we have improved performance of the S Class systems by three and a half times," says Maas. "A portion of that improvement comes from AIX."–*ptc*

HP Beefs Up Storage Line

Hewlett-Packard Co., Palo Alto, CA, has announced a broad spate of new products that the company hopes will allow it to continue to be a leading supplier in the storage space. The wares consist of the company's first hard disk-based network-attached storage (NAS) appliance product line, a magneto-optical jukebox and two new CD-ROM drives.

Interest in NAS storage has been high, analysts say, because it has the potential to help companies lower operating costs. "Since the storage system is separate from the server operating system, it becomes easier to install and maintain," says Bob Katzive, vice president of Disk/Trend Inc., a Mountain View, CA-based market research firm.

HP's entry into the NAS market–the SureStore HD Server 4000–is designed for small workgroups.

HP's entry into the NAS market–the SureStore HD Server 4000 product line–is designed for small workgroups. "We understand customers' desire for NAS products that could support data center storage requirements and plan to address that in the future," says Sue Gillespie, HP product manager, who declined to set a time frame for when the company would deliver such products.

The new NAS system connects directly to Ethernet LANs and offers 18 to 90 GB of RAID 5 storage. The product features an embedded Web-based management tool that eliminates the need for special client/server software and helps systems administrators with installation and configuration tasks. In addition, administrators can manage the device from anywhere on the network using HP's Server Admin package. Pricing for the SureStore HD Server 4000 ranges from $5,000 to $8,900, depending on configuration

The HP SureStore 125ex jukebox is an entry-level magneto-optical storage system designed for small businesses, such as medical offices, legal and

Skepticism Over Open-Source Solaris

Sun Microsystems Inc., Palo Alto, CA, plans to make the source code for its Solaris operating system freely available to programmers under a community source licensing agreement–although, to date, the company has not announced when the program might start. Under the agreement, developers will be able to download the source code for Solaris and make changes, although those changes will have to be passed back to Sun. If the source code is incorporated into commercial products, then licensing fees will be charged.

Some industry analysts are skeptical of Sun's motives. They believe this is an attempt by Sun to take advantage of the rising popularity of open-source software such as Linux and Apache. "This could be thought of as a very clever use of marketing to attempt to ride on the open-source movement's coattails," says Dan Kusnetzky, program director for International Data Corp. (IDC), a market research firm based in Framingham, MA. "They are now positioned, in some people's minds, as a friend of the open-source community. The older and wiser cousin that is glad to help when needed."

But others, including members of the open-source community, and more important, those who would actually do the developing, are critical of Sun's program. "The Sun community source license is an attempt to use outside developers as free labor, while keeping proprietary control of the results of all their work," says Eric Raymond, a noted open-source participant, author and evangelist. "Open-source developers can smell this manure a mile away and will have no part of it. Sun can have either proprietary control or our cooperation. It must choose one, because it won't get both."

It remains to be seen whether open-source developers will participate in Sun's licensing program, nevertheless, Sun may have already accomplished its goal without a single person taking part in the Solaris program. "Whether or not a person touches a keyboard to add things to the source, Sun got what they wanted," says IDC's Kusnetzky. "It allowed them to look like they are part of the open-source community and they would love to position Solaris as the operating system you move to when you outgrow Linux."–*ptc*

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Circle No. 5

The SureStore HD Server 4000 is HP's first foray into the network-attatched storage market. The new system connects directly to Ethernet LANs and offers 18 to 90 GB of RAID 5 storage.

accounting practices, and schools that need to archive and quickly retrieve substantial amounts of reference data.

Though revenue for optical storage systems has been increasing at a rate of only about 5% per year, according to Michael Peebles, HP product marketing manager, two factors could boost growth in the next few years. First, with email becoming a key component in business functions, corporations need to put backup procedures in place so they can archive employee mail. Second, the U.S. Securities & Exchange Commission has mandated that financial firms keep copies of all online stock transactions.

The HP jukebox has 24 5.2-GB slots, capable of archiving 31.2 million digitized pages. HP's SureStore 125ex magneto-optical jukebox offers 50% more capacity than the previous model (the SureStore 80ex) for the same price: $7,990 for a single-drive system.

In addition, HP has also introduced two CD-ROM drives that write data at up to 8x transfer speed and read data at up to 32x transfer speed, a performance increase of two to four times that of previous models. The CD-Writer Plus 9200e series, which sells for $499, is an external SCSI drive, and the HP CD-Writer Plus 9100i series, priced at $299, is an internal IDE drive.–*paul korzeniowski, freelance writer* (paulkorzen@aol.com)

Sun Drops Ultra 5 Pricing

In October, Sun Microsystems Inc., Palo Alto, CA, once again tightened its grip on the low-end workstation market when it dropped the price of its Ultra 5 workstation to $1,945, making it the first 64-bit UNIX workstation priced below $2,000.

With an UltraSPARC-IIi 333- or 360-MHz CPU, onboard 24-bit PGX graphics, EIDE disk controller, three PCI I/O slots, 10/100BaseT Ethernet, 1.44-MB floppy drive and Solaris 7 preinstalled, Sun says the Ultra 5–introduced in early 1998–is now the world's best-selling UNIX system. According to International Data Corp. (IDC), a market research firm in Framingham, MA, Sun sold more than 98,000 Ultra 5 units in 1998, and through the second quarter of this year, IDC estimates Ultra 5 sales accounted for 25% of all traditional workstation market sales and 42% of all Sun workstation sales.

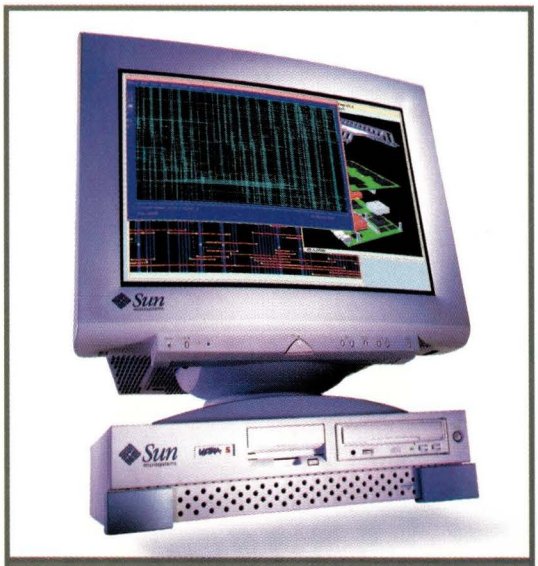
Coupled with a SunPCi card–which shares the Ultra 5's hard disk, floppy drive and network interface, and allows users to run Windows 95/98/NT and DOS applications natively on their Solaris desktop–and the freely available StarOffice software suite, which includes word processing and spreadsheet applications, the Ultra 5 is quickly moving in on what was traditionally a PC-only space.

Although Compaq Computer Corp., Houston, TX, Dell Computer Corp., Round Rock, TX, Gateway Inc., San Diego, CA, Hewlett-Packard Co., Palo Alto, CA, and IBM Corp., Armonk, NY, all offer workstations using Intel Corp. processors for around $2,000, Sun says SunPCi puts the Ultra 5 in a separate category. "The goal in the life of the Ultra 5, so to speak, is to drive volume," says Steven Grigory, senior product marketing manager for Sun. "[With SunPCi] it's an incredibly great development platform, with incredible pricing. No one else can even compete."

The price of the Ultra 5 has dropped more than 20% in the past year, down from $2,495 in November 1998. Sun has no immediate plans to drop its prices on high-end Ultra workstations, Grigory says, but he won't rule it out in the future. "We have been very aggressive on price/performance," he says. "I would say it's a very safe bet that [price reductions] continue."

Kara Yokley, market analyst with IDC, agrees that Sun's new prices are attractive, but says they should be taken in context. "Sun has a history of pushing prices down," Yokley says. "The [latest] Ultra 5 announcement was fully in keeping with this. These are normal price drops we expect from Sun as its production efficiencies and volume increases."

But Yokley adds that the inclusion of SunPCi is what makes the Ultra 5 special. "In the UNIX market, Sun is the only one competing in the sub-$2,000 range. And for people who want both UNIX and Windows capability at this price point, the Sun Ultra 5 is the only game in town."



Sun's Ultra 5 workstation with SunPCi is the first 64-bit UNIX workstation priced below $2,000.

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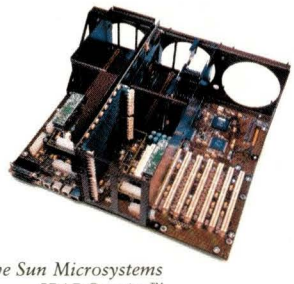

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Despite its attraction to potential buyers, the immediate effects of the Ultra 5 price reduction won't be felt by most VARs, says Chad Donnell, vice president of sales for Sun reseller Donnell Systems Inc., South Bend, IN, which services the greater Chicago area. "The lower end doesn't drive our business model," Donnell says. "You can't really provide a value-add for the Ultra 5."

The bulk of Donnell Systems' business revolves around Sun's Ultra 10 and Ultra 60 models. Donnell estimates that his company sells only 20 Ultra 5 workstations per month. The majority of Ultra 5 systems are purchased directly from Sun, through sales representatives or via Sun's Web site, he says. However, Donnell's interest in low-end Sun workstations has increased as the price of the Ultra 5 has continued to decrease because with every price reduction and Ultra 5 sale, the company's future client base is growing. "If the price goes down and it gets new users onto the Sun platform, that's a great thing. Eventually, those users will work their way up," Donnell says.–*ml*

Commercial Service Support for Apache

One problem facing users of free software developed in an open-source community is the general lack of available support. When problems or questions arise, users typically have to turn to newsgroups or independent Web sites for fixes and answers. For those wishing to use the software to run a business, however, this is not always acceptable. But one vendor believes it has a solution to the problem.

Covalent Technologies Inc., Lincoln, NE, announced in October that it will provide 24x7 commercial support for the open-source Apache Web server. Of course, IBM Corp., Armonk, NY, already offers support for Apache that is integrated into its WebSphere application server, and so does C2Net Software Inc., Oakland, CA, which sells a commercial version of Apache incorporating public key cryptography. But Covalent says its approach is slightly different. When a user signs a service contract with Covalent, the company will provide technical support for the free version of the software.

"There are great resources online for self-help," says Randy Terbush, founder of Covalent, cofounder of the Apache HTTP Server Project and director of The Apache Software Foundation, a Forest Hill, MD-based not-for-profit organization that provides support for Apache open-source software projects. "But many of the environments that are wanting to use Apache have restrictions by upper management that there needs to be somebody to call, and that is the one thing open source doesn't provide, a phone number. We are trying to be that for some of the bigger customers out there."

The service plans vary from $995 per year for support that is limited to business hours (Monday through Friday) to $60,000 per year for unlimited, around-the-clock support. Covalent also offers its customers limited support plans based on the number of phone calls or email messages sent to the company. At

Sun Unveils JDMK 4.0

Sun Microsystems Inc., Palo Alto, CA, is trying to make Java more inviting to the network management world. With the October release of Java Dynamic Management Kit (JDMK) 4.0, Sun has for the first time included Java Management Extensions (JMX) with its tool for creating Java management applications to work in conjunction with legacy management systems.

"Our existing JDMK customers wanted something that would be available to implement a standard and would be acceptable by heavy management players like Computer Associates [International Inc.], Tivoli [Systems Inc.] and the middleware vendors that are looking for the management of applications," says Eve Kleinknecht, product manager for JDMK. "JDMK is using Java to manage and to create a new way of doing management for both Java solutions and also any type of Java-enabled system device."

JDMK is a framework for building and integrating management applications with existing network management infrastructures. It delivers a set of customizable JavaBeans so developers can build their own applications. Additional JavaBeans can be created to handle new network devices and services added to the network. Also, JDMK comes with an SNMP Management Information Base (MIB) compiler, which provides the translation of SNMP MIB definitions into JavaBeans, and a set of protocol adapters for HTTP/TCP, HTTP/SSL, UDP, Remote Method Invocation (RMI), IIOP and SNMP.

"It's based on a portable object agent architecture," says Anne Thomas Mares, senior analyst with Boston, MA-based Patricia Seybold Group. "You can actually send these management components to where they need to be. They can send information back to whatever system is collecting all the management information so it can be viewed by whoever is watching the system. It also can work autonomously so that if a management application gets notified that there is some kind of a problem, it can then attempt to resolve and fix it dynamically without actually alerting a person to make sure that it gets done."

Sun says JDMK provides "smart agents" that can evolve with the network and application services, while remaining integrated with legacy management systems. It uses the JavaBeans component architecture specification, agents and management services. New agents can be updated and deployed using a push distribution mechanism. Once a device or application is enabled through JDMK, Sun says, they can be managed directly via any Web browser that supports Java or existing SNMP management applications, such as Sun's Solstice Enterprise Manager Software or Computer Associates' Unicenter TNG.

"Everything in the world of systems and applications changes," says Sun's Kleinknecht. "What JDMK provides is a unique combination of features that allows you to create management tools that are adapted to change first and are also able to integrate existing management infrastructures."–*ptc*

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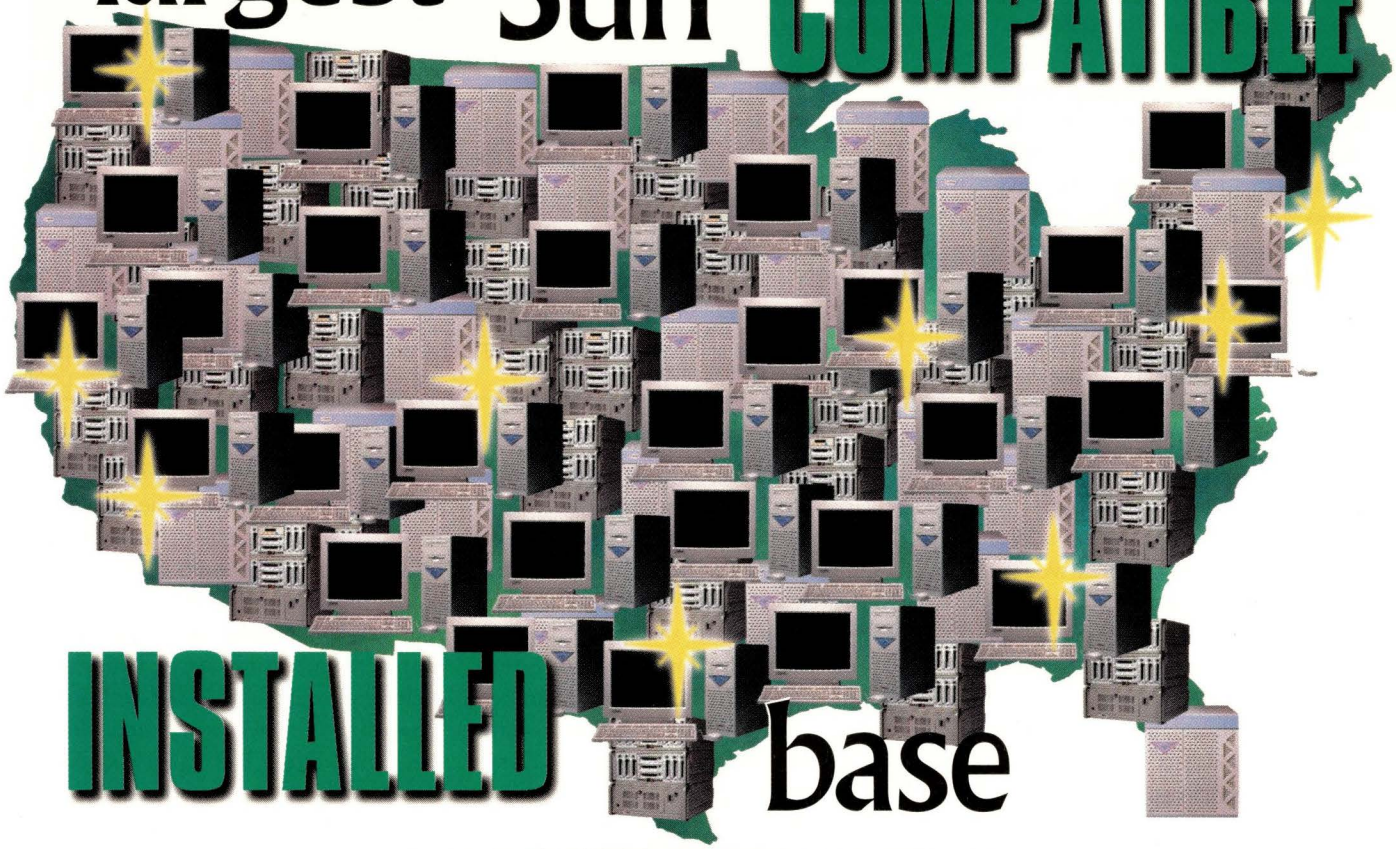

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Eric Raymond, an open-source evangelist, author and participant, says Covalent's new services are a positive sign for the open-source community. "I think it's a wonderful idea," Raymond says. "It points the way toward a future in which most software is shared [in an] open infrastructure and the software industry becomes largely a service industry."

Covalent isn't generally recognized as a service company. It's best known for its Secure Sockets Layer (SSL)-based Apache security module, Raven SSL. But when the company started taking support calls from Raven customers, Terbush noticed his module wasn't the reason why most people were calling. "When we released our Raven SSL module a year ago this past April, we had to bring up a support system," he says. "The majority of questions [we receive] are Apache-related and not necessarily related to our module. There is obviously a need in the market for a commercial support entity for that platform and we already had the infrastructure in place."

According to a 1999 survey conducted by NetCraft, an online research firm based in the United Kingdom, 55% of all the Web servers in use are Apache-based. But despite the software's popularity, analysts agree that corporations want service support. "If stuff goes down on the IT side of the corporate house, companies want to point the finger to someone to fix it in a certain amount of time," says Martin Marshall, research director for Internet research company Zona Research Inc., Redwood City, CA. "Companies want a commercial service instead of catch-as-catch-can help."–*ptc*

Vendors Jump into ASP Space

There's a new gold rush among hardware, networking and software suppliers. A bevy of vendors, including Hewlett-Packard Co., Palo Alto, CA, Intel Corp., Santa Clara, CA, Qwest Communications International Inc., Denver, CO, and USWeb/CKS Inc., San Francisco, CA, are racing into a new service genre, the application service provider (ASP) market.

Potential Benefits of Outsourcing Applications

Benefit	Level of Importance (1-5)*
Reduce implementation and management costs	4.2
Free up IT to focus on mission-critical applications	4.1
Implement applications more quickly	4.1
Enable seamless application access for remote users	4.0
Reduce or eliminate application administration tasks	3.9
Allocate costs better than fixed application costs	3.7

* Results taken from a survey of more than 100 enterprises currently using or planning to use an ASP in the next 12 months.

Source: Zona Research Inc., Redwood City, CA

Here, vendors handle day-to-day application management for a set monthly fee. Many services started off by simply offering customers a place from which to run Web applications. Now they're evolving to support day-to-day business functions in which ASPs become virtual members of corporate IT teams. Use of such services is expected to grow quickly: International Data Corp., a Framingham, MA-based market research firm, expects U.S. spending on such applications to increase from $150.4 million this year to $2 billion in 2003.

The reason, according to analysts, is these services offer customers many potential benefits (see "Potential Benefits of Outsourcing Applications"). With suppliers managing applications at their own facilities, customers do not have to deal with the nitty-gritty grunt work, such as ongoing application support, maintenance and upgrades. Rather than devoting precious IT resources and employees toward making sure their applications are compatible with the latest Web browser, companies can free them up for more important work.

That was the primary reason Quote.com Inc., an online stock market analysis firm based in San Francisco, CA, decided last year to hand over the management of email queries generated by its Web site to eGain Communications Corp., a Sunnyvale, CA-based ASP that specializes in this area. "We had better ways to use our personnel than have them building and maintaining an email management package," says Kaj Pedersen, vice president of engineering at Quote.com.

