JANUARY 1998 Vol. 9 No. 1 $5.50

SUNEXPERT

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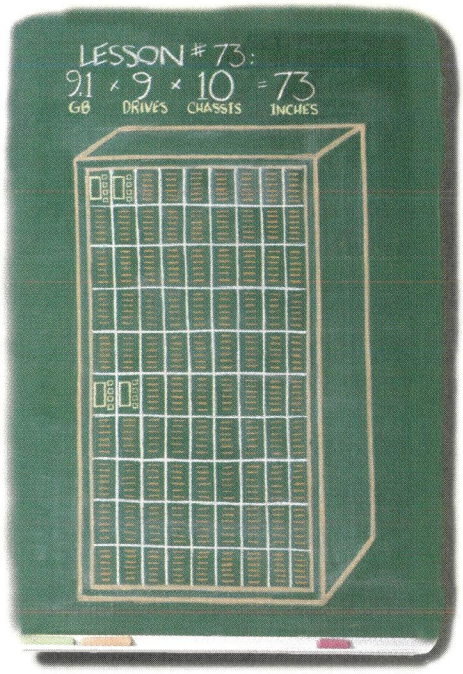
Review: Ross hyperSTATION

UNIX Basics: Web Tables

Artecon's New RAID Math



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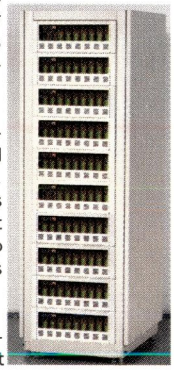

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SUNEXPERT
The Server/Workstation Magazine

January 1998
Volume 9
Number 1

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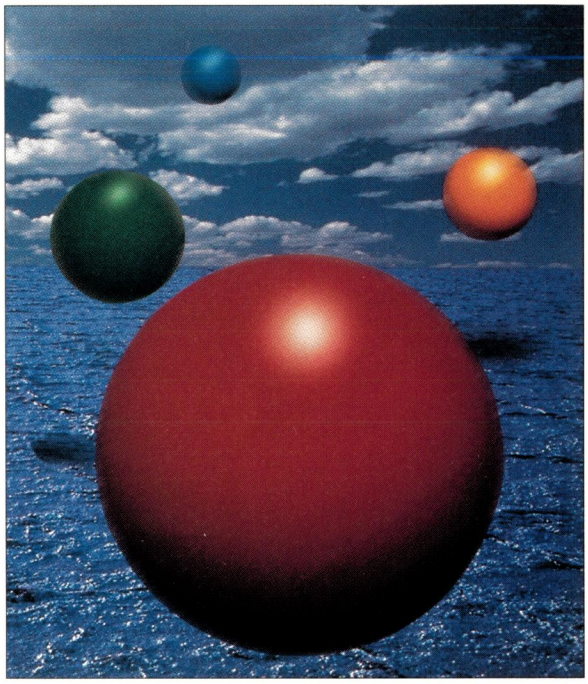

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News

Columns

SUNEXPERT Magazine (ISSN 1053–9239) is published monthly by Computer Publishing Group, 320 Washington St., Brookline, MA 02146. Telephone (617) 739-7001. Periodicals Postage Rates paid at Boston, MA, and at additional mailing offices. Posted under Canadian IPM #0235873. This publication is free to qualified subscribers as determined by the publisher. Subscription rates are $60 per year in the United States, and $95 (surface mail) and $150 (air mail) outside the United States. Subscription requests can be sent to Circulation Department, *SUNEXPERT* Magazine, 320 Washington St., Brookline, MA 02146 or electronically mailed to circ@cpg.com.

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

Product Review

54 A Versatile Multiprocessor

Ian Westmacott, Technical Editor

Ross' hyperSTATION 30 will be at home in any multithreaded application area, including database and Web server applications, CAD/CAM and graphics design.

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RS/Magazine

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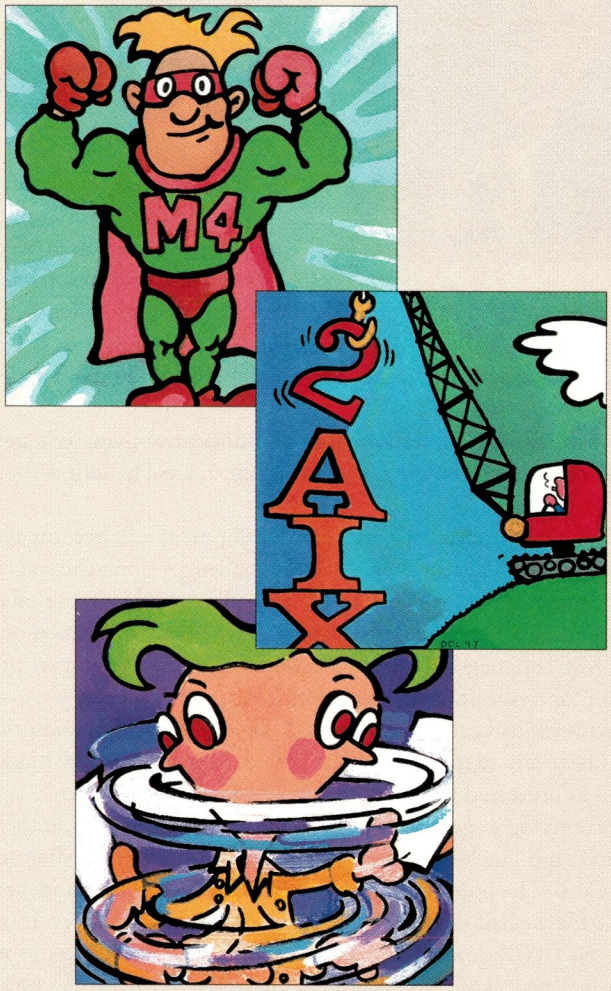
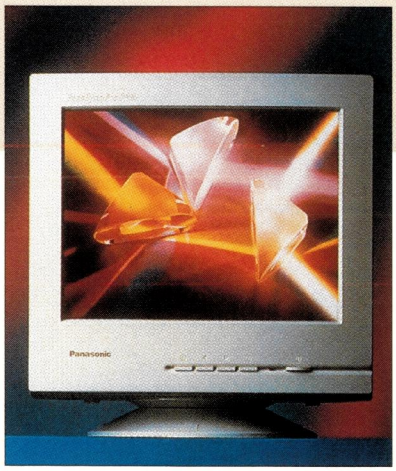


Columns illustrated by DANIEL C. O'CONNOR



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EDITORIAL

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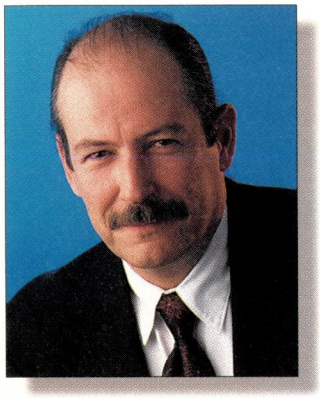

Happy New Year

This month's cover story, "Turbo-charging Object Projects," by regular contributor Karen Watterson, takes a look at recent trends in software development. Of course, Java and the World Wide Web have to some extent legitimized and accelerated the use of components. That, by most appraisals, is a good thing because the idea behind components is to buy or build them and then use them over and over.

And when you can find prebuilt components, buying is generally far more cost-effective than building your own, but the real benefit is shortened development time.

Maybe the promise of rapid app development will become real over the next few years. There will be a host of challenges along the way, as Karen suggests. Programmers will have to get a handle on object reuse metrics and hone their object analysis and design skills. Maybe new tools based on the Unified Modeling Language will help in developing new programmer productivity metrics for a component-based world. Of course, the age-old economic question will rear its head: What are sane object distribution and pricing models? If you have any suggestions about how components can be bought and sold, as well as protected from piracy, I would love to hear them.

We're trying to get to the meat of the strategies evolving in the various component camps, including those at Sun Microsystems Inc., Microsoft Corp. and IBM Corp. The point is to help you evaluate your object model options. Sorry, but we felt we had to give Microsoft a large piece of the story. It is imperative that even UNIX developers get to know the ins and outs, so to speak, of ActiveX, DLLs or Visual Basic eXtensions just to deal with Microsoft's ubiquity in software. Today, even UNIX developers can use ActiveX controls, thanks to tools such as Wind/U 4.1 from Bristol Technology Inc. and Nutcracker from DataFocus Inc. (That's one of my resolutions for this year: Don't be too hard on companies from Redmond. The weather is punishment enough.)

Doug Pryor

Incorporating RS/Magazine

SUNEXPERT

The Server/Workstation Magazine

January 1998 Vol. 9 No. 1

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SunExpert NEWS

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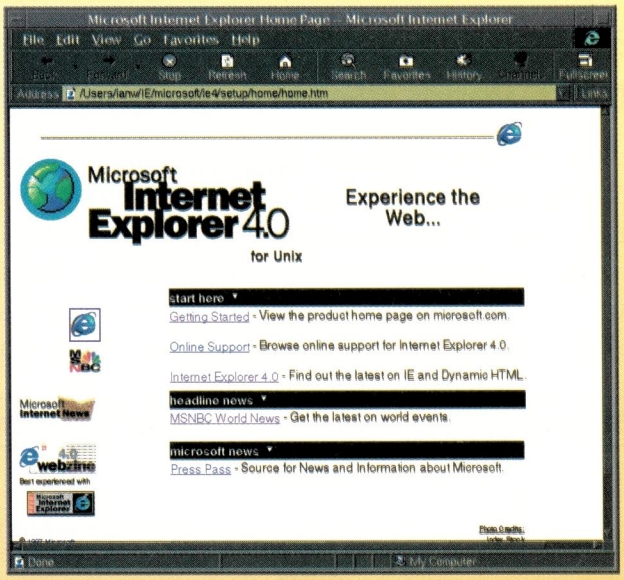
Solaris Users Can Surf the Web with Explorer

Despite the fact that Microsoft Corp. and Sun Microsystems Inc. are duking it out in court, the Redmond, WA-based software giant has announced the Preview 1 release of Internet Explorer 4.0 (IE) for Solaris 2.5, Sun's UNIX operating system. In upcoming months, Microsoft plans to announce separate UNIX versions of IE for Hewlett-Packard Co. HP-UX, IBM Corp. AIX and Silicon Graphics Inc. IRIX.

The Solaris release of IE is Microsoft's first attempt to offer a UNIX-flavored browser. "We talked to our enterprise customers and what it came down to was they liked the Internet Explorer product, but they were holding up deployment because we didn't have a browser for the platforms they needed," says Craig Beilinson, product manager for IE. "They told us that the bulk of their UNIX desktops were on those four [Solaris, HP-UX, AIX and IRIX] platforms."

The Solaris release of IE is based on the Motif interface and can integrate with UNIX applications. For example, Microsoft says that IE 4.0 can be used to send and receive email in existing UNIX mail applications, and that the browser also has the ability to read UNIX-specific file types off Web sites without having to invoke that application for that file separately. "We spent a lot of time optimizing for the operating system as opposed to simply porting some code," says Beilinson. "The goal was to make sure that we were writing the best browser for that platform. We wrote the browser specifically for the Sun Solaris platform."

IE 4.0 for Solaris supports Dynamic HTML, basic browsing functions of locating Web sites and content, and offline browsing to view downloaded Internet content when users are not connected to the Internet. Also, the new UNIX browser offers users and corporate administrators the ability to control content downloaded to the user's desktop. This feature allows ActiveX controls and Java to be disabled and can also block previews of any site.



The Solaris release of Internet Explorer 4.0 is Microsoft's first attempt to offer a UNIX-flavored browser.

The IE UNIX release was announced just before new market share figures were released from Dataquest Inc., a Gartner Group Inc. company, showing Netscape Communications Corp.'s Navigator still the market leader over Internet Explorer. Dataquest's findings show Navigator holds 57.6% of the market, while IE now has 39.4%. The report depicts a clear fall for the Netscape product, which grabbed 73% of the market in fourth-quarter 1996, while IE only had 20%. As it relates to the "browser war," IE for UNIX is not a major strategic move. "It's just something [Microsoft] had to do," says Kathryn Hale, principal analyst for Dataquest's Internet and enterprise strategies worldwide program. Hale estimates UNIX users make up 4% of all Web traffic.

Microsoft also announced Preview 2 of Internet Explorer for Windows 3.1. The plan as of press time is to release the other three UNIX versions of IE over the next six months and to provide the final version for Solaris in the first quarter of 1998. The browser is free from the Microsoft Web site (`http://www.microsoft.com`).–*ptc*

New Netras Debut

Sun Microsystems Inc. has added two servers to its Netra product line. One is a dedicated server for Network File System (NFS), and the other is designed specifically for the telecommunications industry. According to Sun, the Netra NFS 1.2 server is designed to recover deleted files and older versions of altered files without the help of a systems administrator. The Netra t 1100 server is designed to meet the requirements of the telecommunications central office, with stringent fireproofing standards, alarm capability and packaging requirements.

A telephone company central office is typically in the basement of a building, with raised floors of computing platforms supporting a wide variety of applications and systems. Often, it has its own electrical generation capability. "There is no question that a central

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office is a unique environment," says Traver Kennedy, analyst at The Aberdeen Group, a market research firm based in Boston.

To assure potential customers that the Netra t 1100 can meet the unique demands of the central office, Sun submitted the product to Bell Communications Research Inc. (Bellcore) for Network Equipment Building Systems (NEBS) testing. It has received NEBS Level 3 certification, meaning the product will operate reliably under a wide range of environmental stresses that a product could foresee in its lifetime. Specifically, the Netra t 1100 was tested for fire resistance and the ability to operate in extreme temperatures and humidity, as well as the ability to withstand earthquakes. Bellcore also performed tests for electromagnetic interference and lightning surges. "It gives an assurance of a high level of integrity," says Rudi Schubert, director of NEBS technical services with Bellcore. "[It means] no loss of service as a result of any kind of environmental stress."

Initially, the Netra product line was introduced for connecting to the Internet but now is evolving into more network-centric products.

In addition, the Level 3 rating means Sun has committed to having the product tested on an ongoing basis. Upgrades and product enhancements will also be tested for NEBS compliance. "[Sun's] in it for the long haul," says Schubert. "They plan to subject it [the Netra t 1100] to a series of tests on an as-needed basis depending on how the product evolves."

The Netra t 1100 is priced at $16,995 with a 250-MHz UltraSPARC-II processor and flexible rack-mount options and telco-specific alarms. Also, it supports 48V DC power–a requirement unique to the telecommunications industry. "Most telco equipment likes to survive under batteries, and that means 48V DC," says Will Strause, president of Fast Forward Concepts, a market research firm based in Tempe, AZ. "That's something you're not going to find in an NT-based server."

The Netra NFS 1.2 server is a slightly different product. It is available in two models, the 2/1300 and 2/2300, with one and two 300-MHz UltraSPARC II processors, respectively. Netra NFS offers two-way symmetric multiprocessing and an SBus 32-MB nonvolatile RAM card. Sun says the NFS server has a usable storage capacity of up to 319 GB, and customer data is protected from drive failures with a choice of RAID 5 or RAID 0+1 and hot-swap/hot-spare drives. The Netra NFS 1.2 Models 2/1300 and 2/2300 are priced at $33,995 and $43,995, respectively.

All the new servers are Solaris-based and continue a departure from the original line of Netra servers. Initially, the Netra product line was introduced for connecting to the Internet but now is evolving into more network-centric products. "We believe the industry has a different problem to solve," says Daniella Russo, director of product marketing with Sun's network product division. "Netra has been extremely successful in its time with getting our customers on the Web. Their problem is no longer how do we get on the Web but how to manage their network right."

In related Netra news, Sun has also unbundled Netra Internet Server and has made the product available as a software-only package. Sun's Netra i 3.2 uses third-party Internet and security products in a Web server package. The new server software offers access to upgrades of Netscape Communications Corp. Enterprise Server 3.0, Check Point Software Technologies Ltd.'s FireWall First!3.0, TrendMicro Inc.'s InterScan VirusWall 2.0 and Haystack Labs Inc.'s Webstalker First 2.0. Sun's Netra i 3.2 runs on Solaris 2.6 and is priced at $2,995. Also available is Netra i Pro 3.2 for $5,995. It includes Netscape's SuiteSpot Standard Editions. "In the past, Netra Internet Server was a hardware/software bundle," says Bob McKee, group marketing manager at Sun. "A lot of customers want the ability to put it on any new product or platform that we'll come out on, and they also want to redeploy on old hardware. Now we're able to do that."–*ptc*

Support for OpenMP

A group of major hardware vendors, including Silicon Graphics Inc. and IBM Corp., recently announced they would support OpenMP, a multiplatform application programming interface (API) for developing shared-memory programs on UNIX and Windows NT. Currently, OpenMP is defined for FORTRAN, but C and C++ support is planned.

OpenMP is designed to let software developers add parallelism to code that is portable to different hardware platforms without a major rewrite. "OpenMP is a viable, portable, shared memory model that people can count on to move their application from machine to machine," says Jeff McDonald, systems performance manager at SGI, one of the companies pushing OpenMP.

The API is said to serve the needs of software developers writing technical programs for multiprocessors. An alternative is Pthreads, an accepted standard for shared memory, but one that is limited in the technical/high-performance computing space. Another option is message passing interface (MPI), which requires programmers to make an entire application parallel. OpenMP, on the other hand, allows a programmer to make a certain portion of an application parallel. "I think it was hindering the speed at which applications were being moved to parallel platforms," says McDonald. "What OpenMP does is provide a second model, or API, for programmers to target, and that model is one of shared memory."

OpenMP™

The selective parallelism is made possible with a feature called Orphan directories. The directories allow certain loops and subroutines in an application to be defined as parallel while also enabling sections in a program to run sequentially as needed. "There was never anything like this," says David Kuck, chairman of the board for Kuck & Associates Inc. (KAI), Champaign, IL, maker of parallel software engineering tools, another supporter of OpenMP. "It provides a functionality

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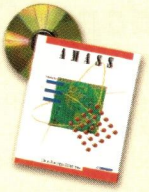

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Circle No. 5

at the programming language level as opposed to the assembly language level for expressing parallelism that has never been there before."

In addition to SGI and KAI, other companies supporting OpenMP include Absoft Corp., Rochester, MI; Digital Equipment Corp., Maynard, MA; Edinburgh Portable Compilers, Champaign, IL; Genias Software GmbH, Neutraubling, Germany; IBM (including the Personal Systems Division and the Compiler Division), Armonk, NY; and Intel Corp., Santa Clara, CA. Several application developers have also endorsed OpenMP, including Ansys Inc., Canonsberg, PA; Fluent Inc., Lebanon, NH; and Livermore Software Technology Corp., Livermore, CA.

While Sun Microsystems Inc. is not now supporting OpenMP, the technology can be leveraged by independent software vendors and developers writing applications for Sun's operating systems. KAI offers a product suite that makes software parallel for Sun's Solaris operating system, called KAP/Pro Toolset Version 3.5. These third-party products will be necessary as long as Sun doesn't natively support OpenMP. The general feeling among those pushing OpenMP is that Sun will support it in the future.

"At this point, we're still studying OpenMP," says Bill Moffitt, product manager for the FORTRAN performance workgroup at Sun Microsystems' SunSoft company. "Obviously, we want to do the thing that is best for our customers. It's not completely clear that this is the best thing, but we're open to it if it turns out to be that way."–*ptc*

X.500 Vendors Adopt LDAP

As industry support for the Lightweight Directory Access Protocol (LDAP) grows, vendors of X.500-based directory services are reiterating their long-standing affiliation with the now popular client access protocol.

In recent months, several X.500 vendors have announced LDAP-related upgrades to their X.500 products. For example, ICL Inc. in Reston, VA, announced in September that Version 7 of i500 Enterprise Directory now features multithreaded LDAP for increased performance. And in November, Isocor, Santa Monica, CA, announced that X.500-based Global Directory Server 2.1 is now equipped with LDAP and ODBC connectivity.

For X.500 vendors, the push to associate themselves with LDAP stems from more mainstream vendors' vocal adoption of the technology. Netscape Communications Corp., for example, has advocated using LDAP as the directory service of choice for all Internet-enabled applications. Netscape also counts among its staff Tim Howes, who developed LDAP while at University of Michigan. Novell Corp., Banyan Systems Inc. and Microsoft Corp. have also pledged support for LDAP in their respective directory service offerings–Novell Directory Services (NDS), StreetTalk and Exchange Server.

In truth, having an X.500 server support LDAP doesn't represent any new technological achievements, says Mark Levitt, research manager with International Data Corp., Fra-mingham, MA. From the beginning, LDAP was designed to provide the same basic functionality as X.500's own Directory Access Protocol (DAP). What LDAP brought to the table, however, was its ability to run over vanilla TCP/IP–typically embedded into the client operating system–and not over a little-used, heavyweight transport protocol like DAP. LDAP also simplifies some X.500 functionality and eliminates some less useful features outright, Levitt explains.

"What's going on is that companies are becoming more vocal about their support," says Levitt. In fact, before Netscape et al came out in support of LDAP, many X.500 vendors viewed the leaner LDAP as being somewhat of a compromise, Levitt says.

The market, for its part, has viewed X.500 as overkill. With the possible exception of large-scale enterprise customers and universities, the number of X.500 deployments has been disappointing. For most organizations, says Levitt, implementing X.500 is analogous to stripping and repainting your entire car just to cover up a single scratch.

Meanwhile, interest in LDAP has been fierce. But, according to Bill Wolf, vice president of business development and corporate marketing at Isocor, "LDAP alone doesn't meet organizations' needs." The result? Several high-profile companies, including NationsBank Corp., Charlotte, NC, and Texas Instruments Inc., Dallas, TX, have announced aggressive X.500 projects where LDAP is playing a strong role. For X.500 vendors, therefore, interest in LDAP is presenting itself as a way to gradually introduce the desire for heartier X.500-style directory services.

IDC's Levitt, however, isn't entirely convinced that X.500 vendors are in for entirely smooth sailing in the years ahead. Development work on LDAP has not stood still. And while Isocor's Wolf complains that "LDAP is losing some of the lightness," that makes it a good client access protocol, proponents of the technology still see LDAP bloat as a better alternative to full-fledged X.500. "LDAP," says Levitt, "just might have a life of its own."–*as*

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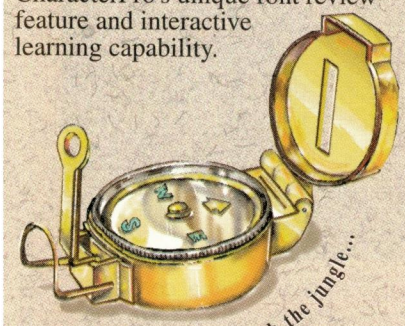

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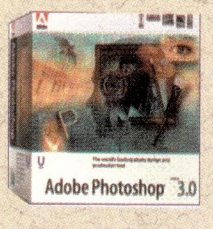

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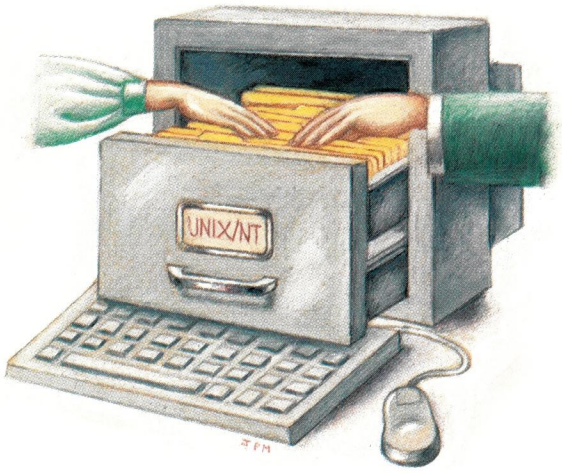
UNIX/Windows NT File Sharing

For proof of UNIX and NT coexistence, you only need look as far as the corporate data center, where IT professionals are increasingly fond of using the same storage media to hold data destined for both operating systems.



But according to Network Appliance Inc., Santa Clara, CA, maker of network-attached storage "filers," the ability to share physical storage is only moderately useful. Because the two platforms address file-locking differently, administrators cannot confidently share files across platforms for fear of data corruption. When both a UNIX and a Windows NT application require access to the same file, the only safe solution is to make duplicate copies of the data. And this, administrators complain, costs them both in terms of storage space and administrative hassle.

NetApp, as the company is commonly known, has proposed a solution to this problem in Version 2.0 of its Windows Networking Software, a protocol option that provides Windows file sharing and server management facilities for the company's Data Ontap operating system. In mixed Windows/Common Internet File System (CIFS) and UNIX/Network File System (NFS) environments, the feature, called SecureShare, ensures data integrity simply by making sure that the stricter file-locking procedures of CIFS always take precedence over NFS lock requests.

"With Windows NT, file locking is mandatory; with NFS, it is simply recommended," explains Bridget Allison, NetApp's project manager for Windows Networking Software. "SecureShare essentially forces the NFS client to take notice of file locking."

SecureShare is by no means the industry's first attempt to address the discrepancies in file-locking between NT and UNIX, but, according to Allison, it is the first implementation to be directly integrated into the operating system. Other attempts–for example, TAS from Syntax Inc., Federal Way, WA, which Sun Microsystems Inc. includes in Solaris 2.6, and the public-domain Samba–run in user mode, says Allison, resulting in substantial performance degradation. With this in mind, Allison hopes that SecureShare will lure the more demanding, data-intensive environments into implementing multiprotocol file sharing, something which, until now, she believes they could not have even contemplated.–*as*

Migrating to Fibre Channel Storage

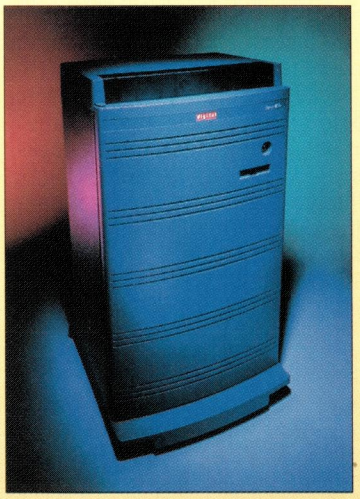
In many IT environments, systems administrators and network managers are wondering if SCSI storage systems have run out of steam. Because of the increasing number of storage subsystems required, the wider dispersion of data throughout an enterprise and the need to get the most performance in return for investment, some companies are migrating to Fibre Channel storage products to satisfy these needs.

"Customers are saying, 'Give me more performance, give me higher availability,' and these are the underlying principles that are pushing Fibre Channel forward," says Michael Peterson, president of Strategic Research, a market research firm based in Santa Barbara, CA.

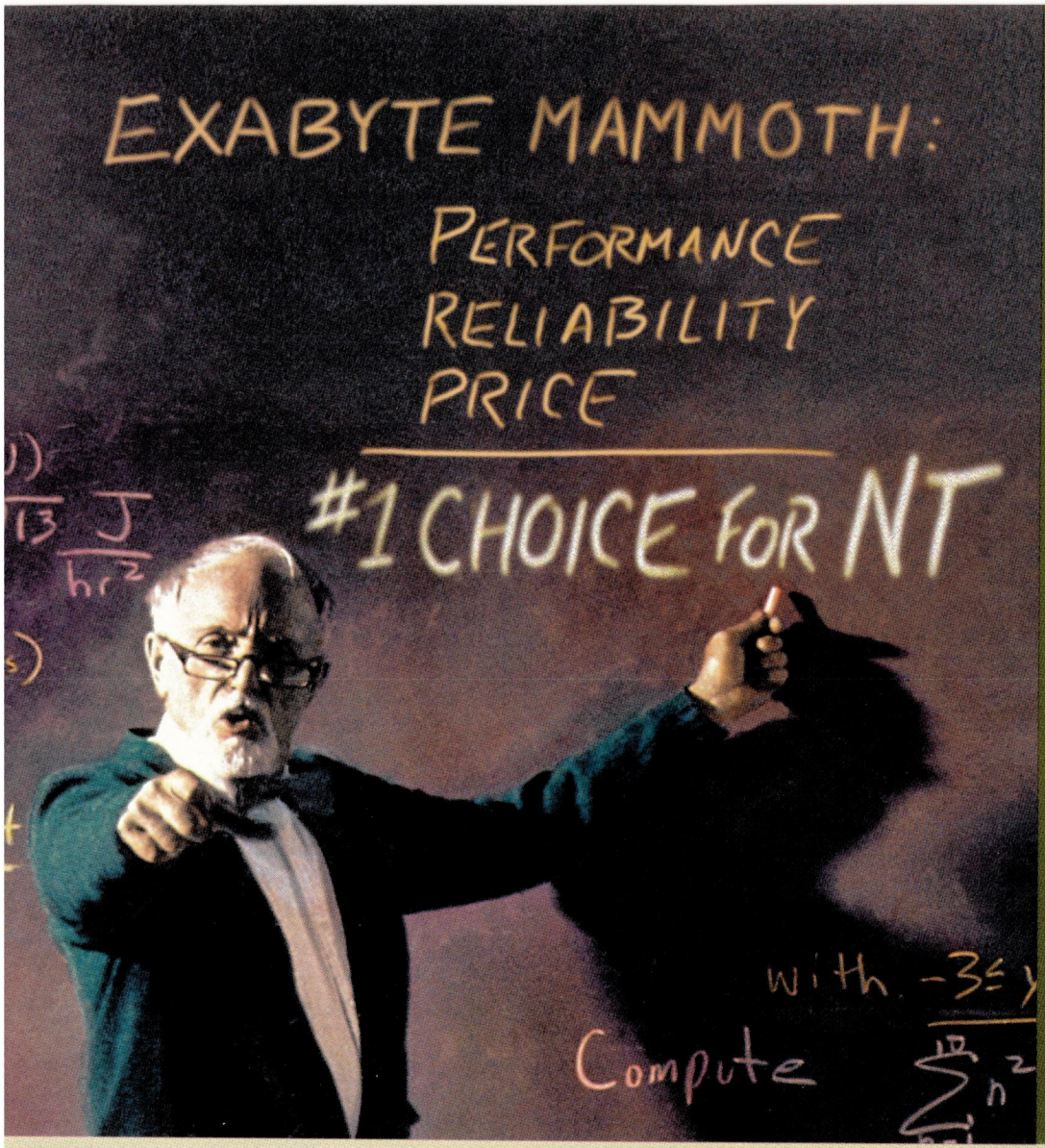
But companies don't want to have to scrap entire storage solutions that they have up and running in exchange for expensive new systems costing in the $130,000 neighborhood. Peterson says that migration tools, such as Digital Equipment Corp.'s Fibre Channel controller and CLARiiON's SCSI-to-Fibre Channel storage upgrade program (more below), are serving as temporary Fibre Channel solutions. Full-fledged Fibre Channel products are currently available to select OEMs only but users are in need of Fibre Channel functionality now.

