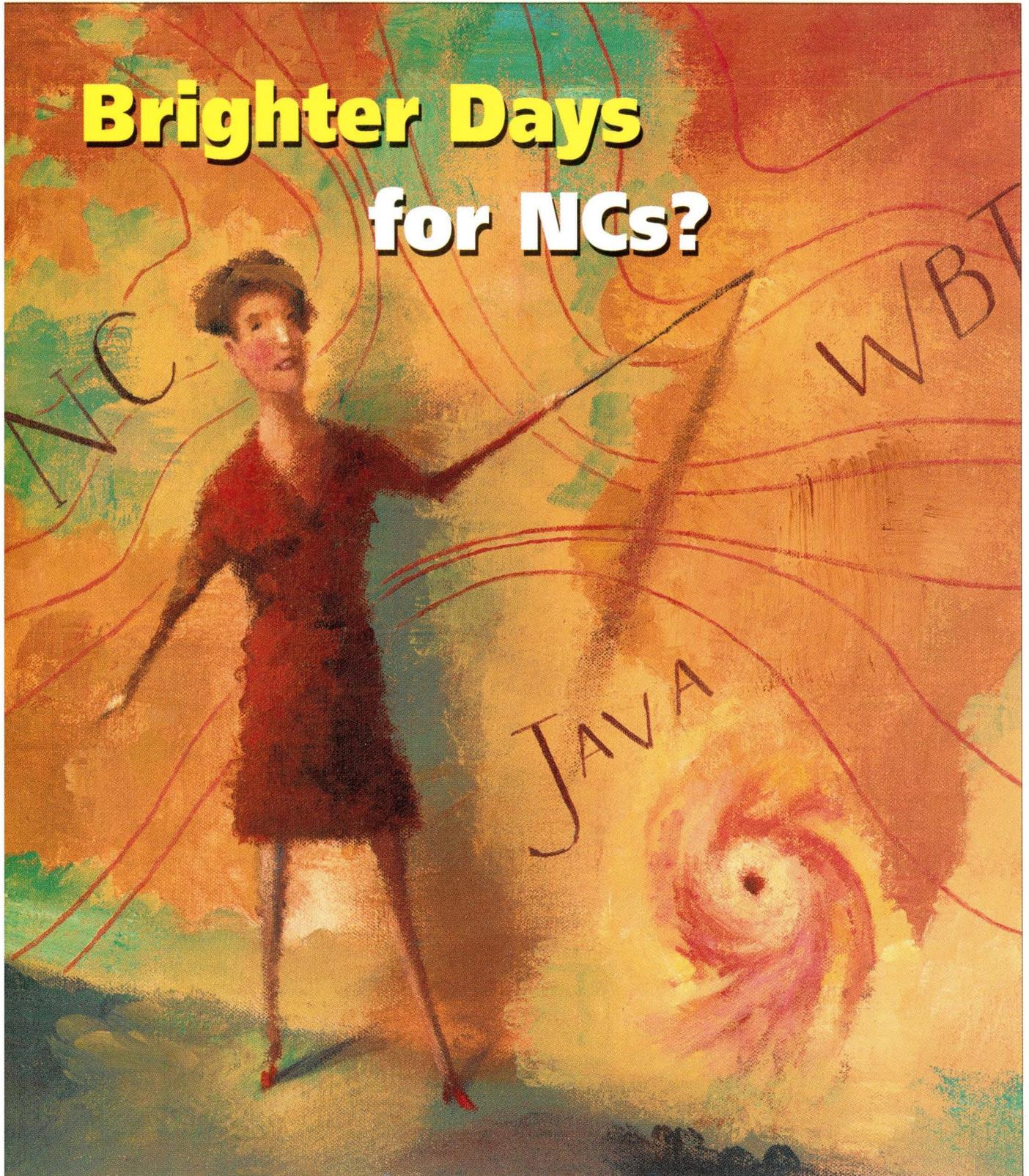


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# SUNEXPERT

## The Server/Workstation Magazine



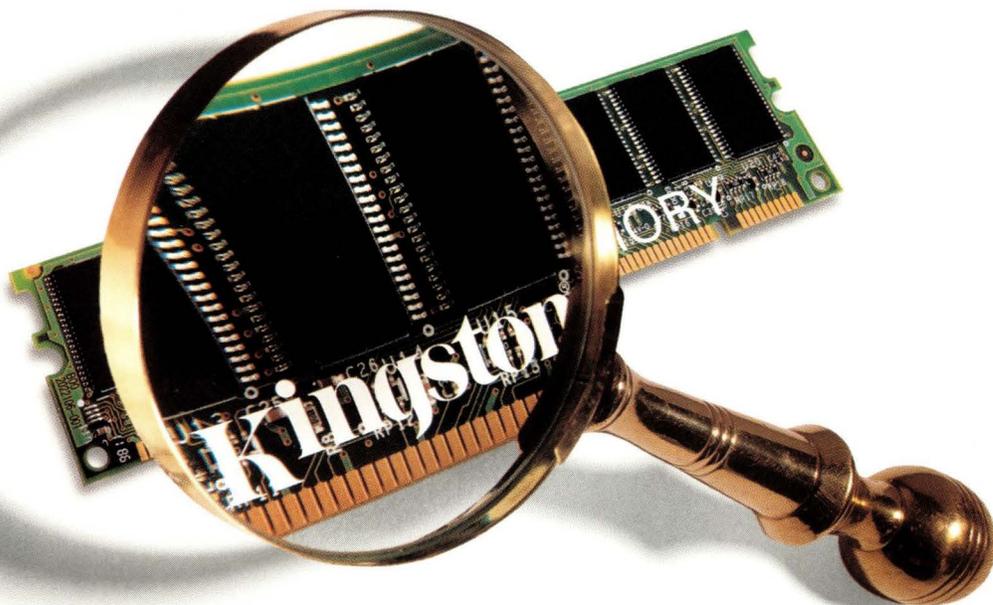
### Brighter Days for NCs?

WebServer: The Search for Substance

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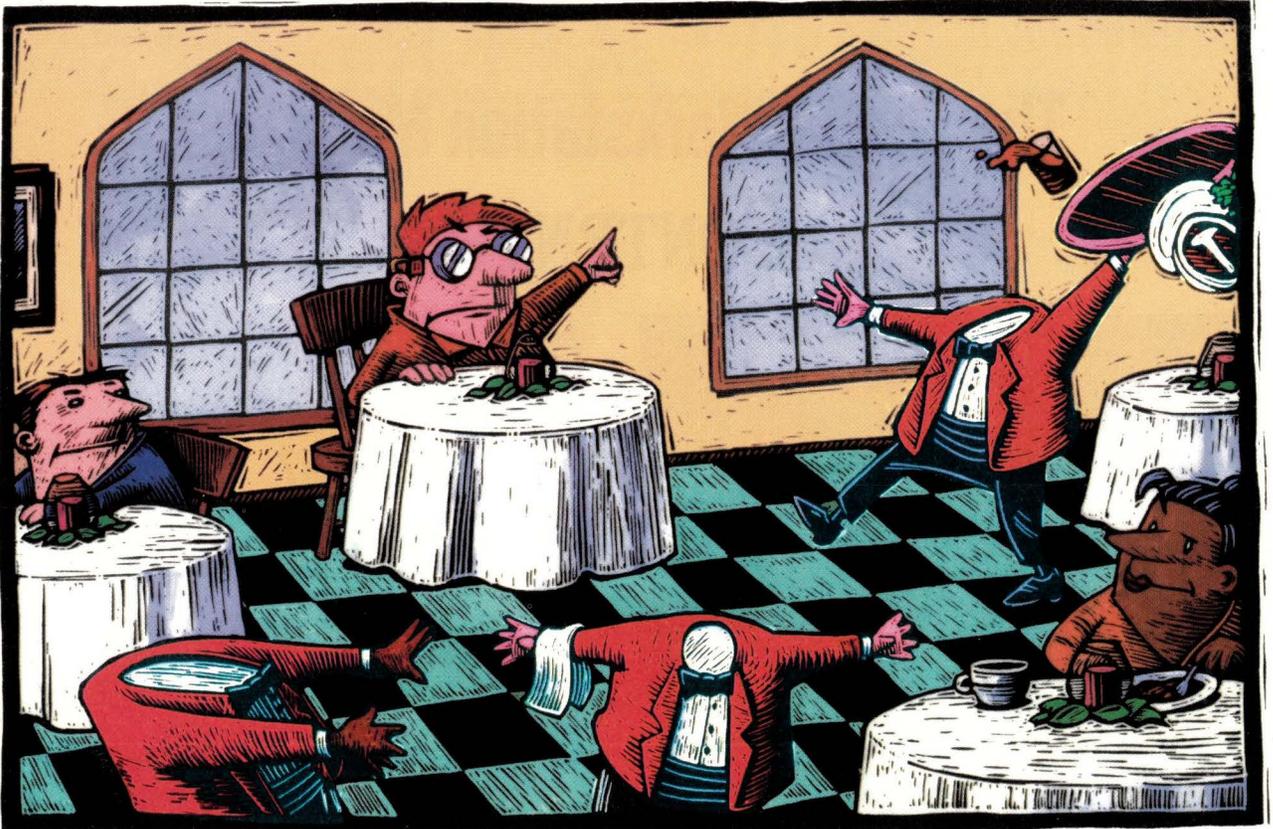


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## The Server/Workstation Magazine

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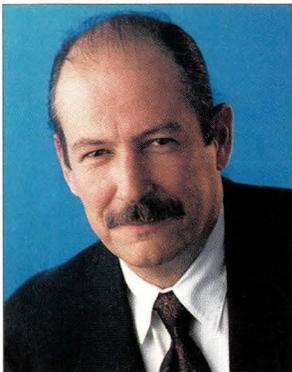
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# EDITORIAL

dpryor@cpg.com



## Be Careful What You Wish For...

I have to admit some sense of relief knowing that Microsoft's deadly embrace of a technology solely for the purpose of ending it as a threat to MS market dominance has been shrugged off. (I'm alluding to the recent injunction preventing Microsoft from shipping Windows-laden Java products.) As you know, the Redmond strategy of endorsing, incorporating, loading with Windows-specific code and calls, then killing the original has generally worked smoothly in the past. Every claim the Redmondians have made that the company only innovates in the interest of the user has always rang dully on the ears of industry veterans. Early on, I suspected that Microsoft's endorsement probably would be the end of Java as a mainstream technology, but, this time, the Department of Justice suit and all the attention it has focused on the Gate's way of doing business may have gotten in the middle.

Sun Microsystems may have won a skirmish against Microsoft over "polluted" Java, but only time will tell if the victory is Pyrrhic. What happens if Microsoft gets serious about a Java-free Windows? Not likely, but possible. "Write once, run anywhere but Windows" would not be the best marketing slogan imaginable. For the sake of the future of Java as a language—not just a runtime environment—I hope we don't end up with a bunch of Windows terminals hanging off NT servers with the vast UNIX resources acting as some sort of file server and data warehouse. We should do better, don't you think?

That's the subject of this month's cover story. Staff Editor Suzanne Hildreth searched the globe for sources. In Spain she found Miguel Barreiro Paz. Paz, a researcher in the computer science department at the Universidade da Coruna, is evaluating Network Computers (NCs) as a way of delivering access to the Internet and to Java-based educational and productivity software to local schools over a citywide network. To discover more about how NCs are being used to cure IT labor shortages or cut application delivery time, be sure to read "Brighter Days for NCs?" Page 50. There may be some gloomy days ahead for NCs, but the architecture coupled with a cross-platform Java is right for the problems a lot of MIS gurus face—even without Microsoft's participation.

If you're involved in an NC project, we'd love to hear from you.

*Doug Pryor*

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## Netra j Now Does Proxy Caching

Good news for network administrators who are implementing, or considering implementing, Network Computers (NCs) on their corporate networks. Last month, Sun Microsystems Inc. released Version 3.0 of its Netra j server software for managing JavaStation NCs. This new release features enhancements designed to speed performance and improve an administrator's ability to monitor the status of NCs on the network.

The most significant performance enhancement comes from the new proxy caching capabilities, which, Sun says, will cache the most frequently requested files and Java applets at the

local Netra j server. This, in turn, will speed download times for the most frequently used applications and files by shortening the distance the information has to travel and by reducing the number of requests the central server is expected to handle, says Natalie Churchill, Sun's NC server products line manager. "For example, instead of Java applets having to go all the way back to the mother ship—the central data center—to get the applet or Web page, it's cached right there locally on the server." It not only caches applets, but Java .class and .jar files, as well as HTTP, FTP, GIF, JPEG and .exe files.

In addition to the Netra j's existing

administrative tool—a browser-based tool for adding/changing JavaStation configurations, including Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP) and Network Information System (NIS) network services—the server now contains a set of tracking tools, collectively called the NC Health Management Suite. Designed to improve an administrator's monitoring capabilities of JavaStations on their network, the Management Suite has three key components: NC Monitor, which monitors the status of NCs; NC Services Diagnostic tool, which is designed to monitor the status of core network services, such as DHCP, required for booting an NC off a server; and the NC Data Flow Trace tool, which monitors IP traffic flow and helps identify configuration errors.

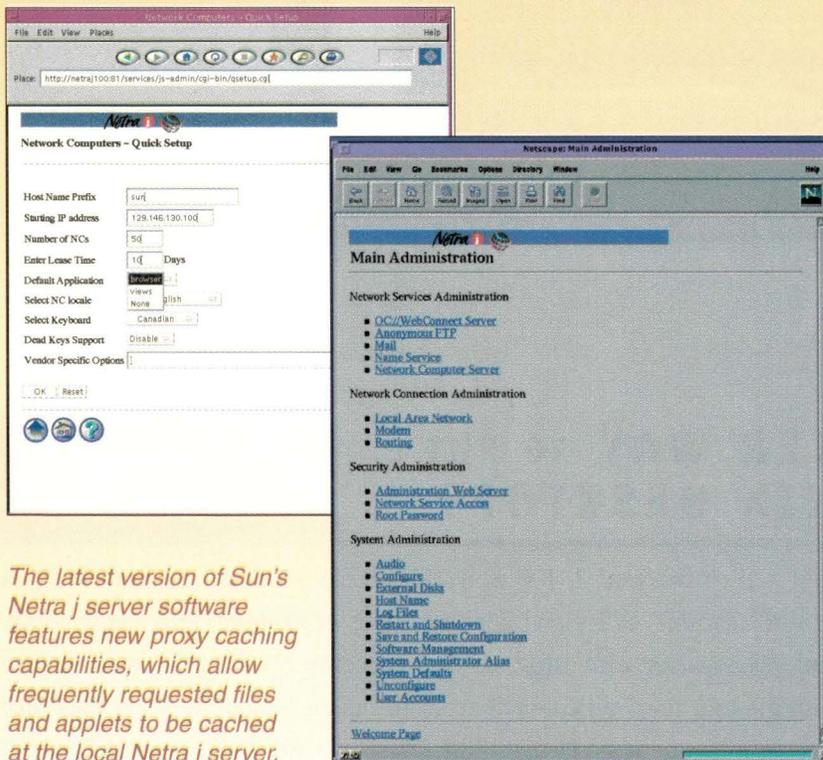
"It makes network services easier to manage," says Churchill. "If you're having difficulty booting for some reason, and you're not quite sure why, it will tell you what processes have been deleted and where it is in the process."

Churchill adds that while managers have always had IP packet monitoring capabilities via a Solaris command-line tool called *snoop*, this suite offers them a more user-friendly GUI with which to work. "You can still use the command line, but now you've got a choice," Churchill says.

Netra j 3.0 also supports Secure Sockets Layer (SSL) tunneling and persistent HTTP connections, as well as dynamic proxy failover and SNMP MIB network monitoring and control protocols. Netra j 3.0 costs \$1,495; upgrades cost \$195.—*sjb*

## Revving Up Java

Solaris and Java platforms are going to become a lot closer in the future, according to executives at Sun Microsystems Inc.'s Solaris software division. Future versions of Solaris will include a revved-up Java Virtual Machine (JVM),



The latest version of Sun's Netra j server software features new proxy caching capabilities, which allow frequently requested files and applets to be cached at the local Netra j server.

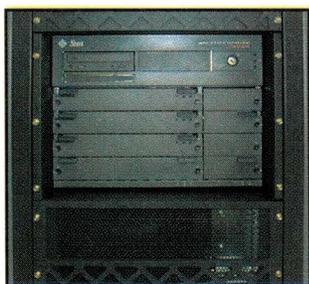
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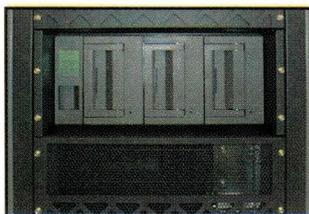
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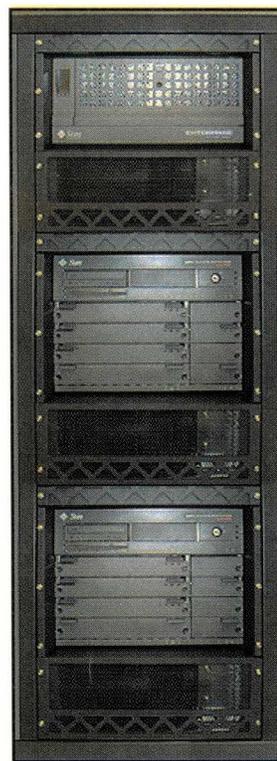
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tighter integration with some elements of Java and the addition of Java APIs for Solaris system functions.

"We see Solaris' future focus as being a Java execution platform," says David Nelson-Gall, director of Java technology at the Solaris software division. "We are aggressively trying to do things that will make Solaris run Java applications faster, longer and more reliably than other platforms."

The latest release of Solaris, Solaris 7, will include an optimized JVM based on technology from the new HotSpot JVM. Sun's second-generation JVM features an improved memory model and faster thread synchronization.

A new method for allocating and referencing memory will speed performance through the use of direct pointers, rather than handles, which are used in the current JVM, says Kati Wojciewhowski, Java product manager for Solaris software. Under the present method, a handle acts as a sort of placeholder for the object, adding an extra step to memory referencing. "The use of direct pointers allows object-to-object navigation to happen at twice the speed," Wojciewhowski says.

In addition, new JVM generational garbage collection capabilities will reportedly increase performance by dividing objects in memory storage into younger and older groups. Objects in the older group are examined by the garbage collector less frequently, saving CPU time.

The upcoming Solaris JVM will also improve on threading performance with faster synchronization. "This means that Java applications running on Solaris can handle larger data sets and problem sizes, more simultaneous connections and more concurrent transactions," says Wojciewhowski. "For the first time, we're seeing real advantages to doing large, server-side applications with Java."

The new JVM won't ship with the initial version of Solaris 7 but will be incorporated into a later release slated for summer 1999, Nelson-Gall says.

But Sun's plans for Java in Solaris go beyond a new JVM. In Solaris 8, Sun will incorporate its newly released Jini protocols into the operating system. Jini is a framework, or "Web tone," as Sun

likes to refer to it, for letting network devices communicate with one another without requiring special configuration. For example, a printer, fax machine, laptop and other devices equipped with a JVM would be able to communicate over a Jini network, sharing capabilities and resources.

In Solaris 9, Enterprise JavaBeans, Sun's specification for writing Java objects capable of performing behind-the-scenes business processes, will be added to the operating system. Also in Solaris 9, Sun says it will be possible to access Solaris system commands via Java APIs. "Sun is committed to making it easy for ISVs and application developers to provide services on top of Solaris. So rather than have a developer do a `/dev/kmem` [to find out how much memory is available] and start reading kernel memory, we'll provide some system level services in the Java API. Applications running in Java will be able to access underlying system services that Solaris provides," says John Finelli, product line manager for Solaris servers.

According to Wojciewhowski, some Solaris functions are already accessed via

a Java interface. The WebStart setup wizard technology that Sun added to Solaris 2.6, for example, is written in Java. "Making system functions accessible through Java interfaces is the way we want to go," she says.

Using Java to make Solaris easier to use is a good strategy, says George Weiss, vice president and research director of hardware and operating systems for Gartner Group Inc., a Stamford, CT-based market research firm. "The objective of Solaris people, I believe, is to provide more integrated functionality that is easier to use, easier to manage and easier to install...and I think it's a good idea because, too often, UNIX has been considered too complex for the common user."

Also, Weiss says, by bringing Java and Solaris closer together, Sun is reinforcing brand identity: "Even though Java is licensed to other operating system vendors, the packaging, the branding, the association of expertise and functionality [that Sun's Java has] will help Sun increase the value of Solaris. It won't be just another UNIX."

Eric McCann, a consultant with

## Perl Creator Honored by FSF

**B**illion-dollar businesses aside, one of the things that keeps the UNIX community on its toes is its core members' unwavering commitment to free software.

This year, the Free Software Foundation, or FSF (<http://www.fsf.org>), announced the first annual Free Software Foundation Award for the Advancement of Free Software. This year's recipient is Larry Wall (<http://www.wall.org/~larry>), senior developer at

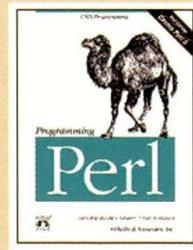
O'Reilly and Associates Inc., Sebastopol, CA (publisher of *Programming Perl*), and creator of Perl—Practical Extraction and Reporting Language—a scripting language frequently used to write CGI scripts for the World Wide Web.

Among Wall's other contributions to the world of free software are `rn`, a news reader; `patch`, a development and distrib-

ution tool; `metaconfig`, a program used to write Configure scripts; and the Warp space-war game.

FSF is arguably responsible for the whole notion of free software, where "free" refers to freedom, not price. A central tenet of FSF is the notion of "Copyleft," which says that anyone who redistributes public-domain "Copylefted" software, with or without changes, must also pass along the freedom to further copy and change it.

FSF is also directly responsible for the GNU Project, which has generated fundamental UNIX utilities such as the emacs editor and the GNU C++ compiler. FSF is also in part responsible for Linux, the popular freeware operating system. While Linus Torvalds developed the Linux kernel, GNU tools and utilities make up the rest.—*ab*



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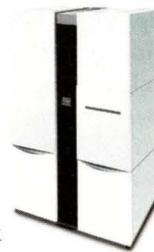
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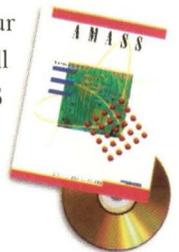


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Circle No. 5

MCGeoNET UNIX Consulting in Menomonee Falls, WI, agrees. McCann says it will be an additional selling point for Solaris over other UNIX operating systems. "Many Web browser companies have embedded Java as an integral part of their applications, for good reason...I think it is one more way to set Sun apart from the many other UNIX vendors," he says.

However, McCann cautions that it's unlikely to cause UNIX shops to rush to Solaris, or to Java. "My customers have not really shown much implementation interest, although they think Java is interesting. Unfortunately, my customers are unclear as to what Java can do for them and how to integrate it into their applications. I think that my customers may be—and some of them definitely are—interested in using server-side Java, but they just don't know where to start and can't justify programming in a language that is unfamiliar to them," McCann says.—*sjh*

## Keep It Simple

According to the old saying, "Variety is the spice of life." But according to a recent report from Meta Group Inc., variety is the source of increased operational and support costs.

**Maintaining fewer operating systems saves time and preserves a manager's overall mental health.**

In "Consolidating Unix Flavors, or 'How many cooks in the IT kitchen,'" published in September, the Stamford, CT-based research company concludes that while competitive bidding from UNIX vendors provides a 10% to 20% savings in upfront server expense, that onetime savings does not cover the expense of having multiple operating systems in an enterprise.

"Users currently supporting just one UNIX flavor should keep it that way," according to the report written by Brian Richardson, program director of open computing and server strategies service

at Meta Group. "Users with more heterogeneous environments should target gradually reducing UNIX variations to no more than two."

Traditionally, corporations were able to force vendors into discounting their products if a competitive platform purchasing environment had been established. At one time, this practice could result in a 50% to 60% savings upfront, Meta Group says. However, by 2002 or 2003 fostering multivendor environments will result in only a 2% savings in total infrastructure related costs, the report found.

As well as a reduction in upfront savings, there is the added day-to-day expense of maintaining a multivendor environment. Some IT shops require additional staff to support the multiple operating systems. The distribution of software or updates to existing applications and operating systems becomes much more complex in an enterprise that has a number of UNIX flavors. The old adage, "Time is money," certainly applies to the modern IT shop.

The American Institute of Physics (AIP), Woodbury, NY—an organization dedicated to promoting the understanding of physics—is, for all practical purposes, a full Sun Microsystems Inc. UNIX shop, with more than 20 servers from SPARC 10s to an Enterprise 4500. James Wonder, manager of online systems for AIP, says his organization has one Hewlett-Packard Co. machine and one Silicon Graphics Inc. machine, but "they don't typically do much." The advantage of running mostly Sun machines, Wonder says, is a significant savings in time. "That's one of the big benefits of going with a single vendor," he says. "People always miss the aspect of 'people' time."

Frank Nardis, senior systems administrator for Rockwell International Corp., Mayfield Heights, OH, agrees that maintaining fewer operating systems saves time and preserves a manager's overall mental health. Currently, his division runs two operating systems, Solaris on Sun hardware and OSF on Digital Equipment Corp. hardware. "From a maintenance standpoint, and a sanity standpoint, it's a lot easier to support one OS," he says.

Meta Group's recommendation for simplicity appears to be a trend IT shops are recognizing. "We see that UNIX is consolidating," says Nancy Weintraub, manager of marketing programs and strategy at Sun. "Overall, customers are looking to simplify management and increase service levels, while reducing overall cost."

Another influence has been the increased functionality of different UNIX platforms. In the past, certain platforms had a reputation for being ideal for particular applications. For example, SGI offered the UNIX platform of choice for any type of heavy graphics work. Today, UNIX platforms are starting to break away from such typecasting. "Now, pretty much all software is cross-platform," says AIP's Wonder. "[Before] you would purchase a machine based on the software you were going to purchase." But he adds, "There is still some of that."

Meta Group's report concludes that if users supporting one type of UNIX find it necessary to add additional operating systems or servers to their enterprise, they should perhaps try to do it with Microsoft Corp. Windows NT-based machines.—*ptc*

## RS/6000 Powered by New Chip

IBM Corp. has introduced the RS/6000 43P Model 260 workstation, a 64-bit system designed specifically for high-end graphics applications. The new box is capable of running two- and three-dimensional applications and features IBM's latest microprocessor, the Power 3 chip. "It's an extremely powerful device for numeric computation," says John Holtz, vice president of workstation marketing and management at IBM. "As more and more engineers are doing design and analysis work on their desktop, this is the kind of machine they will need."

The 43P Model 260 supports up to two 200-MHz Power 3 processors. IBM says it achieved record-breaking floating-point performance, beating out older RS/6000 workstations, Compaq Computer Corp. Alpha 21164, Hew-



*Despite disappointing integer performance, IBM's new RS/6000 43P Model 260 workstation looks to be a positive addition to the product line.*

lett-Packard Co. PA-8200, Sun Microsystems Inc. UltraSPARC II and Silicon Graphics Inc. R10000. The SPECfp-95 benchmark rose to 30.1, more than 13% higher than IBM scored with its Power 2 chip.

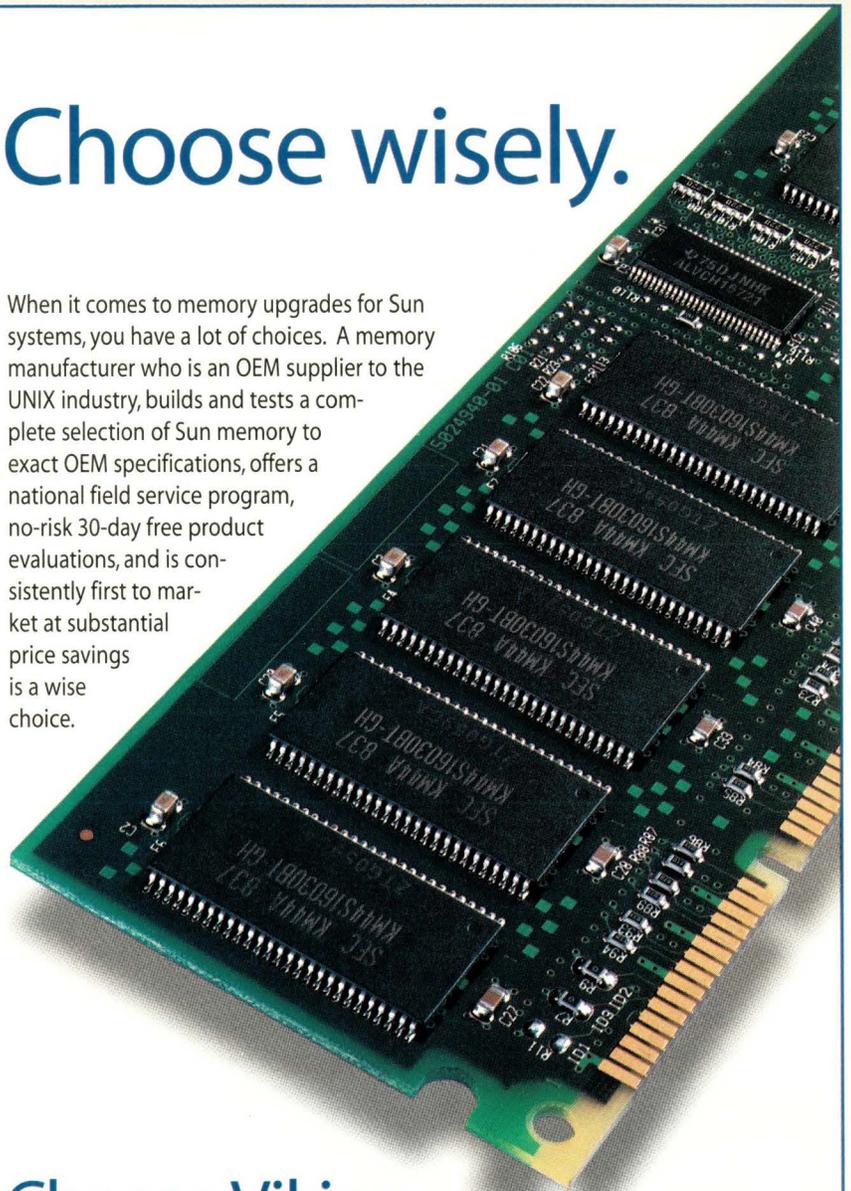
While IBM can boast of the 260's floating-point numbers, it still lags behind its own PowerPC chips in terms of integer performance. The Power 3 runs at only 200 MHz. James MacKinnon, a professor of economics at Queen's University, Kingston, Ontario, uses the 43P Model 140, which runs 604e PowerPC chips. MacKinnon uses his workstation to perform number crunching applications, but wasn't overly impressed with the new workstation. "The 260 offers much better floating point, but the integer isn't any better than what I have on my box," he says. "Obviously, the 260 is a little disappointing since it only runs at 200 MHz."