Yet, there can be problems with ASP services. Vendors have outlined ambitious plans for delivering a wide range of services, including e-commerce, which includes Web advertising and billing; office automation, such as email and groupware; back-office systems like payroll, human resources and supply chain management; and vertical markets, including legal, finance and real estate. Though some have experience with e-commerce, many lack experience hosting the other three. In addition, they are not currently equipped to take care of every possible hardware, software or network problem that occurs when running these applications. Aware of their shortcomings, suppliers have been teaming up to fill the gaps. For instance, Quest has formed a partnership with HP and Intel is working with Pricewaterhouse-Coopers LLP, Chicago, IL, and Uunet, Fairfax, VA.

But it is unclear whether these alliances will lead to the seamless services users desire, or finger-pointing sessions they will have to referee. "Since ASP services are new, there are no set procedures in place so customers can be sure vendors will deliver quality service," says Greg Blatnik, vice president of Zona Research Inc., a Redwood City, CA-based market research firm.

This uncertainty is the main reason why Quote.com has kept the majority of its applications in-house. "By running our own applications, we have more control and are able to respond to problems faster than if we'd relied on an ASP," Pedersen says.

Vendors are confident they will be able to deliver quality service and that may determine whether they are panning fool's gold or the real thing.–*pk*

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Circle No. 8

Ask Mr. Protocol

by Michael O'Brien

TOM BARRETT

"Yahoo! and Sprint PCS will deliver personalized content and services to wireless devices..."
– Sprint PCS press release

"In addition, The Times maintains latimes.com..."
– Beginning of final paragraph of "About The Times" section at `www.latimes.com`, the rest of the article being about the print version of *The Los Angeles Times*, showing where its head is at

"By the time you can afford one, you can't read it."
– Aging techno-freak commenting on handheld Web devices

Origami, the Internet and Mr. P.

Q: *Out there...in your back yard, Mr. Protocol...He...Can I sit down?*

A: My, you do look a little green, don't you? Have a Big Stuf Ding-Dong. Here, I'll stick a chocolate chip cookie on it. It won't make you feel better, in fact, quite the reverse, but it'll take your mind off things. Hmmm. Yes, it's just as I thought, he's out there with his new Palm IX. I'll never know how he gets hold of these things. I think he has the only Apple Newton 2500 in existence; the one with speech recognition. That was the first I knew that ARM made a vector machine. Who needs a personal digital assistant that can understand 12 people writing on it at once? Although the Ouija board game is killer, I have to admit that.

He's been out there for hours with that dang Palm IX. He just can't get over the differential global positioning system (GPS) capability. He's had that blindfold on the whole time, and he just wanders around. I'll grant you, that as a user, he's unique. He doesn't read the Palm's screen. He can just sort of tell what the thing says by holding it in his hand. He was very surprised to learn that the Graffiti handwriting system the Palm uses doesn't require spray paint. He'd laid in 12 cans of the stuff in all colors. That Palm was going to be a color machine no matter what the specs said. Oh well, waste not, want not, he's used up most of the paint drawing really *big* network diagrams on the town water tower. It got some sort of funky township art award. What they think is abstract turns out to be just bad routing. Peering agreements don't make very good art, I'm afraid.

Yes, yes, I know you're upset. It's the way he walks right through the trees as if they aren't there. He and the trees don't even occlude one another. He just sort of passes by them in a way that's really hard to watch. I asked him about it when he came in for lunch, but all I could get out of him is that the trees "weren't relevant to the application."

Most people think Mr. Protocol has no sense of humor, on the grounds that they've never heard a recognizable joke out of him. Nothing could be further from the truth. It's just even more oblique than the rest of him. The day he got that Palm IX (which I'm still trying to figure out–no one visited and it didn't come in the mail), he showed me a favorite cartoon of his. The caption reads: "Bernard had been hoping for more from his brand-new GPS unit." The picture shows a man holding a tablet-shaped device in one hand. It has a large, downward-pointing arrow on it, with the label "YOU ARE HERE."

That's what Mr. P. has been doing all day: experiencing different values of "HERE." Never mind that he could take the blindfold off and see instantly and with great precision and accuracy that he's in his own dang back yard. No, he'd rather get it by the numbers, to tenths of a second. I suppose it's good exercise.

He once showed me this rather baffling Web page. It was automatically updated by its owner, showing every reading he got out of his handheld GPS unit,

which he'd connected to a patch antenna on the roof of his house. Hour by hour, day by day, month by month, it took position readings and plotted them on a grid. He lived at the center of an accumulating cloud of position reports, which could be reduced to give an ever-more-precise location of his house or, more properly, the patch antenna on his roof.

Mr. P.'s Palm IX uses differential GPS, though. It communicates with a differential base station here in town, subtracting the errors from the signals the Palm receives from the GPS satellite constellation. The cloud of points is reduced to a narrow line, following Mr. P.'s perambulations about the yard. But the Palm IX is not just a differential GPS receiver, oh my no. It's a fully integrated and fully connected Internet device and personal reminder. It shows his exact position on a moving map display that it downloads from a mapping service. Optionally, it can show his position on a satellite photo of the region, likewise downloaded from the Net. More than that, he can tag reminders with coordinates, so that as he approaches the point some time later, the Palm IX reminds him: "This is where you ran into Paul last week." Or, "You're approaching the shop with the excellent deep-fried donuts." Or, "Two years ago, this corner was occupied by a homeless person in the evident throes of some exultant religious experience." Or, "Seven months and five days ago, you stepped in dog poop on this selfsame spot." A mobile agent, reasoning from insufficient premises just like everybody else, combines these facts and opines: "Maybe life is trying to tell you something."

Of course, Mr. P. seldom, if ever, leaves the compound. His peregrinations are confined to the orchard in the back, eliminating the possibility of such reminders, with the possible exception of the dog poop. Confined in space but untrammeled in time, Mr. P. wanders through his spatial memories courtesy of the Internet, which is just how he likes it.

The Palm IX, like just about all current wireless Internet devices, is a Web browser. Unlike a desktop Web browser, all of the pages displayed are about three inches on a side. Malgré one of those nifty Fresnel lenses out of *Brazil*, that means the information on the page must be highly compressed. Looking at the same page on a desktop would resemble watching a 35mm movie on an Imax screen. It would be lost in the middle of tremendous empty space like a signpost in the Gobi desert. On the other hand, looking at a regular Web page on a handheld device is an exercise in futility. No, that's not right. It's an exercise in scrolling. Lots and lots of scrolling.

There is a special type of markup language–actually several contestants–for handheld devices. It allows what would be displayed as a single Web page on a desktop to be displayed as a series of pages on a handheld device. This is the most obvious answer to the problem of screen real estate, but like many obvious solutions, it misses the point.

It really is obvious that building a Web page that looks good both as a single page on the desktop, and as a bunch of pages on your Palm VII PDA or your Sprint PCS cellphone, is a difficult task. It's a whole new challenge to the field of graphic arts. "This page has to look good on the desktop. It has to look good as separate pages on a PDA. And it has to be one single batch of HTML, so we only have to update it once for both places."

Right. Even granting that is possible, there's a bigger problem: the problem of context.

Fixed, desktop operation is far different from mobile operation. A small, very mobile device is used in very mobile situations, and those situations are very different from sitting in front of a desktop. At a desk, you browse far and wide, you write, you handle most of your email, you look up your genealogy… If you're going on a trip, you suck over lots of nice big color maps and print them on your nice big color printer. When you're out and about, your needs are much more focused: "I'm lost. Where the heck am I, and how do I get where I'm going?" "Any good restaurants near here?" "Sally! I'm late!" "I have three minutes to kill. Give me all the world news." Genealogy isn't in it. This is a fundamentally different situation. This is a fundamentally different market.

The Paperless Market

Before the Internet was created, and right into the period of its early deployment, people wondered if the Internet could ever be self-supporting. The question was whether it would ever find a market. It has become clear over the past couple of years that the Internet is not going to find a market. It is itself a market, an agora, not only an exchange of goods and materials and information, but of ideas. The value of ideas varies wildly. The Internet is not one market, but many…but it is not *all* markets. Some things work, most don't, as many traders in Internet stocks have discovered. The things that don't work on the Internet don't make the big headlines, but there surely are a lot of them.

One beautiful simile likens the Internet to origami. In the beginning, there was just a federation of networks, a flat piece of paper. As markets develop, the paper folds, and each flat surface is a different market, at angles to all the others. Lovely, isn't it? Unfortunately, most of the flat planes in this piece of origami aren't there because those markets don't work. Those markets that do work, don't have a lot to do with one another. Perhaps the simile is more like the rich man's house described in Neal Stephenson's *Cryptonomicon*, which has tens of thousands of shards of a crashed jetliner hanging from the high ceiling, forming a ghost image of the plane. Currently, the Internet is the ghost image of a marketplace. Lots of shards. There isn't much synergy on the Internet, yet. Almost all market offerings are still vertical. What synergy there is, takes place at the lower levels of the network.

Industry-specific wireless and mobile applications used to be built using special-purpose hardware, and for reasons of ease of use and to provide the most efficient user interface possible, many still are. Have you taken a look at a taxicab dispatch console lately? Not the one back at the garage, the one in the cab! It's very highly optimized to distribute fare calls, but it's useless for anything else. It doesn't resemble an Omnitrax truck-tracking terminal much at all, but both are wireless services devoted to fleet dispatch and tracking. The differences between trucking and hacking (as in cab driving) have led to two very different pieces of hardware.

As wireless services proliferate, though, some synergy is taking place at lower levels. Ardis, RAM Mobile Data and the like

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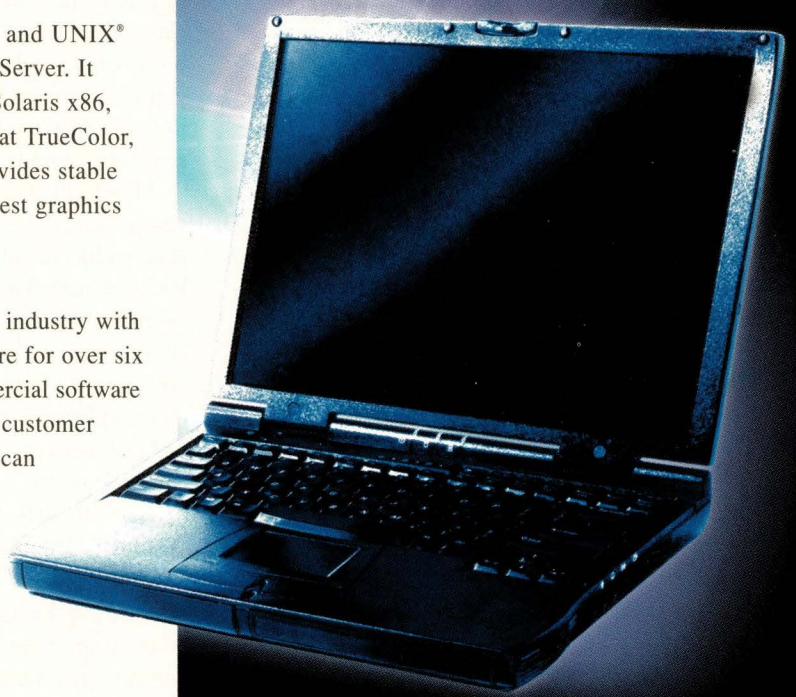
Will it run Solaris?



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Circle No. 10

started the trend, by providing a low-bandwidth common carrier that anyone could use, but which didn't provide any services other than pure data-passing. It was up to pioneers like Radiomail to build a vertical service out of it.

Now, with the advent of devices such as the Sprint PCS browser-capable handset and the Palm VII PDA, more general applications can be built for a more general class of users. But these services aren't the same services one uses at a desktop at all. The marketing planes are orthogonal. In addition to the fact that very different user interfaces, on very different devices, are being used to pass very different information over the Internet, it should be noted that while a desktop user could be running a server and acting as a source of information, anyone using a mobile browser is purely an information sink, aside from email and phone calls. Mobile users don't publish information to the Net. All those wonderful Web sites devoted to various brave travelers around the globe sending pictures of exotic mountaintops and Florida alligator farms, aren't actually serving up the data themselves. They're phoning it in. They're sending the pictures and the text back to a "home base" Web server, which is most definitely not mobile.

Does this matter, or is it a distinction without a difference? Mr. Protocol is glad you asked, or he would be, if he didn't have his head full of lat/long/look-out-for-the-gas-meter!

Can I Have that in Writing?

The radio has been on in the house while Mr. P. has been out back not bumping into trees. Some radio interviewee, speaking apropos of online news services, made the claim that "Newspapers will be around for at least another hundred years."

This is an interesting take. On one hand, it claims that there is something about newspapers which gives them intrinsic value over and above any conceivable online service for the next hundred years. On the other hand, it foresees the possibility that there may come a day when printer's ink on newsprint paper becomes irrelevant. Both claims have been made, and frequently, but to see them juxtaposed, if only by implication, within a single statement is remarkable. It points up a dynamic tension between the development of online services and the kipple with which we willingly surround ourselves in our daily lives.

I mean, newsprint is tough to get rid of. If you subscribe to a paper, you wind up recycling hundreds of pounds of paper per year. And it's unidirectional. Aside from letters to the editor, news comes from *them* to *you*. You are a pure consumer: you don't publish squat. On the Internet, free Web pages are a dime a dozen, so to speak. Everyone is a potential publisher. The immediately obvious corollary is that most people don't have a whole lot to say, and that many of the rest, who do have a lot to say, aren't worth listening to. But the playing field is there, even if it's not quite level. Most personal Web pages have limits on how many hits per month are allowed, which is backwards from the paper publishing industry. With paper, the more people who read your stuff, the more money you make. On the Net, if too many people read your stuff, it costs you money. Now there's a paradigm worth contemplating: the perils of success.

Smart paper, like the electronically rewritable paper being developed at MIT, may take a bite out of the newspaper market, because you can curl up in the breakfast nook with both of them, and you can recycle the smart paper by overwriting it. But for today, compare the speed of access of a newspaper with a Web browser, and the newspaper wins hands down. What resolution! What a huge display size! And I'm sorry to report that when it comes to pressing the Forward button on your browser vs. reaching for the next page in a newspaper, it's no contest. Trying to put a newspaper, as such, onto the desktop is a losing proposition, and has been ever since Ben Franklin's day. Newspapers fill a niche brilliantly, and some profoundly new technology will be necessary to dislodge them. It's for darn sure the screen of a Sprint PCS isn't going to do it.

Similarly, the desktop can give us a type of news feed the newspaper can't. We can watch video news clips on demand. Some of us, with cable modems, can actually make out some faces in that online video blur–bandwidth has a ways to go yet. Even so, the ability to browse through a sorted collection of all the wire service stories from all over the world, without subordinating ourselves to the judgment of the newspaper's editorial panel, is a powerful tool. That panel isn't made up of idiots by any means, and their individual and collective judgments are scarily perceptive if you were able to watch them work up close. But they're judgments for a one-size-fits-all product, and it's no longer necessary for one size to fit all.

Consider the `my.cnn.com` site, recently launched by Cable News Network. This site allows you to set some sophisticated preferences and filters, and presents you with a daily collection of exactly those news items that match your profile. Most of the time. Actually, sometimes the matches are a bit raw, especially out in the boondocks. But overall it works well and provides you with a far, far lower percentage of outright ignorable stuff than the daily paper. Meanwhile, daily papers are doing the same sort of thing, and they're doing it on a local level.

Handheld Web browsers, desktop browsers, desktop servers, newspapers, personal Web sites. All are consumers, some are also producers. All represent different markets, and these markets rise and fall independently of the others. Most new Internet ventures are doomed to failure, and in this they are similar to all other types of business venture. Most of the sites on the Net are operating at a loss, as each one tries to build up a customer base and figure out how to make money. Some will succeed, but each market is separate. The Internet succeeds by providing the marketplace. The individual markets do not succeed just because they're on the Net. They succeed because people are genuinely interested in them. ⊷

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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by Peter Collinson, Hillside Systems

PAUL SCHULENBURG

Working with the Dark Side

Inevitably, I spend a lot of time dealing with files that emanate from other systems. In my case, they mostly start life on a box that's running a product from Mr. Gates' organization. I do also sometimes have to deal with files that are created on a Macintosh, although there are many less such systems in Europe. Apple Computer Inc. stupidly charged much more for early models here than it did in the United States, and Macs became expensive machines running a funny operating system on a little screen. The keyword is "expensive" and the operating system was generally ignored. Apple blew its chance of being the worldwide supplier of the first true personal computer.

Incidentally, I am not even thinking about the ever-changing undocumented internal formats used by various programs. People send me files containing text in a wide variety of formats, and pragmatically I have to deal with them. There are intentional versioning problems with many of the formats used by these applications. Application authors seem to work hard to prevent you from moving files from one application to another, in what can only be defined as a vindictive manner. However, people are mostly sending me just text, and I can usually generate text from their application. How portable is text as a format?

You might think that if you asked someone to create a text file in ASCII and put it on a floppy so you can copy it onto your machine, that text file would be the same everywhere. Sadly, this is not the case. For a start, each of the three system families use different conventions to mean "end of line" for text files.

In the ASCII character set, it was necessary to send two characters to the output device to make it start a new line: "line feed" moved the paper up one notch and "carriage return" moved the print head back to the start of the line. The designers of UNIX decided to use a single character to mean end of line in disk text files and chose line feed for the job. It became the task of the device driver that sent characters to the output device to convert a single end-of-line character into the necessary pair. Macs use only the carriage return character to mean the end of a line. MS-DOS and its descendants use the character pair, carriage return followed by line feed.

The effect of these different design decisions is that when we copy a file image from one system to another, we need to perform conversions to ensure that each line on the local machine is terminated by a character (or sequence) the local system understands.

If you don't do any conversion, then things may still work, but it depends on the application. If you process a native MS-DOS file on a UNIX system, then all the applications will be looking for line feed to end the line and will count the carriage return as part of the text on the line. UNIX editors will show you

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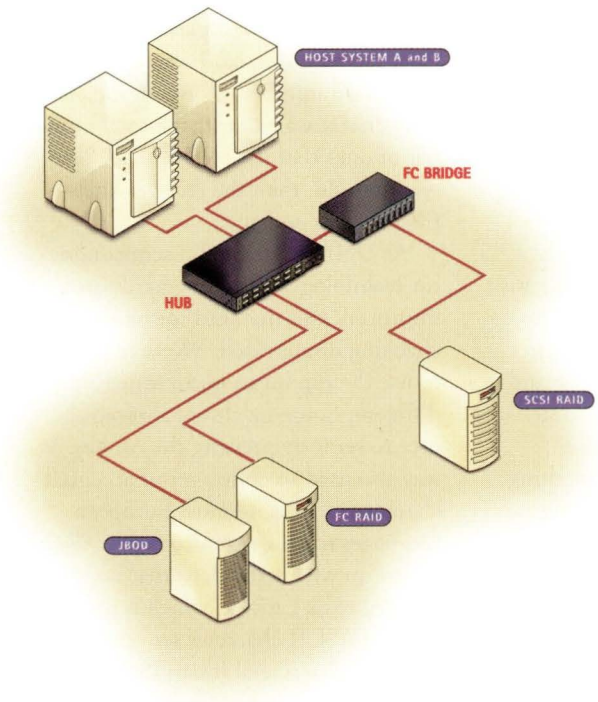

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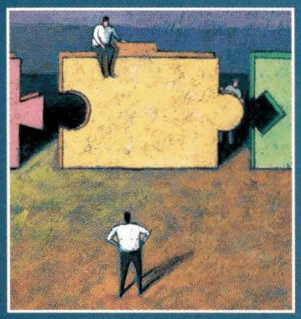
that the line terminates in carriage return-line feed by displaying `^M` (Control-M, the code for line feed) at the end of each line.

I've found that some Windows applications don't mind that the carriage return is missing from the file. The Windows C compiler, for example, is happy to deal with UNIX files. However, a Mac file can be very bad news for UNIX applications that are not presented with an end-of-line character and are asked to deal with a file that is effectively one single line of text.



Sun helpfully provides a pair of conversion programs intended to translate from UNIX to MS-DOS and back again.