A few of the new Fibre Channel storage products announced recently offer an inexpensive, logical migration path to Fibre Channel technology. Instead of requiring users to purchase entire new RAID systems, vendors, including DEC and CLARiiON (a Data General company), are offering upgrades for existing SCSI systems that require very little new hardware and can cost a third the price of a new Fibre Channel system.

DEC recently announced a Fibre Channel connectivity solution for its StorageWorks family of RAID products as well as new Fibre Channel components and solutions for OEMs. According to DEC, users can migrate to Fibre Channel storage with a simple board swap. Kirby Wadsworth, director of marketing for DEC's storage business unit, says, "When the RAID products



DEC's Fibre Channel controller, the HSG80, will be available to RAID Array 7000 (shown above) users in mid-1998.



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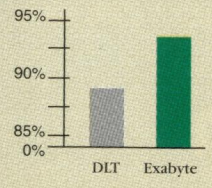

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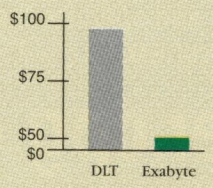

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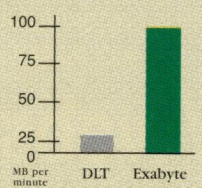

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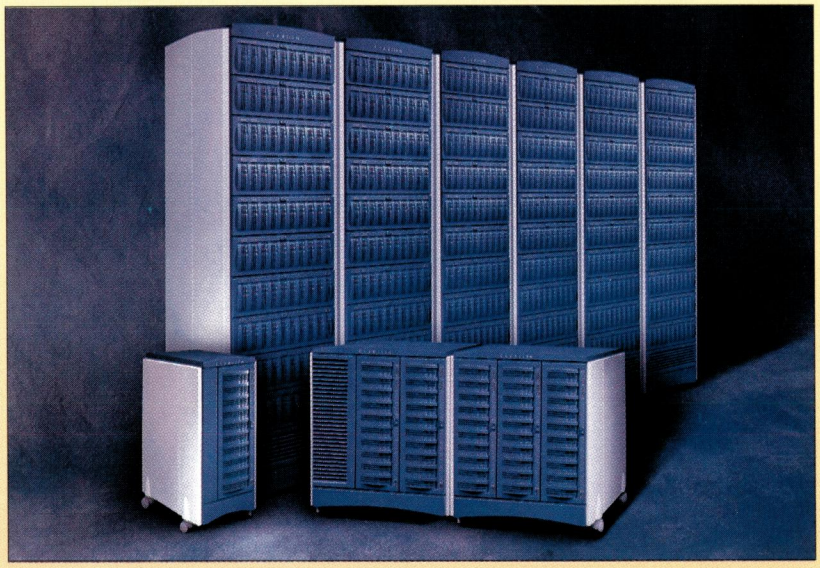

CLARiiON allows customers who order Series 3000 arrays to trade them in for FC5000 all-Fibre Channel storage arrays, part of the Fibre Channel family shown above.

were announced in September of 1997, Digital announced at that time that Fibre Channel would available later for these products through a simple board swap upgrade, and now Digital's promise of Fibre Channel has been fulfilled."

DEC's new Fibre Channel controller, the HSG80, operates at 25,000 I/Os per second per pair with data rates of up to 90 MB/s for high-speed transfers. Wadsworth says the Fibre Channel controller, which supports up to 72 drives, will initially ship in new orders directly from the factory, so customers ordering new systems will have the option of either Ultra SCSI or Fibre Channel. The HSG80 will be available to RAID Array 7000 and ESA 10000 Ultra SCSI users sometime in mid-1998.

DEC also recently announced other Fibre Channel connectivity solutions, including a PCI-to-Fibre Channel adapter, the KGPSA, which offers data rates of up to 100 MB/s, and a Fibre Channel arbitrated loop hub, the DS-DHGGA-CA, which enables shared storage over many host systems. The hub is expandable to 127 ports. Support for a new OEM Fibre Channel gigabit switch that supports up to 32 switches and hundreds of connections for distributed networks is in the works.

Meanwhile, CLARiiON unveiled three migration programs in November to help SCSI users migrate to Fibre Channel storage. "Many users have decided that SCSI has ended its useful life and really want Fibre Channel," says Paul Danahy, product marketing manager for CLARiiON's solutions business group. He adds, "Migration tools make it attractive for them to move to Fibre Channel without a significant impact to their systems or finances."

The first of the new CLARiiON programs, called the Series 3000 Fibre Channel Upgrade Program, enables customers to purchase SCSI-based storage now, and later convert to storage that is based on the Fibre Channel interface standard. This is effective only on purchases made after November 17, 1997.

CLARiiON is also offering free SCSI-to-Fibre Channel storage processor upgrades for Series 3000 arrays ordered from participating CLARiiON resellers. This permits organizations to upgrade Series 3000 arrays to Fibre Channel at no cost during 1998. Upgrading Series 3000 arrays from SCSI to the Fibre Channel is simple and takes less than an hour, the company says. In the process, no backup and restore of data is necessary, and all storage management tools remain the same. CLARiiON claims the conversion to Fibre Channel is completely transparent to existing applications.

For organizations that require fast Fibre Channel RAID storage processing, CLARiiON's second migration program, called the DPE Technology Upgrade Program, allows customers who order Series 3000 arrays from participating resellers to trade them in for CLARiiON's FC5000 Series of all-Fibre Channel storage arrays. This exchange offer is in effect until the end of 1998.

CLARiiON's third migration program is called the Classic CLARiiON Consolidation Program. In combination with the first two Fibre Channel migration programs, participating CLARiiON resellers will offer rebates to users of CLARiiON hardware who decide to trade in their existing arrays for new Series 3000 systems. These trade-in rebates are based on the type and amount of hardware being exchanged. Current Series 3000 arrays users are eligible for the free Fibre Channel upgrade and the FC5000 technology upgrade program.–*mm*

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Ask Mr. Protocol

by Michael O'Brien

TOM BARRETT

"Men see largely what they expect to see, and they record what seems to them important."
– Arnold Toynbee, *A Study of History*

"The 'diasporan' model takes account of societies which have been geographically dispersed and partly merged in the life of alien societies...."
– Ibid.

"Society is the total network of relations between human beings."
– Ibid.

Mr. P. Gathers the Diasporas

Q: *I'll tell you something I, for one, would like to know. How can the Internet be a great unifying force in society, a great democratizer, when all I ever see on it is people trying to sell things, or people trying to tear other people to pieces?*

A: What could possibly be more democratic than that? If there's a succinct capsule characterization of 200-odd (very odd) years of American history, that'd be it.

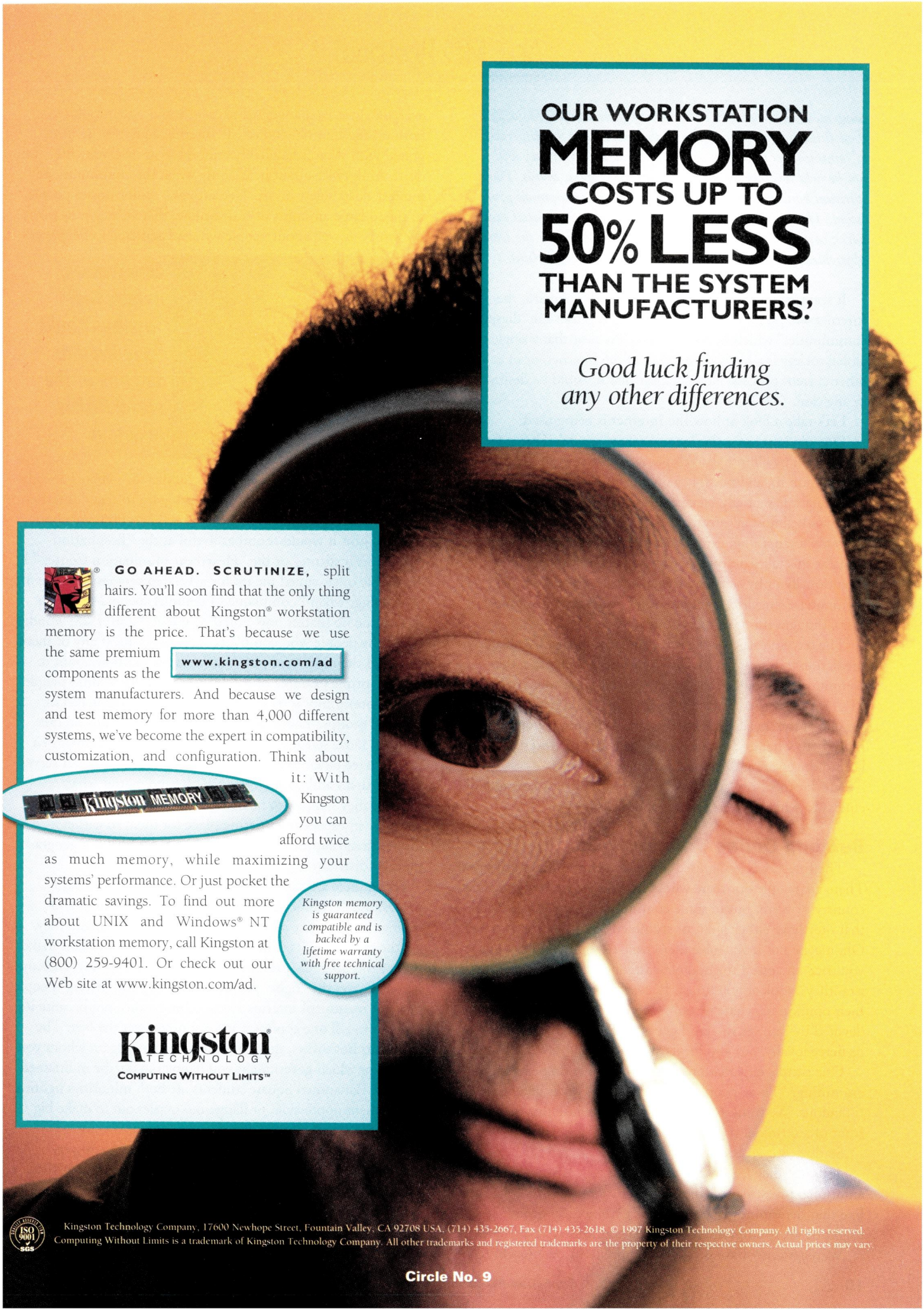
Mr. Protocol knows very little about society, probably because he has no friends. He can speak just about any communications protocol known to man, including diplomatic protocol, but has nothing intelligible to say in any of them, which is mostly why he's got me. I'm the only one who can stand him for more than 15 minutes at a time. My job in life is figuring out what he's trying to say and putting it into a form that someone else might possibly understand.

Of course, a lot of this job consists of figuring out early on that his current ravings du jour have nothing to do with reality, and ignoring the rest of the packet stream until it finally shuts down. Today, for example, he spent four and a half hours explaining in great detail this fascinating metaphor he'd come up with about packet encapsulation, where the packet was this Big Stuf Ding-Dong, and the encapsulated packet was the filling inside, and the packet header was the icing on the outside, and how the cinnamon sprinkles were the checksum, and there was more stuff in there about the white chocolate chips and the chocolate chocolate chips and the pastry dough and the cake dough and the little silver balls and the black cherry rope vines that hold the whole mess together, and it got me thinking, "Whoever would want to actually eat one of these things anyway?" Not to mention, "I never realized how much evil stuff there was in one of these chocolate frosted sugar bombs. Are they missing any ingredients that are bad for you? I think this is a lard-based life-form." And, "He's got 47 ingredients to go, and those are just the obvious ones."

I decided it was the perfect time to read Arnold Toynbee.

This time, I picked up a copy of *A Study of History*. No one could concentrate on the original with Mr. P. ranting in his ear, so this happened to be a copy of the one-volume edition, abridged and illustrated with graceful pictures of people trying to do civilization but mostly just doing art instead. One passage in particular was riveting, considering that it was written no later than 1972, the date on this edition.

The "annihilation of distance" by the progress of technology applied to physical means of communication opens up the vista of a future society that will embrace the whole habitable and traverseable surface of the planet, together with its air-envelope, and will unite the human race in a single comprehensive society. In such an ecumenical society, diasporas, not territorially compact local units, seem likely to be the most important of the global society's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component communities, and we may guess that the majority of these future diasporas will not be the products of the dispersal of communities that were originally local, and that they will not be held together by ethnic or even by religious bonds. Their spiritual bond will be some common concern or common profession. The world's physicists already constitute one global diasporan community; the world's musicians are another; the world's physicians and surgeons are in process of becoming a third.

It seems clear that, if Toynbee is at all on the mark, the Internet will play a large part in binding together the "diasporan communities" which he foresees. It is less clear that a single global society is a likely by-product of the Internet, or of any other current process. Nor is it clear that it would be desirable in any case.

Let's take a look at how the Internet is being used.

One obvious use is the "one-to-many" model. This is the model used by almost all Web pages. These exist to disseminate information to, and possibly gather it from, a large number of individuals. Essentially, all commercial Web pages fit this model, along with almost all private ones. This doesn't serve to bind anybody to anything, except customers to a business. Occasionally, this takes on the trappings of a community, either intentionally or by accident; the fanatic devotion of Apple Computer evangelists comes to mind in this regard. In most cases, though, this is simple commerce.

The second usage model is the one that brings Toynbee's prediction to mind. This is the community Web page, the communal mailing list, the Internet Relay Chat room, the MUD. One wishes, in fact, that Toynbee could have lived to see one of the social MUDs in action. A diasporan community, indeed. To what extent, then, is it likely that the Internet will lead to the creation of vertical societies?

Mr. Protocol is glad you asked, or would be, if he had any clue as to what we were talking about.

Building Online Communities

The Internet is being used to build communities right now. There are people out there whose first allegiance is not to their country of birth, but to some community of the imagination that they have either built, or stumbled across, on the Internet. Oh, maybe not if you gave them time to think about it, but if you tried an appeal to good old-fashioned nationalist patriotism, they'd look at you funny. If, on the other hand, you asked their opinion of whatever online community of interest they'd devoted themselves to, you'd get a diatribe notable not only for its fierce loyalty, but also for its sheer length.

One simple explanation of this phenomenon bears examining: "These people have no lives." This is patently ridiculous. We think they have no lives because they sit in front of a terminal typing all day.

So does Steven King.

Actually, they lead rich lives. It's just that most of their emotional investment is in their online community. It's a thin line that determines whether this is pathological or not. It might be an appropriate response to conditions.

We'd certainly have no such qualms about people whose everyday lives were involved with an activity that took place both on the Internet and off. If Internet activities are integrated with what is laughably referred to as "everyday life," we don't think twice about it. It's only when the community of interest exists solely on the Net and, as a result, causes people to spend large amounts of time online, that we begin to worry. We worry as well about people who are addicted to telephone

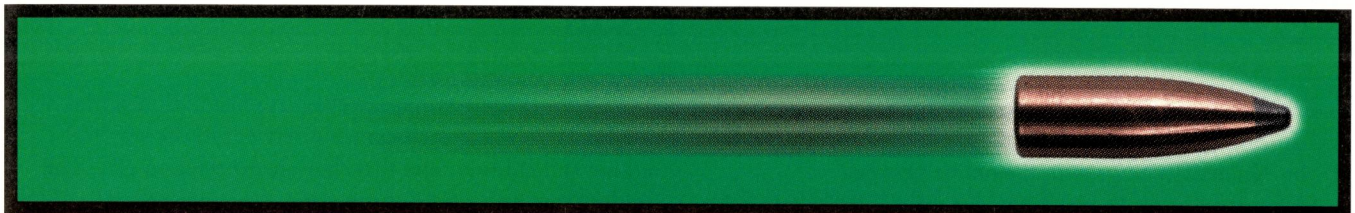
One wishes, in fact, that Toynbee could have lived to see one of the social MUDs in action.

chat lines, but the key word here is "addicted." There's already an institution that has developed a program to treat "Internet addiction." I haven't had the heart to tell Mr. Protocol about that. To him it would sound as useful as the "Respiration Addiction Institute" or the "Heartbeat Elimination Center." I know. He once signed me up for a 12-step program to cure me of sleeping, when I complained I couldn't spend 24 hours a day online no matter how bored he got at 3 a.m. I still wonder about the people who completed that program. If any of them collected their one-year pins, I don't want to know about it.

One prime example of the Internet's ability to bind people into a community is its use by various exiled nationalist or political groups. These range from heroes to villains on our political radar screens. The dissident students of Tiananmen Square have taken to the Internet like ducks to water. It serves to bind them and their efforts together no matter what country they happen to be living in at the moment. It also serves as an excellent gathering place for them to garner international support. This is nearly impossible for a geographically distributed group of people to do otherwise.

Then there are the "sizable minorities" of other political stripes, usually homegrown, such as white supremacist and militia groups. They play on the same playing field, and they get the same benefits. The flip side of the coin is that this makes them easier to track, presuming that their Web site isn't a decoy. It's hard to let the "right" people in and keep the "wrong" people out, not because of Internet security limitations, but because it's difficult to tell one applicant from another over the Net. The knife cuts both ways, though, because depending on whom you talk to, or which government you happen to be, the militiamen and the Tiananmen Square students are both minorities fighting government oppression, or dangerous crazies out to make big trouble for everybody.

All of these groups are far outnumbered by the flower-tenders, the tandem bicyclists, the devotees of the Nash Metropolitan and the adherents to the Church of the Sub-Genius. Because no one paid the slightest bit of attention to any of these people when they were off the Net, no one pays any attention to them now that they're on. But communities they



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were, communities they are, and communities they remain. And at least a sizable percentage of them have some sort of off-the-Net activity to go with the online persona.

So far, then, it looks like Toynbee's right. How likely is it that this process will continue to the extreme, resulting in the dissolution of geographical boundaries, the blurring of nationalities and the emergence of a world society?

I think the answer is, "Not anytime soon."

The problem is the touchy one of personal identity. This is rooted in tribalism to a degree that Toynbee doesn't seem to realize. It was his opinion that it would be difficult, in the absence of the Yugoslavia and the Czechoslovakia that he knew, to write a purely Serbian or a purely Croatian history. He believed that throughout history, these regions had been minority players in every major event to take place in and around them.

All of this may be true, but it hasn't prevented these people from writing their own quite extensive histories, histories whose academic correctness is subservient to the very real ethnic and cultural roles that they are expected to play. The multiethnic wars of the current decade are not part of Toynbee's thinking.

Online communities form primarily as communities of common interests, common activities, common cultural or political goals. They are extremely goal-driven, and are usually concerned with only one facet of a person's life. The activists and extremists do tend to live their lives closer to the edge, but their Net presence is swamped by the sheer numbers of "everybody else with a Web site."

The communities people actually live in, though, are much more closely tied to who they are, or who (or what) they believe themselves to be. Militiamen and students fighting for democracy identify themselves largely in terms of their membership in these organizations, which therefore organize

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support networks for their members.

Similarly, we now have a new and unfortunate term in the language: "ethnic cleansing." People of one ethnic persuasion who have historically been warring with their neighbors continue to do so. Their strong ethnic (or nationalist) identity is carried over intact into cyberspace. This is who they are, this is who they see themselves as being, and there is no need or desire to identify with an online diaspora community. Though they might also see themselves as gardeners or doctors, and belong to online communities of gardeners and doctors, this is not bound up in who they are nearly as much as their (embattled) national identity.

People's ethnic and geographic roots stem from tribal instincts. No amount of cultural relativism is going to change that. And people's personal identity almost always stems from the culture in which they're born and raised. This sort of continuity is not going to disappear overnight.

What is more likely to happen is that people will become members of more than one culture at a time. If Toynbee saw doctors, physicists and the like becoming members of diasporan societies, these people did not at the same time cease to be members of whatever culture they were geographically living in. They were members of the local culture, and members of the worldwide culture of physicists or physicians or whatever.

Communications has, in fact, led to a sort of splintering of the personal sense of identity. Many people now view themselves as members of several "societies" at once, some "real" and some virtual. The boffins could probably make an argument that a person with a weak sense of identity might join one or several online societies in an effort to shore up that identity by weight of membership, and they might be right. What's certain is that as people become more involved with the Internet, they will become more pluralistic as they create and join in online societies.

This could, one hopes, lead to a fair fraction of the population of the planet finally being able to examine a given question from more than one perspective. That has to be a good thing. ⊸

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

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

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

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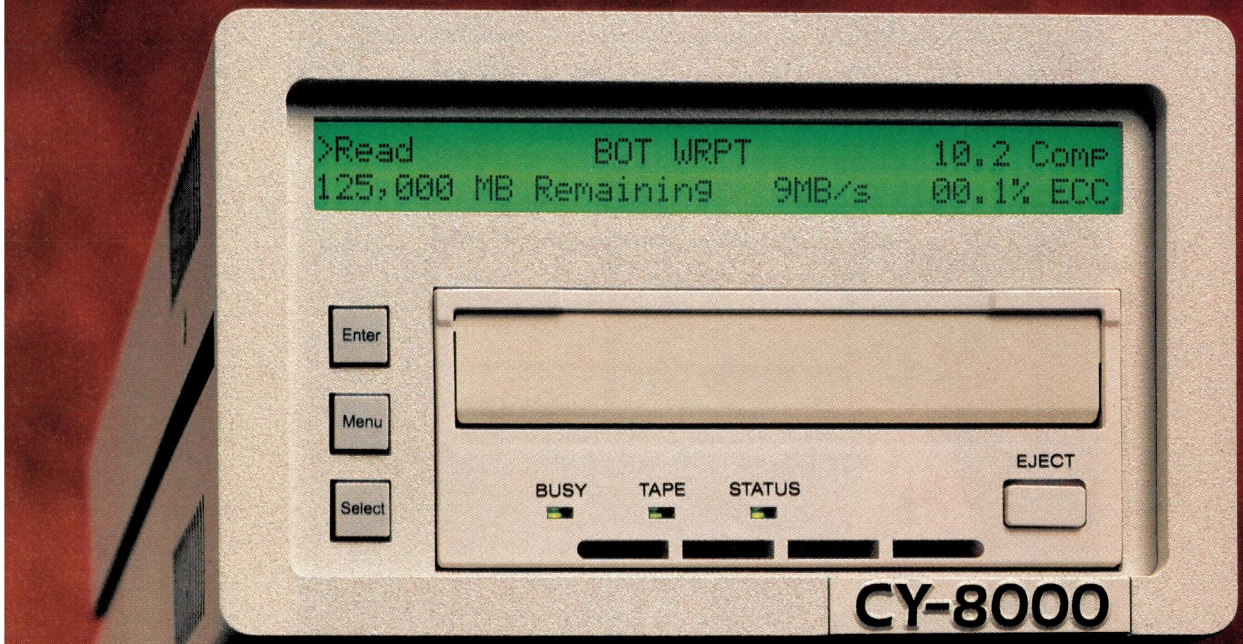

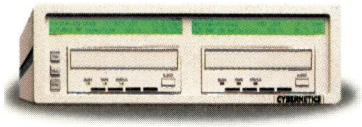

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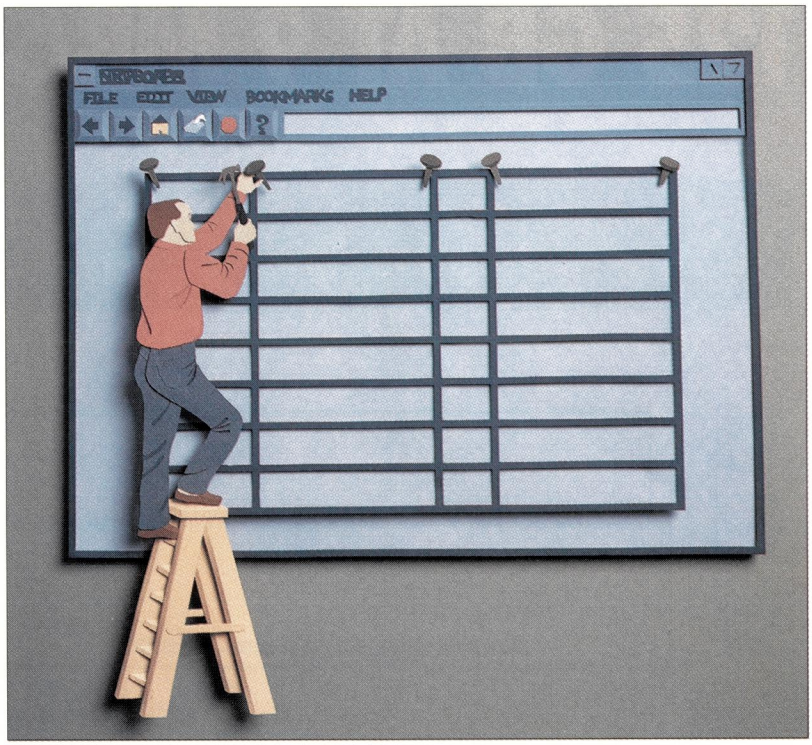

DENISE ORTAKALES

Tables on the Web

Since the earliest days of HTML, there has been what might be described as "a battle of approaches" between the folks that generate the HTML standards and the users of those standards. By users, I mean both Web page authors and the browser vendors.

The people who create the standards see HTML as a markup language, a way of specifying relatively high-level information about the text. HTML uses <P> to mean "new paragraph," and it's up to the browser to use that information to implement the "look" of a paragraph. The view is that it should always be the responsibility of the program that displays the HTML to provide the actual formatting, making its own decisions about the placement and size of text or images based on the high-level markup information. So, for a paragraph, the browser could have a selection box allowing the user to specify whether they want to see paragraphs as left-justified blocks of text or whether they want the first line of a paragraph to be indented a little.

The aim of the standards body, the World Wide Web Consortium (W3C), has been to provide more flexibility in formatting, not by implementing new formatting tags but by separating the content markup, the HTML, from the formatting information that is placed in a style sheet. Browsers are appearing on the market that implement Cascading Style Sheets, enabling the browser, the page author and the viewer to change the meaning of the tags by specifying how the tags should affect the content.

Style sheets will become considerably more important as the new generation of browsers come into more widespread use, but I suspect that it will be some time before page authors can confidently use them in preference to the current widespread set of tricks and hacks that are used to make Web pages look "nice."

Actually, most page authors are not terribly interested in the theoretical notions of page markup. They just want to make their pages work on the Web, and by "work" I mean "what the author sees, the viewer gets." Ideally, the pages should look the same to all viewers irrespective of the browser or system they are using. Many page designers would also like to be able to place objects at fixed positions on a page, so they can control the completed page design precisely. However, Web viewers all have different-size screens with different resolutions, and so being able to absolutely position objects may not be quite what is needed. As a compromise, it would be reasonable to expect that the relationships between the objects on the page should remain constant across all browsers and platforms. This is certainly far from the reality today.