Despite disappointing integer performance, industry analysts say the 43P Model 260 is a positive boost to the RS/6000 line. David Witzel, research analyst with D.H. Brown Associates Inc., Port Chester, NY, was impressed by the floating-point performance. He also says its price, at \$19,000, gives the system a very favorable price/performance ratio. In addition, Witzel says he is convinced IBM is moving in the right direction in terms of integer performance. "They have bumped up the integer significantly," he says. "But there is work to be done there. They will get to that in the future."

IBM says the new chip features eight execution units fed by a 6.4-GB/s memory subsystem. It also features hardware memory pre-fetch, which uses an intelli-

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gent memory subsystem to recognize user commands and retrieves frequently accessed data.

In addition to two 200-MHz Power 3 chips, the new workstation features 4 MB of Level 2 cache per processor and comes with two 64-bit PCI slots, three 32-bit slots, 32x speed CD-ROM and a 4.5-GB Ultra SCSI disk drive (expandable to 27.3 GB).

IBM has also introduced RS/6000 43P Model 150, which comes with a 375-MHz PowerPC 604e processor, 1 MB of Level 2 cache and five PCI slots. Like the 260, the 150 includes a 4.5-GB Ultra SCSI disk drive that is expandable to 27.3 GB. Model 150 costs \$9,995.—*ptc*

## Sun Pulls In i-Planet

Sun Microsystems Inc. has acquired i-Planet Inc., a little-known software start-up based in Sunnyvale, CA. Sun's goal is to use i-Planet's products to pursue the remote access market. Sun plans to add the company's technology to its software division in the hopes of selling stand-alone, shrink-wrapped products that provide remote access.



For close to a year, Sun has used i-Planet's technology internally to drive a project called Sun.net. The first implementation allowed Sun's sales people, developers and other employees to check email from outside the corporate firewall. To accomplish this, Sun used i-Planet's PonyEspresso, a Java-based email client. PonyEspresso is said to provide an encrypted connection to a company's email system via a Web browser through the use of Secure Sockets Layer

(SSL). No software needs to be pre-installed on the client-side, but instead a small application, described as a "net-let," is downloaded to the browser when a connection is made to a central server. The application is maintained on the server-side. Sun says its employees were able to use a Web interface from remote locations to securely access their email.

Based on the internal success of this implementation, Sun wants to take the technology, add its own security functionality, and sell it as a unique product. Sun also plans to integrate i-Planet's Remote Passage, which is designed to enable TCP/IP applications to run over the Internet on a browser without requiring the client to have the application installed, much like PonyEspresso. The benefits of this future product, Sun says, is easier maintenance and reduced costs. "Specifically, what this technology enables is the elimination of all of those modem bank problems," says Stephen Borcich, director of security and re-mote access products at Sun. "Today, you need to update clients, update modems, update software for dial-up, and the corporation needs to update modem banks and software on the back end. That is a huge cost issue."

The assimilation of i-Planet into Sun should be a smooth one, according to both companies and industry analysts. Indeed, one of i-Planet's founders, David Vereeke, is a former director of engineering at Sun. In addition, the software start-up should benefit from Sun's deep pockets and its established distribution channels and partnerships. "[i-Planet] is a technology firm," says Rob Enderle, director of desktop and mobile technology at Giga Information Group Inc., a research firm based in Norwell, MA. "They were under-penetrating. They needed a brand like Sun's behind them. Fortunately with this acquisition they get that."

As well as corporations, the new offering based on Sun.net will be marketed to Internet service providers (ISPs). Sun says some customers will be able to use the Sun.net-based product as early as the end of the year, and the company will continue to roll out the software until March 1999. No official name or decision on the pricing has been announced at press time.—*ptc*

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## Another Upgrade for Trusted Solaris

Sun Microsystems Federal Inc., McLean, VA, a wholly owned Sun Microsystems Inc. subsidiary, has announced Trusted Solaris 2.5.1, the fifth release of the trusted operating system in nine years.

The operating system, targeted at federal agencies with stringent security requirements, is equipped with several new features that address usability concerns. For example, Trusted Solaris 2.5.1 now runs the Common Desktop Environment (CDE) windowing system, allowing "users to do multilevel work in an intuitive manner," according to Sun literature.

Administration is now performed using Sun's Solstice AdminSuite 2.1 tool set, and new File Manager options reportedly make it easier to change sensitivity labels.

Indeed, a major theme driving Trusted Solaris development has been to make it easier for organizations to configure the trusted operating system according to their needs, rather than configuring the organizations around the requirements of the trusted operating system, says Ian Prickett, senior product manager for Trusted Solaris.

According to John Leahy, group manager of government affairs and public relations at Sun Federal, government interest in trusted operating systems has been spurred on by the growth of the Internet and the subsequent growth of what he terms "cybercrime."

"For a start-up cost of \$9.95 per month for an Internet account, a hacker can get to work from anywhere in the world. Hacking has reached epidemic proportions," Leahy says. By way of example, Leahy cites one security con-



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sulting firm that monitors 38 government agencies. According to that firm, clients experience three to four major security incidents every week.

Interest in Trusted Solaris has also been fueled by a presidential directive issued in May ordering U.S. agencies to create the post of chief information assurance officer (CIAO). Under the directive, each CIAO was responsible for outlining a plan on how to protect critical systems, which was due at the end of November.

Another boon to Sun Federal's business was the signing this fall of the Common Criteria international security schema, whereby security evaluations performed by French, German, British, Canadian and American governments are recognized and valid in each of the other member countries. "This means that we'll be able to perform single evaluations for each product, which will significantly speed up sales," Prickett says.

But next on Sun Federal's agenda is to push Trusted Solaris beyond the government market and into the commercial sector. "The government will always be our core market," says Prickett. "But

we see more and more commercial organizations taking an interest in trusted operating systems."

A prime example of a commercial company that might install Trusted Solaris is a bank launching an electronic commerce initiative. Commercial vendors that adopt Trusted Solaris might be in for a surprise, says Randy Sandone, chief executive officer of Argus Systems Group Inc., Savoy, IL, an independent vendor of trusted operating systems. Despite its name, Sandone explains, Trusted Solaris

is a separate operating system from commercial Solaris. That is, in order to run Trusted Solaris, administrators must install the operating system from scratch. Trusted Solaris does not

maintain all the features you find in regular Solaris, he says. In contrast, Sandone says, Argus' offerings install on top of Solaris, as modules, and let you turn security features on and off as you please.

For Sandone, the difference between Sun's trusted operating system and Argus' offerings is the target market. "Sun Federal development is fueled by the government sector; we focus on the needs of the commercial."

But according to Eric Hemmendinger, senior analyst for The Aberdeen Group, Boston, MA, no trusted operating system is really appropriate in a commercial setting. "Trusted operating systems don't necessarily map well to what commercial markets are looking for," he says. Instead, Hemmendinger says, commercial organizations looking to lock down their platforms would do better looking at security offerings from companies like Memco Software Inc., New York, NY, and Axent Technologies Inc., Rockville, MD. These products lock down aspects of the operating system but are not operating systems in and of themselves.—*ab*

**Next on Sun Federal's agenda is to push Trusted Solaris beyond the government market and into the commercial sector.**

## Active Server Pages for Mainframes

**W**ebmasters in mainframe and midrange server environments have yet another tool at their disposal: Active Server Pages (ASP) technology is now available on IBM Corp. System 390 mainframes and RS/6000 servers. In October, ChiliSoft Inc., a Bellevue, WA-based maker of ASP products, announced it would release versions of ChiliASP for the OS/390 and AIX platforms by the end of the year. In addition, the company announced it has begun shipping ChiliASP for Solaris.

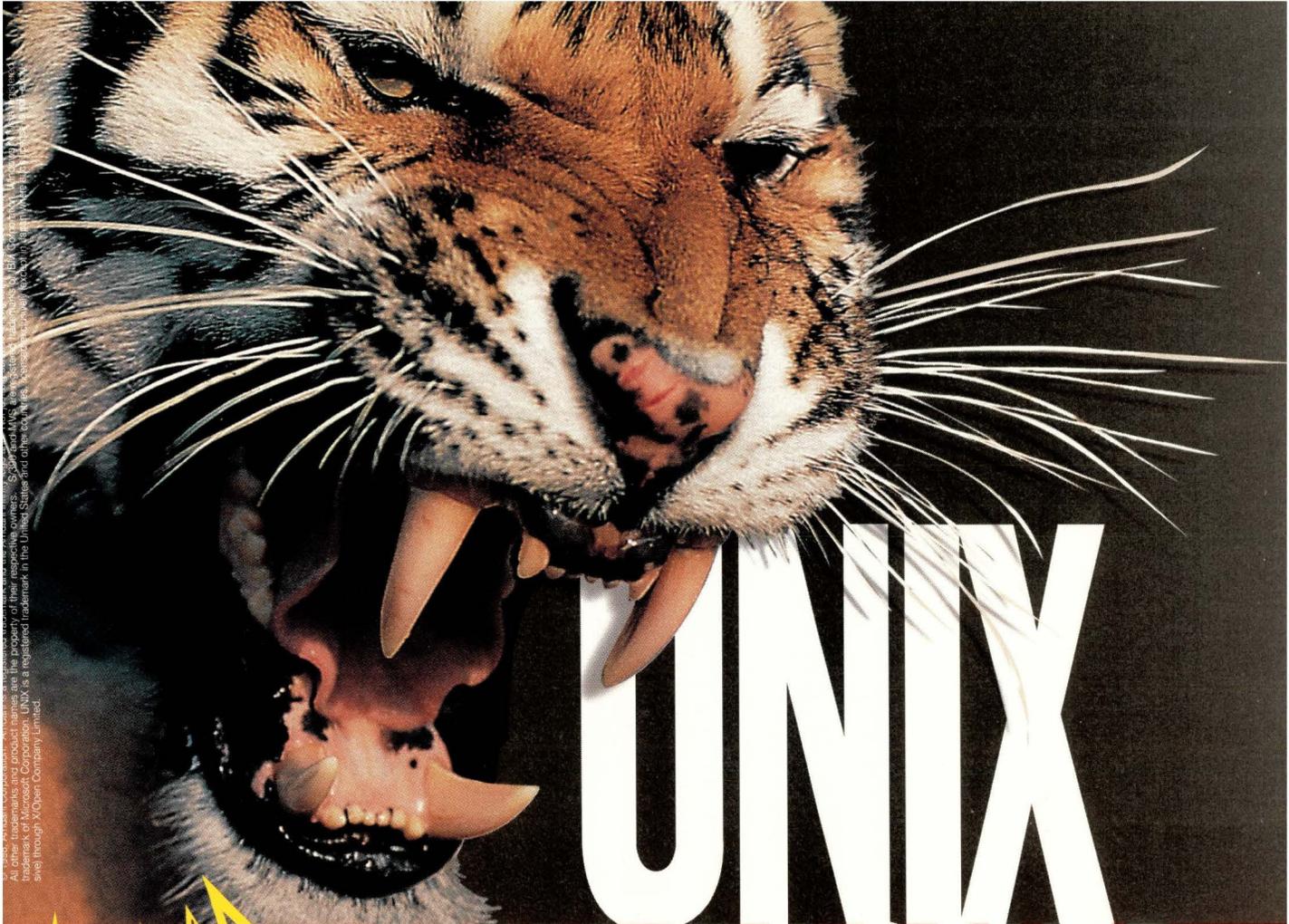
These announcements mean that developers will be able to deploy ASP-based applications and Web pages on S/390, RS/6000 and Solaris environments. ASP, developed by Microsoft Corp., is a framework for building Web applications with components written in different programming languages—components written in Java, C++, Visual COBOL or Visual Basic accessed by a Web browser through an ASP text file. ASP pages are, essentially, HTML pages in which certain code is executed at the server level and the output is delivered to the browser. The idea is to allow programmers with different skills to work on a single project without having to learn new languages. All of the application objects can be "glued" together using ASP and a simple scripting language, such as VBScript, JScript or HTML, that scripts to the objects. "Anyone who can do Visual Basic can do an Active Server Page," says Mickey Friedman, vice president of marketing for ChiliSoft.

"It's a simple macro language."

The move by ChiliSoft to port ASP to "Big Iron" environments such as the S/390 underscores the comeback that mainframes have been experiencing in corporate environments. A study by the International Technology Group (ITG), a consulting firm based in Mountain View, CA, predicts that more than 2,300 organizations worldwide will have implemented Web servers on mainframes by the end of 1998 and that more than 10,000 will be up and running by year-end 1999. The study also reports that more than 75% of internal data accessed by corporate PC users, and more than 60% of all data available on the Web, is housed in mainframe databases. Some of the reasons given by corporate executives as to why they prefer to deploy mainframes as Web servers include: leverage existing mainframe infrastructure (88.1%); faster and easier application deployment (76.1%); availability and reliability (71.6%); lower cost (58.2%); and scalability (53.7%).

"It's being driven by practicality," says Bob Simko, executive director at ITG. "Mainframes allow you to have a reliable, distributed environment."

At this writing, pricing has not been set for the S/390 and RS/6000 versions of ChiliSoft. Pricing starts at \$1,995 per CPU for the Solaris version and at \$995 per server for the Windows NT version.—*sjh*



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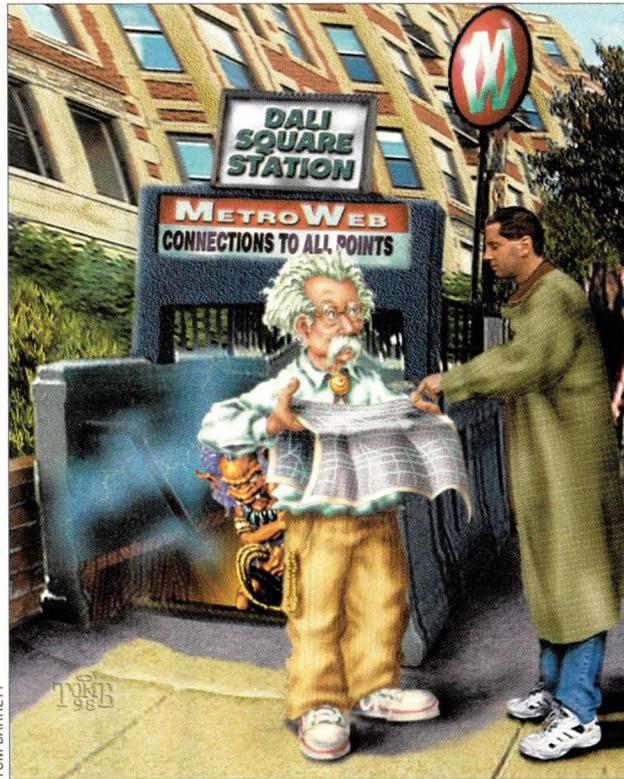
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Circle No. 7

# Ask Mr. Protocol

by Michael O'Brien



*"But in that sleep of death  
what dreams may come?"*  
— Hamlet, Wm. Shaksper

*"All those moments will  
be lost in time, like tears  
in the rain."*  
— Ray Batty in  
"Blade Runner"

*"Mr. Earbrass irritatedly  
wonders why anyone should  
have had a fantod stuffed  
and put under a glass bell."*  
— *The Unstrung Harp,  
or Mr. Earbrass Writes a  
Novel*, Edward Gorey, or  
maybe Ogdred Weary

## Rendering Mr. Protocol

**Q:** *OK, got a good one for you this month. What can you tell me about 100BaseT, and how does it stack up against FireWire? I mean, what protocols does FireWire run, and...oh good heavens, that can't be right! I can see him! I mean, I can actually SEE this lunatic! He looks REAL! I think I have to sit down now.*

**A:** The best book ever written about the art of writing was actually written by an artist by the name of Edward Gorey. It was the first book he ever wrote, called *The Unstrung Harp, or Mr. Earbrass Writes a Novel*. No one has ever covered the vicissitudes of writing better or more clearly, or covered more of the creative process and its fearsome aftermath. At one point, Gorey writes, "The first draft of *TUH* is more than half finished and for some weeks its characters have been assuming a fitful and cloudy reality. Now a minor one named Glassglue has materialized at the head of the stairs as his creator is about to go down to dinner.... Glassglue is about to mutter

something too low to be caught and, stepping sideways, vanish."

That's sort of what's happened to Mr. Protocol. He's been caught up in a more general effect, it seems. These days, a thing's irreality is no longer a barrier to its visibility, down to the smallest detail. The effect is not limited to the Internet, where Web sites routinely provide vivid pictures of things that don't exist, shouldn't exist or (usually) both.

People have been using computers to render simulations of the unreal since they were created. Under the rubric of "simulation and modeling," this is regarded as a Good Thing and a way to save boodles of money, usually by discovering all the ways in which a desperately over-designed piece of billion-dollar hardware can find to commit suicide, before it's built rather than after.

Under the rubric of "screwing around," this is regarded as a Bad Thing and a complete waste of taxpayers' money and corporate resources, which usually results in dishonor and dismissal. Then once the

corporation has loudly and publicly disowned the Bad Thing, the disgraced employee can go to market with it, in the sure knowledge that the millions of dollars he will earn from the product are safe from the original corporation's frantic attempts to get it back, neener neener.

Most simulations of the first sort are mathematical. Lately, in the world of simulation and modeling, "visualization" has become a Big Deal. This means taking all the numbers that fall out of the simulation and making some sort of picture out of them, generally three-dimensional, on the grounds that we're much better at looking at objects than we are at looking at columns of numbers. Now the general reaction here tends to be "Well, big whoop!" mostly because this seems so obvious one wonders why they didn't start in on this 40 years ago. Mostly the reason is that all the cycles needed to build the picture were needed 40 years ago to crunch out more tables of numbers.

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Circle No. 8

Partly, though, the reason is that although it's obvious that many, if not most, simulations are much more readily comprehended as a picture, exactly how that picture should be rendered is tricky. It is easy enough to come up with a multicolored blob in space which, while absolutely faithful in its representation of the simulation output, is bloody useless. This picture is complicated by the fact that most people who actually run these big simulation programs don't have the foggiest idea about the assumptions on which the mathematical model is based, so that when they see a picture of the results, the picture is so ludicrous that it must obviously be wrong. The picture, of course, is absolutely faithful to the simulation's output, which is also ludicrously wrong based as it is on input data that is wildly outside the valid range of the simulation. But it is much harder to call a great big simulation just flat-out "wrong," whereas people draw wrong pictures every day. So it must be the picture's fault, go back and make me a new one, and get it right this time.

It's hard to overcome the reputation you get from this sort of treatment. Visualization tools, therefore, are generally the Great White Hope and always have been. Unless, that is, the visualization is the point of the whole thing. It is marvelous how pragmatic people can be when the picture is the important thing. Just look at the weather report.

Television stations in big metropolitan areas have known for years that not only does sexy video sell, it's the only product they've got. It's one thing to use a nice computer-rendered picture of a satellite in orbit to get a general all hot to fund your program, but for a television station, it's the video that's the product, not the satellite. So not only is there guaranteed to be at least one female reporter who looks so perfect that one suspects she's been shellacked, there is also guaranteed to be a computerized rendering of the cloud cover that would make a university department of meteorology ecstatic, if only it could afford that kind of compute power. It used to be that just showing the WEFAX picture from the weather satellite as raw data was hot stuff, but these days, you have to be able to tilt the angle of view so that people can see the land beneath the clouds. As the only actual camera able to change viewpoint that fast is mounted in a UFO, television stations spend enormous amounts of money making sexy computer-generated weather maps.

Which leaves the screwing around part.

### All the Colors of the Rainbow

Computers have been used to make pictures on line printers for as long as there have been line printers. The death of extended binary-coded decimal interchange code (EBCDIC) as a viable artistic medium quickly gave rise to ASCII art, which is still a going concern in a few spots. A phototypesetter has even been pressed into service to make a famous, if foggy, picture of Bell Labs' Al Aho using periods.

When you want to make pictures using hardware that was designed to make pictures, things get more complicated. Suddenly, you're not so much spending time dealing with the shortcomings of an inappropriate medium, you're dealing with the complexities of a medium that suits. Consider televisions.

The first color televisions were famous for not really doing

a hot job of interpreting the color signals they were given. This gave rise, in turn, to a famous ad for one of the early sets that did a somewhat better job, by putting up a model who said, "My dress is green. The chair is blue..." and so forth. If you didn't see those colors, you knew you needed a new TV set.

However, although the colors might have been wrong, they certainly were vivid. Most people don't think about it but televisions are not going to give reds that are any more vivid than what you get if you turn the "red" electron gun on full bore and shut off the green and blue ones. The same goes for the other two colors. If you make a color saturation chart as a triangle made up of red, green and blue, and stake out the extreme positions of each color for a given picture tube, the inside of the triangle you get by connecting the dots gives you the "color space" of the tube. Colors inside the space, it can render faithfully; colors outside the space are going to look wonky, flattened, dull and distorted. Early picture tubes had color spaces much larger than today's sets because the rare earth grids used in their construction had short lifetimes. The colors were magnificent but the picture tube only lasted a couple of years. In order to get 15 or 20 years out of a tube, longer-lived color targets had to be used with color saturation distinctly inferior to the originals.

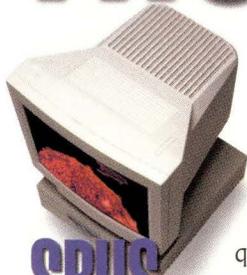
Color spaces and their ilk are the sorts of things real computer graphics experts have to worry about. If you want to put up a picture of a real thing on a Web page, you have to take a picture of it on photographic film, develop the film, scan it in and project it on a monitor. Let's take a look here. We have to worry about the color response of the film, the color values used in developing, the color table assigned to the scanned-in image file, its representation as an HTML color table and the actual response of the phosphors in the computer screen. The upshot is if you take a picture of a rock and put the picture on your Web page, then hold the original rock up next to the screen, the colors probably won't look at all alike. If you know what you're doing, this can be an advantage.

Real, full-up computer graphics got started when machines became powerful enough to render an image in a length of time that was tolerable to a human, where "tolerable" is a slippery term. "Rendering," in this field, more or less means "painting." A typical computer graphics image is not created by calculating purely in the two-dimensional plane of the image. Instead a three-dimensional model is created of objects, usually made up of polygons (think "Bizarro Superman"). A surface texture is assigned to every surface of every object (Jim Blinn thought this up as his Ph.D. thesis at the University of Utah, and used it to good effect in the Jet Propulsion Laboratory animated movies of planetary fly-bys) and a source (or sources) of illumination are created, usually outside the view of the image. Although the light sources may not be visible in the image, the light they create illuminates the scene. The paths of individual light rays are traced from the source, off a surface (or surfaces) and into the eye of the camera. In this way, the image is built up, ray by ray. The process, originally enough, is called "ray-tracing." It is the slowest and most powerful rendering technique. Slow, because ray by ray is much slower than, say, surface by surface. But this technique allows the introduction of items into the

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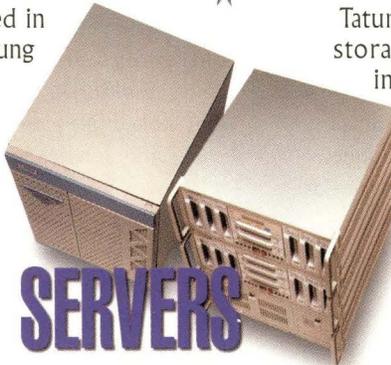
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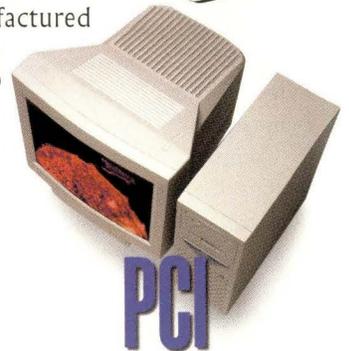
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## Ask Mr. Protocol

scene that are translucent, transparent or reflective. Mirrors, glass balls, drops of water and so forth are the ray-tracing tour de force.

At this point things can go one of two ways. The first way is to create an entirely artificial image from first principles. Individual images of arbitrary complexity are now well within the reach of any home enthusiast using commercial rendering software. Some artistically minded hobbyists love to generate leafy trees, for example, using the latest algorithms. Fractal geometries were a godsend when it was noticed that the general texture of a landscape is to a great degree independent of scale. Anthills and mountains share a lot of common features, if all you're after is a picture of one or the other. Fractals allow the creation of detailed texture maps that closely resemble nature.

One logical extreme of this technology is the animated feature. Consider the film "Antz," which came out a couple of months ago. The characters are, well, ants. And a couple of hornets, ticks, beetles and blowflies just to round out the cast of millions.

In the first years of this century, Windsor McKay created one of the very first animated cartoons, "Gertie the Dinosaur." The effort was noteworthy because although the cartoon was photographed on movie film and projected onto a screen in a theater, it was not a stand-alone production. It was shown with a live human on stage talking to the audience and appearing to give the dinosaur instructions. At the close of the film, the announcer appeared to move toward the dinosaur, his theater spot was extinguished, and the cartoon showed the (now animated) announcer riding Gertie out of the picture, the real human having ducked into the wings.

"Gertie the Dinosaur" was drawn on rice paper, frame by frame. Each piece of paper was pin-registered with the frame before it, the rice paper allowing McKay to see the old frame as he drew the next frame on top of it. All through the years of the triumph of Disney, with "Snow White," "Sleeping Beauty" and "Fantasia" at the pinnacle, each animation cel of each movie was individually drawn, only the backgrounds being shared from frame to frame—still a big advance from McKay's technique.

Computer-based animation, naturally enough, started out looking absolutely terrible. Animation is by far the most expensive type of filmmaking there is, and so it was easy for the money magillahs to convince themselves that early attempts at computer-enhanced animation looked lovely because they made the bottom line look lovely. They didn't. They stank. But they were cheap and kids will watch anything (almost). So for many years, and indeed right up to the present, Saturday morning cartoons looked absolutely terrible.

Which didn't mean it was a terrible idea. This was a case where throwing money and technology at the problem made large parts of it go away. In "Antz," we have a full-length spectacle where every single frame is rendered in three dimensions, from facial expressions to backgrounds. The raw compute power currently available allows for the creation of characters who are more three-dimensional than the usual cartoon, but are less realistic-looking than real, physical objects. There is some surface texture, but fine detail is missing in most areas. The important parts of faces—the eyes and mouth—are rendered

in greater detail than the rest.

Backgrounds are unnerving. They are more realistic than the characters because less overall computation is necessary to create them. They remain substantially the same over a large number of frames. However, while they look more "realistic" than cartoons, they look less realistic than real-world objects that have been photographed. It is not a look we are comfortable with, yet, though we will soon become accustomed to it.

If this is the state of the art in animation, you ask, what is the other logical extreme? Mr. Protocol is glad you asked.

### Painting the Real World

The other extreme is the enhancement of live action. Until a few years ago, the creation of moving sequences of impossible scenes was done directly on the film. "Blue screen" projection, layering, stop-motion animation, matte shots and other technologies have given us a world where the eye of the camera really does see even the impossible things, but it is a narrow, monocular view that gets fooled a lot.

Once it became feasible to scan in each frame of film and operate on "real-world" pictures in the digital domain, a raft of hybrid techniques arose. Stop-motion animation with pixilation, and particularly the work of Mike Jittlov, is the closest one can come to filming an arbitrary world without generating the image pixel by pixel. Jittlov's work, which outreaches even that of Ray Harryhausen, uses in-camera and animation-stand work in combination with stop-motion to produce impossible pieces of film, such as his short work (and later full-length feature) "The Wizard of Speed and Time."

Digital work on motion pictures was at first limited to film restoration. This was done beautifully the first time "Gone With the Wind" was restored, but it also led to the bastard stepchild of colorization, which allowed black-and-white films to be rereleased in color. Aside from the artistic merits of the process, early efforts suffered from the same choice of money over excellence, resulting in movies in which all the actors sported heads that looked like glowing pumpkins.

Again, better technology led to better techniques, especially in television, where a great deal less picture resolution is required than in film. "The Young Indiana Jones" was one of the early beneficiaries of this sort of thing, in which about 20 extras could be replicated along a computer-generated street, turning a sound stage into an outdoor street shot with perspective out to the vanishing point. Compositing and repeating digitized scenes and scene fragments gives a very realistic effect with a minimum of compute-power. Images do not have to be fully rendered, as they consist of fragments of scenes that are already complete in themselves, and need only to be color-corrected and blended into the larger scene.

In the extreme, rendered objects can be combined with live action. One early success in this regard was the fantasy film "Dragonslayer," which was the first film to use "motion blur" to render the computer-generated dragon. When filming a real object in rapid motion, the object becomes a blur on film. We see the resulting motion as natural. A computer-generated object, with sharp, clear edges, looks peculiar in rapid motion. The staccato effect can result in an apparent

## Ask Mr. Protocol

doubling of the image. If the image is rendered "pre-blurred" in the same fashion that a real object would be, its motion appears more natural.

