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The 5th Wave **By Rich Tennant**

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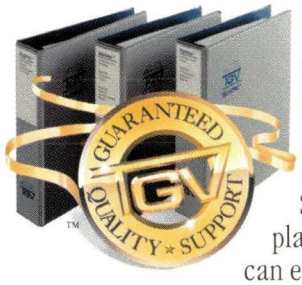

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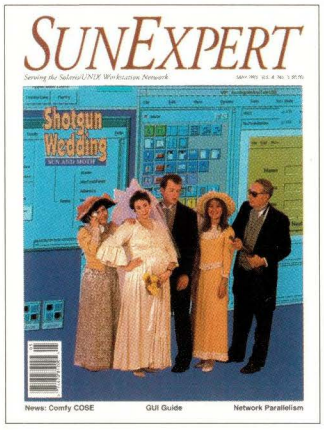

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SUNEXPERT
serves the UNIX workstation environment, emphasizing Sun, SPARC and Sun-compatible systems.

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Editorial

The Fortune 1,000 Sweet Spot Revisited

"Our sweet spot is small work groups, departmental and enterprisewide computing." A comment from a displaced mainframe software vendor? A disgruntled minicomputer shop? Guess again. The president of SunSoft, Edward Zander, made this remark to more than 1,700 software developers at the Sun Developers Conference in Santa Clara, CA.

Could this mean, perhaps, that DOS, Windows, UnixWare and even NT aren't the real enemy? Even with the release of Solaris for x86, SunSoft is not targeting the "standalone, nomadic or home use" segments of the market, as Zander pointed out. "Our Fortune 1,000 focus is what sets us apart in enterprisewide downsizing."

SunSoft's Solaris for x86 pricing reflects Sun's budding high-end emphasis. Rather than attempting to match NT at $495 or the super-stripped-down version of UnixWare (the so-called Personal Edition, sans basic UNIX utilities and NFS, retails for $249), SunSoft is making a 1- to 2-user desktop license of Solaris 2 for SPARC and x86 available for $795. And the work-group server and enterprise server versions sell for $1,995 and $5,995, respectively. All part of the Solaris package are graphics, networking and the hottest technology demonstrated at the Conference, WABI–which stands for Windows ABI or, translated from the Japanese, "contentment," according to product manager Keith Erskine. WABI is the as-yet-unannounced result of SunSelect's acquisition of Praxsys Technologies. WABI lets you run Windows applications natively on your Solaris 2.X-based SPARC or x86 machines (or even X terminals) without loading DOS.

This month's cover story, "Shotgun Wedding," should help fill in some more details on what Sun's decision to phase out XView and OLIT support in favor of a Motif-based tool kit and window manager will mean to software developers and end users. Attendees at the Developers Conference weren't fed much in terms of the whens, wheres, whys and hows on Sun's interface about-face. And for that brave, lone developer in the Conference session on COSE who wanted to know where he could get a list of suppliers of Motif-based development tool kits–and for all you others secretly wondering the same–check out our GUI development tools buyers guide on Page 54.

Mary Jo Foley

Mary Jo Foley
Senior Editor

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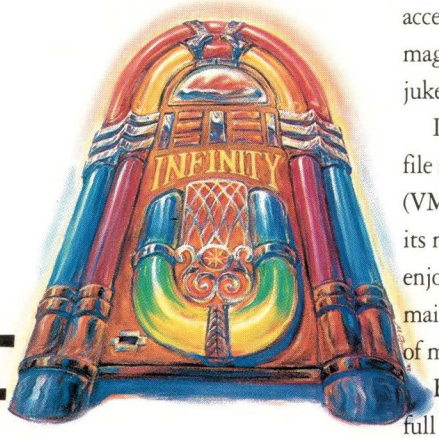

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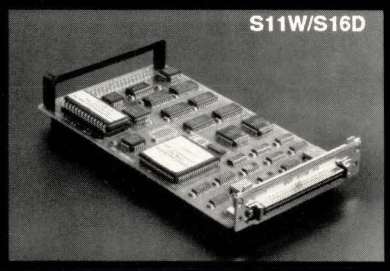

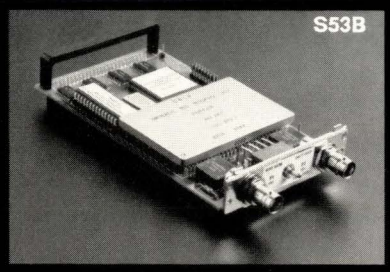

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LETTERS

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

Mr. Protocol Potpourri

Dear Mr. Protocol:

Your question on the diameter of the Internet is truly fascinating ("How Wide is Round," December 1992, Page 22). I suppose a net-crawler might know, but wouldn't it be more fun to just ask the network? I suggest a contest: Ask your readers what is the farthest traceroute they know of?

From Boulder, CO, China is only 14 hops away, which is sorta the opposite from here. South Africa seems the farthest at 19 hops. Your 22 to Berkeley must be attributed to how dense they are there.

In any case, I agree that the answer is hard to know a priori. I would be interested in the experiential result.

Mike Maish
`maish@central.bldrdoc.gov`

When you're right, you're right, and so it goes. Very well then. Mr. Protocol hereby throws open the gates to the swirling crowds of network citizens. What's the largest traceroute that you personally have seen? Send results to `amp@expert.com`.

Mike O'B for Mr. P

Dear Mr. Protocol:

You made a major error in your description of `traceroute`. It does *not* send ICMP echo packets, it sends UDP packets that it constructs itself. Indeed, the comment on the first page of the `traceroute` source code says, "Probe packets are UDP format."

There's a simple reason for this. Correct implementations *never* send an ICMP error when an ICMP packet is thrown away (else you could get into an error, in response to an error, in response to an error...). Since `traceroute` is counting on the UDP packets being thrown away by the intermediate routers, it can't use ICMP.

Another question I ask students after describing `traceroute` is, how does it know when the packet reaches the final destination, since the packet isn't thrown away (even though the incoming TTL is 1)? The answer is that the UDP packet being sent is sent to a real bogus port number, causing the destination host to generate an ICMP port unreachable, instead of an ICMP time exceeded.

Richard Stevens
`rstevens@noao.edu`

I wondered why I found your email in a `/tmp` *directory slated to be wiped. I now suspect Mr. Protocol put it there so it wouldn't be found. He wouldn't say anything for days.*

I've checked, and of course, you're right. ICMP has nothing to do with what `traceroute` *sends, only with the replies that it receives. In fact, the packet* `traceroute` *sends is a bizarre and horrible thing, with stuff encoded in the UDP header so it can keep track of which packet it is, since ICMP only returns 8 bytes of the failed packet, just big enough for a UDP header. Quel horreur!*

Still, it's interesting that one item that keeps popping up in discussions of a new IP format is, "We've gotta have some mechanism that people can't leave out of their implementations that'll support an equivalent of `traceroute`*!"*

Mike O'B for Mr. P

Dear Mr. Protocol:

Oh wise and experienced Mr. Protocol, I have searched high and low and cannot locate a soul who can answer the following question: What is the difference between a caching-only name server and a forwarding name server? What should I pick?

I would like to make my small department server run named to keep a cache of frequently looked up names to

1. Speed up access for those names (given that the DNS I use is on the

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other side of a T1 link).

2. Provide some minimal reliability (so that `sendmail` won't hang) when that T1 goes down.

Can you also point me to a good reference on how to set such a beast up? (Given that the Sun Admin Reference is incomplete at best.)

I'll await your answer by baking a batch of chocolate chip cookies...

Robert L. Howard
`uunet!matd.gatech.edu!robert.howard`

Mr. Protocol has decided to leave the question of caching vs. naming name servers as an exercise, but feels that once you get "named," you're most of the way to a solution. The reason Sun is mostly silent on the matter is because they have buried the name service deep in their Network Information Service package, which used to be known as Yellow Pages. You just set up Yellow Pages and they'll take care of everything for you. Honest. They promise.

Mike O'B. for Mr. P.

Right Book, Wrong Title

Dear Editor:

On Page 52 of the February issue of *SunExpert*, S. Lee Henry refers to my book as a "Great Security Book." While I greatly appreciate the recommendation, Ms. Henry unfortunately missed the title–it's *UNIX System Security:* A *Guide for Users and System Administrators* not *UNIX System Administration: A Guide for Users and System Administrators* (ISBN 0-201-56327-4).

Dave Curry
`uunet!ecn.purdue.edu!davy`

Security Exchange

Dear Editor:

The February *SunExpert* article on account security (Page 48) provided an excellent summary of Sun security issues. You correctly noted that account security problems and solutions are arrayed along a continuum from the mundane to the critical.

We would point out an important omission in the article. The article discussed public domain software that addressed certain security issues. Many users in the commercial environment would prefer to use software that is developed by a company with technical support and long-term commitment to customer satisfaction. Los Altos Technologies co-developed a program called Fortress that checks for viruses, worms, Trojan horses and unsecure passwords for Sun UNIX. Los Altos Technologies has also developed UniShred Pro, a government-approved security data remnants remover, and TermServ, a modem pool management and security dialback program. Information on this and other UNIX security products can be obtained by contacting Los Altos Technologies at (800) 999-UNIX.

Gary Kremen
Executive Vice President
Los Altos Technologies Inc.
346 Costello Court
Los Altos, CA 94024-4707
`gary@lat.com`

SCM Revisited

Dear Editor:

Your article "Checking Out SCM" (*SunExpert*, March, Page 71), was well written, nicely researched and even-handed. I'm sorry to say we were disappointed because there was no mention of our product (Razor) or our company.

To be completely fair, we are a new player in the field and it would be premature to expect even billing with the "big boys" you highlighted. We believe, however, that we have an excellent package. The package is already quite mature. We're now at Release 3.2.

We plan to be an exception to your statement, "Software configuration management systems don't come cheap." Razor is available for $349 per floating license with discounts beginning at the sixth seat. A full site license is $20,000.

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NEWS

How Comfy Is COSE?

As the dust settles from the hastily convened Common Open Software Environment (COSE) coalition, more questions than answers remain. One of the most pressing is how comfy is Sun Microsystems Inc.–the most surprising participant in the group–with COSE. The response could foretell whether the COSE initiative becomes the roadblock needed to derail Microsoft Corp.'s Windows NT, or whether it ends up an "ACE II," named for the ill-fated Advanced Computing Environment group that rallied around the MIPS processor.

The gang of six (Sun, Hewlett-Packard Co., IBM Corp., The Santa Cruz Operation Inc., Univel and UNIX System Laboratories Inc.), which is backing the creation of a common desktop environment across UNIX platforms, managed to put aside their differences in record time. Details of the agreement were being hammered out right up to the time of the official unveiling of the group.

Participants and pundits agree that two forces helped to rapidly unite the group: the real or imagined (depending on your perception) threat of NT to the future of UNIX on the desktop and a lot of trade-offs. Sun itself acknowledges that its agreement to standardize on a Motif-based user interface, the least expected part of the entire announcement, was made possible by the other group members' willingness to support ToolTalk and ONC+.

Once it moves beyond its current status as a gleam in the UNIX community's eye, COSE will become a set of published, freely available application programming interfaces that will enable developers to create a consistent, common operating environment across all UNIX platforms. The APIs will establish standards in the areas of user interface, graphics, multimedia, object technology, networking and systems administration.

To Sun users, the biggest visible change resulting from Sun's COSE work will be in the user interface area. With the first COSE-compliant Sun products–slated for delivery during the first half of 1994–users will find their Open Look window manager and XView or OLIT (Open Look Intrinsics Toolkit) tool kits replaced with a variation of the Motif window manager and Motif tool kit. The interface will resemble quite closely HP's VUE, says SunSoft's John Felahi, director of product marketing for the windows and graphics group, with elements of DeskSet, SunSoft's desktop manager, running on top. "HP's done Motif one better. We just need to add changes to make Open Look X applications run" on VUE, he says.

Sun's about-face on supporting Motif didn't require as much swallowing of Sun pride as it first might seem, Felahi maintains. Regardless of which user interface, Motif or Open Look, was technically superior (there are fanatics in both camps), more and more developers and ISVs were choosing to standardize on Motif (see "Shotgun Wedding" in the Features section).

And although the exact dollar figures are being held incredibly close to the vest by both Sun and the Open Software Foundation, it sounds as though Sun struck one heck of a deal for itself when it finally licensed Motif from the OSF.

"Sun has always been about open systems, which means, among other things, low or no royalties required," explains Felahi. "The biggest concession we got was from the OSF. Now X/Open owns the branding and certification rights for Motif. This means Motif is no longer proprietary and controlled by one entity."

In the year or so before the first COSE-compliant user environments are available from Sun and other UNIX vendors, there will be a lot of transitioning going on. SunSoft has nearly completed work on

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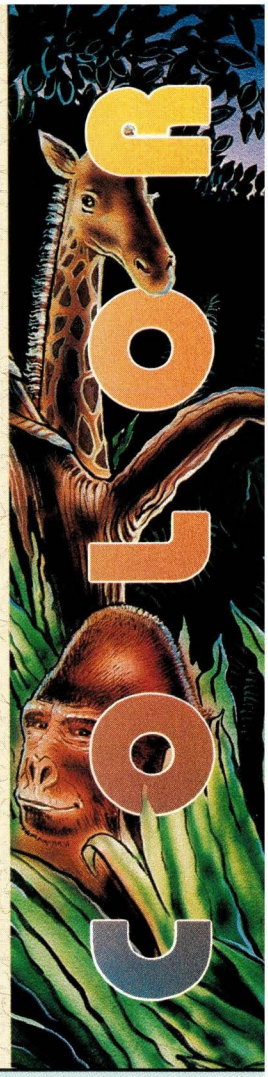

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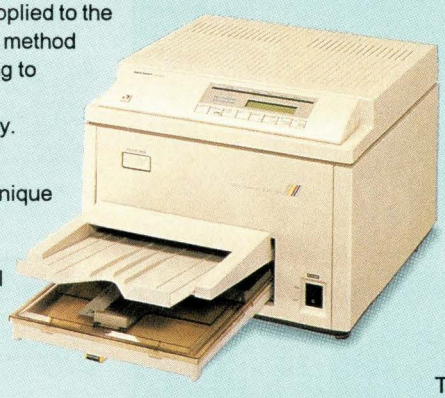

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Print

its next Open Look and OpenWindows releases and plans to deliver them this summer, as promised. In the late fall, Sun will introduce a version of its windowing system that will "support Motif more robustly," according to Felahi. In order to provide this, SunSoft will be making "minor fixes" to Open Look so that Motif applications will work better, he says.

At the Sun Developers Conference in late March, SunSoft gave all attending developers coupons for Motif tool kits for either SPARC or Intel. As an interim solution, SunSoft has signed a letter of intent to make IXI's OSF/Motif developers kit available for Solaris SPARC and X86 platforms. SunSoft was also looking into how it should proceed regarding Open Look-to-Motif conversion tools; it could decide to recommend or license any of a number of third-party solutions that are on the market today. Although the official word hadn't yet come down, Sun was expected to make public plans to extend its DevGuide GUI builder in order to support Motif.

For now, SunSoft and the other COSE members are consistent in emphasizing the similarity in their products and approaches rather than their differences. The overriding fact to remember, says Felahi, is that "today, there are more X applications–whether they're pure X, OLIT or Motif–running on Sun than any other platform."–*mjf*

ToolTalk vs. BMS Revisited

Buried within the Common Open Software Environment (COSE) announcement was a key agreement between SunSoft and Hewlett-Packard Co. regarding the future of UNIX interapplication connectivity.

The two rivals hammered out a common application message server standard, bringing together elements of both SunSoft's ToolTalk and HP's Broadcast Message Server (BMS). Sun contributed its entire ToolTalk server, while HP is adding its HP Encapsulator interface and its distributed execution management capabilities to the table. The merged technologies will result in products that "will offer transparent migration for Sun, HP and IBM customers and ISVs [IBM's SDE WorkBench/6000 software development products are based on the BMS]," as HP points out.

"Both ToolTalk and the BMS are underlying, enabling technologies," HP continues. "Most users are unaware of this technology layer, and it matters little to them whether BMS or ToolTalk is providing the messaging service. What matters far more is that a single messaging system is in place and endorsed by the leading platform vendors."

In the two to three years before tangible product makes its appearance, HP and SunSoft are expected to continue to push their own message server technologies. HP will continue to license its SoftBench framework, which consists of BMS and various CASE tools. In fact, this summer, HP will be releasing a new version of its SoftBench and C++ SoftBench products for the Solaris 2.1 environment. The products will incorporate HP's Distributed Debugging Environment (DDE) technology. Both versions will employ BMS as their messaging servers.

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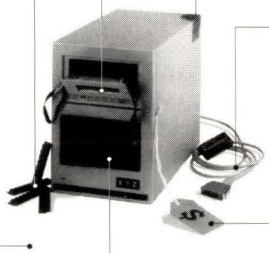

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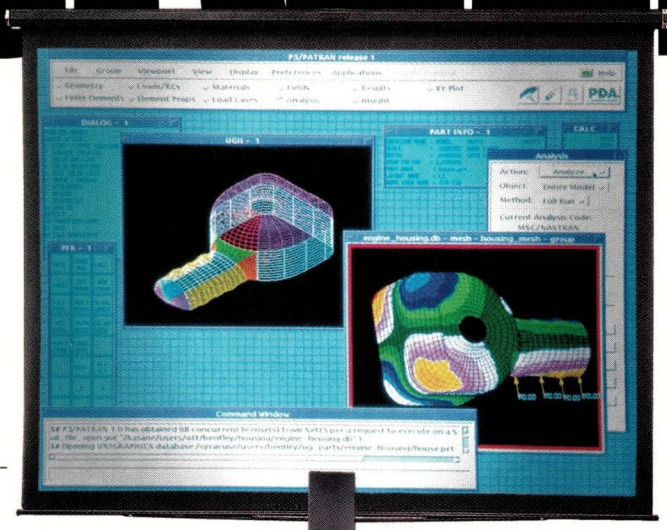

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At the Sun Developers Conference in late March, HP demonstrated that it is already able to run SoftBench on top of ToolTalk. According to the company, "The demonstration shows that intertool communication among the SoftBench tool set happens independently of the underlying technology, whether that technology is based on HP's Broadcast Message Server or the combined messaging technology." At the conference, HP also introduced an end-user tool, called the SoftBench Message Connector, which allows software developers to define interactions among tools "within a matter of minutes without writing a line of code," according to HP. Developers can use a menu to change their tool environment whenever needed to support new assignments or automate new tasks involving more than one tool.–*mjf*

First Person Singular?

Market watchers expect the newest Sun subsidiary, First Person Inc., to offer some singular consumer-electronics-related technology once it introduces its first product sometime in 1995. But as to whether it is a personal digital assistant (PDA) or handheld computer based on a low-power implementation of SPARC (or some other processor) is not as certain.

Sun spokeswoman Kay Hart says the subsidiary is concentrating on software, rather than hardware, development. "There may be a hardware component," she says, but a personal communicator system along the lines of recently introduced products from General Magic, Eo Inc., AT&T, IBM Corp., Motorola Inc., Philips Electronics and Matsushita, among others, isn't likely. Perhaps a PDA operating system, meant to compete with Go Corp.'s PenPoint, Microsoft Corp.'s Windows for Pen Computing or Grid's PenRight is in the works. Or maybe First Person will attempt to build upon software developed by Sun's Sitka subsidiary (now part of SunSelect). Sitka developed PenTOPS, a package that allows clients to connect to DOS PCs, and PenCentral, software that allows multiple PenTOPS clients to connect to various network resources.

First Person is headed up by Wayne Rosing, the former director of SunLabs.–*mjf*

Sun Ups Its Net Worth

Like all workstation users and vendors, SunConnect and Sun Microsystems Computer Corp. are assessing their networking options and honing their products and strategies accordingly.

"We're currently looking at all of our products and deciding what to take forward," says Stan Baldwin, SunConnect's director of marketing. "We'll definitely take frame relay, SMDS, ISDN and ATM. And we'll be working to enable the management of all of these."

Within the past few months, SunConnect has signed a deal with MCI Communications involving SMDS and frame relay technologies, introduced SNA integration products, brought out a new version of its X.25 software, rolled out the Solaris 2.1 version of SunNet Manager and continued to spearhead the desktop network-management standard work via the

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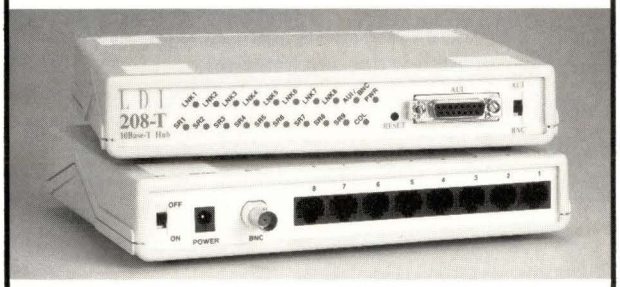

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Desktop Management Task Force (DMTF). SMCC, the part of Sun Microsystems Inc. that is charged with handling ATM strategy (as was decided by Sun when it divided the company into individual divisions a couple of years ago), has signed a joint-marketing deal with SynOptics Communications Inc. and is evolving its in-house ATM plans.