So we have a clash of ideas: On one side, the standards body wants to push HTML more in the direction of carrying content and not page formatting; on the other, we have the page designers, who want to be able to have precise control of where objects are placed on the page.

Where are the browser vendors sitting in this difference of opinion? Early on,

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Netscape Communications Corp. realized that there were a great many deficiencies in HTML, and it successively released browsers with a growing list of nonstandard experimental features that are commonly called "Netscape extensions." Some of these features added new markup capabilities, such as the ability to describe tables. Some added new tags that are aimed at changing the format of the HTML page. For example, you can change the size and color of the font of some random portion of the text.

Microsoft Corp. joined the fray with its Internet Explorer browser and, in a relatively short time, has managed to generate more new features than Netscape ever did. Any good book on HTML now has to spend considerable space describing the features that work in one browser and not another.

I am now walking along a narrow knife edge between my page "working" for your browser and my page looking disgusting.

What of the viewers? As each new Web browser has been released, I believe we have seen a reduction in ability of the viewer to change the look of the pages they are seeing. The "power" has shifted to the page designer. My guess is that as a viewer you have your own opinions of exactly what power you would like to have. Putting my viewer hat on, I certainly want to control the size of the browser window on my screen. I also want to control the size of the fonts that are used to render characters inside the browser window. I like to be able to change the size of the characters because I have screens of differing resolutions and want to set things up so I can see as much of the page as possible and still be able to read the text.

Early browsers gave me complete control over the sizes of the fonts that were used to display the content. I could independently alter the style and point sizes of the two available fonts: variable- and fixed-width. I note that Internet Explorer has actually reduced this control. I can now set the size from a range of T-shirt sizes: extra large, large, medium, small and extra small. I cannot select the actual point size of the fonts.

This erosion of the viewer control is good for the page designer; it makes it harder for the viewer to set up their browser so the page will not render as the designer created it. I dislike the loss of my ability to set point sizes. I find the normal setting for the point size of my chosen fixed-width font (Courier) in Internet Explorer is too small relative to the size of my selected variable-width font (Arial), whatever overall T-shirt size setting I choose. I'd like to be able to increase the Courier default size by a point or so.

Table Basics

As a page designer, I am now walking along a narrow knife edge between my page "working" for your browser and my page looking disgusting, or worse, not appearing at all. My own rule is that I try hard to avoid features that are only supported by one browser, unless I can easily detect the difference. I continue to make judgments about what "new feature" is acceptable. I suppose that I am somewhat conservative, believing that people don't often replace programs that are apparently working, so there's a considerable proportion of old browsers in use.

I've felt that it's been safe to use HTML tables for some time now, although I don't employ some of the newer features because I am unsure whether the browsers that implement them are in mass use yet. Tables are part of the HTML 3.2 recommended specification (current at the time I write this), which describes "the widely used subset" of the various browser implementations of tables. I talked a little about using tables to control page layout in my article, "Designing Web Pages" (December 1996, Page 28). I'll revisit that topic in this column. But first, some basics.

The HTML table model is easy to understand. A table is a collection of *cells* arranged in rows and columns. You start a table by entering the <TABLE> tag and end the table with the </TABLE> tag. The end tag is important because browsers can deal with nested tables and need to be able to tell where tables start and end. Leaving off the end tag can sometimes lead to parts of the page mysteriously disappearing when it's viewed.

Each table row is started with the <TR> tag and ended with </TR>. Within the row are a number of cells each started with <TD> and terminated with </TD>. You'll find that browsers will be lax about the need to include these end tags, and your table may still be output if you omit them. However, forgetting to include end tags can cause huge problems when tables are nested, so my advice is always to use them when creating tables.

Here's a simple, six-cell table made up of three columns and two rows:

```
<TABLE>
<TR><!-- start of row 1 -->
<TD>1</TD>
<TD>2</TD>
<TD>3</TD>
</TR><!-- end of row 1 -->
<TR><!-- start of row 2 -->
<TD>4</TD>
<TD>five</TD>
<TD>6</TD>
</TR><!-- end of row 2 -->
</TABLE>
```

Incidentally, a comment in HTML is any text enclosed between <!-- and -->. The table will display as:

```
1 2    3
4 five 6
```

It will be left justified on the page, and each column and row will expand to fit the data in the cell. You can add a caption to the table by placing text inside <CAPTION>...</CAPTION> and inserting the result where a row specification would be placed. Special column and row titles can be created by using <TH>...</TH>, which specifies a *header* text cell rather than a normal <TD>...</TD> data cell. I've never used any of these features.

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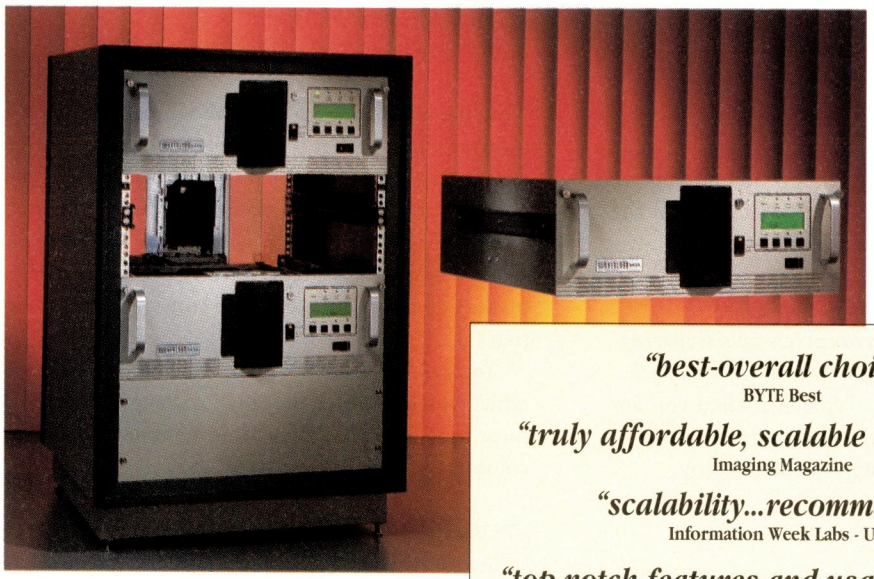

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If you want the table to be centered on the page, then you must enclose it within a <CENTER>...</CENTER> pair, or place it in a paragraph that is defined with the center attribute:

```
<P ALIGN="center">
<TABLE>
<!-- table contents -->
</TABLE>
```

You can also use this method to place the table on the right-hand side of the page.

These alignment methods leave the table standing on the page with white space around it. If you want the text to wrap around the table, then you can add an ALIGN attribute.

```
<TABLE ALIGN="left">
```

will place the table on the left-hand side of the page with the text flowing round it on the right. You can replace "left" with "right" to achieve the reverse effect. Incidentally, the ALIGN attribute for TABLE is relatively new (it's part of the 3.2 specification) and may not work for all browsers.

Cell Spacing and Borders

By default, the browsers place two pixels of *cell spacing* around each cell in your table. You can control the space using the CELLSPACING attribute. Typically, when you are using a table for layout, you want to eliminate the extra space, and you can do that by using a value of zero:

```
<TABLE CELLSPACING=0>
```

The browsers also supply two more pixels as *cell padding*. The pixels are added around the data in each cell. Again, you can control the padding with an attribute. The following will turn off both spacing and padding:

```
<TABLE CELLSPACING=0 CELLPADDING=0>
```

The final attribute of interest, <TABLE BORDER>, controls whether or not a border is drawn around your table. By default, a table is displayed with no borders. You need to explicitly turn them on if you want the browser to draw lines around your table.

The browser will add a "raised" section around each cell. Browsers attempt to make the borders look three-dimensional by adding highlights and shadows. The unqualified BORDER attribute will add a single-pixel border, and you'll find that some browsers will add a single-pixel shadow inside the data cell to give it a 3D look. You can extend the BORDER attribute by giving it a value corresponding to the number of pixels of highlight that are to be added:

```
<TABLE BORDER=2>
```

The highlight and shadow decoration is added around the cell spacing in pixels, so in the above example, you will get two pixels of spacing between the highlights. A table that starts

```
<TABLE BORDER=1 CELLSPACING=0>
```

will result in a minimum-size border around your table.

Using the Width Attribute

I mostly use tables to control the layout of my pages, and this is possible because you can supply a WIDTH specification to the TABLE tag. The simplest use of the WIDTH attribute is to spread a table across a browser window, irrespective of the size the user has chosen for the window:

```
<TABLE WIDTH="100%"
CELLPADDING=0 CELLSPACING=0>
```

Now the table will occupy all the horizontal space inside a browser window that is available to it and will stretch and contract as the window is resized. If the table itself is within another table cell, it will occupy the full horizontal space that is allotted to it and, again, will size itself to fit the available space. I'll often use a table with WIDTH set to 100% when presenting a simple index page consisting of a table with links that take you into a Web site.

You can also add WIDTH specifications to columns within a table, which removes the equal spacing that is the default in most browsers. So, a two-column table with a constant relative column width can be specified as

```
<TABLE WIDTH="100%"
CELLPADDING=0 CELLSPACING=0>
<TR>
<TD WIDTH="30%">...</TD>
<TD WIDTH="70%">...</TD>
</TR></TABLE>
```

In addition to using percentages of the available screen width, you can supply absolute pixel counts for the table. This is a useful device if you want to place a table over a background with a colored left margin:

```
<TABLE WIDTH="100%"
CELLPADDING=0 CELLSPACING=0>
<TR>
<TD WIDTH=50><BR></TD>
<TD>...</TD>
</TR></TABLE>
```

The table will stretch as the screen is resized, but the left column will remain the same absolute width of 50 pixels. To create an empty column, I tend to insert a <BR> break tag. Some people just use , adding a nonbreaking space into the column. Browsers tend to suppress completely empty columns.

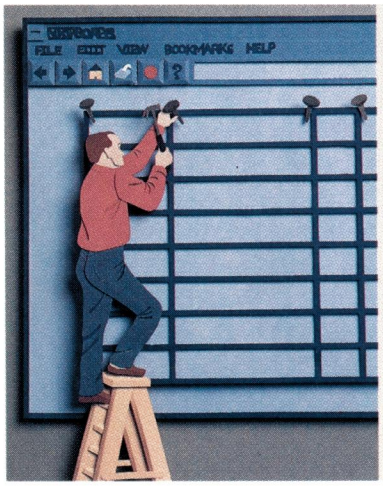
For most of my Web pages, I like to create an empty left margin that is sometimes filled with a colored image tiled onto

the background. The main contents of the page are placed in a width-constricted section on the right-hand side of the browser window. The complete page is contained in a single two-column table providing the layout. Constraining the width of the page makes any text in the page much more readable and follows traditional typesetting practice that understands that humans read short lines faster and more comfortably than long ones. I discussed these issues in my column, "Automatic Web Page Creation" (February 1997, Page 26).

My basic page template looks like this:

```
<TABLE WIDTH=450
CELLPADDING=0 CELLSPACING=0>
<TR>
<TD WIDTH=50><BR></TD>
<TD WIDTH=400>
<!-- page contents here -->
</TD>
</TR></TABLE>
```

The page is thus constrained to 450 pixels, with a 50-pixel left margin and 400 pixels occupied by the contents. I found early on that you do need to specify both width values in the <TD>...</TD> tags for some browsers to operate correctly.



By trying to be helpful, Internet Explorer has created a new problem for the designer.

The total screen width is somewhat arbitrary. You may wish to choose a wider value if you believe that most of your viewers use PCs. The main problem with this approach is that you not only constrain the page to a maximum width, which is a good thing, but you are also setting a minimum width, which is a bad thing. The page begins to stop being usable if the user increases the point size of the text to some large size on a small screen. Also, if the user resizes the page so that it is narrower than the total table width, then most browsers will chop off the right-hand side of the page. The browsers cannot resize the displayed area, because you've told them not to.

The problem of chopping off the right-hand side of the page led to a complaint about the USENIX site that I redesigned. First, one user complained that he couldn't get two nonoverlapped Netscape windows on the screen of his Sun and still read the full information. Second, another user complained about the general theory behind constraining the page size to an absolute pixel width. He said that he used a large font and the pages didn't work at all. I believe that what he reported was true, although, I suspected he overdramatized the problem somewhat. I felt that both complaints were justified, but that both people must be having problems with the many Web sites that are designed for PCs showing at least 600 pixels across the screen. To be honest, after I redid the USENIX site, I expected a barrage of complaints from the very vocal and outspoken USENIX community, and hearing but two, it seems that constraining the page size is an acceptable compromise needed to achieve the enhanced readability of the contents of the site.

There are, of course, other problems. One problem begins to emerge when you attempt to display data that is naturally wider than the width of the table column containing the active page content. For example, you specify a column width of 400 pixels and attempt to display an image wider than 400 pixels or, perhaps, place a fixed-width CODE section that occupies more than 400 pixels. You've presented the browser with a formatting problem. It needs to find some way of squeezing the information onto the screen.

Netscape Navigator deals with the problem by clipping the content that it wants to display using a rectangle whose width is the size of the area you have allocated. The clipping can lose information. For example, I noticed that some of an important PDP signature had been quietly clipped from a displayed page.

Internet Explorer tries to be helpful. It seems to notice that there is nothing in the left margin and will migrate the bulging page contents leftwards across the screen, creating space for the image or text that will not fit. The migration can be unwanted, especially when the active content starts being displayed over a colored image in the background that normally appears in the left margin. By trying to be helpful, Internet Explorer has created a new problem for the designer. At some point sizes, a carefully laid out page will lurch to the left, disappearing into the background. Of course, all this goes away if frames are used to create margins, but that's another can of worms, and possibly another article.

Cell Attributes

When text is written into a cell, it is formatted as if it were appearing in a browser window. Text and images will be wrapped, and all the standard formatting tags will be obeyed. As we've seen, the browsers differ in what they do when the content is too wide to fit the cell.

The inverse case is easier. If there is more space in the cell than is needed to display the contents, then by default, the text and images will be left justified and vertically centered in the cell. Attributes in the <TD> tag can be used to change these defaults for a single cell. The same attributes can be supplied to the <TR> tag, changing the attributes for the entire row.

The ALIGN attribute is used to change the horizontal placement of the HTML within a cell. Don't confuse this ALIGN with the one that may be placed within the TABLE tag. The ALIGN attribute within the <TD> or <TR> tags takes values of left, right or center and will perform left or right justification, or centering of the data within

the cell, respectively.

The VALIGN attribute affects the vertical placement of the data within a cell. Its values are top, bottom or baseline. I make extensive use of the top attribute, ensuring that the top of the data in a cell is placed at the top of the area being rendered. The bottom value for VALIGN ensures that the data is placed at the bottom of the column. The baseline value aligns the top line of the data with the baseline of the text in other cells across the table, and is useful if your table contains different font sizes.

Apart from these controls, the data displayed in cells can sometimes be hard to format "correctly." For example, there is no easy way to line up data in a table, and it's difficult to line numbers up on decimal points, unless you use a fixed-width font, which can sometimes look ugly.

Another pair of attributes that are useful to achieve special effects are COLSPAN and ROWSPAN. Saying something like

```
<TD COLSPAN=2>
```

makes that cell span two columns across the table. The ROWSPAN attribute makes the cell span some number of rows down the table.

Finally

My current HTML bible is the Second Edition of *HTML, The Definitive Guide* by Chuck Musciano and Bill Kennedy, published by O'Reilly & Associates Inc. You can find more of the gory details on tables in this excellent book. The USENIX Web site is http://www.usenix.org. The HTML 3.2 specification, a W3C recommendation, is available on the Web at http://www.w3.org/TR/REC-html32.html. ⊷

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

I/Opener

by Richard Morin, **Technical Editor**

ERIC YANG

Of Cathedrals and Bazaars

Cathedrals are awe-inspiring creations. Many are graceful and beautiful, but even a graceless, cobbled-together cathedral took many years of hard, organized work. A bazaar, in contrast, can be started in a vacant lot one afternoon and knocked down the same evening when the customers have gone home.

On the other hand, a truly successful bazaar is almost always the result of years of community involvement. Merchants and customers alike have to make room in their schedules for the bazaar. The "vacant lot" must be kept unoccupied, lest there be no place for the bazaar to meet.

Bazaars also have a degree of flexibility that cathedrals cannot possibly emulate. If a fruit stand needs more room, it will find a way to expand or move to a larger venue. Cathedrals, in contrast, are literally "cast in stone"; adjusting the room size is not a task to be taken lightly!

In the November 1997 issue ("Perl Conference Report," Page 36), Vicki Brown and I discussed "The Cathedral and the Bazaar," a paper that Eric Raymond presented at last year's O'Reilly Perl Conference. Rather than send you scurrying for an old issue, here is what we said about it.

Eric Raymond is best known as the editor of *The New Hacker's Dictionary* (MIT Press, 3rd Edition, 1996, ISBN 0-262-18178-9). His talk on "The Cathedral and the Bazaar" is a fascinating look at the ways (free) software is developed. Eric has given this talk at several venues and has even dedicated a Web page to it, see `http://www.ccil.org/~esr/writings/cathedral.html`.

The cathedral model attempts to issue "perfect" releases, using a small set of highly skilled developers and relatively long release cycles. This model allows users to have a relatively high degree of confidence in the issued code, at the expense of a somewhat slow development cycle. In the cathedral model, users must never see bugs. Many freeware projects use the cathedral model; it is almost universal in commercial software development.

The bazaar model, in contrast, issues new releases whenever significant changes have been made. No claim is made for perfection, but releases come frequently and incorporate bug fixes promptly. To shield naive users from the perils of rapidly evolving code, most bazaar-based projects have release schemes that provide both debugging and production snapshots.

Confounding Eric's preconceptions and much of the available literature, the bazaar model has been shown to work for substantial software projects, for example, Linux. What's more, the code tends to develop (in an attempt to become bulletproof) at a very rapid rate. Eric has analyzed the reasons for this and performed a small-scale experiment to test his theories. I strongly recommend that you take a look at his Web page.

A Bazaar Approach to Publishing

Prime Time Freeware (PTF) is heavily involved these days in creating, publishing and promoting a book on MacPerl, *MacPerl: Power and Ease*, which is scheduled for publication in early 1998. We are trying to produce a high-quality product in a rather short period of time. Most publishers would take a year to do this project; we're allocating six months and hoping for less.

We are also working toward building up the MacPerl community. Part of our reason is altruistic: We actually believe that MacPerl fills an important technical niche and that many Perl and Macintosh users would benefit from learning about its existence. On the other hand, we also realize that an active MacPerl community could be very useful to us in getting out the word on our product. (Being the only fisherman at an empty fishing hole is not all that useful...) So, we are (ahem) strongly motivated to assist MacPerl in reaching its full potential.

In pursuit of this goal, we have created the MacPerl Pages (`http://www.ptf.com/macperl`), sent many announcements to email lists and media contacts, held meetings with marketing folks at Apple Computer Inc., etc.; in short, the usual guerrilla marketing blitz.

At the same time, of course, we are writing and editing like crazy. At some point in this craziness, yours truly was struck by a thought: Why not apply Eric's bazaar model to the editing process? By bringing assorted volunteers (and near-volunteers :-) into the process, we can establish checkpoints, get useful feedback and help to build a receptive audience for the finished product.

The results aren't all in yet, but the early returns are very promising. Several weeks into the book's development, we have more than three dozen reviewers, ranging from casual to intense. With each new snapshot, we pick up a few more critics; I expect the grand total to reach well over a hundred!

The comments we have received so far also span a wide range. Some reviewers are very nitpicky, dealing with typos, arithmetic errors and so on. Because, as Eric has observed, finding bugs is much harder than fixing them, these folks are real jewels. Other reviewers have discussed our organization, pedagogical style and degree of political correctness. This diversity of feedback is useful in that it helps us to find different problem areas.

The Economics of the Bazaar

One of our reviewers asked how we found the time to edit chapters of the book and work on putting up Web pages at the same time. A good question. It does take time to create a new "product" and, at the same time, keep the "stall" in order. On the other hand, we could not possibly afford to pay for the kind of feedback that we're getting for free.

Fundamentally, this is just the "potlatch" economics of the bazaar at work. PTF is providing MacPerl users a communal watering hole (the MacPerl Pages) and some much-needed publicity. With luck, this will attract new users and programmers, helping everyone in the community.

As a bazaar grows, the number and variety of available resources increases. In the case of MacPerl, this means that there will be more volunteers to answer questions, find bugs, contribute explanations to the FAQ and so on.

By writing a book on MacPerl, we are organizing and disseminating information on MacPerl–a "good thing to do." Our reviewers respond to this "donation" by making their own donations. They sit down with our efforts, look them over, learn what they can and let us know what's wrong.

PTF, in turn, "pays for" this volunteer effort by giving public acknowledgments and credit. Not only will the book have a substantial acknowledgments section, but the MacPerl Pages have a page dedicated to listing folks who have helped out with the project. Finally, we will give away some tangible goodies to volunteers who have been really helpful.

There are some unexpected psychological side effects to using the bazaar model. The main ones have to do with the creators' egos. The problem is not, as you might expect, that creators are unwilling to give away credit. As Eric has noted, any substantial project will have plenty of credit to go around. Rather, the problems lie in accepting criticism and being willing to "let go" of a draft when it is still known to have problems. It's hard enough to deal with nitpicky criticism from a single editor; are you really ready to encourage input from dozens of critics?

And, at two in the morning, are you secure enough in your convictions to push out something that you know can be improved with only a few more hours of work? I have worked until 5 a.m., trying to get out a "clean" release, so I understand this issue all too well.

Upcoming Bazaars

I expect to try the bazaar model in future projects, when it seems appropriate. If the reviewing (i.e., debugging) effort looks distributable, and the schedule allows me to distribute intermediate results, there is very little reason not to try the approach again.

I would also encourage others who work in suitable environments to consider how multiple rounds of editing and feedback could improve the final product. I realize that many commercial environments do not allow projects to "wash their laundry in public," but the benefits can far exceed the risks. ⊷

Richard Morin *operates Prime Time Freeware (`ptf@cfcl.com`), which publishes mixed-media (book/CD-ROM) freeware collections. He also consults and writes on UNIX-related topics. He may be reached at Canta Forda Computer Laboratory, P.O. Box 1488, Pacifica, CA 94044 or by email at* `rdm@cfcl.com`.

by S. Lee Henry

KEN CALL

Living with syslog

Do you ever wonder if you are aware of all the processes that are writing to your log files? Are you comfortable with how much you know about where all your log files are and whether they're being properly reviewed, trimmed and rotated? Does the `/etc/syslog.conf` file on your system provide the kind of control over messages that works best for you? In this month's column, we'll take a look at the system logger `syslogd` and the services that it provides to help you centrally administer processes on your systems.

In the beginning (the early days of UNIX), `syslog` didn't exist. Processes were responsible for writing messages to log files on their own. When `syslog` appeared, it relieved programmers of the need to open and update log files. They replaced file creation and write commands with calls to `syslog`, and `syslog` took care of routing their messages to the proper files. In addition, because the location of these log files and the types of messages that were written to each of them was defined in a world-readable text file, systems administrators could leverage their knowledge of a system's configuration to determine what messages to capture and whether to display them on system consoles or append them to log files to be reviewed as needed.

In larger networks, some systems administrators take centralization a step further by collecting messages from any number of systems on a single system on their networks, known as the `loghost`.

The /etc/syslog.conf File

The message routing daemon, `syslogd`, starts up when a system enters run state 2 (see `/etc/rc2.d/S74syslog`) and leaves its process ID in `/etc/syslog.pid`. It reads its configuration file, `/etc/syslog.conf`, when it starts up and anytime you send it a hang-up signal (`kill -HUP `cat /etc/syslog.pid``, for example) Depending on the nature of each `syslog` call and details in the configuration file, messages are then written to one or more files or to other destinations (for example, the system console).

The format of the configuration file is a bit tricky. One of the first things you'll need to understand is the way that message types are defined. Message types have a two-part name, `user.err`, for example. The first part, called the *facility*, defines the origin of the message. Messages might come from user activities, kernel activities and so on. The facility field can have any of the following values: `kern`, `user`, `mail`, `daemon`, `auth`, `lpr`, `news`, `uucp`, `cron`, `local0`, `local1`, `local2`, `local3`, `local4`, `local5`, `local6`, `local7` or `mark`. The second part, called the *level*, indicates the severity of the message. The level field can have any of the following values: `emerg`, `alert`, `crit`, `err`, `warning`, `notice`, `info`, `debug` or `none`. For example, the message type `kern.emerg` represents emergencies related to the kernel.

Lines in the `/etc/syslog.conf`

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file have roughly this basic form:

```
facility.level                  file-to-update
```

or

```
facility.level                  user-to-notify
```

Note: The space in these commands is not just any white space, but must be tab characters and *only* tab characters. Entries will not work correctly if spaces are used instead.

One of the most active log files on a system is the `/var/log/syslog` file. If you look at the `/etc/syslog.conf` file, you'll quickly understand why. The line

```
mail.debug                      /var/log/syslog
```

would direct `sendmail` to write its messages about incoming and outgoing email to `/var/log/syslog`. This line is actually

```
mail.debug
ifdef('LOGHOST',/var/log/syslog,@loghost)
```

The additional logic specifies that `sendmail` messages for non-`loghost` systems will be sent to the `loghost` system instead of being logged locally. Commenting out this line would stop all `sendmail` message logging.

syslog Messages

You will come to recognize messages that are written by `syslog`. They have a characteristic format that includes the time and date of the event being reported, the name of the process making the call to `syslog`, the process ID of that process (optional), and the text of the message:

```
Jan 8 08:08:08 sunland inetd[188]: shell[12345]
    from 128.220.26.29 1001
```

If you write or modify software and want to log events yourself, you can use the `syslog` system call to do this. The skeletal C program shown in Figure 1 provides sample code showing how to do this.

Figure 1. Sample C Program

```
/*****************************************************************************

 *****************************************************************************/

#include      <syslog.h>
#include      <stdio.h>

/*****************************************************************************
 *                                                                           *
 *  main                                                                     *
 *                                                                           *
 *****************************************************************************/
int
main(argc, argv)
      int           argc;
      char          **argv;
{
      int     i;

      openlog ("testing", LOG_PID | LOG_NDELAY , LOG_DAEMON | LOG_USER |
LOG_LOCAL0 | LOG_AUTH );

      syslog(LOG_ERR,       "<1>log_err msg");
      syslog(LOG_DEBUG,     "<2>log_debug msg");
      syslog(LOG_EMERG,     "<3>log_emerg msg");
      syslog(LOG_ALERT,     "<4>log_alert msg");
      syslog(LOG_WARNING,   "<5>log_warning msg");
      syslog(LOG_NOTICE,    "<6>log_notice msg");
      syslog(LOG_INFO,      "<7>log_info msg");
      syslog(LOG_LOCAL0,    "<8>log_local0 msg");
      closelog();

}
```

The parameters to the `syslog` call are the message priority and the text. Other parameters that govern what is written into the log files (for example, the tag and process ID) are set up in the `openlog` call. Read the `man` pages for `syslog`, `syslogd` and the `syslog.conf` file for more information on the available options.

Another way that you can add messages to your log files–interactively or from within a script file–is to use the `logger` command. `logger` is very similar in format to the `syslog` call. Optional parameters include a tag, the process ID of the calling process and the priority (defaults to `user.notice`). The message text can be typed on the same line or pulled from a text file.

Here are some sample `logger` commands:

```
logger message
logger -t testing checking
logger
logger -p user.err -i -t
testing "user errors"
```

Debugging with syslog

If in the course of tracking down elusive system problems, you notice that log files are not being updated with the messages that you expect to see, the `logger` command or a simple program (like the one shown in Figure 1) using a `syslog` call might help you track down the problem. If the message that you create with `logger` or `syslog` doesn't make it to the appropriate destination, you might check: a) the permissions and ownership on the file itself, and b) the format of the lines in the `/etc/syslog.conf` file (watch out for white space masquerading as tabs!).

One thing that I like to use these commands for is to add comments to my log files noting significant changes that I've made to my systems. If these changes coincide with radical changes in the kind and quantity of errors being reported, I want to know about it. The comments that I add allow me to analyze my log files statistically sometime later. Using the comments and a simple `awk` script to count up errors by the hour, I can quickly see whether the change is significant.

Log files become extremely useful sources of "vital statistics" regarding a system's overall health if properly managed and kept within mind's reach. Knowing how messages get to log files in the first place and how to inject messages of your own is a great place to start.