The ultimate in this technique appears in the recently released "What Dreams May Come." This movie's take on theology is that the afterlife is whatever we wish it to be, both in heaven and in hell. Scenes in this movie include a "paint world," in which a man finds himself within a painting he loved when he was alive. It is a fully realized, three-dimensional world in which the earth, sky, flowers, trees, houses, everything is made from the same paint that appeared in the original painting. A flower, picked and crushed in the hand becomes a blob of paint. The ground is slippery because it is made of paint, and smears where footsteps are left. Another setting represents a library whose floor and corridors are canals in which boats ply among the shelves.

The genius of this movie lies not in its plot, which is overwrought, but in the simple idea that, rather than rendering yet another imaginary world from the minds of the filmmakers, they render classic paintings of the last century and turn them into fully populated, three-dimensional stage settings for the movie. The imagery is consequently far more powerful than even the scariest alien rendered so far. Although the movie in its own right is hardly memorable, there are scenes and images that deserve to live on in the minds of the viewers.

And this is the hard part. In another 10 or 20 years, assuming processing power continues at its current rate or better, it will be possible to make films that appear to contain perfectly real scenes, but in which none of the scenery, props or actors have any basis in three-dimensional reality. However, in the near to middle future, it will still be very hard to do this. The result is an art form, which is not spontaneous but exists as a small number of creations that, while they may be planned by one person, must be executed by a horde over a period of years. Even the slightest change requires endless meetings, and some things cannot be changed at all.

Art is not made like this, or at least, it never has been before. Everything about art is endlessly arguable. If it's certain, it's not art. Nevertheless, a strong case can be made that art without spontaneity is mere construction. Some of the best lines in live-action movies are ad-libbed. Remember that scene at the end of "Blade Runner" where the dying android played by Rutger Hauer mourns the loss of his memories? "...assault ships on fire off the shoulder of Orion...C-beams glitter in the dark near the Tannhauser Gate..." That was ad-lib. This does not happen in a computer-generated movie, at least it won't for a long time to come.

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The stiffness, the difficulty, in creating fully rendered realities is antithetical to the creative freedom necessary to raise art to a high level. Painting is easy to do, but hard to master. Rendering is hard to do, and near-impossible to master. In painting, the ratio of good art to bad art is depressingly low, no matter how one judges "good" versus "bad" art. How much worse, then, in a medium which must be created by an army?

Difficult media can actually aid art by requiring discipline. Sestinas, for example, are notoriously difficult to write, but this made them all the more popular back in the days when educated people actually had a grasp of the written language.

One can only hope that this effect will be equally beneficial as we attempt to turn virtual realities into reality. ➡

*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](mailto:amp@cpg.com).*

# UNIX Basics

by Peter Collinson, Hillside Systems



## The *rlogin* Program

I've been idly watching Robert X. Cringely's "Glory of the Geeks" television series that was recently broadcast on this side of the pond. Just in case the series passed you by, it was four programs from PBS on the history of the Internet. "Pop" histories of things with which you've been involved are always fun, providing a sort of alternate misreality. Actually there were several interesting interviews in this series, but I think that a veil needs to be quickly drawn over the things that were missed or misreported. I guess history is a winnowing process, people who really did the work get lost, while one or two make it into the history books or, in this case, onto the television screen.

Anyway, one slogan popped up in the series that's worth thinking about when defining points in the history of computing: Sun Microsystems Inc.'s slogan, "The Network is the Computer." This slogan takes us back to the beginning of Sun in the early '80s and the creation of the workstation. Of course, Sun was not

actually responsible for the idea, but was the first company to make a huge success of selling a workstation that would run UNIX and opened up a market for what we now think of as the desktop computer.

Networking on UNIX started early with the development of UUCP, which began life as a quick hack connecting two machines together with serial lines and grew into a worldwide network containing several thousand machines. What's often lost in most popular versions of the Internet story is how UUCP widened expectations of how networking should be done. The UUCP network gave email and news to many people and created a demand for the fully interactive services that we use today.

The basic commands that were supported on the 4.2BSD operating system and shipped with the early Suns were also quick hacks. The *rlogin* (remote login) and *rcp* (remote copy) commands were quickly put together by Bill Joy when the networking code in the BSD kernel was newly operational. (Bill Joy, a Sun

founder and software genius, was the prime mover of UNIX at the University of California at Berkeley, in case that name has passed you by.) The commands were intended as a stopgap to see if the networking code worked and were to be used only until the "official" ARPANET protocols of FTP (for file copying) and Telnet (for remote login) were developed. Of course, in the way of all quick hacks, we still have the *rlogin* and *rcp* commands on machines today and they are still useful.

### **rlogin**

The *rlogin* command allows you to sit on one machine and log into another. You probably do this every day and take it for granted, but there's actually a considerable amount of clever stuff going on to make this work the way you want it to, which means "with as few surprises as possible." Some of the clever code resides in the program that is running locally and behaving like a terminal, which is the *rlogin* program; and some on the

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# UNIX Basics

remote system. Let's start with what is happening locally.

The fewest number of surprises will occur when the behavior of the remote machine when accessed over the network is identical to the normal behavior when logging in via a terminal. I suppose that "logging in via a terminal" is rare these days, but this is still the model that is used.

Terminals are bidirectional devices, that is, they permit you to type into the computer and receive text at the same time. The job of `rlogin` is to make a connection to the remote machine and wait for you to type something so it can send it down the network wire to your programs running remotely. At the same time, it needs to wait for data from the remote machine so that it can write it onto your screen. Both data flows need to be independent of one another.

The consequence of the bidirectional flow is that `rlogin` needs to look for data from two sources. Making a single program wait for data from more than one source was not easy in the early UNIX systems. The traditional approach was to split the program into two processes, each handling flow in one direction. So one process would handle data transmission from your keyboard to the remote machine, where most of its time would be spent waiting for keyboard input. The other process would handle data travelling in the reverse direction, where most of the time it would be waiting for data to come from the network.

UNIX makes all of its devices into files, so each process is forced by the kernel to wait for input from an open file. The

process performs a read system call on the open file and is put to sleep. The read call returns data to the process, waking it up only when data is present in the kernel. When data appears, there's a quick flurry of activity as it is passed on and then the process goes back to sleep, waiting for more data.

Using two processes for bidirectional flow does work, but there are cases where the two processes need to share data and sharing is easier if we can use a single process instead of two. The fundamental problem is that we can only wait for data arriving from one source. The 4.2BSD solution was to implement the `select` system call. Specifically, the system call actually allows a program to wait for data to be available from one or more open files. When data arrives in the kernel from one source, the program is awakened and notified that it can now obtain data. It then reads the data, does the necessary processing and returns to wait in the `select` system call for more data to arrive. Armed with the `select` system call, we can write a program that handles two-way communication with a remote machine.

## Terminal Characteristics

We must now think about the characteristics of terminals. When using a regular terminal, a user types a character that's sent into the host machine and is echoed back to appear on their screen. There should be minimal delay when echoing the character (the delay is the apparent response time of the machine). When we are connecting to the machine via a regular terminal and using command-line programs, the kernel will do the work of echoing each character back to the screen. The kernel hangs onto the data and handles line editing, such as the deletion of the last character or the last word. It will wait for the Return key to be typed before sending the completed line of text to the user process that is waiting for the data.

However, there are several "visual applications" where the process needs the input immediately without the Return key being hit—the process wants the data sent one character at a time. Also, it may turn echoing off because a single keystroke may translate into a complex command for the editor. UNIX has developed ways of permitting a program to take such control of terminal input and output. The UNIX terminal interface is now a complicated piece of code, controlled by the processes on the machine. Settings in the interface depend on the application the user is using.

If we are writing a program like `rlogin` (or `telnet`), we have a choice about where character echoing can be done. Option one is to echo the characters locally, using local kernel processing to handle things such as character deletion. When the user types Return, a line of clean data can be sent to the remote machine as a single complete message. Option two is to echo the characters from the remote machine. So when a user types a character, it's not echoed locally but rather sent to the remote machine and echoed back from there. Input is usually done one character at a time and if the network is slow, user response time can be poor. Also, a packet is sent over the network every time a user types a character, so the amount of network traffic is much higher and the network is being used more frequently.

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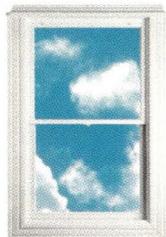
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# UNIX Basics

Option one works fine when the user is typing lines of information and was the method used by default in early `telnet` programs that ran over very slow lines. On slow networks it meant that the user didn't have a perceptible delay after each character was typed. The response was fast because the local machine was doing all the work. However, the method begins to break down when the user is logged into a remote system and wants to run a program such as a visual editor that normally takes control of the keyboard and screen. These programs will execute some special system calls to configure the terminal interface and, in general, there is no provision made to communicate that change of state in the terminal interface on the remote machine to the user's `rlogin` or `telnet` program running locally.

**Because `rlogin` is designed to work over a LAN, there are no problems with unsatisfactory response times owing to the passing of single characters. In fact, the problems of using single-character I/O over the Internet have diminished with time.**



There's no reason why one cannot construct a protocol that will allow terminal interface state to be passed over the network so that all terminal processing can take place locally. In fact, the X.29 protocol, which supported terminal access over the X.25, did permit the passing of terminal control state. However, what happened at the terminal interface was very operating system-specific and because X.29 was designed to work in heterogeneous environments, it inevitably didn't support all the features needed to provide good transparent access to a UNIX system.

It's actually much simpler to handle all the "funny" terminal processing on the remote machine and make the local emulator work in one-character-at-a-time mode. This means the local `rlogin` program simply has to pass each character through in either direction as fast as it can, while all the clever stuff is done remotely.

Because `rlogin` is designed to work over a local-area network (LAN), which should be fast, there are no problems with unsatisfactory response times owing to the passing of single characters. In fact, the problems of using single-character I/O over the (much wider area and slower) Internet have diminished with time. Nowadays, I regularly make a 6,000-mile electronic commute from Canterbury to Berkeley and it works fine, supplying more than adequate response time. I suppose I should qualify that a little: It's fine until someone on the East Coast of the United States decides in the middle of the night that it's safe to reconfigure that router, at which point my line

drops out until the network reroutes itself.

If you place no intelligence about character handling in the local program, there remains one final set of problems that are worth mentioning. On a UNIX system, we expect to be able to type a character and have a program die on the machine. On most systems, typing Control-C will stop a running process dead, so that if a program is writing reams of stuff to your screen, it will stop and the system will become usable again. With the `rlogin` character-passing approach, the local program passes your Control-C character back to the remote host, which interprets the character as an interrupt signal and stops your process. This approach works, but there may be data in transit and you may get more data on the screen than you bargained for.

OK. So we understand what's needed on the local machine, and I'll bet that it's a more complicated story than you thought. What about the remote machine? What do we need to run to make things work?

## The Remote Machine

Well, our first problem on the remote machine is that all the processes that we need to run for the user are designed to talk to terminals supported by the complex plethora of system calls used to establish terminal state. However, we are planning to communicate with the remote machine with network packets. We need to find some method of changing the data from the incoming network packets into data that appears on a system device that behaves like a terminal. Similarly, when the user process writes data, it will do so thinking that it's writing to a terminal. We want to capture that data, translate it into network packets and transmit it to the locally running `rlogin` process that started everything off.

I was faced with this problem in the early '80s. Our campus plan was to connect terminals to concentrator boxes (running on z80s for the historically minded). The concentrators would reach out over the local area Cambridge Ring-based network and communicate with the UNIX machine. I implemented a terminal device driver that fed data from the network into the regular UNIX terminal-handling code (and vice versa). User processes would talk to some code that behaved like a terminal, except that the data was being transmitted to the network and onto a remote terminal rather than being passed along a serial line to some directly connected VDU.

The folks at Berkeley took a more general approach and wrote a special-purpose driver called a *pseudo-terminal* or *pseudo-tty*. Each invocation of the device driver has two ends in the file system address space: the terminal end, which behaves like a regular terminal, and the control end, which provides traditional UNIX data streams in both directions.

When the local `rlogin` connects to the remote machine, a daemon (`rlogind`) is started whose first task is to find a free pseudo-tty and initiate an appropriate login process on the terminal end of the device. The job of `rlogind` is to sit in a loop waiting for data from the network and stuffing it down the control end of the pseudo-tty. It also waits for messages from the control end (actually output from the user process to its terminal) and sends them over the network to the

# UNIX Basics

local machine. By the way, I am trying to retain consistency here. For clarity: the local machine is the machine on which the user is typing and the remote machine is running `rlogind`.

Actually, the mechanism is fairly inefficient. Data from the user's keyboard goes into the local kernel and passes across the system call interface into the local `rlogin` program. The data is immediately parcelled up and sent back across the system call interface and out onto the network. Each data packet arrives in the kernel of the remote machine, where it passes across the system call interface into `rlogind`, which in turn immediately passes it back into the control end of the pseudo-ty. It then travels across a system call interface once more and finds itself in the user's process. Of course, the user's process will immediately reply with some information that is sent back along the tortuous route to the user. We've all got enough CPU power now and don't really notice all this data yo-yoing around between user processes and the kernel. Back when I was designing my system, I didn't want to take this approach because I was trying to support in excess of 50 simultaneous users on a 1-MIP VAX11/780 and the possible load was a big concern.

Nevertheless, the general-purpose nature of the pseudo-ty interface was and is a win. It is useful for other programs that wish to start user processes. For example, my preferred editor, JOVE, uses a pseudo-ty to implement a command that runs a user shell in an editor window.

## Telnet

As I said at the top of the article, `rlogin` was not supposed to have endured as long as it has. It should have been replaced by `telnet`. The replacement hasn't happened. People still use `rlogin`. The issue is probably one of convenience. The `telnet` command is designed to support heterogeneous machines and, therefore, is not as well tailored to the UNIX-to-UNIX login application. UNIX has always wanted to know the type of its terminals so that it can adapt visual programs to send the correct control sequences to effect cursor addressing on the target screen. When `rlogin` connects to a remote machine it sends the terminal type in a secret prologue so the remote machine can set things up for you. Of course, `telnet` doesn't have this mechanism and so you need to establish the terminal type to enable visual editors to work properly.

The `rlogin` program is also supported by an ad hoc authentication system that permits automatic login to the remote machine without needing to supply a user name and password. When you login, your identity depends on the name of the local machine, determined by reverse lookup from your IP address to a machine name (it also depends on the user name on the local machine that is passed in the secret prologue).

Originally, the integrity of the authentication system depended ultimately on the fact that `rlogin` connected to the remote machine from a "privileged port number," a port number less than 1,024. Recall that a TCP/IP stream connects to an interface that has an IP address and a port on that interface. In a UNIX-only world, it was possible to stop users from creating communication paths using the set of privileged ports, however, once the PC gained networking code all this

false security went away.

Current security wisdom states that you should not run `rlogin` over the Internet because it's too easy to break its weak security. In fact, I have a set of filters on my router that prevents anyone outside my network from using `rlogin` to access an internal machine.

The convenience and speed of `rlogin` can be regained by augmenting the somewhat weak, old system with Kerberos. I tend to use `ssh` these days when connecting over the Internet so that the whole communication is encrypted, protecting my passwords against packet sniffers and other systems used by the bad guys.

PS. I've since discovered from reading *Wired* magazine that Cringley's series is called "Nerds 2.0.1: A Brief History of the Internet" on your side of the Atlantic. Why there should be a name change as the tapes travel over water is beyond any reasoning. I am sure that we would understand "Nerds," and I cannot believe that "Geeks" would not have worked for an American audience. Perhaps TV programs need longer names in North America to stand out in the TV listings books, which are generally physically smaller than ours. Who knows. →

*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@cpj.com.*

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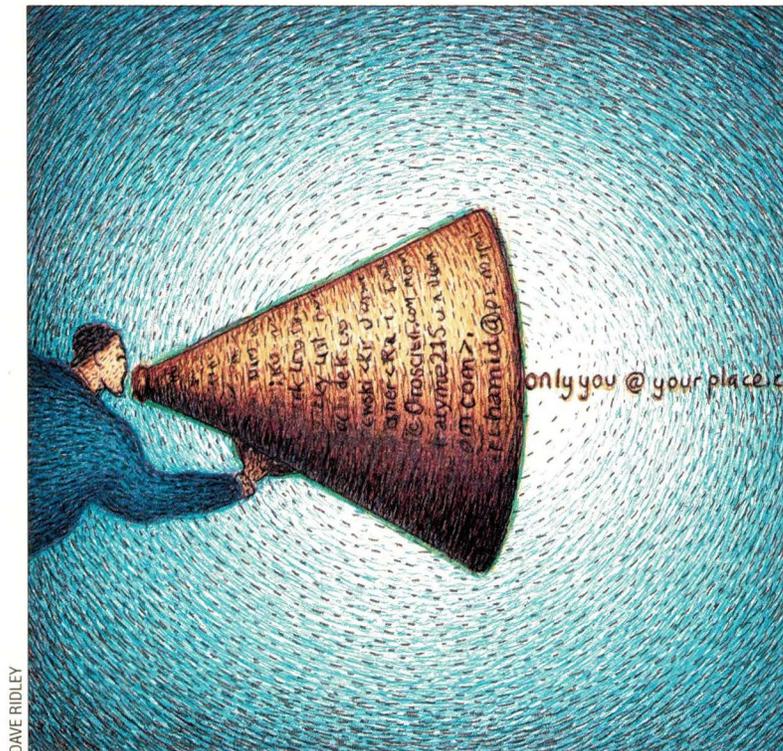


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# Systems Administration

by S. Lee Henry



## Emailing to the Masses

Ever receive a piece of email with page after page of addresses? By the time you wade through screen after screen of your friends' friends or some salesman's contacts from around the country, you're probably thinking "This had better be good!"

This month's column takes a look at a gentler way to send email to a mailing list. Not only will your messages be distributed without this addressing "overhead," but there are a number of other advantages as well. For one, the script reduces the amount of text you send. For another, it doesn't expose your recipients to all the other recipients on your list. For a third, it allows you to track the history of your mass mailings using a log file rather than the voluminous file maintained by `syslog`. In addition, any bounces you might get will be a little easier to isolate and correct. And last, your users will be able to send out mass mailings without requiring you to maintain their recipient lists in your `/etc/aliases`

file (or corresponding map).

The first thing we must do is set up the defaults we'll use when our users don't supply all the arguments needed by the script. We require a subject, but the files containing their message text and their list of recipients will be assumed if they don't supply them. Because many of your users are likely to send messages to a single list of recipients, they can add or remove recipients using their favorite editor.

```
#!/bin/sh
# mass mail a message (from a file)
# to addresses (from a file)

# defaults:
recipfile=recip.list
msgfile=msg.txt
subject="mass mailing"
log=massmail.log
returnadd=$USER@"`domainname`"
```

The first line of the script identifies the shell. The second and third lines

are comments describing the purpose of the script. As you can see, the return address to be used in the email is the address of the person who runs the script. We've tacked on the domain name using the `domainname` command. If this won't work on your network, you can replace it with the fully qualified name of your mail server (for example, `mailhost.myfirm.com`).

```
# prompt with usage statement if
# no arguments are given
if [ $# = 0 ]; then
    echo "Usage: $0 -s" \
        \"subject\" [-r <recip.list>]\" \
        [-m <msg.txt>]"
    exit 1
```

If one of our users enters *only* the name of the script, she will be prompted with a usage statement reminding her of the arguments. The order in which she enters these arguments is not important. Notice the all-important back-slashes that precede the quotes around `subject`. These

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# SYNTAX

2 5 3 8 3 8 2 6 2 6  
<http://www.syntax.com>

# Systems Administration

keep our `echo` command from choking on the internal quote marks of the externally quoted usage statement.

If our user enters arguments, the script will identify which is which by the arguments that precede them. You could cut down on the overall complexity of the script by requiring the arguments to be in a certain order. This would allow you to drop the `-s`, `-r` and `-m` identifiers and simply require the three arguments in a given order. This script looks at every odd-numbered argument and uses it to assign the value that follows. Our user could, in fact, enter the `subject` argument three times. If she did, the other two arguments would default to the file names included in the script.

The following script uses a series of `case` statements to look at the first, third and fifth arguments. Each `case` statement is protected by an `if` statement to guard against doing things with arguments that don't exist. We don't want to generate messages that will confuse our users.

```
else
```

```
if [ $# -ge 2 ]; then
case $1 in
-s) subject=$2 ;;
-r) recipfile=$2 ;;
-m) msgfile=$2 ;;
*) echo "unknown option: $1" ;;
esac
fi
```

```
if [ $# -ge 4 ]; then
case $3 in
-s) subject=$4 ;;
-r) recipfile=$4 ;;
-m) msgfile=$4 ;;
*) echo "unknown option: $3" ;;
esac
fi
```

```
if [ $# -ge 6 ]; then
case $5 in
-s) subject=$6 ;;
-r) recipfile=$6 ;;
-m) msgfile=$6 ;;
*) echo "unknown option: $5" ;;
esac
fi
```

```
fi
```

The next thing we need to do is specify the mail commands we want to use to send the messages and a confirmation notice when the job is complete.

We can also include the name of the person to whom the confirmation should be sent. In the following script, notification goes to the person running the script. If you prefer, you can change this to the person who is responsible for monitoring mass mailings.

The `delay` variable slows down the issuance of each piece of email in order to avoid overwhelming the system with `sendmail` processes:

```
sendmail=/usr/lib/sendmail
mail=/usr/ucb/mail
admin=$USER
delay=1
```

We then check to make sure the files have been either specified or defaulted to actually exist. These include the list of recipients and the text of the message. Your users can maintain these files in their home directories or include a full path name when using the `massmail` tool. In addition, we provide a calculation of the time we expect it to take to send the message to all the recipients. You can change this if the estimated time is much different from actual time on your system.

```
if [ ! -f $recipfile ]; then
    echo "cannot find $recipfile"
    exit 1
fi
if [ ! -f $msgfile ]; then
    echo "cannot find $msgfile"
    exit 1
fi

#
# calculate estimated time
ndat=`wc -l $recipfile 2> /dev/null | awk '{print $1}'`
time=`echo "$ndat $delay" | awk \
'{printf("%.2f", ($1*($2+1.22))/3600)}'`

The log entry is prepared, added to the log file and displayed to our users. Notice how the tee command is used to send the output to two places at once:

(
echo "Mass mailing started at `date`"
echo
echo "subject line:      $subject"
echo "recipient list:    $recipfile"
echo "message file:      $msgfile"
echo "logfile:           $log"
echo "return address:     $returnadd"
echo "delay:              $delay seconds"
echo "time required:      $time hours ($ndat addresses)"
echo
) | tee -a $log
sleep 3
```

The next part of the script prepares the message for each recipient and then mails it. Notice, in particular, how the file containing the recipients (`recipfile`) is used as input for the `while` command. With each pass through the loop,

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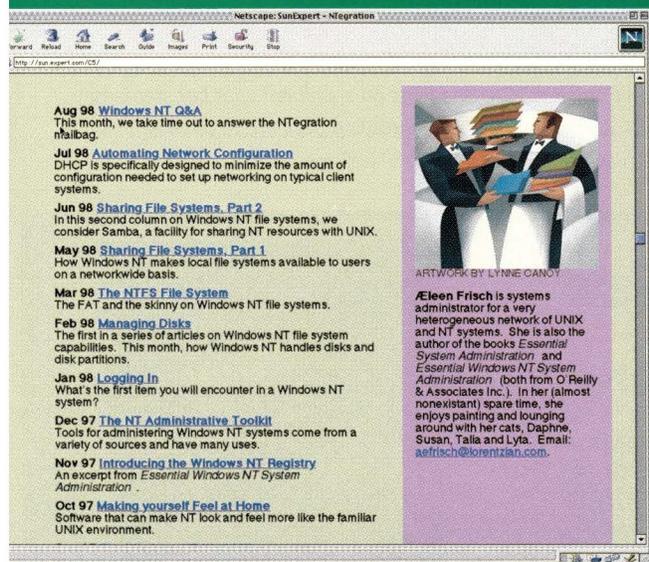
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- Have you seen the Jeffrey's column on Practical RCS?
- Looking for Peter Collinson's wisdom on Network file systems?
- Did you read Eileen Frisch's tips on the NT registry?
- Searching for information on OS coexistence?
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DHCP is specifically designed to minimize the amount of configuration needed to set up networking on typical client systems.

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In this second column on Windows NT file systems, we consider Samba, a facility for sharing NT resources with UNIX.

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How Windows NT makes local file systems available to users on a networkwide basis.

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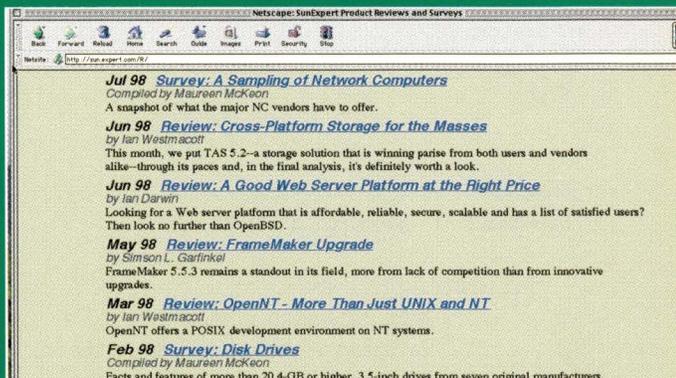
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**Eileen Frisch** is systems administrator for a very heterogeneous network of UNIX and NT systems. She is also the author of the books *Essential System Administration* and *Essential Windows NT System Administration* (both from O'Reilly & Associates Inc.). In her (almost nonexistent) spare time, she enjoys painting and lounging around with her cats, Daphne, Susan, Tala and Lyta. Email: [aefrisch@lorentzian.com](mailto:aefrisch@lorentzian.com).