Incidentally, if you are copying the text file over a TCP/IP network, then you can use the FTP protocol in ASCII mode. The protocol insists that the sending machine must change any text file that it sends into "network native" form, where each line is terminated by a carriage return-line feed pair. Your local FTP client will store such files using the native text file representation.

Also, if someone sends you a text file as a MIME attachment to a mail message using the *text/plain* format, then the text file will end up with the correct line-termination characters on your local machine.

Text files can be moved easily and transparently where there is extant conversion software embedded in the utility being used to transport the file. Problems only arise when the file is copied as an image, where we move the bytes in the file directly from one machine to another. I do this quite a bit, either saving text directly from a Windows application on my UNIX disks that are accessible to my Windows machines, taking a file from a floppy, or unpacking a ZIP file (more on this later). So I am stuck with a file in a foreign format that I need to convert so my UNIX programs can deal with it appropriately.

Conversion Programs

As a first hack, you can convert DOS text files to UNIX by simply removing the carriage return characters using `tr`:

```
$ tr -d '\015' < dos > unix
```

The `\015` is the value of the code for the carriage return character expressed in octal. The `-d` flag tells the `tr` command to delete any characters from its input file that match the list in its argument. The command above simply deletes any carriage return characters from its standard input and writes the resulting data to its standard output.

For Mac files, a similar technique is available:

```
$ tr '\015' '\012' < mac > unix
```

Here, we replace all carriage returns with newline characters.

Sun Microsystems Inc. helpfully provides a pair of conversion programs intended to translate from UNIX to MS-DOS and back again. These are unsurprisingly named `unix2dos` and `dos2unix`. I've wondered for some time why these programs are not scripts–they must be doing something that needs slightly more processing than can be done easily in a script.

One reason for the extra processing is that removing carriage returns is not sufficient. Many early DOS programs signalled the end of a text file by appending a Control-Z character to the end of the file. You'll find that `dos2unix` deletes this end-of-file indicator, removing Control-Z only when it is the last character in the file.

It also appears that `dos2unix` deals with character codes that are greater than 128. Before I can discuss why this is desirable, you need some background.

Character Codes

UNIX started life using the ASCII coding sequence for characters. Characters fit into eight bits, but only seven of these were used in ASCII, allowing a character set of 128 characters. The code was intended to be sent down serial lines, which carry a sequence of pulses representing the ones and zeros in the character code. There was a need to check that this serial data had been received properly in early devices and ASCII allowed for this by using the eighth bit to check the remaining data.

The eighth bit was used in early devices as a "parity" bit. When the sending hardware transmitted the character as a sequence of ones and zeros, it had the ability to force the extra bit to a one or a zero, ensuring that the total number of ones was odd for "odd parity" or even for "even parity." Choices. Choices. The installer had to choose the type of parity to be used on the line. Let's choose odd parity. In this case, the receiving hardware checked for an odd number of ones in the character that it was sent. If the total number of ones that the receiver had seen was not odd, then the receiver knew the data was corrupt.

As UNIX grew, so did semiconductor technology. Serial line hardware improved, and the need for parity checking disappeared. We were able to use the top bit to mean something different. Some machines allowed the user to set it by pressing the Alt key. It was also used to code a set of accented characters, allowing most European languages to be written correctly. We ended up with a standard that's often referred to as Latin-1, which is the original ASCII character set plus 128 accented characters. It's an ISO standard, ISO 8859. This coding became the de facto standard for the Web.

In MS-DOS-land along One Microsoft Way, the top 128 characters were used early on in applications for their

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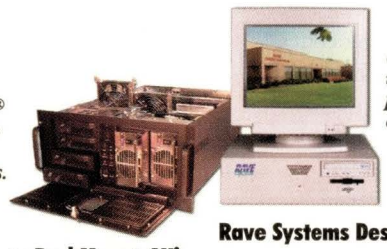

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own multilingual purposes and MS-DOS uses a different mapping of codes onto characters to enable accented characters, codes for fractions and some other special characters. It seems Sun's `dos2unix` command understands this mapping and will convert these characters into the appropriate Latin-1 codes.

However, MS-DOS text format is not used these days when people save text from Microsoft Word. In Word, you can specify that a file is to be saved as "MS-DOS TEXT," which uses this coding. But when most people save a file from Word as text they save it as "TEXT," which uses a mapping that's an extended Latin-1. The extensions exist from codes (decimal) 127 to (decimal) 159 and are used to express some characters that don't exist in Latin-1, and also to preserve things like smart quotes and other internal codings. So, it may be that `dos2unix` should no longer be used on text files that come from modern versions of Windows.

Working Out What's Happening

Dealing with all these character codes is confusing; when moving files between machines and operating systems it can become unclear what system is doing what conversion on the file. The box below shows a tiny Perl program you can run to generate a file that can be read by an application using different settings to investigate the character set.

```
for ($i = 0; $i < 256; $i++) {
    printf("--%c-- %d 0x%x 0%o\r\n",
            $i, $i, $i, $i);
}
```

It prints a character code in between some minus signs and then the value of that code in decimal, hexadecimal and octal. I've made it terminate the line in MS-DOS fashion. To run the program, put it into a file, say, `cgen` and type

```
$ perl cgen > file.txt
```

If you don't have Perl, you can render this program in `awk`. Take the code above, remove the dollar characters and make sure the `printf` and the line that follows it are joined on one source line. Then wrap the whole thing in

```
BEGIN {
    program
}
```

and place it into a file, `cgen.aw`. To run it, type

```
$ awk -f cgen.aw /dev/null
```

Try looking at this output file using a UNIX tool like `cat` or `more`. I suspect that you will see the Latin-1 character set (I cannot be sure because my machine is set up to use Latin-1 and yours may not be). You can then read the file into various Windows utilities with various settings and see what character set is being used.

By reading this file into Word, you can see the mapping that is used for Word's internal special characters. I've used this intelligence to create another small Perl program, `win2dos`, that converts Windows text file output from Word. This program, and its friend `unix2win`, are available from my Web site (see below for details). It's much too complicated to describe here.

Incidentally, if you take data from a Web form driven by a CGI script, you must expect people to cut and paste from programs like Word into the form. Your script will undoubtedly see the special character codings Word uses for smart quotes and the like, so this problem of private coding has more knock-on effects.

Packages

Most systems have some way of packaging several files into one. UNIX traditionally uses `tar` or `cpio`. The Windows world uses the ZIP format and has various freeware and shareware applications that are available on the Internet to pack and unpack files. Some of these versions will read `tar` files.

However, early versions of these programs didn't understand the need to preserve directory hierarchy, and it can sometimes be confusing to work out how to move a complete tree from one machine to another.

From a UNIX perspective, ZIP files are supported by open-source software, `zip` and `unzip`. Incidentally, don't confuse these programs with `gzip` and `gunzip`, which form a compression and decompression utility. I find `zip` and `unzip` easy to use, and because you can run them from the command line, they can be embedded easily into scripts.

Mac users are prone to send you email containing files in `binhex` format. There are a small number of shareware programs for the Windows world that can unpack files in this format. But for UNIX, I used to be somewhat stumped until I found a small program

by Dave Johnson, Brown University Computer Science. Again, this code is open source, a rubric in the code says: "May be used but not sold." I don't remember exactly where I found the program–but I had to do some digging, I think. The program unpacks the files, and then sometimes you have to work out exactly what is what because the Mac transmits files along with internal meta information on how to use them.

When reading files from a Mac into a Windows box, you may need to coerce the filename suffix into something that your version of Windows understands and can find a suitable application to process the file. Windows uses the suffix to determine the file type, but the Mac doesn't. For example, if you are moving EPS files from a Mac to Windows, you need to rename the files to have a suitable suffix (usually `.EPS`) for the Windows applications to read the information correctly.

Filenames

All of the package unpacking programs will generate files on your machine whose names obey the filename rules on the machine from which the files emanate. There is a range of incompatibilities with file naming conventions across the various platforms. UNIX allows filenames to contain any character, except /, and have infinite length, where infinity is set to 255 characters. Older UNIX systems set infinity to be 16 characters, which was never enough. Filenames are case-dependent, so files named `Fred`, `FRED` and `fred` can all coexist in the same directory.

These days, Windows of all flavors allows filenames to contain any character except the Control characters and \, /, :, ?, ", <, < and |. Filenames have infinite length, where infinity seems to be set around 255 characters too. Windows has a problem with backwards compatibility into MS-DOS, where the names are eight characters with a three-letter extension. Names on Windows are case-independent. Case-independence is maintained by the software on Windows NT, and is not implemented in the file system itself. When you create a file on NT, it's really created using the case that the application uses. If you type `FRED`, it will be created as `FRED`, but will be shown to you in the GUI as `Fred`.

Problems with the case of filenames can be pretty boring to resolve when moving files from a Windows machine to a UNIX system. I typically see this when I'm sent pages in HTML, where the source talks about `picture.gif` but the Windows system has created a file called `picture.GIF`. These are the same files on Windows, but are different on a UNIX system.

Listing 1 shows a small "template" file that I hack to create the edit I need in order to combat the tedium and inaccuracy of repetitive edits.

The `grep` command is inside backquotes so that its output is read and processed by the shell. It is used to create a list of arguments to the `for` statement. The `-l` switch tells `grep` to list the filenames it finds that contain the string, so the output from the command is a list of files.

The `for` statement scans through this list of files presenting their names one at a time to the loop. It opens each file using `ed`, which takes a sequence of instructions from the "here" document starting at the first `EOT` and finishing at the second. The backslash before the first `EOT` serves to quote it, so the shell does not try to expand any dollars or stars in the document itself.

The `ed` commands perform a global

Listing 1. Template File

```
#!/bin/sh
for name in `grep -l picture.GIF *.htm`
do
ed - $name <<\EOT
g/picture.GIF/s,,picture.gif,g
w
q
EOT
done
```

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search for some text and replace any found with the new contents. I've used commas as the separator for the substitute (`s`) command instead of the usual /, so that I can place pathnames more easily in the command. Finally, I write the file back in place. Beware! It's perfectly possible to lose all your data in this way. If you are uncertain whether the edit will work as expected, make a backup copy of the original data first, then use `diff` to check the changes.

Spaces

The other problem we have on UNIX is caused by the ability of Windows and Mac users to use spaces in filenames. UNIX does support spaces in a filename, but spaces can cause problems for shells because they expect spaces to be used to separate files. UNIX operates with the tacit assumption that there are no spaces in filenames. For example, a common loop like

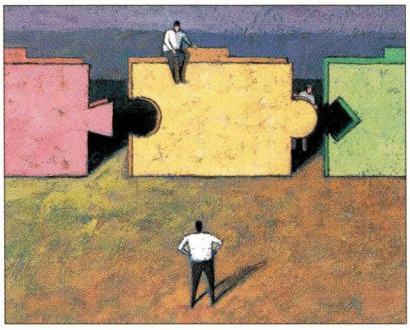
```
for name in `find . -print`
do
    echo $name
done
```

where the `echo` command can be replaced by several operations, assumes that the `find` command will generate a space-separated list (where the space is really a newline) and the `for` loop will process that list one name at a time. This assumption breaks down when a file is found whose name contains a space.

I tend to rename filenames that contain spaces, changing the space to underscore. Here's a script that works in the current directory:

```
for name in *
do
   na=`echo "$name"|tr ' ' '_'`
   if [ "$na" != "$name" ]
   then
        echo mv "$name" "$na"
        mv "$name" "$na"
   fi
done
```

We are using the shell here directly (*) to expand the list of names in the `for` loop, so we know that a name with a space will be passed into the name variable as a single entity. We are careful to use quotes around the name variable so that the shell will treat names with embedded spaces as one string.



First, we need to check whether a name has a space or not, and the simplest way to do this is to change any spaces in the name to an underscore, which we want to do anyway. This is done using the `tr` command we discussed earlier. We now have a string that possibly contains underscores and a string that possibly contains spaces. We know that the `tr` command will only have altered names that contain spaces, and if the original string differs from the massaged one, then `tr` will have made the change to the name. In this case, we rename the old file name to the new, taking care to quote the original name.

Where to Get Things

You can find my Perl 5 version of `win2unix` and `unix2win` on my Web site at `ftp://ftp.hillside.co.uk/sunexpert/darkside`. I'll also make `hexbin.c` available, because I have forgotten where I obtained it. Alternately, the programs can be found at `ftp://ftp.expert.com/pub/UNIXBasics`. You can get `zip` and `unzip` from `ftp://ftp.uu.net/archiving/zip`, where you will find the source and also many precompiled binaries for different platforms.

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

by Æleen Frisch

LOUISE GOLDENBERG

OS in a Bottle

At the moment, I happen to be writing about both Windows NT and Linux. When I'm at my usual workplace, the dual focus does not produce any significant problems or inconveniences (other than the occasional mild sense of schizophrenia) because I have several computers running various operating systems. Recently, however, I was traveling and had only a single laptop at my disposal. I found myself frequently rebooting the laptop in order to switch between the two operating systems, a task that quickly became tedious. What I wanted was a way to run both NT and Linux on the same machine at the same time.

A recent product, VMware from VMware Inc., enables you to do just that. The software allows you to install one or more "guest" operating systems running underneath the "host" operating system (the operating system actually booted by the hardware) into containers known as "virtual machines." These virtual machines are defined via configuration files within the host operating system's file system, while the guest operating system, along with all of its disk space, typically resides within another file located in the native file system (guest operating systems may optionally be placed in raw disk partitions). System resources that are used by the guest operating system, such as floppy disk drives, CD-ROM drives, serial and parallel ports, are mapped transparently to the real hardware devices; the systems administrator can customize the way this mapping occurs. Full networking services are also available within the guest operating system and may be configured in several different modes.

As an example, consider Windows NT running as a guest operating system on a Linux system. The Windows NT virtual machine appears to the Linux system as a rather large disk file. From a user's point of view, the entire NT desktop appears within an X window (illustrated in Figure 1, Page 34).

In this example, we see the entire X desktop. In addition to the window manager's toolbar at the bottom of the screen, there are three other native applications running: a terminal window on the local system, an `emacs` session to a remote system and an image editing application (the small toolbar on the left). Most prominently, we see the Windows NT virtual machine running in the window at the top of the desktop. Within that environment, we can see several desktop icons and three open windows. Under Windows NT, we are currently running the Event Viewer on the local system (hostname `hecate`), browsing a share on a remote system (named `leda`) and editing a document using QuarkXPress (the document also happens to reside on a remote system).

As this session illustrates, full native NT networking is available from within the virtual machine. If we look closely at the desktop icons, it is evident that a CD is present in the CD-ROM drive. As on a native NT system, CDs are mounted and made available automatically when

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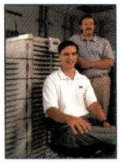

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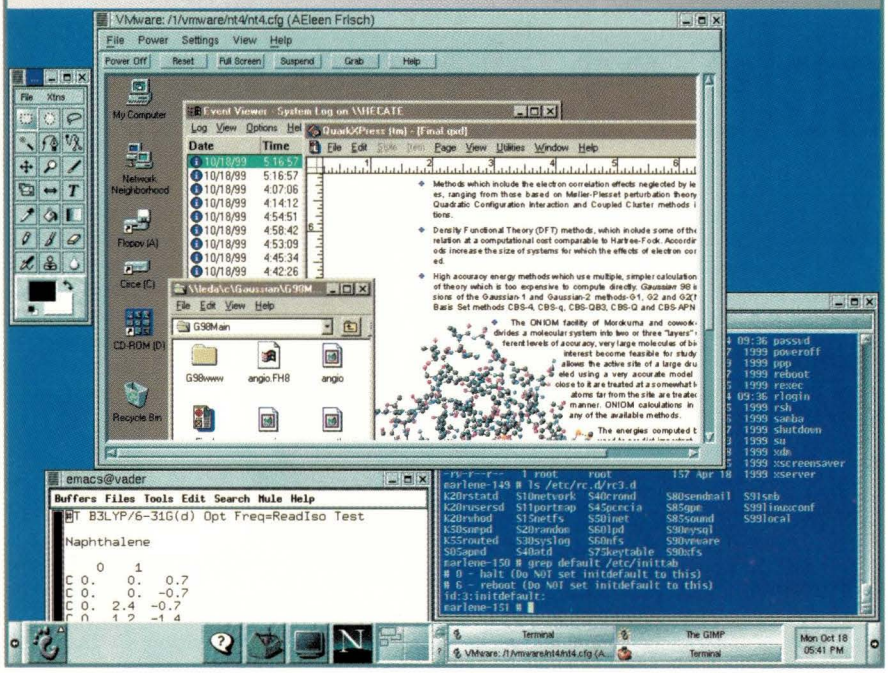
Figure 1. X Desktop on Linux Running Windows NT



placed into the drive. The CD does not need to be mounted under the Linux operating system in order to access it from Windows NT and, in fact, the CD's contents will not be accessible to Linux processes even though they are available to NT processes. (The host operating system must access the resource using its normal mechanisms; for example, the Linux system must mount the CD-ROM as usual.)

We could easily show a similar setup in which Windows NT is the host operating system and Linux is the guest operating system. Both Windows NT and Linux may serve as host operating systems, and a wide variety of choices are supported as guest operating systems: Windows 3.1, Windows for Workgroups, Windows 95/98/NT/2000, Linux (RedHat, Caldera, SuSE), FreeBSD and even DOS 6. System requirements for VMware are generally modest with the exception of memory. Running multiple operating systems simultaneously effectively divides the available memory resources among them, and so the computer system needs to have sufficient memory to run both. (The absolute minimums are 64 MB for a Linux host and 96 MB for a Windows NT host. However, I'd recommend 128 MB in either case.)

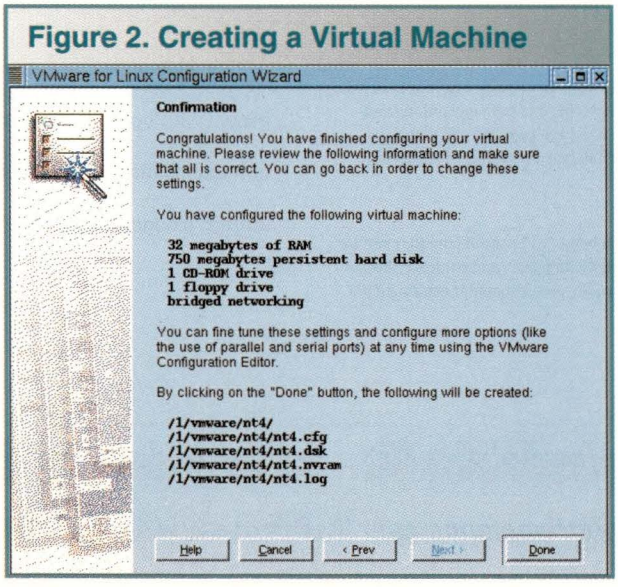
In addition to a convenience value, this technique of confining a guest operating system within the host operating system has a number of other advantages. The most important is probably that the guest operating system appears simply as a series of processes running on the host operating system. If there's a problem with the guest operating system, these processes simply die without affecting the host. In this way, the virtual machine allows you to experiment with a new operating system without risk to the system at large (or requiring a dedicated test system). Similarly, many kinds of security analysis and quality assurance testing can be conducted in this sort of protected isolation. In addition, the virtual machine can also allow you to evaluate a new operating system or application using the same kind of safe scenario.

Installing VMware is quite easy. Regardless of the host operating system, the process follows the same basic path. Unpack the software (if it was delivered as a compressed archive) and then run the installation script that is provided. Moving the license file to its final directory location completes the software installation process.

Next, you start the VMware application and define a virtual machine. This can be done manually or via the Configuration Wizard provided. Figure 2 illustrates the final dialog displayed by the wizard, which summarizes the characteristics of the virtual machine.

In this example, the guest operating system within the virtual machine will use 32 MB of memory (half the amount installed on the system), it will reside within a 750-MB virtual disk and its floppy disk drive and CD-ROM drive will be mapped to the corresponding physical devices on the system. This guest operating system will use "bridged networking," meaning it will exist on a local network as a distinct host accessible to any other system in the usual ways. The host operating system will provide the bridge between its internal virtual networking and the physical network hardware on the computer. Note that other networking modes are available. In particular, the virtual machine can also be isolated on a network, which is accessible only to itself, the host operating system and other virtual machines on the same computer.