S. Lee Henry *works as a security services engineer at Infonet, El Segundo, CA. She lives in the foothills to the north of Los Angeles with her new family and spends her free time watching traffic with them on "The 405." You can send her more by addressing it to* `slee@cpg.com`.

by Æleen Frisch

WILL TERRY

Logging In

This month, we'll step back and consider the Windows NT login process. This is usually the first item you will encounter in a Windows NT system, and it is also the first place where important differences between Windows NT and UNIX become evident. We'll also look at ways of customizing the login process. I'll conclude this column by addressing a few issues raised by readers in response to my October 1997 column on UNIX compatibility software for Windows NT ("Making yourself Feel at Home," Page 50).

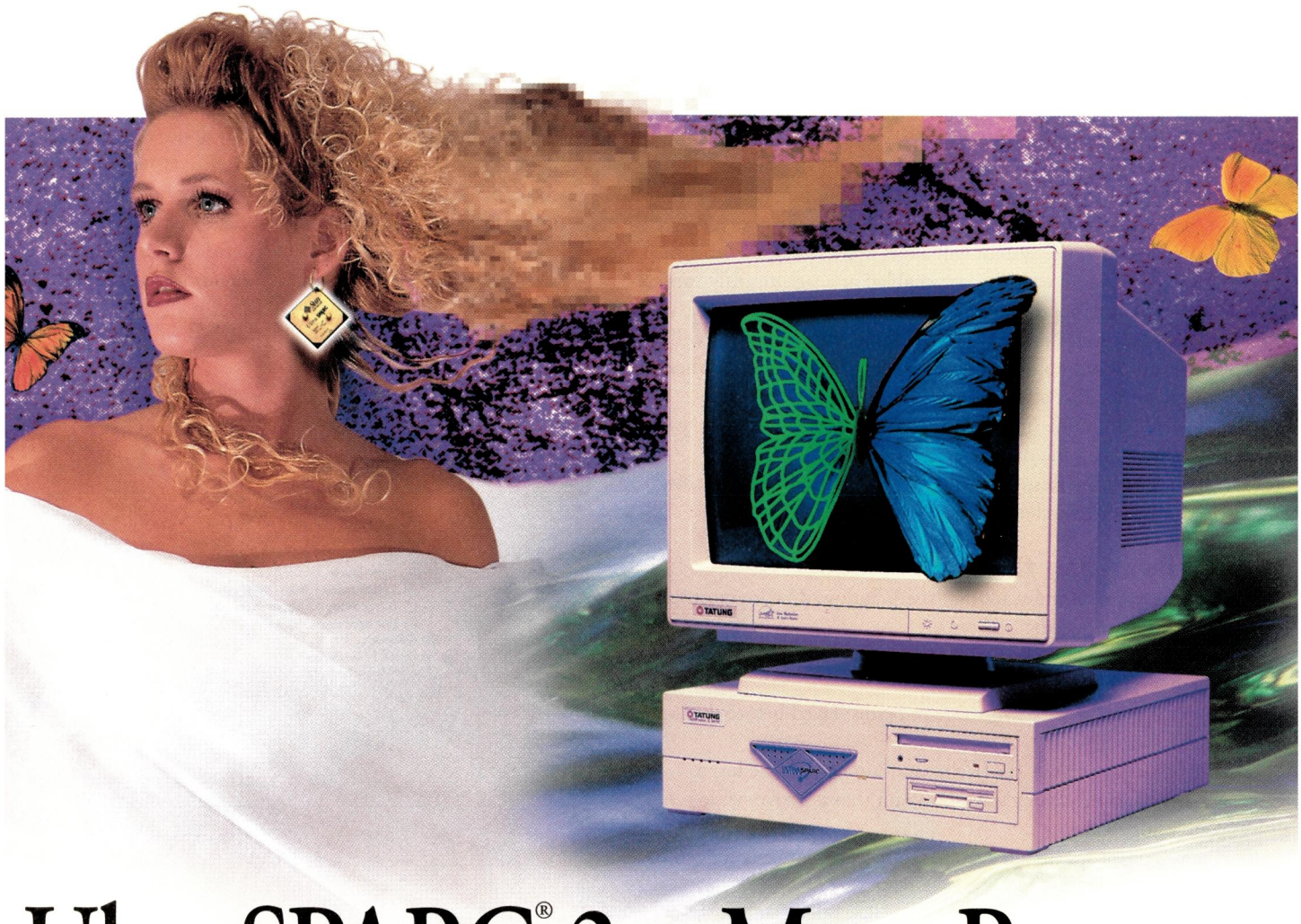
A Strange New World

The first thing you'll notice about the Windows NT login sequence is that you must enter the Ctrl-Alt-Delete key combination before the login dialog box will appear. This behavior fulfills one of the requirements of C2 level security, which is that the trusted computing path be accessible only as the result of a deliberate action on the part of the user (usually by entering some specific key or key combination). Beware that any purported login dialog box that appears without your having entered Ctrl-Alt-Delete is likely the product of a Trojan horse program masquerading as the normal login sequence.

The Windows NT login dialog box has three fields: **User name**, **Password** and **Domain**. The first two of these are familiar, but the third requires some consideration. When you enter a domain name into this field, you will be logged into the specified Windows NT domain. This means that your user name and password will be validated by one of the domain controller systems administering the domain. (If you want to log into just the local system, you must select its host name as the desired domain.)

The tricky part comes from the fact that when you log into a Windows NT domain, what you are actually logging into is the network and *not* the specific system at which you happen to be seated. Domain-wide settings for user account attributes, file, directory and other resource permissions, and allowed and forbidden user actions will be in effect, and these global settings supersede any settings on the local system. In the same way, if you log into the domain using the *Administrator* account, the scope of the standard administrative tools will generally default to the domain rather than to the local system (or any single system within it). These concepts will be familiar to users experienced with the Novell Inc. NetWare environment, but they take a bit of getting used to if you come from an exclusively UNIX background.

An important corollary of the previous point is that Windows NT is not a multiuser operating system (at the very least, Windows NT embodies quite a different view of a multiuser operating system than UNIX users will be used to). Under Windows NT, distinct computer systems are almost always viewed as single-user systems. Only one user at a time may be logged into the domain from any given system. What this means is that only a single user can use a given system's CPU



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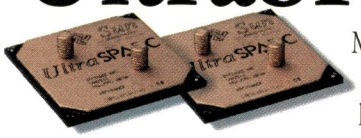

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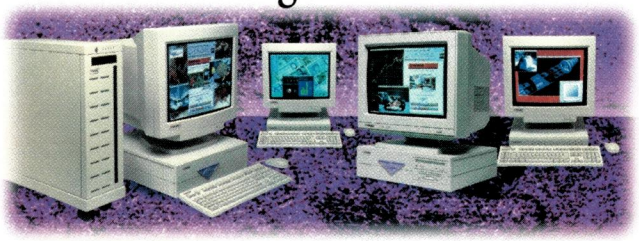

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resources to start interactive processes (there is no standard equivalent for, say, starting an `xterm` window on a remote system). Users on other systems can run processes in a batch mode and use other system resources such as files and printers.

Our final note about the Windows NT login process concerns when the system will allow users to log in during a system reboot. User logins are enabled at a significantly earlier point in the process than on UNIX systems. In particular, you cannot be certain that all system initialization activities will have completed before a user login occurs. Beware that there is no guarantee that all standard system activities will have finished before the first user login. Similarly, actions that you designate using the optional system boot script facility provided by the Resource Kit (via the AutoExNT.Bat facility) may also not complete before user logins.

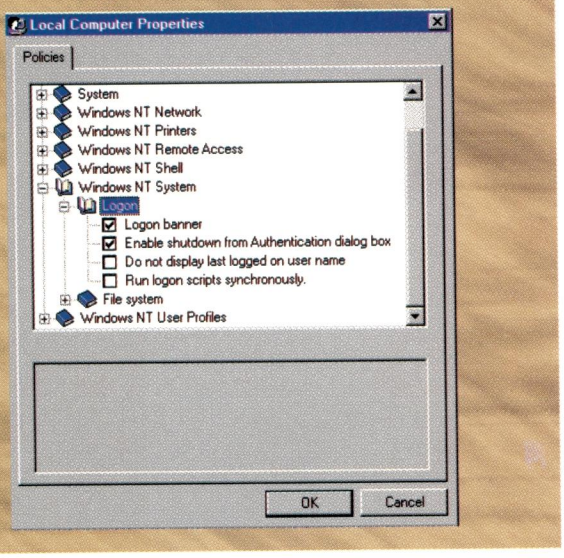
Customizing the Login Process

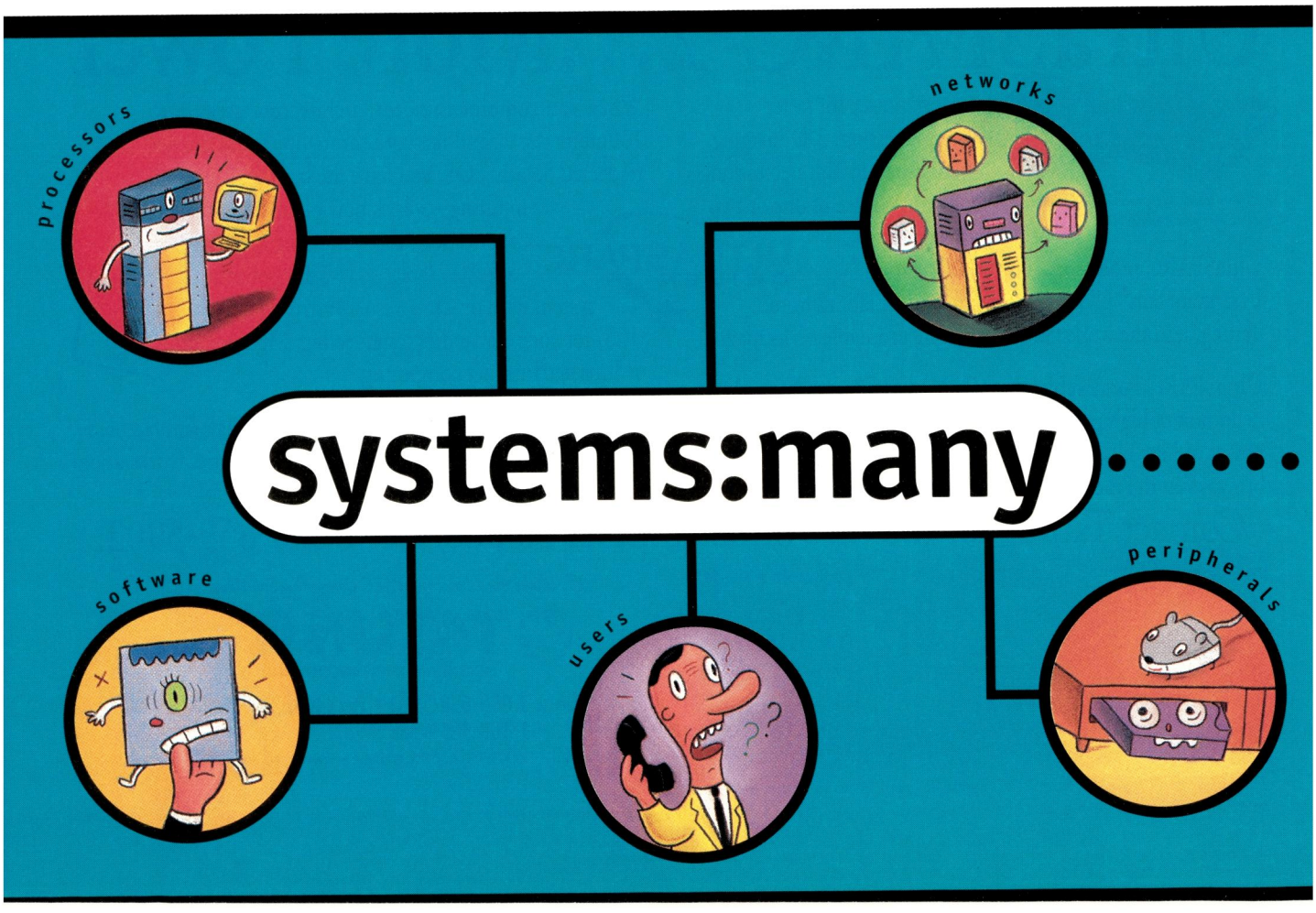
There are several ways that the Windows NT login process may be customized:

- You can control whether or not the **Shutdown** button on the login dialog box is active.
- You can specify a message to be displayed before the login dialog box appears.
- You can change the background image for the login process and the screen saver program that is active while no one is logged in.
- You can specify an account to be automatically logged in when the system boots (but it is usually a bad idea to do so).

Most of these items are controlled by values under the `HKEY_LOCAL_MACHINE\Software\Microsoft\WindowsNT\CurrentVersion\Winlogin` registry key. You can edit them using the Registry Editor or, in some cases, by using the System Policy Editor, which can be found on the **Administrative Tools (Common)** menu and can also be started by

Figure 1. Login Process Customizations





entering the `poledit` command. Once the tool has started, select the **File=>Open Registry** menu path.

The System Policy Editor groups accessible registry settings in a hierarchical structure, dividing them into computer-related and user-related settings. The ones we want are accessed by double clicking on the **Local Computer** icon and navigating to the **Windows NT System/Logon** group (see Figure 1).

If the **Enable shutdown from Authentication dialog box** item is checked, then the **Shutdown** button on the login dialog box will be enabled and accessible. By default, it is disabled on server systems and enabled on workstation systems. For systems that are physically secured from unauthorized access, having the button enabled can be convenient, but it should be disabled if there is any chance that an unauthorized user could gain access to the system.

The **Logon banner** item allows you to define a message box to appear just prior to the login dialog box–in other words, just after the user has keyed in Ctrl-Alt-Delete. When this item is selected, you can enter the message box's caption and message text into the fields that appear in the lower part of the System Policy Editor's dialog box. Such messages are typically used to warn unauthorized users against attempting to log into the system, but the facility may be used for any purpose that you like.

The **Do not display last logged on user name** item controls whether Windows NT pre-fills in the login dialog box's **User name** field with the name of the last user to successfully log in. By default, this feature is enabled. In some circumstances, disabling it makes sense from a security standpoint, for example, if you do not want valid user names to be viewed by casual passers-by.

You can change the screen saver that runs when no user is logged in and its behavior by modifying the following values of the `HKEY_USERS\Default\Control Panel\Desktop` key:

- `SCRNSAVE.EXE`: The name of the screen save executable file (assumed to be located in *%SystemRoot%*). The default file for Windows NT Version 4 is `logon.scr`. Be sure to specify a 32-bit screen saver program if you decide to change this value.
- `ScreenSaveTimeOut`: The number of seconds before the screen saver is activated (the default is 900). I generally reduce this value to 10 seconds.
- `ScreenSaveActive`: Whether a screen saver is used between user logins. The default value of 1 (for Windows NT 4.0) enables the screen saver.

You can change the background image that appears when no one is logged in by substituting a different bitmap file for the standard ones in *%SystemRoot%*: *WinNT256.Bmp* and *WinNT.Bmp* on workstations and *Lanma256.Bmp* and *LanmanNT.Bmp* on servers. The files with "256" in their name are 256-color bitmaps. You must substitute true bitmap files of the same (or lower) color depth for the standard files, or no image will appear. You should also be aware that large bitmap images usually do not work. I advise substituting another file of approximately the same size as the ones that

Windows NT provides. Be sure to rename or save a copy of the original files before installing your new versions.

The freely available NT Default User Registry Editor (NTDURE), written by Michael G. Martin, provides a convenient interface to many of these registry settings (illustrated in Figure 2). The software may be obtained from `http://www.bhs.com/download/default.asp`.

Windows NT provides an optional automatic login mechanism through which you can specify a user to be automatically logged in when the system boots. This feature is disabled by default, and you should only consider enabling it for systems that are in physically secure locations.

This feature is controlled by the **AutoAdminLogon** value of the `HKEY_LOCAL_MACHINE\Software\Microsoft\WindowsNT\CurrentVersion\Winlogin` registry key. The value does not exist by default, so you must create it (the data type is `REG_SZ`) to enable this feature. A setting of 1 causes an automatic login to be performed when the system boots. The facility uses the settings in the **DefaultDomain Name**, **DefaultUserName** and **DefaultPassword** values of the same key to perform the login process. Once again, you must create these values if they do not already exist and set them appropriately.

One final note about the Windows NT login process: Windows NT people say "logon" not "login." I just can't bring myself to do it.

UNIX Compatibility Odds and Ends

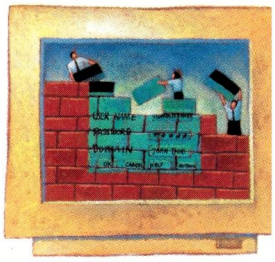
I've received quite a bit of mail from readers in response to the "Making yourself Feel at Home" column. I'll conclude this month by addressing the most important questions and comments:

- **Emacs** – Several readers reminded me that I neglected to say where one could get a version of the GNU `emacs` editor for Windows NT. One source is `ftp://ftp.agt.net/pub/coast/vendors/gnu/nt`.
- ***vi*-Style Editor** – A couple of readers wanted information about `vi`-style editors for Windows NT. There are several of them, including `lemmy`, `vim` and `xvip`, all three of which may be found at `http://www.coast.net/SimTel/nt/editor.html`.
- **UWin Package** – There are also at least two other UNIX-like environment packages for Windows NT. The UWin package, created by David Korn (author of the Korn shell) and others at AT&T Labs, contains more than 150 UNIX-compatible utilities. It is based around a Korn shell and provides all of the expected commands. For example, here is its `df` command run within the Korn shell:

```
$ df
Filesystem    Type  Mbytes  Used   Avail   Cap   Mounted on
Ariadne       NTFS     598   524      74   88%   /C
ANANKE         FAT     499   490     9.2   98%   /D
Janus         NTFS    1342   157    1185   12%   /E
Aporia        NTFS    1019   4.3    1015    0%   /G
Acrasia       NTFS     509   4.3     505    1%   /H
Aveya         NTFS     683   4.3     679    1%   /I
Amelia        NTFS    1161   229     932   20%   /J
Amanda        NTFS     300   285      15   95%   /K
Anitra        NTFS     439   171     267   39%   /L
```

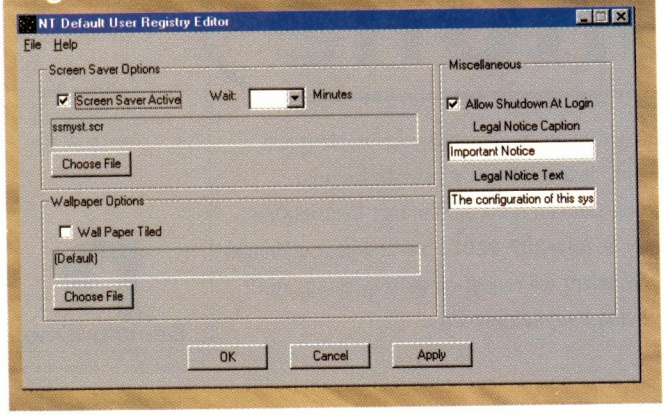
This output is correct and complete (recall that this command was missing or simplified in some of the other packages examined).

The UWin package is available for download at `http://www.research.att.com/sw/tools/uwin`. While it is available free of charge to educational institutions, commercial entities may download it for evaluation purposes only. Commercial licenses start at $200; ordering information is available from `http://www.gtlinc.com/Products/Uwin/uwin.html`. There is also an optional POSIX-compliant software development kit available, structured as an interface to the Microsoft Visual C/C++ compiler. Future developments include X11 and networking support facilities.



- **MKS Toolkit** – Another excellent UNIX-compatible environment for Windows NT is provided by the MKS Toolkit from Mortice Kern Systems. It is also designed around an implementation of the Korn shell, and contains a quite complete set of UNIX utilities. The toolkit also includes additional commands designed to make performing Windows NT tasks easier in a UNIX-compatible environment and from within Korn shell scripts. We'll look at this commercial product in detail in a future column. For now, additional information is available at `http://www.mks.com`. ⊸

Figure 2. The NTDURE Utility



Æleen 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 non-existent) spare time, she enjoys painting and lounging around with her cats, Daphne, Susan, Talia and Lyta. Email:* `aefrisch@lorentzian.com`.

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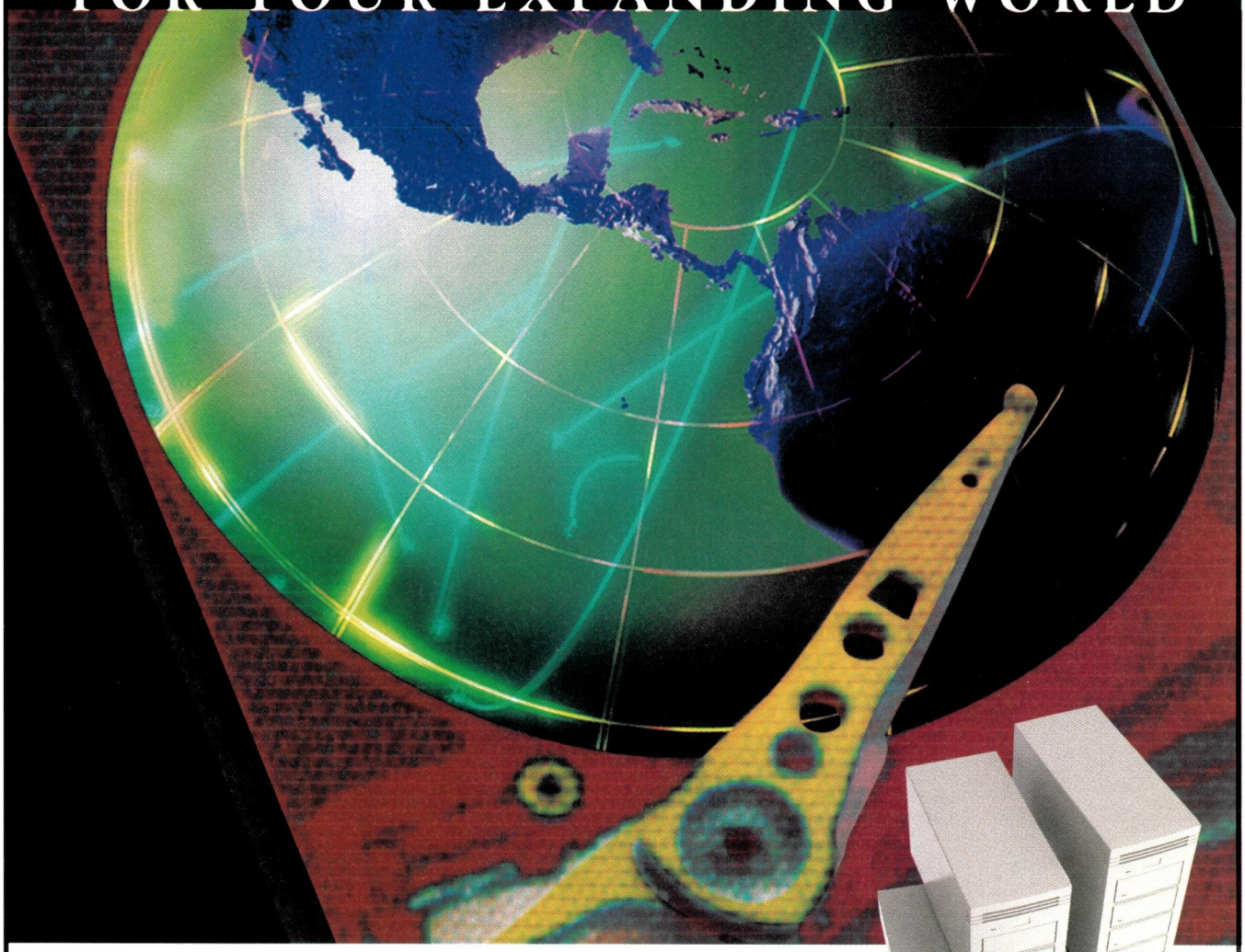

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TURBOCHARGING

It's no secret that Java and the Web have legitimized–and accelerated–the use of components. The idea behind components is to buy or build them–buying is generally considered far more cost-effective than building your own–and then use them over and over.

by Karen Watterson

Components, of course, have been around in one guise or another for a long time. One can argue that certain sequences of Hollerith cards were the original components–long before there were commercial function libraries or PC programmers who reused their own chunks of Z80 or 6502 machine language code.

IMAGE BANK / ERIC MEOLA

OBJECT PROJECTS

It seems to me, though, that the Age of Components dates back to 1991 (see Figure 1). That was the year that Brad Cox popularized the vision of "software ICs" in his seminal *Object Oriented Programming: An Evolutionary Approach* (Addison-Wesley Inc., ISBN 0-201-10393-1).

That same year, David Taylor tried to explain the now well-known litany of encapsulation, polymorphism and inheritance in layman's terms in his equally influential *Object Technology: A Manager's Guide* (now in its second edition, Addison-Wesley, ISBN 0-201-30994-7).

In this article, we won't impose yet another lesson about "object-oriented programming" on you. Instead, we'll try to help you cut through the hype emanating from the various camps of "True Component" believers at Sun Microsystems Inc., Microsoft Corp. and IBM Corp. and help you evaluate your object model options.

Unless you're an object polymath, you're probably confused about the real differences between VBX, ActiveX and OCX controls on one hand, and applets, servlets and JavaBeans on the other. You may also wonder where Dynamic Link Libraries (DLLs), classes, frameworks, plug-ins and application developers' components (from SAP AG and Baan Co., for example) fit in–not to mention COM, COM+, DCOM, SOM and CORBA.

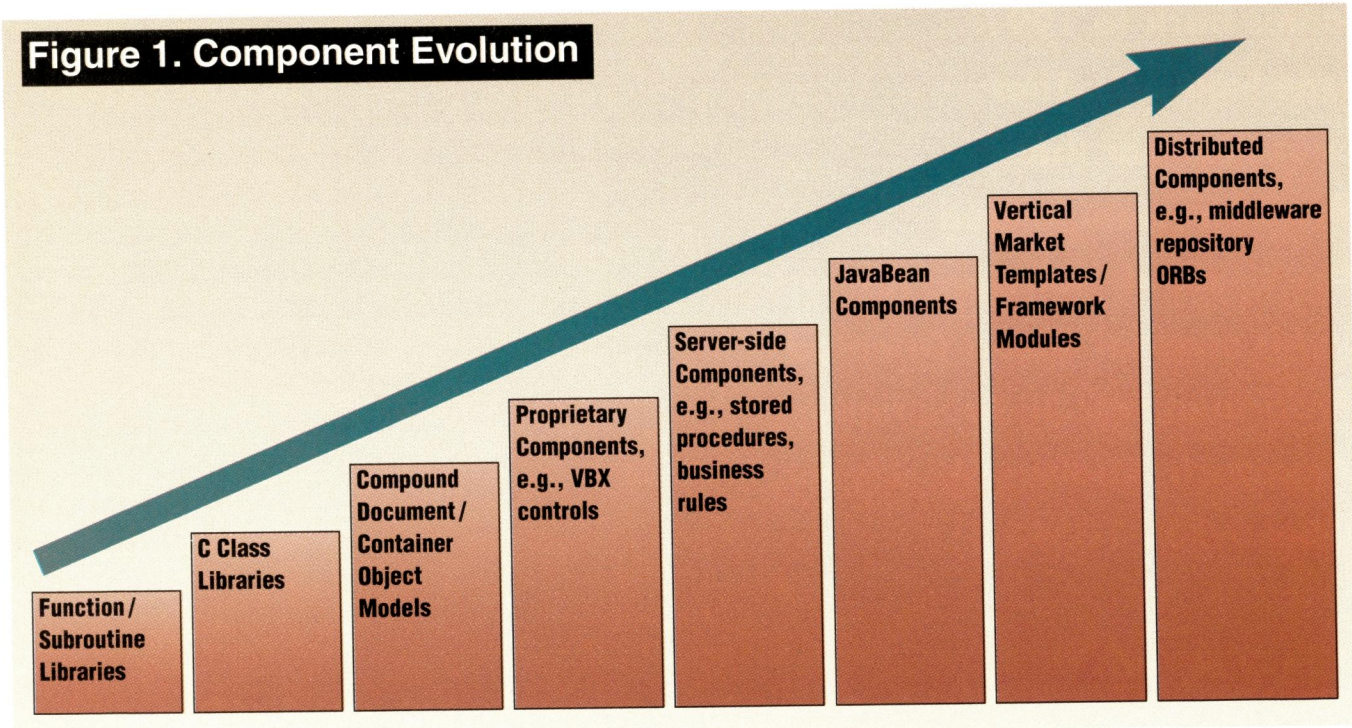
Microsoft Components

Because Microsoft's Visual Basic eXtensions (VBXs) were the first widely used components, we'll start with them. VBXs were originally limited to use in 16-bit Visual Basic programs–meaning, of course, that you could only use them in the Windows environment. In fact, VBXs were really just 16-bit Windows DLLs, so, for all practical purposes, you had to be a C/C++ programmer to create them. But any of the millions of Visual Basic developers could *use* them. Often referred to as "controls," they typically had settable properties along with any number of methods that could be called from a Visual Basic program (and eventually, by programs created with many other Windows application development tools). Many VBXs were distributed as freeware or shareware, and most of the commercial ones cost well under $100. VBXs created a market for cheap, reusable components. Today, there are thousands of commercial VBXs; if you could figure out how many additional internally developed VBXs are being used, the number would undoubtedly be in the tens of thousands.