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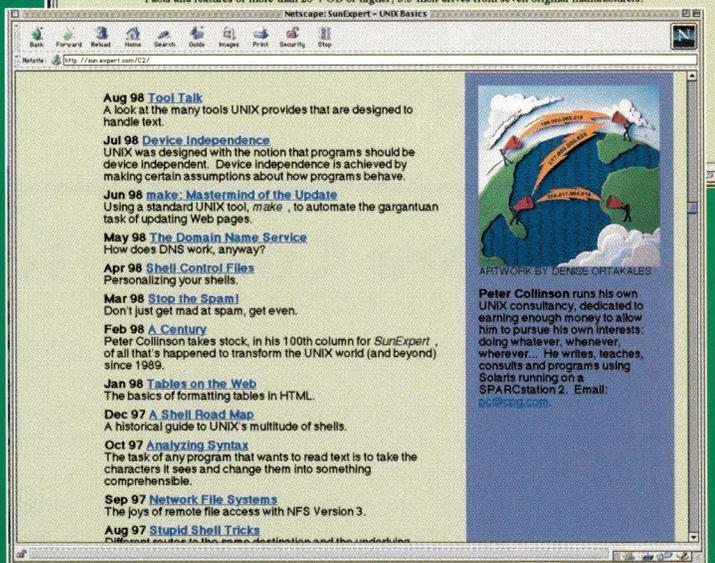
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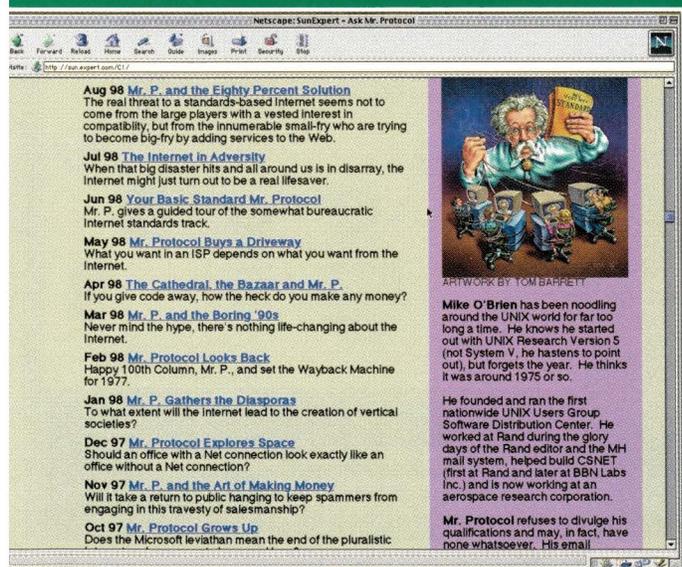
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**Peter Collinson** runs his own UNIX consultancy, dedicated to earning enough money to allow him to pursue his own interests: doing whatever, whenever, wherever... He writes, teaches, consults and programs using Solaris running on a SPARCstation 2.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



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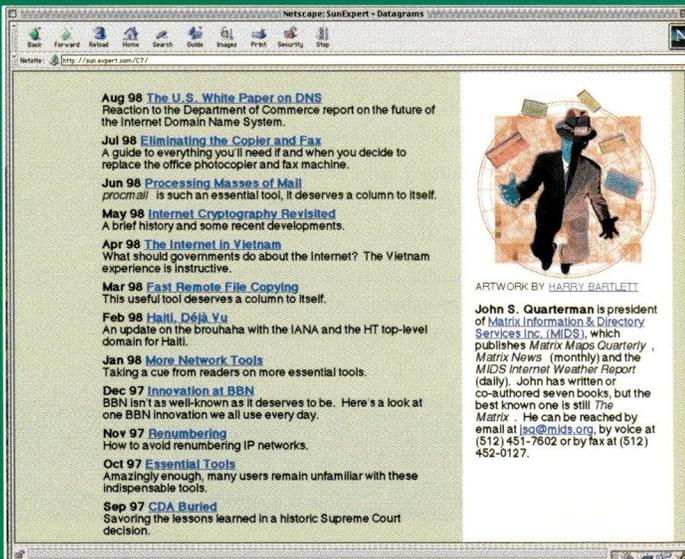
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Does the Microsoft leviathan mean the end of the pluralistic

**Mike O'Brien** has been hoodooing 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 Mf 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



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

# Systems Administration

the message is sent to the next address (recipient) on the list:

```
j=0;
while read rec
do
    j=`expr $j + 1`
    echo "sending #${j} to: $rec" | tee -a $log
# send outgoing message to addressee
(
cat << EOF
From: $returnadd
Subject: $subject
To: $rec
EOF
cat $msgfile
) | $sendmail -f "$returnadd" $rec

if [ $? != 0 ]; then
    echo "dispatch of #${j} \
    returned with non-zero exit status" |
    tee -a $log
fi

sleep $delay
done < $recipfile
```

At the end of the script, we display a statement of the completion time and send a message to the person identified earlier in the script to receive confirmation that the mass mailing is complete. The log file will include information about the files used and each recipient to whom the message was sent.

```
(
echo " "
echo "Mass mailing completed at `date`"
echo
) | tee -a $log

echo "$0 done at `date`" | $mail -s $0 $admin

exit 0
```

If you paste together the fragments of Bourne shell scripting shown above, you will have the complete listing of the massmail tool. If you're averse to typing or don't feel like scanning the pages of this magazine, send me an email and I'll ship a copy out to you. →

*S. Lee Henry is a Webmaster and systems administrator in San Francisco, CA. She lives on a sailboat with her stepfamily and spends her free time throwing popcorn to the seagulls. To reach her, send email to [slee@cpg.com](mailto:slee@cpg.com).*

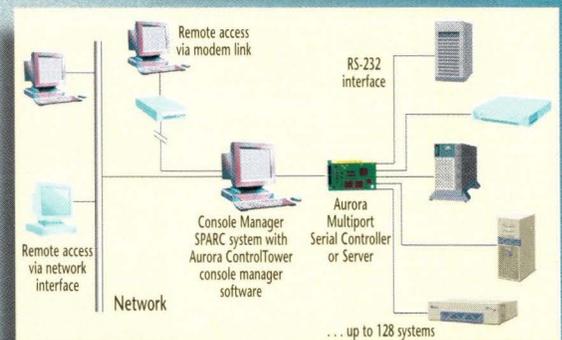
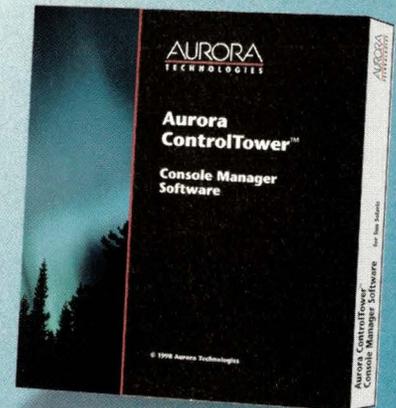
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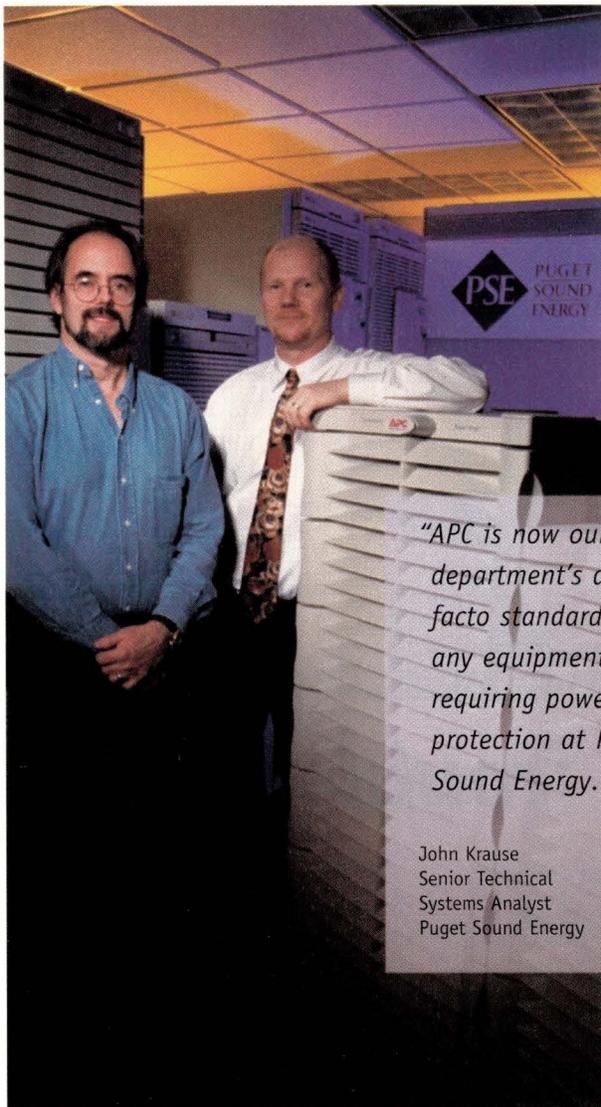


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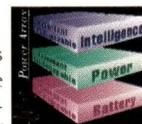
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## Analyzing Trouble

This month, we resume our consideration of Windows NT performance after a two-month detour. We will examine data from an actual production system under stress. This detailed study will illustrate both the important performance data and the process of interpreting it.

The system we are looking at runs Windows NT Server and is used primarily as a database server; interactive user logins are meant to be rare events. The system was configured to support normal daily database activity for an order-entry and fulfillment application, along with occasional ad hoc queries by or on behalf of management. The division's manager was running a few large queries during the period we will be reviewing. At the same time, a designer from the graphics department decided to take advantage of the seemingly free system to perform a quick touch up on an upcoming brochure illustration using the Adobe Systems Inc. PhotoShop image editing application. (Although the data

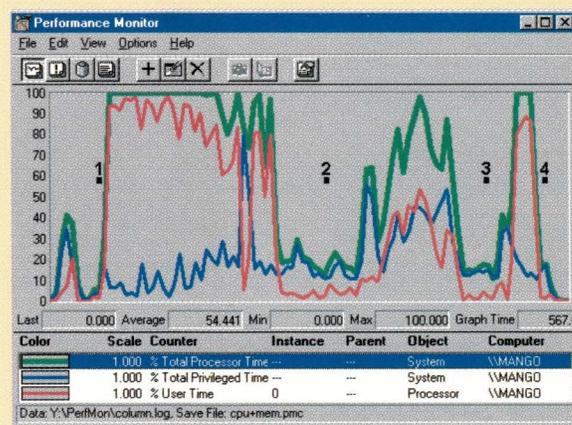
presented here was gathered during a reenactment, the situation did occur.)

We'll begin by looking at CPU usage (see Figure 1). The green line represents total CPU usage, the blue line indicates privileged CPU time (system time consumed by the operating system in the process of servicing user processes) and the red line indicates user time (CPU time spent getting actual work done).

System CPU usage is high throughout this period, although most of the time is spent as user time. At the beginning of this period, all the applications are open and running (including the database server, the PhotoShop image editor and Windows NT Performance Monitor).

The first usage spike occurs after the point marked 1, which indicates when PhotoShop began to load the image file.

Figure 1. CPU Performance



*CPU usage is high throughout this period, although most of the time is spent as user time.*

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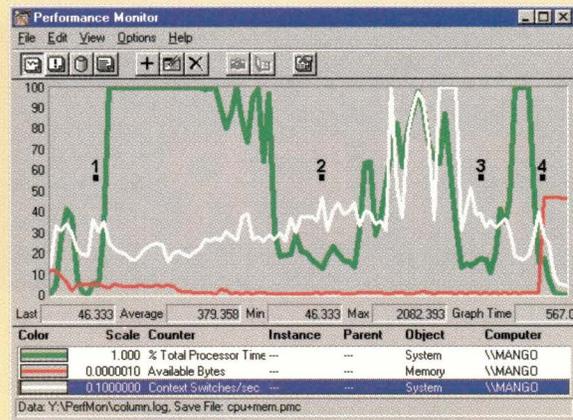


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**Figure 2. Overall System Resource Usage**



*System memory is almost completely consumed, rising only after point 4 when PhotoShop is terminated.*

The illustration was stored as a 3-MB compressed TIFF file on disk, which expanded to 32 MB when uncompressed by the application. The expansion operation accounts for the high amount of user CPU time; in this case, the overhead of reading the 3-MB file is negligible compared with the time required to uncompress it.

The file is open and ready for editing when CPU usage drops near point 2. Shortly thereafter, the manager initiates a fairly large application (a four-table join across approximately 20,000 records in a primary table). At the same time, the designer begins a transformation operation on the image file. CPU usage is again high during this period, split more or less evenly between user time and system time, but the available CPU resources are not always fully consumed.

By point 3 both activities have finished, and the designer writes the modified image back to disk. CPU time again spikes as the image is compressed before it is saved to disk. At point 4, the save operation is complete and PhotoShop is terminated.

Interactive response time ranges from poor to hideous during this period. Somewhat surprisingly, the worst period occurs during the interval between points 2 and 3, and not during either of the times when total CPU usage spikes at 100%. The system is quite sluggish during the latter, but is completely unrespon-

sive during the former; thus, the worst interactive performance corresponds to when system time is at its highest.

In Figure 2, we examine a broader range of system performance statistics. The green line again shows total CPU time, the red line indicates available memory usage and the white line plots context switches per second during the same period.

We've adjusted the scale of both the available memory and context switches plots to bring the data within a meaningful range. Available memory is measured in megabytes (MB), and the graph clearly indicates that memory is almost completely consumed during this period, rising only when the save operation completes after point 4. The default scaling for this counter is 10 times larger (expressed as units of 100 KB) and can be somewhat misleading.

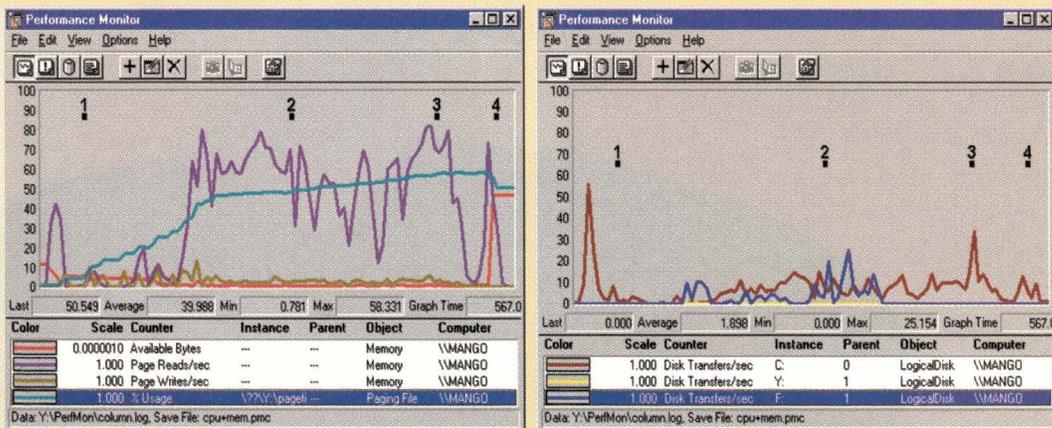
The number of context switches is scaled by 0.1 and it ranges from two to three most of the time. However, it rises to above 10 during much of the period between points 2 and 3 when the database query and image manipulation operations are being performed. This accounts for the rise in privileged CPU time during the same interval. The system does not have sufficient resources to complete both operations along with its normal workload and must constantly alternate between them, significantly reducing the efficiency of both.

The leftmost graph in Figure 3 gives more detailed information about system memory use and paging. The red line again indicates available memory (in MB). The purple and gold lines plot page reads and writes per second, respectively, and the light blue line indicates total usage of the system paging space.

Although available memory is seriously low, the system isn't paging poorly. There are a fair number of page reads but these are frequently part of normal I/O, a conclusion reinforced in this case by the fact that there are very few page writes. Memory seems to be fully consumed but not overcommitted to the point that needed pages are being forced out to disk. And although paging file usage creeps up, it never becomes critical.

The right-hand graph in Figure 3 summarizes disk I/O activity for three partitions on this system. C: is the Windows NT partition, and is indicated by the red line. F: holds the database files (and is mirrored using the Windows NT fault tolerance facility) and is plotted in blue. And Y: is where the image file is stored and is shown by the yellow line. (The data-

**Figure 3. Memory Usage and Disk I/O Data**



*The leftmost graph gives more detailed information about system memory and paging. The right-hand graph summarizes disk I/O activity for three partitions on the system.*

**Table 1. Summary of System Performance Data**

Performance Statistic	Time Period					
	Normal Baseline	Setup (before point 1)	Load Images (points 1-2)	Database Query & Image Filter (points 2-3)	Save Image (points 3-4)	Cleanup (after point 4)
% CPU usage	<1	13	78	46	47	7
% privileged time	<1	9	16	27	17	4
Processor queue length	0	1	4	1	1	2
Total interrupts per second	106	180	238	340	237	181
Available memory (MB)	23	6	<2	<1	5	46
Pages per second	<1	55	113	131	85	35
Paging file % usage	46	26	33	53	58	51
% disk time C: (NT partition)	<1	17	18	25	23	8
% disk time F: (database files)	0	0	5	12	0	0
% disk time N: (software)	<1	<1	15	19	7	5

base software and the PhotoShop application executables are stored on partition N:, which we will consider shortly.)

None of the disk I/O we see here is cause for concern. Partition C: is fairly active throughout this time period owing to operating system activity. Partition F:’s most active period occurs after the database query has started but levels off again about a third of the way into the operation, indicating that disk I/O is not the limiting resource. Once the data is retrieved from disk, which happens quite rapidly, it must be processed, making CPU and memory resources more critical to its overall performance and completion time.

Partition Y: seems to be idle during the entire period. This seems odd, given that the image file is known to be read from and written to disk. However, the lack of any recorded activity on this disk is an artifact of the large sampling interval (10 seconds) we used during data collection via the Performance Monitor facility. Y: resides on a very fast disk, and so the transfer of 3 MB is a trivial operation. (Note that if all disk counters always register zero, then it means they have not been enabled, not that there is no disk activity on the system. In this case, run the `diskperf -ye` command and reboot.)

Sometimes, it’s necessary to go beyond performance graphs to get a full picture of system activity. Table 1 summarizes various numeric performance statistics for this system averaged over the defined intervals we have considered (they were collected using Performance Monitor’s report mode). Although this summarized data will not reflect the spikes and peaks illustrated in the graphs, they are very useful for identifying trends. The first column in Table 1 presents the corresponding values from baseline measurements taken during a period of minimal system activity when the database server is running but there are few transactions occurring.

CPU usage is most intensive while the image file is being loaded and uncompressed. Interestingly, during the most active interval in this period, while the query and image manipulation are running, CPU usage averages only 46% (although it spikes to 100% at several points). At the same time, privileged (system) time averages 27%, meaning that almost half of CPU resources in use are being spent as operating system overhead. The total interrupts per second follows the same pattern as CPU usage, rising to an average of 340 during the period of

worst interactive response time. Clearly, the system is overloaded with work at this point.

The processor queue length statistic, which is a measure of how much excess desire there is for the system’s CPU resources, behaves somewhat differently. Its highest value occurs during the image load, and this is the only time that a process is required to wait for CPU resources—in other words, the only time during this period that the CPU capacity is the primary limiting resource on this system.

The available memory and paging statistics confirm what we observed from the performance charts. Memory is scarce during the image load and the database query/image filtering intervals, and paging rates rise accordingly at these times. Paging file usage remains well within acceptable limits, especially given its typical level during times of minimal system activity.

The final entry under available memory indicates that 46% of total system memory is available after PhotoShop terminates. This seems odd given that baseline available memory is only 23%. It is another anomaly of the data collection process and the brief length of the final interval; we can expect the database server application to grab much of that memory as soon as it needs it.

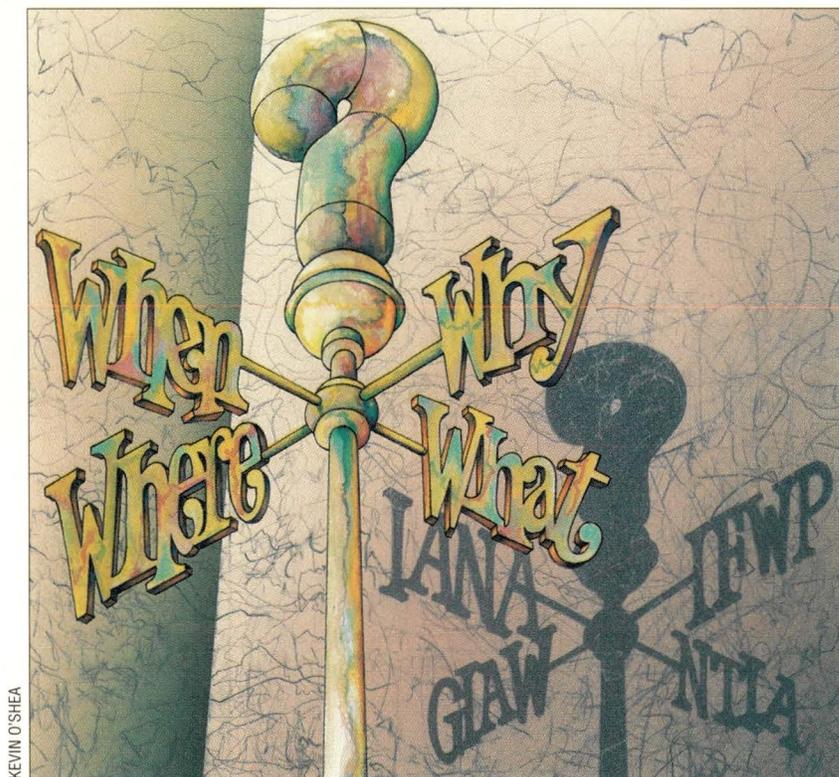
The final three rows of the chart indicate the percentage of time that disk partitions C:, F: and N: are active during this period (read and write activity is not distinguished). None of the values are ever higher than 25%, confirming that disk I/O is not a significant factor in overall system performance.

All in all, it is clear that memory is the performance-limiting resource on this system, and we can expect that increasing the amount of available memory would improve the situation. If memory were to be increased, CPU speed would become the new critical factor determining how well the system performed and how quickly the ad hoc jobs were completed. ➔

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# Datagrams

by John S. Quarterman



## Internet Politics Endgame

A few weeks ago in Edinburgh, Scotland, I was roundly criticized by a prominent Internet personage for what he considered the unduly positive slant of my recent column, "A Historic Conference" (September 1998, Page 50), about the July meeting of the Global Internet Alliance Workshop (GIAW) in Reston, VA. The GIAW was the first in a series of conferences coordinated by the International Forum on the White Paper, or IFWP (<http://www.ifwp.org>), an ad hoc coalition of professional, trade and educational associations representing a diversity of Internet groups from around the world. I assured him that my next column on the subject would not be so positive about either the IFWP or the current Internet politics endgame. This is that column. I intend it to be an evenhanded overview of the situation, but given the particulars, the overall impression may appear harsh. One article cannot begin to describe the entire Byzantine mess, so I'll make do by touching on some of the main topics and players.

### The Marathon Talkathon

The IFWP Steering Committee coordinated a series of four meetings around the globe:

- July 1-2 in Reston, VA
- July 24-25 in Geneva, Switzerland
- August 11-13 in Singapore
- August 20-21 in Buenos Aires, Argentina

All four meetings were themselves a significant accomplishment in simply bringing interested parties together in a room rather than have them at each others' throats via electronic means. There was also a separate meeting in Brussels in early July, organized by the European Commission, that was considered by many to be part of the IFWP series.

Unfortunately, the participants and organizers never got far beyond talk, talk, talk to generate actual results. They lost sight of the goal, which was to participate in organizing the creation of a corporation to be successor to the Internet Assigned Numbers Authority, or IANA (<http://www.iana.org>), meeting

the U.S. government's criteria set out in its white paper, "Management of Internet Names and Addresses" (see [http://www.ntia.doc.gov/ntiahome/domainname/6\\_5\\_98dns.htm](http://www.ntia.doc.gov/ntiahome/domainname/6_5_98dns.htm)). The white paper was issued on June 5 by the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce.

Many in the IFWP Steering Committee would say this was not the IFWP's goal, and I would agree with that. The IFWP Steering Committee was merely supposed to organize these meetings, but it often strayed into actual policy. Many IFWP participants would say the creation of a new corporation was not the goal of IFWP either. I would say if it wasn't, it should have been.

Of course, considering the extreme disorganization of the IFWP Steering Committee, it's a wonder it managed to coordinate anything, even meetings. This is a group that bragged about running open and transparent forums, yet couldn't manage to publish minutes

# Datagrams

of its own meetings in a timely manner. This was a steering committee that didn't manage to ask IANA's Jon Postel directly if he would attend one of its meetings until it was far too late. This was a steering committee that repeatedly changed or reinterpreted the rules of its own membership to fit, or not fit, specific applicants. I could go on, but you get the picture.

Karl Auerbach attempted to organize an IFWP drafting committee early on. I don't know what the delay was, but no draft appeared until after all four meetings had happened.

Then, there was an attempt to organize a further meeting in Boston, MA, to wrap up. The IFWP Steering Committee disowned that meeting, but a small number of IFWP participants met anyway and became known as the Boston Working Group (BWG). The BWG did finally produce a draft (<http://www.ntia.doc.gov/ntiahome/domainname/proposals/bosgrp/merged-bwg-bylaws.html>) and, in fact, submitted it to NTIA *before* the IANA draft (<http://www.ntia.doc.gov/ntiahome/domainname/proposals/icann/bylaws.htm>).

Meanwhile, Einar Stefferud took the BWG draft and enhanced it, in typical Internet tradition, to produce the Open Root Server Confederation, or ORSC, draft (<http://www.ntia.doc.gov/ntiahome/domainname/proposals/orsc/bylaws.html>). The ORSC draft has an additional structure for determining membership (something none of the other proposals have worked out). Other features include "fair hearing panels," a limitation of powers of the board to those specifically granted in the bylaws (similar to the U.S. Constitution), more board seats (14) and a stronger clause against conflicts of interest, corporate funding through supporting organizations and incorporation in Delaware.

Both the BWG and ORSC proposals mandate someone other than the stakeholder organizations to elect the board (keeping the people who make the policy from electing someone to uphold their policies without oversight), much more openness, accountability (fiscal and otherwise) and a more bottom-up structure.

## Is NSI the Villain?

Many people have cast Network Solutions Inc. (<http://www.netsol.com>) as the villain of the piece. This is easy to do because NSI, through its cooperative agreement with the U.S. government as InterNIC, is the registrar for the .com, .net, .org, .edu and .gov domains, and registration fees net NSI on the order of \$35 million

per year. NSI's domain name dispute policy has been widely criticized; MIDS has published several legal critiques of that policy, see <http://www.mids.org/legal>.

However, NSI has been demonized to a ridiculous extent. On the IFWP Steering Committee's internal discussion list, for example, it was common for people to be asked whether now or

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## Datagrams

in the past they had been employed by NSI. People seriously worry about whether having dinner with someone from NSI will taint their reputation.

**NSI did the work of drawing up draft bylaws for the new corporation. The NSI draft wasn't perfect, but it was one of only a very small number of bylaws that appeared.**

The most shameful episode of this sort was the way in which the entire organization of the Reston meeting was derailed, delayed and confused by accusations that the organizers were in some way controlled by NSI.

I agree that NSI is not perfect and I think we need multiple domain registrars (but not necessarily more top-level domains, or TLDs) as soon as we can get them in

some orderly manner. However, I will say this for NSI, while a large number of people were complaining loudly about the lack of progress in organizing a new corporation, NSI did the work of drawing up draft bylaws for the new corporation. The NSI draft wasn't perfect, but it was one of only a very small number of bylaws that appeared. NSI further proceeded to discuss directly with IANA the differences between the NSI draft and the IANA draft.

Within the Internet Engineering Task Force (IETF), the body that writes the protocol specifications and coordinates testing and standardization of them, there is great respect for people and organizations that do the work of actually writing drafts and driving discussion on them. NSI (like IANA before and BWG later) did the work and should get some respect for that.

Only a few groups, as far as I know IANA, NSI, BWG and ORSC, did the work of producing drafts of bylaws and articles of incorporation. A useful comparison of the three drafts is available

on Ellen Rony's Web site (<http://www.domainhandbook.com/comp-bylaws.html>), where she has put together a side-by-side comparison. Other groups, such as Réseaux IP Européen (RIPE), have provided substantive input to those drafts, although rather late in the game.

### The Saint?

I knew Jon Postel, not very well, but I once worked with him on a project (I made the pilgrimage to Marina del Rey to ask his blessing on my first book, *The Matrix*) and on several occasions I discussed policy with him, such as the notorious Haiti case (see <http://www.mids.org/mn/712/reht.html>). I can attest that he seemed as dedicated to the Internet that he helped found as anyone, and he definitely worked as hard at it for as little reward. He certainly deserved the standing ovation for all his work that he received at the last IETF meeting before he died.

*In Memoriam  
Jonathan B. Postel  
1943-1998*

However, myths have already grown up about the man. Someone who should know better was quoted in *The New York Times* saying that Jon Postel had never done anything in his life that wasn't open and accountable. I don't see how anyone who is familiar with how IANA operated could say that. The appointments to the initial board of the new corporation that Postel set up are an example—even Vint Cerf says he has no idea how they were selected. It is also well-known that once Postel made up his mind he seldom changed it, and he was accountable to no one. I say this not to malign the dead, but merely to point out that it is enough for people to remember Jon Postel as a great man of the Internet; there is no need to make him out to be a saint.

IANA has completed a proposal for the new corporation, to be called Internet Corporation for Assigned Names and Numbers, or ICANN (<http://www.icann.org>). Amusingly enough,

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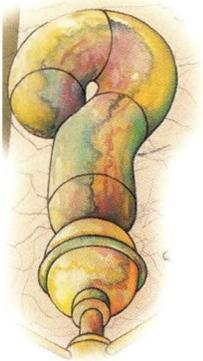


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its domain name is registered with a postal address that is identical to that of NSI. I am told this is because NSI was asked to reserve the domain when NSI and IANA were negotiating on IANA's fourth draft. Ironically, IANA's fifth draft was apparently done without consultation with NSI. More important, while there are many good features of IANA's ICANN articles and bylaws, there are a number of questionable items, such as an initial board that was picked by means that nobody knows yet (and which can serve for a long period of time), a lack of membership structure and insufficient rules for accountability.



## Side Effects

These politics, and the IFWP process, have resulted in some interesting beneficial side effects. Networkers in Europe and Asia have been quite vocal in their participation in Internet politics. This is nothing new for Europe, but the amount of participation from Asia was perhaps more than one might have expected. The proliferation of Asia Pacific Internet-related organizations is also a sight to behold. For a more or less complete list, see the Asia Pacific Networking Group's Web site, <http://www.apng.org>.

Networkers in Latin America and the Caribbean have suddenly become more aware of the need to participate in global Internet politics and have been more willing to do so since the IFWP meeting in Buenos Aires. Some of the players have even formed a new group, Asociación de Latinoamérica y el Caribe para Internet, or ALCI (<http://www.alci.org>). Unfortunately, as of this writing, the new group still has no content on its Web site. Meanwhile, the long-standing group, Foro de Redes de América Latina y el Caribe, or ENRED (<http://www.enred.org>), has not decided to support ALCI. ENRED makes a good case that ENRED is the

appropriate organization to represent Latin America and the Caribbean in these politics, and has at least twice sent comments directly to IANA concerning the new corporation.

## The Arbitrator

I don't know Ira Magaziner, senior adviser for domestic policy to the president, but I don't envy him. He was appointed by the Clinton Administration to deal with what was then just the Internet Domain Name System (DNS) mess, but has since mutated into the general Internet governance mess. First, Magaziner and NTIA solicited input to assess the situation, then they spelled out some criteria to be met and asked in the infamous white paper for the Internet community to get its house in order and meet those criteria. The deadline was short, but the squabbling parties frittered away a lot of time with infighting or by trying to ignore the problem.

Faced with a lack of cohesion of the interested parties and active criticism

from the U.S. Congress, Magaziner must now attempt to either choose one of the submitted corporations or try once again to get those involved to agree on a single submission.

If the Internet is to govern itself, now is the time for all the interested parties to set aside their distrust of one another and pull together. If we do not organize ourselves, rest assured that someone else will do it for us, most likely the U.S. government. Perhaps we can all let the death of Jon Postel be the occasion for the new birth of the Internet. →

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



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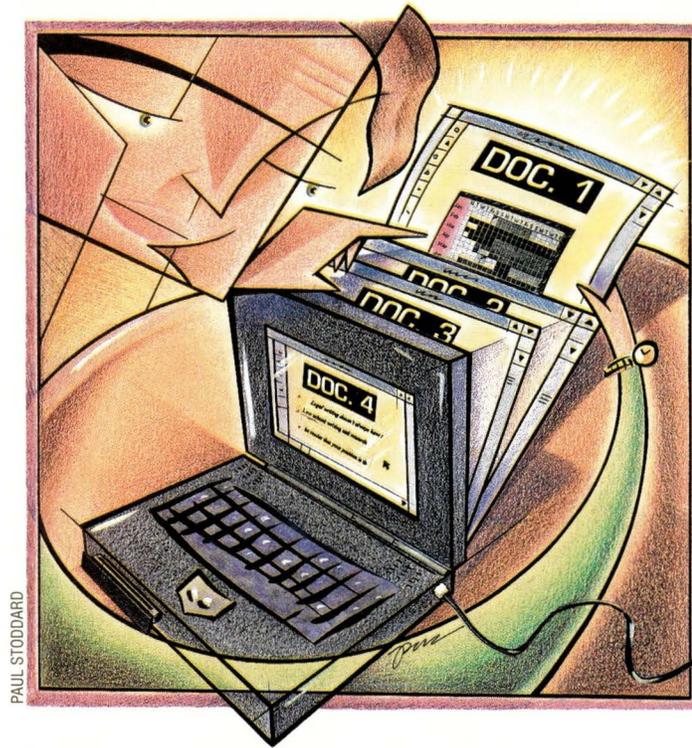


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# Work

by Jeffreys Copeland and Haemer



## Reader, Part 1

Last month, we talked about reading text online. This month and next, we'll provide some code for you to do so. We wrote the original version of the program we present here during a standards meeting. We brought along a few dozen back issues of the RISKS-Forum Digest (see Usenet newsgroup, `comp.risks`, or `ftp://ftp.sri.com/risks`) to read on our laptop during the boring parts of the meeting, but kept having to interrupt our reading to check data in other files. "Gosh," we thought, "how come `more` doesn't have a way to start up where we left off last time?" (Reading RISKS during a meeting is certainly better for our sense of well-being than reading it on an airplane!)