Figure 2. Creating a Virtual Machine



Once the virtual machine is configured, you install the desired operating system in the usual manner. For example, when installing Windows NT within a virtual machine on a

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Linux system, you place the Windows NT distribution CD into the CD-ROM drive and activate the corresponding virtual machine. After doing so, the virtual machine will go through a (virtual) power-on sequence and then boot from the CD, allowing you to install the NT operating system. The Windows NT installation process proceeds exactly as it does on a stand-alone system. When complete, you can begin using it as you would any NT system. Because the virtual machine is simply another window with respect to the host operating system, it is easy to cut and paste between Windows and other operating systems.

The trickiest part consists of managing the interactions between the graphics requirements of the guest operating system and the graphics capabilities of the native windowing environment, and you can expect glitches in this area (less frequently, the mouse will also behave somewhat eccentrically in the mixed environment). VMware provides modified graphics environments and tools to minimize these issues.

Evaluation copies of the software are available from the VMware Web site. Single copy pricing for VMware is currently $99 for noncommercial use and $299 for commercial use; add an extra $10 if you want the software delivered on CD-ROM (rather than downloading via the Internet).

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by Jeffreys Copeland and Haemer

ALEX GROSS

"A picture is worth a thousand words."
– Anonymous

"Talks, speeches, articles and resolutions should all be concise and to the point. Meetings also should not go on too long."
– Mao Tse-tung

Slides

Last time, we talked about photographs, so this time we thought we'd discuss slides. Now that laptop computers are ubiquitous, people have defeated the idea of traveling light by choosing to cart around 25-pound projectors that connect to their 10-pound laptops to do presentations. The current tool of choice for generating presentations is Microsoft Corp.'s PowerPoint. If you like WYSIWYG word processing systems, and would rather use your mouse than your keyboard, PowerPoint might be the tool for you.

But back when overhead projectors were predominantly used, people usually brought in black-and-white slides–viewgraphs–for presentations, assuming there would be a projector on-hand when they got there. The tool of choice for producing viewgraphs–for us, at least–was the `-mv` macro package for `troff`. Because we would rather edit the map than the territory, we almost always prefer to use `troff` or `TeX` for any text-processing exercise. (And because we'd rather carry a file folder of viewgraphs than 35 pounds of computer and projector, we still favor the old method.) Unfortunately, `-mv` required a fair amount of markup. Fortunately, Perl guru Tom Christiansen wrote an alternative called `perlpoint`, an obvious pun on PowerPoint.

There are a number of other ways to attack the problem. As UNIX bigots, we've always favored any approach that uses a tools-and-pipes solution. Certainly, the `-mv` solution does that: we can build diagrams and tables into our slides using the `troff` preprocessors `pic` and `tbl`.

The other end of the spectrum–the wrong approach, in our view–would be to take some text marked up for slides, have a huge markup language that allowed for tables, pictures and equations, and directly generate PostScript from that language. (In this world-view, the PowerPoint solution is perhaps a step worse because you don't even get to edit the markup. But we realize that this is a religious battle in which we may be adherents of a shrinking cult.)

The tools-and-pipes solution allows us some extra flexibility. We can make some decisions about the structure of the slides–a title, two levels of bullet items, some font changes and so on–and decide what the text markup for those will be. Given a fixed set of markup rules–for example, a title line is bracketed by `<TITLE>...</TITLE>`–we can then build a filter to translate each markup element into the appropriate `troff` directives. Even better, because the structure of `troff` allows us to encapsulate a series of directives into a macro, we can simplify our markup translator by pushing most of the `troff` work into a macro package. Later, if we wish to change the appearance of our slides, we can modify the macro package without having to change anything about the markup of the slide text or the filter. We can do this because what we've used to mark up the slides is structural information, not the procedure for generating each element.

If you've followed our discussions of Perl's `pod`–that is, "Plain Old Documen-

tation"–language for documentation, you'll realize that it's exactly this kind of markup. It generally uses structural markup without worrying about the way in which each title or heading is going to be rendered. This is important because `pod` can be, and normally is, translated into a number of different forms. For example, there are `pod2html`, `pod2man` and `pod2tex` filters, and each will have a different way of rendering some text in italic.

This is an example of the virtue of documented intermediate formats. By having the input and output formats of `TeX`, `troff`'s `-man` macros and HTML all carefully documented, we can generate filters to be added before or after existing tools.

Back to Tom Christiansen's solution: It uses the UNIX-like approach of a Perl filter along with a `groff` (the GNU version of `troff`) macro package for formatting slides. We've recently done some work on the macro package to add some features, so we thought we'd discuss the whole package. Look for it on the Comprehensive Perl Archive Network (CPAN) at `http://www.cpan.com/`. Because `perlpoint` uses a simple structured markup, it's also easy to build a filter to convert `perlpoint` input to HTML. (Such a filter exists, called `pp2html`, but even though it's part of the `perlpoint` distribution we won't discuss it here.)

Input Format and Script

Let's begin with the input format and script, which will allow you to see how things flow. The input format is very simple, as shown in the following self-documenting test file:

```
=A perlpoint Test File

This file is an example of Perlpoint input

* The line beginning with = is the slide title.

* These lines beginning with asterisks are bullet items.

* It is also possible to use font changes in the same
way we do in C<pod>.
For example, I<italics>.

* All work and no play makes a very long slide.

    1) this is a display
    2) test
    3) where we have code
    4) on 4 lines

INDEX
```

The only slightly obscure item in this example is the line containing `INDEX`. It triggers the macros to produce an index of the slides. This is helpful when you're conducting a presentation and someone asks a question about "that slide a few minutes ago labeled Middle East Religions."

How does that get translated into slides? It's pretty simple, really. A command line like the following will do the trick:

```
pp2roff test.pp | groff - | lp
```

The Perl script `pp2roff` deals with the `troff` markup for you, and then `groff` deals with the formatting. The `pp2roff` script–which was originally written by Christiansen, and slightly modified by us–is fairly straightforward (see Listing 1). Here follows a dramatic reading.

We begin with the usual shebang line, `use strict` and `-w`, so Perl will keep us honest about grammar. Line 3 sets Perl's record separator to the empty string, which separates records with a blank line rather than the usual newline. Lines 6 through 9 define the text to be used at the start of each slide: a comment for a separator and the `author` tag from data we set up in lines 4 and 5. Line 10 produces the text to start the package of slides: we read the `slidemacs` macro package–`groff`'s `.mso` directive is the same as `troff`'s `.so` directive but it uses the macro package search rules, so it will begin looking in `/usr/local/share/groff/tmac`.

Our major `while` loop beginning on line 11 reads each record of the input–remember they're now separated by blank lines–and processes them. Line 13 ensures that backslashes aren't eaten unnecessarily by `troff`. The `if` statement at line 15 processes the bullet items tagged in our input file with an asterisk, turning them into `.2` macros for `groff`. The `if` statement on line 20 processes the `INDEX` line in the input.

There's a slightly complicated `if-else` between lines 25 and 43 that bears a little study. In the `if` clause, we take any block of lines beginning with white space, strip off the white space and bracket the lines with a `.b/.e` pair of macros. Why? This handles an inset display–generally, a code example. The `else` clause, on the other hand, deals with `pod`-like font changes, converting double-hyphens into en-dashes.

Fairly simple, right? Which means most of the magic of what's happening is pushed down into the `slidemacs` macro.

Listing 1. The pp2roff Script

```
1  #!/usr/local/bin/perl -w

2  use strict;

3  $/ = '';

4  my $author = (getpwuid($<))[0];
5  my $title = @ARGV ? " \\- $ARGV[0]" : "";
6  my $TOP = <<EOF;
7  .\\"----------------------------------
8  .au "$author$title"
9  EOF

10 print ".mso slidemacs\n.ns\n";

11 while (<>) {

12    chomp;
13    s/\\/\\e/g;
14    s{^=\s*(.*)}{$TOP\n.c "$1"\n};
15    if (/^\*\s*/) {
16      # handle bullet items
17      s/^  (?=\S)//gm;
18      s{^\*\s*}{.2\n}gm;
19    }

20    if (/^INDEX$/) {
21      # produce an index slide
22      print "\n.IX\n";
23      next;
24    }

25    if (/^[\t ].*\S/s) {
26      s/^    //gm;
27      print <<EO_DISPLAY;
28 .b
29 .sz -7
30 .sp .5
31 $_
32 .sp .5
33 .sz +7
34 .e
35 EO_DISPLAY
36    } else {
37      s{I<(.*?)>}{\\f2$1\\fP}g;
38      s{C<(.*?)>}{\\f(CB$1\\fP}g;
39      s{B<(.*?)>}{\\f3$1\\fP}g;
40      s/\s*--\s*/ \\(en /g
41        if( ! /^.\\"/ );
42      print $_, "\n";
43    }
44 }
```

The Macros in Question

Space limitations prevent us from doing a complete reading of `slidemacs`, but we'll touch on the high points to give you a flavor for some `troff` tricks you may not have seen. You can collect the entire set of macros from our Web site, `http://alumni.caltech.edu/~copeland/work/`, or from CPAN. We've heavily modified the `slidemacs` macro package from the `perlpoint` distribution.

Let's begin with the setup. We define whole flock of numeric constants:

```
'\" Parameters:
'nr PW 11i
'\"   PW=paper width
'nr PH 8.5i
'\"   PH=paper height
'nr MB 1i
'\"   MB=margin border
'nr MT 0.5i
'\"   MT=margin text
'nr BW \n(PWu-\n(MBu-\n(MBu
'\"   BW=border width
'nr TW \n(BWu-\n(MTu-\n(MTu
'\"   TW=text width
'nr C  0.5i
'\"   C =corner radius
'nr PT \n(MBu+\n(MTu
'\"   PT=page offset for text
'nr BB \n(PHu-\n(MBu
'\"   BB=bottom of box
'\" 0.7i is amount the logo sticks up over line
'nr CH 0.6i
'\"   CH=height of logo (above base)/2
'nr BT \n(BBu-\n(CHu-1v
'\"   BT=bottom of text
```

Notice that we've calculated some of these from other values. Also, we've used the single-quote mark as an introducer, rather than the normal troff dot. This is a carryover from the original and is overkill. As you may know, the single quote performs the directive without doing a line break. For the setup, this is probably unnecessary.

The next step is to set the parameters for troff:

```
'pl \n(PHu
'll \n(TWu
'lt \n(Twu
'ev 1
'll \n(TWu
'lt \n(TWu
'ev
'po \n(PTu
'wh \n(BTu fa
'wh 0 hd
.em FL
'ds ff "''' \*(DA '"
'de Ft\" footer
'ds ff \&\\$1
..
```

We're setting up the line length and title length–.ll and .lt–in both the base and alternate environments. (Environments are troff's way of allowing you to have different setups for the page headers, footers and body text. They can be extended to other uses, too, such as footnotes.) The alternate environment is the one in which we will draw the frame around the box. We set up two traps with the .wh directive: one at the top of the page, which invokes the header macro .hd, and one that invokes the .fa macro at the bottom of the page. We also ensure that we flush the last bullet item by invoking .FL as the end-macro. Last, we set the footer text to the date, the DA string, but we can reset it with the .Ft macro.

From all that setup, we proceed to the .c macro, which gets translated from a line starting with an equal sign and begins a slide. That is, pp2roff converts a line like

```
=This is a title
```

into

```
.c "This is a title"
```

Note the odd use of the .FL macro in the definition of .c (more on this later).

```
.de c
.FL \" finish the previous bullet item
.bp
.sp 1v
.in 0
```

```
.na
.\" if we have an argument, it's the
.\" first of a series of slides, else
.\" we just increment the slide number
.\" and print it.
.ce  \" the title line is centered
.ps +3 \" and slightly larger
.ie !@@\\$1@ \{\
.  ds @t "\\$1
.  nr @p 1
\&\\*(@t
.if \\n[index-on] \{\
.da @x  \" -- divert to the index
\&\\*(@t ... \\n%
.br
.da
.\}
.\}
```

Notice that this macro anticipates the possibility of being invoked without an argument. To handle that case, we keep a part number, `@p`, and save the title string in `@t`. We take the slide title argument and append it to the `@x` diversion in which we are caching the titles. (For the uninitiated, a `troff` diversion captures text into a buffer, but doesn't print it. It's a trick that allows you to save the text for a footnote, an index or other text that is gathered out of sequence with its printing. Because you can measure the aggregate height and width of the captured text, it also allows you to decide when you need to end the body text so the whole footnote will fit on the page.)

Also notice that we've committed to using `groff` with `slidemacs` by not using a two-character register name, which traditional `troff` requires. Finishing up the `else` side of the `if`

```
.el \{\
.  nr @p \\n(@p+1
\&\\*(@t (part \\n(@p)
.\}
.ps
..
```

we've incremented the part number and generated a title line with the original title and part number, for example, "Sample Slide (part 3)."

In practice, we only use one level in the bullet lists on our slides. So even though we have different levels of bullet in the macro package, the one we translate asterisks into from our `perlpoint` input is `.2`:

```
.de 2
.KP
.in 0.5i
.ti -\w'\(bu\h@0.15i@'u
\(bu\h@0.15i@\c
.if !@@\\$1@ \&\\$1
..
```

This is fairly simple: we do a negative indent slightly wider than a bullet, we put out the bullet and, if there's an argument, we drop that text next to the bullet. If there's no argument, it can follow the macro because we have not done a line break. Note that we didn't use the `.FL` macro, we used `.KP` instead. We'll explain both of these tricks now.

You'll remember that we did some hand-waving above in the `.c` macro, which starts a slide, allowing us to continue onto a new slide with an incremented part number. This feature lets us continue adding items to our slides without having to worry about them overflowing. The other thing required to make this feature work is to capture the bullet item that would have forced the overflow onto a new page and wait until the page break to print it. In other words, each bullet item must be captured and cannot be printed until we determine whether it will fit on the page. The `.KP` macro starts the capture and the `.FL` macro does the flush:

```
.de KP \" start a keep for a new bullet item
.FL
.di @k
..
```

The new bullet item is saved into diversion `@k`, but only after we've flushed the old bullet item with `.FL`:

```
.de FL \" flush the current bullet item
.br
.if !@\\n(.z@@ \{\
.  br
.  di \" close the diversion
.  \" bullet item diversion
.  if \\n(dnu>\\n(.tu  .PF
.  nf
.  in 0
.  @k \" now print the bullet item
.  in
.  fi
.\}
..
```

Remember that we're invoking `.FL` before we start the new bullet. We don't even bother if there is no active diversion. It is a peculiarity of `troff` that the name of the current diversion is stored in a *number* register named `.z`. So if the string contained in `\n(.z` is empty, we have no diversion and, hence, no bullet item in progress.

On the other hand, if that register does contain something–presumably `@k`, the name of the bullet diversion–we close the diversion. If it is too long to fit on the page–that is, if the diversion's height in the `dn` register is more than the distance to the bottom-of-page trap in register `.t` –we invoke `.PF` to finish the page. In any event, we print the last bullet item by invoking the diversion as though it were a macro.

The `.PF` macro is pretty simple:

```
.de PF \" page flush for overflow slide
```

```
.c
.sp 1v
..
```

We rely on the ability of .c to remember the last title it was given, and use it to begin the new page. This is an implicit insertion of a line like the following into our input:

```
= Test slides (part 2)
```

The .sp generates the blank line we normally insert after a title.

Finishing Up

We only have a few more things to do to finish up the macro package. The index is fairly simple:

```
.de IX \" print index
.nr index-on 0   \" don't index the index
.FL
.c "Slide Index"
.sp
.nf
.@x
.nr index-on 1   \" turn indexing back on
..
```

We turn off indexing by resetting the index-on number register. This prevents our title line for the index slide from appearing in the index. Then we flush the last slide, which actually begins the index slide. To produce the body of the index slide, we just spill the contents of the @x diversion. We finish by turning the index-on register back on, in case we have more slides to come.

Last, we need to take a brief look at how we format code. As we noted earlier, we bracket code with a pair of .b and .e macros:

```
.de b
.ft CB
.ps 23
.nr X 8*\w' 'u
.ta +\\nXu +\\nXu +\\nXu +\\nXu \
  +\\nXu +\\nXu +\\nXu +\\nXu
.nf
..
.de e
.ft R
.ps 23
.vs 23
.fi
..
```

The .b macro forces us into Courier Bold font, sets the point size, gives us tab stops at every eight spaces and sets us to no-fill mode. The inverse .e macro returns us to the body Roman font, regular point size and fill mode. (OK, our code is not actually presented in a different point size, but we can change these macros depending on the availability of fonts on our printer.)

We've shown you some of the perlpoint package. It fills an important niche now that with the advent of groff, the -mv macro package is usually not available. Mostly, this has been a tutorial in setting up troff macros. Take this knowledge and your own needs for presentation slides, and extend perlpoint for your own niche. Then donate your extension back to the Perl community by sending it to the CPAN or to Tom Christiansen. Or as the Sirius Cybernetics robots say, "Share and enjoy."

Next time, we will continue the theme with a different purpose-built macro package, which will allow you to amaze your friends in an entirely different way.

Until then, happy trails. ⊸

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Note: The software from this and past Work columns is available at http://alumni.caltech.edu/~copeland/work *or alternately at* ftp://ftp.expert.com/pub/Work.

by Jim Frost

LISA VAN DUSEN

Going Postal

So far, this column has covered a number of the smaller Java APIs, things that could be dealt with in just an article or two. We're going to depart from that format so we can investigate some of the more interesting Java APIs in depth. Taking a cue from Bill Jolitz's series on porting BSD UNIX to the Intel 386, which appeared in *Dr. Dobb's Journal* from January 1991 through July 1992 (see `http://www.ddj.com/articles`), we're going to build a full-blown application over a series of articles and investigate the APIs and techniques we need along the way.

A couple of years ago, I made the jump to using the Internet Message Access Protocol (IMAP) as my email access protocol of choice. This has allowed me the flexibility of accessing my complete email store from wherever I happen to be on the Internet, a terrific advantage when you're traveling.

Unfortunately, back then there was a serious lack of high-quality IMAP clients. Even for Microsoft Corp. Windows, with its wealth of available software, only a handful of IMAP-capable clients existed. The situation on UNIX was much worse: there was the freely available Pine, useful but feature-poor, or Netscape from Netscape Communications Corp., feature-rich but terrifically buggy.

For the past few years, I've been using Windows NT on my desktop to draw from the wealth of Windows applications without having to deal with the traditional Windows instability. I eventually narrowed down my favorite Windows IMAP client to Outlook Express–it's cheap, featureful, robust and has excellent usability. It has its quirks, but overall it's pretty good.

Well, my full-time use of NT is drawing rapidly to a close, driven away by the Linux phenomenon and my deep-rooted love of all things UNIX. Much to my chagrin, the state of IMAP clients on UNIX has not improved much during the past few years. Netscape remains the most useful all-around, but if anything, it has become more buggy than it used to be and it still doesn't support sending mail from multiple email addresses. Most other IMAP clients are either feature-poor, have horrible user interfaces, or cost too much for me to even try. There's a serious need for a flexible, usable, portable, robust and free GUI-based IMAP client.

So we're going to write one, entirely in Java, so I can use it wherever I go–and with a tip of my hat to contemporary slang, I'm calling it Postal.