Starting with Visual Basic 4.0, Microsoft extended the VBX model with so-called Object Linking and Embedding (OLE) 2 controls. Later renamed OCXs (for OLE Component eXtensions), and then ActiveX controls, these are basically 32-bit versions of the original VBXs that conformed to Microsoft's ever-evolving object model, Component Object Model (COM). More information can be found at `http://www.microsoft.com/com`. Oh, and in case you're wondering where Microsoft's Distributed interNetwork Applications (DNA), announced in September, fits in, we recommend you think of it as a rebranding of the Active Desktop notion that had been launched the previous November. But let's return to Microsoft's ActiveX controls–which happily don't seem to have been renamed DNA controls. Beginning in 1996 with the release of the still available free VB5 Custom Control Edition, developers didn't even need to know C/C++ to create their own controls; they could use VB5 CCE.

Today, many programs let you use VBXs and ActiveX controls. You can add them to numerous client/server and Internet development packages and can even embed them directly into Web pages. Even UNIX developers can use ActiveX controls, thanks to tools from Bristol Technology Inc. and DataFocus Inc. Wind/U 4.1 from Bristol Technology supports Win32 services, including ActiveX and COM, on Solaris, HP-UX, AIX and VMS. DataFocus' NuTCRACKER DirectLink technology similarly allows Win32 DCOM, COM and ActiveX libraries to be called directly from and linked to

Figure 1. Component Evolution



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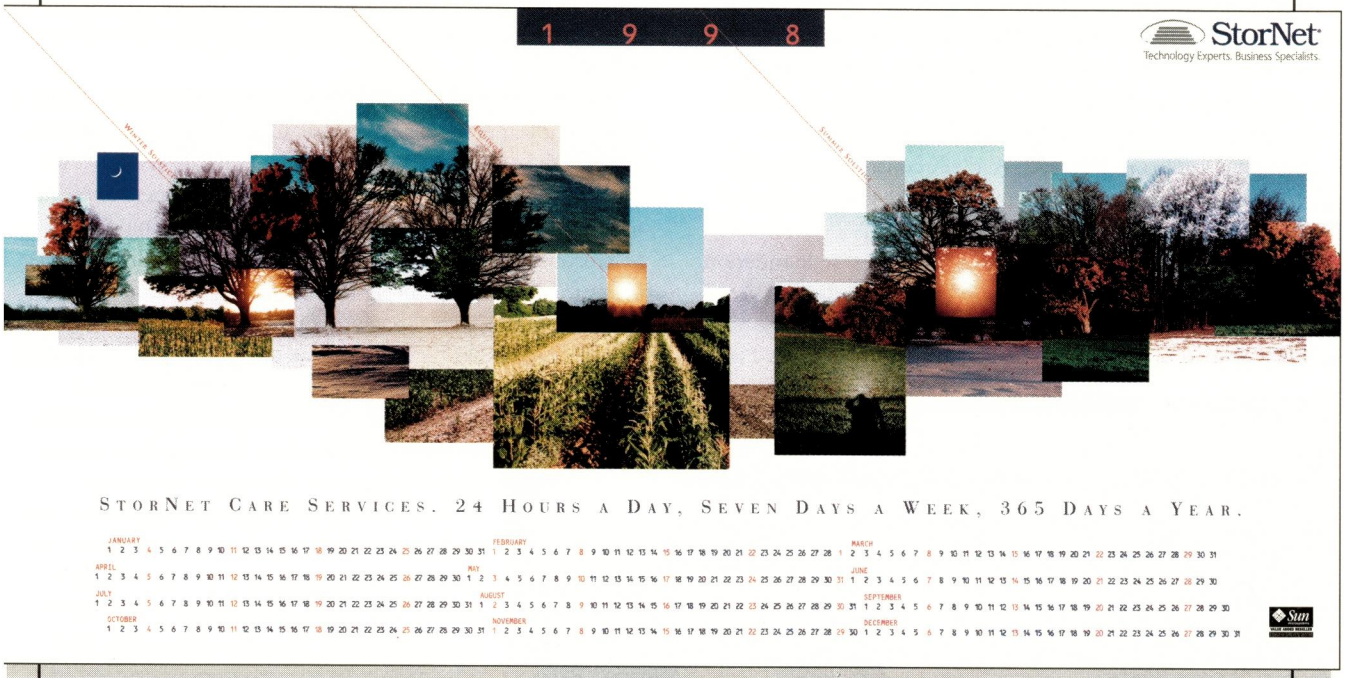

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ported UNIX applications. Netscape Communications Corp. browser users can use ActiveX controls, in addition to Java applets, thanks to NCompass Labs Inc.'s ScriptActive Netscape plug-in.

Microsoft's ActiveX controls, like JavaBeans (more about JavaBeans below), are developer-level components. They generally aren't used directly by end users the way applets are, for example, and are considered somewhat "granular" or "low level." Until recently, ActiveX controls have almost always run on a client, but Microsoft encourages developers to write Active Server controls and other script-based code that is meant to be run from the server. ActiveX controls are thought of as "fat"–often running several megabytes in size–because of the overhead associated with the Windows API.

COM is Microsoft's fundamental architecture or foundation upon which ActiveX controls are built (see Figure 2). COM specifies a set of rules by which objects expose their functionality to other components and to host applications. One of COM's most fundamental concepts is that of "interfaces," the mechanism through which objects expose their functionality. In COM, an interface is a table of pointers (like a C++ vtable) to functions implemented by the object. The table represents the interface, and the functions to which it points are the methods of that interface. An object can expose as many interfaces as it chooses. Each interface is based on the fundamental COM interface, IUnknown. The methods of IUnknown allow navigation to other interfaces exposed by the object. Also, each interface is given a unique interface ID (IID).

IUnknown defines three methods: QueryInterface, AddRef and Release. QueryInterface allows an interface user to ask the object for a pointer to another of its interfaces. AddRef and Release implement reference counting–the technique by which an object (or, strictly, an interface) decides when it is no longer being used and is therefore free to remove itself. Other concepts associated with COM include marshaling–the mechanism that enables interfaces exposed by an object in one process to be used in another process–and aggregation, whereby one object can make use of another through containment.

What's important to understand is that COM objects, like other "object-oriented" components, know something about themselves and can be queried in a standard, well-defined fashion.

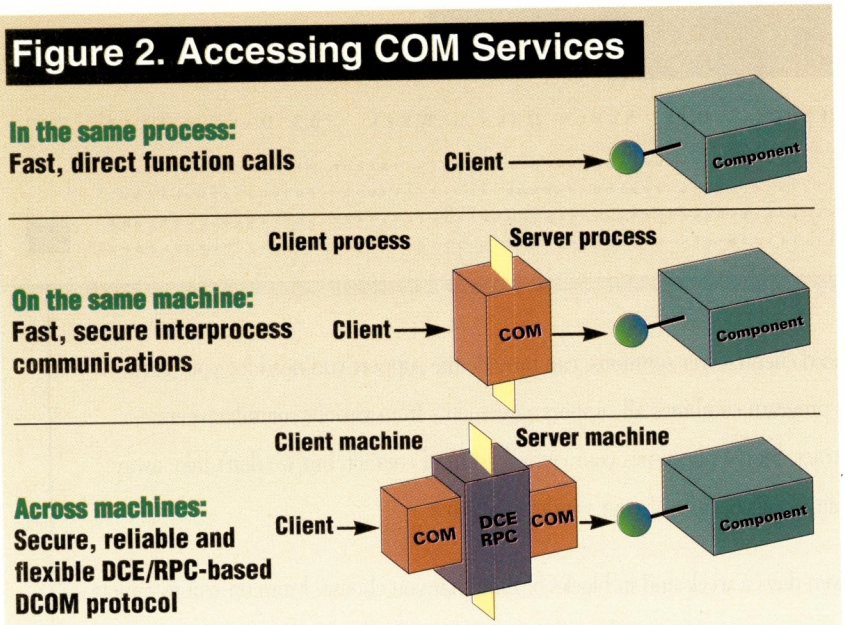
Microsoft continues to hone its object architecture, however, to make it leaner and easier to use. One of its recent attempts to streamline COM is Active Template Library (ATL), a set of template-based C++ classes that allow developers to create smaller, faster COM objects than are possible using the full Microsoft Foundation Classes (MFC). Microsoft likens templates to macros, explaining that templates work like macros, accepting parameters, but then expanding into code. Template libraries such as ATL differ from traditional C++ class libraries in that they are typically supplied only as source code and aren't inherently hierarchical in nature. Rather than deriving from a class, users instantiate a class from a template.

Microsoft encourages developers who plan to distribute MFC and ATL controls via the Internet to package them as signed Cabinet (CAB) files. Signed files assure a user downloading controls that the code is safe, and CAB files contain a compressed version of any controls plus information about how they are to be installed. (Even Java developers take advantage of compression via JAR files, which consist of a set of class files and any associated GIF images, data files or other resource files.) ATL templates, of course, are based on C++, and Microsoft shipped a new set of Java-based Application Foundation Classes (AFCs) in September. At press time, it's unclear whether subsequent releases will support JavaBeans or Java virtual machines other than Microsoft's own Java Virtual Machine (JVM) for Windows.

Last fall, Microsoft announced the latest version of COM, COM+, scheduled for beta availability in fourth-quarter '97. (Beta 1 for COM+ has subsequently been delayed and is now expected to ship with the second beta of NT 5.0–got that straight?) Among the announced new features in COM+ are data binding, which lets developers create database applications with less programming, and interceptors, which allow components to redirect their functionality dynamically to call various services, including data access, transaction and system monitoring services, at runtime.

We've spent a lot of time on the "Microsoft vision" of components for a couple of reasons. First, it's the leading object model, like it or not. Second, even if you prefer more open object models, including JavaBeans, chances are you'll have to interoperate with Microsoft components, one way or another.

Figure 2. Accessing COM Services



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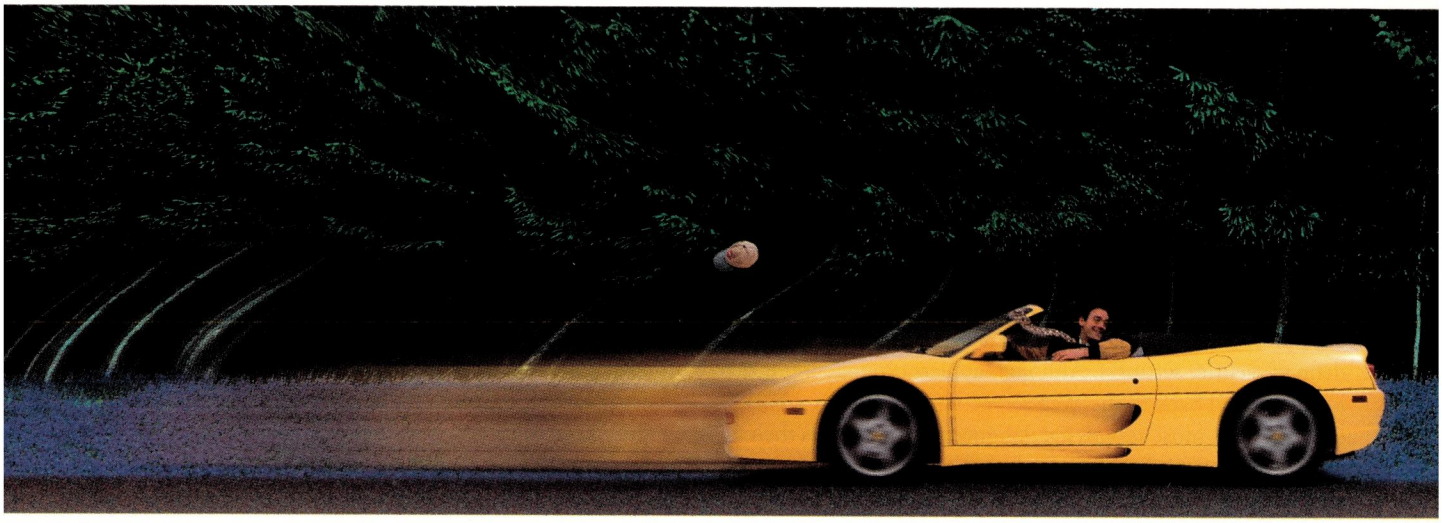

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Don't Forget Applets and JavaBeans

Although Microsoft's VBX and ActiveX controls dominate the Windows desktop, applets have made serious inroads, and JavaBeans promise to offer Microsoft's controls a run for their money.

Applets (`http://www.javasoft.com/applets`) are applications that are written in Java and run in Web browsers, invoked with an HTML `<APPLET>` tag. They are generally, but not always, "small," so users can download them quickly, and they can be sent from one computer to another over the Internet. The code for the applet itself resides on a Web server, and when the user gets to a page with an applet, the browser downloads the applet and any supporting files. Applets verified as legitimate by the browser's JVM are executed (legitimate in the sense that the applet doesn't contain code that "runs outside the sandbox" or, if it does, that it abides by alternate user-defined security settings). Although applets can take input that is transmitted back to the Web server, and potentially a back-end database, most applets are designed to accomplish their tasks locally to minimize network traffic. Applets consist of Java class files (`.class`) with compiled byte code and optional `.gif`, `.au` or other data files used by the applet, for example, to perform animation. Java source code (`.java`) isn't required to run the applet but is needed to modify it.

Applets can be created with tools like Sun's Java Developer's Kit (JDK), Symantec's Visual Cafe (available for Windows or Macintosh) or Microsoft's Visual J++. Once a program is written in Java, it must be compiled with a Java compiler (Symantec Corp.'s compiler ships with the Sun JDK), and then it can be included in a Web page. An end user who has a Java-enabled browser can then "run" the applets on his computer. As you might imagine, there are thousands of applets that accomplish all kinds of tasks. The Gamelan (`http://www.gamelan.com`) and JARS (`http://www.jars.com`) sites are renowned for their wide selections of applets.

JavaBeans, on the other hand, are more granular components for developers. Like ActiveX controls, they're written to a specification according to certain rules. JavaBeans (`http://www.javasoft.com/beans`) publish properties and methods and can fire events. For example, JavaBeans have "getter" and "setter" methods that let developers get and set properties. Some JavaBeans have bound properties that require that the JavaBean be informed of any potential changes to their property settings via the Java event mechanism. Unlike the COM architecture underlying Microsoft's ActiveX controls, however, the JavaBeans architecture is platform-neutral.

JavaBeans, like ActiveX controls, can be visible or invisible, small and simple such as a timer or slider, or complex, for example, as an analysis tool that lets users query and manipulate multidimensional data. JavaBeans can be part of stand-alone Java applications or they can be part of an HTML page. Also, a JavaBean can be used as an applet and can include other Beans.

SunSoft, Lotus Development Corp. and IBM are among the earliest and strongest supporters of JavaBeans. SunSoft, for example, released Java Studio in September, an end-user tool for assembling JavaBeans into applications. Java Studio ships with more than 50 JavaBeans that support multimedia, data flow and database operations, computational tasks and GUI elements. Sun's package for *creating* JavaBeans, not just using them, is the Java WorkShop. Through February 1998, Sun will sell the Java WorkShop/Java Studio bundle for $189.

Lotus, now an IBM subsidiary, is also aggressively supporting JavaBeans. This follows an abortive attempt to launch its own proprietary Lotus Components standard (primarily for developing Notes applications) and a subsequent one that used ActiveX controls. Now, however, Lotus is banking on JavaBeans and should have released its modestly priced eSuite product line (previously known by its code name "Kona") by the time you read this. Corel Corp., another player in the "suite" market, also abandoned its early efforts to create applet-style desktop products in favor of a JavaBeans approach.

IBM, widely recognized for its work in Java (`http://www.ibm.com/java`), including VisualAge for Java and its own JavaBeans initiative (`http://www.software.ibm.com/ad/javabeans`), is also building an innovative template-based server product code-named San Francisco Frameworks.

Basically, the Java-based San Francisco project, which is being developed in collaboration with several hundred independent software vendors, provides a significant amount of basic business logic that can be enhanced and extended instead of having to build the entire application from scratch. According to IBM, feedback from companies that tested early versions of

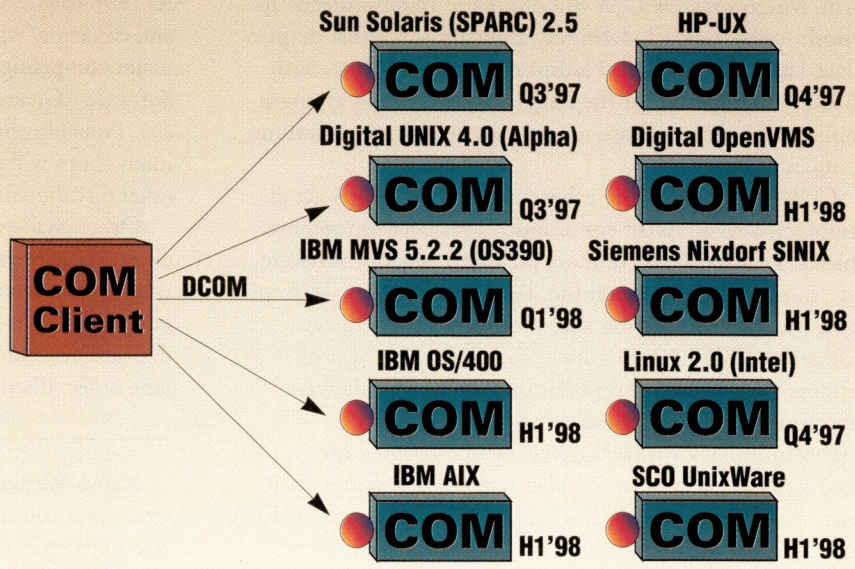
Read All About It

- ✔ Don Box's *COM: The Component Object Model* (Addison-Wesley, 1998, ISBN 0-201-63446-5, $27.95)
- ✔ David Chung's *Component Java* (McGraw-Hill Inc., 1998, ISBN 0-079-13690-7, $44.95)
- ✔ Richard Grimes' *Professional DCOM Programming* (WROX, 1997, ISBN 1-861-00060-X, $49.95)
- ✔ Christina Lau's *Building Distributed Applications with IBM Component Broker* (John Wiley & Sons Inc., 1998, ISBN 0-471-15661-2, $49.99)
- ✔ Eran Marom's *Visual Basic: A Programmer's Guide to Managing Component Based Development* (Prentice Hall Inc., 1997, ISBN 0-135-91504-X, $29.95)
- ✔ Brent Rector's *Component Development with ATL* (Addison-Wesley, 1998, ISBN 0-201-69589-8, $27.95)
- ✔ Frank Redmond's *DCOM: Microsoft Distributed Component Object Model* (IDG, 1997, ISBN 0-764-58044-2, $39.99)
- ✔ J. Sametinger's *Software Engineering with Reusable Components* (Springer Verlag, 1997, ISBN 3-540-62695-6, $49.95)
- ✔ Roger Sessions' *COM/DCOM* (Wiley, 1997, ISBN 0-471-19381-X, $34.99)
- ✔ Jon Siegel's *CORBA Fundamentals and Programming* (Wiley, 1997, ISBN 0-471-12148-7, $49.95)
- ✔ Clemens Szyperski's *Component Oriented Programming* (Addison-Wesley, 1997, ISBN 0-201-17888-5, $45.25)

the code is that the frameworks provide about 40% of a typical working application. The San Francisco project (available on Windows 95, Windows NT and AIX) has three layers of reusable code: Core Business Processes, which provide business objects and default business logic for selected vertical domains; Common Business Objects, which provide definitions of commonly used business objects that can be used as the foundation for interoperability between applications; and a Base layer with the infrastructure and services that are required to build industrial-strength applications in a distributed environment.

Many of the services are based on the object service definitions from the Object Management Group (OMG). For example, the kernel service provides an object transaction service, collections, communication between distributed objects and persistence management. However, San Francisco does not provide a Common Object Request Broker Architecture (CORBA)-compliant Object Request Broker (ORB).

Figure 3. COM: Ubiquitous



Microsoft has enlisted vendors with expertise on other operating systems to port DCOM to non-Windows platforms.

San Francisco's Object Model Classes are based on IBM's System Object Model (SOM). SOMobjects form the basis for IBM's implementation of the OMG CORBA and Object Services. The application domains that have been addressed in the initial requirements and design phases for the San Francisco project include business financials (accounts payable/receivable and general ledger), order management (sales orders and purchase orders) and warehouse management (movement of material in and out of warehouses). The initial toolkit for San Francisco contains the General Ledger framework, several Common Business Objects and the Base infrastructure.

IBM is also working on Component Broker, a middleware product that will provide a distributed object computing infrastructure when it ships on NT, AIX and OS/2 in first-quarter 1998. Component Broker will initially support not only C++, Java, JavaBeans and ActiveX clients, but also server-side CICS (Customer Information Control System) and MQ-Series applications. IBM also posts dozens of Java-based prototype applications on its AlphaWorks Web site (`http://www.alphaworks.ibm.com`). For example, you'll find "aglets," applets with agent technology, at the site. IBM has also extended its flagship DB2 Universal DataBase (UDB) to support stored routines written in Java, using them as methods for UDB's new abstract data types (ADTs). Sybase Inc. is promising similar functionality, and Oracle Corp. has also announced plans to support Java-stored procedures in Oracle 8.1. Other database-related component initiatives include Oracle's "cartridges," which extend Oracle's basic database engine with new functionality, and Informix Software Inc.'s DataBlades. In the application space, vendors such as SAP and Baan have announced more modular, component-based initiatives that support Java.

We've seen how varied the "component" landscape is–ranging from Windows-based ActiveX controls and cross-platform JavaBeans components to templates and modules such as the San Francisco project and Oracle cartridges. We've also seen that components can be either store-bought or homegrown. Today, the biggest challenge facing the industry is figuring out how the various objects will interoperate and communicate. After all, although objects may be interesting in themselves, their main purpose is to communicate with other objects via messages.

Some vendors, such as SuperCede Inc. (`http://www.supercede.com`, formerly part of Asymetrix Corp.), already ship products that, while JavaBean-oriented, will provide "wrappers" for ActiveX controls that allow them to be used in a Java environment. Others are following suit. In the meantime, JavaSoft (`http://www.javasoft.com/beans/software/bridge`) is working on a "bridge" product called JavaBeans Bridge for ActiveX (or ActiveX Bridge) that allows JavaBeans to reside in ActiveX containers as "first-class COM objects."

The Challenge of Distributed Objects

Although the OMG's CORBA had more than a year's head start on Microsoft's DCOM (Distributed COM), which first shipped with Windows NT 4.0, Microsoft has wisely enlisted vendors with expertise in other operating systems to port DCOM to non-Windows platforms (see Figure 3). In fact, more than 1,000 Solaris customers have already downloaded Software AG of North America Inc.'s free DCOM for Solaris.

Software AG has an aggressive timeline for porting DCOM to other major operating systems, and both Bristol and Data-

Focus are also in the process of porting DCOM to their products. Many industry watchers predict that, in the near term, Microsoft's DCOM will dominate small projects. Its repository initiative is definitely a bottom-up effort despite a late 1997 alliance with Platinum Technology Inc., with CORBA being used for the large-scale, industrial-strength applications such as those required by telecommunications companies.

CORBA's architecture is based on ORBs, which act as middlemen to establish communications between remote objects. Leading ORB vendors include Visigenic Software Inc./Borland International Inc. (VisiBroker), Iona Technologies Inc. (Orbix), Visual Edge Software Ltd. (Object Bridge) and BEA Systems Inc. (Tuxedo), but a host of vendors are poised to ship their own object middleware repositories and/or transaction monitors. Sun is discontinuing its own JOE ORB, which is based on SunSoft's NEO, in favor of third-party relationships with Iona, BEA and Visigenic/Borland, and will support CORBA directly from within Solaris. This year promises to be a confusing, perhaps vicious year, as vendors fight over infrastructure standards associated with object brokers and distributed objects in general.

In Summary

Components of all sizes are changing the face of computing. As 1998 dawns, we expect objects to communicate intelligently and efficiently with one another. Unfortunately, there are two major competing models: DCOM, supported by Microsoft and Software AG; and CORBA, supported by just about everyone else. Probably, they'll coexist, thanks to various bridges, but many shops will prefer to simplify life by opting for one or the other distributed object model.

Other challenges we'll face this year: getting a handle on object reuse metrics, honing our object analysis and design skills (perhaps with new tools based on the Unified Modeling Language, UML), developing new programmer productivity metrics for a component-based world, and coming up with sane object distribution and pricing models. ➸

Karen Watterson is an independent San Diego, CA-based writer and consultant specializing in data architecture and data warehousing issues. She writes monthly columns for *Windows NT Magazine* and *DM Review* and is old enough to have written programs both on punched cards and Apple II cassette tape. Email: karen_watterson@msn.com.

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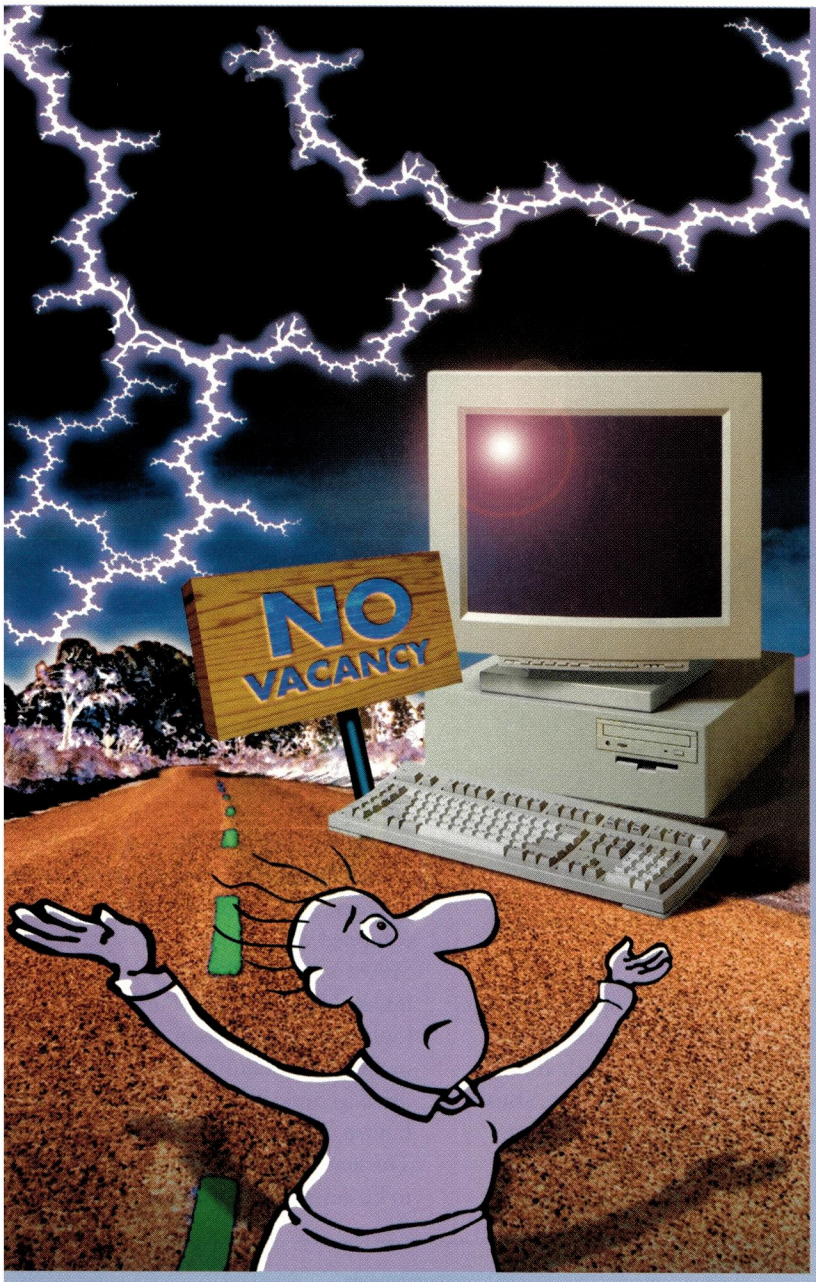

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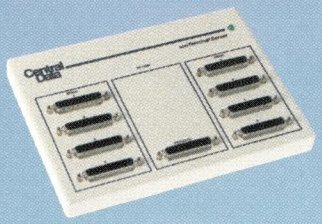

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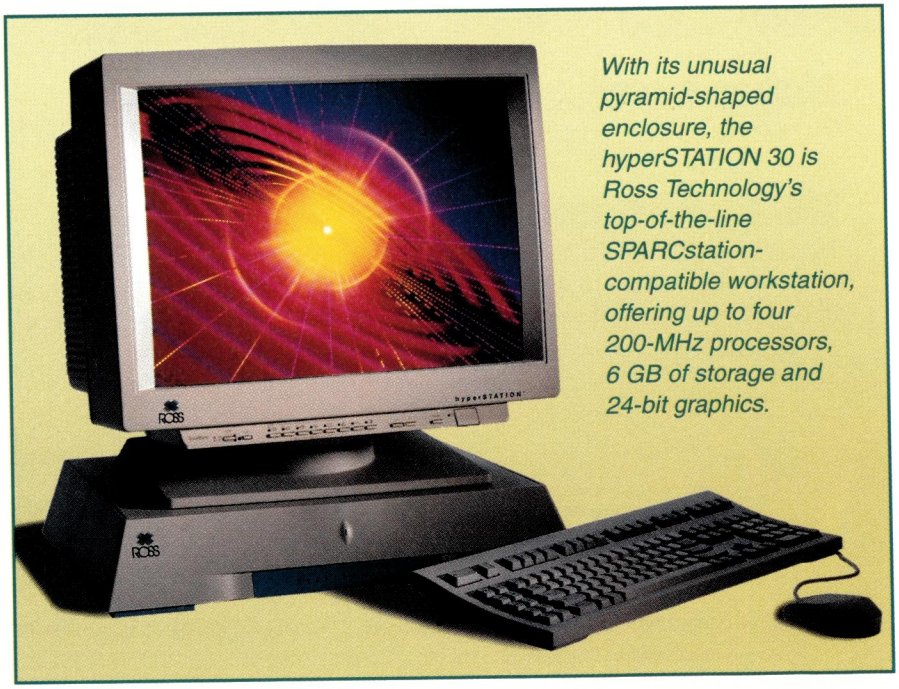
by **IAN WESTMACOTT, Technical Editor**

Ross' hyperSTATION 30 will be at home in any multithreaded application area, including database and Web server applications, CAD/CAM and graphics design.