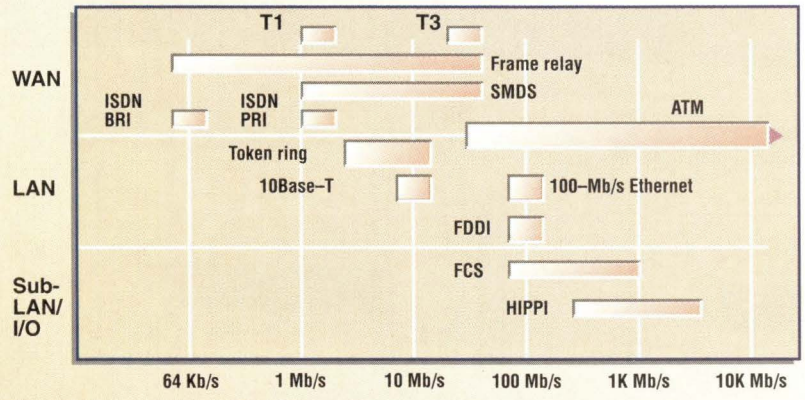
On the network services front, Sun and MCI signed a deal to incorporate SunNet Manager into HyperStream, MCI's infrastructure for supporting frame-relay and SMDS networks today (and broadband ISDN ones in the future). HyperStream's customer network-management service, HyperScope, will be able to be used in conjunction with SunNet Manager software to monitor and control systems in high-speed, wide-area networks.

In terms of IBM connectivity, SunConnect has added SNA integration capabilities to its SunLink SNA products and has made managing them easier. Sun has enhanced its SunLink SNA 3270/RJE and SunLink SNA Peer-to-Peer product, while upgrading both of them to Solaris 2.X-compliant Version 8.0.

The 3270/RJE product is part of SunConnect's family of 3270 emulation gateways, linking Sun systems to IBM and compatible mainframes. Among the additions made to the product are TN3270 server capabilities, TN3278 client functions, support for Ethernet and FDDI, SNA/RJE 3770 emulation, double byte support for 3270 emulation in Asia and backward/forward compatibility with previous versions of the product.

The SunLink SNA Peer-to-Peer product provides a set of SNA services,

Sun's View of the Internetworking World



Source: Sun Microsystems Computing Corp.

HANNA DYER

Internally, Sun is betting the store on the success of FDDI, 10/100-Mb/s Ethernet and ATM. Via SunConnect, it is supporting nearly every emerging networking standard.

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including LU6.2, CPI-C and DIA, that allow Sun systems to communicate and share resources with IBM and plug-compatible mainframes. New features added to Version 8.0 include support for IBM's Common Programming Interface for Communications (CPI-C), support for Ethernet and FDDI and support for SNMP traps.

As if all this wasn't enough, SunConnect also introduced a new version of SunNet Manager–2.1. The product supports Solaris 2.1 and 1.0 systems. (Version 2.0 will continue to be available for Solaris 1.0 systems, however.) SunNet Manager 2.1 is available now, for a list price of $3,995. SunConnect has also unveiled a Solaris 2.1 version of its SunLink X.25 software. SunLink X.25 is a STREAMS implementation of the X.25 protocol, supporting speeds of up to T1/E1. Version 8.0 of SunLink X.25 also provides easier configuration and two new APIs for ISV developers.

Inside Sun, networking gurus are championing three technologies as the best hopes for overcoming existing bottlenecks: FDDI, 10/100-Mb/s Ethernet and ATM. Sun is positioning FDDI single-attach as the short-term solution for whenever speed is a primary requirement. It is pushing 10/100-Mb/s Ethernet as "an excellent low-priced alternative for existing applications starting as soon as 1994." And it is holding ATM as its trump card, calling it "ultimately the best LAN solution for workstation networking for the rest of the century and beyond."

In keeping with its bullishness for ATM, SMCC created a technology partnership with SynOptics, Santa Clara, CA, to jointly develop future ATM products. The first result of the collaboration will be a low-cost 155-Mb/s SBus adapter card from SynOptics to attach Sun workstations or servers to ATM local-area networks. The card will be manufactured and sold by SynOptics.–*mjf*

Another Fibre Association?

Just as the same communication speed can be quoted in megabytes by system vendors and megabaud by telecommunications aficionados, so, apparently, can the emerging Fibre Channel standard be propagated by more than one trade association. In February, Sun Microsystems Computer Corp., Hewlett-Packard Co. and IBM Corp. created the Fibre Channel Systems Initiative (see *SunExpert*, April, Page 10). In March, a group of vendors–including IBM and HP, but not Sun–and users came together to launch the Fibre Channel Association.

While the Fibre Channel Initiative representatives tout the Fibre Channel as a 1-GB/s interconnection standard for both workstations and peripherals, the Fibre Channel Association folks are emphasizing Fibre Channel's applicability as a peripheral data-transfer mechanism. Rather than comparing Fibre Channel to ATM, frame relay, SMDS and other networking technologies, as does the Fibre Channel Initiative, the Fibre Channel Association discusses the emerging standard in the same breath with HIPPI, SCSI, IPI and block multiplexer channel.

In spite of their different foci, both Fibre Channel groups are endeavoring to cooperate rather than compete. For more on the Fibre Channel Association, contact FCA, P.O. Box 2161, Saratoga, CA 95070, phone 408-867-0907, email: `fca-info@amcc.com`.–*mjf*

ELC, IPC, SS2: Going, Going...Gone

The grand phase-out of the popular SPARCstation ELC, IPC and SS2 and 600MP-Cypress products has begun. In March, Sun Microsystems Inc. increased the prices on all of these models in order to make way for the new SPARCclassic, LX, SPARCstation 10 and SuperSPARC-based 600MP models. The last date that any configuration of the ELC, IPC and SPARCserver 600MP-Cypress systems and upgrades can be ordered is October 31, 1993, and the final ship date for these systems is December 31, 1993.

"During the past 12 months, demand for SPARCstation ELC and SPARCstation IPC products has steadily declined," reads a recent SunFlash posting on the topic. "With the overwhelming market acceptance of the SPARCclassic and SPARCstation LX products coupled with the SPARCstation IPX price reductions, this decline has increased rapidly since November 10, 1992. And with the volume availability of SuperSPARC processors for the SPARCstation 10 and SPARCserver 600MP, demand for SPARCstation 2 and SPARCserver 600MP-Cypress has also declined since last quarter."

Declining demand means increasing production costs, Sun says, thus the price increases, which range from $1,000 to $6,000, depending on platform and configuration. There will be no price change to any of the upgrades to the IPC, or to upgrades from Sun-3s or 386i systems to the ELC, IPC or SS2.

Indisputably, demand is rising for Sun's new desktops and servers. But the extent to which demand is really declining for at least the SS2 is up for debate (see *SunExpert*, April, Page 14). In Sun's second fiscal quarter, the company sold 10,000 SPARCstation 2s and a total of 18,000 IPCs, IPXes and all servers.

But what better way to transition a user base to a new operating system than to get them to adopt new hardware that runs only the latest version of Solaris?–*mjf*

More Disk Drive Deals

As part of its continuing SPARCstation/SPARCserver 10 promos, Sun Microsystems Computer Corp. is making new 1.05-GB internal drive configurations available on its SSLX and SS10s. The 1.05-GB drive is a fast, 10-MB/s SCSI-2 drive that offers more than twice the capacity and up to 60% better performance than the current 424-MB SCSI configurations.

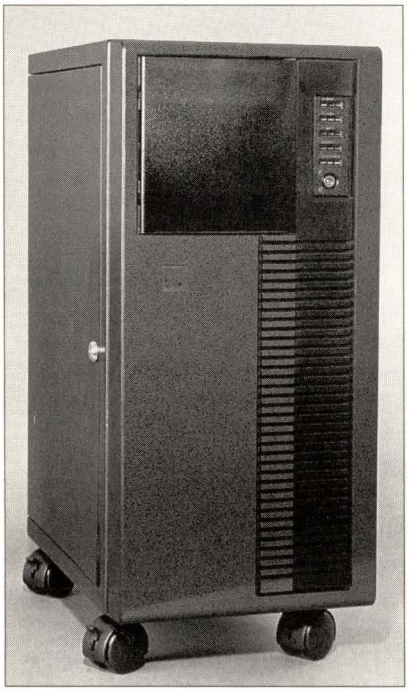
All upgrades to the SS10 Model 41 are available with the 1.05-GB disk, if desired. (The 424-MB drive option for Model 41s is still available to upgrading customers, however.) The 1.05-GB drive is not available for the SS10 Model 20, nor is it available for customers upgrading to the SS10 Model 30.

On the LX, SMCC also is making available a 32-MB memory option, featuring two 16-MB SIMMs, leaving four SIMM slots available.–*mjf*

An NFS Server–On a PC?

Santa Clara, CA, neighbors Auspex Systems Inc. and newcomer Network Appliance Corp. (NAC) will soon be vying for the same piece of the UNIX pie. Auspex has remained relatively unchallenged as a dedicated NFS file server provider, with competition mostly from systems vendors selling workstations configured as file servers. NAC's new file server is intended to offer better performance and easier installation and administration than a general purpose system, while coming in at a lower price than offerings from Auspex.

Network Appliance Corp.'s file server is intended to offer better performance and easier installation than a general-purpose system.



The goal behind Network Appliance's FAServer is to provide the same type of reliability as one would expect from a household appliance. To provide reliability and ease of use, the company has reduced system complexity by using embedded controls within a 486-based EISA bus PC combined with proprietary software called FASware. FASware provides systems administration capabilities and a Snapshot utility to give end users access to automatic backup and file histories. The software includes a real-time kernel, a simplified UNIX-like command user interface, a file system that NAC calls WAFL, for write anywhere file layout, RAID Level 4, a Snapshot manager, SCSI support, the NFS/TCP/UDP/IP protocol stack and Ethernet support. By designing RAID and the file system together, NAC says performance loss due to external RAID subsystems is eliminated.

FAServer comes with one Ethernet port, two 3½-inch 1.08-GB Fujitsu hard disk drives with FASware installed, a console and a keyboard. The list price is $16,995, and units will begin shipping next month through VARs such as Highland Digital of Palo Alto, CA, and Work Group Solutions of Burlington, MA.–*Jane Majkiewicz*

Vendors Unite to Promote PowerOpen

It's official. The seven proponents of the RISC-based PowerOpen environment–Apple Computer Inc., Groupe Bull, Harris Corp., IBM Corp., Motorola Inc., Tadpole Technology Inc. and Thomson-CSF–have formed an independent corporation called the PowerOpen Association Inc. Headed by Domenic LaCava, a long-time Digital Equipment Corp. executive, the company's goal is to recruit more PowerOpen adherents from both the hardware and software worlds.

In addition to publishing an application binary interface derived from AIX, the group plans to offer the following tools and services:

- Verification Test Suites available for both platforms and applications, leading to shrink-wrapped applications and what LaCava hopes will be the largest UNIX-based application base.
- System Information Library, a library of technical reference information that assists system platform developers developing an ABI-compliant operating system for PowerPC platforms.
- PowerOpen Environment classes.
- A catalog of PowerOpen-compliant applications and tools.
- A branding program.

The platform vendors also discussed plans for systems based on the first PowerOpen microprocessor, the single-chip 601 available from both IBM and Motorola. Apple expected to have a product sometime in 1994, while both IBM and Thompson-CSF, which is building a VME board with the chip, said they would have products later this year. Harris is skipping the 601 chip and basing its next-generation Nighthawk computer on the 604 or 620 chip. Bull is developing symmetric multiprocessing software that will be used by both the French company and IBM. Previously, IBM said its notebook PowerPC, to be developed and manufactured by Tadpole, will be available in mid-1994.

One of the most interesting products discussed was Apple's Macintosh Application Services. Expected sometime next year, the software will be available from both Apple and IBM. The software consists of the following components, which will let users run Macintosh applications on PowerOpen platforms:

- Macintosh Finder provides the Mac GUI within an X Window.
- Macintosh Application Engine, described as an intelligent switching device that switches between PowerPC code and 680x0 code.
- Macintosh 68040 Emulator.
- Macintosh Toolbox: An interface written in native PowerPC code through which all Macintosh applications (both 680x0 applications and those written for the PowerOpen architecture) interact with the PowerOpen platforms.

The founding members, save Harris and Tadpole, are association sponsors, kicking in $750,000 in the group's first year and $250,000 every year thereafter. Associate membership, which is what LaCava expects most independent software vendors to fall under, costs $100 a year. The association is headquartered in Billerica, MA.

In a related development, SunSoft and Motorola have announced intentions to port Solaris to Motorola's PowerPC architecture.–*Anne Knowles*

This Just In...

- *SunSelect* has introduced Version 5.0 of its PC-NFS product. The latest release adds support for Microsoft Corp.'s Windows for Workgroups and Novell Inc.'s NetWare, "allowing users of these environments to share applications, files, printers and email across any TCP/IP or ONC/NFS network,"

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according to the Chelmsford, MA-based Sun subsidiary. PC-NFS 5.0 supports the Windows Sockets API and the NetBIOS interface and contains Telnet and FTP applications for both MS-Windows and MS-DOS. SunSelect also introduced a new companion email product called SelectMAIL. The program allows MS-DOS and MS-Windows users to exchange mail files with other PCs, UNIX systems and mobile computing environments. SelectMAIL provides a text-or-binary file attachment capability, a spell checker, a read/receipt confirmation option.

• A somewhat unlikely source for RAID, *CompuAdd Computer Corp.*, has introduced the CompuAdd Drive Array. The RAID-5 array, priced from $7,495, is completely software- and hardware-independent, says the Austin, TX, company, and fully supports SCSI-1 or SCSI-2, without additional software drivers. The array consists of six fast SCSI-2 channels. Up to seven Drive Arrays can be chained per SCSI controller. Configurations storing up to 8 GB and certification for Novell NetWare, OS/2, Solaris 1.0.1, Solaris x86, UnixWare and Microsoft Windows NT are slated for midsummer availability.

• Software configuration management vendor *TeamOne Systems Inc.* has extended its product line with two new tools. TeamView provides a graphical, real-time view of a development project, and TeamMake is a distributed version of the UNIX make utility. The two tools are packaged with TeamNet, the Sunnyvale, CA, company's flagship product.

• A new release of EXPO, a graphical worksheet program for investment traders and analysts, is now available from Cambridge, MA-based *Leading Market Technologies.* Release 2.4 adds new features including the controlling of EXPO from independent packages, the ability to customize worksheet-specific menus and new multiday and intraday graphics. Version 2.4 also offers enhanced date/time functionality and a feature allowing users to dynamically annotate windows based on real-time calculations.

• A transfer program that enables Sun SPARCstations to read, write and format standard 3½-inch Macintosh and any IBM-compatible disks, as well as SyQuest and Bernoulli removable drives and Sony optical drives, is available from **Pacific Microelectronics Inc.**, Mountain View, CA. Pacific-Micro's Common-Link Plus gives Sun users these capabilities, without requiring them to purchase additional hardware or software. The product is based on Pacific-Micro's existing Common-Link Mac/DOS-to-UNIX transfer utility.

• A U.S. District Court judge in New Jersey has rebuffed Unix System Laboratories' attempt to stop the distribution of Berkeley Software Design Inc.'s BSD/386, saying that USL "failed to demonstrate a likelihood that it can successfully defend its copyright in 32V." USL had sought to prevent the distribution of BSD/386 pending trial, alleging that the University of California at Berkeley and BSD had infringed copyrights and trade secrets in its UNIX operating system. U.S. District Court Judge Dickinson R. Debevoise denied USL's request for a preliminary injunction, freeing BSD to continue to distribute BSD/386. ➸

TOM BARRETT

Getting the Point Across

by MICHAEL O'BRIEN

":-)"

–Some woman posted this to `net.singles` in the late '70s or early '80s and no one paid any attention. If we knew who that was now, she'd be world-famous.

"In medias res."

–You're on the inside looking out.

"Blot blot squiggle space blot squiggle squiggle blot."

–Beethoven's Ninth Symphony, as seen in an old-style mail reader

Q: Something seems to be wrong here. Mr. Protocol is just sitting there reading a book. That's the most normal thing, by far, that I've ever seen him do. Something must be up. What is it?

A: First, take a look about six inches northwards. See that nice illustration? Why don't you ever get one of those in your morning barrage of electronic mail? (N.B.: The obvious answer that your friends and co-workers are a bunch of no-talent noodniks who couldn't draw to an inside straight, let alone produce something as magnificent as Mr. Barrett's work, doesn't count.)

Think about that one while I answer your question. Mr. Protocol is being so assiduous because the book he's reading isn't your average mass-market paperback-for-the-price-of-a-hardback. He has managed to cadge himself a reader's pass to the library of the British Museum, and what he's poring over is a medieval Book of Hours. It serves as an excellent reminder of the fact that technological progress is not unidirectional.

Calligraphers and students of medieval literature have long noted that the calligraphic hands used in works such as these are unparalleled in the grace and beauty that they lend to the Roman alphabet, which was initially what we now call "upper case" (a term that obviously came in only with printing, where it referred to the cases used to hold type slugs for hand-loading into the press). Winchester, uncial, chancery…these scripts are still

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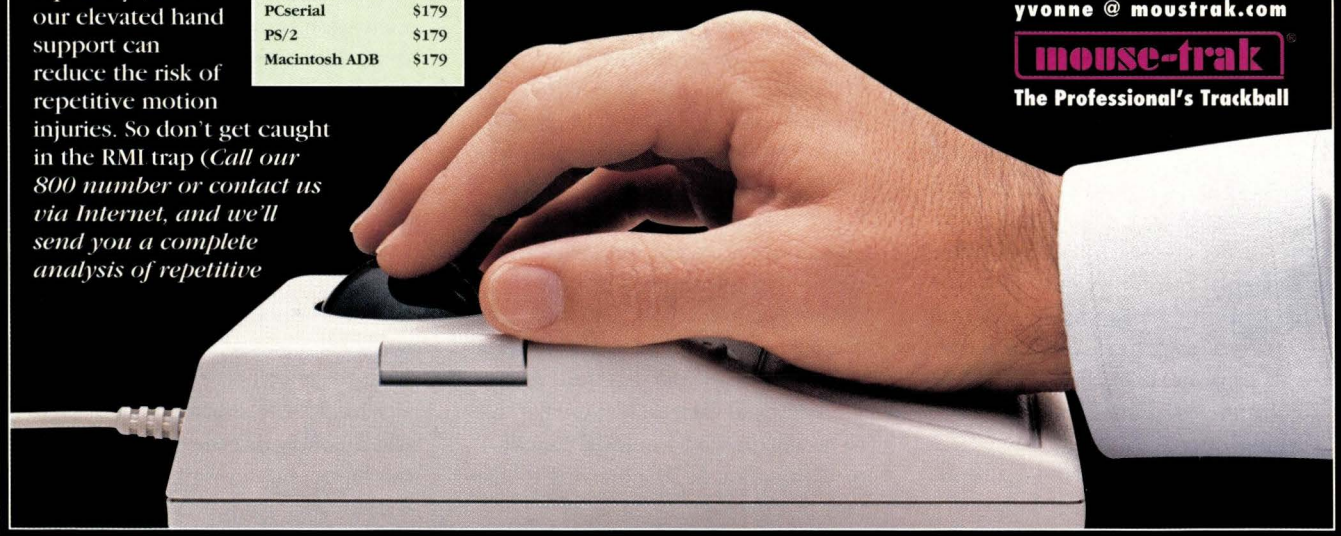

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taught and still in wide use today, at least by those who make their livings wielding a pen instead of a keyboard. (It would be just like Mr. Protocol to break in at this point and claim loudly that 23rd Dynasty hieratic has any modern script beat, hands down, in the beauty pageant category–which is probably why he did it.)

However, it would take any viewer who had not previously seen one of these books up close quite some time to get around to actually looking at the script, because the first elements that would grab his or her attention are, of course, the filigree, the giant initial letters, and the gorgeous full-page paintings that make any one of these books a riot of line and color, a complete universe in miniature.

The thing that first meets the eye when looking at these works is the balance between the illustration–the "illumination"–and the text that it surrounds and enhances. The physical body of the text provides a ground around which the fanciful artwork is laid. This unity of text and illustration proves that we have a very long way to go in integrating text and graphics in our current communication system.

In fact, at present we don't really do this at all, and that's why Mr. Protocol is taking a break by diving about five or six centuries back in the art of written communication. However, we're making a start.

Take, as one example, the multimedia mail support provided with the Sun workstation. Now you may be asking yourself, "What multimedia mail support?"

Right you are. There isn't any, at least not in the current operating environment provided by Sun.

Now, when Steve Jobs decided to get his own back by starting a computer company, and before his second lifework was pretty well squashed by the spawn of his first lifework, a conscious decision was made not to be overly bound by standards, but to push the state of the art. This resulted in optical disk technology being delivered before it was really ready, and Mach being delivered as a production operating system before it was really ready. It also resulted in the delivery of multimedia mail several years after it should have been planned for by the community at large. Being a single-vendor solution in an era of open systems, it promptly sank like a stone, along with most of the rest of the company. So much for not being bound by convention. After all, Digital Equipment Corp. tried the same thing when they first got started, and look where it got them. (Oh, shut up.)

However, one edge Jobs pushed was the creation and handling of electronic mail. The very first NeXT box ever made had full sound capture and reproduction hardware in it, and the operating system has supported this capability right along. The mail system has always been able to represent audio as a part of mail messages. Other data types may be included as well, such as drawings and images. It's very handy to be able to send a quick sketch of something, made by a drawing tool, as part of a message.