JavaMail

One of my long-term complaints about Sun Microsystems Inc.'s handling of the Java programming language has been its focus on expanding the available APIs, rather than making the ones that are already available work well. This has made it terrifically hard to write commercial-quality applications in Java. This time, however, Sun's

Listing 1. The MailWatcher Application

```
public class MailWatcher extends Thread implements MessageCountListener
{
    // Properties

    /** Mail folder we are watching. */
    private Folder folder;

    /** Number of seconds between new mail checks.  Default is one check per minute
     *  (60 seconds). */
    private int checkInterval = 60;

    /** Set of messages we have already displayed that have not yet been read. */
    private Hashtable reportedMessages = new Hashtable();

    // Constructor

    public MailWatcher(Folder folder)
    { this.folder = folder; }

    // Property accessors

    public int getCheckInterval()
    { return checkInterval; }

    public void setCheckInterval(int newInterval)
    { checkInterval = newInterval; }

    // Methods

    /** Prints out the "from" and "subject" information from a Message object. */
    private void printMessage(Message message)
    {
        try {
            Address[] from = message.getFrom();
            if ((from == null) || (from.length == 0))
                System.out.println("<unknown>\t" + message.getSubject());
            else
                System.out.println(from[0] + "\t" + message.getSubject());
        }
        catch (MessagingException e) {
            System.err.println("Error accessing message:");
            e.printStackTrace();
        }
    }

    /** Loop to interact with the server periodically.  This is necessary
     *  to generate the new message events that we are interested in. */
    public void watch()
    {
        for (;;) {
            try {
                // this call triggers a MessageCountEvent if
                // there are any new messages.
                folder.getNewMessageCount();
            }
            catch (MessagingException e) {
                e.printStackTrace();
                return;
            }
            try {
                sleep(checkInterval * 1000);
            }
            catch (InterruptedException e) {}
        }
    }

    // MessageCountListener interface implementation

    public void messagesAdded(MessageCountEvent event)
    {
        // fetch messages and print out any new ones
        try {
```

approach is going to serve us well.

Sun has created a Java extension, called JavaMail (the `javax.mail` package), that provides APIs useful for accessing a variety of message-based systems, particularly IMAP, and includes support for dealing with message attachments and decoding. This gives us a big leap forward in our project. So this month, we're going to take a quick look at how to use JavaMail to access an IMAP server.

Most of Postal will be implemented using Java's Swing GUI package, but in the interest of brevity and simplicity, this first investigation will be entirely text-mode. Next month, we'll start working with Swing by taking the things we learn here and wrapping them in Swing-based objects.

MailWatcher

Our example program, MailWatcher (see Listing 1), is much like the traditional UNIX `biff` program. It connects to the email server and lets you know when new mail arrives, from whom it came and its subject. While simple in concept, it allows us to illustrate how to do most of the tasks necessary in a mail reader.

The MailWatcher program may be downloaded from `ftp://ftp.expert.com/pub/JavaClass/12.1999/mailwatcher.tar`. This distribution contains source, compiled class files, libraries and a start-up script.

All JavaMail sessions start with the `javax.mail.Session` object. This is nothing more than a placeholder for default values; you provide it with a `java.util.Properties` object that contains your preferred protocol, email host, email address and other attributes. Optionally, you may also supply it with authentication information that can be used when setting up a connection to the email server.

The MailWatcher program starts by creating the `Properties`

object and populating it with reasonable defaults. It then looks at the program arguments for anything that would override the defaults or provide additional information (such as the user's password). A new `Session` object is then created. `Session` objects are created through the `Session.newInstance()` method. This allows `Session` objects to be shared when possible.

Using the `Session` object, we obtain a `javax.mail.Store` object, through which we connect to the email server using the protocol supplied to the `Session` object when it was created. The `connect()` method in the `Store` object takes a hostname, user name and password, and makes the connection to the email server using the protocol specified in the `Properties` object when we created the `Session` object.

When `connect()` returns, we're talking to the email server and can ask it questions. We can't get email yet, however, because a server maintains a collection of `javax.mail.Folder` objects, each of which is a collection of email messages and/or other `Folder` objects.

IMAP specifies a particular mailbox folder, `INBOX`, that is used for receiving new messages. We therefore ask the `Store` object for the `INBOX` folder and, because we never intend to do anything other than look at messages, we open the folder in `READ_ONLY` mode. Finally, we have what we need to start watching for new messages.

Listening for New Mail

The JavaMail package can produce a number of events (found in the `javax.mail.event` package) to inform a program of various changes in the state of the email database or the connection to the database. For our purposes, we are only interested in the `MessageCountEvent` that indicates a change in the number of messages

```
            Message[] messages = folder.getMessages();
            for (int i = 0; i < messages.length; i++) {
                Message message = messages[i];
                try {
                    Flags flags = message.getFlags();
                    if (flags.contains(Flags.Flag.SEEN))
                        continue;
                }
                catch (MessageRemovedException e) {
                    // message disappeared out from under us
                    reportedMessages.remove(message);
                    continue;
                }

                // We have what the message store believes is a new
                // message.  Now check to see if we've seen it before.
                if (reportedMessages.get(message) != null)
                    continue;

                // this message is new, so print it out and remember it.
                printMessage(message);
                reportedMessages.put(message, message);
            }
        }
        catch (MessagingException e) {
            e.printStackTrace();
            return;
        }
    }

    public void messagesRemoved(MessageCountEvent e)
    { /* don't care */ }

    // Application interface

    public static void main(String[] args)
    {
        String user = System.getProperty("user.name");
        String password = null;
        String folderName = "INBOX"; // default folder for IMAP
        int checkInterval = 60;
        Properties sessionProperties = new Properties();

        // set up default session properties
        sessionProperties.put("mail.from", user);
        sessionProperties.put("mail.user", user);
        sessionProperties.put("mail.host", "localhost");
        sessionProperties.put("mail.store.protocol", "imap");
        sessionProperties.put("mail.store.transport", "smtp");

        // process arguments
        for (int i = 0; i < args.length; i++) {
            if (args[i].equals("-interval"))
                checkInterval = Integer.parseInt(args[++i]);
            else if (args[i].equals("-folder"))
                folderName = args[++i];
            else if (args[i].equals("-mailhost"))
                sessionProperties.put("mail.host", args[++i]);
            else if (args[i].equals("-password"))
                password = args[++i];
            else if (args[i].equals("-protocol"))
                sessionProperties.put("mail.store.protocol", args[++i]);
            else if (args[i].equals("-user"))
                user = args[++i];
            else {
                System.err.println("Unknown option '" + args[i] + "' ignored");
            }
        }

        // Create a session for the user
        Session mailSession = Session.getInstance(sessionProperties, null);

        // Get the mail store for the user
        Store mailStore = null;
```

Continued on Page 46

```
        try {
            mailStore = mailSession.getStore();
        }
        catch (NoSuchProviderException e) {
            System.err.println("No support for the
            " + sessionProperties.getProperty("mail.store.protocol") + " protocol");
            System.exit(1);
        }

        try {
            // Connect to the message store
            mailStore.connect(sessionProperties.getProperty("mail.host"),
                              sessionProperties.getProperty("mail.user"),
                              password);
        }
        catch (MessagingException e) {
            System.err.println("Cannot connect to " + sessionProperties.getProperty("mail.host"));
            System.exit(1);
        }

        Folder mailFolder = null;
        try {
            // Get the folder for the user
            mailFolder = mailStore.getFolder(folderName);
        }
        catch (MessagingException e) {
            System.err.println("Cannot find folder " + folderName);
            System.exit(1);
        }

        try {
            // open the folder to look at it
            mailFolder.open(Folder.READ_ONLY);
        }
        catch (MessagingException e) {
            System.err.println("Cannot open folder " + folderName);
            System.exit(1);
        }

        // create the mail watcher and set it up to listen for
        // events from the mail folder
        MailWatcher watcher = new MailWatcher(mailFolder);
        watcher.setCheckInterval(checkInterval);
        mailFolder.addMessageCountListener(watcher);

        // run the watcher in the main thread
        System.out.println("Watching " + mailFolder.getName());
        watcher.watch();
    }
}
```

in the mail folder. To listen for these events, our `MailWatcher` object implements the `MessageCountListener` interface, which provides the `messagesAdded()` and `messagesRemoved()` callback methods. The `main()` method of our program adds a `MessageWatcher` object as a listener for `MessageCountEvents` so that it will be notified whenever new messages are added to the `INBOX` folder.

Unfortunately, we won't receive message-count events just because we are listening for them, at least not with IMAP. We have to interact with the email server in order to generate them. To perform this interaction, our `MailWatcher` object provides the `watch()` method, which periodically queries the server for new messages. You can tune the frequency of the check using the `-interval` option, otherwise it will check every 60 seconds.

Handling New Mail Events

At this point everything is set up: we have a folder we're watching, and we'll get an event whenever new email shows up. Now we have to figure out which messages are new.

A `Folder` object is used to access a collection of `javax.mail.Message` objects, each of which contains all of the relevant information about a particular email message. These `Message` objects contain a `javax.mail.Flags` object that indicates certain information about the state of the message, including whether it has already been seen by the user, responded to or deleted. It can also indicate whether a message is "recent," indicating that it is relatively new. For our purposes, we are only interested in whether or not a message has been seen already (we could use "recent," but what constitutes "recent" is somewhat vague).

Whenever we are informed that new mail has arrived, we retrieve the set of messages in the folder and inspect each. Every message that has not been seen

is checked against the `reportedMessages Hashtable`, which we use to remember messages we've already reported. If we can't find the message in the `Hashtable`, then we print it out and mark it as having been reported.

The `printMessage()` method is used to print out the "from" and "subject" attributes of the message. The subject attribute is straightforward, but from is a little more complicated. The JavaMail API provides an object, `javax.mail.Address`, that is used to indicate the email address of a sender. The `Message.getFrom()` method returns an array of `Address` objects, indicating all of the authors of the message. There should be only one author for each Internet email message, but some collaborative messaging systems allow multiple authors. For our purposes, we print out only the first author.

Running MailWatcher

Unlike previous programs that have been written for this column, the MailWatcher program is a bit complicated to set up and run. It relies on at least two additional class libraries, the JavaMail library (`mail.jar`) and the JavaBeans Activation Framework library (`activation.jar`). The latter manages MIME-type handling for the JavaMail library; we make no use of it for the MailWatcher program, but that will change as we implement features for the Postal mail reader. The libraries may be downloaded from `http://java.sun.com/products/OV_stdExt.html`, or you may use the copies that are provided in the MailWatcher distribution.

In the MailWatcher distribution, there is a `watchmail` script that invokes the Java Virtual Machine (JVM) on the `MailWatcher` class, using the appropriate extension libraries, and passes it command-line arguments. A typical invocation might be

```
$ watchmail
-mailhost mail.my-isp.net
-user myaccount
-password mypassword
```

For some reason known only to Sun, the JavaMail package does not include support for the extremely popular POP3 email client protocol. It does, however, provide an extension class library, `pop3.jar`, for this capability. In theory, the MailWatcher application can work with other protocols besides IMAP, including POP3, but in practice, the Sun POP3 support does not send message-count events and does not work with MailWatcher. It has a number of other quirks as well. This library is included with the MailWatcher distribution if you'd like to experiment; it would not be difficult to synthesize the events.

Next month, we'll start work on the GUI portions of Postal by creating portions of the message browser, which will allow us to begin an in-depth investigation of the Swing GUI library. Stay tuned.

***Jim Frost** is a software engineer specializing in Java technologies and strong opinions. He may be reached by email at* `jimf@frostbytes.com`.

WARMING UP TO WORKGROUP PRINTERS

Everyone, it seems, has become enamored with the workgroup printer–except perhaps the resident sysadmin burdened with its upkeep. But with vendors pushing the latest multifunction peripherals and the paperless office just around the corner, what changes can we expect in the office printer market?

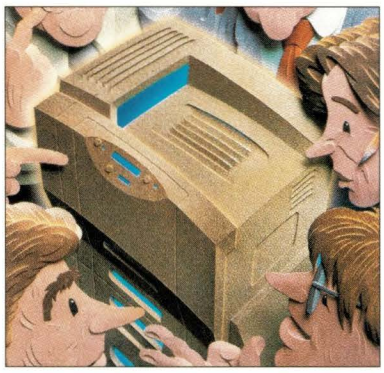
by Alexandra Barrett

If your company is anything like the majority of companies out there, you know that the modern enterprise has largely outgrown its need for a monolithic production printer in the basement, and that equipping everyone's desktop with a personal printer is not cost-effective. So the enterprise has settled for the middle ground, network office printing, where a high-capacity laser printer provisions a smallish workgroup.

All in all, network office printing has been a relatively happy compromise. End users don't mind

CHRIS BUTLER

workgroup printers because they are typically located a short distance away from their desk, on the way to the coffee machine, as it were. Sure, a personal printer would be preferable, but at least this approach doesn't entail any long walks to an out-of-the-way print center. Management likes the workgroup printer approach too. Requiring less overhead than a dedicated, centralized print solution, and easier to support and track than personal printers, workgroup printers are relatively economical.



Perhaps the only folks in the organization that aren't too happy about the advent of workgroup printing are the systems administrators, who inherited responsibility for upkeep and maintenance of these smaller, workgroup printers when the corporate print center was dismantled. "From our conversations with most systems administrators, they aren't too happy about having inherited the responsibility for printing," says Angelo Caruso, global software services manager for printer and copier behemoth Xerox Corp., Stamford, CT.

Oh well, things will only get better, right? In another couple of years, no one will print anything anymore–virtual documents will prevail–and the printer will be relegated to an out-of-the-way corner of the office, left to die a slow death.

Or so you think. Printing, actually, is on the rise. Judging by the amount of paper we consume, it is growing by an estimated 8% every year, says James Lundy, research director at Gartner Group Inc., Stamford, CT. So much for the paperless office.

You can blame this little bit of news, like everything else, on the Internet. "People are printing more because there's just so much more information out there," says Christina Tiner, worldwide product manager for digital office solutions at Lexmark International Inc., Lexington, KY. Whereas printing of interoffice communications such as memos might be down, other forms of printing are up.

The introduction of higher resolution and color print systems into the average office has also driven print volumes. Before, if you needed to print a brochure, you sent it out to a third-party print center. These days, you print it out yourself, on demand.

Experts predict the paperless office will arrive eventually, sometime in the next 15 to 20 years. "There are simply things that we are still more comfortable doing with hard copy," says Gartner Group's Lundy. But, with time, electronic paper will become more prevalent and today's "younger people, who are more comfortable doing things online" will become the dominant office population, Lundy says.

In the meantime, things aren't too bad. Printers are becoming faster, more function-rich and easier to manage. Plus, in the next couple of years, printers will come increasingly equipped with copy, scan and fax capabilities. In this way, devices that have traditionally resided off the network will be brought under centralized control. Assuming all goes as planned, office peripherals should become even easier to manage, experts say. Here's a sampling of what changes you can expect in the next couple of years.

Color Printing

In the low-end personal printer market, color has already established a conclusive foothold over black and white. In fact, as anyone experienced in the matter will tell you, it's near impossible to find a personal monochrome ink-jet printer these days. In order to get a decent black-and-white printer, ironically enough, you add a couple hundred dollars to your budget and go for a laser printer.

Color lasers, on the other hand, remain completely out of reach for most consumers, and still only play sparingly in the networked office environment for two reasons: performance and cost.

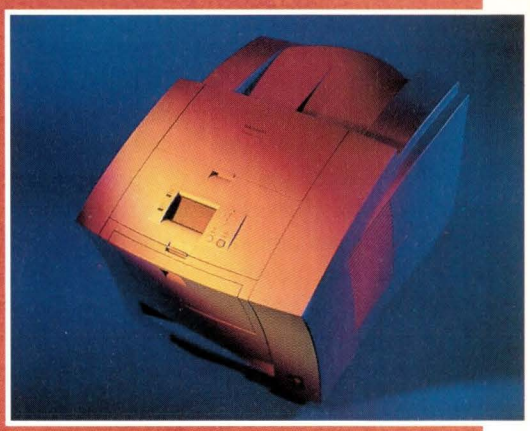
First, color laser printers don't even begin to approach the speeds demonstrated by monochrome laser printers. A simple rule of thumb is that a color laser printer operates at one quarter the speed (page per minute, or ppm) of a companion monochrome laser. This only makes sense because the color laser printing process involves making four passes with four different color inks–cyan, magenta, yellow and black–to generate the color document.

Second, most color laser printers on the market still feature a fairly prohibitive sticker price. Take, for example, LaserJet

printers from Hewlett-Packard Co., Palo Alto, CA. HP's monochrome LaserJet 4050 series, rated to 17 ppm and producing 1,200 dots per inch (dpi), starts at an estimated $1,099. The comparable 4-ppm color/16-ppm black-and-white LaserJet 4500, on the other hand, starts at $2,499, networking interface not included. Consumables such as inks and toners are also much more expensive in a color environment than in black and white.

However, the differences between color and monochrome printers will diminish over time, experts say. A lot of research and development money is being pumped into color lasers, with the expectation they will be brought up to or near the speed of monochrome lasers, according to Lexmark's Tiner. Even so, as monochrome lasers hit the 45- to 60-ppm range, a color laser operating at one quarter that speed (11- to 15-ppm) could very well become the sole printer in a small workgroup setting.

Advances in alternate color printing technologies stand to influence the market as well. In particular, technologies that increase the speed with which color is printed will thrive, predicts Bob Sostilio, analyst with CAP Ventures, Norwell, MA. "Color printing is going to have to increase its speed substantially if it's going to capture the clicks, so to speak," he says. In Sostilio's mind, the two technologies that look promising in this regard are color ink-jet and solid ink (see "Color Printing Technologies," Page 52).



Based on Tektronix solid-ink technology, Xerox says its Phaser 840 workgroup color printer provides an unmatched combination of quality (1,200 dpi) and speed (10 ppm in FastColor).

"Hewlett-Packard [ink-jet's main proponent] has shown us color ink-jet printers that look very promising," says Sostilio, with prototypes operating at 20 ppm.

Meanwhile, solid ink printers received a big plug recently when Xerox announced it would acquire Tektronix Inc., Wilsonville, OR. Until its acquisition, Tektronix had been the only printer manufacturer to sell solid ink-based printers in the office market, says A.J. Rogers, vice president of strategic marketing for color printing and imaging division at Tektronix. Despite models printing at 10 ppm in black and white as

well as color, people used to dismiss solid ink, Rogers says. Today, printers like Tektronix's Phaser 840, rebranded as Xerox, stand to do quite well, Sostilio says.

Even with upstart color technologies taking on the color laser, the days when color printing is as affordable as black and white are still a ways away. "It will probably be another five years before color gets down to a price point comparable with black and white," says Lexmark's Tiner. However, she's certain there will come a time when color printers will cross over to where there's no "penalty" involved.

When that happens, monochrome printers will go the way of the monochrome CRT. "Ten years ago, black-and-white monitors were the norm. You only bought a color monitor if you really needed it," says Xerox's Caruso. "Soon enough, we'll reach the point where color printers are the norm, and black-and-white [printers] are the exception."

Print, Copy, Fax, Scan

The other incentive printer manufacturers are extending to potential customers is the ability to copy, fax and scan using a printer. In the next few years, expect to be buying not a printer, but a multifunction peripheral, or MFP.

A brief trip to the printer department of your local computer office superstore will show you that these multifunction printers are hot tickets in the personal and small office printer markets these days. This same trend will invade the networked workgroup environment as well.

Indeed, to hear industry pundits discuss it, the days of the single-function printer are numbered. "The monochrome printer market is flattening out," says Lexmark's Tiner, but the MFP market is expected to increase dramatically over the next couple of years. In fact, according to Gartner Group's Lundy, by 2002, at least 70% of networked midrange peripherals will be multifunction-capable. That is, it will be possible to upgrade existing peripherals with additional functionality.

There are already a number of competitive MFP products on the market. HP comes to mind with its Mopier 240 and 320 products, with print and copy capabilities; Xerox, with its WorkCentre line; and Lexmark, with OptraImage add-on modules for its more popular workgroup printer offerings.