As multithreaded applications–uncoupled transaction systems such as Web servers and database engines–become the norm rather than the exception, multiprocessor servers and workstations are becoming more common, and cheaper. Ross Technology Inc., a subsidiary of Fujitsu Ltd. and perhaps best known for hyperSPARC processors (used in the Sun Microsystems Inc. SPARCstation 20 line) and SPARC multiprocessor upgrades, offers single-, dual- and quad-processor SPARCstation 20-compatible workstations in its hyperSTATION line. Being SPARCstation-compatible, the hyperSTATION supports Sun's Solaris operating system off-the-shelf and more than 10,000 SPARC applications.

The hyperSTATION 30 is Ross' top of the line, offering up to four 200-MHz processors, 1 GB of RAM, 6 GB of internal storage and 24-bit graphics. Ranging in price from $10,000 to $40,000, the hyperSTATION 30 is available in various configurations. Graphics options include the Turbo GX frame buffer with 1 MB or 4 MB of memory, or the AG10-E 24-bit 3D frame buffer; peripheral options include a six-speed CD-ROM drive and full-featured digital 17- or 21-inch color monitor with on-screen display; SBus options include 100BaseT Ethernet, FDDI and SCSI; software options include various versions of Solaris and Netscape Communications Corp.'s SuiteSpot.

The hyperSTATION is also easily upgradable, so you can add processors as the need arises. Our review unit came equipped with four 142-MHz hyperSPARCs, 256 MB of RAM, a 2-GB internal hard disk and SunOS 5.5.1 (Solaris 2.5.1) preinstalled. All units include a standard 3.5-inch floppy disk drive, generic Type 5 keyboard and a Fujitsu three-button mechanical mouse. The keyboard and mouse leave a little to be desired. The small keys have a



With its unusual pyramid-shaped enclosure, the hyperSTATION 30 is Ross Technology's top-of-the-line SPARCstation-compatible workstation, offering up to four 200-MHz processors, 6 GB of storage and 24-bit graphics.

shallow stroke with no feedback, and the mouse buttons and ball are sticky.

The dimensions of the base unit are 3.75 inches high by 20 inches wide by 17.25 inches deep, and it weighs 28 pounds. Its unusual truncated pyramid-shaped enclosure was designed by Austin, TX-based Design Edge. Although at first this design may seem somewhat gratuitous (and a waste of footprint space), for office installations it is certainly an improvement over the bland boxes most workstation vendors are so fond of (kudos to Ross for actually hiring a design firm). Moreover, Ross claims the design improves airflow in the hyperSTATION ventilation system.

Removable storage devices are accessible on the right-hand side, where the single 5.25-inch and single 3.5-inch externally accessible bays are located. The rear panel includes SCSI, serial, parallel and twisted-pair Ethernet ports, and 16-bit audio ports for stereo in/out, mono microphone input and stereo headphone output. Inside the box are two additional 3.5-inch bays, one of which was occupied with the internal hard disk; four SBus slots, two of which were occupied by the AG10-E; and two 50-MHz MBus slots, each occupied by dual-CPU daughter cards. Engineering is excellent. Despite cramped quarters, every component is easily accessible, and cable management is good. High-quality parts and attention to detail are evident.

Two Are Better Than One

As a multiprocessor, the hyperSTATION will find a home in any multithreaded application area, including database and Web server applications, CAD/CAM and graphics design, and most technical compute-intensive applications such as visualization and simulation. We tested our unit with Adobe Systems Inc. PhotoShop, Netscape's Enterprise server and a noncommercial molecular dynamics simulator. In all cases, the hyperSTATION performed well, on par with the SPARCstation 20. One limiting factor of the hyperSTATION is its sustainable memory throughput, which we found to be about the same as the SPARCstation 20, but which is about one third the rate of an Ultra 1 140 (thanks to the Ultra Port Architecture). This can be a factor for applications that work with large data sets (larger than the cache size).

If a SPARC-based desktop multiprocessor is what you are looking for, then your choices are limited. And if your budget constrains you further, then the hyperSTATION line from Ross may just fit the bill. We found the hyperSTATION to be a well-constructed workstation with available options to fit most installations, and at a price that won't break the bank. You may want to replace the keyboard and/or mouse, but otherwise we had no problems with the system.

Ross hyperSTATION 30

Company
Ross Technology Inc.
5316 Highway 290 W.
Austin, TX 78735

Telephone
(800) Ross-YES

WWW
http://www.ross.com

Best Feature
Design, construction and price

Worst Feature
Keyboard/mouse

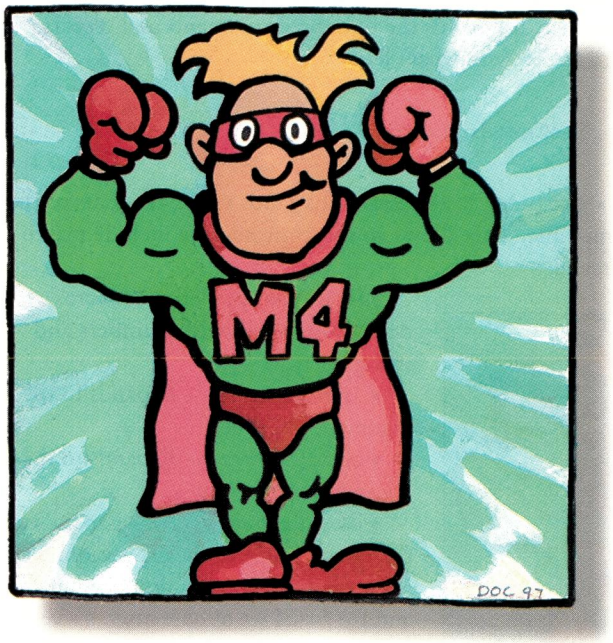
Price
Depends on configuration

Reviewed Configuration
Quad 142-MHz with 1-MB cache
64-MB RAM
2-GB hard disk drive
Turbo GX frame buffer
6X CD ROM
Solaris 2.5.1
17-inch color monitor
$23,560

Circle 170

Q&AIX

by Jim Fox



M4 – A More Powerful Macro

Jim Fox *works as a systems programmer for the University of Washington. He writes and maintains distributed applications that run on a variety of UNIX systems–and some non-UNIX ones. He is also the deputy manager for the Interoperability Project for SHARE's Open Systems Group. Email:* `fox@cac.washington.edu`.

wizard's apprentice

super user

wizard

Q: Your October 1997 article ("Virtual Windows," Page 75) mentioned two ways to customize the `rc` file used by the `fvwm2` window manager. One was `cpp` and the other was M4. Would I be better off going straight to M4?

Beverly Rhodes
City University

A: Last month, we looked at the `cpp` preprocessor, which is simple and very easy to work with. This time, we'll take a look at a much more powerful macro language, M4. Will M4 be the right tool? That depends on how much processing you would like to do.

A macro processor can be defined quite easily–it copies input to output, expanding macros as it encounters them. *Expanding* a macro means to replace it with its definition. How it goes about that macro expansion defines the character of the macro language. Some languages, like TeX, are very complicated; others, like `cpp`, are simple; M4 is somewhere in between.

M4 was written quite a while ago–in computer years. It was originally the macro preprocessor for RATFOR, the rational FORTRAN compiler, which, I think, no longer exists. Its preprocessor, however, has enjoyed something of a revival. It is used by `fvwm` and by the program that generates the GNU Configure files.

The Free Software Foundation (`http://www.gnu.ai.mit.edu`) has made some enhancements to M4; some of which are very useful. The M4 you get with AIX is the original version. If you find you like the program and want to do more with it, you should consider getting hold of the FSF's version.

M4 Macros

M4 normally uses the pound sign "#" to indicate comments. Oddly enough, M4 passes comments into the output stream. I have no idea why it does this, but it will certainly cause trouble if your target program doesn't recognize comments the same way. Fortunately, it is possible to define comments that are not output. We'll see in a moment how to do that. M4 macros can appear anywhere in the input line, not just at the front like `cpp`. They don't have any introductory symbol. A macro name appearing anywhere triggers macro expansion.

Although we always use the term *macro* to indicate a special word that is not simply

passed to the output stream, some of these macros could rightfully be considered commands. We use the term *expand* to mean the action of a macro, even those that are internal and appear to have spurious functions. In general, an M4 macro invocation has the following syntax:

```
macroname(arguments)
```

where *arguments* is a comma-separated list of arguments to the macro. The opening parenthesis must follow immediately after the *macroname*. M4 is very sensitive about spaces, which are almost always significant. Text strings are delimited by quote marks: a single left-quote to start a string and a single right-quote to end it. Macros found in the argument list will be expanded unless they are quoted.

Because M4 is interactive, you can type into it and see the results of any macro expansions immediately. This is a good way to learn the language. Here are some of M4's most useful macros:

- `define(`name',value)` – Defines a new macro, *name*, giving it the expansion of *value*. The value string can contain these symbols to make use of arguments:
  - `$n` – Will expand to the *n*th argument of the invocation.
  - `$0` – Is the macro's name.
  - `$#` – Will expand to the number of arguments.
  - `$*` – Will expand to a comma-separated list of all arguments.
  - `$@` – Will expand to a quoted, comma-separated list of all arguments.

Note: The quoting prevents *name* from being expanded before it is defined.

- `dnl` – Deletes all characters until the new line. This is often a convenient way to avoid new lines in the output stream. Here's a way to use `dnl` to define a comment that does not get passed on to the output:

```
define(`C',`dnl')
```

Now any text after a `` `C' `` will be ignored. Actually, the `` `C' `` must appear as a word. Text such as `` `Chapter' ``, for example, will not invoke the macro. The `dnl` is quoted to avoid having it expanded, which would have the unfortunate consequence of deleting the rest of the definition.

- `pushdef(`name',value)` – Also defines a new macro, but saves the old definition on a stack. This is useful for defining temporary variables in complex macros.
- `popdef(`name')` – Recovers a pushed macro definition.
- `ifdef(`name',true_text,false_text)` – If the macro, *name*, is defined, this expands to *true_text*; otherwise, it expands to *false_text*.
- `ifelse(string1,string2,true_text,false_text)` – If *string1* is equal to *string2*, this expands to *true_text*; otherwise, it expands to *false_text*.

Note: The *false_text* may be omitted.

- `ifelse(string1,string2,true_text,more args)` – `ifelse` can be invoked with more than four arguments. If the strings are equal, it expands to *true_text*; otherwise, it discards the first three arguments and repeats the `ifelse` with what's left:

```
ifelse(arg4,arg5,...)
```

- `include(filename)` – Expands to the contents of the named file. This allows you to conveniently include macro libraries.

M4 also has predefined macros designed to work with numbers and strings:

- `incr(number)` – Expands to the argument plus one.
- `decr(number)` – Expands to the argument minus one.
- `eval(expression)` – Expands to the integer value of the expression. The expression can contain numbers, macros and the usual set of operators. It's very similar to C programming. For example, `eval(45*3)` expands to `135`.
- `len(string)` – Expands to the length of *string*.
- `index(string,substring)` – Expands to the index of the first occurrence of *substring* in *string*. It returns `-1`, if there are no occurrences. Note: The first character of a string is at index zero.
- `substr(string,index,length)` – Expands to the substring of *string*, which starts at *index* and is *length* characters long. If the length is missing, the substring contains characters to the end of *string*.
- `translit(string,chars,replacement)` – Expands to *string* with characters in *chars* replaced by the corresponding characters in *replacement*.

There are a few more commands in AIX's M4, and quite a few more in GNU's M4, but these will give us something to work with to explore the power of the language. For more information, consult the M4 man page. Also, check out one of the M4 Web documentation sites. One is `http://www.stat.ucla.edu/develop/gnu/m4_toc.html`. These sites describe the GNU M4, but most commands that also exist on the AIX M4 work the same way. I don't know of any books dedicated to M4.

Using M4

Here's an example of how we can use M4's language to write a macro to do loops. We'll define the macro

```
for(var,
```

Daily Times

Special Edition

TODAY'S NEWS...

IBM®AIX® 3.2.x Users Need to Upgrade to 4.x

By Bill Stevens

After December 31, 1997, IBM will no longer support older AIX versions 3.2.x. According to Stephan Moen, Vice-President of Information Technology, Aspen is ready to upgrade all AIX 3.2.x users to the latest version of AIX 4.x. "This is just one of the many system integration services that Aspen offers," commented Moen.

As the system integrator to the AIX user community, Aspen Consulting is a full service firm handling all aspects of the RS/6000 and AIX. Aspen consultants are experts working with IBM RS/6000™SP™, Storage Systems, HACMP, Tivoli®,

SEE UPGRADE, PAGE 5

Martian Pathfinder Mission A Success

IBM® RS/6000™ Capabilities Make It All Possible

By Linda Smith
DAILY TIMES NEWS SERVICE

This month's
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SEE PATHFINDER, BACK PAGE

start,*end*,
procedure)

such that the *procedure* is expanded for each value of *var* from *start* to *end*. For example,

```
for(`x',1,5,`
   x squared = eval(x**2)')
```

would expand to

```
1 squared = 1
2 squared = 4
3 squared = 9
4 squared = 16
5 squared = 25
```

Notice a couple of fine points: The first x is quoted, which prevents it from being expanded too soon; and there is a new line in the procedure part, which gives us a new line at the start of each iteration.

Figure 1 shows the definition of the `for` macro. In Figure 1 and in Figure 2, I have included line breaks and leading spaces in the definitions. This is only to help show the structure of the macros. Actual M4 macro definitions almost never have spaces or line breaks. Also, note that I have made use of the `` `C' `` comment macro.

In Figure 1, we have added a `break` macro to provide an escape from the loop. See if you can figure out how this macro works. It uses a couple of techniques common to macro programming. The public `for` macro just sets up some parameters and then calls the private `_for` macro to do all the work. The private `_for` macro performs the loop function by conditionally re-expanding to itself.

Let's demonstrate use of this new loop function, in a sublime sort of way, by writing a prime number macro. All real programmers write prime number programs in every language. It also demonstrates the use of the `for` loop and complex macro programming, and it could conceivably be useful. Many programs, M4 included, allow you to specify a hash size on the command line. This hash size is supposed to be prime. How do you find a prime? Use the `nextprime` M4 macro. It expands to the next higher prime number from the argument. For example,

```
cmd -H nextprime(50000)
```

will expand to

```
cmd -H 50021
```

Figure 2 shows the definition of `nextprime`. Once more, the indentation is illustrative only. Don't include spaces in a real M4 macro unless you mean them.

The macro in Figure 2 uses the same recursive technique as Figure 1. See if you can figure out how it works. We break out of the `for` loop if we find a factor (the `` `t' `` test) or we

Figure 1. M4 Loop Macro Definition

```
C
C *** for loop ***
C
C      usage:  for(var,start,end,procedure)
C
define(for,`undefine(`_break')
   define(`$1',`$2')
   _for(`$1',`$2',`$3',`$4')')dnl
C
define(_for,`$4`'ifelse($1,`$3',,
   `ifdef(`_break',,
      `define(`$1',incr($1))
       _for(`$1',`$2',`$3',`$4')')')')dnl
define(`break',`define(`_break')')dnl
```

Figure 2. M4 nextprime Macro

```
C *** M4 prime number finder ***
C
C         usage:  nextprime(number)
C
C         expands to:  next prime >= number
C
define(nextprime,`undefine(`_done')
   for(`j',2,$1,
      `define(`t',eval($1%j))
       ifelse(t,0,`break()')
       define(`s',eval($1-j*j))
       ifelse(substr(s,0,1),`-',
      `define(`_done',`d')break')')
   ifdef(`_done',$1,
      `nextprime(incr($1))')')dnl
C
```

Figure 3. Useful Definitions Passed from *fvwm2* to the M4 Preprocessor

WIDTH	Width of screen in pixels
HEIGHT	Height of screen in pixels
BITS_PER_RGB	Number of colors available
COLOR	"Yes" or "No"
USER	User name
OSTYPE	Operating system ("AIX" for all versions of AIX)

go past the square root of the number. Recall from your number theory studies that a composite number must have a factor less than or equal to its square root.

Using M4 with fvwm

Now that you've become accustomed to the M4 macro languages, writing that `.fvwm2rc` file in M4 will be a piece of cake. When `fvwm2` runs the M4 preprocessor, it defines several names, which you can use in your file. The most useful of these are shown in Figure 3. See the FvwmM4 man page for the rest.

Here is how we would use M4 to do the simple task shown last month. Suppose you work at various locations, where there are different size X terminals, maybe a large-screen terminal at your office and a smaller one at home. You might want to use different fonts, depending on the size of your screen. You could make some definitions related to screen size at the start of your `rc` file. We'll do things slightly differently this time.

```
# Define screen sizes
   ifelse(eval(WIDTH/1500),1,
       `define(`BIG_SCREEN')
        define(`FONT',7x13)',
     eval(WIDTH/1200),1,
       `define(`MID_SCREEN')
        define(`FONT',6x12)',
     eval(WIDTH/1000),1,
       `define(`SMALL_SCREEN')
        define(`FONT',6x10)',
       `define(`TINY_SREEN')
        define(`FONT',6x10)')
```

Now we can make direct use of the `FONT` macro

```
WindowFont FONT
```

Be sure to start `fvwm2` with the M4 option:

```
fvwm2 -cmd "FvwmM4 rc_file"
```

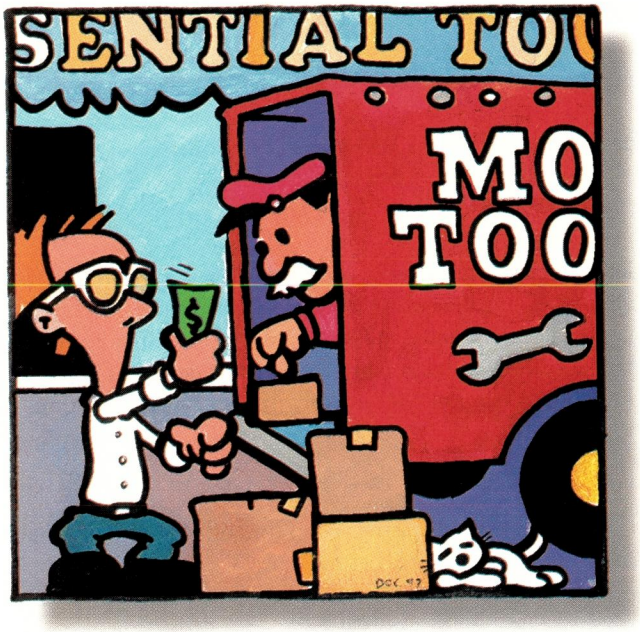
Some documentation tells you to use the `-f` option for this command, but that won't work–you have to use `-cmd`, you have to use the quotes and you have to specify the `rc` file. Also, a couple of documented options work only if you have the GNU version of M4, notably the "-m4-prefix" option.

* * * * *

There are probably other good uses of M4. Perhaps you can think of something. Let me know.

If you would like to try these macros, you can find them all at `http://weber.u.washington.edu/~fox/M4/`. ➸

by John S. Quarterman



More Network Tools

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

A few months back, I wrote a column called "Essential Tools" (October 1997, Page 78). That was a popular topic, judging by the amount of feedback it generated. Many readers suggested more tools and asked for still more. In this month's column, I'm going to list a few of the suggested tools with my comments. I haven't actually used many of these tools yet, so this column is mostly reporting what readers have told me and what the documentation says. In future columns, I will examine some of them in detail. I welcome more comments from people who have used these tools and will incorporate them into future columns, along with my own comments.

I also welcome suggestions of more tools. Because this is a networking column, I'm trying to stick to network-related tools rather than purely systems administration tools, which are covered by other columnists. And that's not much of a restriction anyway, because almost everything is network-related these days. The one exception I'm going to make here is for RCS, because I mentioned it last time.

Somewhat paradoxically, I will not be addressing network monitoring tools this month. This is for two reasons: There are so many of them, and they are a class unto themselves that needs its own explanation. They will appear in a later column.

RCS Revisited

Last time, I looked at RCS, the Revision Control System. One reader asked how to get a copy of it to run on a system that doesn't include it in the regular system distribution. The current RCS sources are available from several places, including:

- The main distribution point for RCS is at Purdue University, see `ftp://ftp.cs.purdue.edu/pub/RCS/`.
- RCS is also distributed as part of the GNU Project (`http://www.gnu.org`) and is available from the usual server, `ftp://prep.mit.ai.edu/pub/gnu/` or `ftp://prep.mit.ai.edu/pub/rcs-5.7.tar.gz`.

wreq Is Just the Ticket

Last time, I extolled the virtues of `req` and RUST. Unfortunately, `req` is getting a bit overtaxed with the kinds of demands current support environments are putting on it, and RUST never seems to have quite really happened. Two readers, Yunliang Yu

ıd Matthew Stier, pointed out a third ay: wreq.

In many ways, wreq is just another ouble-ticket system, similar in basic ınctionality to req, with incoming quests mailed to a support mail alias, ut into an active queue and eventually ıoved to a resolved queue. But there e several distinctive features of wreq. irst, it is thoroughly based on the Veb, so any user with a Web browser vhich these days means most any user all) can use it. While I usually prefer ommand-line interfaces, this particular Veb interface seems at first glance suffiently well thought out that it doesn't ok too painful to use. Second, it tempts to handle coordinating request ueues run by different groups, using ıe Web for this function, as well. The asic idea is to distinguish one Web

rsync seems to have developed along a slightly different path than rdist, yet it seems to be case of parallel evolution.

rver as a database coordination root ıd have all other wreq Web servers be ıbsidiary to that one. Third, it as facilities for building FAQs, so ou don't have to kludge something p for that yourself. A facility is proided for converting req data to wreq rmat. For more information about req, see http://www.math.uke.edu/~yu/wreq/.

How well does wreq work in practice? Well, we'll see. Comments from ıore people who have used it would be elcome. I'll incorporate them into a ıture column about wreq, along with ıy own comments.

sync – A rdist Alternative

Last time, I discussed the recent ewrite of rdist. In a similar vein, ın Howell points out rsync (ftp://amba.anu.edu.au/pub/rsync/). sync seems to have developed along slightly different path than rdist, et it seems to be a case of parallel evolution. rsync claims to be a replacement for rcp. It can do the following:

- Transfer only the differences in a set of files.
- Use either rsh or ssh for network transport.
- Do everything it does without needing to be setuid.
- Accept or reject files according to parameter files.

This all sounds remarkably like rdist. However, in addition to the command-line options and parameter file syntax being different, there is another, more important difference. rsync transfers only the *pieces* of the files that have changed, not the complete files. It will also compress data before transfer if requested.

Another big advantage is that with

rsync you don't have to have a parameter file. If you want to synchronize a directory between two systems, you don't have to fiddle with files, you just use rsync instead of rcp. You use the same syntax as for rcp, which is similar to cp.

Is rsync really more efficient and easier to use than rdist? If readers have opinions on that, please send them in. I'll incorporate them into a future column. My guess is that rsync is more convenient for neatly packaged directories and over slow links, while rdist is probably more appropriate for complex packages.

The New Message Handler

Mick Farmer suggests (OK, not in response to the previous column) nmh, or new MH, where RAND MH is the Message Handler, which has long been available. (The old paper on MH seems quaint today: "How to process 200 messages a day and still get some real work done." Only 200? That would be a slow day.)

You can get nmh at http://www.math.gatech.edu/nmh/ or ftp://ftp.math.gatech.edu/pub/nmh/nmh.tar.gz. But what is it? Basically, it's a rewrite of MH-6.8.3. Perhaps we should call 1997 the year of rewrites; it does seem to have been a popular activity. The curious thing is that all of these particular rewrites are in C, not C++ or Java. Maybe 1998 will be the year of rewrites in Java. It's clear that the C compiler of choice for all these packages is gcc. In the case of MH, a rewrite from the old TOPS-20-style code is welcome.

Some of you may not be familiar with MH. Unlike Mail, Elm or Pine, MH is not a monolithic single-program mail system. Rather, it is a collection of related programs, one for incorporating received mail, one for reading it, one for replying, one for forwarding, one for composing new messages and so on. This makes it very easy to interleave mail processing with other work.

And unlike most other mail user agents (UAs), MH doesn't keep mail in big files, each with many messages. With MH, each mail message is a file, and a mail folder is a directory. This means that if you've lost a mail message and want to find it, you can easily grep for it. And messages may be linked into multiple folders using UNIX hard links without taking up multiple disk space. While mail UAs are a matter of taste, those of us who handle large numbers of messages daily do prefer MH for reasons such as these.

nmh has documented some programs that weren't previously documented in MH, added a few more bells and whistles and improved efficiency somewhat. Still, the main difference between nmh and MH seems to be that it uses a modern C compiler and make program, thus making it portable to more platforms.

What else does nmh do? It is *much* easier to configure and install because it uses the de facto UNIX configure script idea. But don't worry; because it is supposed to be plug-compatible with MH, nmh still has the plethora of MH runtime configuration files.

Some features have been removed, such as bulletin boards and the Post Office Protocol (POP) server. In these days of Majordomo, LISTPROC and LISTSERV, there's not much need for specific MH bboards, which were an old style of mailing list. And most Internet service providers use the Pine POP server these days, anyway.

nmh has documented some programs that weren't previously documented in MH, added a few more bells and whistles and improved efficiency somewhat.

Still, the main difference between nmh and MH seems to be that it uses a modern C compiler and make program, thus making it portable to more platforms, particularly Linux. Whatever the reason that caused nmh to appear, it seems to be leading to more active development than MH has seen in years.

Can You Do without procmail?

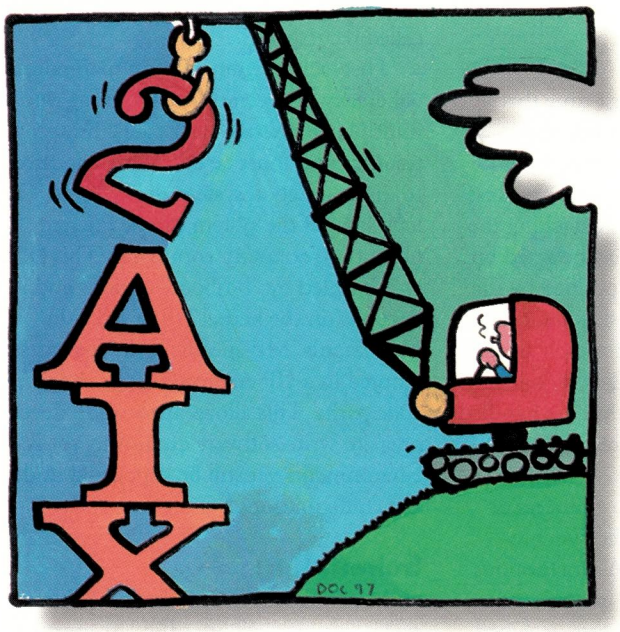
"What tools couldn't I do without?" Gretchen Phillips asked herself. High on the list was procmail. In these days of spam (for links to more information on the fight against spam, see http://www.mids.org/nospam/), filtering at the external router and at the host aren't enough. You still need personal filtering. You also need personal filtering to handle status messages, routine reports, mail that you need to answer but not right now, mail that you want to batch together and answer all at once and mail that you want to automatically file under /dev/null.

procmail is possibly the most common per-user mail filter used under UNIX. It can redirect mail to another person, to a list, to a file, to a mail folder or to the bit bucket. It can do this based on the From:, To:, Subject: or other headers, including regular expression matches and logical combinations of any or all of them. Discard anything with multiple exclamation points (!!!!) in the Subject: line and avoid reading a lot of spam.