The rest of the Internet is finally beginning to catch up. Implementations are beginning to appear that are "MIME-compliant," meaning that they conform to the specifications of RFC 1341, Multipurpose Internet Mail Extensions (MIME). This specification, which appeared in June of last year, extends good old RFC 822, which specifies the format of Internet mail headers. It points out that RFC 822 never said much about message bodies, which Mr. Protocol strongly suspects was a highly deliberate move on Mr. Crocker's part, as Mr. Protocol was around at the time Mr. Crocker was wrestling with RFC 822 and he didn't envy him one little bit, no sir, and what Mr. Crocker did and did not put in to RFC 822 was in general a highly deliberate and much thought-about affair.

It was the job of the MIME working group, which developed the specification laid out in RFC 1341, to do as little violence as possible to RFC 822, so as to be able to do as little violence as possible to RFC 822-compliant but MIME-ignorant mail systems. They did this by maintaining the orthogonality of multimedia extensions to RFC 822 as much as they could.

In a MIME-compliant message, the first giveaway is a header component that says `MIME-Version: 1.0`. This is the indicator that the message is (or may be) more than the simple RFC 822 message we've seen in the past.

In the extreme case, this would be the only difference between a MIME mail message and an old-style message. In RFC 1341, compatibility with existing software and practice wins out over elegance every time, and this is a deliberate choice.

However, it would be pretty silly to send a MIME message with no other indications at all, considering the fact that current messages may contain anything from clear text to a uuencoded `tar` file. Therefore, MIME messages contain a `Content-Type:` header component, which specifies what the contents of the message actually are. MIME is extensible, so there will probably be other types defined in the future, but for now, the initial set is `text`, `multipart`, `message`, `image`, `audio`, `video` and `application`. Each of these types has several subtypes defined, and it is a peculiarity of the spec that a subtype of some sort

MIME is extensible, so there will probably be other types defined in the future, but for now the initial set is `text`, `multipart`, `message`, `image`, `audio`, `video` and `application`.

must *always* be specified. There are no default subtypes. After the subtype, one or several parameters may be specified. There is an entire default `Content-Type:` specified, at least, in case of error or the use of an old-style user agent. The default is `Content-Type: text/plain; charset=us-ascii`. This is equivalent to a completely old-style RFC 822 message. Another possible subtype for `text` is `richtext`, which defines a very simple rich text format that can, with an appropriate setup, be parsed by a standard SGML parser.

The content type `message` means that the body is a completely RFC 822-compliant message, which may contain its own `Content-Type:` header component (the `MIME-Version:` header component exists only at top level). This means that MIME is potentially recursive: MIME messages can contain other MIME messages.

The `multipart` component type is what gives MIME its richness. A MIME message may be made up of several different components, each of a different type. This permits what we usually think of as a "multimedia" message, containing text intermixed with pictures, audio, video, etc. Each body part has an optional header section, useful mainly for holding a `Component-Type:` header component detailing what this particular subsection of the message is all about. One familiar subtype of `multipart` is `digest`, which indicates that the message is constructed like one of the familiar Internet message digests, with each component being a separate message.

Several other things have to happen at the same time to make MIME really operate well, of course. One of these is the choice of how to send all this stuff through mail systems that believe that mail consists of text, only text and never anything else but text. This leads to the third major new header component, namely `Content-Transfer-Encoding:`. This header component is responsible for detailing how binary data has been transformed (if at all) for inclusion in the message. Possible values for this field are BASE64, QUOTED-PRINTABLE, 8BIT, 7BIT and BINARY, as well as anything that two consenting end systems may agree upon, so long as it starts with "X-". BASE64 represents a simple binary encoding scheme, similar to `uuencode`. QUOTED-PRINTABLE is used to represent text that consists mainly of printable characters, with only the occasional no-no character interspersed. It mostly leaves things alone, so that the result is generally about as human-readable in its uninterpreted form as the original. BASE64 requires machine interpretation no matter what the original text looked like. The other three possible values, 8BIT, 7BIT and BINARY, indicate that no encoding whatsoever has been performed on the body of the message, but with different expectations on what's there. 7BIT says that it is all legal under the old rules (7-bit bytes with line lengths kept to limits), while 8BIT says that it contains funny characters but all the lines are guaranteed within length limits. BINARY says that all bets are off.

Of course, current SMTP specs don't allow 8-bit bytes. However, it has been observed by various folks hither and yon that various SMTP implementations don't actually care about this, and are "8-bit clean," so of course these people have been merrily ignoring this part of the spec for some time now. This has led to a brief flurry of RFCs, which make interesting reading. The base RFC is RFC 1425, "SMTP Service Extensions," which specifies how two SMTP implementations may come to agree on which extensions to the SMTP base spec they might happen mutually to support. Given this newly carved doorway out of the bind, RFC 1426, "SMTP Extension for 8bit-MIME transport," specifies how to allow two SMTP implementations to exchange guaranteed 8-bit clean MIME messages, thus allowing 8BIT and BINARY to exist over SMTP.

But what good does all this do the end user? Mr. Protocol is more than a little glad that you asked.

For most folks, right now, the answer in the Sun world is "damn all." Real multimedia mail still doesn't exist, at

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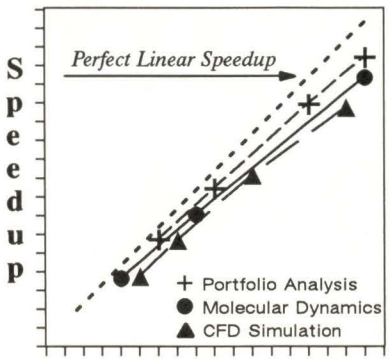

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least in the NeXT sense. In fact, NeXT users who are also Sun users live in a state of some frustration, because the NeXT mail system basically looks like a revamped Berkeley "Mail" system, which means that it is not very capable when it comes to handling the industrial-strength "mail as landfill" volumes of email seen by many researchers and mailing-list addicts.

In the Sun mail world, the MH mail system has achieved a great deal of popularity due mainly to the fact that it integrates well with the UNIX file system semantics, and has tools for dealing with mail in bulk. However, only the latest release of MH (Release 6.8 as of this writing) has any support at all for MIME. The MIME support in MH lives within a single MH command, `mhn`. This command is responsible both for interpreting incoming MIME mail, and for composing outgoing MIME mail. This makes it just about the only MH command that combines two functions in this way, which Mr. Protocol finds unfortunate. But then, Mr. Protocol was around when MH was first created, and remembers when it was a small, easily understood mail system. In this context, there are a lot of things that Mr. Protocol finds unfortunate about MH.

Such quibbles aside, there is a graver problem with this method of dealing with multimedia mail: Unless you are a diehard text-based interface weenie, it's just too hard to use. The whole essence of having a multimedia mail system is that it should be not much more difficult to use than a regular text-based mail system, and, if possible, a whole lot easier. In fact, this is one area where the drag'n'drop paradigm of user interface design is a godsend. If you can write a bunch of text, open a drawing package, scribble pictures, and drag'n'drop the picture into your mail message at the proper point in your text, you win. This is the conversational equivalent of chattering along, then grabbing the chalk and drawing pictures. A program like this you might actually use. If the editor you're using to write your mail message lets you do the scribbling without invoking a separate application, so that the experience of using it is even closer to "real life," then you win even more. Really great computer programs are notable for getting out of your face and out of your way. `mhn` does not do this.

This is just one more example of the main problem with UNIX at its current age: It is still, fundamentally, a text-based system. Multimedia mail systems making use of things like OpenWindows and ToolTalk would allow this sort of mail system to be built. The only trouble with this is, the conceptual beauty and ease of the original UNIX system, and the MH mail system, are lost in this approach. Whatever ToolTalk may be, it is not a conceptually pure, delightfully spare, solution. Oh no. It is a thing built to solve a problem, which it does, but Mr. Protocol will bet big money that it never wins its author(s) a Turing Award.

And, sadly, that's what's missing. Multimedia mail, written with easily learned, easily used, capable user agent software, is a Good Thing. However, the baseline system we are running to support it is getting to be as crufty and awful as the giant mainframe systems that UNIX once so gracefully replaced.

We must look for something new on the horizon. So far, Mr. Protocol sees nothing but more clouds. ⊸

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

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

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

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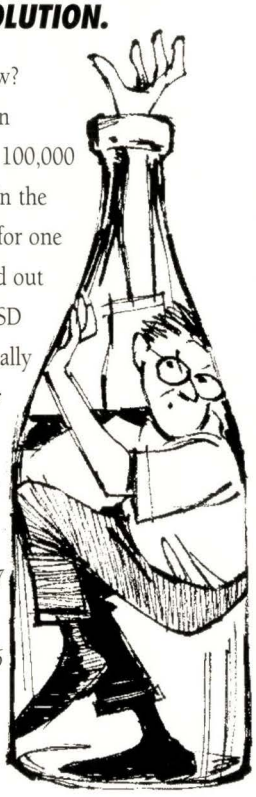

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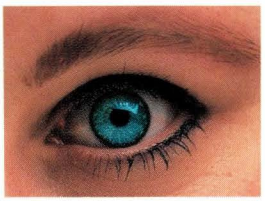

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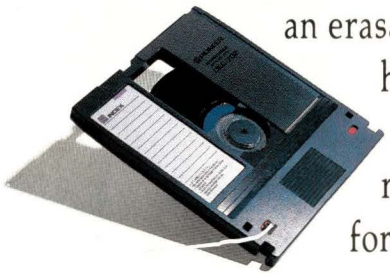

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KEITH GRAVES

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Two X Applications

Last month I looked at the basics of the X Window System. The key idea is that the display, keyboard and mouse are controlled by a server. All processes wishing to talk to the screen are *clients* of the server and communicate with it using the X protocol. The X protocol permits a basic set of graphical primitives. Most clients are programmed using a tool kit, a set of routines that provide the programmer with a higher level functionality.

An important client is the *window manager*, a program that is responsible for organizing the appearance and layout of the screen. The user controls the window manager, telling it where clients should be placed, whether they should be made into icons, whether a client should be completely visible or obscured by other applications. The window manager communicates with clients, sending them events: whether a key on the keyboard has been pressed; whether the mouse has moved; or telling them to redraw their portion of the screen.

The designers of X built a great deal of flexibility and user control into the system. This was done not only because it was felt that vendors promoting the system would want to supply their own "look and feel" but also in the recognition that people like to be able to change their environment to suit their own tastes, rather than having things dictated to them.

Choosing a Window Manager

If you are using OpenWindows on your Sun, then it's a good guess that you will be running `olwm`, the OpenLook window manager. As you might expect, this interfaces well with the applications that are available to you.

I prefer to use the `twm` window manager, originally from MIT but supplied by Sun as part of the OpenWindows command set. It's not difficult to install. Simply copy `/usr/openwin/lib/Xinitrc` to your home directory, calling it `.xinitrc`. Now change the line:

```
olwm -syncpid $pid &
```

to

```
twm&
```

and you are off and running.

You will need to establish one other file to complete the tailoring of your environment. When X starts, it will rarely start with a blank screen; you generally want some programs to be running. The default is to start a `cmdtool` for the console, a copy of the file manager `filemgr` and the Help viewer. This default setup is taken from the file

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/usr/openwin/lib/openwin-init. When you change things and tell olwm to "Save Workspace," then the names and current positions of all the programs are captured and placed in .openwin-init in your home directory. It will contain dire warnings about editing the file by hand because next time you use "Save Workspace," any changes that you may have made will be lost.

If you are moving away from olwm, then your ability to update this file from a menu option moves away too. The file is simply a list of commands that are run when X is started. The script is executed one line at a time, and you don't want to wait for them to complete. They are either terminated by an ampersand or preceded by a call to Sun's toolwait program. The "Save Workspace" menu option uses a command owplaces to create the start-up file, and you can do the same.

```
% owplaces -multi -script
```

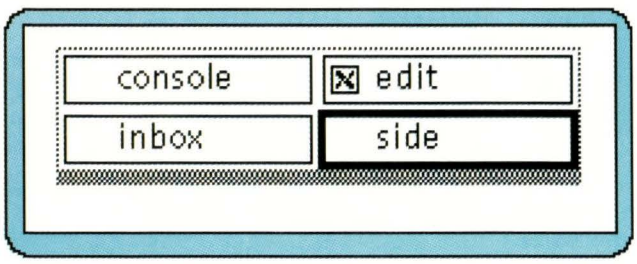
puts the current screen settings to standard output. Look at the manual page for other options. Actually, the best way to learn what is in the file is to create one using "Save Workspace" and then look at it with an editor. You can always save your old .openwin-init and replace it later. I tend to hand-edit the file.

Running twm

You can run twm using a number of different interface styles. Its configuration is controlled by a start-up file called .twmrc in your home directory. There are a number of built-in defaults that are used if that file does not exist. The program usually comes with a sample .twmrc that summarizes these settings. It should live in /usr/lib/X11/twm/system.twmrc, but sadly Sun has not seen fit to include this in its standard distribution. This is a shame because the sample does allow you to see how to build your own run-time environment.

I run twm in a mode that adds title bars to windows. Title bars can contain buttons causing actions when the button is clicked with the mouse. There are two default buttons: one on the left-hand side of the title bar that iconizes the application and one on the right-hand side that permits window reshaping. You can iconize windows in the conventional way by collapsing the window to a small bit map that appears on the screen. Alternatively, you can use an *Icon Manager* (see Figure 1). This is a box containing a button for each window on the screen. When the application is iconized, its window disappears from the screen. In X-speak, this is called *unmapping* the window. A marker (usually the X logo) appears in the button box in the manager showing that the application is iconized. Clicking on the button makes the window reappear (yes, it's called *mapping* the window).

Figure 1. twm's Icon Manager



We can now start creating a sample .twmrc file. The file consists of a number of keywords. Some give Boolean values; others take parameters by enclosing them in curly braces. The file is free format and can be commented by using the shell convention. Anything after a "#" on a line is a comment.

Let's add the first entries that control the Icon Manager and the way that this works:

```
# Iconify windows by unmapping them
IconifyByUnmapping
# Icon manager properties:
# How big and where to place it
# =width x height +X+Y
IconManagerGeometry "=200x50+0+0" 2
# Display the icon manager window in
# startup - default off.
ShowIconManager
# sort Icon Manager entries alphabetically
SortIconManager
# Ignore case when sorting
# icon manager entries
NoCaseSensitive
```

This places the Icon Manager in the top left-hand corner of the screen. It has two columns by default; other geometries are possible.

There are some windows that we would like not to appear in the Icon Manager. I start these applications from my .openwin-init, so they are placed on the screen and stay there.

```
# No windows will appear in the
# icon manager
IconManagerDontShow {
    "xclock"
    "xload"
    "xbiff"
}
```

Also, there are some windows that we don't want to have titles on:

```
# don't put titles in these windows
NoTitle {
    "TWM Icon Manager"
    "xload"
    "xclock"
    "xbiff"
}
```

You will find that there is a cultural difference between olwm and twm. All of the MIT tools have a button or a menu option that permits you to kill them. All the OpenWindows

tools *expect* the window manager to be used to dismiss them. The default `twm` will not interface well to the OpenWindows tools because it is not easy to get rid of them.

To avoid this problem, I install a new title button:

```
RightTitleButton "opendotMask" = f.delete
```

The `f.delete` string is the name of an internal function; these are all listed on the manual page. It sends an X message saying, "I would like to remove this window." You can choose your own bit map in place of `opendotMask`.

We now want to think about how we use the mouse. You must have some of the following lines; otherwise you will not be able to exit from `twm` satisfactorily. The mouse button setup lines specify a button number since you can change the binding with the `xmodmap` command. By default, Button 1 is the left mouse button, Button 2 the center button and Button 3 the right-hand button.

The mouse moves a cursor over the screen and different actions can be taken depending on the type of object at which it is pointing. You can also hold down different keys on the keyboard when pressing the mouse buttons, and this increases your number of options.

```
# Buttons function
# This section maps actions onto keys and
# mouse button presses
#
# Button = KEYS : CONTEXT : FUNCTION
# Keys:
# s Shift
# c Control
# m Meta
#
# Contexts:
# icon     - i When in an icon
# root     - r Root window
# title    - t when in a titlebar
# frame    - f when in a frame
# iconmgr  - m when in the icon manager
# window   - w when in the window
#
Button1 = : r : f.menu "button1"
Button2 = : r : f.menu "button2"
Button3 = : r : f.menu "button3"
```

The last three lines establish basic menu settings. When a mouse button is pressed when pointing at the root window (the background) then a menu is popped up. There is a different menu for each button, giving a wide variety of actions.

We also need to specify what happens in the Icon Manager:

```
Button1 = : m : f.iconify
Button2 = : m : f.raiselower
```

When you press Button 1 in an Icon Manager box, it will toggle the state of the window to which it refers; pressing Button 2 flips the window between the top of a window stack and the bottom. Let's add some buttons so that we can get our three menus by pressing the Meta Key (marked with a diamond on my keyboard) and the appropriate mouse button:

```
Button1 = m : r|w|t : f.menu "button1"
Button2 = m : r|w|t : f.menu "button2"
Button3 = m : r|w|t : f.menu "button3"
```

This also shows how you can combine contexts. You should go on and define some more combinations of buttons.

We now need to create the menus that are invoked by the button pushes. This is also easy. It's good to have some policy about how you are going to use the menus. I have actions relating to windows on the left button, actions that start new applications on the middle button and other less-used general-purpose actions on the right button. I also put quit in this menu; I don't want to select it by accident.

```
menu "button1" {
"Window actions"  f.title
"Zoom"            f.zoom
"FullZoom"        f.fullzoom
"Refresh"         f.refresh
"Move"            f.move
}
# The middle button starts applications
menu "button2" {
"Functions"       f.title
"Terminal"        f.function "newterm"
"Calculator"      f.function "calc"
} # Other useful things - and quit
menu "button3" {
"Window Ops"      f.title
"Show Icon Mgr"   f.showiconmgr
"Hide Icon Mgr"   f.hideiconmgr
"Source .twmrc"   f.twmrc
"Identify"        f.identify
"Kill twm"        f.quit
}
```

This is somewhat stripped down but should give you the idea. Each line consists of the text to be shown and the action to be taken when the line is selected. Each menu has a title that has no action. A title is underlined in the menu. The "Source .twmrc" action is good for developing start-up files. Always include a call to `f.quit`; otherwise it's hard to get out of X.

The actions in the middle button call functions that we now need to define:

```
Function "newterm" {
    !"xterm -sb -name Terminal -sl 1000 &"
}
Function "calc" {
    !"calctool&"
}
```

The exclamation point tells twm to run the command in a subshell. It's also a good idea to create a default menu that is used when no action is bound to a mouse button/key press combination. The default action is established by the line:

```
DefaultFunction f.menu "default-menu"
```

I'll leave you to create the menu.

There is much setup information that I have not included above. For instance, you can choose the fonts used to display text in various parts of the operation of twm. You can choose different colors for windows and menus. Look at the manual page for more information.

Terminal Emulators

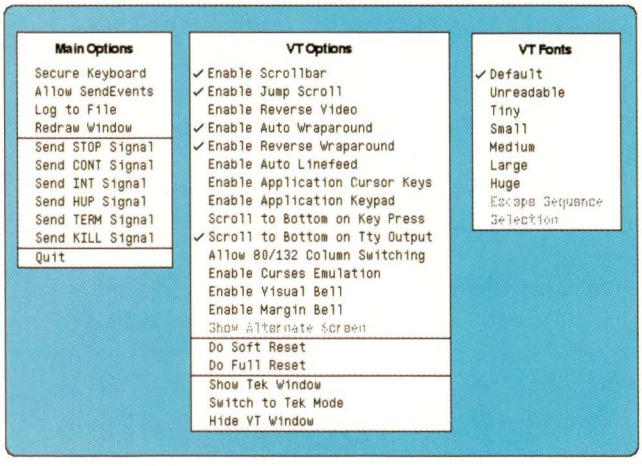
I use xterm to talk to the system rather than cmdtool or shelltool. Some of this is history and some because I find that the on-screen editing that cmdtool implements is more complicated than I need. The xterm program allows you to pick up some lines from the screen by sweeping out the data using the left mouse button. You plonk the lines down in another place by simply clicking the middle button. Simple, click-click and the data is copied. You can also select words by double-clicking on the text; triple-clicking picks up a whole line. You can change a previously selected area by using the right button. I simply cannot be bothered to learn the generalized complexity of the cmdtool interface.

The xterm program provides a VT100 terminal emulator. It is fortunately not limited to 24 rows of 80 columns, although this is the default. It also supports Tektronix 4014 terminal emulation, giving you the ability to use several of the older UNIX graphical tools. This terminal used a persistent phosphor to store an image drawn on the screen rather than a raster scan to redisplay the image stored in some memory in the terminal.

You can control xterm by command-line options. There are also three menus that are obtained by pressing the Control key and a mouse button simultaneously (see Figure 2). The use of the Control key is probably the only bit of magic that you need to know about the program.

The menus consist of two sections: The top half allows you to select some modes that are toggled by selecting them in the menu; the second half contains actions that are initiated by choosing the menu line. The toggles are shown "on" by a check mark that appears in the left-hand margin.