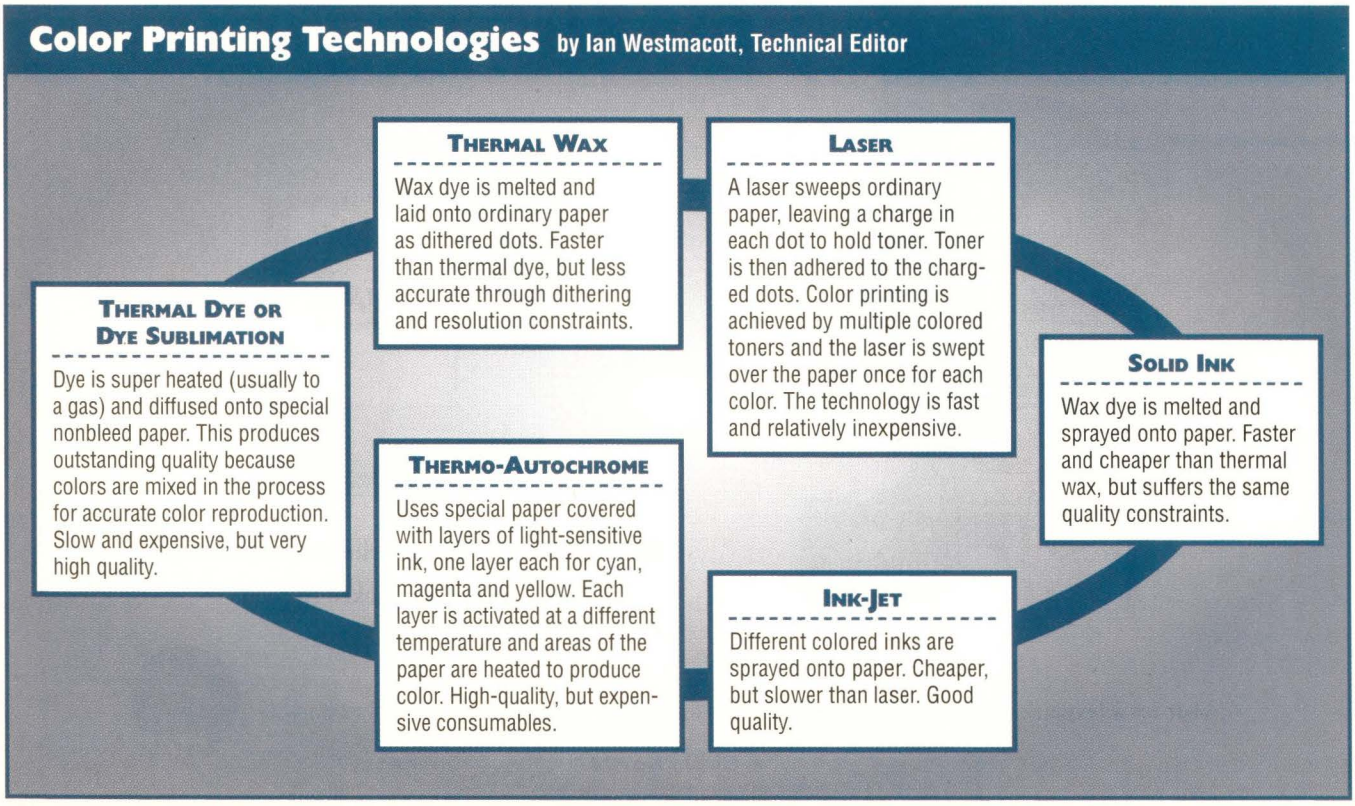
> Even with upstart color technologies taking on the color laser, the days when color printing is as affordable as black and white are still a ways away.

Done right, MFPs hold great appeal for printer customers. Users like the idea of multifunction printers because they reduce the time spent schlepping around the office from the printer to the fax machine, to the copier and back again. And for offices with only occasional copying or faxing needs, for example, an MFP can represent a substantial cost saving, as well as taking up less floor space.

For IT, however, the greatest appeal of the multifunction approach is manageability. "Most offices have separate devices for printing, copying and faxing. We see the industry moving to simplify all that," Tiner says. "This way, we give you everything the user needs to do in one device that can be managed over the network."

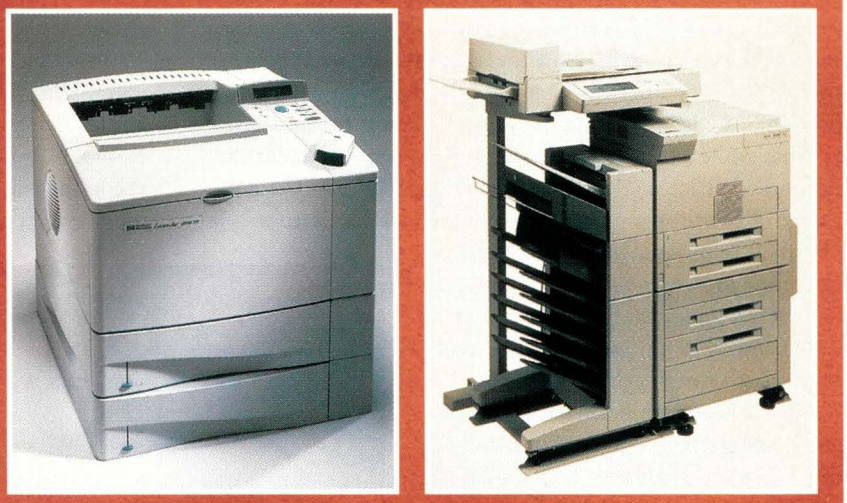
A compelling argument indeed. Once islands at sea, rene-

Color Printing Technologies by Ian Westmacott, Technical Editor



gade copiers and fax machines can now become part of the network, all managed remotely with vendor-supplied software, or integrated into SNMP-based network management frameworks.

Another benefit of many multifunction printers is that they can be incrementally customized to meet the user's exact needs. That is, with a base printer unit, customers can choose add-on modules–hardware and software combinations–that snap onto the device to extend its functionality. These add-ons can usually be bought either at the time of purchase or sometime down the road when the need arises.



HP, long known for its LaserJet workgroup printers, such as the 17-ppm LaserJet 4050 series (left), offers a line of MFP products with its Mopier 240 and 320 (right) network digital copiers.

While IT likes the manageability of MFPs, some customers are scared off by this sort of consolidation. Pessimists among potential MFP buyers are quick to envision the worst-case scenario: What if this multifunction device goes down? Now, not only is my printer down, but so is my copier, my fax machine and my scanner.

Vendors and analysts alike tend to downplay this potential problem. "I think one of the messages that needs to be communicated to the user is that if you're in a workgroup environment, chances are you won't be left out in the cold if one of these devices goes down…because there are probably others of these devices nearby," says Keith Kmetz, program director of the Multifunction Peripheral Program for Framingham, MA-based research firm International Data Corp. (IDC). "This is not a devastating, 'Oh my God!' scenario."

More to the point, Kmetz adds, if an organization is that

concerned about a device going down, chances are it needs to reevaluate what its document needs really are. "If they can't tolerate this device going down, perhaps the device is being overworked," he offers. In that case, the organization would do well by adding a second, backup MFP onto the network.

Still, while MFPs are becoming serious contenders for the networked office market, they do have their critics. The golden age of multifunctions has yet to arrive, warns Gartner Group's Lundy. Some MFPs still take a long time to switch between functions, he says, forcing users to spend a lot of time hanging around the machine, waiting for it to switch gears.

Also, integration between the printer and scanner unit, which controls copying, scanning and faxing, isn't always up to snuff on printer-based MFPs, says Dennis Amorasano, system director of office copier and networked systems for Canon U.S.A. Inc., Lake Success, NY.

However, for the user that only requires the occasional copy or scan, a multifunction printer might be exactly what's in order. "Our philosophy," says Grady Yarbrough, director of color print systems for printer manufacturer QMS Inc., Mobile, AL, "is to start with printing, and as a convenience, add a copier to the unit." To that effect, QMS offers a $399 scanner/copier option, the SC200, that fits onto virtually its entire printer line. That's hardly a lot to pay for the convenience, Yarbrough says.

Digital Copiers

Depending on whom you talk to in the multifunction peripheral market, you might get a different take on where to direct your funds when considering an MFP purchase. Ask a copier manufacturer what kind of multifunction printer to buy and they'll likely tell you not to buy a printer at all, but a digital copier. As the office has become increasingly digital, copier manufacturers have seen their volumes shrink dramatically. With those decreased copy volumes, so go the aftermarket maintenance opportunities, consumable sales and the like.

For copier manufacturers, the antidote to decreased copy volumes is digital networked printers. "Copier vendors recognize that they have to get on the network," says IDC's Kmetz. "Only a few years ago, the office world adhered to the 'print and distribute' model," Kmetz explains. That is, users made copies of documents, which they then distributed to their colleagues. Now the tables have turned, with users distributing documents electronically, and leaving recipients to print the documents for themselves. "With more and more information being digital, copier vendors are being seriously threatened," Kmetz says.

The copier manufacturers' solution to waning copy volumes lands smack in the middle of the traditional workgroup printer market. From an end user's perspective, the differences between networked digital copiers and printers are negligible: they both deliver original prints of digital documents. That said, networked digital copiers do hold several advantages over traditional printer solutions.

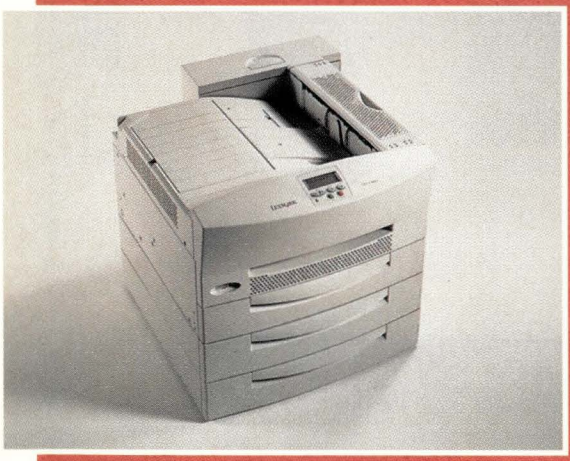
Perhaps the most noticeable advantage of a copier-based MFP is print speed. By design, copiers are inherently faster than laser printers, a fact reflected in prevalent ppm specs. Whereas most high-end monochrome laser printers top out at around 40 ppm, it's not unusual to find digital copiers churning out upwards of 50 to 60 ppm.

Copier-based MFPs also appeal to organizations that require high-end finishing capabilities such as collating and stapling, one of the strong points of copiers.

Printer manufacturers, however, are quick to point out their competition's weaknesses. And by all accounts, the real bugaboo of copier-based MFPs is their relatively recent entrance into the world of networking. True, Canon's digital copiers have been on the network since 1994, but even as of 1998, only about 40% of digital copiers were sold with a network interface, says IDC's Kmetz. "Clearly, we're not hitting the main objective," he says. Consequently, management software for digital copiers may not be up to par.

For IT, this is an especially important consideration. "When push comes to shove, systems administrators are asking, 'What impact does this have on my network?'" says Dwight Lewis, senior program manager for strategic alliances at Lexmark. Potential customers must be careful to evaluate management packages that come with digital copiers, and look for integration with in-house SNMP frameworks.

Another strike against digital copiers, as compared to laser printers, is image quality. Whereas many laser printers deliver 1,200 dpi, as a rule, digital copiers only offer 600 dpi. As Kmetz points



Lexmark offers multifunction add-on modules for its line of workgroup printers, including the Optra W810 (left), which combines print, copy, fax and scan capabilities into a single MFP.

but, however, "Resolution is in the eye of the beholder." In an office environment printing out mainly business correspondence, 600 dpi could very well be sufficient.

Finally, perhaps the biggest shortcoming of copier-based MFPs is their reputation for instability. "Copiers have a reputation for needing a repair man every week," says Tektronix's Rogers. "Printers, you just install and forget." But, he adds, copiers are also moving to a more printer-like model, stressing user self-sufficiency. And in the same way that printers have gotten a whole lot more reliable over the past couple of years, copiers stand to do the same.

In the same way that printers have gotten a whole lot more reliable over the past couple of years, copiers stand to do the same.

In the end, however, the differences between multifunction printers and multifunction copiers may become irrelevant. Already, the lines between the two product types are being blurred. Case in point: Xerox, known for both its printers and copiers, does not differentiate between copier- and printer-based multifunctions. Print- and copy-capable WorkCentre models are distributed under the auspices of a single corporate division, the Office Systems Division.

That said, not all printer and copier manufacturers have taken such an enlightened stance to the market. The way IDC's Kmetz sees it, the industry is poised for a bit of a shake-up. "Some vendors have less than enviable market positions [and may very well buckle under the stress of shifting focus]," Kmetz says. Workgroup printer buyers, however, stand to gain from vendors vying for their business. May the best networked multifunction hard copy output peripheral win.

Alexandra Barrett is a Massachusetts-based freelance writer specializing in computer industry topics.

Companies Mentioned in this Article

Canon U.S.A. Inc.
1 Canon Plaza
Lake Success, NY 11042
http://www.usa.canon.com
Circle 150

Hewlett-Packard Co.
3000 Hanover St.
Palo Alto, CA 94304
http://www.hp.com
Circle 151

Lexmark International Inc.
740 W. New Circle Road
Lexington, KY 40550
http://www.lexmark.com
Circle 152

QMS Inc.
1 Magnum Pass
Mobile, AL 36618
http://www.qms.com
Circle 153

Tektronix Inc.
26600 S.W. Pkwy.
Wilsonville, OR 97070
http://www.tektronix.com
Circle 154

Xerox Corp.
800 Long Ridge Road,
Stamford, CT 06902
http://www.xerox.com
Circle 155

Any Document, Any Place, and a Place for Every Document

by **IAN WESTMACOTT**, Technical Editor

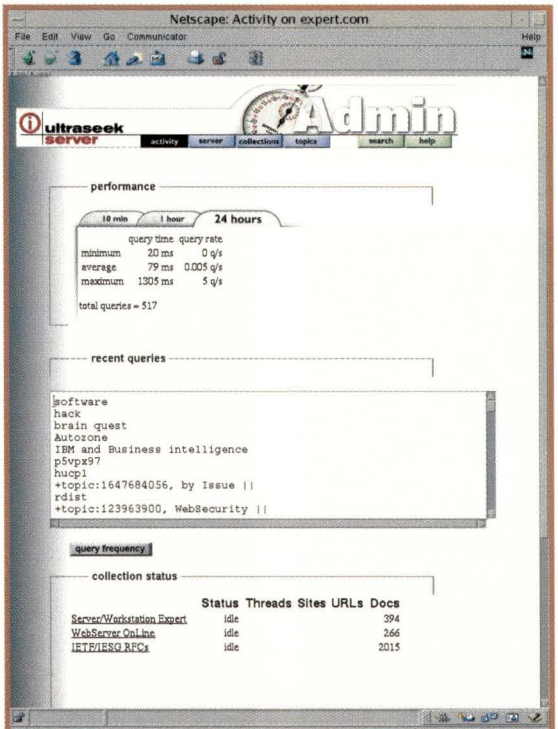
Infoseek's Ultraseek Server emerges as a superb search engine for distributed text-based documents.

Infoseek Corp. launched its Internet search engine in February 1995 at a time when few people knew what a "Web portal" was, and the commercial viability of search engines had not yet been proven. And although today many Internet users are familiar with Infoseek's search engine and, more recently, its Go Network (part of an alliance with The Walt Disney Co.), few are aware that Infoseek sells its patented search engine technology in the form of Ultraseek Server and Ultraseek Server CCE. In August, Infoseek released Version 3.1 of both products, introducing some interesting new features, including the ability to index and search XML elements and namespaces.

Ultraseek Server

Ultraseek Server is a document search engine that provides English indexes and partial support for other languages, an advanced query interface, an intelligent scanner and a customizable scripted results interface. It runs on Solaris, Linux and Windows NT, with some variations in functionality among the three platforms. Symmetric multiprocessing (SMP) configurations are also supported.

The server is able to index documents by spidering a network (starting with a particular URL, and then following links found in subsequent documents), scanning a local file system, scanning Usenet newsgroups, scanning Web-accessible Microsoft Corp. Exchange public folders (new in 3.1), or by mirroring other Ultraseek Server indexes. It does not support database indexing. Supported document types include plain text, HTML, XML (XML field search and namespace mapping is new in 3.1, with the ability to decode ISO Latin-1 and UTF-8 encodings), RTF, Word, Excel and PowerPoint, FrameMaker, PDF and PostScript, WordPerfect, Lotus 1-2-3, WordPro and Freelance Graphics. Nontext document types, such as images and dynamic data, are not supported.



Snapshot status and statistics are available in the administrative interface.

The scanner, responsible for finding and retrieving documents to be indexed, runs continuously, automatically removing deleted documents from the index and updating modified documents. It is intelligent in that it will adjust scanning frequency (the frequency with which the server checks for new or modified documents) based on how often documents and sites are updated. It also performs some optimizations such as caching the `robots.txt` file (robot exclusion protocol file), so it need not be accessed for every document indexed. These attributes help reduce network traffic and make the scanner fast. New in 3.1 is support for authenticating proxy servers using basic authentication, and authenticating Web servers using NT challenge/response.

Administration of Ultraseek

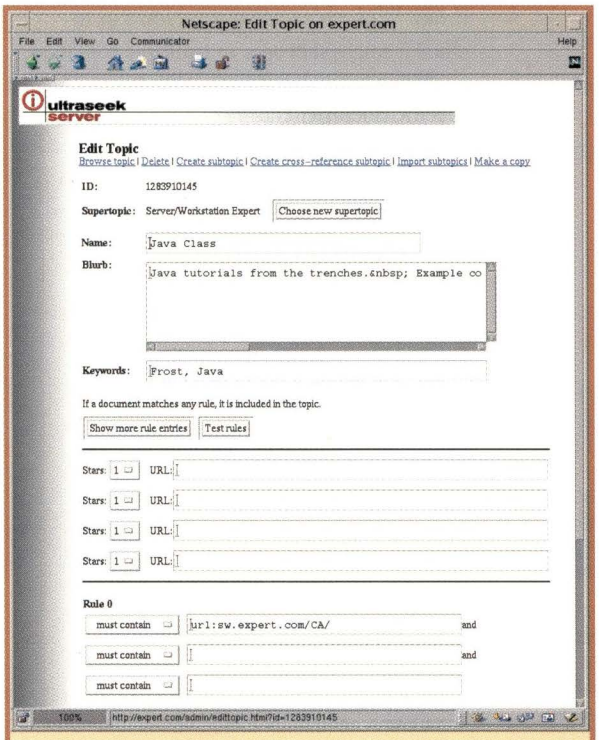
Server is browser-based, with basic HTTP user- and address-based access control. Once set up, the server can be completely administered with a Web browser (by "admin" users), including most common configuration and tuning parameters–from Web server parameters such as keep-alive timeouts to tuning the scanning frequency, to MIME types and XML mappings. Even CPU, disk and memory resource usage can be customized. The administrative interface also includes some basic log file reporting and analysis. Also new in Version 3.1 is the ability to define admin users with limited access, allowing them to update only certain aspects of the configuration, or certain indexes (collections).

Beyond basic customization and tuning, indexer and scanner functionality can be patched using Python code. For example, each indexed document is parsed for terms and metadata to be stored in the index. This procedure is performed by the Python function `Parse`, which pulls out certain metadata, such as document title and modification date, that can be referenced in the results interface. If you want to change which metadata is treated this way, you can write a modified version of `Parse` (in Python) for the server to use. This provides a high degree of customization control over the server and indexes.

The end-user search interface is also customizable. Any browser that supports HTML tables may be used, although some JavaScript code provides extra functionality for those browsers that support it. The results documents are HTML code with embedded Python code, which are parsed and interpreted by the server before being sent to the client. In this way, the results pages have access to and can process a wealth of information provided by the search engine regarding the current search query and its results.

New additions to the results interface include Cascading Style Sheets (CSS) class tags, so that CSS can be used to further customize the interface; out-of-the-box support for the Accipiter DirectServer and NetGravity AdServer Network ad servers; and term highlighting in results hits, so that a search term will be hightlighted if it appears in the results display.

The Ultraseek query language is fairly advanced. It supports keyword, phrase or adjacency, boolean, field or property, and natural language queries (using Inxight's LinguistX product, a spin-off, and technology from Xerox Corp.). In addition, it supports natural language stemming and customizable stemming dictionaries. Also new in 3.1 is thesaurus expansion of search terms, where synonyms and acronym expansions can be suggested for query terms. The thesaurus is customizable.



Ultraseek Server CCE topics are used to create directories of related information.

Content Classification Engine

There are two basic methods of searching for information. It used to be that the Web had search engines (like Infoseek and Lycos) and directories (like Yahoo!). The former providing keyword-type searches, and the later providing hierarchical categories of related information. If you wanted to find information about Solaris, you might use a search engine. But if you were merely looking for information on UNIX operating systems, you might use a directory. These days, most larger search sites and portals offer both keyword-type searches and directories.