To ensure you're not missing a few messages from excitable users, you can discard messages with such subjects only if they don't come from within the local domain. Refile everything that comes from cron to a mail folder. And so on. All this works by putting a line in your .forward file redirecting your mail through the procmail program. Be sure to make a .procmailrc file first, containing instructions for procmail.

There are other programs that do more or less the same as procmail. One is slocal, which comes with MH or nmh. What's your favorite network tool? ⊸

by Jim DeRoest



Process Management, Part Deux

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In last month's column ("Process Management 101," Page 70), I began a two-part discussion of AIX process architecture and management, of which this is the conclusion. As old as UNIX is, there are still many systems administrators who are new to UNIX, or AIX in particular. My intent is to describe how units of work are packaged and scheduled for execution in the system.

Last month, I covered general process structure and administration as it pertains to the AIX Version 3 architecture. AIX Version 4 breaks up the AIX V3 process model into independent tasks called "threads" to overlap task execution and capitalize on multiprocessor hardware. Multiprocessing (MP) architectures are better able to meet the workflow demands of commercial transaction processing, data mining and multimedia authoring and delivery. Once found only in mainframe system implementations, multiprocessor configurations have been enabled for low-cost desktop systems by PowerPC technology.

This time, I'll review how AIX V4 takes advantage of MP through process thread architecture. Much of what I covered in last month's column still pertains to the process thread model. In the general case of process administration and management, one can usually interchange "thread" for "process" as they relate to system commands and monitoring tools. However, there are differences in how threads and processes behave and how they respond to system events such as signals. Once you are aware of these differences, you'll experience fewer surprises as you manage the system workload.

Processes and Threads

Threads provide the means for overlapping, multiplexing and parallelizing operations within a process. Each thread represents a dispatchable unit of work. Rather than forcing the entire process to wait for an event like file I/O or wait for a single CPU in a uniprocessor (UP) system, threads within a process can be dispatched independently across multiple CPUs in an MP complex. Multiple process tasks executing on multiple CPUs usually means that work gets done faster, resulting in improved system throughput. I did say "usually." These features don't come without additional complexity and overhead. More about this later.

In an AIX V3 world, a new process is created when a parent process invokes a `fork()` system call. Both the parent and the new child processes share a common copy of the parent's program executable text. A private copy of the parent's program data is created for the child. This means that the parent and child processes

cannot automatically communicate by manipulating variables in a shared data space. To facilitate interprocess communication (IPC), a shared address space or semaphore must be created explicitly.

In AIX V4, threads are created by invoking `pthread_create()` and `pthread_atfork()`. A process and all its associated threads can also be cloned using the `forkall()` routine. The newly created thread continues to share a common data space with the parent, so no additional IPC mechanisms are required. Variables manipulated by one thread are visible by other threads in the same process address space. This means that additional synchronization methods are required to coordinate access to shared data elements.

Thread Structure

Threads are created by breaking down the process structure into independent dispatchable components and associated global resources. Global resources remain a part of the common process `user` and `proc` structures. These structures are accessible by all of the threads that make up a process and are used to provide conduits for communication within the constraints of the structure's defined variables and attributes.

Along with the shared resources maintained in the process `proc` and `user` structures, each thread has corresponding thread-specific `thread` and `uthread` structures. These thread local structures include stack, registers and other kernel data. Thread local structures make it unlikely that one misbehaving thread can corrupt structures specific to other threads.

Globally shared code sections called "critical sections" can be corrupted if signal and address modifications are not synchronized. Each processor in an MP system has its own Level 1 and Level 2 cache hardware for storing instruction streams. Care must be taken to ensure that updates to a code section resident in more than one processor cache are validated and serialized. This is called "cache coherency" and is an important consideration when designing thread-safe applications.

AIX V4 threads are based on the POSIX 1003.4a draft 7 model as implemented in the Open Software Foundation OSF/1 libpthreads. Threads are represented by both user and kernel thread components. For every user thread, there is a corresponding kernel thread. Kernel threads may exist independently. This user-to-kernel thread mapping is known as the 1:1 thread model. The Distributed Computing Environment (DCE) pthreads implementation in AIX V3 was based on an N:1 thread model. DCE allowed multiple user threads to be mapped onto a single kernel thread.

Handling Signals

You might recall from last time that signals are the means for gaining the attention of a process when a system event occurs, for example, terminating a process with a hang-up signal when detaching the controlling TTY. Signals may be acted on or ignored by a process as specified by the signal mask. The signal mask is basically a set of on/off switches, one for each signal type. When applied to threads, signals are defined at the process level but are handled at the thread level. Each thread has a local signal mask.

When signals are sent to a process or thread, they may be delivered synchronously or asynchronously. A synchronous signal is initiated due to an exception caused by the particular process or thread. Asynchronous signals are generated by asynchronous events, such as invoking the `kill` command from a command shell. An asynchronous signal is delivered to only one thread in the process. This could be a thread that has issued a `sigwait()` for the particular signal, or a thread that does not have the signal blocked by its mask. A signal caught by a thread executing on one processor in the complex may be an unknown event to threads executing on other processors or sleeping. What all this means is that coordinating processwide signal handling can be a mess and requires special mechanisms for synchronization.

Locks – Thread Synchronization

Locks are the primary mechanism for synchronization between threads and for protecting critical code sections. In order for this to work, the lock test and set operation must be protected from interrupts. Lock requests will block until the lock is available by either spinning or waiting. A "spin lock" will cause the thread to loop for a predetermined period until the lock is free. If the period time expires, then the requestor will sleep until the lock is released by the holder. A "wait lock" will sleep until the lock is available.

Two OSF lock types are implemented in AIX V4: "simple locks" and "complex locks." Simple locks spin and are exclusive but may be preempted by higher priority requestors. Complex locks are used to synchronize requests between a writer and multiple readers. Complex locks are wait locks; they are not exclusive and may be called recursively.

This lock instrumentation maintains coherency between threads running on multiple processors. Locks are a finite resource and must be efficiently allocated to maintain good system throughput. The lock state of the system can be queried using the `lockstat` command. This facility is enabled by "bosboot" options and depends on the kernel UP or MP run mode status. MP-specific lock requests are ignored in a UP environment to shorten code paths. This allows application developers to write software exclusively for MP environments yet still be supported under UP configurations.

Scheduling

Much of the AIX process scheduling architecture we discussed in last month's column equally applies to threads, although there are differences. As dispatchable units of work, threads are assigned a priority number from 0 to 127. Each level is represented by a run queue. Some functions that affect priority, such as the `nice` value, operate on the process as a whole rather than an individual thread.

A scheduling trade-off had to be made on how threads are dispatched to available processors. This thread-to-processor binding is called "processor affinity." The system experiences fewer cache misses if threads can be dispatched to the same processor on which they last ran. Conversely, overall processor utilization is improved if threads can be scheduled to any available processor. The AIX V4 scheduler implements what has been termed "opportunistic affinity," where an attempt is made to run a thread on the same processor on which it last ran if that processor is available. The routine, `bindprocessor()`, is available for those instances when a programmer would like to enforce processor affinity for a code section.

Along with general thread support, three new scheduling options are available in AIX V4, `SCHED_RR`, `SCHED_FIFO` and `SCHED_OTHER`. `SCHED_RR` enforces strict round-robin scheduling. `SCHED_FIFO` uses a fixed-priority, first-in, first-out ordering system. `SCHED_FIFO` does not support

preemption and is not time sliced. A thread must either block or yield the processor. The third option is SCHED_OTHER, which represents the standard AIX scheduling algorithm, where task priority degrades with CPU usage.

Kernel Support

AIX kernel enhancements were required to facilitate the thread dispatch model and handle the processing of interrupts. Much of the task of instrumenting these requirements in the AIX V4 kernel are facilitated by the design of the AIX V3 kernel and the characteristics of the PowerPC architecture. The kernel in AIX V3 is preemptable. This means that the kernel can be interrupted at any time to service higher priority tasks, a feature important to MP architectures. Still, some MP operations must remain atomic (i.e., cannot be interrupted) and are run with interrupts disabled. Also, as mentioned before, new locking mechanisms are required to protect common code and data sections that may be in use by multiple threads executing on separate processors.

Two special-purpose reserve instructions and the weakly ordered memory architecture of PowerPC processor formed the basis of the new AIX V4 locking algorithms. The PowerPC `lwarx` load and `stwcx` store operations are considered complete at address translation time to facilitate out-of-order instruction execution by the PowerPC's multiple execution units. Any dependencies or cache misses automatically invoke a reordering of instruction execution. Address comparison ensures that correct instruction order is maintained.

Many legacy applications assume they are executing on a single processor. This is especially true for code sets like device drivers. In order to grandfather in processor-dependent software, processor binding or "funneling" operations ensure that an application is always dispatched to the same processor in an MP complex.

Multiprocessing Overhead

As I've already mentioned, the ability to dispatch work across multiple processors does not come without some overhead. An eight-way processor system isn't going to perform at eight times the throughput of a single processor of the same architecture. MP contention for kernel structures, longer instruction paths, spinning and waiting on locks, bus contention, maintaining cache coherency and so on all add to system overhead. The AIX V4 design goal was to keep increased MP overhead within 15% to 20% of UP overhead. Note that the overhead increases as you add more processors to a complex.

It probably comes as no surprise that process thread and MP technology is not entirely a free lunch. However, low-cost MP hardware and the ability to use a common AIX distribution between your UP and MP boxes do make for an attractive combination for applications that are MP enabled. Just remember that the signal you sent to a process may not elicit quite the response you expected: A stitch in system time might be a loose process thread. ➸

by Jeffreys Copeland and Haemer

Comparing Text, Part 2

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

Last time, we began building a wrapper for `diff` that allows us to compare running text. Why would we want such a thing? To isolate the differences between two versions of a draft RFC, or two versions of a formatted email message, for example.

Our basic strategy is to strip each of the two files into a list of words, one per line, and do an `sdiff` (or `diff -y`) on them. We then postprocess the differences and fold them back into something readable, with the differences highlighted. Last month, we finished the shell script wrapper, called `redline`, which is very simple. We'll include it here for reference:

```
#! /bin/sh
# $ Id: redline,v 1.1 1997/10/13 14:59:39 jeff Exp $
#   This does a diff on running text,
#   in the same style as a Word or
#   WordPerfect red line comparison.

#   set the cleanup
trap 'rm -f /tmp/$$*'   EXIT HUP QUIT INT TERM

#   check that file arguments are present
[ -z "$1" -o -z "$2" ]   &&
 echo usage:  $0 file1 file2   &&
 exit

#   begin by breaking files into a word per line
#   ensure that paragraphs are handled nicely
#   whether they're indented or preceded by
#   blank lines
expand $1 | sed -e 's/^   */\
/'  | fmt -2 >/tmp/$$a
expand $2 | sed -e 's/^   */\
/'  | fmt -2 >/tmp/$$b

#  now do an sdiff, and collect the differences
diff -y /tmp/$$a /tmp/$$b | expand | reddiff
```

The guts of the whole thing is the `reddiff` program, which formats the differences into something readable. We had just finished with the `parse()` routine from `reddiff` when we ran out of time last month. For review, `parse()` takes a line of input and two `char **`s as arguments. It returns the `sdiff` difference indicator (<, >, | or blank) and the words it found on the input line.

Beginning where we left off, let's proceed with the rest of the `reddiff` program. We'll continue by laying out the global declarations:

```
char line[BUFSIZ];
char bufcomm[BUFSIZ];
char bufnew[BUFSIZ];
char bufold[BUFSIZ];

#define ANY(bp)   (*bp)
#define WIDTH   75
```

We need an input line, and buffers for common text–text in the new version and text in the old version. We add a macro for detecting text in the buffer. Because, in the end, we'll be filling the text we gather, we define the width.

Given that, we can begin the main program:

```
main()
{
   char *word1, *word2,  tag;
   char **wp1 = &word1,  **wp2 = &word2;

   bufcomm[0] = bufnew[0] = bufold[0] = 0;
```

We declare pointers to strings and pointers to pointers, and initialize the buffers to the empty string before beginning. Next, we'll begin the main loop:

```
while( fgets(line, BUFSIZ, stdin) != NULL )
{
   tag = parse(line, wp1, wp2);
```

We read each line from the output of `sdiff`. Then we use the routine we wrote last time to extract the words from the input line. It takes a pointer to the line and returns pointers to the two words from its argument list.

We have to deal with a special case next: If we've only got a separator, but no words on the line, we've got a paragraph break:

```
/* special case:  if we only have
a separator, we've
got a paragraph break */
if( ! *word1  &&  ! *word2 )
{
   spill();
   showme("",'x');  /* forces a
         reset of line counts */
   printf((tag == '') ? "\n\n" : "\n%c\n", tag);
}
```

We have two new routines: `spill()`, which outputs the current buffers, and `showme()`, which maintains the state of those buffers and shows them as needed. We'll explore these two routines later.

We now need to deal with the general case of the return from `parse()`:

```
/* store the words on the line */
switch( tag ) {
case ' ':
   if( ANY(bufold) || ANY(bufnew) )   spill();
   addword(bufcomm, word2);
   break;
case '|':
case '<':
case '>':
   if( ANY(bufcomm) ) spill();
   addword(bufold, word1);
   addword(bufnew, word2);
   break;
default:
   fprintf( stderr,"huh? what? %c\n",tag );
   break;
}
```

Each time we need to add a word to a buffer, we use the `addword()` routine. We need to dump the accumulated paragraph buffers at specified times. For example, when we switch from common text to text in either new or old versions, or vice versa, we need to invoke `spill()` to dump the partial paragraph.

This completes the main `while` loop. When we drop out of that loop, we spill the partially accumulated output and finish:

```
   spill();
   printf("\n");
   return(0);
}
```

The main program completed, we can now deal with the service routines.

The Service Routines

We have postulated three routines to deal with the text that's flowing into our filter: `addword()`, which puts words from the input streams into the buffers; `spill()`, which spills out the contents of the stored buffers; and `showme()`, which manages and shows the individual buffers. Let's start with the simplest:

```
void
addword( char *buf, char *word )
{
   /* if the word is null, forget it */
   if( ! *word )
      return;
   /* ensure that we don't overflow the buffer */
   if((strlen(buf)+strlen(word)+2) >= BUFSIZ)
      spill();
```

```
    /* now add the stuff to the buffer */
    if( *buf )
        strcat(buf," ");
    /* add extra space at end of sentence */
    if( *buf  &&  buf[strlen(buf)-2] == '.' )
        strcat(buf," ");
    strcat(buf,word);
}
```

Roughly, we just string the word onto the end of the specified buffer, spilling out all the buffers if this one is full and adding an extra space if the word represents the end of a sentence.

Exercise for the reader: Add an extra space at the end of all sentences, including ones that end with exclamations and parentheses.

Next, we can piece together the `spill()` routine, which simply invokes `showme()` for each buffer:

```
void
spill( )
{
    /* output the common buffer, first */
    showme(bufcomm, ' ');
    /* next, do the old text */
    showme(bufold, '<');
    /* finish up with the new text */
    showme(bufnew, '>');
    }
```

We call `showme()` with the buffer and a marker.

"Yeah, yeah, yeah," say those of you who learned discourse from our 12-year-old daughters, "but what does this silly `showme()` routine do?"

That's a good question, and we're glad you asked it. Let's think quickly about how we want the output to appear. We want to fill the lines of the buffers as we output them, preceding each line by a flag character to tell us whether these words appear in both files or just one. For example, using the test files from last time, we'd want output something like this:

```
  The
< Way that can be told of is not the eternal
< Way; The name that can be named is not the
< eternal name. The
  Nameless is the origin of Heaven and Earth;
  The
< Named
> named
  is the mother of all things.
>
  Therefore let there always be non-being, so
  we may see their subtlety, And let there
  always be being, so we may see their outcome.
  The two are the same, But after they are
  produced, they have different names.
> They both may be called deep and profound.
> Deeper and more profound, The door of all
> subtleties!
```

Thus, we start the routine with the usual flock of declarations:

```
/* This routine, which prints the
   actual text, is where the really
   messy formatting stuff happens.
   We need some retained state between
   invocations, and some other stuff. */
void
showme( char *buf, char marker )
{
    char *s, *end;
    /* length of last partial line */
    static int current_length = 0;
    static char last_marker = 0;
```

Because this is the routine that fills the lines for us, we need to keep track of the length of the last partial line, and we need to keep track of the last marker we printed out. If the marker is different between two invocations, we need to start a new line on the output. If we've filled a buffer and spilled it out, we want to know where we stopped on the page, so we don't end up with lines of different lengths.

Given that, we need to dispose of a special case. If we want to declare that the persistent state should be discarded, the easiest way to do it is to set the last marker to something we won't normally see, for example:

```
/* special for resetting the persistent state */
if( marker == 'x' )   last_marker = 0;
```

Also, if the buffer is empty:

```
/* don't bother if the buffer's empty */
if( ! ANY(buf) )   return;
```

If we are trying to spill a different buffer than we did on the last call to `showme()`, we need to start a new line and reset the marker:

```
/* deal with a new kind of spill */
if( last_marker &&
  ( marker != last_marker ||
    current_length == 0) )
      printf( "\n" );
if( marker != last_marker )
      current_length = 0;
```

Because we've added extra spaces, we may need to skip some of them:

```
/* because we force a second blank
   after each full stop, we may need
   to skip a blank beginning a line */
if( *(s=buf) == ' ' )  s++;
```

We're filling lines with the text from our buffers, so we need to do some line breaking. We do that via a couple of steps in a big

while loop:

```
/* add some line breaks to the huge
   string and print it */
while( (strlen(s)+current_length) > WIDTH )
{
   /* find the maximal end-of-line,
      and find the preceding space */
   end = s + WIDTH - current_length;
   while( *end != ' '  &&  end > s )  end--;
   /* we occasionally have too long a word */
   if( end == s )
   {
       printf("\n");
       current_length = 0;
       continue;
   }
```

We go for the longest possible line and backtrack for a space. We do a bit of work for the special case of a word longer than our line length. In each case, we terminate the chunk of buffer with a NULL character.

After that, we need to print a segment of the buffer. Again, we do some special-case work if we're dealing with a word longer than our line length:

```
   if( end > s )
   {
       *end = 0;
       printseg(s, marker, '\n', current_length);
       s = end + 1;
       if( *s == ' ' )  s++;
   } else {
       /* this handwave is for real long words */
       char oops;
       end = s + WIDTH;
       oops = *end;
       *end = 0;
       printseg(s, marker, '0, current_length);
       *end = oops;
       s = end;
   }
   current_length = 0;
}
```

We finish up the showme() for the buffer by printing the trailing bit of the buffer, saving information about what we just put on the page, and marking this buffer so that we don't reprint it:

```
/* print the last little bit */
if( *s == ' ' )  s++;
printseg(s, marker, 0, current_length);

/* save data about the last state */
current_length = strlen(s);
last_marker = marker;

/* reset, so that we don't
   reprint this puppy */
*buf = 0;
}
```

The last bit of code we need to write is a function to print the buffer segment used by showme(). It takes the pointer to the buffer; the difference indicator, such as < or >, to prepend to the line; the character to append to the end of the buffer segment; and the current length of the printed line. (The last argument is needed because if there are characters on the line already, we don't need to print the difference marker.)

```
void
printseg( char *s, char marker,
     char terminator, int current_length )
{
 if( !current_length )
     printf( "%c", marker );
 printf( "%s", s );
 if( terminator )
     printf( "%c", terminator );
}
```

With that, we're done, save for some function prototypes and include files at the top of the source. As always, pick up the source code from our Web site if you'd like to try it out for yourself.

Alternate Implementations

As we discussed at the beginning of last month's column, there are several other ways we could have approached this problem. Even using this approach–filtering the output of sdiff–there are alternate paths we could have taken.

Much of the code in the program we've just written deals with line filling. We could have relied on nroff to do this for us. In other words, the last line of our redline script would look something like this:

```
diff -y /tmp/$$a /tmp/$$b | expand |
   reddiff | nroff -mdiff -
```

Exercise for the reader: Build this version of reddiff and a diff macro package to format its output. (We didn't use this approach in our version because we don't have nroff on our DOS laptop machines, and we initially needed the functionality at standards meetings. We also couldn't think of an nroff-based version built around anything other than a flock of diversions in the macro package; if *you* can, we'd be interested in seeing it.)

Similarly, we can use the formatting capabilities of troff to provide real font changes for the output, for example, rendering the mainline text in a roman font, the new text in italics and the old text overstruck. Exercise for the reader: Provide *this* version of reddiff.

Last, we could use the terminfo database to render the new and old text in different forms, such as highlighted and underlined, on our terminal screen. Exercise: Revise the code we built in this column to do that.

We don't have a clue what we're going to do next month. Until then, happy trails. ⊸

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.

Caching System to Improve SCSI I/O

MegaCache-4000 from Imperial Technology is available for Sun environments that need to accelerate the I/O performance of SCSI disks and RAID arrays connected to host computers. With it, the company says, administrators can achieve data access time of 0.1 msec–a fraction of the time it takes conventional disks.

MegaCache-4000 comes with a cache capacity ranging from 268 MB to 8 GB. It uses up to six independent interface modules, each with two 40-MB/s Ultra-SCSI ports. All ports attach either to host computers or to disk storage.

MegaCache-4000 also features a user-partitionable solid-state disk, which, Imperial says, prevents known "hot files" (for example, the logs from an OLTP

environment) from being flushed out of cache by other temporarily active files.

Caching options include Full Cache, which caches both read and write operations; and Write Through, where a complete write status is not returned to the host until the data is written to the system disks. Hardware availability is ensured through the redundant AC inputs, power supplies, batteries and a proprietary multi-byte correction capability that reportedly protects the integrity of the stored data.

MegaCache-4000 can be installed and configured through the Service Adapter Facility (SAF), accessed via an RS-232 serial port. It is available in 19-inch rack-mount configurations starting at $25,000.

Imperial Technology Inc.
2305 Utah Ave.
El Segundo, CA 90245
http://www.imperialtech.com
Circle 101

Systems, Database Management Suite

Platinum Technology has announced ProVision, a suite of integrated systems and database management tools. ProVision is based on the integration of nine Platinum tools that address several IT management disciplines, including job

Out with the Old, in with the New

Panasonic Computer Peripheral has replaced the Panasonic P15 and P17, in its PanaSync/Pro series of color monitors, with the P50 and P70. The two new monitors have higher refresh rates, superfine dot pitch and an icon-based, on-screen menu, the company says.

The P70, described as "perfect for graphics and engineering professionals," is a 17-inch monitor with controls for rotation adjustment and color temperature. It features an ultrafine .25mm dot pitch, 16-inch diagonal viewing area and 1,600-by-1,280-pixel maximum resolution. Also, the P70 is TCO92-compliant and incorporates Panasonic's Double-Quadrupole Dynamic Astigmatism and Focus (DQ-DAF) electronic gun technology. Panasonic says DQ-DAF electronic gun technology produces 20% less spot aberration than conventional guns for virtually perfect dot circles.

The P50 is a 15-inch monitor that features a crystal pigment tube and uses a colored dye filter to encapsulate phosphors of the same color, Panasonic says. The P50 has digital on-screen controls, a .27mm dot pitch, a 14-inch diagonal viewable area, up to 1,280-by-1,024-pixel resolution and is TCO92-compliant.

Both monitors come with a three-year warranty on parts, labor and the CRT. Each is VESA DDC 1/2B-compatible and uses the VESA DDC (Data Display Channel) standard. Also, each monitor comes with

Panasonic's AGRAS coating, which offers high resolution with reduced glare. The P70 exact dimensions are 16.1 inches wide by 16.4 inches high by 17.5 inches deep and weighs 37.8 pounds. It is priced at $729. The P50 is 14.7 inches wide by 14.8 inches high by 16.2 inches deep and weighs 27.5 pounds. It costs $329.

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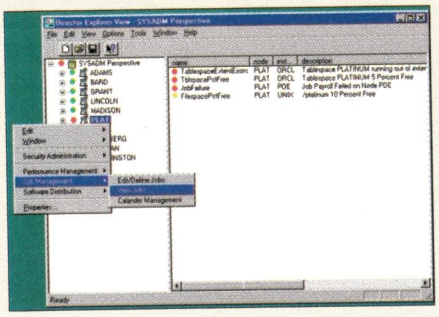
VMCZX01

Circle No. 32



management, performance management, software distribution, problem resolution and security. The nine components are offered individually or integrated into the ProVision suite using Platinum Open Enterprise Management Services (POEMS). POEMS allows multiple tools to share common data, integrate messaging and events management, share a common GUI and employ common installation and configuration management, Platinum says.

The nine tools integrated into the ProVision suite are AutoSys, WireTap, ServerVision, DBVision, Apriori, AutoXfer, AutoSecure Access Control (ACX), TSreorg and Enterprise DBA. WireTap, ServerVision and DBVision together form the ProVision EPM (stands for Enterprise Performance Management) toolset that is said to provide database, server and network resource management for distributed applications. EPM has been enhanced to include event correlation and a redesigned Windows interface. In addition, EPM now supports Oracle Corp. Oracle 8 and Microsoft Corp. SQL Server monitoring.

All nine tools have been enhanced for POEMS, and several have new features, the company says. For example, AutoSys is said to provide job management capabilities for large batch systems, a reporting system on historical and real-time information, a single point of control for the entire AutoSys environment and user-customized views of jobs. And AutoSecure ACX is designed to secure the UNIX operating environment by controlling who and what can access sensitive resources, while, at the same time, providing centralized security administration for heterogeneous UNIX environments.

The tools in the ProVision suite are offered individually or as a bundle with prices ranging anywhere from $1,400 to $20,000 (contact Platinum directly for specific pricing information). All the ProVision tools have been enhanced with Windows NT and 95 interfaces and with one central management console. The suite also supports Windows NT management of heterogeneous UNIX environments, including Solaris, AIX, HP-UX and IRIX.

Platinum Technology Inc.
1815 S. Meyers Road
Oakbrook Terrace, IL 60181
http://www.platinum.com
Circle 102

Solaris 3D Modeling Program Unveiled

Icem Technologies, a business unit of Control Data Corp., is now offering its Surf 3D free-form surface-modeling software for all Solaris operating environments. Icem Surf 2.2 is a design software package that allows users to create, analyze and modify free-form shapes in order to reduce the time it takes to bring products to market.

Icem Surf 2.2 provides designers with a tool to generate, diagnose, visualize and model surfaces dynamically and in real time, the company says. The work is done on a 3D surface model, which allows for dynamic rotation and positioning. Also, surfaces can be selected and controlled, manipulated and stretched in real-time animation. In addition, Icem Surf 2.2 is said to provide visual diagnostics, including highlight reflections, section curves and shaded displays. Data exchange is accomplished via VDA/FS (the German standard for the transfer of surface data between dissimilar CAD/CAM systems) and IGES (the U.S. standard for the exchange of data between dissimilar CAD systems) interfaces, the company says.

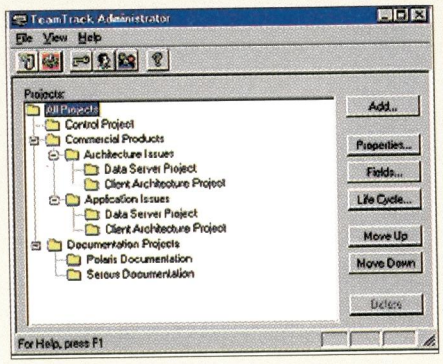
Icem Surf 2.2 runs on Sun, SGI, HP, IBM and Windows NT platforms and costs $27,500.

Icem Technologies
4201 Lexington Ave. N.
Arden Hills, MN 55126
http://www.icem.com
Circle 103

Intranet-Based Problem Tracking

TeamShare has announced the release of TeamTrack, an intranet-based problem tracking system designed to help software teams monitor and manage defects, customer requirements and feature requests that arise during a software development project.