Figure 2. Menus Available in the xterm Program



Pressing Control and the left mouse button pops up the "Main Options" menu. The first two entries relate to security, and you should look at the xterm man page for a full description of these. The next two modes allow logging output to a file and redrawing the window. The log file contains all the characters that were sent to the emulator so it will contain carriage return characters. People are sometimes confused when they see ^M characters appearing in the log; this is a feature and not a bug. Most of the rest of this menu allows you to send signals to the programs running in the window; this is occasionally useful. The last entry is "Quit"; this is an MIT application and allows you to get rid of it by a menu item. However, it's more usual to get out by terminating the shell or program that was started in the window.

Pressing Control and the middle button gives you a menu of modes that are used to configure the emulator. I will omit the full gory details and refer you to the manual page. There are a couple of actions that allow you to reset the emulator, like power-cycling a real terminal. Use with discretion. Finally, the bottom three rows get you into the Tektronix terminal emulator. This will give you a new window that contains the "storage" screen. It's a common mistake to forget that this is still the same terminal that you were just using. To make things work, you should set the TERM= entry in your environment.

```
setenv TERM tek4014
```

will do for csh users. Be careful to reset this back to xterm when you return to the VT100 screen.

The final menu appears when you press Control and the Right mouse button. This allows you to choose a font dynamically. It redraws the screen without affecting the current application. There are a range of possible fonts from "Unreadable" to "Huge." The "Unreadable" font is one pixel per character and shows you the shape of the data in the window. This is great if you are waiting for something to happen in a window and want it to occupy minimum screen real estate.

Starting xterm

Modes selected by the middle menu can also be specified from the command line. I normally start xterm like this:

```
% xterm -sb -sl 1000
```

The -sb option installs a scroll bar on the left-hand side of the window so you can scroll back to see the history. The -sl installs a history of 1,000 lines rather than the default 64. This makes sense in my system, where xterm windows stay around for long periods of time.

You can also put a title on a window:

```
% xterm -sb -sl 1000 -title Edit
```

This only sets the title bar, and it is better to "name" a window

```
% xterm -sb -sl 1000 -name Edit
```

This looks the same as a title but is more useful because this makes the window an entity in the X resources database. You can then use this name to change the characteristics of any window called "Edit." You can make it have a different font or color.

In general, when `xterm` is started under `olwm`, it will position itself on the screen. If you use `twm`, you will see an outline of a window and be expected to place it at some point on the screen (unless you have specified `RandomPlacement` in your `.twmrc`). Often you want to place a window at a specific position on the screen. You do this with an argument like

```
-geometry 80x62+574+4
```

The `xterm` program interprets this string as the number of columns (80), the number of rows (62), and the `x,y` pair that specifies where to place the top left-hand corner. The `-geometry` argument is understood by a great many X applications. It makes sense for `xterm` to interpret the first two numbers as a column and row count. Not all programs do that; some use this as the number of pixels in the screen area.

You can partially specify this string:

```
-geometry 80x40
```

gives an 80-character by 40-line terminal emulator, but its position is not specified. You can specify a position and have the default size established:

```
-geometry +574+4
```

My example above is taken from my start-up file. It's a large window occupying the whole right-hand side of my screen. I mostly work in such a window. It sounds stupid, but it's a good idea not to use a screen width of much wider than 80 columns. There are people who still use fixed-width terminals, and it's a pain to have to deal with mail or source code from people who have used wider default windows. Actually, I tend to generate text that is not much wider than 72 columns.

You may also wonder why it's on the right-hand side of the screen. This is basic ergonomics. When people start placing windows on their screen, they tend to do it left to right since that's the "cultural" way of doing things. I did this for a bit and

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then wondered why I was doing it. You have to understand that when I start X, I tile my screen with several `xterm`'s. Later I dynamically overlay the tiling with other windows.

Placing windows on the left-hand side of the screen meant that I was looking left. I decided that I would prefer to sit square onto the workstation and look at the center of the screen. You can see that placing the main working window so that its left margin is down the center of the screen makes sense. This is where I do most of my typing and see most of my output. All that being said, I am currently typing into a editor window that is placed firmly in the middle of the screen, but I am still sitting square into the workstation. It's perhaps a sign of advancing senility to be worrying about such things.

So far, we have always started up a copy of the shell in the `xterm` window. You can add a command at the end of the `xterm` command line and use this as the shell. You can start up a window with a visual editor loaded by

```
xterm -e vi
```

Notice that having a scroll bar in the editor doesn't have much utility because the editor will directly address the window (just like it would a real terminal), and nothing will scroll off the top of the screen anyway. The name of the window is taken from the command name, so here it will be called `vi`. If you want to change the title, you must give a `-title` parameter.

All this forms a basis for a command that logs you into another machine on the network.

```
xterm -sb -sl 1000 -e rlogin remote
```

This becomes a little more convenient if you have a command `remote` that takes you to that machine. This is simply a link (hard or soft) to the `rlogin` program.

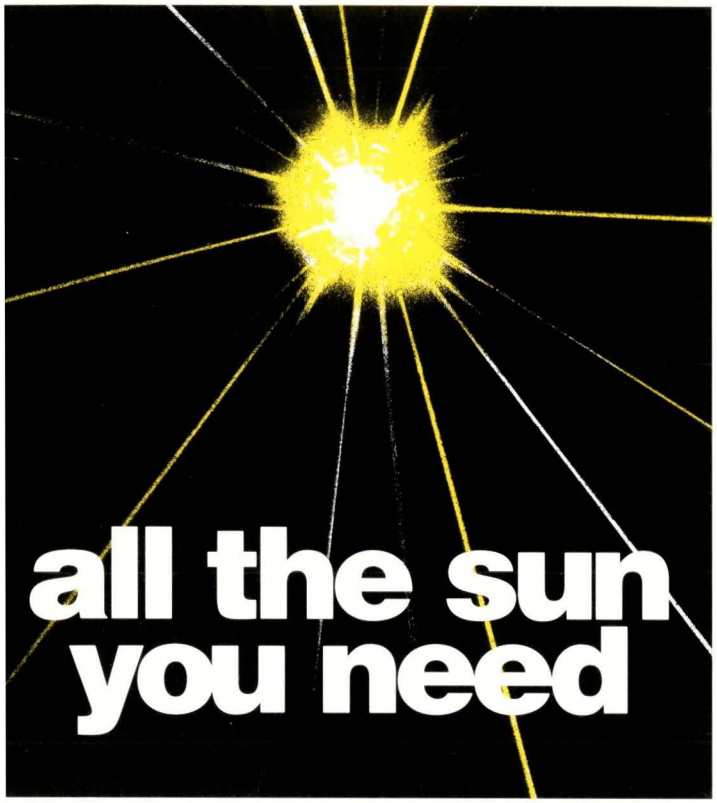
```
xterm -sb -sl 1000 -e remote
```

You can run anything that is designed to run on a terminal in an `xterm` window. This was originally seen as a short-term expedient so you could use the standard UNIX tools in a separate window on the screen. We do now have editors like `textedit`, `emacs` or `sam` that start their own windows so the utility of the `-e` parameter is perhaps diminishing. It remains useful to be able to define a `csh` alias like

```
% alias xvi 'xterm -e vi'
```

and instantly invent a new command that operates with the window system with a minimum of fuss. ➸

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



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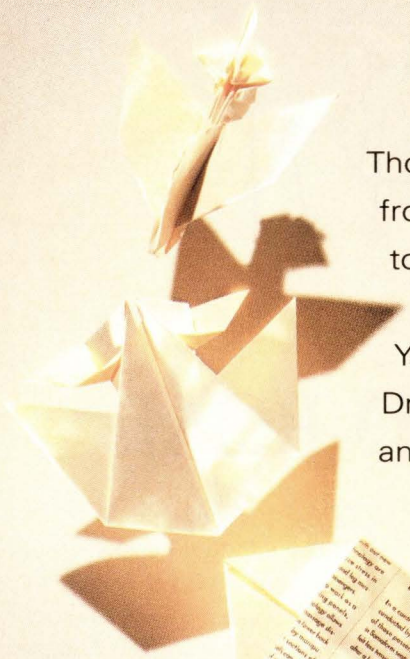

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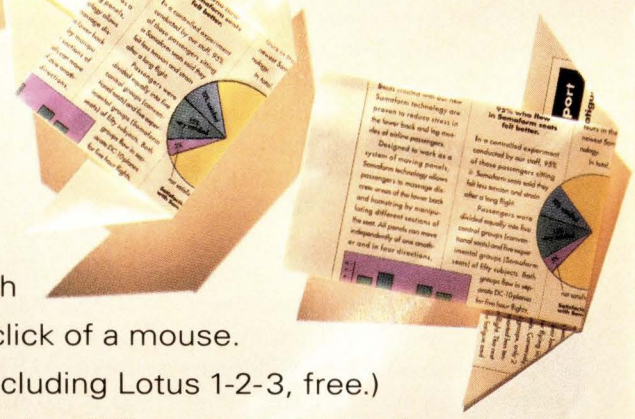

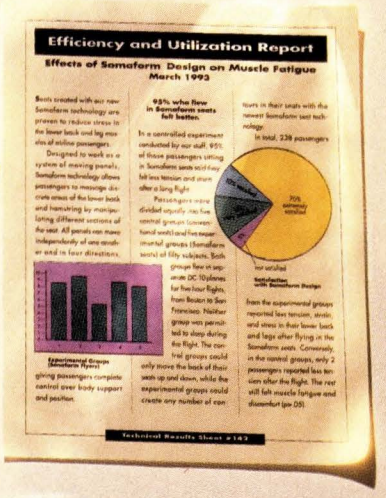

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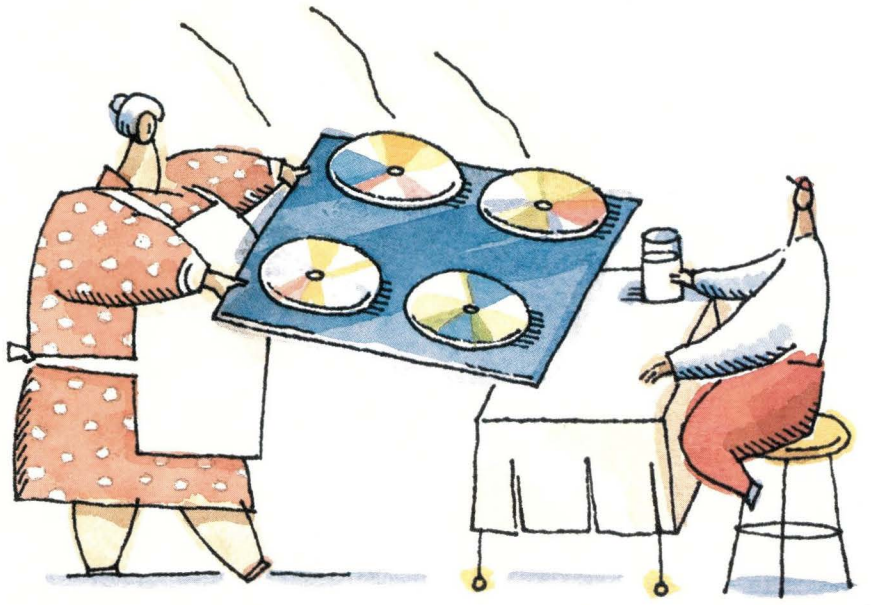

ROBIN JAREAUX

by RICHARD MORIN, Technical Editor

UNIX-related Freeware CD-ROMs

First, a word of warning: This column is not a review. It can't be; I produce my own UNIX-related freeware CD-ROMs and can't pretend to be objective. Instead, I'm presenting a selection of disks for your examination, frequently using the producers' own descriptions. Look around; you may see something you like.

There seem to be two major approaches to doing freeware disks. The first attempts to take frequent, simple snapshots of Internet archives, adding little in the way of indexing or organization, but keeping costs to a minimum. The second tries to add value by organizing, annotating, building binaries, etc. Both approaches are valid, but buyers need to be aware of the distinction, lest they get one while looking for the other.

File Systems

Except as noted, all of the disks discussed in this column are written in ISO-9660 (or at least High Sierra) format. This means that they should be easy to use on a Sun CD-ROM drive. I don't expect to see many more UNIX File System (UFS) disks. UFS is poorly optimized for use on CD-ROMs, and it isn't portable at all. Its only advantage is the fact that it supports UNIX file system semantics, and Rock Ridge (an extended form of ISO-9660) does that equally well.

Consequently, I expect to see more Rock Ridge disks emerging, particularly for plug-and-play and vendor-specific applications. Vendor-independent collections of compressed archives (e.g., PTF) will tend to stay with ISO-9660 for a while. Most systems can't use the Rock Ridge extensions yet, and some ISO-9660 implementations get confused by them. Handling two sets of names is a lot of extra work and provides little benefit when the real file names are hidden in archives.

GNU Project

"This CD-ROM contains source code from the GNU Project. You can mount it as a read-only file system on most operating systems. Also, you can build most of this software without needing to copy the sources off the CD; you need only enough free disk space for the object files and intermediate build targets," according to the GNU Project.

The GNU & IMPROVED CD-ROM (GNU Source Code, Edition 1.0, October 1992) is actually the GNU Project's first CD-ROM. It costs $400 to corporations and other organizations, $100 to individuals. This is more than most of the other disks cost, but there is a reason. The proceeds go to support the GNU Project, generating more GNU software for everyone to use and distribute. No matter how you get your GNU software, you should send some money to Free Software Foundation for the project. Buying GNU software

distributions (also available on tapes and floppy disks), documentation or T-shirts is an easy way to do so.

InfoMagic

The InfoMagic CD-ROM (Volume 2, Number 2; August 1992; $75) contains 638 MB of source code and documentation, most of which is related to UNIX and/or networking. Most of the material on the disk is stored in `tar` archives. The DOS-related files are a mix: ARC, DOC, EXE, ZIP and so forth.

The top-level directories are: 386BSD (53 MB: Version 0.1, DOC (60 MB: IECs, RFCs, etc.), DOS (46 MB: DOS networking tools), GNU (128 MB), ISODE (45 MB: Version 8) UNIX (79 MB: Athena, NET/2, etc.) WINNT (1 MB: Windows NT tools) X (220 MB: X11R5). The NET/2 and 386BSD inclusions are noteworthy. Followers of this space will recall that a lawsuit is currently going on about NET/2 and derived code. As far as I know, this is the only available CD-ROM that contains this material. InfoMagic has several new disks coming out soon. Contact them for details.

O'Reilly & Associates

O'Reilly says that their X disk (promised a year ago) will be included in *The X Window System Administrator's Guide* (O'Reilly, ISBN 0-56592-052-X, $60), which should be available by the time you see this column. It promises to have more than 600 MB of X11-related software, including source code and precompiled binaries of X11R5 core software for DECstations, IBM RS/6000s, Sun-3s and Sun-4s.

I am very impressed with *UNIX Power Tools* (Jerry Peek, Tim O'Reilly, and Mike Loukides; O'Reilly/Bantam; ISBN 0-553-35402-7; $60). This isn't the first mixed-media publication containing UNIX freeware. It's the first one I've seen, however, from a major UNIX publisher. The book itself is more than 1,100 pages in length and provides an enormous collection of UNIX lore.

What's most unusual about the disk is that O'Reilly has not taken the approach of packing in as much software as possible. Instead, they restricted the disk to utilities discussed in the book, and ship precompiled binaries for seven common platforms as well as source code. O'Reilly advertises this as "shrink-wrapped software for UNIX."

An interactive installation utility provides quick installation for seven environments: DECstation Ultrix 4.1, IBM RS/6000 AIX 3.2, HP 700 HP-UX 8.07, SCO UNIX 3.2.x and Xenix 2.3.2, and SunOS 4.1.1 on Sun-3s and Sun-4s.

The disk is intended as a companion to the book, rather than an independent collection of freeware. Because of this, and because of the decision to support several platforms, the amount of material for any single platform is relatively small. Specifically, the disk contains 18 MB of common source code and 50 to 60 MB of compressed binaries and doecumentation for each supported environment.

Prime Time Freeware

Prime Time Freeware is a semiannual collection of UNIX-related freeware. PTF now has two issues on sale, and another should be available soon. Each

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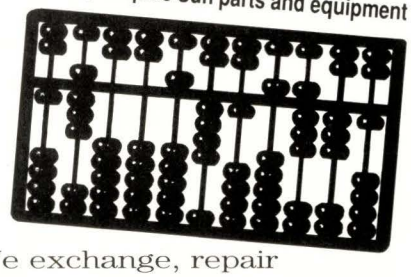

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issue consists of two disks, bound into an explanatory booklet. Each freeware package has its own directory, including an annotation file, listing files and compressed archives. Concatenated copies of the annotation files are also available in the top level directory of each disk, to facilitate browsing.

PTF 1-2 (July 1992, $60) contains a gigabyte of compressed archives, unpacking to more than 3 GB of graphics tools, language processors, snapshots of `comp.sources` groups, etc. PTF 2-1 (January 1993, $60), at 1,200 MB, is even larger. It spends about a third of its space updating packages from PTF 1-2, then moves on to include the UK TeX Archive (300 MB), the ICOT Fifth Generation AI code (79 MB), NetLib (82 MB) and StatLib (27 MB), etc.

Sterling Software

Sterling Software's first freeware disk (Netgems 91) covered almost all of the Usenet source groups, picked up several archives of Internet documentation, etc. At this writing, the Netgems 93 disk is still under development, but it should be ready by press time.

Sun User Group

The 1992.1 disk ($50), which was assembled by Robert A. Bruce, has 543 MB of material, including X11R5, 212 MB of contributed X sources, GNU sources, libraries, SPARC binaries and an archive of `comp.sources.x` postings. The 1992.2 disk ($150) has more SPARC binaries, resource materials, archives, patches and source code not found on previous disks.

You need to be a SUG member to buy any of its disks. Both of the 1992 disks come in Sony CD-caddies. The 1992.2 CD-ROM emphasizes information sources (archives of useful textual information) and includes plug-and-play SPARC binaries for many useful libraries and programs.

The Sun User Group, like the GNU Project, does more than distribute freeware collections. SUG sponsors technical conferences, publishes a quarterly newsletter, supports local Sun user groups, provides vendor discounts to members, and runs the `comp.org.sug` newsgroup. In general, it acts to promote interaction among

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Sun users. By joining SUG and buying its disks, you help to ensure the existence of an independent forum for Sun users.

Walnut Creek CDROM

Walnut Creek's X11R5/GNU CDROM (December 1992, $40) contains more than 500 MB of GNU and X11R5 sources and SPARC binaries. It is written in Rock Ridge format but provides a program (`copydir`) that allows ISO-9660 users to retrieve and rename selected directories.

The Sprite Project disk ($25) was produced as a commemorative effort for the termination of the project. It is *not* a complete operating system, let alone a polished distribution. Nonetheless, it contains a lot of interesting code and papers, and the price is certainly right.

Walnut Creek is very prolific, with several titles coming out each year. They have offerings for Amiga, Macintosh, Microsoft Windows, MS-DOS, OS/2, NeXT and UNIX systems. Contact them for a catalog, lest you miss something nifty.

Yggdrasil Computing

The Yggdrasil Linux/GNU/X Operating System Beta Release ($60) consists of an 85-page booklet, two floppy disks and a Rock Ridge CD-ROM. It will boot and run on a variety of Intel X86 platforms, providing a UNIX-like operating system, a large set of GNU tools, the X Window System and a number of other enhancements.

Yggdrasil is attempting to act as a commercial focus for Linux activity. If they can establish a bit of order (or at least stable reference points) for the frenetic Linux community, they will be performing a great service. Their goal, however, goes even further: helping Linux become a stable, supported alternative to proprietary operating system releases. The production release should be on sale by press time. At $60, can you afford not to try it?

In Summary

CD-ROM is a wonderful medium for distributing large chunks of freeware. It is cheap to produce and transport, durable, widely supported and capable of handling hundreds of megabytes without problems. Looking back on the days of expensive, fragile, incompatible and cramped tape distributions, I am quite relieved to be past all that.

On the other hand, I worry that I don't see any technology on the horizon to replace CD-ROM. More than 600 MB may seem like a lot, but many freeware vendors already manage to fill up their disks. Some use compression, ship multiple disks and/or release multiple titles. A more capacious medium would be useful now and will be badly needed in only a few years. Let's hope blue lasers and/or other advancements get us out of the crunch before it gets too tight.

Richard Morin produces Prime Time Freeware, a semi-annual CD-ROM collection of redistributable, UNIX-related source code. Between releases, he consults, writes and teaches on UNIX topics. He may be reached at Canta Forda Computer Laboratory, P.O. Box 1488, Pacifica, CA 94044 or by email at rdm@cfcl.com.

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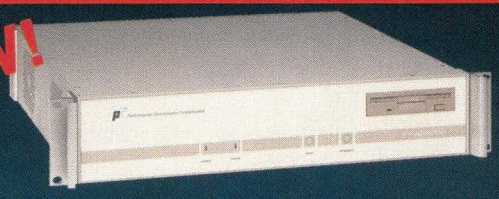

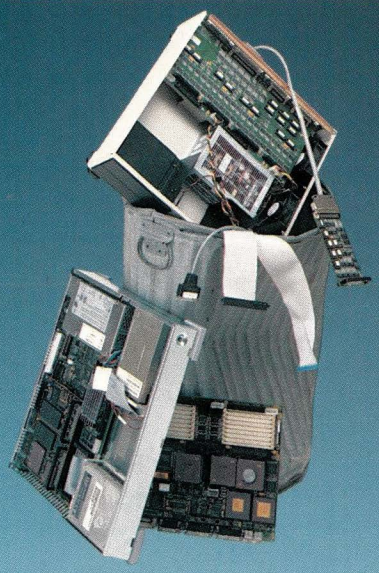

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Circle No. 28 on Inquiry Card

Your Standard Column

JOHN W. KELLEY JR.