Ultraseek Server Content Classification Engine (CCE) is an add-on to Ultraseek Server. It provides directory-like categorization of indexed documents, or topics, in CCE parlance. Using CCE, you can create topics and subtopics, each of which includes a name, a description and a set of rules that determine which documents to include in the topic. End users may then browse topics looking for documents, rather than performing a specific search.

As a concrete example, take the *SW Expert* online archive (`http://sw.expert.com`), where several years of the magazine's back issues are stored. Suppose a reader had a problem they were trying to solve using `awk`, a pattern scanning and processing utility. He might perform a keyword search on the archive to see if any articles were published on `awk` (and indeed would find 42 of them). On the other hand, a new subscriber might enjoy Peter Collinson's "UNIX Basics" column. She might go to the online archive to read those that she had missed, without looking for any topic in particular. In this case, she would find a CCE topic called UNIX Basics, which includes just Peter's columns from the past three years.

The rules that determine the documents to be included in a CCE topic are simply Ultraseek Server search queries. Any set of documents that can be defined by a search query can be a CCE topic. Thus, a topic can be defined by location such as site or URL; metadata such as title, author or date; document type; or by any other search term. The UNIX Basics topic is defined by location because all of Peter's columns are stored in the same directory on a Web server–they have a common unique

Ultraseek Server CCE 3.1

Company
Infoseek Corp.
1399 Moffett Park Drive
Sunnyvale, CA 94089

Phone
(408) 543-6500
(888) 328-7335

Fax
(408) 543-6164

Email
software-sales@infoseek.com

WWW
http://www.software.infoseek.com

Ultraseek Server

Best Feature
Document scanner

Worst Feature
Administrative interface

Price
$995 for up to 1,000 documents; $4,995 for up to 10,000 documents. Contact Infoseek for licensing more than 10,000 documents. Annual software support contracts (which include software upgrades) cost $150 for up to 1,000 documents and $750 for up to 10,000 documents.

Note: The Ultraseek license restricts use to creating indexes of searchable content solely for employees of your company (internal search site), or content created and maintained by your company (public search site). This excludes indexing content not maintained by your company, which is searchable by nonemployees.

Ultraseek Server CCE

Best Feature
Directory-style searches in a snap

Worst Feature
Price

Price
$4,995 for up to 50,000 documents (requires Ultraseek Server). Contact Infoseek for licensing more than 50,000 documents. Annual software support costs $750.

Circle 160

initial string in their URLs.

New in Version 3.1 is topic cross referencing. A CCE topic may have subtopics (for example, the topic "UNIX" might have subtopics "Solaris," "AIX," "HP-UX" and so on), in which case the topic includes all the documents in its subtopics. Perhaps you want a particular topic to be a subtopic of more than one other. Previously, you had to create it multiple times. With cross references, you can include a single subtopic in multiple topics.

Also new in 3.1 is the ability to assign specific documents to topics (in addition to query results), and to make those documents appear first in the topic display. In addition, CCE topics can now be assigned a list of keywords, which will cause the topic to be displayed whenever a search is performed on one of them.

Documentation

Ultraseek Server documentation is in the form of HTML, with additional documentation available from the Infoseek Software site (`http://www.software.infoseek.com`) in both HTML and PDF format. The documentation is decent, but could use some mprovement. If you want to get into advanced customization, you will find that there is much that is undocumented. However, there is an FAQ page and a moderated mailing list, and Infoseek Software runs annual user group meetings. Technical support (requires maintenance purchase, see "Ultraseek Server CCE 3.1") is competent and reasonably fast, often replying to email queries within hours.

Performance

Ultraseek Server can support indexes containing more than 5 million documents, drawn from up to 25,000 sites. The indexed sizes are approximately 50% of the document size. According to Infoseek, the server is capable of indexing 100,000 documents per day and processing 15 queries per second.

Running Ultraseek Server on a 170-MHz dual-processor Ultra 2 with 256-MB RAM and 512-MB swap space, we were able to index (scanning the file system) 400 PDF documents in 11 minutes; that corresponds to 52,364 PDF documents per day. We have also seen query times as low as 20 msec.

Summary

Ultraseek Server is truly a superb search engine for distributed text-based documents. It can be used either out-of-the-box, or highly customized to meet almost any implementation needs. For example, one Ultraseek user has reportedly customized his server to provide an Active Server Pages (ASP) interface, hiding the Python implementation so his staff doesn't have to learn Python. Administration is simple, although the HTML administrative interface is sometimes slow and frustrating owing to large HTML tables. We would like to see some of those large tables split up into smaller, separate pages to make the interface more reasonable. We would also like to see more advanced log processing and reporting options.

Some of Ultraseek Server's strengths include its fast, efficient scanner and its interface customization and server patching based on open-source tools (Python). It is much less painful to learn an API or customization language when it is nonproprietary and of general applicability.

Ultraseek Server CCE is a great add-on for implementations that need directory-style search capabilities because it's easy to set up and maintain and can represent a huge time saving over maintaining directories by hand. CCE topics are automatically updated as the indexes are updated, adding new documents that match the topics rules and removing deleted documents. However, the cost is a bit steep for a product which essentially only hardwires certain queries.

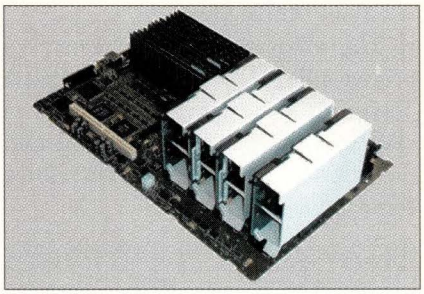
NEW PRODUCTS

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.

Ultra 2 PCI-Based Upgrade Board Debuts

Cycle Computer has announced its CycleQuad Ultra 2 PCI-based upgrade board. The company says the new board is designed for customers–particularly those in the financial, petroleum and scientific industries–who are currently using Sun Microsystems Inc. Ultra 2 systems but are looking for more performance from their desktop.

Based on components and designs licensed from Sun, CycleQuad uses the same 64-bit Ultra Port Architecture (UPA) as the Ultra 450 servers, the company says. The CycleQuad board supports four UPA CPU modules, Creator2D and Creator3D Series 1 and 2 graphics, 100-Mb/s Fast Ethernet and dual-channel Ultra Wide SCSI in a standard Ultra 2 footprint, Cycle Computer says. The upgrade board is said to provide high memory bandwidth from standard memory devices, and features four 33-MHz 32/64-bit PCI slots. It has



a total memory capacity of 3 GB.

The Ultra 2 PCI-based upgrade board supports all standard Ultra 2 software and runs Solaris 2.6 or 7. Contact company for pricing.

Cycle Computer Corp.
20245 Stevens Creek Blvd.
Cupertino, CA 95014
http://www.cyclecc.com
Circle 101

Tcl Upgrades

Scriptics has unveiled significant new versions of the open-source Tool Command Language (Tcl) scripting language and the company's flagship TclPro development suite. In addition, it has introduced comprehensive support and services to accompany its Tcl platform.

The enhanced products–Tcl/Tk 8.2.0 and TclPro 1.3–enable Tcl users to efficiently tackle enterprise-scale scripting requirements, such as enterprise application integration (EAI) and application integration with the Internet, the company says.

Among the new features included with Tcl/Tk 8.2.0 are improved I/O compression and encryption, and enhanced string manipulation capabilities. Scriptics says the new technology can play an important role in business-to-business transactions over the Internet. Tcl/Tk 8.2.0 is an open-source technology and is freely available from the Scriptics Web site.

TclPro 1.3, Scriptics' commercial development tool suite, offers several new capabilities and features and has been enhanced to work seamlessly with Tcl/Tk 8.2.0. These features include a Y2K-compliance checker for custom-

Tatung Unveils Ultra 60-Compatible System

The new COMPstation U60-2450 from Tatung features two 64-bit 450-MHz UltraSPARC-II processors, and is aimed at high-end users such as those involved in high-end graphics and 3D modeling, Java development and electronic commerce, the company says.

The COMPstation U60-2450 is available in either tower or rack-mount configurations. The U60-2450 tower model comes standard with 128 MB of RAM, 9 GB of hard disk storage, PCI graphics card and Solaris 7 preinstalled. It supports one 33-MHz 32-bit PCI device, two 33-MHz 64-bit PCI devices and one 66-MHz 64-bit PCI device. In addition,

a 64-bit Ultra Port Architecture (UPA) slot is available for add-ons such as Creator3D or Elite3D graphics cards. Other standard features include two serial ports, one parallel port and a 100BaseT Ethernet interface.

In addition, the tower model offers five drive bays for incorporating two standard 3.5-inch hard drives, one 5.25-inch CD-ROM drive and one 4mm or 8mm tape drive. Options for the U60-2450 tower include 2 GB of RAM, 36 GB of hard disk storage, asynchronous transfer mode (ATM) network interface and Ultra Wide SCSI.

The rack-mount model, which features a small 7- by 17.25- by 18-inch footprint, offers the same basic storage and I/O slots. Options for the U60-2450 rack-mount version include 2 GB of RAM, 18 GB of hard disk storage, ATM network interface and Ultra Wide SCSI.

The COMPstation U60-2450 tower model is priced starting at $16,610 and the rack-mount version starts at $16,800.

Tatung Science & Technology Inc.
1840 McCarthy Blvd.
Milpitas, CA 95035
http://www.tsti.com
Circle 100

developed Tcl scripts and improved script debugging capabilities. TclPro 1.3–which comprises TclPro Checker, TclPro Debugger, TclPro Wrapper and TclPro Compiler–also includes the company's first implementation of the Tcl Extension Architecture (TEA), which Scriptics says makes it easier for Tcl developers to create and share Tcl extensions, as well as deploy multiple extensions in a single Tcl application.

The TclPro tool suite is available for various platforms, including Solaris, HP-UX, IRIX, Linux and Windows 95/NT. It is licensed per developer, with a single-user license priced at $1,000 (volume discounts are available).

Scriptics has also introduced TclCare, what it calls a comprehensive range of commercial support, training and consulting services for its open-source scripting language. With TclCare for Tcl/Tk, users receive telephone, email and Web-based support for the Tcl platform, as well as a number of Tcl extensions, including Expert, TclX, [incr Tcl], [incr Tk] and [incr Widgets]. Users can choose between per-incident, annual support plans and a combination of email, Web and telephone support services, the company says.

Pricing for TclCare for Tcl/Tk starts at $1,000, which covers up to three incidents in six months. TclCare for Tcl/Tk Premium is priced at 20% of the software list price, and includes priority email and telephone support and annual membership to the Scriptics Customer Advisory Council.

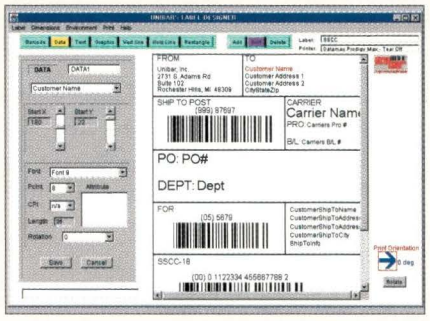
Scriptics Corp.
2593 Coast Ave.
Mountain View, CA 94043
http://www.scriptics.com
Circle 102

New Label Printing Software for UNIX

UniBar has announced Barcode 2000 Version 4/Java, the company's server-based label printing software for applications running under UNIX (including Solaris, AIX, HP-UX and Linux) and Windows NT.

Written in Java, Barcode 2000 provides WYSIWYG capabilities for UNIX and NT users. The WYSIWYG interface reportedly enables users to preview graphics, multiple sizes of text and data, multiple bar code sizes and types, and rotated text on the screen before printing. Users can scroll and select from a features list, using dialog boxes for easy selection, UniBar says.

The software is application- and printer-independent, and also offers a powerful and easy way to print bar code labels or documents throughout the enterprise from a single server, the company says.



Barcode 2000 Version 4/Java can be used with most printers (thermal and laser), with more than 50 models supported. Pricing starts at less than $795.

UniBar Inc.
2731 S. Adams Road, Ste. 102
Rochester Hills, MI 48309
http://www.unibar.com
Circle 103

Java-Based Management Software

SAN InSite 2.2 from Vixel is a new Java edition of the company's storage area network management software. SAN InSite 2.2 monitors the status, control and diagnostics of switches, hubs and Gigabit Interface Converters (GBICs). In addition, it attempts to keep a SAN operating continuously at its full potential, the company says.

Reportedly, SAN InSite is designed to coexist with all server platforms operating independently on the SAN and can be directly installed on Solaris, Linux and Windows NT 4.0. The software is available with Vixel 2100 Zoning Managed Hub and Vixel 8100 Fabric Switch, and provides network managers with a historical view of bandwidth consumption on each port of the optional Vixel hardware, the company says. SAN InSite also provides a step-by-step instruction module, called Vixel Quick Start Guide, for software installation and configuration.

Data can be viewed in real time through a graphical interface, providing information on the SAN interconnects, including switches, hubs and GBICs. Proactive management policies can be set for automatic insertion and recovery actions, and event notification features inform managers of system faults, the company says.

In addition, SAN InSite 2.2 can be configured to monitor network and storage management frameworks from Computer Associates International Inc., Hewlett-Packard Co., Legato Systems Inc. and Veritas Software Corp. It also comes with remote monitoring capabilities, the company says.

SAN InSite 2.2 can be purchased for $995; contact vendor for pricing with optional Vixel hardware.

Vixel Corp.
11911 N. Creek Pkwy. S.
Bothell, WA 98011
http://www.vixel.com
Circle 104

Y2K Contingency Tool for UNIX

SN2K from SolutionSoft is a contingency tool for companies concerned about a possible Y2K failure. SN2K is targeted at companies developing application contingency plans, businesses that have yet to finish Y2K testing and companies that suspect they will have unresolved Y2K issues.

SN2K is designed to protect applications by allowing them to run 28 years in the past (every 28 years, days of the week match exactly). This lets companies continue daily operations while avoiding a disastrous application failure when 2000 arrives, the company says. On the other hand, if an organization does experience a Y2K crash, SN2K can enable it to maintain a "business as usual" image while working to identify the problems and recover from the failure, SolutionSoft says.

SN2K reportedly allows applications to use simulated "virtual clocks" instead of altering the system clock. Unlike resetting the system clock, SN2K's virtual clock safely ensures that system operations and Y2K-complaint applica-

tions are not impaired, the company says. File time stamps and the system log will reflect the system clock, so that backup, logging and other system tasks operate normally. When SN2K is invoked for an application, it intercepts program calls from that application to the system clock, then returns a simulated time and data minus 28 years relative to the present time, SolutionSoft says.

SN2K is available for the following operating systems: Solaris, AIX, HP MPE/iX, HP-UX, MP-RAS and Windows NT. An enterprisewide license for an unlimited number of servers costs $99,000; optional support costs $25,000 per year.

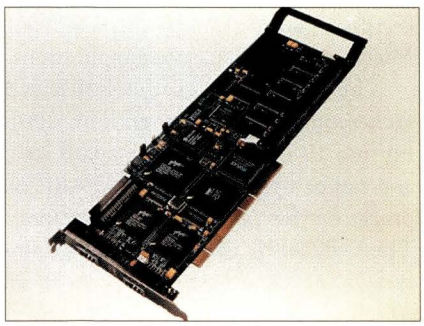
SolutionSoft Systems Inc.
2345 N. First St., Ste. 210
San Jose, CA 95131
http://www.solution-soft.com
Circle 105

Fibre Channel PCI RAID Controller

Mylex's new eXtremeRAID 3000 Fibre Channel PCI RAID controller reportedly offers 66-MHz 64-bit PCI performance for clusters and networks requiring maximum speed, fault-tolerance and scalability.

eXtremeRAID 3000 incorporates several new technologies that eliminate I/O bottlenecks, boost performance, maintain availability and enable scalability, Mylex says. It uses a 233-MHz RISC processor and features a 66-MHz 64-bit PCI bus. Two external Fibre Channel loops are said to allow the controller to scale to 252 drives, with up to 12.5 TB of capacity per controller. The controller also incorporates an 80-MB/s internal Ultra 2 SCSI connector to support local SCSI devices within the server.

Using Intel Corp.'s StrongArm 233-MHz SA110 RISC processor with Mylex's own intelligent firmware, the controller decouples disk drive I/O management tasks from the network operating system, freeing the operating system to service other applications, the company says. The controller further eliminates potential I/O bottlenecks by incorporating a 33/66-MHz 64-bit PCI bus, which doubles sustained transfer data rates to more than 190 MB/s. The bus itself provides burst data transfer rates up to 266 MB/s.



eXtremeRAID 3000 supports RAID levels 0, 1, 0+1, 3, 5, 10, 30 and 50, Just a Bunch Of Disks (JBOD) and all major operating systems, including Solaris, SCO UNIX, UnixWare, Linux, NetWare and Windows NT. eXtremeRAID 3000 costs $1,949.

Mylex Corp.
34551 Ardenwood Blvd.
Fremont, CA 94555
http://www.mylex.com
Circle 106

Strong Authentication for Linux

CryptoCard, a leading vendor of network information security products, and Red Hat Inc., maker of the Red Hat Linux distribution, have announced that CryptoCard's CryptoAdmin 4.0 authentication server and CryptoKit development kit are now included on the application CD that ships with Red Hat Linux 6.1.

With CryptoAdmin, Red Hat customers can implement affordable token-based authentication within virtual private networks (VPNs), firewalls and secure extranets to effectively guard against network intrusion, CryptoCard says. The strong authentication system is based on two-factor authentication: users must possess both the token and its activation code, which includes a user name and PIN.

Once integrated, CryptoAdmin is said to handle access to and management of the token user database. In addition, the development kit includes an API for embedding an automated software token that pops up on Web pages, or while connecting to a VPN, to make strong authentication as easy to use as static passwords, the company says.

Along with CryptoAdmin 4.0 and CryptoKit, CryptoCard has made available licenses for five portable software tokens and five hardware tokens, which customers must request before June 30, 2000. CryptoCard tokens do not expire and only need to be deployed once. In addition, there is no annual license or maintenance fee for CryptoAdmin 4.0 or CryptoCard tokens. Pricing for Red Hat Linux 6.1 starts at $29.95.

CryptoCard
300 March Road, Ste. 304
Kanata, Ontario
Canada K2K 2E2
http://www.cryptocard.com
Circle 107

HP Workstation Aimed at Design Automation

Hewlett-Packard's new Visualize J7000 workstation is a four-way symmetric multiprocessing (SMP) system aimed at advanced electronic design automation (EDA) and mechanical design automation (MDA) applications, the company says.

The J7000 offers full support for kernel threads in a 64-bit operating system and up to 8 GB of RAM. The machine features four 64-bit PA-8500 processors running at 440 MHz, a choice of either 64-bit HP-UX 11 or HP-UX 10.20 operating system, eight industry-standard PCI slots and a choice of 2D or 3D graphics subsystems.

An entry-level configuration with 4-GB RAM, 18-GB disk, monitor and 2D HP Visualize graphics subsystem is priced at less than $50,000.

Hewlett-Packard Co.
3000 Hanover St.
Palo Alto, CA 94304
http://www.hp.com
Circle 108

DVD-RAM Libraries Debut

The MC-7000 Series of DVD-RAM libraries from JVC is targeted at applications requiring backup of images and audio/video recordings. The MC-7000 Series is available in three models, with either 260 GB (100 disks), 520 GB (200 disks), or 1.6 TB (600 disks) of data storage.

With four times the capacity of CD and CD-R technology, the MC-7000 libraries are designed for organizations

faced with an ever-growing need for storage capacity, JVC says. Each model features 50-disk removable magazines, 1x DVD-RAM drives and a SCSI 2 interface, and can support six drives.

Depending on the model, the disk loading time varies from 2.5 to 4.5 seconds. As with all JVC libraries, the MC-7000 Series is designed with reliability features that include airtight enclosures, disk transport trays and support for local/remote diagnostics via an RS-232C port, the company says.