We wrote a pager that did just that. You started it with a list of files on the command line, and it saved the list of files and the point at which you stopped reading. When you started the program without arguments, it found the last list of files—and your electronic equivalent

of a bookmark—and restored itself to where you left off.

We wrote the current version of the program when we found ourselves fixing the paging code for the seventh time to more closely match the behavior of `more`. This version is actually a front-end to a modified version of `less`. As a result, the underlying pager code has a full set of features. We have written the wrapper code in C++ (so we can use some data-hiding capabilities) using the CWEB literate programming tool. (If you're not familiar with this tool, CWEB allows us to pleasantly mix program and documentation and then extract one or the other as needed. It's well-suited to articles like this one. For more details, see "Cathedrals, Bazaars, and News Readers," July 1998, Page 57, and "Virtual Threaded News Reader," August 1998, Page 54, or take a look at our Web page.)

In addition to those outlined above, we needed some other features:

- The code needed to be portable

because we wanted to run it on our desktop SPARCs and our DOS-based laptops. (It turns out this code is sufficiently portable that we could also run it on Windows NT-based laptops loaded with Interix, a soon-to-be-certified port of UNIX to Windows NT. Interix used to be called OpenNT; Windows NT will soon be called Windows 2000.)

- The data files needed to be portable for the same reason—they couldn't depend on byte order.

- We wanted to be able to store a collection of files, such as RISKS, in a single ZIP archive and read that as if it were a directory.

- The ability to store "clippings" (that is, save parts of a file for later reference) would be useful.

- We wanted something small enough that we could run it out of RAMDISK on DOS. This means it would use minimum power when we were reading on an airplane. (Peter Neuman reports in RISKS that until airlines made provisions for power onboard, trans-Pacific flights

often found their restrooms occupied by laptops, more so than humans.)

We'll discuss each of these features as we develop the code, and we'll throw in some exercises for the reader along the way. Having said all that by way of setup, we can jump right in.

Let's begin by laying out the basic program:

```
<header files>
<prototypes>
<global data>
<class definitions>
<auxiliary routines>
<main program>
```

It will be helpful to have two versions of the main program: "test" and "production." So we can swap in test or production versions as necessary.

```
<main program>=
#ifdef TEST
<test main>
#else
<production main>
#endif
```

We can also guess a couple of the header files we'll need. We're going to do our input using the `stdio` library, rather than the newer C++ `streamio` package. (Exercise for the reader: How would you go about converting the program to use `streamio`?) We'll also need some standard definitions. Similarly, we know a priori that we're going to need to do some string processing—what do we write that doesn't? We've included both a DOS and a UNIX complement of `include` files. Notice that the `strcasemp` interface exists under various names, so we use a `#define` to work around that:

```
<header files>=
#define _ALL_SOURCE
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#ifdef __MSDOS__
#include <io.h>
#include <dos.h>
#define strcasemp stricmp
#else
#include <unistd.h>
#include <strings.h>
#endif
#include <sys/stat.h>
```

We're going to make use of a string routine that is common, `strdup()`, but we have run across C implementations without it. Let's add it just in case it's missing:

```
<prototypes>=
char *strdup(char *s);
```

And the routine itself:

```
<auxiliary routines>=
char *
strdup(char *s)
{
    char *x;
    x = (char *) malloc(strlen(s)+1);
    if( x != NULL )
        strcpy(x,s);
    return x;
}
```

Last, we've got some routines that we will define later but for which we need prototypes now:

```
<prototypes>=
void fatal( char *msg );
void warning( char *msg, char *s );
char *next_file_from_listing(void);
```

## Bookmark Class

We actually have two types of bookmarks. One is used to mark the point where we last left off on our linear reading of the material, but we also need to simulate fingers holding our place in the book as we flip back and forth chasing references, or places we want to read to our spouses later. For convenience, we'll refer to these as the *main bookmark* and the *supplementary bookmarks*. In the normal course of events, we'll only have a single instantiation of the `Bookmark` class.

```
<class definitions>=
<bookmark class definition>
<bookmark interface code>
```

The class internals are simple at the top level:

```
<bookmark class definition>=
class Bookmark {
public:
<bookmark interfaces>
private:
<bookmark data>
};
```

For the data, we need to include the following. (If we had structured our classes differently, we might have included a *FileList* class containing the list of files and a *BookMark* class containing a single bookmark. We could then instantiate a "BookMark" for the main bookmark, and one for each supplementary bookmark we used. Instead, we've decided to include all the data in a single class.)

```
<bookmark data>=
int file_count; // how many files
char **file_names; // the actual file names
ssize_t file_which, file_where; // main bookmark
```

```
// next some constants
enum { BOOKMARKS=26 }; // the array sizing
enum { EMPTY_BM=-1L }; // empty bookmark defn
// supplementary bookmarks
ssize_t bm_which[BOOKMARKS];
ssize_t bm_where[BOOKMARKS];
```

Let's add the prototypes for our interfaces to the class definition:

```
<bookmark interfaces>=
Bookmark(FILE *fp);
Bookmark();
~Bookmark();
void Add_File(char *name);
int Find_File(char *name);
void Write(char *name);
bool Query(char c,
            ssize_t &which, ssize_t &where);
bool Set(char c, ssize_t which, ssize_t where);
void Set_main(ssize_t which, ssize_t where);
bool Set_main(char c);
```

In addition, we'll add some inline routines to return data from inside the class:

```
<bookmark interfaces>=
char *
Current_File()
{ return file_names[file_which]; }

ssize_t
Current_FileNr()
{ return file_which; }

ssize_t
Current_Line()
{ return file_where; }

int
File_Count()
{ return file_count; }
```

And we need a handful of interfaces to modify data inside the class. (Exercise for the reader: Can you implement these as C++ overloaded operators?)

```
<bookmark interfaces>=
void
Prev_File()
{
    if( file_which > 0 ) --file_which;
    file_where = 0L;
}

void
Next_File()
{
```

```
if( ++file_which > file_count )
    --file_which;
    file_where = 0L;
}

bool
No_More_Files()
{
    return( file_which == file_count );
}
```

We need to define a global (variable) to tell us if we're (reading) a ZIP archive; for convenience, we'll save the file name of the archive. Also, if we're reading a ZIP, we unfurl the current file into the current directory. This means we need to access `basename(file)` if it's a ZIP we're reading; otherwise, `file`. We define a macro to test this for us:

```
<header files>=
#define we_are_zip ((zip_name != NULL))
#define locate(x) (we_are_zip? basename(x) : x)
```

The Boolean type is not necessarily part of the language—it has been in and out of the C++ specification so many times no one's quite sure. So we do some more defensive programming:

```
<header files>=
#ifndef bool
#define bool short
#define false 0
#define true 1
#endif
```

We've discovered that in older versions of certain DOS compilers, some useful constants may be missing:

```
<header files>=
#ifdef __MSDOS__
# ifndef FILENAME_MAX
#  define FILENAME_MAX BUFSIZ
# endif
# ifndef R_OK
#  define R_OK 04
#  define W_OK 02
# endif
#endif
```

Similarly, we're going to need a file in which to save our list of files and bookmarks. We'll define its name and the name of the printed clippings now, and save ourselves some grief later. We'll also define a single string containing both names. This will save us some effort in function calls later on, as we shall see.

```
<header files>=
#define INDEX "___ndx__"
#define PRINT "___prt"
```

## Work

```
#define INDEX_PRINT "___ndx__ ___prt"
```

At the same time, we'll need to define the global instances of the `Bookmark` class and the `zip_name` defined:

```
<global data>=  
class Bookmark;  
char *zip_name = NULL;  
Bookmark *marks;
```

How will the data be stored in the index file? In an effort to make the index file portable, we will write the file in flat ASCII. For example, the following sample index file for a selection of RISKS Digests contains a count of files, the names of the files, the main bookmark (in the form of file number and line number within file) and the supplementary bookmarks, which are lettered for convenience:

```
10  
risks17.60  
risks17.61  
risks17.62  
risks17.63  
risks17.64  
risks17.65  
risks17.66  
risks17.67  
risks17.68  
risks17.69  
7 90  
a 3 24  
c 4 93  
q 7 114
```

Next, we must provide the code for the methods we prototyped earlier. We begin by providing a method to read an open bookmark file. Let's do this in the constructor, as follows:

```
<bookmark interface code>=  
Bookmark::Bookmark(FILE *fp)  
{  
    char buf[BUFSIZ];  
    if( fgets(buf,BUFSIZ,fp) == NULL )  
        fatal("bad bookmark file: file_count");  
    file_count = atoi(buf);  
    // now we allocate the file names array:  
    file_names =  
        (char **)malloc(file_count*sizeof(char *));  
    // read the file names:  
    for( int i = 0; i < file_count; i++ )  
    {  
        if( fgets(buf,BUFSIZ,fp) == NULL )  
            fatal("bad bookmark file: file_name");  
        char *s;  
        if( (s=strchr(buf,'\r')) != NULL ) *s = 0;  
        if( (s=strchr(buf,'\n')) != NULL ) *s = 0;  
        file_names[i] = strdup(buf);
```

```
    }  
    // main bookmark:  
    if( fgets(buf,BUFSIZ,fp)==NULL )  
        fatal("bad bookmark file: main bookmark");  
    sscanf(buf,"%ld %ld", &file_which,  
           &file_where);  
    // range check current file number:  
    if( file_which >= file_count )  
        file_which = file_count - 1;  
    /* supplementary bookmarks: */  
    // ...begin by clearing them:  
    for_all_bookmarks(c) {  
        bm_which[MARK(c)] =  
            bm_which[MARK(c)] = EMPTY_BM;  
    }  
    // ...now read the ones in the file:  
    while( fgets(buf,BUFSIZ,fp) != NULL )  
    {  
        char c;  
        sscanf(buf,"%c %ld %ld", &c,  
              &bm_which[c-'a'], &bm_where[c-'a']);  
    }  
}
```

We've done a trick with the loop around the supplementary bookmarks that needs some explaining. We're going to be looping through those supplementary bookmarks frequently and we don't want to institutionalize the notion that there are only 26 of them. What we'll do is set up a macro for the loop and a macro to decode a bookmark name (whatever form that may take) into an array index. Note that we specify the loop variable to `for_all_bookmarks` so that we can use the same one with `MARK`. (This is a case where we might have been better with an inline function rather than a macro.)

```
<header files>=  
#define for_all_bookmarks(x) \  
        for(char x='a'; x<='z'; x++ )  
#define MARK(x) ((x)-'a')
```

We'll also need a method to provide an empty `Bookmark` instance. This gives us a way to generate a `Bookmark` with no files in it. In other words, it lets us bootstrap the `Bookmark` when we don't already have an index:

```
<bookmark interface code>=  
Bookmark::Bookmark()  
{  
    file_count = 0;  
    file_names = NULL;  
    file_which = file_where = 0L;  
    for_all_bookmarks(c){  
        bm_which[MARK(c)] =  
            bm_which[MARK(c)] = EMPTY_BM;  
    }  
}
```

We only need one destructor for the class:

```
<bookmark interface code>=
Bookmark::~Bookmark()
{
    for( int i = 0; i < file_count; i++ )
        free( file_names[i] );
    free( file_names );
    file_count = 0;
    file_which = file_where = EMPTY_BM;
    for_all_bookmarks(c) {
        bm_which[MARK(c)] =
            bm_where[MARK(c)] = EMPTY_BM;
    }
}
```

When starting up with a fresh file list, we need to be able to add files to the end of the list in the `Bookmark`. This routine will also be useful if we want to add files to an existing index. To do this, we just need to expand the existing array of file names:

```
<bookmark interface code>=
void
Bookmark::Add_File(char *name)
{
    file_count++;
    if( file_names )
        file_names =
            (char **) realloc(file_names,
                file_count*sizeof(char *));
    else
        file_names = (char **) malloc(sizeof(char *));
    if( file_names == NULL )
        fatal("can't add file to bookmarks");
    file_names[file_count-1] = strdup(name);
}
```

Similarly, we're going to need a method to find a file name in the file name list. If we don't have it, we'll return `-1`; otherwise, we'll return the index in the `file_names` array.

```
<bookmark interface code>=
int
Bookmark::Find_File(char *name)
{
    for( int i = 0; i < file_count; i++ )
        if( strcmp(file_names[i], name) == 0 )
            return i;
    return -1;
}
```

We will eventually need to write the bookmarks to a file. Normally, we would use the file specified by the `INDEX` macro. Given its name, producing the file itself is easy. (Exercise for the reader: How could we name the index file so it is hidden on DOS and UNIX, and use the same name on both systems?)

```
<bookmark interface code>=
void
Bookmark::Write(char *name)
{
    FILE *fp;
    if( (fp = fopen(name, "w")) == NULL )
        fatal("can't open bookmarks for writing");
    fprintf(fp, "%d\n", file_count);
    for( int i = 0; i < file_count; i++ )
        fprintf(fp, "%s\n", file_names[i] );
    fprintf(fp, "%ld %ld\n",
        file_which, file_where );
    for_all_bookmarks(c)
    {
        if( bm_which[MARK(c)] != EMPTY_BM )
            fprintf(fp, "%c %ld %ld\n",
                c, bm_which[MARK(c)], bm_where[MARK(c)]);
    }
    fclose(fp);
}
```

We'll also need to query and set supplementary bookmarks. When we ask for a bookmark, we will handle the file and line number by reference and return `false` if the bookmark is unset. When we want to set a bookmark, we'll return `false` only if the bookmark is out of range.

```
<bookmark interface code>=
bool
Bookmark::Query(char c,
    ssize_t &which, ssize_t &where)
{
    if( bm_which[MARK(c)] == EMPTY_BM )
        return false;
    which = bm_which[MARK(c)];
    where = bm_where[MARK(c)];
    return true;
}

bool
Bookmark::Set(char c,
    ssize_t which, ssize_t where)
{
    if( MARK(c) < 0 || MARK(c) > BOOKMARKS )
        return false;
    bm_which[MARK(c)] = which;
    bm_where[MARK(c)] = where;
    return true;
}
```

We'll also need a method for setting the main bookmark. If we choose a file out of the range of our array of file names, we only change the line number, not the file.

```
<bookmark interface code>=
void
Bookmark::Set_main(ssize_t which, ssize_t where)
```

```
{
    if( which >= 0 && which < file_count )
        file_which = which;
    file_where = where;
}
```

Also, we want a version of `Set_main` that sets from a given secondary bookmark and returns `true` if the bookmark is set:

```
<bookmark interface code>=
bool
Bookmark::Set_main(char bkmk)
{
    ssize_t which, where;
    if( !Query(bkmk,which,where) )
        return false;
    Set_main(which, where);
    return true;
}
```

We need to add some code so that we can handle the previous context as we do in `vi`: We can get back to the last place we were reading using a `'` command. But we won't do that now. (Exercise for the reader: How would you add that code?)

## Initial Setup, Command-Line Parsing

We need to get in here and define the skeleton of the main program, which will include the following:

- How to parse the files and flags on the command line.
- How to distinguish text files from ZIP archives.
- How to set up the initial index file.
- How to instantiate the `Bookmark` class.

```
<production main>=
main(int ac, char *av[])
{
    <parse the command line>
    <instantiate and populate Bookmark>
    <additional index processing, if needed>;
    <process the files>
    return( 0 );
}
```

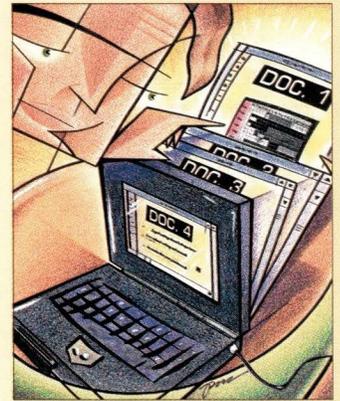
Next, we can parse the command line. There are a few cases to consider:

1. There are no arguments.
2. The first argument on the line is a plus sign (+).
3. The first argument on the command line is a ZIP archive.
4. The first argument on the line is a file.

We'll explain the action in each case as we go along, but the fundamental goal is to identify and open the index file, resulting in a `FILE *` for the index.

An earlier version of this program recognized additional flags, in particular, the flags for encryption in the various ZIP tools. We're not going to support that here, for two reasons: First, there is a lot of difference between encryption in the Info-ZIP utilities on UNIX and in the PKZIP utilities on DOS—the

*If there are no arguments, then we should already have an index file in our current directory. If we have no arguments and cannot open an index file, we've got a problem.*



UNIX versions want the passwords from the console not on the command line, for example. Second, such encryption is adequately provided by external programs such as the Info-ZIP `zipcloak` and Phil Zimmerman's Pretty Good Privacy (PGP). When we wrote the original program, we added a note apologizing if the U.S. cryptographic regulations made it difficult for users to get those software packages, but now it's probably easier to get them from outside the United States.

```
<parse the command line>=
FILE *fp = NULL; // the index file pointer
```

If there no arguments, then we should already have an index file in our current directory. If we have no arguments and cannot open an index file, we've got a problem.

```
<parse the command line>=
if( ac == 1 )
{
    if( access(INDEX,R_OK) != 0 )
        fatal( "no arguments and no index file?" );
}
```

If the first argument is a plus sign (+), we want to add the files given here to the existing index file. We should already have an index file. We'll set a flag to tell us that we're adding and deal with their names later:

```
<parse the command line>=
else
if( strcmp(av[1],"+") == 0 )
{
    if( access(INDEX,R_OK) != 0 )
        fatal( "files to add but no index file?" );
    adding_files++;
}
```

For that last case, we need to declare the variable:

```
<global data>=
int adding_files = 0;
```

Next, we need to determine if our first argument is a file.

Because it may be a ZIP archive, we'll try both the given name and the name with `.zip` appended. If the first argument is not a file, we're in trouble. The status messages are not strictly necessary but allow us to see what progress is being made.

```
<parse the command line>=
else
{
    char name[FILENAME_MAX];
    char namezip[FILENAME_MAX];
    strcpy(name, av[1]);
    strcpy(namezip, av[1]);
    strcat(namezip, ".zip");
    if( access(name,R_OK) != 0 )
    {
        printf("can't open %s, checking %s\n",
            name, namezip); //???
        if( access(namezip,R_OK) == 0 )
            strcpy(name,namezip);
        else
            fatal( "can't open first file" );
        printf("whew! got %s\n", name); //???
    }
    <check if we're a zip>
}
```

If we reach this next section of code, we have a readable file. (If not, we invoked `fatal()` in the last section.) Let's check if we're reading a ZIP file: The magic cookie is `PK\003\004`. If so, we'll set `zip_name` and try to extract the index and clippings files:

```
<check if we're a zip>=
char buf[BUFSIZ];
fp = fopen( name, "rb" );
fgets(buf,BUFSIZ,fp);
if( strcmp(buf,"PK\003\004",4) == 0 )
{
    zip_name = strdup(name);
    <clobber an existing index file>
    <unzip the index and print files>;
}
fclose(fp);
```

If we are reading a ZIP (which we must be if we're inside this `if`) we must remove any existing index file before we unpack the new index file. We're set up to overwrite it, but if the current directory has an old index file, and our current zip doesn't have one yet, we could be looking at an unrelated index.

```
<clobber an existing index file>=
if( access(INDEX,R_OK) == 0 ) unlink(INDEX);
```

If we can open an index file, we can instantiate a populated `Bookmark` from it. If not, we can create an empty `Bookmark`

object and proceed from there. We still haven't dealt with the issue of adding files if we had a plus sign (+) argument; we'll do that at the end.

```
<instantiate and populate Bookmark>=
if( (fp=fopen(INDEX,"r")) != NULL )
{
    marks = new Bookmark(fp);
    fclose(fp);
} else {
    marks = new Bookmark();
    <populate the bookmarks>
}
<possibly add files>
```

If we don't already have an index file, we need to populate one. We only need to worry about this in the non-ZIP case. In the ZIP case, we populate the file names into the `Bookmark` when we synchronize the listing with the list in the `Bookmark`, as follows:

```
<populate the bookmarks>=
if( !we_are_zip )
{
    <populate text bookmarks>
}
```

Populating a non-ZIP bookmark is pretty easy, we just add all the file names to the list on the command line:

```
<populate text bookmarks>=
for( int i=1; i < ac; i++ )
    marks->Add_File(av[i]);
```

Now, we return to conditionally adding files from the command line:

```
<possibly add files>=
if( adding_files )
for( int i = 2; i < ac; i++ ) {
    if( access(av[i],R_OK) == 0 )
        marks->Add_File(av[i]);
    else
        warning("can't open file to add %s", av[i]);
}
```

There is one other major order of business. In general, if we are reading a ZIP file, we want to synchronize the index file to the files actually in the archive. That is, if files have been added to the archive since the index file was created, we want to add them to the file list in the `Bookmark` class (we ignore files removed from the archive). We use the service routine we just postulated to achieve this. Note that this will also handle the initial population of the index from the ZIP if we are lacking an index file.

We perform the synchronization only if there is an index file present; if there is not an index file, then we just create

a `Bookmark` from the listing (we already know what the full complement of files are). We ignore the index and clipping files.

We finish this step by unlinking the index file, because we don't need it while we're reading—it's in memory—and we'll recreate it at the end:

```
<additional index processing, if needed>=
if( we_are_zip )
{
    char *s;
    while((s=next_file_from_listing()) != NULL)
    {
        if( marks->Find_File(s) < 0 &&
            strcasecmp(s,INDEX) != 0 &&
            strcasecmp(s,PRINT) != 0 )
            marks->Add_File(s);
    }
    unlink(INDEX);
}
```

## The Test Driver

This is slightly out of order, but we'll address some test code next. In the best of all possible worlds, we would provide a full set of test scripts to run in parallel with this. Instead, we provide some pretty simple-minded routines to exercise the methods in our `Bookmark` class. To ensure that the `Bookmark` suite is working, we need to examine the generated bookmark file `foo`. (Exercise for the reader: Build a more comprehensive test driver.)

```
<test main>=
main(int ac, char *av[])
{
    FILE *fp;
    fp = fopen("a","w"); fclose(fp);
    fp = fopen("b","w"); fclose(fp);
    fp = fopen("c","w"); fclose(fp);
    marks = new Bookmark();
    marks->Add_File("a");
    marks->Add_File("b");
    marks->Add_File("c");
    unlink("a"); unlink("b"); unlink("c");
    marks->Set_main(1L,27L);
    marks->Set('r',2L,84L);
    marks->Write("___foo");
}
```

## Leftovers

We have a few leftover routines from the work above, which we'll write next time. In the meantime, we need to name them and provide their prototypes.

The first thing we need to do is display the files:

```
<process the files>=
process_the_files();
```

We also need code to extract the index and print files if we're reading from a ZIP archive:

```
<unzip the index and print files>=
unzip_index_print();
```

And prototypes for both routines:

```
<prototypes>=
void unzip_index_print( void );
void process_the_files( void );
```

Next time, we'll provide the code for these and also build the actual interface to `less`.

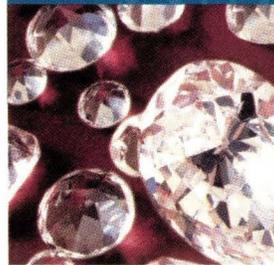
Until then, happy trails. →

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

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# Brighter Days for NCS?

PAUL ZWOLAK

# Network Computers

**A little like the weather, the Network Computer market is one day sunny and clear, the next overcast and dreary.**

by Suzanne Hildreth, Staff Editor

**M**iguel Barreiro Paz is the type of customer who gives proponents of network computing cause for hope. Paz, a researcher in the computer science department at the Universidad da Coruna, Spain, is in the process of evaluating Network Computer (NC) products for use in a citywide project offering local schools access to the Internet and to Java-based educational and productivity software. The high-speed network being coordinated by the council will eventually connect up to 900 NCs in 68 schools, two museums and four libraries in this regional hub of 230,000 residents. In October, Paz began putting Sun Microsystems Inc. JavaStations and IBM Corp. Network

Stations through their paces.

Coruna opted to go the NC route, says Paz, in part because it needs low-maintenance alternatives to PCs, and also because it wants to develop a completely cross-platform network. "We need Java for standardization," says Paz. "All new development will be done in Pure Java and will replace Windows-based ones progressively."

The city of Coruna, and other municipalities, corporations and organizations planning to implement a Java-based network computing environment, represent a silver lining for the struggling NC industry.

Of course, where you find a silver lining, you also find dark clouds. If industry sales data serves as an

# Network Computers

accurate barometer, the climate in the NC market is undeniably overcast. In 1998, NC vendors sold a meager 265,000 units, according to estimates by International Data Corp. (IDC), a research firm based in Framingham, MA. NCs are defined as diskless Java-based network terminals capable of limited local processing. Vendors expect to ship only slightly more in 1999, a mere 330,000. Not exactly the volume of sales forecast back in the glory days of 1996 when Sun had just unveiled its plans for the JavaStation, and Larry Ellison, chief executive officer of Oracle Corp. and its subsidiary Network Computer Inc. (NCI), was weaving visions of an NC on every desktop. Back then, Ellison was predicting a total shipment of 100 million NCs by 2000.

Ellison's enthusiasm for NCs has since waned considerably. In April, he publicly asserted that any desktop computer with a Web browser was, in fact, an NC. While technically true, it wasn't the sort of statement that clarifies the concept of an NC for potential customers and investors, or lends credibility to the market (see "What's an NC?"). Ned Miller, vice president of DLT Solutions Inc., a Herndon, VA-based systems integrator and reseller of NCI NCs, says his NC sales dipped noticeably following negative comments from a "certain industry executive," presumably Ellison. "It gave Microsoft [Corp.] an opportunity to come forward with its Hydra Windows-based terminals, and customers began investigating that technology [instead of Java-based NCs]," Miller says.

Speaking of Microsoft, 1998 also heralded the arrival of its Windows NT 4.0 Terminal Server Edition (TSE) and an upsurge in vendors pushing Windows-based terminal (WBT) products. Eileen O'Brien, director of NC research for IDC, says, while only 241,000 WBT products shipped this year, sales will jump to 494,000 in 1999 and 791,000 in 2000—a

rate of growth substantially higher than she is predicting for Java-based NCs.

Which doesn't mean the network computing game has been called off because of rain. The problem is too many people compare the current market with the optimistic forecasts of a year or two ago. "NCs got way overhyped and then there was a backlash and everyone assumed they were dead," says Greg Blatnik, vice president of Zona Research Inc., a research firm based in Redwood City, CA. "But I think we're going to see them rise from the grave and get used in a number of places where they make sense."

There have been a few sunny breaks this past year. While NCs have failed to sweep PCs and workstations off the desktop, they have made a number of small but solid inroads. According to IDC, Sun sold 5,000 units of its JavaStation (released in March) in the second quarter of this year—not exactly a sellout showing, but at least it's a start. And since then, Sun has landed a few major deals, such as a remarketing agreement with travel conglomerate The Sabre Group, Fort Worth, TX, to resell the JavaStation bundled with The Sabre Group's own reservation software to travel agencies and airlines. IBM, the other major NC vendor, sold an estimated 55,000 of its three NC models, the Network Station 100, 300 and 1000, in

the first half of 1998, according to IDC.

Wyse Technology Inc., San Jose, CA, is back in the market after a false start in 1997. Then, the long-time terminal vendor abandoned plans to produce a Java-based NC and expanded its line of Windows-based terminals instead. Now, however, Wyse has unveiled its Winterm 5000 network terminal, a product that is designed to hook up to whatever the customer has available, be it an intranet, UNIX, server-side Java or multiuser Windows, and provide the graphical interface, according to Wyse. Another traditional Windows termi-

**While NCs have failed to sweep PCs and workstations off the desktop, they have made a number of small but solid inroads.**

## What's an NC?

**A** lot of vendors are calling their products NCs, but not all are technically Network Computers. Conversely, a few companies with products that do meet the specifications for an NC are positioning them as Windows-based terminals (WBTs) instead. To know if you're looking at a true Java NC, you have to turn to the specifications set forth by The Open Group, a Cambridge, MA-based organization of vendors, customers and industry veterans that has become the keeper of NC standards.

In 1997, The Open Group released the first NC Reference Profile defining what minimum features an NC client must include. In October, The Open Group finished work on the second version of those specifications. This new

version (<http://www.opengroup.org/nc/pubs/catalog/C720.htm>) includes the same basic requirements as the original, a Web browser capable of running Java applets, support for SMTP and a user interface with text input capability, plus some new additions.

Under the new Open Group specifications, NCs must also be able to execute a Java application, not just an applet in a browser, as well as a full email client (not just SMTP, which allows users to send email by clicking on the "mailto:" tag in a Web page) and must include support for Adobe Systems Inc. Portable Document Format (PDF) documents. Features such as terminal emulation, support for Cascading Style Sheets (CSS) and support for a distributed object environment are optional.—sjh

nal maker Sherwood America Corp. (Sherwood Network Division), Hayward, CA, announced its first Java-based NC in July: the \$600 Sherwood 9000SC. It features a 166-MHz Intel Corp. Pentium processor, 16 MB of RAM, a Netscape Communications Corp. browser and a Java Virtual Machine (JVM) for running Java applets on the client.