Government Issues

by PETER H. SALUS

Many of you may have thought that with the Clinton/Gore election and the apparent prominence of Apple's John Scully in the closet cabinet as well as a press conference emanating from Silicon Graphics' headquarters, the new U.S. regime would be doing wonderful things for the technology issues with which it claims to be concerned.

Permit me to disillusion you.

Last year, for example, then-Sen. Gore was the sponsor of the WINDO bill (see *SunExpert*, February, Page 46). But now the bills to open access to U.S. government documents have been reintroduced, and what do we find but a yet further watered-down version of the Republican minority bill of last session.

GPO Access

Both the House and Senate are soon expected to consider legislation that would replace the Government Printing Office (GPO) Gateway/WINDO bills that were considered in the last session of Congress. According to congressional staff members, the bill will be called "GPO Access." The new name (which may change again) was one of many substantive and symbolic changes.

The most important changes to the legislation concern the scope and ambition of the program. Key supporters have decided to opt for a decidedly scaled-down bill, based upon H.R. 5983, the minority version of last year's, which was produced with considerable input from the commercial data vendors, through the Information Industry Association (IIA).

Gone from the Gateway/WINDO versions of the bill is the funding (S. 2813 would have provided $13 million over two years) to implement the legislation, and any findings that set out the congressional intent regarding the need to provide citizens with broad access to most federal information systems. Also missing are any references to making the on-line system available through the Internet or the NREN.

The current GPO Access bill would:

1. Require the GPO to provide public on-line access to the Federal Register, the Congressional Record, an electronic directory of Federal public information stored electronically, other appropriate publications distributed by the Superintendent of Documents, and information under the control of other federal departments or agencies, when requested by the department or agency.

2. Require user fees equal to the "incremental cost of dissemination of the information." This is an important feature that was included in the Gateway/WINDO legislation. Many federal agencies, including the National Technical Information Services (NTIS), make profits on electronic information products and services.

3. Provide free access through the 1,400-member federal Depository Library Program. It does not reveal who will pay for Depository Library Program telecommunications costs, and whether GPO will use the on-line system to replace information products now provided in paper or microfiche formats.

The bill will not

• provide any start-up or operational funding.

• require GPO to provide on-line access through the Internet.

• give GPO broad authority to publish federal information on-line (as the Gateway/WINDO bills would have). But the new bill would restrict such authority to documents published by the Superintendent of Documents (a small subset of federal information stored electronically), or situations where the agency itself asked GPO to disseminate information stored in electronic formats.

• include language that would have explicitly allowed GPO to reimburse agencies for their costs in providing public access, as did the previous legislation. This is a potentially important issue, since many federal agencies will not work with GPO to provide public access to their own information systems, unless they are reimbursed for costs that they incur.

• include a reporting requirement. S. 2813 and H.R. 2772 would have required GPO to publish an annual report on the operation of the Gateway/WINDO and accept and consider *annual* comments from users on a wide range of issues.

I had hoped that the election of the Clinton/Gore administration and the increased awareness of public access issues would lead to a stronger, rather than a weaker, bill. I think that public expectations are rising and that Congress and the administration must begin to take public access seriously. The GPO Access legislation provides incremental benefits over the status quo, but less than might seem from a cursory reading.

The statutory mandate to provide on-line services is useful, but public access proponents have always argued that GPO already has the authority to create the Gateway/WINDO under the current statutes. In fact, GPO now offers hundreds of CD-ROM titles and the on-line GPO Federal Bulletin Board, a service that could (and should) be greatly expanded.

The three products the GPO Access bill refers to are already on-line or under development. GPO is now working on the development of a locator system and an on-line version of the Federal Register, and the Congressional Record is already on-line in the Congressional LEGIS system–a system that is presently closed to the public, and which is not mentioned in the GPO Access bill.

Anyone who has tracked the growth of the Internet will recognize that public access to ftp-able bits is growing at a rate that is more than linear, though I don't believe that it is exponential. Tools like gopher and archie put access to terabytes of information on our desktops. The notion that the U.S. government is slowly backing into the 19th century is just ghastly. ➸

Peter H. Salus is currently working on books on internationalization and computer communication. He has attended P1003, P1224 and ISO meetings. He can be reached at `peter@uunet.uu.net`.

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PETER KALABOKIS

The Book on NIS+

by S. LEE HENRY

Long ago, I was fond of soaking up wisdom that came in the form of reflections like, "The best way to get someplace is to begin by already being there." Though I have no objection to such thoughts today, I find that I am seldom already there, and the goal of transitioning my naming service to NIS+ is no exception.

Getting There

Getting from here to there, as far as NIS+ is concerned, is going to take a lot of simply getting comfortable with the much more powerful model for network information services, planning out a good migration strategy, loading and augmenting current information from `/etc` files and NIS maps, and learning to manage the new service during the transition to Solaris 2.X and afterwards.

To get ready for NIS+, you need to start by thinking about yourself and your organization. NIS+ is more than an opportunity to migrate to a faster network information service, but a chance to rethink how you manage and control your network services and beef up the security, administration and performance of your network.

Wherefore NIS+?

NIS+ is far more than a reworking of NIS for SVR4. Although designed as a replacement for NIS, NIS+ addresses the needs of increasingly large, heterogeneous and interconnected networks whose size and complexity requires distributed administration across autonomous domains. Where NIS freed us from having to maintain local files on each of our hosts, NIS+ gives us freedom to choose how much to centralize administration and how much to spread it across different domains of control. As a result of this control, finding the best fit of this new networking service to your organization will require some reflection on your organization's structure and considerable planning on how to lay out and phase in the new capabilities.

On the other hand, the benefits of NIS+ make it very

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attractive and well worth the time and effort we'll have to invest in learning how to manage the new service and migrate our current services. For large networks, especially for sites distributing network administration across different administrative groups, NIS+ provides the following:

- distributed administration of network information,
- a hierarchical name space that matches the organizational structure,
- much improved security,
- tremendous performance improvements both for updates and binding,
- much easier integration with DNS,
- easier and more flexible customization of tables for your own use.

Read All About It

To help you get ready for NIS+, plan your transition and manage the new network services, there is a new book I strongly recommend. *All About Administering NIS+*, by Rick Ramsey (1993 Sun Microsystems Inc., SunSoft Press, A Prentice Hall title), is divided into three parts that correlate well with the phases you will go through in becoming expert with the new service and getting it up and running smoothly at your site.

Learning to Think NIS+

Part 1 covers all the topics intended to familiarize you with the NIS+ model. The purpose of network information services, understanding the hierarchical name space of NIS+, and a description of NIS+ tables (the replacement for NIS maps) are covered in enough detail and with enough examples to give you a conceptual grasp of what NIS+ is all about.

Part 1 also covers security. An overview of the security process, a description of how credentials are created and used and an explanation of access rights (read, modify, destroy, create) will get you up to speed on the basics of NIS+ security. Part 1 closes with details on the name service switch, which allows clients to select as the source for network information NIS+, NIS, DNS or `/etc` files. As a matter of fact, the name service switch allows a client to look for different information in different places (e.g., hosts from NIS+, group information from the `/etc` file) and can provide alternate sources should the first search fail.

Making the Move

When you move into Part 2, you will be reading about the process of setting up NIS+. You will begin to sketch the hierarchical name space that will be used in your organization.

The name service switch allows clients to look for information in different places, e.g., hosts from NIS+ and group information from the `/etc` file.

For those of us with Internet connections, addresses like `wizard.eng.magic.com` will not seem at all unfamiliar. For the rest of us, the process of rethinking our network setups and changing from host names like "wizard" to names like `wizard.eng.magic.com` will take some getting used to but will eventually win us over because the advantages of having our names relate to the organizational structure in which we work begin to pay off.

Selecting which servers on your network will provide name services, which will be redundant ("replica") name service

Figure 1. The niscat Command Showing Passwd Table Content

```
# niscat passwd.org_dir.nextpage.com.
root::0:1:0000-Admin(0000):/:/sbin/sh:
daemon::1:1:0000-Admin(0000):/::
bin::2:2:0000-Admin(0000):/usr/bin::
sys::3:3:0000-Admin(0000):/::
adm::4:4:0000-Admin(0000):/var/adm::
lp::71:8:0000-lp(0000):/usr/spool/lp::
smtp::0:0:mail daemon user:/::
uucp::5:5:0000-uucp(0000):/usr/lib/uucp::
nuucp::9:9:0000-uucp(0000):/var/spool/uucppublic:/usr/lib/uucp/uucico:
listen::37:4:Network Admin:/usr/net/nls::
nobody::60001:60001:uid no body:/::
noaccess::60002:60002:uid no access:/::
slee::111:14:S. Lee Henry:/export/home/slee:/bin/ksh:
fred::444:14:Frederic H. Henry:/export/home/fred:/bin/csh:
vail::333:1:Edna Vail Henry:/home/vail:/bin/csh:
```

providers, and how many administrative groups you want to administer network information at what points in the name service hierarchy are also topics of Part 2. You will also begin planning how you will establish access rights and how you will manage your transition from `/etc` files or NIS. Convenient flow charts and planning guidelines provided in this part of the book are invaluable.

Setting up the root domain and populating NIS+ tables is another topic covered in Part 2. The root domain, like the root of the UNIX file system, is central to your naming scheme. The first thing you will have to determine is what to call this root domain. The client `wizard.eng.magic.com` can't use NIS+ before its root domain `magic.com` and its non-root domain `eng.magic.com` have been established. You will learn how to populate NIS+ tables from `/etc` files and NIS maps and how to set up NIS+ clients and servers.

Part 2 closes with an explanation of how to configure the name service switch, described in Part 1, to properly provide alternate name services. The idea of the name service switch is similar to the "+" entry in the old `/etc/passwd` file, which instructed the system to look to NIS if the user wasn't

Figure 2: The niscat Command Displaying Passwd Table Structure

```
# niscat -o passwd.org_dir.nextpage.com
Object Name          : passwd
Owner                : nextpage.nextpage.com.
Group                :
Domain               : org_dir.nextpage.com.
Access Rights        : --rmcdrmcdr--
Time to Live         : 12:0:0
Object Type          : TABLE
Table Type           : passwd_tbl
Number of Columns    : 8
Character Separator  : :
Search Path          :
Columns              :

        [0]   Name           : name
              Attributes     : (SEARCHABLE, TEXTUAL DATA, CASE SENSITIVE)
              Access Rights  : ------------r----
        [1]   Name           : passwd
              Attributes     : (TEXTUAL DATA)
              Access Rights  :------m---------
        [2]   Name           : uid
              Attributes     : (SEARCHABLE, TEXTUAL DATA, CASE SENSITIVE)
              Access Rights  : ------------r----
        [3]   Name           : gid
              Attributes     : (TEXTUAL DATA)
              Access Rights  : ------------r----
        [4]   Name           : gcos
              Attributes     : (TEXTUAL DATA)
              Access Rights  : ------------r----
        [5]   Name           : home
              Attributes     : (TEXTUAL DATA)
              Access Rights  : -----m------r---
        [6]   Name           : shell
              Attributes     : (TEXTUAL DATA)
              Access Rights  : ------------r----
        [7]   Name           : shadow
              Attributes     : (TEXTUAL DATA)
              Access Rights  : -----------------
```

defined in the file itself. The `nsswitch.conf` file expresses alternate sources with lines that look like the line below, which says, for passwd information, look first to the `/etc/passwd` file, then to NIS+. NIS and DNS can also be referenced in this way:

```
passwd:     files nisplus
```

Administering NIS+

Part 3 tells you how to administer NIS+ once you've got it up and running on your network. You need to learn to use the `niscat` command as fluently as you did `ypcat` in NIS. Many of the new commands and options like `niscat passwd.org_dir.eng.magic.com` and `niscat -o passwd.org_dir.nextpage.com` provide very different data: The first provides information from the passwd table (see Figure 1), the other describes the structure of the table as shown in Figure 2.

Part 3 also includes details on how to create and administer NIS+ groups. NIS+ groups are not simply the NIS+ version of the `/etc/group` file, but include three separate and different kinds of groups: netgroups (workstation access permissions), NIS+ groups (assigning access rights for NIS+ objects) and workstation user groups (UNIX groups as derived from the `/etc/group` file).

You will also learn how to manage the credentials that identify requesters in NIS+ and determine access rights. You will learn about LOCAL and DES credentials, where they are stored, and how they are used. You will learn how to modify passwords and update public keys. You will also learn how to administer access rights for objects and table entries.

NIS+ directories are similar in concept to UNIX directories and correspond to different levels in the hierarchical name space. Commands to list the contents or structure of directories, create directories or add replicas, remove or dissociate a replica from a directory are explained so that you will understand how to maintain and customize NIS+. Figure 3 shows a recursive listing of an NIS+ directory.

You will also learn how to expand a directory into an NIS+ domain or an NIS+-compatible domain.

You will see how to start and stop the NIS+ daemon, `rpc.nisd`, as well as how to start the cache manager and look at contents of the NIS+ cache with `nisshowcache`. The Cache Manager, which runs on all NIS+ clients, maintains location information on which NIS+ servers are supporting most frequently used directories, a real performance booster over NIS.

You will also learn about the `nisping` command, which is used to keep NIS+ servers up-to-date using a checkpointing algorithm and the NIS+ log files. The `nisping` command sends a ping to replica servers telling them to ask for updates immediately. The command first checks the time of the last update received by the replicas and won't bother sending the ping unless it is needed.

The book will also teach you how to display and use the contents of the transaction log and manipulate the time-to-live of objects and entries in the name space, which determines how long they are maintained by the Cache Manager.

Table manipulation commands that allow you to create and delete tables or add and modify entries are also covered. You will learn how to search with `nismatch` and `nisgrep` for specific strings or regular expressions like the example shown below.

```
# nisgrep "^slee" passwd.org_dir.nextpage.com.
slee::111:14:S. Lee Henry:/export/home/slee:
       /bin/ksh:
```

You will learn how to use the `nisln`, which creates symbolic links between NIS+ objects and table entries.

Critical for your migration to NIS+, you will learn how to load information from `/etc` files and NIS maps into NIS+ tables and how to dump NIS+ maps.

With a lot of conceptual support, worksheets and howto's, and guidelines on planning, setting up and managing NIS+, this is a great book to read several months before you make the move to NIS+ and to have on hand forever. ⊷

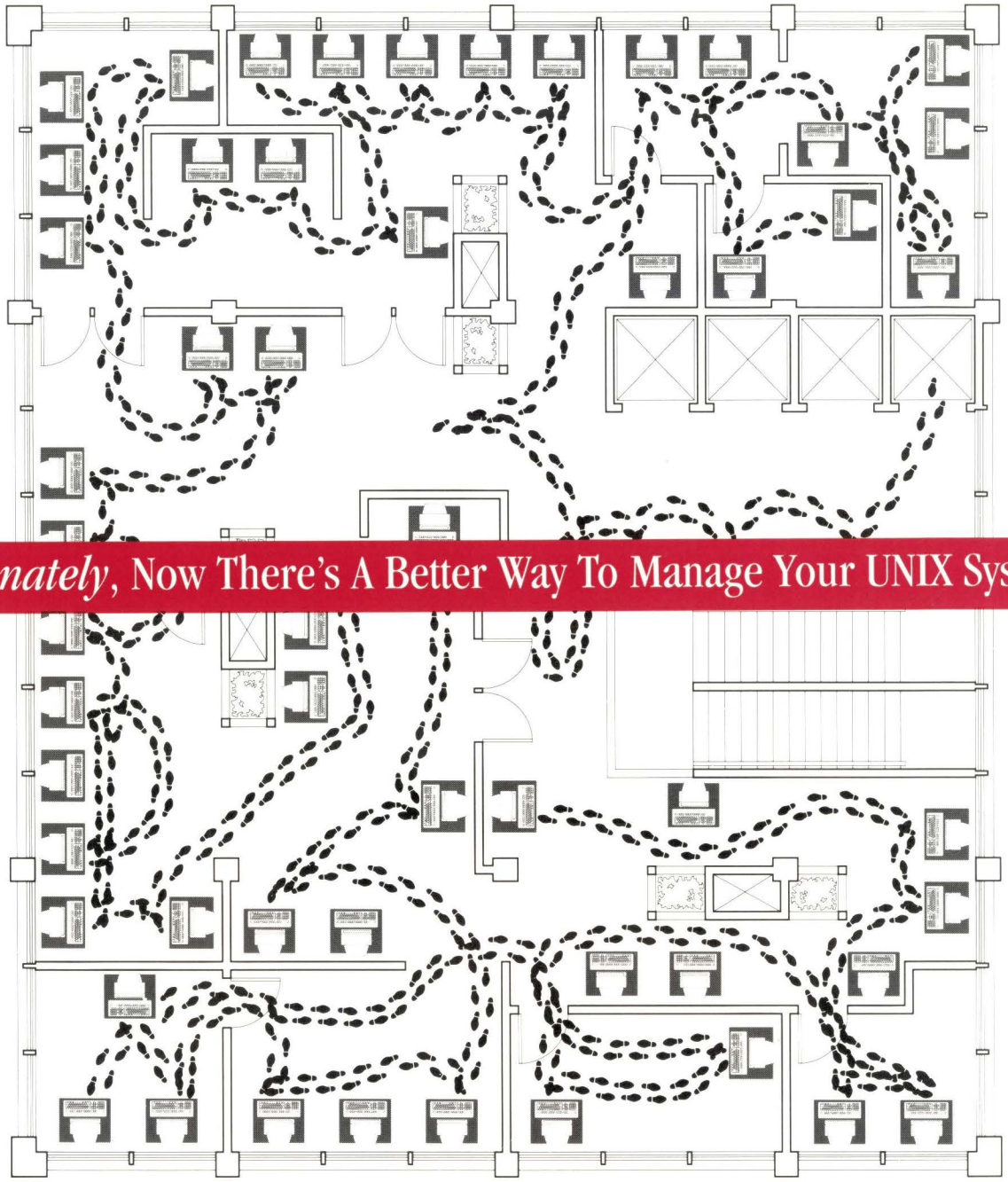
Figure 3. A Recursive Directory Listing with nisls

```
# nisls -R
nextpage.com.:
org_dir
groups_dir

groups_dir.nextpage.com.:

org_dir.nextpage.com.:
auto_master
auto_home
bootparams
cred
ethers
group
hosts
mail_aliases
sendmailvars
netmasks
netgroup
networks
passwd
protocols
rpc
services
timezone
```

S. Lee Henry is on the Board of Directors of The Sun User Group and is a system administrator for a large network of Suns in the federal government. Her email address is `slee@expert.com`.



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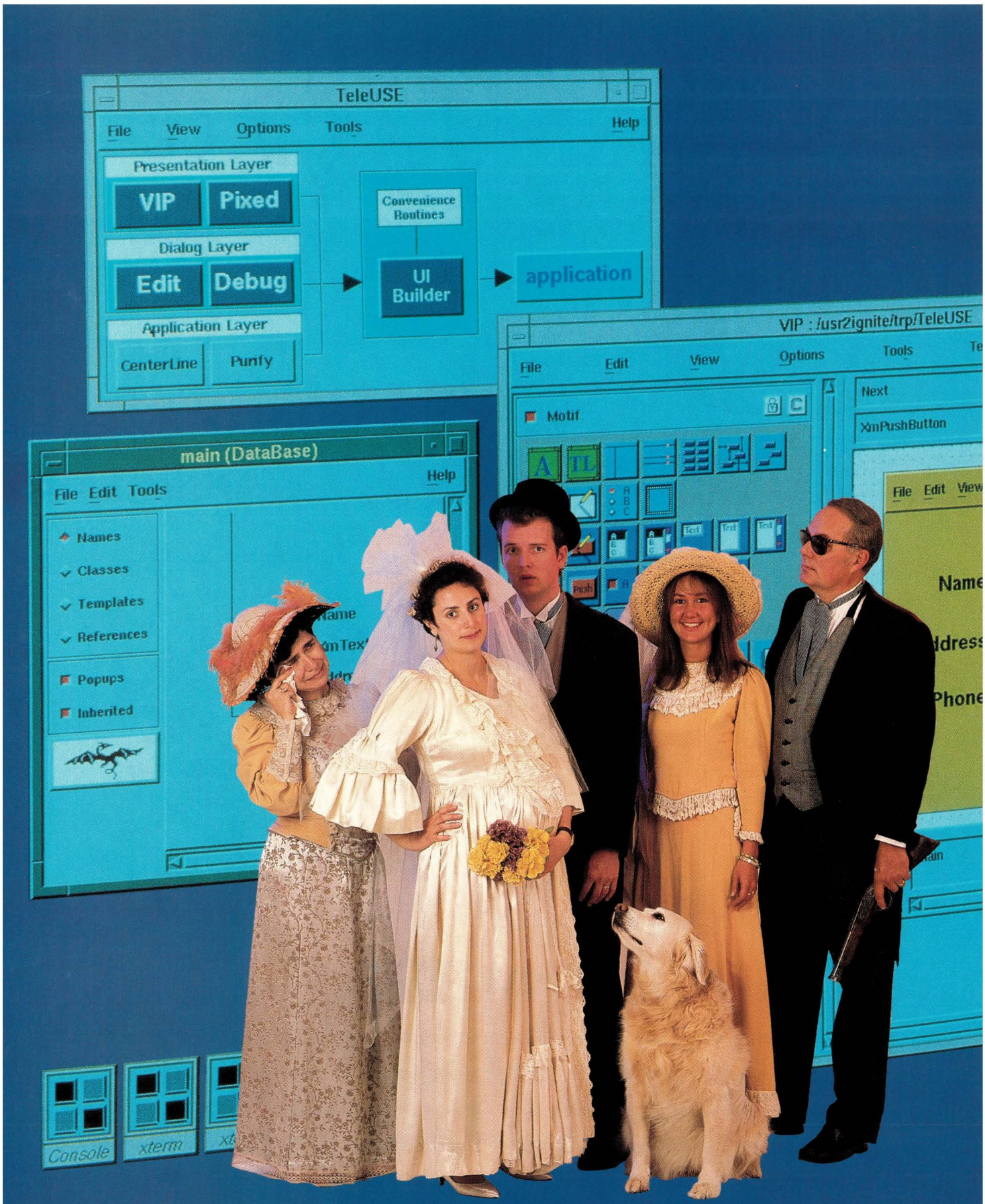
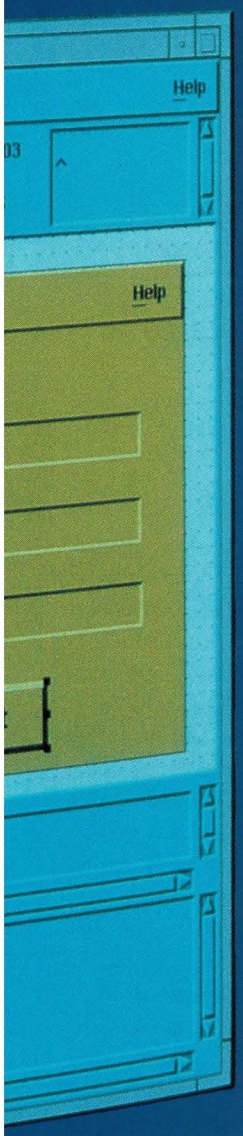
SUMB3



"I believe in mmm...marriage – I mean Motif."