The MC-7000 Series is priced starting at $14,495.

JVC Professional Computer Products Division
5665 Corporate Ave.
Cypress, CA 90630
http://www.jvc.com
Circle 109

Spreadsheet for Linux

Business Logic has released Xess Spreadsheet for Linux Standard Edition Version 4.2, a comprehensive spreadsheet application that has been developed specifically for Linux users and combines familiar spreadsheet functionality with attractive screen displays and an intuitive, point-and-click user interface, the company says.

Xess Spreadsheet reportedly provides a full range of mathematical, statistical, financial, matrix and string functions for complex calculations. In addition, it includes a number of built-in functions–which are said to offer speed, flexibility, high-quality color reports and graphs–and is compatible with existing spreadsheet applications such as Excel and Lotus. It is supported on most commercial Linux distributions, including those from Red Hat Inc., S.u.S.E. GmbH and Caldera Systems Inc.

Xess Spreadsheet for Linux Standard Edition 4.2 costs $69.95 for a single-user license; site licenses are also available.

Business Logic Corp.
4505 University Ave. N.E., Ste. 88
Seattle, WA 98105
http://www.blcorp.com
Circle 110

Rack-Mount Servers for ISPs

EIS Computers has introduced two new rack-mountable servers–VerteX 400-2U and Fusion-iX/2–designed and optimized specifically for Internet service providers (ISPs).

The VerteX 400-2U server comes with one or two 600-MHz Intel Corp. Pentium III processors, 512-KB cache per CPU, up to 2-GB RAM, dual Ultra SCSI disk channels, 10/100BaseT Ethernet, two PCI slots and one 15-pin SVGA video port. The 2U enclosure can hold up to six 9.1-GB hard drives, or up to four 50-GB drives, for more than 200-GB total storage, EIS says. Options include hardware RAID, CD-ROM and tape drive. In addition, customers have a choice of operating system, including Solaris 7 for Intel, Red Hat Linux 6.0 and Windows NT.

The Fusion-iX/2 2U server is driven by a Sun Microsystems Inc. Ultra AXi motherboard. The UltraSPARC-IIi-based server is available in five clock speeds from 267- to 440-MHz, and includes up to 2-MB cache, 1-GB RAM, dual Ultra Wide SCSI, 10/100-MB/s Ethernet, six PCI slots and one 15-pin SVGA video port. The Fusion-iX/2 server comes with either Solaris or Linux preinstalled.

Both servers feature a specially engineered 19-inch rack-mount enclosure that allows easy access for maintenance and upgrades, EIS says. Up to 24 2U units can be stacked in standard racks for use by ISPs. In addition, both servers include hot-swappable power supplies, fans and a locking front door to prevent unauthorized access. Contact vendor for pricing.

EIS Computers Inc.
207 W. Los Angeles Ave., Ste. 303
Moorpark, CA 93021
http://www.eis.com
Circle 111

Free Application Management Software

IMC Networks has announced it will offer its iView management application software suite free of charge.

iView reportedly provides a user-friendly GUI that allows LAN and WAN administrators to monitor and control critical functions of IMC Networks' managed products, including the iMc and iMcV Managed Media Converter Series, the ipMux Ethernet IP Multiplexer and the FiberLinX End-to-End Fiber Management Series. iView can run as a stand-alone application or on top of leading industry standard SNMP-based network management software, including HP OpenView or IBM NetView.

IMC says future releases of iView will support Linux and will have Web-based extensions, allowing it to be run within an HTML-based browser. Contact IMC Networks to receive a copy of iView.

IMC Networks
19772 Pauling
Foothill Ranch, CA 92610
http://www.imcnetworks.com
Circle 112

New SPARCalike Servers

HAL Computer Systems, a subsidiary of Fujitsu Ltd., has unveiled a new line of servers. The GP7000F servers are SPARC V9-compliant, Oracle 8i-certified and are compatible with Sun Microsystems Inc. Catalyst applications.

The GP7000F Model 200R is a rack-mount Solaris server. The 200R fits into 19-inch industry standard racks and can be upgraded to dual SPARC 64 processors for up to 4 GB of memory. The GP7000F Model 400 is a symmetric multiprocessor (SMP) system, which supports four processors and is

available in both rack-mount (400R) and standard models (400). In addition, Model 400 can handle PCI devices, RAID and networking connections.

All GP7000F servers are available with 248- or 272-MHz CPU and up to 8 MB of L2 cache. Other features include a PCI device bus and a system control facility that monitors the system and reports on potential failures, the company says. Hot-swappable tape and disk drives, plus optional dual hot-swappable power supplies are also available. Contact vendor for pricing.

HAL Computer Systems Inc.
1315 Dell Ave.
Campbell, CA 95008
http://www.hal.com
Circle 113

Enhanced Fixed-Point DSP Core

3DSP has unveiled its new fixed-point digital signal processor core, the SP-5 DSP. 3DSP says it has designed the SP-5 with application-specific integrated circuit (ASIC) manufacturers in mind for integration to the next generation of Internet, communications and multimedia devices.

The SP-5 core features 3DSP's Superscalar Single Instruction Multiple Data (SuperSIMD) architecture, processing up to 3.2 billion RISC-equivalent instructions per second, while consuming only 300 milliwatts of power. SuperSIMD is also said to provide the SP-5 with a unique memory-to-register file feature, as well as a load-and-store architecture typically found in DSP technology.

The SP-5 core automatically handles data dependencies and hazards, making it easier for customers to program, as well as reducing the amount of memory required, the company says. Because the SP-5 is one of the smallest DSP cores currently on the market (2.4mm by 2.4mm) and requires minimal power, it is an attractive solution for portable application developers, 3DSP says.

SP-5 DSP is supported by the Direct Support Program, which covers a wide range of technical support and troubleshooting services aimed at increasing a customer's development efficiency and reducing time to market. 3DSP's SP-5 core is currently available via commercial licensing agreements; contact company for pricing.

3DSP Corp.
16735 Von Karman, Ste. 100
Irvine, CA 92614
http://www.3dsp.com
Circle 114

Fibre Channel SAN Platform Debuts

The TrueSAN 6000FC series from TrueSAN Networks is described as a highly scalable and robust storage networking platform for deploying enterprise storage area networks (SANs), consolidating data assets and improving network performance and efficiency.

The product's TrueFibre technology is a 64-bit RISC-based, host-independent RAID architecture that uses the Fibre Channel protocol throughout the entire subsystem to obtain maximum available bandwidth. In addition, the 6000FC's load-balancing technology delivers 200 MB/s of bandwidth over one large segment, enabling internal transfer rates of more than 190 MB/s, the company says.

TrueSAN Networks' SANengage technology is said to provide a host-independent SAN architecture, enabling rapid deployment of high-bandwidth SANs. With SANengage, multiple hosts can access a single TrueSAN 6000FC solution regardless of platform or interconnect method. Access privileges and volume locking capabilities are offered via hardware, off-loading management functions to the dedicated TrueFibre application-specific integrated circuits (ASICs).

In addition, its SANergy technology enables multihost file-level simultaneous reading and writing across Solaris, IRIX, Windows NT and Mac OS workstations and servers, the company says. The TrueSAN 6000FC series is said to protect vital data via its Fibre-Uptime technology, which makes it possible to experience multiple disk and

controller failures without compromising performance. The 6000FC series is priced starting at $22,388.

TrueSAN Networks Inc.
1875 Charleston Road
Mountain View, CA 94043
http://www.truesan.com
Circle 115

Traffic Analysis for iPlanet

Sane Solutions has released NetTracker Web site traffic analysis software for the Sun-Netscape Alliance iPlanet Web Server, Enterprise Edition 4.0. NetTracker is said to offer analysis and measurements of Web site visitor traffic and is designed specifically for Fortune 1,000 companies and Internet service providers (ISPs). Users can remotely analyze their Web site traffic data from any location using the company's Web browser interface. The reports generated by NetTracker can be exported to Microsoft Excel, Access and Word applications, the company says.

The software is available in three versions: NetTracker Professional, which is designed to analyze a single Web site and costs $495; NetTracker Enterprise, which is designed to analyze multiple Web sites and is priced on a per-site basis, starting at $995 for five sites; and NetTracker eBusiness Edition, which offers users the ability to process large log files and starts at $9,995.

Sane Solutions LLC
35 Belver Ave., Ste. 230
North Kingstown, RI 02852
http://www.sane.com
Circle 116

Cable/ADSL Gateway and Firewall

Umax Technologies has released UGate-3000, a secure firewall and Internet gateway for small to midsize firms that can reportedly handle up to 253 simultaneous users.

The UGate-3000 offers high-speed LAN users a secure and load-efficient way to access the Internet via a continuously available, high-bandwidth cable or asymmetric digital subscriber line (ADSL) Internet modem connection, Umax says. The UGate-3000 firewall offers standard access authorization services and can be configured to limit

Internet access or to block any specific port. UGate-3000 also performs network address translation (NAT), which reduces the LAN's exposure to incursions by unauthorized crackers and vandals, the company says.

The UGate-3000 can be configured in minutes, Umax says, and a user-friendly interface controls the built-in, four-port 10/100-Mb/s Ethernet hub, as well as the Dynamic Domain Name System (DNS). The UGate-3000 can be connected to a router to provide fast LAN access for a remote office without the need to reconfigure the local network, Umax says. It can also act as a Dynamic Host Configuration Protocol (DHCP) server, eliminating the time it takes to configure each system on the network individually, the company says. Pricing starts at $399.95.

Umax Technologies Inc.
3561 Gateway Blvd.
Fremont, CA 94538
http://www.umax.com
Circle 117

Data Analysis Software for Solaris

Accrue Software has released Accrue Insight 3.0 for Oracle on Solaris. Accrue Insight is designed to analyze the effectiveness of Internet business initiatives. For example, the software is said to capture data relating to Web site traffic, registration and cookies for analysis. This data is then used to evaluate a site's effectiveness and to develop visitor profiles. This type of analysis provides information relating to a visitor's behavior and demographics, the company says.

The software is capable of capturing data relating to dynamically created Web pages. This includes capturing different methods of HTTP such as POST. Specific access criteria can also be established, limiting an end user's ability to view collected data, the company says. Also, reports can be generated and distributed to appropriate personnel.

Accrue Insight comes with several management features, such as the ability to allocate more storage resources for information relating to a Web site. In addition, it can be used to establish business rules for collecting data, Accrue Software says.

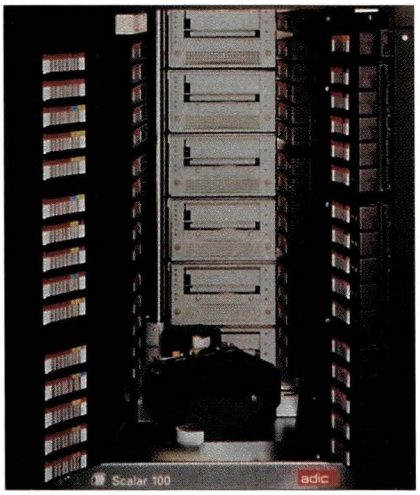
Pricing for Accrue Insight 3.0 for Oracle on Solaris starts at $17,000.

Accrue Software Inc.
48634 Milmont Drive
Fremont, CA 94538
http://www.accrue.com
Circle 118

Tape Library with Multiple Personalities

ADIC has announced the Scalar 100, a new low-end entry point to its line of tape libraries. The Scalar 100 supports 30 to 60 cartridges and one to six DLT drives, which results in a compressed capacity of 4.8 TB.

A key feature of the Scalar 100 is what ADIC calls its drive-independent design. This means the system will support DLT7000 and DLT8000, as well as LTO Ultrium (a new format developed by IBM Corp. and Hewlett-Packard Co.), AIT and SuperDLT drives. Also, the library can be configured as a high- or low-voltage differential (HVD/LVD) SCSI device. FibreReady, an optional module, can make the library storage area network (SAN)-ready, or the library can be equipped with a StorNext module to become a network-attached storage (NAS) device. According to ADIC,



this feature makes the Scalar 100 a solid choice for near-line storage.

For remote monitoring, the Scalar 100 also supports ADIC's new Web management option–which is provided by a user-installable method.

Pricing for the Scalar 100 and optional modules depends on configuration, but starts at less than $20,000.

Advanced Digital Information Corp. (ADIC)
11431 Willows Road N.E.
P.O. Box 97057
Redmond, WA 98073
http://www.adic.com
Circle 119

Data Exchange for the Enterprise

Hummingbird Communications has introduced Genio for UNIX. Genio reportedly provides a data infrastructure for the exchange of data from data warehouses, online analytical processing (OLAP) cubes, enterprise resource planning (ERP) systems and proprietary business applications (such as financial packages) to network users.

Based on a metadata repository, Genio is said to offer cross-platform deployment and scheduling features that can be distributed among UNIX and Windows NT environments. Object sharing is a key feature. Developers can share objects among multiple projects that have common business rules, Hummingbird says. It also supports native connectivity to Hyperion Solution Corp.'s Essbase database.

The UNIX release of Genio runs on Solaris and AIX. Genio is also available for Windows NT environments. Contact vendor for pricing.

Hummingbird Communications Ltd.
1 Sparks Ave.
North York, Ontario
Canada M2H 2W1
http://www.hummingbird.com
Circle 120

E-Business Application Security Software

Perfecto Technologies, a developer of electronic business security software, has introduced AppShield, what it describes as the first plug-and-play Internet application security solution.

AppShield allows e-businesses to deploy application-level hacker protection without modifying existing applications or third-party software and, thus, minimizing application development cycles, the company says.

Using Perfecto's Policy Recognition Engine and Adaptive Reduction Technology, AppShield is said to recognize the running application's security policy by analyzing each outbound HTML page on the fly. The security software then enforces compliance with that policy for every incoming HTTP request. This protects the integrity of an e-business application by making it nearly impossible for a hacker to take advantage of security loopholes in either the application code or third-party products such as Web servers, the company says.

Because AppShield is designed with ease of use in mind, systems administrators can manage the installation and operation of multiple AppShield nodes from a single location, Perfecto says.

AppShield supports Solaris and Windows NT, and costs $20,000 (volume discounts are available).

Perfecto Technologies Inc.
880 Maude Ave.
Mountain View, CA 94043
http://www.perfectotech.com
Circle 121

IP Load-Balancing Between Multiple ISPs

Companies that use numerous Internet service providers (ISPs) for added availability may benefit from the release of RadWare's new Link-Proof load-balancing tool. LinkProof is said to identify healthy ISP connections and will direct packets through those connections. Because LinkProof sits between the enterprise network and a farm of Internet routers to monitor ISP connections, it is able to balance traffic before it enters the network, the company says.

Another key feature is its ability to perform smart network address trans-

lation(NAT) to ensure uninterrupted packet delivery to and from the enterprise network. Internet traffic is optimized through intelligent load-balancing based on the current session and/or load per verified ISP connections, the company says.

Furthermore, network proximity is measured to determine the closest and fastest route, and is based on both router hops and round-trip latency. Proximity detection is also used to perform inbound traffic management. LinkProof runs on any platform that supports TCP/IP. Pricing starts at $9,375.

RadWare Inc.
575 Corporate Drive, Ste. 205
Mahwah, NJ 07430
http://www.radware.com
Circle 122

Tape Drive for Midrange Market

The DLT8000 tape drive from Tandberg Data reportedly offers up to 80 GB of storage capacity and transfer rates up to 43.2 GB/hour (or 12 MB/s compressed). The drive features a low-voltage differential (LVD) SCSI interface, which has the capacity to switch automatically when required, Tandberg says. This is said to allow for longer cabling lengths without using special equipment. A high-voltage differential (HVD) SCSI bus option is also available.

The Tandberg DLT8000 uses the same DLTape IV media as the existing DLT7000 and DLT4000 drives and is fully backward compatible with both drives. The DLT8000 will also read and write to DLTape III, DLTape III XT and DLTape IV, providing users with backward compatibility with the DLT2000 and DLT2000XT drives, Tandberg says.

The DLT8000 tape drive is targeted at midrange computers, network servers and high-end workstations running Solaris, AIX, SCO UNIX, UnixWare, Linux, NetWare or Windows NT. Pricing starts at $4,995.

Tandberg Data Inc.
2685-A Park Center Drive
Simi Valley, CA 93065
http://www.tandberg.com
Circle 123

Parallel Sort Performance Tool Enhanced

Innovative Routines has announced Version 7 of its flagship product CoSort. This latest release adds support for Linux and Solaris 7 for both SPARC and Intel platforms.

CoSort enables developers and end users to fully exploit inherent parallel processing, large file I/O and Internet-related data warehousing, Innovative Routines says. CoSort is said to provide the world's fastest parallel and multithreaded performance on symmetric multiprocessing (SMP) UNIX and Windows NT server platforms. It is used by mainframe COBOL users migrating to open systems, as well as database administrators and data warehouse architects requiring preload join, select, convert, aggregate, sort, merge and reformat functionality, Innovative Routines says.

CoSort is fully interoperable across all UNIX and NT platforms and, in addition to Linux and Solaris 7, supports Solaris 2.5/2.6, HP-UX, AIX, Digital UNIX, Tru64 UNIX, DG UNIX, UnixWare, SCO UNIX and Windows 95/98/NT. CoSort is licensed once for perpetual use; contact company for pricing.

Innovative Routines International Inc.
1775 W. Hibiscus Blvd., Ste. 200
Melbourne, FL 32901
http://www.cosort.com
Circle 124

Upgrades, Enhancements, Additions...

■ Advanced Systems Concepts has announced that its RemoteShadow software now supports Solaris. RemoteShadow is designed to transparently and continuously protect an organization's information by providing access to current data at an alternative location. It includes both local and remote capabilities for partitions or volumes in the event of a disk drive, controller, system or data center failure. With the Network Restart feature, RemoteShadow also assists in the preservation of information following a network failure. Network Restart sends information to a queue when a connection is lost. The information continues to build in the queue until the connection is reestablished, saving hours of downloading time, the company says. RemoteShadow also supports Tru64 UNIX and Open VMS. It is priced from $7,500 to $33,750. **Advanced Systems Concepts Inc.**, 33-41 Newark St., Hoboken, NJ 07030, *http://www.advsyscon.com*. **Circle 125**

■ Veritas File Server Edition Version 5.0 now delivers accelerated performance for Sun Microsystems Inc. servers and enables customers to consolidate multiple small file servers onto a single, easily managed server. The new edition combines Veritas File System, Veritas Volume Manager and file system acceleration/file sharing technology. Enhanced technology now allows users in both Sun NFS and Windows environments to transparently share files and printers with one another, Veritas says. Also, administrators can now improve I/O performance within their high-demand file serving environments that can include workgroup and enterprise-class servers. It is priced from $6,195 to $87,795, based on the number of file server licenses required. **Veritas Software Corp.**, 1600 Plymouth St., Mountain View, CA 94043, *http://www.veritas.com*. **Circle 126**

■ Tadpole-RDI's VoyagerIIi server now offers an UltraSPARC-IIi 360-MHz CPU, up to 32 GB of removable disk capacity and comes with the 64-bit Solaris 7 operating system preinstalled. The server incorporates four high-speed Ultra DMA controllers, supporting two twin packs of 2.5-inch drives. The twin-pack drives each consist of two 8-GB disks, allowing for configurations of 16 or 32 GB. Weighing around 10lbs, the VoyagerIIi server offers 1 GB of memory priced at $11,995. **Tadpole-RDI Inc.**, 2300 Faraday Ave., Carlsbad, CA 92008, *http://www.tadpolerdi.com*. **Circle 127**

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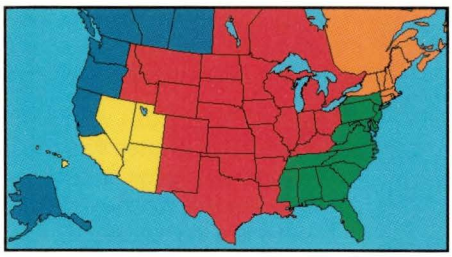

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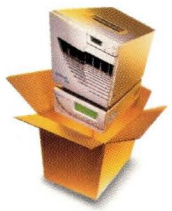

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