Keith Gaylord, product marketing manager for IBM's NC division, predicts that the market for NCs will soon begin to pick up, particularly in industries with a lot of data-entry and data-access transactional applications, such as the insurance, banking and retail industries. "[NCs] will move from an early adoption stage to a commodity stage—and I think we're seeing that begin to happen," Gaylord says.

## Performance Issues Cloud the Horizon

Before corporate America begins to buy NCs by the boatload, however, a couple of concerns need to be addressed.

**SPEED.** For one thing, NCs aren't always as stunningly fast as vendors would like us to believe. Speed depends on a number of things, including CPU speed, network bandwidth, the size of the applications and how much the NC runs off the server as opposed to local memory.

Some NCs store their operating systems in ROM or on a flash RAM disk, which can be removed and updated. Others download entire operating systems over the network. Madhu Siddalingaiah, principal of computer consulting firm Praxis-NET Inc., Alexandria, VA, and a JavaStation customer, says his JavaStations took their time downloading the operating system and HotJava Views Java-based desktop software over his 10baseT Ethernet network. "Booting one up would take a good two or three minutes," he says.

However, Ted Murguia, group hardware manager for Network Computer systems at Sun, says with just the operating system installed, it takes 45 to 50 seconds for his own JavaStation to boot. Also, the JavaStation can be purchased with flash RAM, which helps speed the boot time somewhat over busy networks.

Colin White, founder of DataBase Associates International Inc., an IT consulting firm based in Morgan Hill, CA, says the initial boot is much more of a problem for dial-up users than for local-area network (LAN)-based and wide-area network (WAN)-based NCs. "As long as the NC is connected to a network and can cache the applications, it's not a problem," says White. "But if you're a remote user and have to keep dialing in over the phone line all the time, it would be."

The speed of the CPU can affect performance for users who plan to do a lot of client-side processing, such as running Java applets. NC products have a fairly wide range of processors and clock speeds. The IBM Network Station 1000, for example, which is touted as being suitable for running Java applications, has a 200-MHz PowerPC 603e chip, while its low-end cousin, the 100, has a mere 33-MHz chip. Sun's JavaStation currently sports a 100-MHz MicroSPARC IIep chip, although future models of the JavaStation will get considerably speedier when Sun replaces its current MicroSPARC line with the UltraSPARCe line of 300- to 500-MHz processors.

**INTEROPERABILITY.** Currently, it's difficult, if not impossible, to connect one vendor's NC to another vendor's server. That's because some NCs, such as the JavaStation and Network Station, come with their own server software for booting and managing files and user configurations. So while you may be able to boot the NC off another vendor's server, you might not have full access to its files or be able to connect to network printers.

To foster a greater degree of interoperability between NCs and NC servers from different vendors, The Open Group, a Cambridge, MA-based organization of vendors, customers and industry veterans that has become the keeper of NC standards, released a new set of standards in October, detailing how NC clients and servers ought to communicate (<http://www.opengroup.org/nc>). For example, the specifications list some common management requirements such as support for SNMP and NFS.

The next step, says Shane McCarron, testing research manager for The Open Group, will be to establish how user configuration data is specified and accessed, so that each end user's GUI and directories can be brought up from any NC on the network.

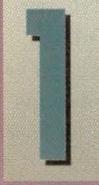
At the moment, however, few consumers appear to really care whether or not an NC meets The Open Group's specifications—perhaps because only Sun and IBM currently have Open Group-certified products. Most companies seem to base their NC purchasing decisions either on the platform they have in place—Sun shops go for JavaStations because the JavaStation's Netra j server software runs on Solaris—or on the functions they need accomplished. Terminal emulation, for instance, isn't part of The Open Group's specifications, but it is nevertheless provided on just about all NCs. The same goes for X terminal support and, increasingly, support for the ICA protocol for communicating with Citrix Systems Inc. WinFrame or Microsoft NT 4.0 TSE multiuser Windows-based products. A few also provide support for Token Ring, in addition to the standard TCP/IP over Ethernet. Some NC vendors include support for local printing, some for network printing and some for both. Others offer various types of multimedia support.

It's this multiplicity of supported protocols and features that may, in the end, be the best barometer of what the forecast for NCs will be in the coming year. Because, if nothing else, it's proof that there are many different ways an NC can provide the benefits of network computing—be it through Java or terminal emulation, X terminal access or multiuser Windows or via all of them at once on the same NC. And it shows that corporate customers really do like the idea of network computing, even if they're not sure they want to do it all in Java, at least not yet. And while they're experimenting with Java development, they're putting NCs to work handling the many existing computing needs from X terminal access to legacy access to Web access. Even Miguel Barreiro Paz in Coruna, Spain, says that the city's network computing strategy includes provisions for access to Windows applications in cases where a similar application just isn't available in Java. "Schools may want to use Windows software, like CD-ROM

encyclopedias and such," says Paz. And one school in Coruna is currently using X terminals to access a couple of UNIX-based simulation packages. "Everyone needs to recognize that the world is bigger than just Windows terminals or just NCs. The world is a melting pot," says Zona Research's Blatnik.

And here's a look at four of the "melting pot" ways in which IS managers are putting NCs to work, from X terminal access to Java computing...

## CASE STUDY



### NCs AS TECH SUPPORT SAVERS

The Contra Costa County, CA, IT department has just three full-time IT employees and 6,000 desktops to support. So when IBM sales representatives came around to demonstrate five Network Station 100 terminals in fall 1997, pitching them as low-cost, low-maintenance desktops, John Forberg, deputy director for IT for Contra Costa County was very interested. NCs sounded like a possible solution to his chronic IT labor shortage, Forberg says, as well as to the problem concerning what to do with the 300 or more 3270 terminals and the aging Data General Corp. mainframe the county needed to replace as part of its Year 2000 program.

His staff installed the first batch of 180 NCs—priced at about \$900 for CPU and monitor—in the Consolidated Courts division last spring. More NC purchases are planned, including 500 for the county's Department of Human Services, Forberg says.

The main benefit so far has been a reduction in technical support demands. "Typically, it takes about two hours to configure a PC, compared to a couple of minutes for an NC," says Forberg. "Everything is centrally administered and centrally backed up. We don't have to run around downloading files to all these machines and we don't have users constantly deleting critical system files."

Because Contra Costa County employees need to access the Internet, a few Windows applications and a variety of databases running on AS/400s, RS/6000s and an ES/9000 mainframe, Forberg says he appreciated the NC's ability to run Citrix's ICA client for access to multiuser Windows NT applications, as well as its ability to support various types of terminal emulation. "You can pretty much get access to anything," he says.

With the additional NCs, however, come greater demands on server memory and processing power. Forberg plans to beef up capacity as more NCs are added to the network: "We're expecting to operate at a ratio of about 15 users per CPU and 256 MB of RAM. A server that's just doing file and print services can handle a lot more users than that," Forberg says.

Sean Thomas, senior network consultant for Rhino Technology Inc., the Benicia, CA-based consulting firm that helped install the Contra Costa NCs, says the county also added separate boot servers at various locations. "The only time there's really a heavy bandwidth demand is when those things first boot up and download the OS," Thomas says.

## CASE STUDY



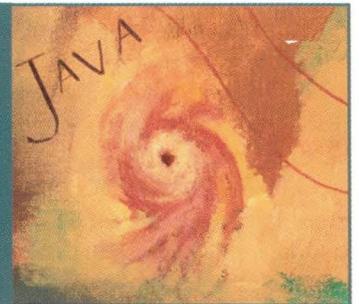
### JAVA ON THE DESKTOP

Java is the reason that Scotia Capital Markets, a subsidiary of Toronto, Ontario-based Scotiabank, is investing in NCs. The company first began to appreciate the potential value of Java on NCs about two years ago, when a boom in mutual fund markets proved to be a bust for Scotiabank's existing legacy order-processing system. Under the old system, brokers would input orders via an ASCII client linked to a Digital Equipment Corp. VAX machine. The VAX, in turn, passed the data to various other back-end systems. Unfortunately, because none of the front-end systems had the ability to perform online order verification, many of the orders contained errors and had to be reconciled by hand. "Some orders might not get executed on the same day because the staff couldn't keep up with the flow," says Manoj Jain, senior manager for architecture, engineering and development at Scotiabank.

So Scotiabank decided to build a new Java-based mutual funds application that would be accessible from both PCs with browsers and NCs. "We wanted a tool that can be used widely in all platforms, and Java seems to fill that bill. It also fits in with the trend [in financial services] of taking applications right to the customer's desktop. If you're using Java, you can do that," Jain says.

For its NCs, Jain selected Sun JavaStations because Scotiabank is primarily a Solaris environment. In October 1997, Scotiabank received its first shipment of 15 JavaStations, which Jain and his staff set up to run email, a Web browser and a Java-based mutual funds package.

**'We wanted a tool that can be used widely in all platforms, and Java seems to fill that bill.'**  
— Manoj Jain, Scotiabank



During the next 12 to 18 months, Scotiabank plans to deploy additional JavaStations—perhaps as many as 550—to administrative and managerial staff in Client Services and Operations, the umbrella division that houses the mutual fund division. They'll be used by employees to run the Java mutual fund application, email, Web browsers, 3270 terminal emulation and, hopefully, word processing, workflow and other productivity software written in Java. Unfortunately, a lack of Java software availability may slow the rollout, says Jain. "There aren't that many applications out there yet," he says. He's currently considering StarOffice for Java, a Java-based desktop productivity suite sold by Star Division GmbH based in Hamburg, Germany.

A few PCs and Sun workstations will remain on employee desktops, but only in instances where the user needs to run

# Network Computers

high-end software, such as market data analysis packages. Those types of applications require too much local memory and are too compute-intensive to be delivered over a network. But he hopes to eliminate as many of the PCs as is practical. "The idea behind using the JavaStations is the overall cost of ownership," says Jain. "PCs are overkill in certain areas. For example, for staff who only need access to a few server-based applications with Web-based front ends and email, it's easier to roll out a Network Computer than a PC."

## CASE STUDY

# 3

### X TERMINALS DOUBLE AS NCs

Yarde Metals Inc., a metals distributor based in Bristol, CT, has enjoyed the benefits of network computing for several years. Yarde's Chief Information Officer, Walter Wulczak, first became interested in NCs back in 1992 when Yarde was experiencing rapid growth and rising sales volume. Wulczak wanted sales representatives to be able to have several order screens open at the same time—a capability that the company's small green-screen Televideo 950 ASCII terminals couldn't provide.

"This place is so busy, you don't always have time to close out one order before you pick up the phone to take the next one," says Wulczak. "We wanted larger screens so that sales people could bring up three or four separate order-entry screens at a time."

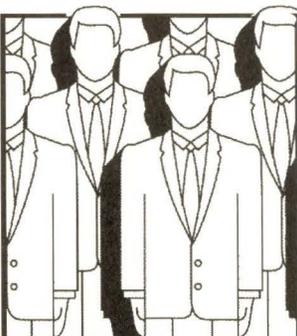
'If a person mainly does order-entry and only rarely needs access to Windows applications, then we look to getting them access to Windows from their [NC] terminal.'

— Walter Wulczak,  
Yarde Metals Inc.



Yarde also wanted to reduce paperwork by creating a database of scanned documents—paper files that typically accompany a shipment of metals, such as tracking slips, sales slips, certificates listing each metal's physical and chemical properties and so on—that could be accessed by sales reps via their terminals.

The answer, it seemed, lay in NCs (then called X terminals). Wulczak negotiated a deal with Neoware Systems Inc., King of Prussia, PA (formerly Human Design Systems Inc.), for the purchase of 13 ViewStation X terminals equipped with 19-inch monitors at a cost of \$2,500 each. Those original 13 were later replaced with newer models and the company has



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# Network Computers

continued to add Neoware @workStations and NeoStation 540s as it has added employees. Today, the company's 110 NCs provide X terminal access to WordPerfect for UNIX and the company's main UNIX-based application, MetalTraq from Decision Tree Systems Inc., Hamilton, OH, which resides on an Intel-based DEC server. The NCs also provide Web access to the company's intranet and to the 80 or more printers and four Fujitsu Ltd. scanners scattered around its facilities, as well as access to a 64-GB database of scanned paper documents. Also in the works are Java applications to display graphs of real-time inventory data on every desktop.

Because the NCs put a heavy demand on the main DEC server as well as the nine or so other servers providing faxing, document scanning and miscellaneous data and application access, Wulczak installed additional boot servers at Yarde's four branch offices in Connecticut, Massachusetts, New Jersey and New York, each of which is connected to the main facility in Bristol, CT, via a 10baseT Ethernet LAN.

Wulczak is also considering the purchase of Microsoft NT 4.0 TES, so that employees can use Windows applications from their NCs. Both the @workStations and NeoStation 540s support the ICA client protocol for access to multiuser NT. Wulczak prefers that approach to adding more PCs. In fact, although the company has 315 employees, there are only 20 PCs currently in use. "We look at justification when it comes to PCs. If a person mainly does order-entry and only rarely needs access to Windows applications, then we look to getting them access to Windows from their terminal," Wulczak says.

## CASE STUDY

# 4

## NCs AS INTERNET KIOSKS

What do you do when you have more than 17,000 end users who need access to email and the Internet but who don't have their own desktop computers? At Boston College, Newton, MA, the answer is Internet kiosks.

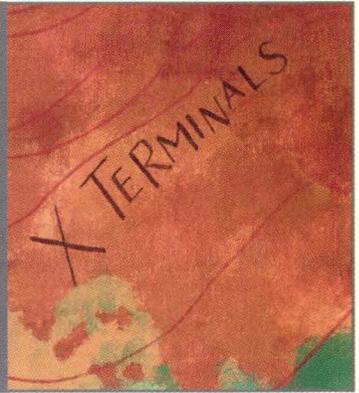
In 1997, BC began experimenting with "email-only" Apple Computer Inc. Macintosh computers. However, the Macs required a lot of tech support and BC was looking for a low-maintenance alternative. So when IBM offered to donate eight IBM Network Stations as part of a pilot program earlier this year, BC readily accepted. Today, BC has close to 50 IBM NCs, mostly model 300s, in various locations around campus and is in the process of deploying another 30. Each unit includes 32 MB of RAM and connects to an IBM RS/6000 Scalable POWERparallel system running AIX and IBM NC server software.

"The beauty of the Network Stations is that the programming and maintenance of the software is done in a central location, so the end users aren't involved," says Mary Corcoran, associate director of technology planning and integration for Boston College.

BC students and staff access the Internet and college intranet via the Network Solutions Inc. Navio Web browser that is downloaded to each NC when booted. Email is provided by PonyEspresso, a Java-based application from i-Planet Inc., Sunnyvale, CA (recently acquired by Sun). "It runs as a Java

'The beauty of the Network Stations is that the programming and maintenance of the software is done in a central location, so the end users aren't involved.'

— Mary Corcoran,  
Boston College



applet inside of the Web browser, so users can access their email off-campus without having to have an IMAP client running locally," says Ed Greene, technical support programmer at BC.

The Network Stations did require some tweaking. For one thing, the NCs came configured as single-user terminals, with a logon prompt that appeared when booted. Corcoran didn't want each user to have to remember to log on and off for every session. So the NCs were reconfigured to automatically log on to a generic account. Now, users only have to remember to close the Java-based email applet before leaving.

They also didn't want users to be able to reboot the NCs—a procedure that taxes the network with an 8-MB download of the operating system and browser. So the CPU boxes were hidden inside locked cabinets. Now, all of the NCs are rebooted remotely each morning, at which time any software updates are also downloaded.

The only downside, says Corcoran, is price. "The price point is still a little bit high for us. We had to purchase additional memory for the NCs and that added another \$150 or so to each, putting them right up into the low-end of the PC range." She hopes that falling PC prices will continue to force down the cost of NCs. And she may be right. In April, for instance, IBM lowered the prices on its Network Station 100s to \$499 and to \$629 for its Network Station 300s. ➔

## NC VENDORS MENTIONED IN THIS ARTICLE

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### NEOWARE SYSTEMS INC.

400 Fehelley Drive  
King of Prussia, PA 19406  
<http://www.neoware.com>

Circle 141

### NETWORK COMPUTER INC.

1000 Bridge Pkwy.  
Redwood Shores, CA 94065  
<http://www.nc.com>

Circle 142

### SHERWOOD AMERICA CORP.

(Sherwood Network Division)  
21056 Forbes St.  
Hayward, CA 94545  
<http://www.sherwoodterm.com>

Circle 143

### SUN MICROSYSTEMS INC.

901 San Antonio Road  
Palo Alto, CA 94303  
<http://www.sun.com>

Circle 144

### WYSE TECHNOLOGY INC.

3471 N. First St.  
San Jose, CA 95134  
<http://www.wyse.com>

Circle 145

# The Search for Substance

*Traditional search engines are fast refashioning themselves as 'portals,' but is this seemingly more democratic search model benefiting users or advertisers?*



Using one of the popular Internet search engines used to feel a lot like going to a yard sale: you never knew exactly what you were going to find. A typical specimen would offer an unpredictable selection of goods, strewn randomly about or, if you were lucky, grouped into inscrutable categories. Perhaps you came with a toaster in mind, but would leave with an eggbeater and a warped Frank Sinatra record.

These days, going to one of these search engine sites feels more like entering an upscale department store. Rechristened "portals," today's search engines feature a well-rounded selection of goods, which are clearly marked and of reasonable quality—"Juniors on Two, Housewares on Four." As a matter of fact, everything that a reasonable person might need can be found under the umbrella of one, central portal site.

For most people, this current state of affairs smacks of progress. After all, who really wants to get a snippet from an archived newsgroup in their search results? Isn't the Web inherently more useful when its content has already been filtered by the portal site's editors and gets distributed from one, easily navigated site?

The advent of the portal site might be good news for your average consumer, and it is clearly good news for the portal companies themselves (case in point: Yahoo! Inc.'s stock market price). However, the portal model also raises a lot of questions about who is left behind when we abandon the messy, but egalitarian, search engine model, for the neat, consumer-oriented portal approach.

Illustrations by ERIN TERRY

## Where Did Search Go?

One of the first questions you'll ask when you visit one of the big, erstwhile search engine sites, such as Excite (<http://www.excite.com>), Yahoo! (<http://www.yahoo.com>) or Hot-Bot (<http://www.hotbot.com>), is, where's the search form gone to? The search form, once the visual focus of any search engine's home page, now seems lost amid the clutter of stock quotes, weather maps, news headlines and advertisements.

The search feature gets even more marginalized once you "personalize" your search engine site. Once a portal site has been properly informed of your preferences and interests, the search field becomes even more insignificant, relegated to an undistinguished corner of the page. Indeed, what do you need to search for when all this nifty, "personalized" content is right there at your fingertips?

But perhaps the best indication of the current status of portal site searches is the page placement of the actual results. A search for "Clinton" on Lycos (<http://www.lycos.com>), for example, returns in first place a Barnes & Noble Inc. link to the Starr report. The same search on Excite returns CBS and CNN news reports about the president. For pure search results, that is, results generated by applying a search algorithm to an index of Web pages, you must scroll all the way down the page, past editorially determined categories such as "Check These Out" and "Directory Matches." There, and only there, can you begin to find information about, say, the Clinton-Massie Local School District in Clarksville, OH. In the olden days, Clinton-Massie would

have figured right up there at the top, and links to commercial sites would have been nowhere to be found.

Indeed, says Chris Copeland, director of operations at Webster Group International Inc., a St. Louis, MO-based company that offers Web site promotion services (including [www.SitePromoter](http://www.SitePromoter.com), a software package designed to help sites optimize their placement within popular search engines), the sense that portal sites are simply vehicles for large commercial Web sites can be so strong sometimes it feels like the "search engine portion of the [portal] business is just there to appease the business legacy."

### It's the Economics, Stupid

What's changed in the world of search engines is that somewhere down the line these organizations figured out they probably weren't going to make a lot of money selling ads to school districts like Clinton-Massie, but could be fairly successful selling ads to large commercial sites such as Barnes & Noble.

The result, understandably enough, has been to devalue search results obtained by a logical search algorithm and promote results that generate advertising revenue. In the days when search engines existed solely as research projects, such as Yahoo! and AltaVista (<http://www.altavista.com>), and were financially unaccountable for their actions, they could afford to have the Clinton-Massie local school district near the top of their results page.

Things are different now. As for-profit ventures, search engine sites have joined the rest of the world in a quest for cash, which in the portal world—as with other media outlets—comes from one basic source: advertising. And like other

**As for-profit ventures, search engine sites have joined the rest of the world in a quest for cash, which in the portal world comes from one basic source: advertising.**

media formats such as print and television, portal sites must grapple with the ethical question of where to draw the line between content and advertising.

The portal equivalent to the television commercial is clearly the banner advertisement—the clickable, animated GIF images that usually reside at the top of a Web page. These ads might not be as visually compelling as their mass media counterparts (yet) but they do feature one significant advantage over other forms of advertising: These ads can be targeted,

that is, portal sites have the ability to display them when, and only when, they have good reason to believe the person viewing the ad is interested. For example, if a visitor performs a search on "Bahamas," the portal might return a page of results with an ad for a travel agency plastered across the top. The portal can do this because it sells popular "keywords" to advertisers. In this example, the travel agency might have purchased keywords such as "Caribbean," "Jamaica" or "Bahamas."

Increasingly, though, portals are banking on more indirect streams of revenue such as category sponsorship and link ex-

changes. For example, an online music store might sponsor a category on music. This is the case at the Yahoo! site when you bring up its Music category, which features a prominent link to online music retailer CDnow.

To give the sites some credit, actual search results on major portal sites do not appear to be doctored. "To my knowledge, you can't actually purchase placement in the results of a search," says David Levin, vice president of strategic planning at i33 Communications Corp., an online advertising agency based in New York City. However, that doesn't mean it hasn't happened in the past. "In my opinion, just about anything can be bought," adds Levin. "Whether it's traditionally sold is another question." For example, there have been ad industry rumors circulating that Microsoft Corp. had at one point brokered a deal with search engine giants Lycos and Infoseek (<http://www.infoseek.com>) for a seven-figure sum to return a Microsoft product at the top of certain search listings. Revenue from the deal, however, proved to be disappointing and it was not renewed.

### The Problem with Portal Advertising

When it comes to portal sites and advertising, it's easy to argue—to take our earlier example—that recent coverage of President Clinton has more relevance to more people than a Web site about the Clinton-Massie school district and, therefore, the portal site's placement of paid sponsors above straight results is right and good.

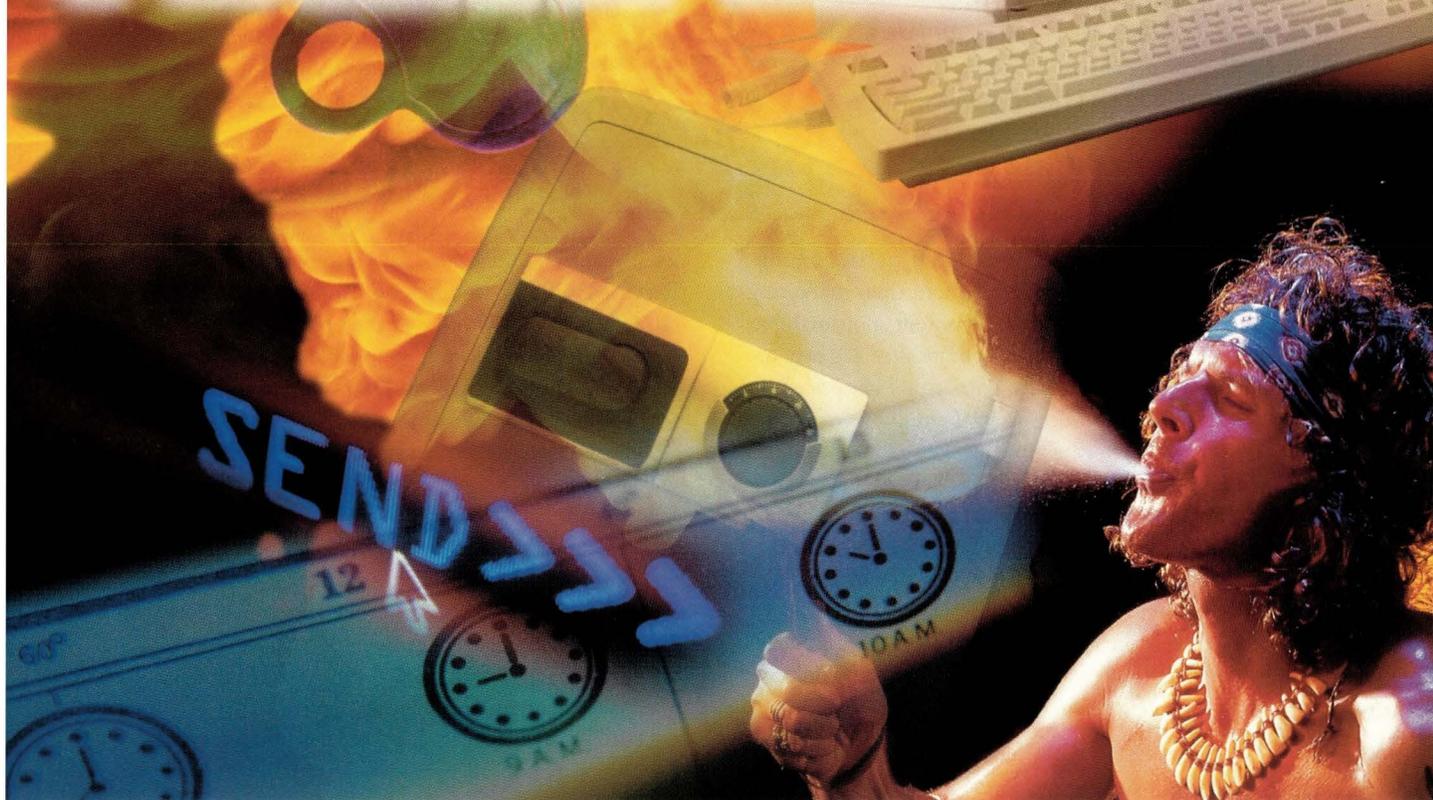
Certainly in the world of traditional media, the Clinton-Massie school district could only dream of national media coverage, whereas the most minor details of President Clinton's personal life make top stories on the evening news.

But the Web is different from other media. While a large city can only support maybe two daily newspapers, the Web can support thousands of local Web sites. A high-end cable TV subscriber receives perhaps 100 channels, but that pales in comparison to the millions of Web sites he or she can visit via the Internet, to say nothing of the millions more that are sure to come. Equipped with only a modicum of skill and a text editor, just about any Jane, Dick or Harry can create a Web site. Many Internet service providers (ISPs) include a "Home Page" feature as part of their service, and for less than \$100 per month, hundreds of Web hosting companies will happily host your entire site on their professionally managed servers.

The Web, if anything, is a much more democratic publishing medium than any the world has ever seen. And as such, the straight search algorithm approach, which did not distinguish between rich and poor, but between word frequency, placement and the like, was arguably better suited to the nature of the Web.

That said, just as a democratic political process can be subverted by a rigged election, search engine results are easily manipulated by anyone with an understanding of the algorithms engines use in their searches. This process, which Webster Group's Copeland refers to as "optimizing the page," can comprise editing a Web page so that its salient characteristics are easily picked up by the search engine, for example, by writing a concise, appositive title. Trickier methods include loading

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the page with HTML tags, where the Web page developer inserts any number of relevant keywords, thereby increasing the page's chance of being found in a greater number of searches.

Web site promoters have become quite adept at page optimization, and have created an entire industry out of knowing how best to manipulate search engines. Services offered run from simple Web site registration, through automated page optimization packages, such as Webster Group's [www.SitePromoter](http://www.SitePromoter.com), to custom consulting services.

But veterans of the site promotion business have bad news for Web sites who hinge their success on placing well within search engine results. "Search is getting less and less priority on the portals these days, and on top of that, we're getting much lower results than we were just a couple of years ago," says John Weiss, vice president of sales for Web-Promote, a Libertyville, IL-based company that focuses on increasing Web site traffic.

Weiss says the problem lies mainly with the sheer number of sites listed by search engines. "If your goal in life is placing number one, well, you might make top 10 if you really work at it, but even then, only for one day. There aren't a lot of promises in the business of search engine positioning."

Therefore, sites that previously saw a lot of traffic coming from search engines are having to supplement their marketing budgets with banner ad campaigns and content sponsorships. And when competing against large corporate sites, it's easy to see how medium- to small-size companies could get priced out of the market. This is to say nothing of the millions of not-for-profit sites that make up so much of the Web's stellar content.

Another glaring problem with the portal advertising model is that if a search engine returns truly useful search results—that is, results that make you want to click and leave the site—the portal is losing money. This may sound cynical, but after all, portals make money when they show visitors ads. Thus, if a visitor leaves the site, it affects their bottom line. Search engines were created to help people find the information they were looking for. Portals have evolved into sites designed to show visitors a maximum number of ads.

## Finding Middle Ground

An interesting newcomer to the search engine fray is GoTo.com (<http://www.goto.com>), which opened its doors to the public in June. The site, unlike its portal space competitors, is adamant in its commitment to search, sporting the slogan "Search made simple," and features a clutter-free home page.

But GoTo differs from other search engine providers in more fundamental ways: In a nutshell, the GoTo.com site auctions off placement within its search results to the highest bidders. That is, if you want your site, [www.superdupercarsite.com](http://www.superdupercarsite.com), to come up in first place whenever someone searches the keyword "cars," all you have to do is outbid the current highest bidder for that keyword. If, however, you are content to come in fifth, you need only bid between bidders four and six. In the case where a user searches a word that no one has yet bid on, GoTo returns search results supplied by Inktomi (<http://www.inktomi.com>),

the search engine that powers the HotBot site.