– Scott McNealy at the March 17 press conference announcing Sun's support of the Common Open Software Environment, which will be based on Motif.

Shotgun Wedding



Cover Photography © Frank Siteman 1993.
Background screen image courtesy of Alsys Inc.

Forced to choose between two evils, Sun Microsystems Inc. CEO (and confirmed bachelor) Scott McNealy has spoken: Sun will replace its Open Look Intrinsics Toolkit (OLIT) and window manager with a Motif-based window manager and tool kit. While the move is monumental from Sun's standpoint, many developers will barely feel a ripple. This isn't because they plan to ignore Sun's strategic direction; rather, they have anticipated it and led it. And among the companies that have been furthest ahead in terms of expecting Sun's change of heart are the GUI builder vendors.

Scott conquers his fear of the 'M word' and frees Sun and all UNIX developers and users to focus on Motif.

---

by **MARY JO FOLEY,** Senior Editor

Whether they sell interactive development tools (IDTs), user-interface management systems (UIMSs), cross-platform development tools or visual-programming environments, nearly all of the GUI tool vendors have thrown their weight behind Motif–and have been doing so for a while now. The Motif versions of GUI builders have outsold the Open Look ones (in the rare cases that the vendors have bothered to do Open Look ports at all) by increasingly wide margins.

"The only reason people coded to Open Look was that Sun wouldn't demo their products if they didn't," claims Michael Foody, president of UIMS vendor Visual Edge Systems. "There was no reason to support Open Look other than to make Sun happy." Sun's about-face on the Motif issue has left many an independent software vendor who was loathe to commit to Motif dancing in the streets. Besides, as Foody and other GUI builder participants are quick to note, Sun's refusal to put all the wood behind the Motif arrow served to divide the UNIX development community's energy and resources–a rift they hardly can afford with Microsoft Corp. and its NT breathing down their necks.

Thanks to a little behind-the-scenes bargaining with Hewlett-Packard Co., IBM Corp., The Santa Cruz Operation/IXI and UNIX System Laboratories (see News section, "How Comfy is COSE?"), Sun has made these concerns moot. The major impact Sun's move will have on GUI builder vendors, says Peter Negulescu, Boston sales manager for UIMS vendor Non Standard Logics, is that it will enable them to refocus their development dollars and other resources. "We were planning on developing an OLIT tool." Instead, NSL is turning its attention to extending Motif by adding to its NSL Widget Library, he says.

For the dozen or so companies that have created a solid business for themselves during the past few years by taking raw Motif from the Open Software Foundation and patching and enhancing it so that it runs on Sun platforms, Sun's decision to begin bundling Motif with Solaris will prove more far-reaching. At press time, Motif for Sun sources, such as Integrated Computer Solutions Inc., SCO/IXI and Quest Windows Corp., among others, were clamoring for a chance to bend Sun's ear, in the hopes that Sun might adopt part or all of their technology in order to transition its customer base to Motif. In the longer term, like the GUI tool vendors, they will be refocusing their money and time on other tools.

Motif for Sun will continue to be a hot commodity for SunOS 4.X/Solaris 1.X customers, since Sun plans to introduce Motif only as part of Solaris 2.X.

"The street value of our Motif product will decrease to zero over time," acknowledges Judy Lazaro, marketing manager for ICS. "But we're still ecstatic. The Motif market just got huge–it increased one-hundred-fold. That's good news for our other products." And, until Sun delivers product, which is expected to be more than a year away, the Motif for Sun vendors will continue to sell their wares to a captive audience. As Lazaro points out, Motif for Sun will continue to be a hot commodity for SunOS 4.X/Solaris 1.X customers, since Sun plans to introduce Motif only as part of Solaris 2.X.

The 78% Factor

While most Sun users are pleasantly surprised by Sun's new GUI direction, for developers, the change isn't likely to be too profound. Estimates as to the number of Sun sites that already were confirmed Motif shops before the March 17 announcement are all over the board, ranging from as few as 15% to 20%, all the way up to the much publicized 78% figure touted by the Fremont, CA, market researchers at the X Business Group. The X Business Group claims 78% of the 400 sites it surveyed use Motif on at least one Sun workstation. It found that Motif was introduced into the Sun community primarily via Motif-based third-party applications that included a Motif license as part of the offering, rather than by Sun customers chucking their free Open Look copies and replacing them en masse with Motif.

Certain vertical industries, for example, oil and gas and financial services, have been gravitating toward Motif for a couple of years. The two have been influenced heavily by industry consortia–the Petrochemical Open Software Corp. (POSC) in the oil-industry case and the Electronic Joint Venture (EJV) Partnership in the financial one–to standardize around Motif. And the federal government has also been rallying around Motif, with a growing number of requests for proposals specifying at least the Xt Intrinsics tool kit, if not Motif itself, on all UNIX workstations.

At Western Geophysical, a Houston-based developer of marine seismic acquisition and navigational software, for instance, Motif has been the standard for a while now. On the 40+ Sun and handful of RS/6000 workstations that the company uses to develop software, Motif is the windowing standard, says software coordinator Bill Dittmman. "Some of our developers have Presentation Manager or Open Look, but our target is always Motif," he says. Western Geophysical began its Motif-on-Sun career with the Quest Windows QuestMotif product. It switched to Bluestone Consulting's Bluestone MWM "because we got better hand-holding from them," Dittmman explains. Currently, the company is employing 100 Bluestone

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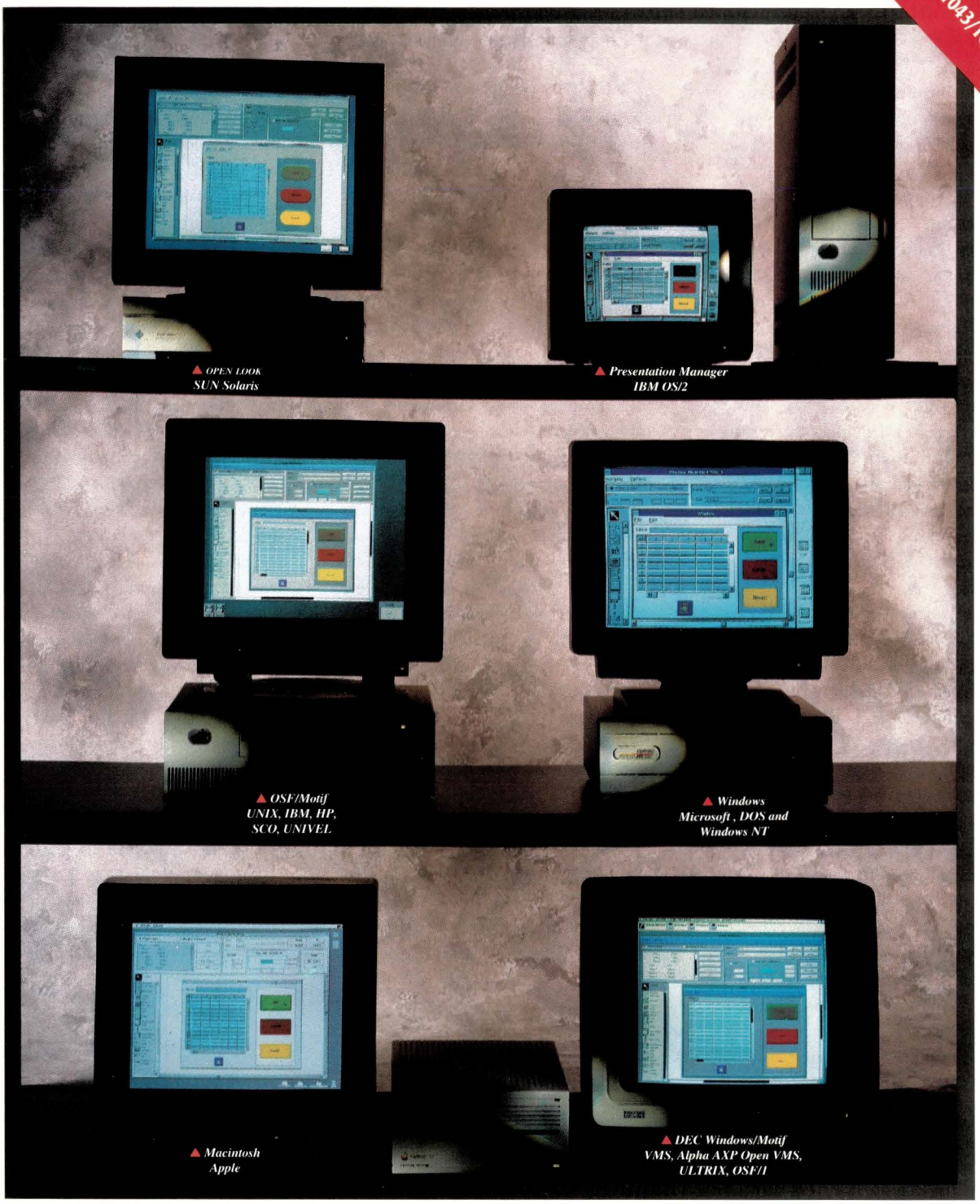

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licenses–50 of them internally and the other 50 on ships at sea.

Western Geophysical is also using Visual Edge's UIM/X on top of Bluestone Motif. It is licensing five copies from Bluestone for its eight or 10 programmers who are involved with GUI development, Dittmman says.

Another customer using Motif on Sun combined with UIM/X is a leading New York-based financial firm (which, like most of them, requests anonymity). Why Motif? It's due to the influence of the EJV, acknowledges Jay Dweck, a consultant to the firm from 100% Software Solutions of Denver, CO. When EJV was formed in 1990 by five financial institutions, it chose Sun running Motif as its first development platform for UniVu, the sales-support software it created. "There was also a view that Motif was more standard and portable," Dweck acknowledges.

At press time, the financial institution was slated to be making a "major [400 to 1,000 copies] purchase" of Motif in the near term. At that time, based on price, ICS was the leading bidder, Dweck said, but it was "still a bit of a tossup"–especially since Sun had just dropped its Motif bombshell.

At press time, the firm also was about to make a major investment (50 to 60 licenses this year, followed by 200 to 250 next year) in a GUI builder, most likely Visual Edge's UIM/X. The firm had been using six UIM/X licenses in its Fixed Income Research division for a few months. The division "has been furiously developing [data analysis] applications for workstations, doing windowing tool kits and adapting class libraries," as part of its upgrade from its Digital Equipment Corp. VAX-based environment, Dweck says. It found UIM/X to offer "the most customizable support" of the six GUI builder tools it evaluated, Dweck continues. "UIM/X is very customizable in terms of enforcing corporate policies. And [Visual Edge] was the furthest along in generating C++ code and in its tool's comprehensiveness."

There are some diehard SunView and OLIT developers, but the great migration to Motif is under way.

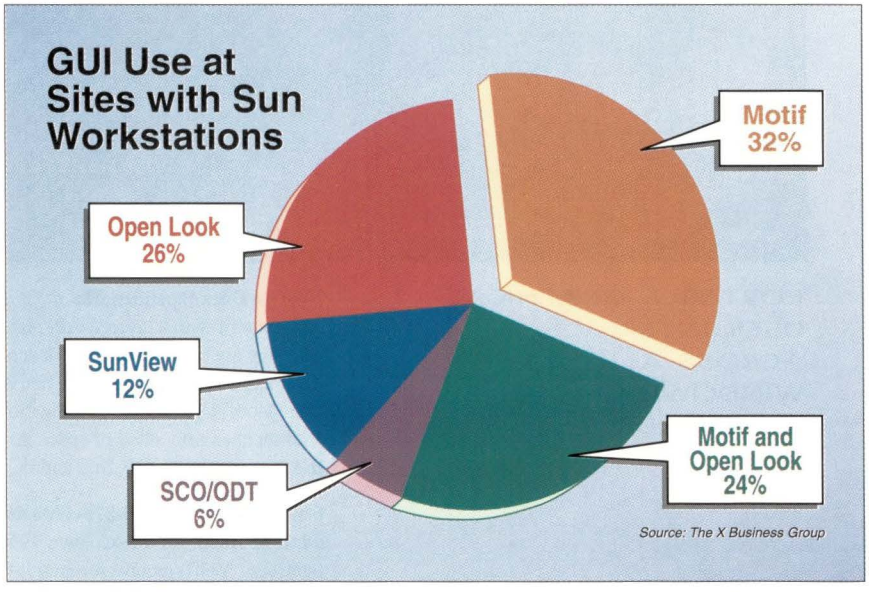
GUI Guys Make Good

Even with the Motif vs. Open Look standoff effectively called off, there are still plenty of projects to keep the GUI development guys going. The Motif for Sun players aren't the only ones about to weather a dramatic market shift. Companies that have focused the bulk of their efforts on developng XView and OLIT tool kits are likely to find the future tough sledding–even though the first implementations of the Common Open Software Environment (COSE) aren't expected before the middle of 1994. It's true that there are some diehard OLIT, XView and even SunView developers out there. The X Business Group, in fact, found in its survey last year that 32% of the Sun sites it surveyed were using Motif on their Suns; 26% were using Open Look; 24% a combination of Motif and Open Look; 12% SunView; and 6% SCO's Open DeskTop.

But the GUI guys that really stand to gain from Sun's newfound Motif fervor are those that market conversion tools and user-switchable UI tools. National Information Systems Inc., developers of the Accent tool kit, which allows users to run the Motif tool kit and choose either the Motif or Open Look window manager at run time, is one example. Sun's adoption of Motif "is going to help us more than hurt us," claims Vice President of Marketing Dave Wagner. "There are still at least three to four years of support [by Sun] left for Open Look customers. People will need a way of using the Motif tool kit to run applications in both environments."

"The move by Sun will give life to our conversion tools," concurs Nick Vitulli, vice president of Expert Object Corp. EXOC will have to do a good bit of retrofitting, regardless, of products such as its SunView-to-Open Look and SunView-to-Motif converters, since "no one's doing SunView source work anymore," according to Vitulli. Business for EXOC's XVconvert, its Open Look-to-Motif converter, as well as for its Hyper-Matrix programmable worksheet, should surge, he predicts.

Meanwhile, the GUI builder vendors are taking Sun's policy shift in stride and enjoying the freeing up of needed programmers and programming dollars. Two trends are emerging among GUI builder companies, no matter whether they are IDT, UIMS or visual-programming environment vendors: the addition of object-oriented links to their products and the extension of their existing offerings with new widgets. As a result of the increasing interest in object-oriented programming, collections of C++ class libraries from vendors such as Liant Software and Quest Windows are becoming more



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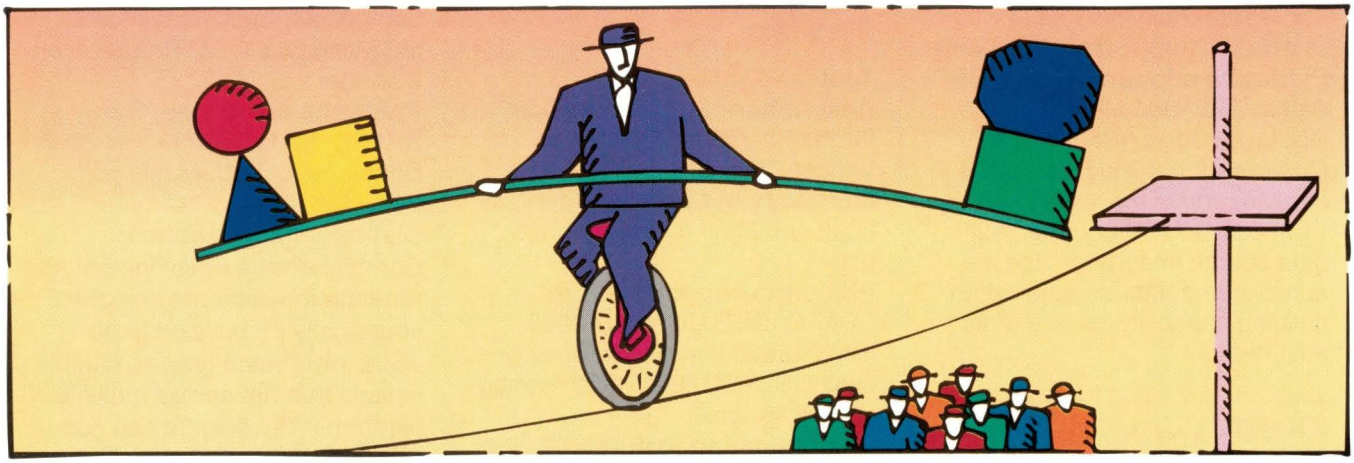

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Distinguishing features: Provides an Xlib interface to both X-display and laser printers. Supports PostScript and PCL, including scalable fonts, graphics and downloadable fonts.

Contexture Systems

One Exeter Plaza
Boston, MA 02116
Circle 240

Tool: Contessa 2.1
Description: Motif Database Application Building Tool
Interfaces supported: Motif only
Platforms supported: Sun, DEC Alpha, DEC Ultrix, HP, IBM
Distinguishing features: Contessa 2.1 (including the DB Module) combines a Visual Editor (X-based), 4GL language, multi-data source integration and an automated database application building capability, all in a Motif environment.

Kinesix Corp.

9800 Richmond Ave.
Suite 750
Houston, TX 77042
Circle 241

Tool: SAMMI
Description: DDVT (Dynamic Data Visualization Tool)
Interfaces supported: Open Look and Motif (in a single product)
Platforms supported: Sun, DEC, HP, IBM, IBM PS/2, Intel 386/486, Modcomp, MIPS, SGI
Distinguishing features: Open Architecture (X, Motif, UNIX, TCP/IP). No programming required for interface building. Independent application development by architectural design. Inherent data handling/network communication.

National Information Systems Inc.

4040 Moorpark Ave.
Suite 200
San Jose, CA 95117-1852
Circle 242

Tool: Accent Toolkit
Description: Xt Intrinsics Toolkit Supporting Motif and Open Look
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun SPARC, PCs running Solaris
Distinguishing features: Any Motif-compliant application can support Open Look "look and feel" by recompiling with Accent Toolkit.

Non Standard Logics Inc.

99 Bedford St.
Boston, MA 02111
Circle 243

Tool: Widget Factory
Description: Suite of Products for the Interactive Design of Widget Classes
Interfaces supported: Open Look and Motif (separate products)
Platforms supported: Sun SPARC, DEC Ultrix, HP 9000, IBM RS/6000, systems running Lynx OS, SCO, SGI, PCs running Univel, Motorola,
Distinguishing features: Allows the automatic generation of the Intrinsics class definition of a widget derived from the NSL Draw Widget, which supports a sophisticated set of graphic components animated by scripts. Widgets so designed include dials, animated drawings, charts and plots, etc.

V.I. Corp.

47 Pleasant St.
Northampton, MA 01060
Circle 244

Tool: DataViews
Description: Dynamic Data Visualization Tool
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun, Concurrent Series 7000/8000, DEC Alpha, DEC DECstation, DEC VAXstation, 88open, HP 9000, IBM RS/6000, Intel 386/486, SGI
Distinguishing features: Allows users to build a fully animated interface to help depict, analyze and regulate real-time industrial or scientific processes. DV-Tools, a comprehensive subroutine library that lets developers manage and manipulate displays created with DV-Draw, is included.