With the use of a Web browser supporting HTML 2.0+ as its primary front end, TeamTrack has a common look and feel on UNIX, Windows and Macintosh platforms, the company says. Two components are installed on a single server: TeamTrack Server, which integrates with a company's existing Web server to deliver problem-tracking features to end users; and TeamTrack Administrator, a Windows application used by a systems administrator to add users, customize fields and configure workflow.



In addition to monitoring the development process of a software project, TeamTrack is said to produce quality cross-project reports for management and provide a team-oriented method to document and resolve problems. Features include workflow automation that can be tailored to enforce a company's existing quality processes; an ODBC-compliant database that supports multiple projects; and user privileges and access restrictions based on user privileges that keep data protected from tampering.

According to TeamShare, TeamTrack is ideal for medium to large teams. A single-user license is available for $499 (volume discounts are available). TeamTrack requires Windows 95 or NT 3.51+.

TeamShare Inc.
1009 Elkton Drive
Colorado Springs, CO 80907
http://www.teamshare.com
Circle 104

PMDF-X400 for Solaris

Innosoft's PMDF-X400 for Solaris email product serves sites that require X.400 interconnectivity but want to

maintain an Internet standards-based email infrastructure by using PMDF as their SMTP/MIME backbone. PMDF-X400 is said to enable users to perform an OSI transport and to interoperate with legacy mail systems and client/server mailers.

PMDF-X400 for Solaris is the latest addition to the PMDF for Solaris product family, which includes PMDF-MTA, an enterprise backbone that is the core to the rest of the PMDF product set; PMDF-LAN, which provides direct channels to PC LAN mailers, including Lotus Notes; PMDF-XGS and PMDF-XGP, which integrate IBM SNADS and PROFS mail systems; and PMDF-ACCESS, which is designed to extend PMDF's functionality to other Solaris, Digital UNIX and OpenVMS systems.

PMDF-X400 for Solaris costs $9,500 and is offered as an optional add-on product to the PMDF-MTA backbone. PMDF licenses are available for Digital UNIX, OpenVMS and Solaris systems.

Innosoft International Inc.
1050 E. Garvey Ave. S.
West Covina, CA 91790
http://www.innosoft.com
Circle 105

CD Recording Solutions for UNIX

DynaTek has introduced a CD recording system, the Compact Disc Mastering (CDM) series for UNIX, that integrates with HyCD Publisher for UNIX, CD-R premastering software from Creative Digital Research. Equipped with this hardware/software combination, end users can create hybrid CDs that contain files from UNIX, PC, Windows 95/NT and Macintosh file systems. Thus, CDs for the Windows and Macintosh platforms can be generated using UNIX workstations. The system can generate data, music, enhanced, mixed-mode and video CDs.

From a hardware standpoint, the CDM series for UNIX comes as either an internal solution, complete with an internal SCSI cable, or as a desktop unit. It features recording speeds of up to 4X, read speeds of up to 6X, a 250-msec access time and a 900-KB/s transfer rate. Supported formats include IS09660, HFS, Hybrid CDs, Joliet, UDF, Mix-Mode CDs, CD Extra, Video-CD, CD-I-Ready (write only) and CD+G (write only). Write methods include Track-At-Once, Disc-At-Once, Session-At-Once and Packet Writing.

The HyCD software runs on SunOS and Solaris as well as SGI IRIX. In a desktop version, CDM series for UNIX costs $1,750.

DynaTek Automation Systems Inc.
200 Bluewater Road
Bedford, Nova Scotia
Canada B4B 1G9
http://www.dynatek.com
Circle 106

Software Promises 'Application Delivery'

CenterLine Software is now shipping the first component of its Application Delivery Management System (ADMS), a framework that aims to integrate application development with testing by allowing team members to manage, monitor and report on the application delivery process.

Acqua Version 2 is an automated software quality management system that coordinates testing activities running on either UNIX or Windows platforms. It comes equipped with integrations into most major testing tools such as Mercury Interactive Corp. WinRunner, Segue Software Inc. QA Partner and Sun Microsystems Inc. JavaStar, including those in areas of test generation and execution, error detection, configuration management and defect tracking. With it, developers gain from Acqua's unified graphical environment, shared repository and test scheduler, which are easier to manage than separate GUIs and repositories. Thus, end users do not need to know the specifics of the actual testing tool they are using, just the Acqua system.

In the second phase of ADMS, scheduled for release in first-quarter 1998, CenterLine will integrate the remaining software components, for example, requirement tracking, configuration and project management and defect tracking. In addition, ADMS information will be available from a Web-based, browser-independent interface.

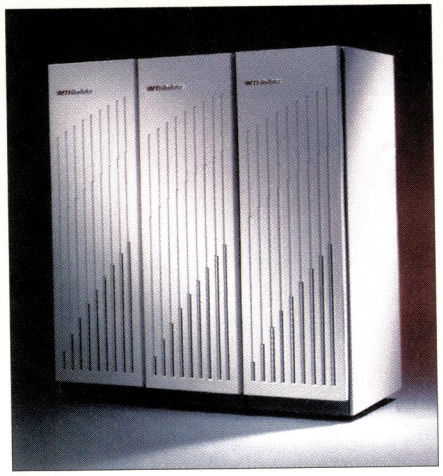
Acqua Version 2 borrows its underlying architecture from QC/Advantage, another CenterLine product. It is available for Windows NT and 95, HP-UX, AIX and SunOS or Solaris running on SPARC platforms. Pricing starts at $50,000. Additional user licensing costs $5,000 per floating UNIX server license and $3,000 per floating Windows license.

CenterLine Software Inc.
10 Fawcett St.
Cambridge, MA 02138
http://www.centerline.com
Circle 107

Gladiator RAID Array

MTI Technology claims to have boosted system performance by 100% over earlier Gladiator 3100 storage systems with the release of its Gladiator 3200 ESS RAID Array. The 3200 ESS array is a scalable, multiterabyte, multihosting storage system with new active/active redundant RAID controllers that are said to double performance and enhance the speed of applications.

The Gladiator 3200 ESS architecture is based on 3.5-inch, 7,200-RPM technology, with 10,000 RPM technology coming soon. Using a 3.5-inch form factor allows for a large amount of storage while retaining a small footprint, the company says. A three-bay cabinet can contain nearly two terabytes of usable RAID storage and occupies less than 16.5 square feet of office space.



MTI's RAIDManager, a GUI software system for managing and monitoring storage in cross-platform, client/server environments, provides the functionality needed to initialize, configure, monitor and maintain the Gladiator 3200 ESS remotely. The system features advanced fault-notification mechanisms and a new Phone Home 24-by-7 service program that automatically notifies service technicians of any fault event to allow proactive response, MTI says.

The 3200 ESS is compatible with HP-UX, AIX, SunOS/Solaris, IRIX, Digital UNIX and Windows NT on Intel Corp. chip-based platforms. A single cabinet configuration providing eight host connections, 1 GB of two-tier cache and 582 GB of raw storage capacity costs $472,520, the equivalent of $0.81/MB.

MTI Technology Corp.
4905 E. LaPalma Ave.
Anaheim, CA 92807
http://www.mti.com
Circle 108

Orb/Enable Addition

Black & White Software continues to expand its line of distributed object development products with the introduction of Object/Observer, which supports multi-ORB distributed object management and builds upon the company's Orb/Enable productivity toolset for CORBA. Users can visually browse, manipulate and manage CORBA information, eliminating some of the need to learn and remember code interfaces. Users can also control, monitor, configure and recover objects to improve application reliability, stability and load assessment.

Object/Observer helps users develop and deploy distributed object-oriented applications in C++ and Java by providing graphical tools and automatic code generation. Diagnostic mechanisms, inherited from Object/Observer's instrumentation classes, monitor and control application projects. A Server Manager can be used to register servers via hosts on a network and to inspect or modify the attributes of each server, such as activation mode and launch/invocation user lists.

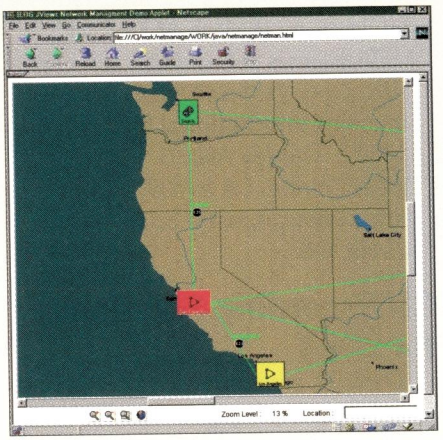
The software uses the IIOP wire protocol to allow communication between objects across heterogeneous networks, all of which users can view on screen.

Object/Observer currently supports Iona Technologies' Orbix CORBA technology, with support for additional ORBs to be announced. The software costs $3,995 on UNIX platforms and $2,995 on Windows 95/NT platforms.

Black & White Software Inc.
1901 S. Bascom Ave., Ste. 700
Campbell, CA 95008
http://www.blackwhite.com
Circle 109

2D Java Graphics Library Unveiled

For developers working on Java applications that require complex interfaces, ILOG has unveiled JViews, a high-performance 2D Java graphics library. The application-specific objects offered in JViews can be customized for applications that navigate maps, render custom editors or display network topologies, for example.



ILOG JViews is a 100% Pure Java library of graphical objects, behaviors and data structures, based on JavaSoft's Java Developer's Kit (JDK) 1.1. JViews reportedly borrows concepts and algorithms developed in ILOG's C++-based Views graphics library, which is reflected in the number of features and performance in the JViews version, according to the company.

Applications created using ILOG JViews run on any platform that supports JDK 1.1, including any Web browser that supports Java.

Pricing starts at $6,500 for a single developer's license.

ILOG Inc.
1901 Landings Drive
Mountain View, CA 94043
http://www.ilog.com
Circle 110

Client/Server Distributed Mapping Software

MapInfo has announced a client/server architecture that integrates spatial analysis and information management across a company's enterprise. The architecture combines the company's MapX 3.0, the latest release of its OCX custom control mapping object, with its SpatialWare 2.0 server technology to provide a scalable SQL III system for analyzing, managing and visualizing spatial information with Oracle Corp., Informix Software Inc. and, available soon, IBM Corp. DB2 databases.

MapX 3.0 lets developers embed mapping within common business applications using Microsoft Corp. Visual Basic, Visual C++, Borland International Inc. Delphi or Powersoft Corp. PowerBuilder. The MapX connection with the SpatialWare server uses a live link to help speed map visualization performance. For its part, SpatialWare server technology stores and manages complex spatial data in the relational database server for SQL III querying. This allows users to incorporate mapping for visualization and analysis within enterprise applications and data warehouses, for example.

Pricing for SpatialWare 2.0 starts at $14,500 for a workgroup configuration. MapX 3.0 Enterprise Edition for Windows 95/NT, which includes a developer's license and 20 runtime seats, costs $4,690. Additional runtime seats cost $199 each.

MapInfo Corp.
One Global View
Troy, NY 12180
http://www.mapinfo.com
Circle 116

Peripheral Sharing Made Easy

Apcon has unveiled the 6 x 4 SCSI Crosspoint Switch, which enables four independent SCSI host ports to be connected, in any combination, to six peripheral ports, allowing up to 42 SCSI peripherals to be shared. The SCSI switch eliminates the need to swap and reconfigure SCSI cables and bus terminators each time a new system configuration is required, Apcon says.

Features include an easy-to-use, menu-driven LCD panel with soft-touch menu, redundant power supplies, dual RS-232 port connections, four independent SCSI buses, as well as 40-MB/s throughput. The 6 x 4 SCSI Crosspoint Switch can be remotely controlled via the RS-232 ports and conforms to ANSI X3.131 and X3T9.2 specifications. In conjunction with the switch's RS-232 serial interface, Apcon has developed a GUI that allows a systems administrator to remotely operate and control the SCSI port interconnections, report SCSI bus activity, gather performance statistics and initiate on-board diagnostics.

The 6 x 4 Crosspoint Switch Model ACI-2028-CDW costs $4,950.

Apcon Inc.
17938 S.W. Boones Ferry Road
Portland, OR 97224
http://www.apcon.com
Circle 117

Y2K Problem Management for Client/Server Apps

Tangram Enterprise Solutions has added Year 2000 features to its Asset Insight enterprise asset tracking software to help users avoid disruptions to their computer systems at the beginning of the next century. New features are designed to focus not on legacy mainframe applications, the target of many Y2K remedial software products, but on custom and shrink-wrapped client/server applications running in distributed environments, such as database and spreadsheet software that works with mainframe systems.

The enhancements, collectively called Asset Insight Year 2000, take a five-step approach to address the Y2K problem. These include: Automated Discovery, to help users identify which assets are installed in the enterprise, who uses them, where they are located, and the speed and direction of their change; Risk Assessment Analysis, which takes information from other companies' products that determine which application versions are subject to risk; Risk Correction Analysis, which allows users to evaluate correction options, including financial impact and application upgrades; Risk Management Analysis, designed to help plan and track the correction process using current asset information and historical trends to set projected correction completion dates and to calculate the number of desktops that must be corrected each day; and Tracking and Auditing–also using the Risk Management Analysis module–to ensure Y2K risks are not reintroduced into the enterprise.

Asset Insight, originally released in January 1997, runs on various operating systems, including Solaris, HP-UX, AIX, OS/2, Macintosh, Windows 95/NT and NetWare. Prices range from $60 to $80 per desktop.

Tangram Enterprise Solutions Inc.
11000 Regency Pkwy., Ste. 401
Cary, NC 27511
http://www.tesi.com
Circle 118

DFS Control Center Out

IBM Corp.'s Transarc subsidiary has introduced the DFS Control Center, an administrative GUI-based tool for managing DFS environments from a single Windows management station.

DFS, supported by leading client/server vendors, provides enterprisewide file access and management for local- and wide-area network installations, enabling collections of computers to act as a single unit, Transarc says. These can include UNIX, IBM OS/390 and Windows NT platforms. DFS Control Center allows network administrators to monitor file server utilization, transfer collections of files among servers and perform load balancing to improve system performance, the company says.

The management console includes a drag-and-drop function that lets users create, delete, replicate and move collections of files from one server to another between UNIX and NT environments. Administrators can also set user quotas and maintain a set of thresholds and alerts that determine when a server is experiencing excessive loads.

DFS Control Center is priced as part of IBM's DFS-enhanced file server

offerings (contact Transarc for detailed pricing information).

Transarc Corp.
707 Grant St.
Pittsburgh, PA 15219
http://www.transarc.com
Circle 119

SLA Conformance Management for UNIX

InfoVista has announced the UNIX version of its Service-Level Agreement (SLA) Conformance Management System, the InfoVista System. The UNIX version runs on Solaris and provides companies with greater flexibility in implementing enterprisewide service-level agreements.

The InfoVista System enables the tracking and documenting of SLAs across all components of a distributed enterprise (LANs, WANs, systems, applications and so on) and converts the resulting data into a wide range of decision-support reports, the company says.

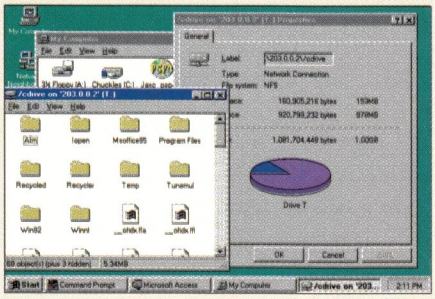
Pricing for the InfoVista System for Solaris for both client and server starts at $29,500. The system also supports Windows NT servers and Windows NT and 95 clients; pricing starts at $19,995. HP-UX and AIX versions will be available in the upcoming months.

InfoVista Corp.
483 Seaport Court, Ste.101
Redwood City, CA 94063
http://www.infovistacorp.com
Circle 120

NFS Server, Client for NT

PathWay Server NFS for Windows NT Version 1.0 and PathWay Client NFS Version 6.0 from Attachmate are designed to help customers integrate Microsoft Corp. Windows NT into their existing UNIX environment.

PathWay Server NFS allows NFS-based file and print services to be accessed from NT clients and servers. Customers with heterogeneous systems can transform an NT workstation or server environment into a high-capacity NFS Version 3- and Version 2-compatible system, the company says. In addition, NFS clients of various hardware platforms and operating systems can access NFS-based file and print resources anywhere on a LAN or WAN.



PathWay Server NFS reportedly extends file system access to Internet browsers, Network Computers and handheld devices when used in conjunction with the WebNFS protocol. Also, the NFS server offers dynamic server configuration, graphical front-end support via an NT control panel applet and virtual mount points.

Attachmate's PathWay Client NFS Version 6.0 allows access to top file and

print services located on heterogeneous NFS host computer systems, including UNIX (any platform that supports NFS), NT, VMS, MVS, Hewlett-Packard Co. and IBM Corp. mainframe environments. PathWay Client NFS offers drag-and-drop access to remote systems via common interfaces such as Windows File Manager or Internet Explorer.

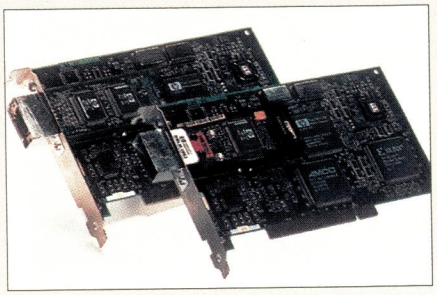
PathWay Server NFS for Windows NT costs $395, and PathWay Client NFS for Windows, Windows 95 and NT costs $100 and is scheduled to be available this month.

Attachmate Corp.
3617 131st Ave. S.E.
Bellevue, WA 98006
http://www.attachmate.com/osg
Circle 121

Solaris Device Driver Out

Jaycor Networks has introduced a Solaris device driver for its FibreStar PCI-to-Fibre Channel adapters. The Solaris device driver is reportedly designed to enable users of Sun Microsystems Inc.'s Ultra 30 desktop workstations to access Fibre Channel peripheral devices.

The Solaris device driver supports SCSI and TCP/IP, allowing support for both applications via FibreStar adapters, the company says. The FibreStar PCI-to-Fibre Channel adapters are installed via a single PCI board slot, and users can select either copper or optical cabling. The FibreStar boards support point-to-point arbitrated loop and switched Fibre network topologies and all classes of Fibre Channel service, including 1,2,3 and Intermix, the company says.



The FibreStar PCI-to-Fibre Channel adapters with Solaris device driver meet ISO 9000 manufacturing standards. Model FCI-1063-CM comes with a removable copper interface and costs $1,995. Model FCI-1063-OM, with the removable optical interface module, is priced at $2,730.

Jaycor Networks Inc.
9775 Towne Centre Drive
San Diego, CA 92121
http://www.jni.com
Circle 122

Upgrades, Enhancements, Additions...

■ Integrated Computer Solutions, a supplier of visual development tools, has announced that Database Xcessory (DX) 1.5–a tool that speeds the development of UNIX client/server applications with graphical user interfaces–now supports Informix Software Inc. databases. DX already supports tools from Oracle Corp. and Sybase Inc. Key elements of the new release are instant feedback and full control over database transactions. Support for object-oriented classes, common styles and CASE tool integration greatly simplifies large database development projects, the company says. Database Xcessory 1.5 includes BX PRO 2.1, a suite of GUI development tools, including the company's advanced GUI builder, Builder Xcessory 4.0; ViewKit/C++ and Java; EnhancementPak, a library of 27 reusable advanced Motif components; and ViewKit ObjectPak, a mature C++ reuse framework. It costs $7,495. **Integrated Computer Solutions Inc.**, 201 Broadway, Cambridge, MA 02139, *http://www.ics.com*. **Circle 123**

■ Triticom has introduced LANdecoder32 Version 1.1 for Windows NT. This latest version includes two new features: real-time protocol distribution display and report, and custom decoding protocols, included with the software development kit. The protocol distribution window displays a table containing statistics about the protocols present on the monitored network. Each row in the table displays information about a protocol encapsulation, while each protocol encapsulation is described by one or more protocol layer descriptions. The data from the table can be output to a Comma Separated Values (CSV) file format, or it can be used in LANdecoder32's "Snapshot" report generation feature. Custom decoding protocols can be added to the LANdecoder32 "decoder" application, through the development of a supplementary dynamically linked library. Pricing for a one-time copy of LANdecoder32 is $1,995. **Triticom,** P.O. Box 46427, Eden Prairie, MN 55344, *http://www.triticom.com*. **Circle 124**

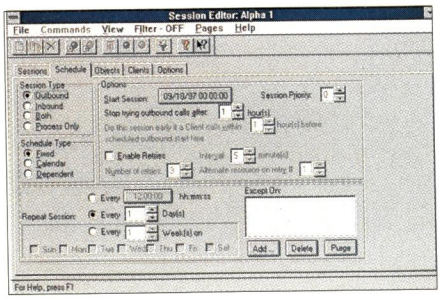
■ Newland Data has announced Version 2 of its network Web surf monitor/log software, UtellWEB, which runs on SPARC workstations with Solaris 2.x and 16 MB of RAM. The software captures all the Web surf activities on a network and can record which Web site is visited by which Web browser on the network at what time. It can monitor all the Web surf activities or be configured to monitor only the activities of a specific subnetwork or computer. Newland Data says UtellWEB can be used to find useful data about the network in general such as traffic generated by Web surfing, peak surf times and most popular Web sites among users on a network. Pricing for UtellWEB 2.0 starts at $499. A free 30-day trial version is available from the company's Web site. **Newland Data Inc.**, P.O. Box 30144, Bethesda, MD 20824, *http://www.std.com/newland*. **Circle 125**

Secure Remote Connections

As more organizations provide access to servers via dial-up connections, Sterling Commerce has added a new component to its Enterprise Data Exchange (EDX) framework. CONNECT:Remote is designed to ensure secure and reliable electronic data exchange across nonpermanent communication connections, Sterling says.

CONNECT:Remote works by providing a direct connection to CONNECT:Direct, the company's point-to-point data exchange product. This system reportedly provides users with several advantages, in the realm of data exchange, systems management, session management and communications management.

CONNECT:Remote also features remote agents, which stage system events to be executed during a connection. In



other words, every time a remote site connects, agents can be instructed to perform system administration and management tasks in the background. This feature helps maximize the efficiency of the user's connection period, potentially reducing the amount of time they need to stay connected, Sterling says.

CONNECT:Remote server is implemented as a native 32-bit Windows NT service, requiring Windows NT 4.0, whereas the CONNECT:Remote client can run on Windows 95/NT/3.x, or even DOS 5.0+. CONNECT:Direct runs on MVS, Windows NT, AS/400, NetWare and several UNIX platforms. Supported communications protocols include SNA and TCP/IP.

CONNECT:Remote server costs $5,500 for current CONNECT:Direct users. Client licenses cost $200 each.

Sterling Commerce Inc.
5215 N. O'Connor Blvd., Ste. 1500
Irving, TX 75039
http://www.stercomm.com
Circle 126

Java Apps Over the Web

InstallShield Software has announced the availability of its InstallShield Java Edition 1.0, an installation development system creating cross-platform application installations for users of Java Virtual Machine (JVM) 1.0.2+.

InstallShield Java Edition works by creating a single Java package file that contains any information necessary to deliver a full application optimized for a given set of virtual machines. By doing so, InstallShield adds approximately 40 KB to the actual Java byte code, the company says.

InstallShield reportedly provides developers with the ability to display dialogs with information such as READMEs and license agreements. It includes Windows-specific functionality such as creating shortcuts, editing the Registry and specifying self-registering files.

Developers can purchase InstallShield Java Edition for $495 from authorized resellers or the company's Web site.

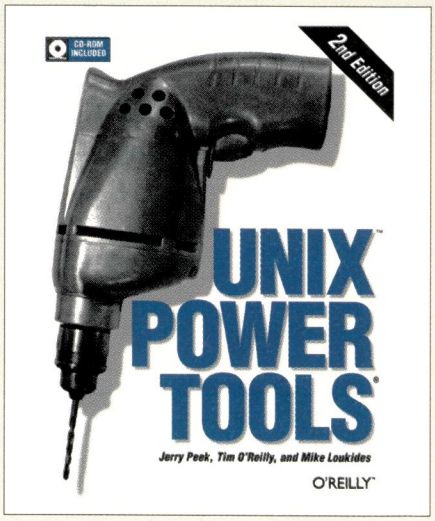
InstallShield Software Corp.
900 National Pkwy., Ste. 125
Schaumburg, IL 60173
http://www.installshield.com
Circle 127

Practical UNIX Wisdom

O'Reilly & Associates has come out with a UNIX book that it says delivers technical, yet accessible, information. *UNIX Power Tools*, Second Edition, by Jerry Peek, Tim O'Reilly and Mike Loukides (ISBN 1-56592-260-3), includes tips, tricks, concepts and freeware. It also covers add-on utilities and how to take advantage of clever features in popular UNIX utilities.

This edition is slanted toward coverage of POSIX utilities' options and commands, including the GNU versions. It also covers the bash and tcsh shells, while retaining the first edition's information on core concepts of the sh and csh shells.

O'Reilly calls it a browser's book, designed not to be read from start to finish but to be picked up in response to need or interest. A CD-ROM included with *UNIX Power Tools* contains all of the scripts from the book plus Perl, GNU, emacs, netpbm (graphics manipulation utilities), the sc spreadsheet and about 60 other freeware programs. In addition to the source code, all the software is precompiled for Sun4, SPARC Solaris, AIX, Digital UNIX, HP-UX, Linux and SCO UNIX. *UNIX Power Tools* costs $59.95.



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http://www.ora.com
Circle 128

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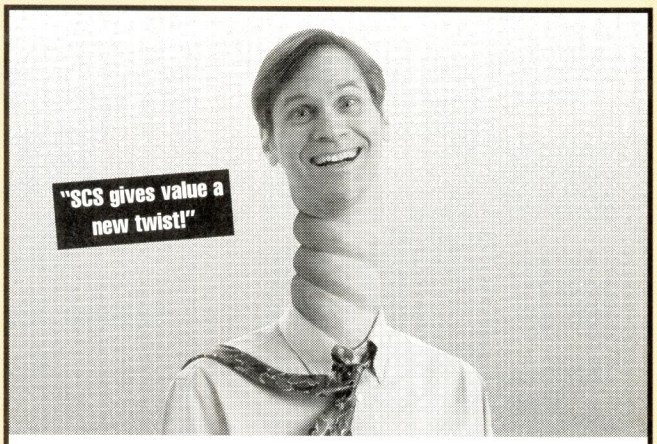

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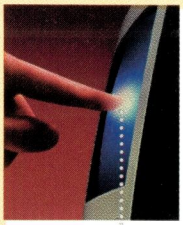

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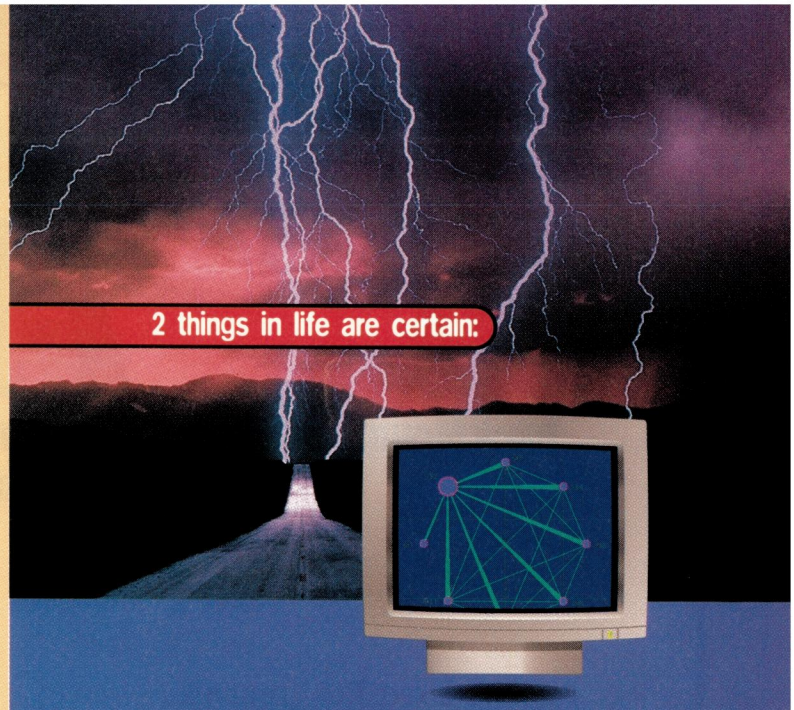

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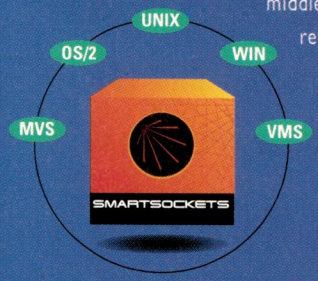

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