At press time, a vintage car dealer, VP-Cars, was featured at the top of the list, instead of the usual auto super sites such as Autobyte.com or Microsoft's CarPoint (<http://www.carpoint.msn.com>). However, unlike the lucky owners of the number one position on a portal site's search results, VP-Cars didn't need to spend months figuring out the search engine's placement algorithm, glut its pages with META tags or pay an outlandish placement fee. Instead, all VP-Cars had to do was outbid its competitors and pay for the number of actual clicks it receives from the GoTo site at the contracted price per click.

At first glance, a lot of people find the GoTo.com business model a bit weird, and sometimes a little repulsive. This feeling can be exacerbated by the fact that GoTo publishes the advertising rates (per click) right next to the advertisers' links, which might seem distasteful to unaccustomed viewers. However, on further consideration, the GoTo model makes a lot of sense and addresses some of the problems the portal model raises.

For example, unlike portal sites, GoTo does not rely exclusively on banner advertising. Instead, "We make money when you find what you are looking for," says Jeffrey Brewer, GoTo's Chief Executive Officer. In other words, there is no conflict of interest. Contrast this with the portal's revenue model of keeping visitors on-site for as long as possible with gimmicks such as weather maps, free email and horoscopes, all in an effort to show visitors as many ads as possible.

The auction model also ensures that most any site can afford to advertise, not just well-endowed ones. For example, the immensely popular Amazon.com, which gets millions of hits per month, would probably not want to pay top dollar for searches on popular authors—that could get very expensive, very quickly. However, a small bookstore specializing in rare first editions may be very interested in paying for premium positioning, because the people who click on the link have a high likelihood of actually being interested in its services.

And for many potential advertisers, GoTo.com is one of the only search engines that will let small, specialized sites advertise at all, much less stand a chance of getting a decent listing. GoTo's Brewer recalls an email from a potential GoTo customer who wanted to purchase several keywords relating to microprocessor technology: "Serial EEPROM," "ROM" and "OTP microcontroller." The advertiser had petitioned Yahoo! for the keywords, but owing to the limited number of ad impressions those keywords would have generated, Yahoo! refused to sell them banner space.

The GoTo model does have its flaws, however. Unlike portal-style categories, Brewer says, GoTo's search results do not reflect the mass market and, unlike pure search engines, GoTo is not the place to go looking for obscure references from academic texts.

But then again, says Brewer, quoting Winston Churchill: "Democracy is the worst political system. Except for all the others." ➔





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# Filtering: Big Brother or Little Helper?

*Internet content filtering, whether it be so-called 'positive' or 'negative' filtering, is becoming a hot topic among lawmakers, corporations, ISPs and parents alike. So what's all the noise about?*



In a replay of the big bang, cyberspace is fast breaking up into distinct and solitary galaxies, with separate “cyberworlds” for different groups of people—children, corporate workers, library users and government employees—each with different Internet resources available. The technology making this possible is Internet content filtering. Filtering software enables network administrators to block access to specific Web sites and newsgroups at either the client or server level.

Internet filtering is a hot topic these days in educational, corporate and legislative circles. Lawmakers and lobbyists are eagerly pushing various content regulation and “child protection” bills through Congress, corporate executives are concerned about potential employee misuse of the Internet and Internet service providers (ISPs) are wondering if they have a responsibility to protect subscribers from pornography and other objectionable material on the Web.

As a result, commercial software developers are coming forth with an array of software products to help corporate managers, ISPs, parents and education officials curtail improper use of the Internet. A 1998 report by Frost & Sullivan, a market research firm based in Mountain View, CA, found 14 companies currently selling Internet filtering products in the United States. One of the largest, NetPartners Internet Solutions Inc., San Diego, CA, targets corporate customers with its WebSense Internet screening system, a server-based package that boasts a database of more than 350,000 Web sites and newsgroups and the ability to block up to 30 categories of content, including adult entertainment, gambling, employment searches and shopping sites. Annual licenses for the software and database start

at \$495 for 25 users (\$396 for educational institutions).

Another market leader, Secure Computing Corp., San Jose, CA, makes a product called SmartFilter, which sits on a proxy server behind a corporate firewall and filters requests for FTP and Gopher sites, URLs and newsgroups based on 27 content categories, such as games, drugs, humor and travel. Meanwhile, Net Nanny Software International Inc., Bellevue, WA, focuses on the educational and consumer markets with its \$27 Net Nanny product, which monitors and blocks programs running on an individual PC. With Net Nanny, parents or teachers can block access to specific software applications as well as Web sites, newsgroups, chat rooms and email.

Another filtering software developer, N2H2 Inc., Seattle, WA, offers Bess CacheExpress, which allows a company to block access to certain sites via an N2H2-managed server and receive reports on the number of blocked sites requested and other information. For \$4,000, N2H2 will deliver a turnkey server with software preinstalled and perform the initial setup. Ongoing fees range from \$0.25 to \$1 per user, per month (depending on the number of users). In addition, N2H2 recently launched a child-friendly search engine, called Searchopolis, in partnership with Inktomi Corp., a San Mateo, CA-based developer of search engine and networking software. According to N2H2, Searchopolis features a value-added, kid-targeted user interface, with educational information and ads aimed at children, as well as a back-end search engine that filters requests and blocks “adult” sites. Director of marketing at N2H2, Jim O’Halloran, says the company plans to

negotiate deals to license the technology to ISPs and other groups, such as religious organizations, allowing them to create their own family-friendly Web sites. "We can provide the filtered search functionality and they can provide their own front end," O'Halloran says.

The upshot of all the activity is a growing market for filtering products. According to Frost & Sullivan, filtering revenue will reach \$1.5 billion in the United States by 2004. It estimates that the current market saturation of Internet screening products is 1.1%.

A key issue driving the market is consumer fear about the safety of children on the Internet and the ease with which kids can stumble across pornographic Web sites. There has been a flurry of legislative activity aimed at forcing schools and libraries to install filtering software on their computers in order to protect children from viewing such material. For example, the U.S. Senate approved a bill this summer requiring all public libraries and public or private schools that receive federal funds for Internet-related equipment and services to install Internet filtering software. In October, the U.S. House of Representatives passed a bill that, among other things, requires ISPs to provide consumers with information on filtering products.

Some ISPs already offer filtering capabilities to subscribers. AT&T Corp.'s WorldNet Service, for example, offers subscribers one year's free use of the Cyber Patrol filtering software and Kids Cyber Highway Web browser from The Learning Company, Cambridge, MA. FamilyConnect Inc., an ISP based in Tulsa, OK, blocks subscriber access to pornographic Web sites and sites promoting illegal activities, such as drug dealing or bomb making. And Exotrope Inc., an ISP based in Elmira, NY, uses its own filtering program, called Guardian, to screen Web pages. Aimed at schools and parents, the service looks for objectionable text and photos and blocks the offending content. Exotrope Chief Executive Officer, Mike Stephani, says his filtered ISP service, which was actually started as a test bed for the Guardian product last spring, is particularly popular with teachers and parents. "We've seen people drop America Online like a hot potato for our service," Stephani says. A commercial version, called BAIR Filtering System, which is based on Exotrope's Basic Artificial Intelligence Routine, is due out this month.

While educators and parents were the first buyers of filtering products and services, corporations are now getting in on the act, says Bryan Wampler, product manager for NetPartners. "Initially, it was the educational market that had the early adopters, but now almost every corporation is also becoming interested," he says.

Interest among corporate IT managers is rising thanks to a couple of factors. One is a growing fear of legal liability—for example, the threat of sexual harassment lawsuits from employees angered by coworkers who access pornographic Web sites from their desktops. A 1997 survey by Nielsen Media Research, New York, NY, found that employees of top technology companies, including IBM Corp., Apple Computer Inc. and AT&T, accessed the online version of *Penthouse* magazine thousands of times each month. Managers have begun to fear, justifiably, that allowing employees to access such material from their work computers could constitute a "hostile atmosphere" at the

office—one possible condition for a claim of sexual harassment. The other factor driving corporations toward filtering products is concern over excessive employee Web surfing and a parallel decline in productivity.

In August, software company SurfWatch Software Inc., Los Altos, CA, released the results of its CheckNet Internet use self-assessment program, in which companies could send in a log of their employees' weekly Internet access and receive a report on what types of sites were being visited. SurfWatch reported that close to one quarter of all employee online time was used for nonwork-related surfing, and the top categories of sites visited were news, sex, personal finance, entertainment and sports, in that order. It is this type of report that has managers who fear employees are spending most of their work day idly surfing for sports and sex sites worried.

"The productivity factor of employees taking a few minutes a day to surf the Web for pornography is incredible," says Exotrope's Stephani. "If you've got 40 employees spending just 10 minutes a day, that's over an hour a day lost."

But it's not just employee productivity that managers want to conserve, bandwidth is also a consideration. Downloads from graphics-heavy sites and online retail catalogs can certainly add to the burden of an over-taxed corporate network. Even news sites can pose problems. The release of Independent Counsel Kenneth Starr's report on President Clinton, for example, spurred an estimated 25 million downloads of the written report, plus an additional 2 million downloads of the president's video testimony, with half of all the downloads occurring at work, according to a survey by NetPartners. While the report itself isn't huge—around 1.2 MB in Corel Corp. WordPerfect format—a few dozen simultaneous downloads of a file that size can have a negative impact on a corporate network.

Another threat to corporate bandwidth is multimedia news. The front page of the CNN Web site, for example, encourages visitors to "Click here to turn your PC into a TV" and "Watch while you work. Stay connected with the news in streaming audio or video right from your desk." Phil Lumish, chief executive officer of Kansmen Corp., Milpitas, CA, maker of LittleBrother filtering software, says the market for corporate filtering products is largely driven "by how much wasted time and how much equipment has to be purchased because of this wasted bandwidth."

But filtering is by no means a solution for every organization, according to Lumish. For instance, a software development firm that requires its programmers to work long, unsociable hours might want to think twice before getting Big

**Interest [in filtering software] among corporate IT managers is rising thanks to a couple of factors. One is a growing fear of legal liability ... the other is concern over excessive employee Web surfing and a parallel decline in productivity.**

Brotherish over Internet use.

In fact, before an organization decides to block Web access, it might first want to establish a monitoring program to find out if it even has a problem with Internet misuse. Many filtering products offer extensive reporting tools to help companies discover how much time employees spend on the Internet and where they're going. For instance, Kansmen's LittleBrother has a reporting console that allows administrators to view real-time and historical data on bandwidth usage by employee, URLs visited, the ratings of the sites visited (work-related versus personal) and how long each user spends at each site. It will even estimate how much bandwidth is wasted owing to "unproductive" Internet access. It's not just a matter of spying on employees, says Lumish, but an issue of needing to know how corporate resources are being used. If a company finds its employees aren't abusing Internet privileges, then it may not need to bother with filtering Web access.

However, for the ISP, school administrator or corporate IS manager who opts to add filtering capabilities to the network, there are many types of products and approaches to filtering and blocking on the market.

### Keyword Filtering vs. URL Matching

There are basically two ways to determine whether access to a particular Web site should or shouldn't be blocked. One approach is to look at a site's content, searching for particular words such as "sex," "sports" or "travel." Proponents of this approach say it makes filtering more flexible and provides a way to evaluate each site individually. Opponents claim it can give inaccurate results. Blocking every site that contains the word "breast," for example, would prevent users from visiting sites on chicken breast recipes or breast cancer. On the other hand, blocking the word "sex" might not block sites that are heavily graphics-oriented or use nonobvious language, after all, a site

that is labeled "Snow White and Her Seven Dwarves" might not necessarily be about children's literature.

Another, more common, method is URL matching. With this approach, the software company creates a database of URLs categorized by content—religion, news, soft porn, hard porn, military and so on. Customers pay for both the software and for access to the database and its updates. The main drawback is customers are dependent on the vendor to maintain a large and accurate database, no small task in a cyberspace where Web sites come and go every day. "It's an ongoing battle," Lumish says.

### 'Positive' vs. 'Negative' Filtering

Most of the filtering software being used by corporations employs a "negative" filtering technique, which entails building a database of inappropriate Web sites and blocking access to them. For example, Cyber Patrol maintains a CyberNOT list of proscribed sites. Network administrators can override the list and allow certain categories or specific URLs to be accessed. For instance, a sports marketing company might decide to allow employees access to sports-related sites. The advantage to this approach is a company can take the view that most sites on the Internet are allowable and simply filter out objectionable ones as they're identified.

Defined focus, or "positive," filtering products take the opposite route, allowing access only to "good" sites that have been identified in the database. Cyber Patrol offers this capability with its CyberYES list of educational sites. SuperScout, from JSB Software Technologies plc based in Cheshire, England, also uses this technique by matching URLs against a database of allowed sites. The advantage to positive filtering is companies can define which sites it wants employees to visit, rather than sifting through countless URLs on the Internet looking for inappropriate content. The \$2,000 SuperScout 2.2 lets

## READER FEEDBACK

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### WebServer Magazine:

- The Search for Substance
- Filtering: Big Brother or Little Helper?

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managers draft a set of rules, based on who is accessing the Internet, when they're accessing it, which protocols they're accessing—FTP, HTTP, Telnet and so on—and what they're accessing. The company specifies the URLs and IP addresses that are allowed. Similarly, EdNet, a service offered to educators by Exotrope, is a collection of 17,000 sites that Exotrope considers appropriate for school use, including reference sites, college admissions and a chat room for elementary school students.

The problem with such a system for corporate use, of course, is that it essentially cuts off Internet access to anything not in the database and puts the onus on the IT manager to review Web sites for possible inclusion.

In fact, with most filtering technologies (positive URL matching, negative URL matching and keyword searching) the accuracy of the results is dependent on the opinions of those doing the categorizing. The software makers, of course, stress that their URL evaluation process is both objective and thorough. NetPartners, for instance, which boasts more than 350,000 URLs, newsgroups and chat rooms in its database, says it has a dozen employees at any given time evaluating sites. They receive three months of on-the-job training before being allowed to perform site evaluation, according to NetPartners' Wampler, and the work is checked by a manager at the end of each day.

Nonetheless, errors, or at least perceived errors, can occur. A December 1997 report from the Electronic Privacy Infor-

mation Center (EPIC) based in Washington, DC, evaluated the results of some sample searches on a "family-friendly" Internet search site that rated URLs and blocked ones with objectionable content. EPIC searched for sites on the American Red Cross, the Bill of Rights and other educational subjects and compared the results generated from that search engine with ones from an identical search performed on a mainstream search engine. The family-oriented search engine blocked access to more than 95% of URLs relating to those topics, even though no objectionable content appeared to be present at the sites. These perceived errors, and the use of filtering products in the public sector, have become a First Amendment question. A lawsuit filed in December 1997 in the U.S. District Court for the Eastern District of Virginia against the Loudoun County Library system by the nonprofit, grass-roots citizens group, Mainstream Loudoun, argues that the library's filtering software (X-Stop by Log-On Data Corp., Orange, CA) blocks access to legitimate sites such as the religious group, The Quakers, or the Zero Population Growth Web site, a national nonprofit organization working to slow population growth.

And despite claims of objectivity, even the censors have found themselves censored by other people's filtering products. The American Family Association, a conservative religious group that offers a filtered Internet service called American Family Online, has itself been put on Cyber Patrol's CyberNOT list for having content intolerant of homosexuals. ➔

### Companies Mentioned in this Article

#### American Family Online Inc.

P.O. Box 3322  
Tupelo, MS 38803  
<http://www.afo.net>  
Circle 180

#### Exotrope Inc.

150 N. Main St.  
Elmira, NY 14901  
<http://www.exotrope.com>  
Circle 181

#### FamilyConnect Inc.

252 S. Harvard Ave., Ste. 150  
Tulsa, OK 74137  
<http://www.familyconnect.com>  
Circle 182

#### Inktomi Corp.

1900 S. Norfolk St., Ste. 310  
San Mateo, CA 94403  
<http://www.inktomi.com>  
Circle 183

#### JSB Software Technologies plc

Riverside  
Mountbatten Way  
Congleton, Cheshire  
England, CW12 1DY  
<http://www.jsbus.com>  
Circle 184

#### Kansmen Corp.

46 Valley Way  
Milpitas, CA 95035  
<http://www.kansmen.com>  
Circle 185

#### The Learning Company

One Athenaeum St.  
Cambridge, MA 02142  
<http://www.learningco.com>  
Circle 186

#### Log-On Data Corp.

828 W. Taft Ave.  
Orange, CA 92865  
<http://www.xstop.com>  
Circle 187

#### N2H2 Inc.

900 4th Ave., Ste. 3400  
Seattle, WA 98164  
<http://www.n2h2.com>  
Circle 188

#### Net Nanny Software International Inc.

10900 N.E. 8th, Ste. 900  
Bellevue, WA 98004  
<http://www.netnanny.com>  
Circle 189

#### NetPartners Internet Solutions Inc.

9210 Sky Park Court  
San Diego, CA 92123  
<http://www.netpartners.com>  
Circle 190

#### Secure Computing Corp.

One Almaden Blvd., Ste. 400  
San Jose, CA 95113  
<http://www.sctc.com>  
Circle 191

#### SurfWatch Software Inc.

175 S. San Antonio Road, 1st Floor  
Los Altos, CA 94022  
<http://www1.surfwatch.com>  
Circle 192



# URL/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.

## Tool Integrates Search, Tracking, Report Functions

BullsEye and BullsEye Pro, from IntelliSeek, are integrated Web search products that combine agent technology, boolean search capabilities and search analysis. BullsEye's search functions are said to provide access to more than 300 search engines and nine search agents that examine both indexed and nonindexed Web pages. The search agents, such as BusinessFinder, Health-Answers Agent and SoftwareFinder, each focus on a specific topic.

According to IntelliSeek, BullsEye's analysis feature compares the results of a search with the user's original query, eliminating duplicate, irrelevant and dead links before presenting the final results to the user. An automated information tracking feature, available only in BullsEye Pro, enables users to receive email or fax alerts whenever specified information on a Web site or discussion group changes, IntelliSeek says.

Both products run on Windows

operating systems and can be purchased from the company's Web site. BullsEye costs \$49 and BullsEye Pro costs \$149.

### IntelliSeek Inc.

10921 Reed Hartman Hwy., Ste. 317  
Cincinnati, OH 45241

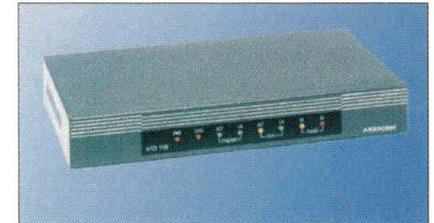
<http://www.intelliseek.com>

Circle 201

## ISDN Access Router Upgraded

Arescom says it has responded to the growing number of requests from Internet service providers (ISPs) for high-quality, easy-to-use ISDN routers with dial-up remote management capabilities with the introduction of Apex 1100 Version 3.2. Apex 1100 is an integrated ISDN BRI terminal adapter, router, bridge and Internet gateway.

The access router includes Apex Manager software, a Windows 95/NT-based GUI that gives administrators the tools they need to install, monitor and troubleshoot their ISDN connection, the company says. ISPs can also



configure and diagnose the Apex 1100 remotely by using Remote Manager Version 2.0 software. Apex 1100 is priced at \$611.

### Arescom Inc.

46724 Lakeview Blvd.

Fremont, CA 94555

<http://www.arescom.com>

Circle 202

## AvantGo Extends Web Applications to Palmtops

AvantGo has released AvantGo 2.0, a tool for extending Web-based applications to handheld computers. This latest release comprises AvantGo Server, a centrally administered server with an open architecture; AvantGo Connect, a

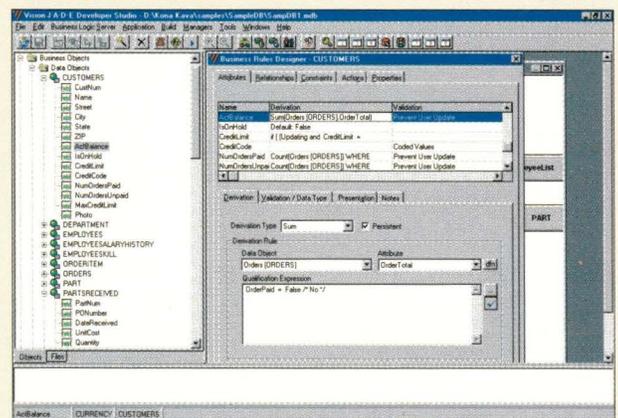
## Speedy Java Application Server

Vision Software's Jade 4.0 is a Java application server designed to speed the development of Web-based Java applications.

This latest release comprises Vision Jade Developer Studio and Vision Business Logic Server Console.

Jade Developer Studio is a business rules environment that allows developers to create applications using components created with JavaBeans, COM or CORBA models, the company says. In Jade 4.0, Developer Studio has additional capabilities, including a component editor, local and remote debugger and support for client- and server-side JavaBeans. Business Logic Server Console provides a single-point solution for managing a collection of Business Logic Servers and graphically monitors the execution of business rules and server and database resource usage, the company says. Business Logic Server Console can also be used to manage security, connectivity and application performance.

Jade 4.0 supports Windows NT and Solaris platforms. Pricing for Jade 4.0 starts at \$2,995 for a 10-user license to Jade Developer Studio and at \$5,995 for a 10-user license to Business Logic Server Console.



### Vision Software Tools Inc.

2101 Webster St., 8th Floor

Oakland, CA 94612

<http://www.vision-soft.com>

Circle No. 200

conduit for desktop and kiosk connectivity; and a major upgrade to AvantGo Client, a Web browser for navigating data and interacting with data-entry forms on handheld computers, the company says.

AvantGo 2.0 reportedly makes it possible to bring Web applications to smaller computers by simplifying user administration and providing universal remote access between corporate databases, or Web applications, and the Microsoft Corp. Windows CE and Palm Computing Inc. Palm OS platforms. It enables handheld computers to connect to the AvantGo Server via a companion desktop computer and will synchronize information on both PCs and handheld units to connect directly to the server via a dial-up or wireless connection, the company says.

AvantGo's multithreaded architecture allows it to support concurrent connections from hundreds of handheld units and maintain both batch and online sessions, the company says. AvantGo 2.0 runs on Windows NT 4.0 and costs \$30,000 for 100 users.

**AvantGo Inc.**

1650 S. Amphlett Blvd., Ste. 212  
San Mateo, CA 94402  
<http://www.avantgo.com>

**Circle 203**

### Adaptive Load Balancer to Ease Web Traffic

Equalizer 2.1, from Coyote Point Systems, reportedly provides intelligent load balancing by calculating which server in a given system has the least amount of load and rerouting traffic to that machine. This latest release includes features to increase user control over Web site traffic management. Equalizer 2.1 can now group servers into virtual clusters, assigning one IP address to a pool of servers.

Another new feature, adaptive load balancing, is said to enable a network administrator to customize how load is balanced among servers based on criteria such as server response time, number of requests pending at each server and weighted values assigned to each server by the administrator. In addition, Equalizer now provides a real-time graphical



display of server and cluster performance measures and includes FTP address translation capabilities.

Equalizer 2.1 works with all operating systems and supports all standard protocols. Pricing starts at \$4,000.

**Coyote Point Systems Inc.**

530 Lawrence Expressway, Ste. 341  
Sunnyvale, CA 94086  
<http://www.coyotepoint.com>

**Circle 204**

### IBM Adds to WebSphere

IBM continues to expand its WebSphere line of products with WebSphere Application Server 1.1 and WebSphere Studio 1.0. WebSphere Application Server 1.1 is a Java servlet-based Web application server and ships with the Apache HTTP server. It also supports Netscape Communications Corp. Enterprise Server and FastTrack Server, Microsoft Corp. Internet Information Server and Lotus Development Corp. Domino Go Web Server.

WebSphere Studio is a collection of development tools for building Web applications. It reportedly combines a Web "development workbench" and servlet generation wizards with IBM's VisualAge for Java development environment and Web site development tools from NetObjects Inc. WebSphere Application Server is available on Solaris, AIX and Windows NT platforms and is priced at \$795. WebSphere Studio is available for Windows 95/98/NT and costs \$495.

**IBM Corp.**

Contact local sales office.  
<http://www.ibm.com>

**Circle 205**

### HP Unveils High-Performance Servers

Hewlett-Packard has introduced two new lines of servers, A-Class Servers and R-Class Servers, aimed at Internet ser-

vice providers (ISPs) and large enterprises that require high UNIX operating system performance density per rack. The A-Class series of UNIX servers come with up to 360 GB of disk space, 40 GB of memory and a 20-MB cache per rack. According to HP, 20 A-Class servers can fit into one 2m rack, providing a high level of performance density. R-Class Servers are available in one- or two-CPU configurations and include two disk drives per server, with 4 GB and 9 GB of disk space, respectively, and 3 GB of memory.

HP Secure Web Console, a device about the size of a video tape, is said to allow up to four operators in different locations to simultaneously access the server. It includes password encryption, data scrambling and download protection. Pricing for A-Class Servers starts at \$2,345, while pricing for R-Class Servers starts at \$10,990. When purchased separately Secure Web console costs \$590.

HP has also unveiled its NetServer LPr and LXr 8000 servers for mission-critical environments. HP says the NetServer LPr system provides high-performance density with up to 20 servers per 2m rack. Pricing starts at \$3,000 for NetServer LPr and at \$13,000 for NetServer LXr 8000.

**Hewlett-Packard Co.**

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

**Circle 206**

### First-Class Intranet Messaging System

SoftArc has announced FirstClass Intranet Server (FCIS) 5.5. This latest version adds features such as dial-up mail collection from remote Internet mail servers and supports multiple POP3 accounts, which is said to enable users to combine several accounts into a single mailbox on the server. FCIS 5.5 supports Java Chat and large-document messaging. Documents can be directly ported from a Web browser using an HTML form to send an authenticated and properly threaded message, the company says. The server comes with FirstClass Rapid Application Developer, which is a development tool for creating

intranet applications and enterprise database interfaces for FirstClass. It supports most popular Internet protocols, including POP3, SMTP, HTTP/HTML with CGI, FTP, LDAP and Java. FirstClass Intranet Server 5.5 costs \$995 per server.

**SoftArc Inc.**  
100 Allstate Pkwy.  
Markham, Ontario  
Canada L3R 6H3  
<http://www.softarc.com>  
Circle 207

## Enhanced Web Application Tool

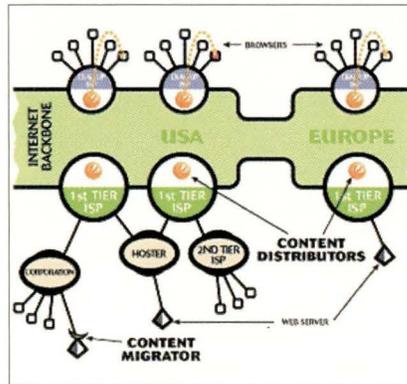
Web+ 4.0, a Web application software tool from TalentSoft, features several enhancements over the previous release. These include a memory cache for scripts to speed execution time, an increase in uptime and stability with configurable alerts and script encryption to ensure source code protection, as well as a script editor. Also new to this release is support for CyberCash Inc.'s ICVerify, which enables credit card authentication for secure electronic commerce transactions, and support for COM and CFX. Web+ 4.0 is available for Solaris, Linux, IRIX, HP-UX, AIX and Windows 95/98/NT.

Pricing varies depending on the number of concurrent connections and platforms. A one-server license with two concurrent connections starts at \$295 on UNIX and \$195 on Windows.

**TalentSoft**  
Talent Information Management LLC.  
900 Nicollet Mall, Ste. 700  
Minneapolis, MN 55402  
<http://www.talentsoft.com>  
Circle 208

## Outsource Content Distribution Worries

Publishers of media-rich Web sites who are grappling with capacity scaling and delivery response time can now subscribe to a new service from Sandpiper Networks called Footprint, which is said to manage content distribution issues for you. The Footprint content management service relies on Sandpiper's global network of custom Web servers distributed at strategic points across the Internet. In particular, Sand-



pipper says, the Footprint distribution network comprises Web servers, so-called Content Distributors, and Content Migrator software, which resides on the publisher's server and seamlessly connects to the Footprint network by intercepting content requests and determining where to serve the information.

Pricing for Footprint is based on reserved and peak aggregate bandwidth used over the Footprint network. Publishers can also subscribe in terms of a Committed Aggregate Information Rate (CAIR), which allows them to burst up to four times their CAIR level.

**Sandpiper Networks Inc.**  
125 Auburn Court, Ste. 210  
Westlake Village, CA 91362  
<http://www.sandpiper.net>  
Circle 209

## Embedded DB Supports Internet Front End

Pervasive Software has announced Pervasive.SQL Software Developer's Kit (SDK), which comes complete with the company's I\*net Data Server, a Pure Java API and support for all Microsoft Corp. Windows development environments and ActiveX controls. Pervasive.SQL is designed to speed development of Windows-based applications that access Pervasive's database over the Web, the company says. Pervasive.SQL is available on Windows NT and Novell Inc. NetWare platforms, with support for DOS, Windows 95/98/NT and OS/2 clients. Pervasive.SQL SDK costs \$149 (price quoted is valid only until the end of 1998).

**Pervasive Software Inc.**  
12365 Riata Trace Pkwy., Bldg. II  
Austin, TX 78727  
<http://www.pervasive-sw.com>  
Circle 210

## net.Analysis for AIX

net.Genesis has announced that net.Analysis, its Web site activity analysis and reporting tool, is now available for IBM Corp.'s AIX operating system. With net.Analysis, users are said to be able to analyze Web site activity and correlate site behavior using enterprise data, then create predefined and/or customized reports. Sites hosted on multiple servers can be supported with net.Analysis. In addition, the tool can handle Web traffic that reaches several million hits per day, the company says.