Visix Software Inc.

11440 Commerce Park Drive
Reston, VA 22091
Circle 245

Tool: Galaxy Application Environment
Description: Cross-Platform Development Environment
Interfaces supported: Open Look, Motif, Apple Macintosh, MS-Windows, OS/2 Presentation Manager
Platforms supported: Sun SPARC, IBM RS/6000, HP 9000 Series, SGI, DEC, Macintosh, PCs (486, 586)
Distinguishing features: Comprehensive development and run-time environment designed specifically for building large-scale, distributed graphical applications that run across multiple platforms. Developers can use Galaxy instead of the Apple Macintosh Toolbox, Windows SDK, Motif and Open Look tool kits. Galaxy provides a superset of the capabilities of these tool kits and lets developers take advantage of each platform's best features.

The WNDX Corp.

#305, 1550 8th St. S.W.
Calgary, Alberta
T2S 3B1 Canada
Circle 246

Tool: Portable GUI Development System
Description: Cross-Platform GUI Development Tools with GUI Builder
Interfaces supported: Open Look and Motif (in a single product that is user switchable), MS-Windows, Apple Macintosh, MS-DOS
Platforms supported: Sun SPARC, Apple Macintosh, HP, IBM RS/6000, Intel
Distinguishing features: Full GUI builder with cross-platform development tools.

Distinguishing features: Almost any type of 2D plot, chart or graph. Fast data updates. PostScript output. "Live" graphs that can respond to user events. Includes graph builder tool.

Tool: XRT/3d
Interfaces supported: Motif only
Platforms supported: Sun SPARC, HP 9000, IBM RS/6000
Distinguishing features: Displays 3-D surface data. Automatically contours and zones data. Supports rotation and perspective. PostScript output. "Live" graphs can respond to user events.

Melillo Consulting Inc./MJM Software

17 Clyde Road
Suite 202
Somerset, NJ 08873
Circle 234

Tool: MoOLIT Graphical User Interface Release 5
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun, DEC, HP 9000, IBM RS/6000
Distinguishing features: OpenWindows 3.0, Sun OLIT 2.5 API, USL OLIT 4i API compatibility; dramatic memory efficiency with flattened widgets, full internationalization.

Non Standard Logics Inc.

99 Bedford St.
Boston, MA 02111
Circle 235

Tool: NSL Widget Library
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC Ultrix, HP 9000, IBM RS/6000, Lynx OS, Motorola, SCO, SGI, Univel
Distinguishing features: Table widget for presentation of tabular data; draw widget manages animated drawing; control widgets for industrial control and simulation; plotting and charting widgets.

CLASS LIBRARIES

ILOG Inc.

2073 Landings Drive
Mountain View, CA 94043
Circle 236

Tool: ILOG Views
Interfaces supported: Open Look and Motif (in a single product that is user switchable), MS-Windows, Windows NT, OS/2 Presentation Manager
Platforms supported: All UNIX (Sun, HP, SGI, DEC), PCs running MS-Windows, NT or OS/2 Presentation Manager
Distinguishing features: Complements the standard widget set of windowing systems; provides a C++ Library of graphical objects.

Liant Software Corp.

959 Concord St.
Framingham, MA 01701
Circle 237

Tool: C++/Views
Interfaces supported: Apple Macintosh, Motif, MS-Windows, OS/2 Presentation Manager
Platforms supported: UNIX-based workstations, Apple Macintosh, IBM compatible PCs
Distinguishing features: Uses the native "look and feel" features of each GUI, instead of "simulated" features. Includes interactive class browser-based on third-generation object-oriented development framework. Class browser=C++ class browser.

XVT Software Inc.

4900 Pearl East Circle
Boulder, CO 80301
Circle 238

Tool: XVT-Design ++
Interfaces supported: Open Look and Motif (separate products), MS-Windows, Windows NT, Apple Macintosh, OS/2 Presentation Manager
Platforms supported: Sun SPARC, DECstation, DEC VAX, HP 9000 Series, IBM PC or PS/2, IBM RS/6000, Interactive 386/ix, SCO UNIX
Distinguishing features: Layered API above the native tool kit for true native "look and feel." Complete access to the underlying tool kit; portable help and print.

MISCELLANEOUS

Bristol Technology

241 Ethan Allen Highway
Ridgefield, CT 06877
Circle 239

Tool: HyperHelp
Description: On-Line Context Sensitive Help Facility
Interfaces supported: Open Look and Motif (separate products)
Platforms supported: Sun SPARC, HP 700, IBM RS/6000, DECstation SVR4 on X86, SCO
Distinguishing features: Help files can be authored by MS Word, WordPerfect or AMI Pro, which output RTF, Frame Maker, which outputs MIF, or any text editor such as vi or Emacs; HyperHelp accepts the same RTF files, project files and bit-map files as MS-Windows Help.

Tool: Wind/U
Description: Portability Took Kit
Interfaces supported: Motif, MS-Windows
Platforms supported: Sun SPARC, HP 700, IBM RS/6000, SVR4 on Intel
Distinguishing features: MS-Windows-to-Motif portability tool kit; source code for MS-Windows applications is recompiled on a UNIX machine and linked with Wind/U, yielding a native UNIX/Motif version of the application.

Tool: Xprinter
Description: PostScript and PCL Printing Library
Interfaces supported: X Window (both Open Look and Motif)
Platforms supported: Sun SPARC, DEC DECstation, HP 9000, IBM RS/6000, SCO, SVR4

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Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC Ultrix, DG Aviion, HP 9000, IBM RS/6000, MIPS, Motorola, NCR, SCO, SGI
Distinguishing features: Generates pure Motif code in either K&R or ANSI C style; can read and write UIL. In addition, an integrated C interpreter specifically customized for interface building enables developers to interactively create, modify and test user interfaces while an underlying application is connected and running.

VISUAL PROGRAMMING ENVIRONMENT

Harlequin Limited

Barrington Hall
Barrington
Cambridge CB2 5RG
England
Circle 226

Tool: ClassWorks
Interfaces supported: Open Look and Motif (in a single prduct that is user switchable)
Platforms supported: Sun SPARC, Sun-3, DEC DECstation, HP 9000, IBM RS/6000, Intergraph, MIPS
Distinguishing features: Tailored for object-oriented development using the common LISP object system.

Oberon Software Inc.

One Memorial Drive
Cambridge, MA 02142
Circle 227

Tool: SynchroWorks
Interfaces supported: Motif Only
Platforms supported: Sun SPARC
Distinguishing features: A 5GL that features utilization of modules of software and "wiring" them together, allowing for savings during developing, testing and revising. Allows users to see work on-screen during the development and debugging process.

Science Applications International Corp.

Market Focus Technologies Division
10260 Campus Point Drive
San Diego, CA 92121-1578
Circle 228

Tool: Visual Programming Environment (VPE)
Interfaces supported: Open Look and Motif (in a single product that is user switchable), OS/2 Presentation Manager
Platforms supported: Sun, DEC, HP, IBM, Intel PCs (SCO, Solaris), NCR, SGI
Distinguishing features: Includes concepts, features and attributes of screen builders, object-oriented programming languages, 3GLs and 4GLs to produce a powerful, flexible development system.

Servio Corp.

2085 Hamilton Ave.
Suite 200
San Jose, CA 95125
Circle 229

Tool: GeODE V 2.0
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC DECstation, HP 9000, IBM RS/6000, Sequent DYNX PTX
Distinguishing features: Code-free object development environment, visual schema designer, visual program design, visual forms designer.

WIDGET LIBRARIES

Expert Object Corp.

500 Hyacinth Place
Highland Park, IL 60035
Circle 230

Tool: HyperMatrix
Interfaces supported: Open Look and Motif (separate products)
Platforms supported: Sun SPARC, DEC Alpha AXP, DEC DECstation, HP 9000
Distinguishing features: HyperMatrix adds the functionality of a spreadsheet to UNIX GUI tool kits; simplifies the task of building database front ends.

Integrated Computer Solutions Inc.

201 Broadway
Cambridge, MA 02139
Circle 231

Tool: ICS Widget Databook
Interfaces supported: Open Look and Motif (separate products)
Platforms supported: Sun, DEC, IBM, SGI, HP
Distinguishing features: A collection of thoroughly tested Motif and Open Look widgets from all over the world. Instead of spending months developing custom widgets, browse through a detailed portfolio of reliable widgets.

Interactive Network Technologies Inc.

10500 Richmond
Suite 224
Houston, TX 77042
Circle 232

Tool: INT Widget Libraries
Interfaces supported: Motif only
Platforms supported: Sun, HP, DEC, IBM, Cray
Distinguishing features: Motif widgets for general-purpose and geoscience applications. PostScript and CAM+ output from all widgets.

KL Group Inc.

134 Adalaide St. East
Suite 204
Toronto, Ontario
Canada M5C 1K9
Circle 233

Tool: XRT/graph
Interfaces supported: Open Look and Motif (separate products)
Platforms supported: Sun SPARC, DEC DECstation, HP 9000, IBM RS/6000, SCO Open Desktop, SGI, UNIX V.4 on 386/486

UIMS

Alsys Inc.

CASE Division
5959 Cornerstone Court, West
San Diego, CA 92121
Circle 218

Tool: TeleUSE
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC Alpha, DEC DECstation, HP 9000 Series, IBM RS/6000, Intel 386/486, NCR 3000, Intel 386/486, SCO, SGI
Distinguishing features: Full development life cycle support–prototyping to maintenance; true OOD methods, special tools for the static and dynamic parts of the application, event debugger, widget tree editor; integrates with C, C++, Ada, SQL and other languages. Works with custom widgets.

Harlequin Limited

Barrington Hall
Barrington, Cambridge
CB2 5RG England
Circle 219

Tool: CAPI
Interfaces supported: Motif, MS-Windows
Platforms supported: Sun SPARC, DEC DECstation, HP, IBM RS/6000, Intel 386/486, Intergraph, MIPS, SGI
Distinguishing features: Manages the look and feel of a Common LISP application so that it maps directly into the interface of target platforms. A Motif application can be ported to MS-Windows at the touch of a button.

Tool: CLIM
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC DECstation, HP, IBM RS/6000, Intergraph, MIPS, SGI
Distinguishing features: A UIMS for Common LISP developers. It fits into an existing host system and can achieve the "look and feel" of a target host system.

ILOG Inc.

2073 Landings Drive
Mountain View, CA 94043
Circle 220

Tool: ILOG Builder
Interfaces supported: Open Look and Motif (in a single product that is user switchable), MS-Windows, NT, OS/2 Presentation Manager
Platforms supported: All UNIX (Sun, HP, SGI, DEC), PCs running MS-Windows, NT, OS/2 Presentation Manager
Distinguishing features: Supports both Motif and its own portable "look" and can be extended with custom widgets. Programming is done in an interactive and interpreted environment which compiles into C code.

NASA/Goddard Space Flight Center

TAE Support Office/Code 522
Greenbelt, MD 20771
Circle 221

Tool: Transportable Applications Envronments (TAE) Plus
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC DECstation, DEC VAX/VMS, HP 9000, IBM RS/6000, SGI
Distinguishing features: Provides an intuitive WYSIWYG editor tool (the WorkBench) that supports the interactive design and layout of an application's user interface and run-time libraries that display and manage the application's user interface. In addition to the Motif widgets, WorkBench supports the design of Data-Driven Objects (DDOs), which are vector-drawn graphical objects linked to application data variable. Provides a code generator for C, C++ and Ada applications.

Non Standard Logics Inc.

99 Bedford St.
Boston, MA 02111
Circle 222

Tool: XFaceMaker
Interfaces supported: OpenLook and Motif (separate products)
Platforms supported: Sun SPARC, DEC, HP 9000, IBM RS/6000, Lynx OS, SCO, SGI, Motorola, Univel
Distinguishing features: Generates intrinsics code for widget class; object-oriented design through templates supporting full multiple inheritance; generates C, UIL and X resource files; extends application callback communication through a data communications mechanism; interprets scripting language sets compiled into C code.

Quest Windows Corp.

4677 Old Ironsides Drive
Santa Clara, CA 95054
Circle 223

Tool: Quest Object Views C++
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun SPARC
Distinguishing features: Quest Object Views C++ environment includes ObjectBuild, Object Draw, ObjectGraphics and a C++ class browser, ObjectBrowse.

Sunrise Software International

170 Enterprise Center
Middletown, RI 02840
Circle 224

Tool: ezX
Interfaces supported: Motif only
Platforms supported: Sun SPARC, IBM RS/6000, DEC Ultrix, DEC VAX/VMS, SCO, SGI
Distinguishing features: Provides a single API to all widgets and integrates user-defined interpreters to enhance dialog management functions.

Visual Edge Software Ltd.

3870 Cote Vertu
St-Laurent, Quebec
H4R 1V4 Canada
Circle 225

Tool: UIM/X

ParcPlace Systems Inc.

999 E. Arques Ave.
Sunnyvale, CA 94086-4593
Circle 212

Tool: VisualWorks
Interfaces supported: Open Look, Motif, MS-Windows, Macintosh, OS/2 Presentation Manager, NeXTSTEP
Platforms supported: Sun-4, Apple Macintosh, DEC DECstation, HP 9000, IBM PS/2, IBM RS/6000, NeXT, Sequent Symmetry
Distinguishing features: Object-oriented application development environment for corporate developers creating GUI-based, client server application that are portable across PC, Mac and UNIX platforms; connectivity to relational and hierarchical legacy databases and a reusable application framework.

Tool: ObjectBuilder
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun SPARC, DEC DECstation, HP 9000, IBM RS/6000
Distinguishing features: Includes (and is built on top of) The Object Interface Library. OI implements both the Motif and Open Look "look and feel" with no run-time royalties. New user interface objects can be subclassed from OI and added to the builder's palette, allowing customization of the builder tool for a specific company's standards.

SL Corp.

240 Tamal Vista Blvd. #110
Corte Madera, CA 94925
Circle 213

Tool: SL-GMS
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun, HP, DEC, 88Open, IBM RS/6000, MIPS, SCO, SGI
Distinguishing features: Customized drawing editor that allows the creation of customized dynamic objects. Extensive function libraries that allow binding to real-time data and control of GUI application.

SunSoft Inc.

2550 Garcia Ave.
Mountain View, CA 94043-1100
Circle 214

Tool: Devguide V 3.0.1
Interfaces supported: Open Look only
Platforms supported: Any Solaris-based system for SPARC or Intel x86
Distinguishing features: Code generators provide the appropriate OLIT or XVIEW code to define the user interface; interface browser provides a graphical and hierarchical representation of the user interface objects, enabling users to easily modify, copy, move or delete portions of the user interface. The Project Manager allows for multiple interface to be grouped together in a project, for large application design.

Tigre Object Systems Inc.

113 Kirby St.
Santa Cruz, CA 95060
Circle 215

Tool: Tigre Programming Environment, V 2.0
Interfaces supported: Open Look, Motif, MS-Windows, Macintosh, OS/2
Platforms supported: Sun SPARC, HP, IBM RS/6000, Macintosh, MS-Windows, Next, Sequent
Distinguishing features: Tigre is a sophisticated class library and interface builder for ParcPlace Smalltalk. It greatly simplifies building applications by providing convenient drag-and-drop interface building in a platform-independent fashion, providing all of the widgets an MIS person would expect. Applications built in Tigre port from one machine to the next (including application logic) and automatically adopts the host "look and feel."

V.I. Corp.

47 Pleasant St.
Northampton, MA 01060
Circle 216

Tool: X-Designer
Interfaces supported: Motif only
Platforms supported: Sun SPARC, Sun-3, Apple Macintosh, DEC DECstation, DEC VAXstation, DG Aviion, HP 9000, IBM RS/6000, Intel 386/486
Distinguishing features: X-Designer includes full support for Motif 1.2 and X11R5, C++ code generation, HyperText help capability and an improved layout editor. There is also an option to generate C, ANSI C, UIL Code and X resource files. (This product was developed by Imperial Software Technology and is resold in the U.S. exclusively by V.I. Corp.)

XVT Software Inc.

4900 Pearl East Circle
Boulder, CO 80301
Circle 217

Tool: XVT-Design 2.0
Interfaces supported: Open Look and Motif (separate products), MS-Windows, Windows NT, Macintosh, OS/2 Presentation Manager
Platforms supported: Sun SPARC, Apple Macintosh, DECstation, HP 9000 Series, IBM PC or PS/2, IBM RS/6000, SCO
Distinguishing features: Action Code Editor allows users to enter and preserve function calls within generated code; connections manager allows user to interactively create connections between GUI objects; test mode for prototyping interface behavior without building applications; make file generation; reusable event-handler classes.

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Circle No. 42 on Inquiry Card

ImageSoft Inc.

2 Haven Ave.
Port Washington, NY 11050
Circle 204

Tool: CommonView
Interfaces supported: Motif, MS-Windows, OS/2 Presentation Manager
Platforms supported: Sun SPARC, DEC Ultrix, HP UX, IBM RS/6000, SCO
Distinguishing features: CommonView is an application framework, a set of predefined C++ classes, which enables developers to create a single, portable, simplified graphical user interface program.

Imperial Software Technology Ltd.

Enterprise House
95 London St.
Reading RG1 4QA
England
Circle 205

Tool: X-Designer
Interfaces supported: Motif only
Platforms supported: Sun-3, Sun SPARC, Apple Macintosh, DG Aviion, DEC DECstation, DEC VAXstation, Hitachi, HP Apollo Domain, IBM RS/6000, ICL, Intel 486 SRV4, Interactive, Mitsubishi, NCR 3000, Omron, SCO, SGI, Sony
Distinguishing features: Includes form layout editor, full Motif–including Motif string editor, no run-time system or proprietary libraries; C and C++ generation, support for building hypertext help systems; X11R5 and Motif 1.2 support. Product is distributed in the United States exclusively by V.I. Corp.

Integrated Computer Solutions Inc.

201 Broadway
Cambridge, MA 02139
Circle 206

Tool: Builder Xcessory
Interfaces supported: Motif only
Platforms supported: Sun, DEC, HP, IBM, SCO, SGI
Distinguishing features: Can generate C, UIL or Ada code without royalties or run-time modules; integration with CenterLine Software's CodeCenter; ICS widget databook compatibility.

IXI Corp.

One Annabel Lane
San Ramon, CA 94583
Circle 207

Tool: Deskterm
Interfaces supported: Motif only
Platforms supported: Sun SPARC, SunOS, DG Aviion, DEC Ultrix, Dell SRV4, HP 9000 Series, IBM RS/6000, Intel V.4, MIPS, NCR, SCO, SGI
Distinguishing features: No X knowledge is required. Can be used with non-UNIX applications. Can be used to add a graphical front end to software written in languages that don't have an X library; GUI independent.

iXOS Software GmbH

Technopark
Bretonischer Ring 12
W-8011 Grasbrunn
Munich, Germany
Circle 208

Tool: iXBUILD 2.1
Interfaces supported: Motif only
Platforms supported: Sun SPARC, DEC DECstation, HP 9000, IBM RS/6000, Intel 80386/80486 PCs, SGI (MIPS) R3000/4000
Distinguishing features: Object-oriented programming in C++; Powerful tree and search editors. No run-time licenses or fees required for interfaces created with iXBUILD. Links to programming environments from CenterLine Software. Interface to existing database schemas for easy conversion of database tables.

ADNT/Metro Link

4, Rue Louis Massotte
78530 BUC
France
Circle 209

Tool: SNAPIX
Interfaces supported: Motif only
Platforms supported: Most UNIX (Sun, Bull, HP, IBM, ISC, SCO, SGI)
Distinguishing features: Employs an object-oriented language (with inheritance, polymorphism, instantiation); event driven (message interception), strongly typed and structured (C syntax), and includes a full-featured graphic editor that generates SNAPIX source code, synchronized with text editors for easy development.

Neuron Data Inc.

156 University Ave.
Palo Alto, CA 94301
Circle 210

Tool: Neuron Data Open Interface
Interfaces supported: Open Look and Motif (separate products), OS/2 Presentation Manager, MS-Windows, NT and Apple Macintosh
Platforms supported: Any computer platform
Distinguishing features: Superset library architecture allows GUI development with a "look-and-feel independence."

Open Inc.

660 Southpointe Court
Suite 200
Colorado Springs, CO 80906
Circle 211

Tool: Aspect
Interfaces supported: Open Look, Motif, MS-Windows, Apple Macintosh, UNIX character terminals
Platforms supported: Sun SPARC, Apple Macintosh, DEC DECstation, HP, IBM RS/6000, MIPS, PCs, other UNIX workstations
Distinguishing features: Uses native GUI tool kits; Interactive resource builder; C programming API producing portable user interface code.