Priced at \$9,500, net.Analysis for AIX comes with net.Analysis Engine, net.Analysis Reporter (client) and ReportSite, a built-in intranet site for viewing and publishing net.Analysis reports.

**net.Genesis Corp.**  
215 First St.  
Cambridge MA 02142  
<http://www.netgen.com>  
Circle 211

## Automated Real-Time Advice Agents

Brightware has announced the availability of Brightware Version 2.0, a complete packaged software application that delivers custom-er assistance via the Internet. The Brightware server comprises two agents: Brightware Advice Agent, which is said to provide real-time advice to customers by conducting interactive dialogs to determine their needs and presenting relevant vendor product and service solutions; and Brightware Answer Agent, which automatically answers customers' Web and email inquiries.

Brightware license fees start at \$95,000 per year—or \$190,000 for a perpetual license—and include a choice of either the Brightware Advice Agent or Brightware Answer Agent. If a second agent is purchased at the same time, license fees for the additional agent start at \$47,500 per year (or \$95,000 for a perpetual license).

**Brightware Inc.**  
350 Ignacio Blvd.  
Novato, CA 94949  
<http://www.brightware.com>  
Circle 212

# 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.

## Box Hill Offers Open Storage Solutions

Box Hill Systems' family of Open Network Storage (ONS) solutions are designed to provide added fault tolerance and performance for business-critical applications in both UNIX and Windows NT environments, the company says.

The ONS product line includes full-featured Ultra SCSI and Fibre Channel RAID storage solutions and comes with Box Hill's ParallelPath software for data redundancy and automated load balancing. By distributing data across all available data paths, ParallelPath can redirect I/O away from a faulty data path, Box Hill says, thereby protecting mission-critical systems from host adapter, cable or port failures. In the event of an overloaded path, ParallelPath is said to provide automatic and statistically configured load balancing to parallel Fibre Channel or Ultra SCSI data paths.

The ONS product line comprises ONS 4000, ONS 5000, ONS 8000 and ONS 9000, featuring storage capacities up to 1 TB, redundancy and hot-swapping of all active components and support for RAID levels 0, 1, 0+1, 4 and 5. Contact company for pricing.

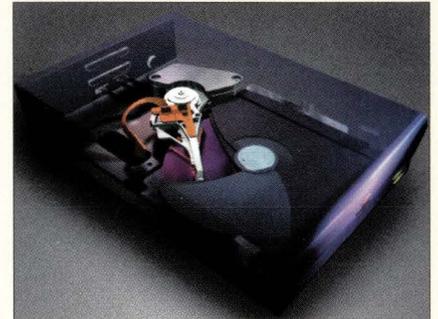
### Box Hill Systems Corp.

161 Avenue of the Americas  
New York, NY 10013  
<http://www.boxhill.com>

Circle 101

## NFR Removable Storage

TeraStor has announced the first products in its line of removable storage drives based on Near Field Recording (NFR) technology. With initial capacities of 10 GB and 20 GB, later to scale to 40 GB, and an industry-standard 5.25-inch, half-height form factor, this new class of rewritable mass-storage products delivers between five and 10 times the capacity of existing high-volume storage products at a lower cost per GB than other random-access prod-



ucts, the company says.

TeraStor's patented NFR technology allows for a sustainable increase in the areal density (the bits per square inch of surface) of the storage medium. The company's patented flying optical head provides average seek times of less than 18 msec, while a contamination-resistant cartridge and advanced error-correction capabilities are said to ensure data reliability.

In an attempt to encourage leading storage manufacturers to incorporate NFR technology into their automated library applications, TeraStor heads the

## Multi-Interface Matrix Switch

Lightwave Communications, a specialist in console management products, has introduced Matrix-Hub, a switch designed for high-performance graphics environments that is said to allow users to route and switch keyboards, mice, peripherals, audio/video and so on.

Each Matrix-Hub is custom-designed according to individual customers' needs, the company says. The switch can comprise up to four rack-mounted chassis, each of which can support a unique interface, such as video, keyboard/mouse, serial peripherals and so on. The chassis may be used independently of one another, or together. In this way, Matrix-Hub allows a maximum of 30 users to access up to 30 sources, lowering the total price per seat of a high-performance graphics workstation, Lightwave says.

The Matrix-Hub switch can be connected to either a network, an attached server, an industry-standard controller or an ASCII terminal. RGB video and audio can be routed to several destinations simultaneously, while keyboard and mouse information is routed to one destination at a time.

Matrix-Hub supports several platforms, including Silicon Graphics Inc. and Sun Microsystems Inc. UNIX and PS/2 PCs, at resolutions up to 1,920 by 1,200. In addition, multiple platforms can be mixed and matched within the same chassis. Pricing starts at \$3,000 per seat.

### Lightwave Communications Inc.

261 Pepe's Farm Road  
Milford, CT 06460  
<http://www.lightwavecom.com>  
Circle 100



## New Products

so-called Managed Storage Initiative. Other members include ATL Products Inc., Overland Data Inc. and Spectra Logic Corp.

TeraStor's 10-GB drive is scheduled to ship by the end of the year with a suggested retail price of \$799; the 20-GB drive, scheduled for availability in spring 1999, will cost between \$999 and \$1,199.

### TeraStor Corp.

2310 N. First St.

San Jose, CA 95131

<http://www.terastor.com>

Circle 102

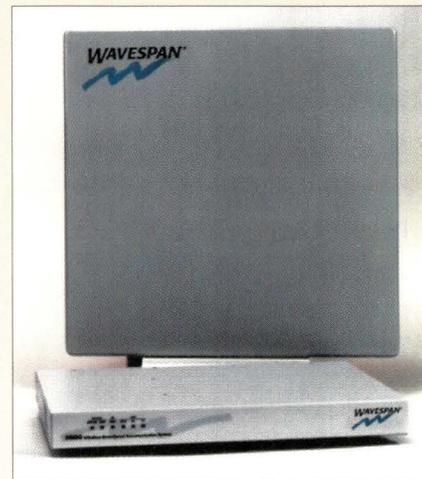
## Next-Generation Wireless Technology

WaveSpan has introduced WaveSpan 5800, which it describes as one of a new generation of wireless broadband solutions that provide two to eight times the spectrum efficiency of earlier systems for Voice-over IP, high-speed Internet access and "last-mile" connectivity applications. A standards-based local-area net-

work (LAN) product, WaveSpan 5800 offers sustained full-duplex Ethernet extensions for point-to-point links at speeds of 10 Mb/s for up to five miles, WaveSpan says. WaveSpan 5800 operates in the license-free 5.8-GHz band and, thus, represents a quick provision for 10-Mb/s access services because Federal Communications Commission (FCC) licensing is not necessary, the company says.

The WaveSpan 5800 system comprises an indoor unit (IDU)—a wireless Ethernet bridge with 10BaseT and AUI ports, embedded SNMP agent, Telnet and a menu-driven agent—and an outdoor unit (ODU), which comprises the 5.8-GHz radio and a focused-beam, flat-panel antenna that can be mounted anywhere with line-of-sight access, the company says.

Other features include support for the Frequency Adapting Spread Spectrum Technology (FAST) protocol, which offers protection against interference as well as data security. In addition,



WaveSpan 5800 offers multiple modulation schemes, including Quadrature Phase Shift Key (QPSK), 16-QAM (Quadrature Amplitude Modulation), 64-QAM and 256-QAM. The 5800 will run in any Ethernet IP environment.

Pricing for a single WaveSpan 5800 link, including both ends, is \$23,950.

### WaveSpan Corp.

500 N. Bernardo Ave.

Mountain View, CA 94043

<http://www.wavespan.com>

Circle 103

## CORBA Meets COM

Iona Technologies has announced OrbixCOMet Desktop, its first product to use Component Object Model (COM) since the company licensed it from Microsoft Corp. OrbixCOMet Desktop is a tool set for Windows developers to create middleware applications that run on both Windows and nonWindows platforms. By rendering CORBA-compliant servers as native COM servers to Windows users, Iona says, developers can continue to program in their favorite Windows-based development environment, freeing organizations from the cost of retraining programmers.

While many CORBA/COM solutions already exist, the company says, OrbixCOMet is one of the first to integrate directly with popular rapid application development (RAD) tools, such as Microsoft's Visual Basic, Sybase Inc.'s PowerBuilder and Inprise Corp.'s Delphi. In addition, OrbixCOMet does not require an in-depth knowledge of C++ or Java, Iona says.

OrbixCOMet Desktop is implement-

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Circle No. 26

## New Products

ed as a dynamic bridge, with complete support for COM-CORBA mapping and Automating-CORBA technology. Through a client-side bridge, COM/Automation clients can talk directly to CORBA servers with support for callbacks. In addition, OrbixCOMet fully conforms with the Object Management Group's standard for interaction between CORBA and COM objects, known as COM/CORBA Internetworking Part B, Iona says. OrbixCOMet Desktop requires a Pentium processor and Windows NT/95 and costs \$495 per seat.

### Iona Technologies Inc.

60 Aberdeen Ave.  
Cambridge, MA 02138  
<http://www.iona.com>

Circle 104

## 100% Pure Java Management Software

Inovie Software has launched TeamCenter, a 100% Pure Java team management system designed to offer real-time collaboration over the Internet and throughout an enterprise. With this real-time capability, Inovie says, TeamCenter can allow users to update a project's status while providing instantaneous feedback to everyone involved.

TeamCenter provides drag-and-drop functionality for visual Gantt-based project scheduling, manipulation and visualization. It is said to allow entire teams to share and organize ideas via an online project outline that provides for threaded discussions. In addition, TeamCenter comes with predefined templates that automatically extract and filter the latest project data into formatted reports that can then be refined using the built-in editor. It runs on Java-supported platforms as either a Netscape Communications Corp. or Microsoft Corp. browser application or as a stand-

alone Java desktop application applet. The TeamCenter client costs \$95 per user, while the TeamCenter server is priced separately and starts at \$675 for a workgroup system.

### Inovie Software Inc.

4112 Randolph St.  
San Diego, CA 92103  
<http://www.inovie.com>

Circle 105

## SAS Releases Data Software

Enterprise Miner from SAS Institute is a data mining package aimed at business analysts and quantitative professionals. The software is said to offer a wide range of algorithms, including decision trees, clustering, neural networks, data-mining regression and associations. Enterprise Miner's Process Flow Diagram, a drag-and-drop GUI, can automate the entire data-mining process. The GUI provides a common ground for business analysts and quantitative professionals who need to collaborate on data-mining projects, SAS says.

For sampling purposes, Enterprise Miner works with the company's SAS/Warehouse Administrator to extract data from data warehouses and other data stores. Enterprise Miner also features a menu of data-visualization utilities for exploring data. An analytical engine forms the backbone of the product's modeling capabilities. It can perform multiple routines such as neural networks and classification trees, SAS says.

Enterprise Miner runs on Solaris, HP-UX, AIX and Windows NT. Pricing starts at \$80,000.

### SAS Institute Inc.

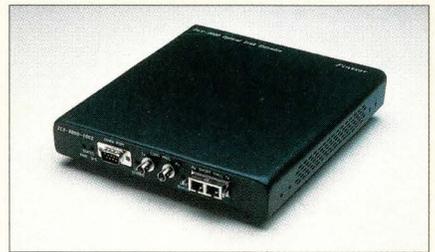
SAS Campus Drive  
Cary, NC 27513  
<http://www.sas.com>

Circle 106

## Finisar Link Extender Out

Finisar's FLX-2000 link extender can reportedly extend Fibre Channel, Gigabit Ethernet or Asynchronous Transfer Mode (ATM) links up to 120km. It uses an internal digital signal conditioner to reset the signal during long-haul connections in an effort to reduce jitter. Data integrity is preserved over long distances with a bit-error rate less than  $10^{-12}$ .

The FLX-2000 link extender is simple to install and features an LED to indicate the status of the system, the company says. In addition, the product offers link monitoring and diagnostics for quick fault detection and isolation. Integration with network management is provided via an RS-232 serial port attached to a local terminal or modem to allow remote access and a redundant power supply (optional) is said to increase reliability.



FLX-2000 is offered in four versions: Fibre Channel (1.062 Gb/s), Gigabit Ethernet (1.25 Gb/s) and ATM (155 or 622 Mb/s). Pricing starts at \$7,500.

### Finisar Corp.

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

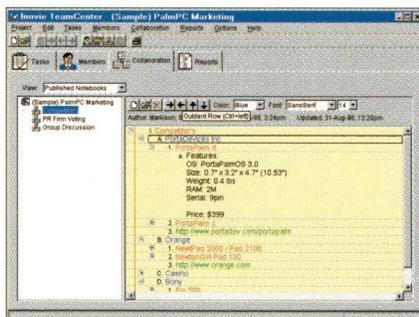
Circle 107

## Stand-Alone Network Management Tool

Computer Associates International has announced NetworkIT Pro Enterprise Edition, a centralized management solution for distributed networks.

Based on the company's Unicenter TNG technology, Computer Associates says NetworkIT is the industry's most comprehensive, stand-alone management tool that enables IT professionals to manage service levels across local-area networks (LANs), wide-area network (WAN) backbones and Internet service provider (ISP)/carrier facilities, such as frame relay and Asynchronous Transfer Mode (ATM).

NetworkIT Pro is said to provide crucial network management functions, including complete discovery, event correlation and performance monitoring over TCP/IP and IPX networks. Network managers can also define automatic corrective actions to be triggered by predefined events, Computer Associates says.



## New Products

In addition to TCP/IP and IPX network protocols, NetworkIT Pro supports Systems Network Architecture (SNA) and DECnet. Complete remote monitoring (RMON) analysis and MIB II support is also offered, providing comprehensive performance monitoring and management, the company says. Furthermore, Network IT Pro provides real-time and historical reporting on network management and continuously measures end-to-end user response times to keep track of current service levels.

Operating system agents for UNIX (including Solaris, AIX and HP-UX), NetWare and Windows NT, work with NetworkIT Pro to manage events and performance throughout the entire systems and network infrastructure. Pricing starts at \$2,500.

### Computer Associates International Inc.

One Computer Associates Plaza  
Islandia, NY 11788  
<http://www.cai.com>  
**Circle 108**

## Mirror Image Backup

For sites that want the extra security of having duplicate copies of their backup tapes, but can't afford the time to make them, Ultra Systems has announced a suite of plug-and-play mirroring controllers, called the Imager series. With Imager, data from a single drive can be backed up onto two or more drives or autoloaders at maximum recording speed, the company says.

The series comprises two models: Imager 1 and Imager 2. Imager 1 oper-

## Upgrades, Enhancements, Additions...

■ Microsoft has updated Internet Explorer for UNIX, expanding platform support to include HP-UX, while also adding functionality to the Solaris version. Internet Explorer 4.01 for Solaris 2.5+ now features IMAP4 support for Outlook Express. Internet Explorer for UNIX supports Dynamic HTML, HTML 4.0, eXtensible Markup Language (XML), ECMA Script and Channel Definition Format (CDF). It can be downloaded for free from Microsoft's Web site. **Microsoft Corp.**, One Microsoft Way, Redmond, WA 98052, <http://www.microsoft.com>. **Circle 109**

■ Lyris Technologies has added several features to the latest version of its flagship list server product, Lyris Email List Server 3.0. Features include fail-safe unsubscribing, message scheduling, auditing capabilities, tracking, anonymous discussions and document mail merging. Optional new components include object database connectivity (ODBC), integration with Microsoft Corp. Internet Information Server (IIS) security mechanisms and an automated billing system. Lyris comes with a Web interface and offers users the option to read, search and contribute to discussions via the Web or email. In addition, the list server will automatically take care of errors associated with invalid email addresses and archive list messages. Lyris Email List Server 3.0 is free for use with mailing lists comprising up to 200 members. Lists with a maximum of 500 members must pay a onetime fee of \$495. **Lyris Technologies Inc.**, 174 Santa Clara Ave., Oakland, CA 94610, <http://www.lyris.com>. **Circle 110**

■ Hitachi Data Systems' Freedom 5700E storage subsystem has received Foundation-level certification from Tivoli Systems Inc. The certification means that

Freedom 5700E can be integrated into a Tivoli environment without requiring the customer to perform any additional integration. See the company's Web site for details. **Hitachi Data Systems Corp.**, 750 Central Expressway, Santa Clara, CA 95050, <http://www.hds.com>. **Circle 111**

■ Global C Version 3.0 from Uniscape is a runtime library that reportedly enables software developers to create single-source, multilingual and fully portable cross-platform applications. It provides Unicode support on multiple operating systems, including AIX, Solaris and Windows NT, without the need to port source code to each operating system separately. This latest version has a number of new features, such as character-based string processing for setting input and output limits in characters rather than bytes, thread support and Unicode APIs to read Unicode input and write Unicode output. Pricing for Global C 3.0 starts at \$30,000. **Uniscape Inc.**, 303 Twin Dolphin Drive, Ste. 510, Redwood Shores, CA 94065, <http://www.uni-scape.com>. **Circle 112**

■ GraphOn has announced GO-Global Version 1.1, which allows users running Microsoft Corp. Windows on their desktop to have access to X Window System and UNIX-based applications. This latest release features expanded platform support and added functionality. The company says it has made enhancements to GO-Global's ability to transfer files and cut and paste between Windows and X Window applications. In addition, GraphOn has added support for RS/6000 systems to its supported server platforms, which includes SunOS, Solaris, HP-UX, SCO OpenServer, Digital UNIX, Linux and IRIX. GO-Global is a native 32-bit, X11R6-com-

pliant, distributed X server built around a thin-client architecture and GraphOn's RapidX protocol—it does not require a PC to run an X server to access graphical UNIX and X Window applications. It costs \$295 per seat. **GraphOn Corp.**, 150 Harrison Ave., Campbell, CA 95008, <http://www.graphon.com>. **Circle 113**

■ Box Hill, maker of the Fibre Box Fibre Channel RAID storage system, has added "SAN Spamming" to its product. SAN Spamming is said to be useful in environments that require fault tolerance for their data because it allows data to be distributed among multiple storage-area networks (SANs). SAN Spamming can also increase bandwidth across multiple 100-MB/s SANs by eliminating data transfer bottlenecks and balancing load between SANs. Pricing for Box Hill's Fibre Box starts at \$0.30/MB. **Box Hill Systems Corp.**, 161 Avenue of the Americas, New York, NY 10013, <http://www.boxhill.com>. **Circle 114**

■ Iona Technologies has enhanced the platform support for OrbixTalk 1.2, a messaging system that enables an application to send data to a group of objects. In addition to Solaris, HP-UX and Windows NT, OrbixTalk is now available for AIX. The messaging system is based on IP Multicast transport service that provides one-to-many or many-to-many communication between a group of components and applications. Furthermore, it's a decoupled system, which allows receiving objects to be changed without altering the sending application. Iona says it offers low-latency delivery and greater throughput with a smaller footprint. Contact vendor for pricing. **Iona Technologies Inc.**, 60 Aberdeen Ave., Cambridge, MA 02138, <http://www.iona.com>. **Circle 115**

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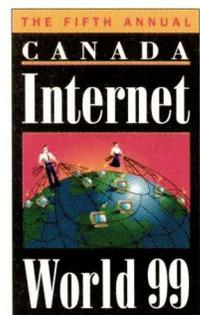
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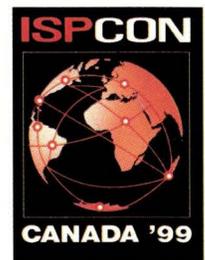
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## New Products



ates over a SCSI 1 or SCSI 2 host channel with burst rates of up to 20 MB/s, while Imager 2 runs at up to 40 MB/s (UltraSCSI) from the host to the drive and supports robotic tape libraries.

Ultera says the Imager series can integrate with any SCSI tape drive and any backup software. Management takes place online via a Microsoft Corp. Windows-based GUI console. Pricing starts at \$2,445.

**Ultera Systems Inc.**  
26052 Merit Circle, Ste. 106  
Laguna Hills, CA 92653  
<http://www.ultera.com>  
**Circle 116**

### Tandberg Unveils Travan Tape Drives

Tape drive manufacturer Tandberg Data has announced two additions to its product line: NS20 Pro and SLR6. NS20 Pro, a low-cost tape drive aimed at small business server applications, offers storage capacities up to 20 GB (with hardware compression). It uses Tandberg's Travan tape cartridges, which are 3.5-inch form-factor cartridges and feature read-while-write and Level 10 Reed Solomon ECC (stands for Error Correcting Code) data recording formats to ensure data integrity. NS20 Pro has a 200,000 per hour mean time before failure (MTBF) rate and costs \$530 for an internal drive version.

The SLR6 tape drive, a storage product for networks, workstations and midrange computing applications, can hold up to 24 GB of compressed data and features a 16-bit Fast Wide SCSI 2 interface and transfer rates up to 8.6 GB per hour (2.4 MB/s in hardware data

compression mode). It ships with Tandberg's Tape Alert security feature, providing diagnostic messages and recommended actions. It is priced starting at \$1,023 for an internal drive, \$1,221 for an internal version of the complete storage management solution with Seagate Software's Single Server Suite software on CD-ROM, data cartridges and cables, and \$1,353 for an external version.

**Tandberg Data Inc.**  
2685-A Park Center Drive  
Simi Valley, CA 93065  
<http://www.tandberg.com>  
**Circle 117**



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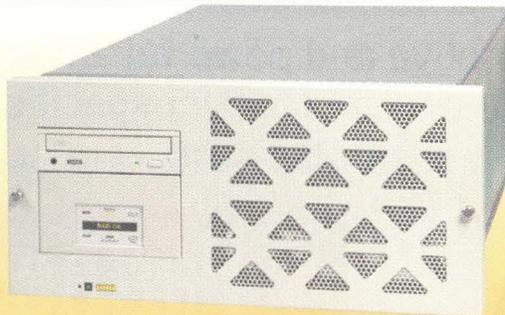


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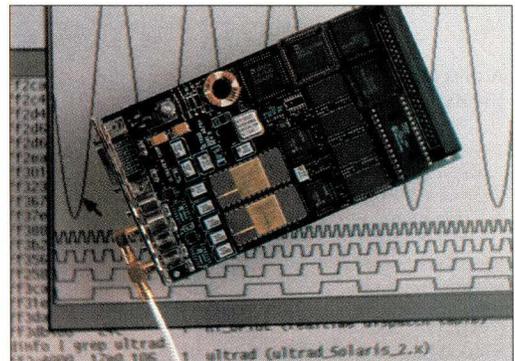
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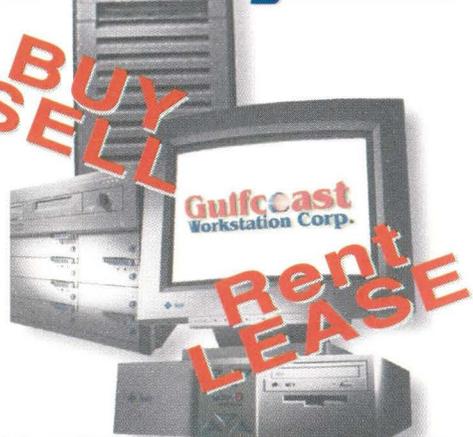
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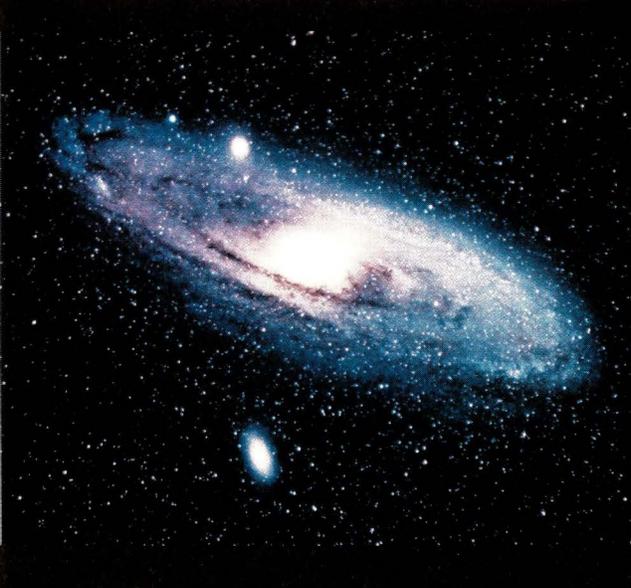
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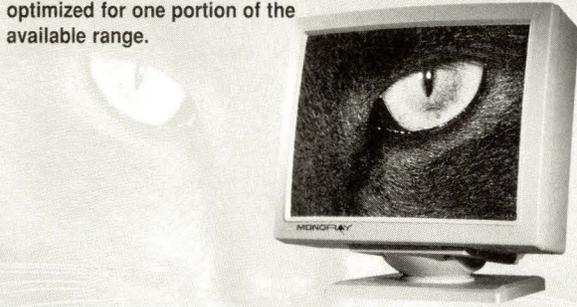


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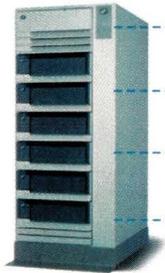
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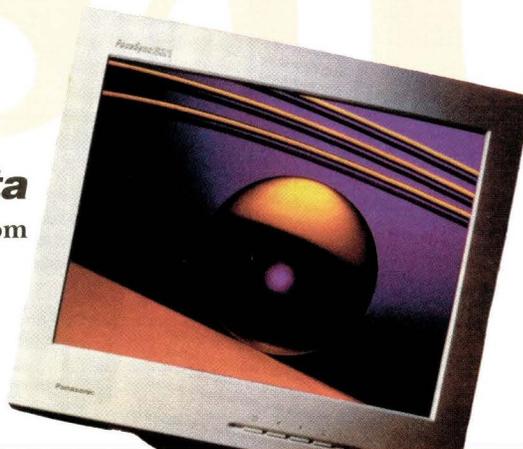
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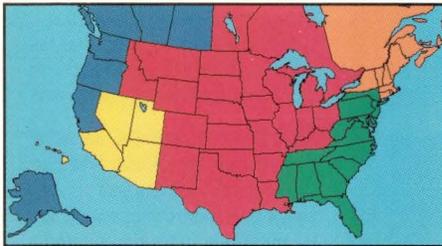


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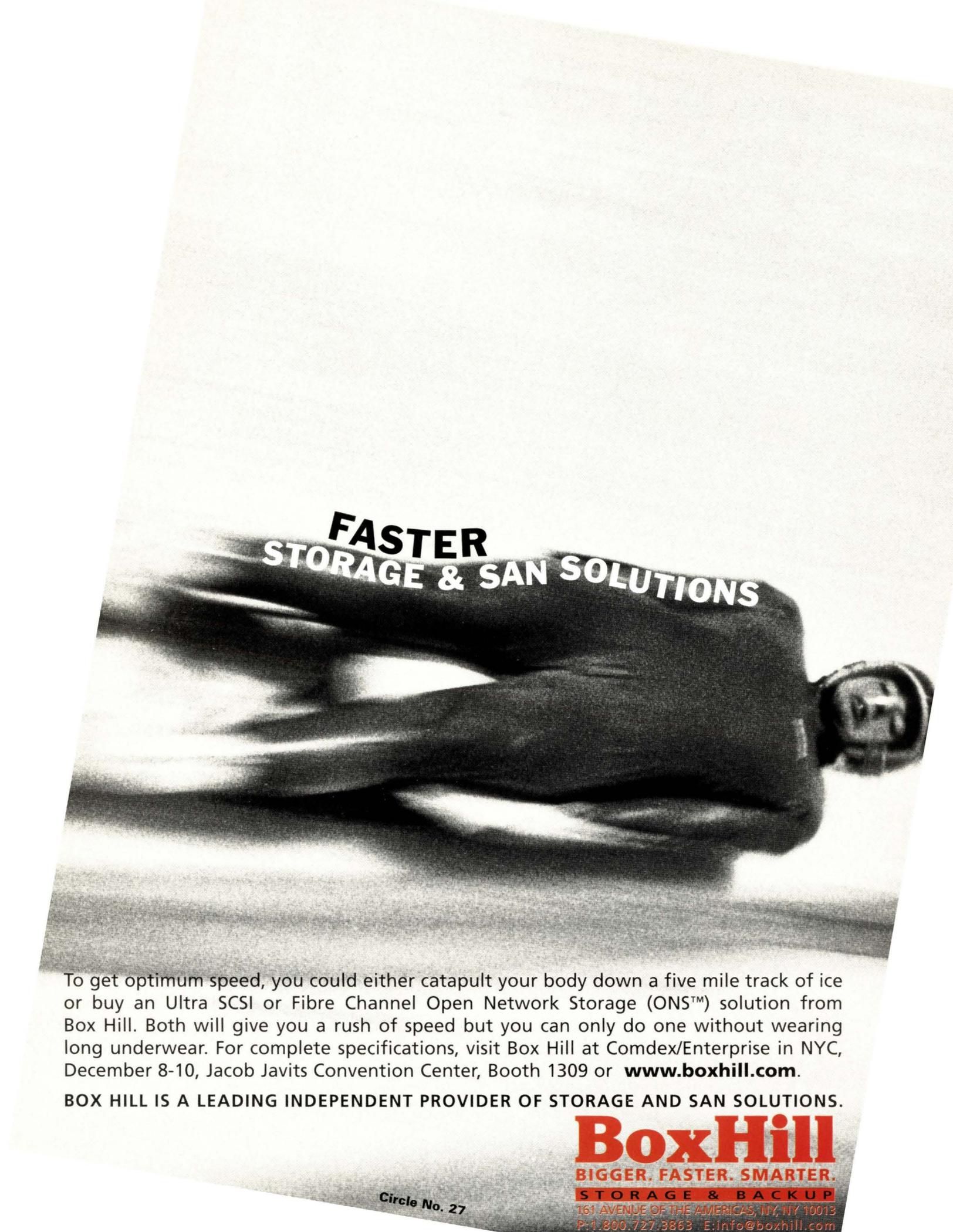
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