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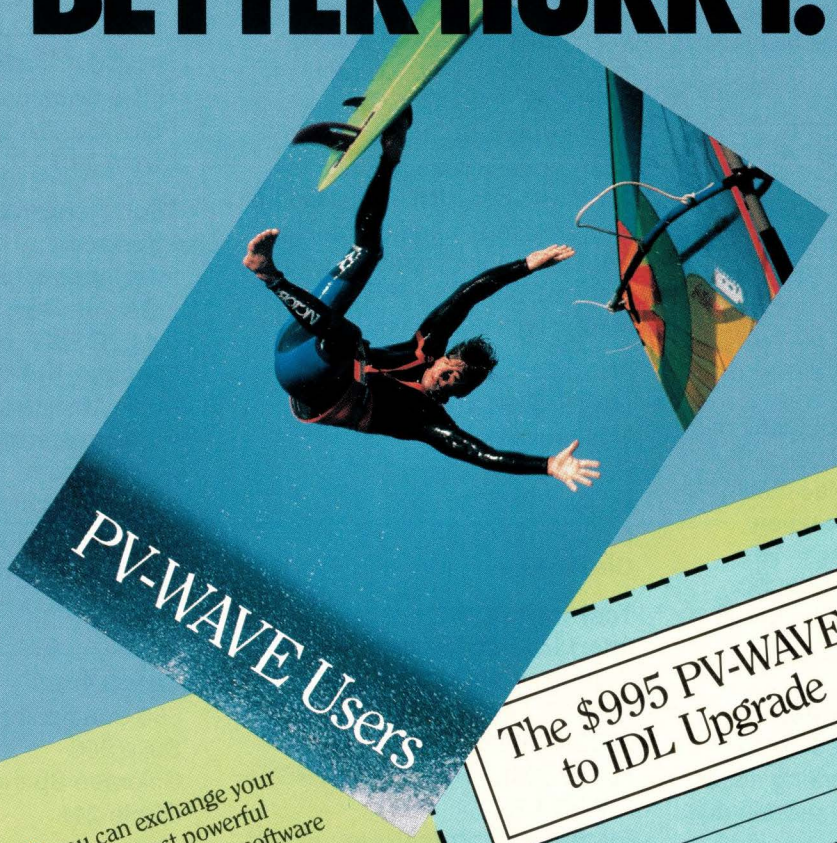

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Circle No. 37 on Inquiry Card

GUI Development Tools

IDT

Cambridge Connectivity Ltd.
192 High St.
Cottenham
Cambridge CB4 4RX
England
Circle 200

Tool: Soft Option
Interfaces supported: Motif and MS-Windows
Platforms supported: All UNIX platforms

COSMIC

382 East Broad St.
Athens, GA 30602-4272
Circle 201

Tool: TAE PLUS V. 5.2
Interfaces supported: Motif only
Platforms supported: Sun-4, DEC Ultrix, IBM RS/6000, SGI
Distinguishing features: Source code included; unlimited site license; no run-time fees, developed by NASA.

Expert Object Corp.

500 Hyacinth Place
Highland Park, IL 60035
Circle 202

Tool: ExoCODE/Plus
Interfaces supported: Open Look only
Platforms supported: Sun SPARC
Distinguishing features: ExoCODE/Plus generates native XView tool kit calls without wrappers or proprietary routines; Modular code-generation facilitates revision of application source code.

ICL

Mid Range Systems
Lovelace Road
Bracknell, Berkshire
RG12 8SN England
Circle 203

Tool: GraphicsPower
Interfaces supported: Open Look and Motif (in a single product that is user switchable)
Platforms supported: Sun SPARC (SunOS 4.1.X), Fujitsu DS/90 7000 Series SPARC workstation (SVR4.0), ICL DRS 3000 (Intel-SVR4), ICL DRS 6000 (SPARC SVR4)
Distinguishing features: Provides applications developers with a set of display objects designed to present real world data graphically.

Compiled by MAUREEN MCKEON

© Frank Siteman 1993

Design++ to be portable across seven different GUIs.

V.I. Corp.'s Release 3.0 of its X-Designer product includes C++ code generation among its list of enhanced features. As of its March announcement, V.I. Corp. customers can generate C, ANSI C and Motif UIL code, in addition to C++.

Widgets are the other big area of expansion for GUI builder companies and their customers. ICS is continuing its Widget Databook program, which it launched last year. "The program has been successful," maintains company President Peter Winston, "but it's been a lot more work than I thought it would be. It's been tough keeping up with the various formats, releases and updates. There has been a lot of curiosity, but only a handful of customers buying more than just a few combo boxes, spreadsheet [widgets] and bar chart [widgets]." Winston notes that "customers are still worried about the quality of widgets," and justifiably so. ICS rejects three of every four widgets offered by software developers for inclusion in the Databook.

The Free Widget Foundation (FWF) project, begun in 1990, continues to plod along with volunteer effort. (To be added to the mailing list, contact `free-widget@kazoo.cs.uiuc.edu`.) The group makes a variety of widgets available by anonymous ftp. FWF says its widgets have been used in the development of several applications.

Other individual GUI builder vendors are concentrating on developing and/or acquiring their own, customizable widgets and incorporating them into their product offerings.

The Lofty and the Mundane

There are more mundane GUI builder concerns than the more lofty and far-reaching C++ and widget extensions. Software maintenance is a pressing one, says Alsys' product marketing manager, Larry Vernec. "Should GUI builders be put on the shelf, leaving maintenance to be done by hand?" he asks. "Or do developers expect these tools to support changes through the GUI life cycle?" Vernec claims the answer is the latter and says this is an area where UIMS systems have it all over IDTs.

Whether or not to move their GUI builders to Intel platforms–and when and how Motif itself will be ported to PCs–is another preoccupation of GUI development companies. "There are folks at Sun who are eager for us to get Motif on Intel," claims ICS' Winston. "The question is how much pressure [Microsoft's] NT will put on the community." The GUI builder vendors themselves seem split as to whether or not they should port to NT. Some claim UNIX and Sun in particular will remain the No. 1 software development platform for the foreseeable future. Others see NT emerging as a credible rival platform for application development.

Finally, there's the much debated issue of what the next generation of user-interface technology will look like. Before Sun axed the Open Look tool kit and window manager, most industry watchers expected the company to offer a new object-oriented GUI and related tool kit that would be part of its Project Distributed Objects Everywhere (DOE) that would exist alongside Open Look. "It is supposed to look like Open Look, but won't be OLIT-, OpenWindows- or even Xt Intrinsics-based," says Winston. Most expect Sun will continue its DOE GUI work, in addition to its COSE development.

Meanwhile, the OSF is expected to forge ahead with its own next-generation interface technology, called User Environment Component (UEC) II. Little concrete information is available at this point as to what form UEC II will take or when it will be available. Some pundits say UEC II will be an object-oriented tool kit; others predict it will be a complete UIMS. The environment is expected to run on all kinds of platforms, possibly even those that don't support X. How DOE and UEC II will compete or cooperate is anyone's guess. ⊸

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popular among GUI developers. In the evolving object paradigm, each widget corresponds to an object, and all widget functions are built into objects.

"C++ is where our development is going," says Non Standard Logics sales manager Negulescu. "Developers want to be able to link into C++." Currently, its builder, XFaceMaker, supports ANSI C, via which users can link into C++. True C++ support is expected as part of a future release.

A number of NSL's competitors already have developed C++ hooks into their GUI builders. Some, such as Alsys (formerly Telesoft), are achieving a degree of object orientation by forging links with C++ compilers and other point products, as Alsys has done with CenterLine Software's ObjectCenter.

Visual Edge Software added GUI object class components and a C++ code generator to Release 2.5 of its product, which it unveiled in February. The class component capability "enables developers to build, using drag-and-drop, GUI object classes that comply with the Object Management Group's CORBA [Common Object Request Broker Architecture] C API specification," according to Visual Edge. Because users can employ reusable, customizable GUI class components in developing their interfaces, they are assured of a level of cross-platform portability not achievable previously, says the company.

XVT Software Inc. created a whole new package, XVT-Design++, for developing C++ applications. The package includes an interactive design tool for user interfaces that incorporates a C++ code-fragment editor and a C++ application framework. (In the GUI builder world, application frameworks are libraries of predefined objects, bundled with customizable application templates.) At the February announcement of the product, XVT also unveiled the XVT portability tool kit, a layered API that allows applications developed in XVT-

Motif for Sun Sources

For those who can't wait another year or two for the first Motif for Sun implementations from Sun, here are a number of other vendors from which you can purchase Motif for your Sun platforms today.

Bluestone Consulting
1200 Church St.
Mt. Laurel, NJ 08057
Product name: Bluestone MWM
Circle 141

Digital Equipment Corp.
110 Spit Brook Road
Nashua, NH 03062
Product name: DECwindows Motif for the Sun SPARCstation
Circle 142

Information Technology Consultants Pty. Ltd.
27 Hampden St.
Paddington, NSW 2021
Australia
Product name: OSF/Motif
Circle 143

Integrated Computer Solutions Inc. (ICS)
201 Broadway
Cambridge, MA 02139
Product name: Motif for Sun
Circle 144

IXI Corp.
(a division of The Santa Cruz Operation)
One Annabel Lane
San Ramon, CA 94583
Product name: IXI Motif for Sun
Circle 145

iXOS Software GmbH
Technopark
Bretonischer Ring 12
W-8011 Grasbrunn/Munich
Germany
Product name: iXMOTIS
Circle 146

Metro Link Inc.
2213 West McNab Road
Pompano Beach, FL 33069
Product name: Motif and X11R5 for SunOS
Circle 147

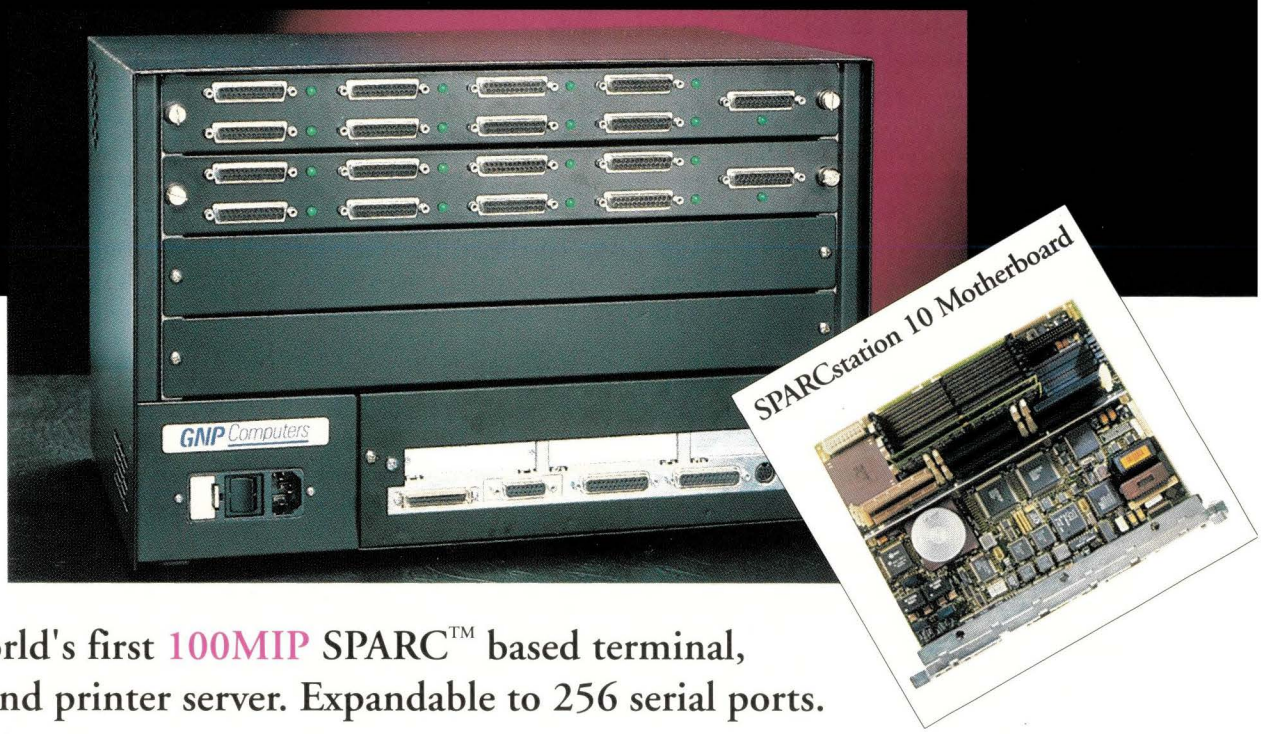
Quest Windows Corp.
4677 Old Ironsides Drive
Santa Clara, CA 95054
Product name: QuestMotif
Circle 148

Science Applications International Corp. (SAIC)
10260 Campus Point Drive
San Diego, CA 92121
Product name: SAIC VUE
Circle 149

SI Systems Ltd.
1400 505 Third St. SW
Calgary, Alberta T2P 3E6
Canada
Product name: Motif and X11R5 for Sun SPARC
Circle 177

Unipress Software
2025 Lincoln Highway
Edison, NJ 08817
Product name: Unipress Motif for Sun
Circle 178

Introducing the DEI-10 WorkServer™



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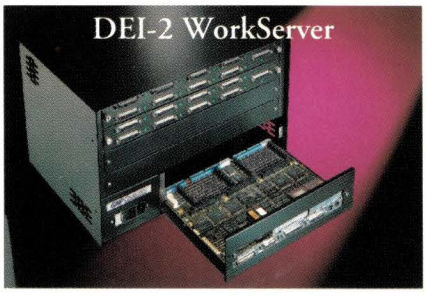

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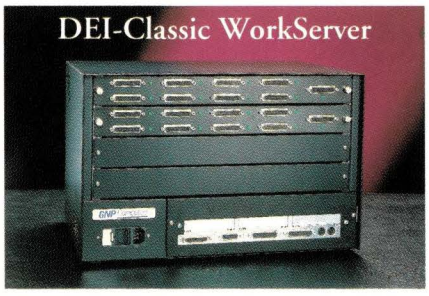

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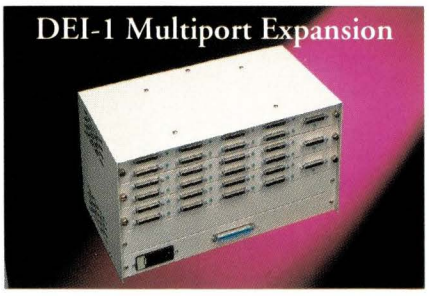

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Parallel Processing on Your UNIX Network, Part I

by **SEAN BURKE,** Inference Corp.

JOHN W. KELLEY JR.

Network parallel processing allows you to speed up many computations by using all of the CPUs on a local-area network in parallel. If you have a large network, the speedup can be much larger than you could get by spending big bucks on a faster CPU. Your LAN need not be homogeneous: I have written applications that use Sun-4s, Sun-3s and even a real-time system together in parallel to evaluate fractal images. Assuming your application can be parallelized, you can realize huge performance gains without a great deal of effort.

Under SunOS 4.1, you can leverage Sun's Lightweight Process (LWP) library and remote procedure calls (RPCs) to write efficient network parallel programs. The LWP library provides user-level "LightWeight Processes": multiple threads of control within a single UNIX process that share the same virtual address space. The RPC library allows you to define functions that invoke services on other networked UNIX hosts. The RPC library is a fundamental component of many Sun network services, such as NFS.

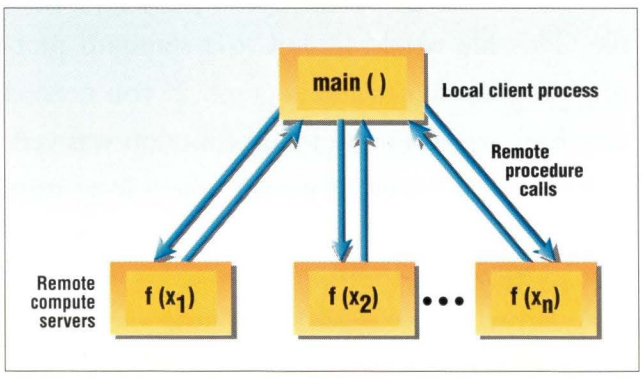
For example, assume that you wish to make a graph of a function *f(x)*: You would write a simple program to evaluate *f(x)* over a range of *X* values and save the resulting *x-y* pairs to a file. This file would be fed to a standard plotting program to produce a graph. If you needed very high resolution and your function was very complex, this program would take a long time to run. Fortunately, this sort of program is very easy to parallelize.

Since *f(x)* may be computed for each *X* without knowing *f(x)* for any other *X*, we could in principle assign each *X* its own processor, and each processor could compute its own value of *f(x)* with no need to communicate with the others. In the argot, the program has inherent, coarse-grain parallelism. This is an easy nut to crack, but many practical, real-world problems are just as easy. Network parallel techniques have been used to produce ray-traced images, a notoriously time-consuming problem. You may wish to apply this technique to write a high-speed Mandelbrot-set viewer, since the pixels of a Mandelbrot image may each be computed independently of the others. I have written the kernel of such a program using the concepts in this article. The sources to both the plot demo discussed here and the mandelbrot demo are available as compressed tars via public ftp at `netcom.com` in `pub/sean` in case you want to test them out.

There are many ways of implementing a network parallel computation, but just about all of them will use RPCs, because RPCs were designed with this sort of purpose in mind. When a program makes a remote procedure call, the arguments to the procedure are bundled into a network packet and sent to a server process on a remote host. The client process waits while the server process does its work, and when the server sends the results of the RPC back to the client process, the remote procedure call returns as would a normal procedure call.

Of course, with the overhead of network delays and such, the remote call actually takes longer than a regular procedure call to do the same work. Clearly, to achieve parallel computation we need to have a number of RPCs outstanding at once. One way to do this is to use asynchronous RPCs. The standard, synchronous RPCs behave much like a regular function call: The call does not return until the function has completed and returned a result. When using asynchronous RPCs, your process will send a request and return immediately without waiting for a response. If you need to get a result, you open a socket on the local host and send the address of this socket to the server along with the other arguments. You then write the server processes to return results to the client process via this socket. The client process alternates between polling this socket and making new RPC requests.

Figure 1. In this form of parallel processing, a client process on your workstation parcels out small units of work to server processes running on a number of other workstations. The client communicates with the servers using remote procedure calls.



One problem with the asynchronous approach is that you need to write a bunch of socket code, which you may or may not be eager to do. You can avoid using asynchronous RPCs and still have multiple, simultaneous RPCs by employing multithreading. In this case, the `rpcgen` utility will handle most of the RPC coding for you, and you won't have to write any socket code. Using the LWP library, you can spawn a number of program threads, each of which can make an RPC call to a remote server. While one thread awaits a result, the other threads can be processing results and making new requests.

Synching the Asynchronous

Of course, things are not quite that simple. SunOS 4.x does not provide "kernel support" for user threads. When one thread issues an RPC request, it will block while waiting for a reply. Since the SunOS 4.x kernel can only block an entire process, and not just an individual thread, all of your threads would be blocked. The solution is to use the nonblocking I/O library, `libnbio`, which replaces the system calls that can block with calls that let the thread spin in a polling loop. As a result, the process continues to run, and through preemptive thread scheduling we can preempt the thread that is spinning to allow another thread to run. This is not an extremely elegant solution, nor is it particularly efficient, which is why many programmers choose the asynchronous RPC method described previously. An alternative way of implementing multiple threads is to fork multiple copies of your process, and then use the System V shared memory and synchronization primitives (such as `shmget(2)` and `semget(2)`) for communication. By using a separate process for each thread, you avoid problems with blocking. Assuming that you are going to use only a few tens, and not hundreds, of threads, there is no reason you can't use a heavyweight mechanism such as a process instead of a thread. One advantage to this approach is that you can debug each process normally, whereas debugging a multithreaded program will severely confuse your debugger.

Since this is a practical demonstration rather than an exhaustive survey, I will conclude with one last argument in favor of the multithreading approach I have chosen. When you finally get your SPARCstation 10 with four processors, it will come equipped with the Solaris 2.1 operating system, which provides complete support for multithreading. An application that has been adapted to support parallelism through threads and RPCs will need only slight adaptation fully exploit your SPARCstation 10 or, even better, a whole network of them.

The first step is to restructure your application into separate threads. To do this, you must take the major loop in your application and convert it to a function that a number of threads can execute simultaneously. Before conversion, our plotting example consists of the following trivial loop:

```
for (x = 0.0; x <= 1.0; x += 0.01)
  printf("%f %f\n", x, f(x));
```

To parallelize this, we would write a function called `thread_top()`, which will be the top-level function call for the worker threads. `thread_top()` will contain a loop in which a thread gets the next *X* value to be plotted and evalu-

ates *f(x)*. If no more points need to be computed, the function returns, terminating the thread. This function can be executed by multiple threads simultaneously (see Listing 1).

Listing 1

```
void thread_top()
{
   float temp;

   while (1) {
      mon_enter(x_mon);

      if (x <= 1.0) {
         temp = x;
         x += 0.01;
      }
      else {
         mon_exit(x_mon);
         return;
      }

      mon_exit(x_mon);

      printf("%f %f\n", temp, f(temp));
   }
}
```

In the code fragment in Listing 1, `x` is a global variable shared by a number of threads. For this reason, we need to serialize accesses to this variable by placing calls to `mon_enter()` and `mon_exit()` around the access. The `mon_enter()` call permits only one thread at a time to "enter" the monitor. While any thread is in the monitor, a thread calling `mon_enter()` for that monitor will block until the other thread calls `mon_exit()`. To see why we need to do this, imagine that two threads happen to execute the code simultaneously: Both compare `x` to 1.0, both assign `x` to a local variable, both increment `x` by 0.01. As a result, both threads compute *f(x)* for the same value of `x`, and then `x` is incremented by 0.02, so that one value of `x` ends up being skipped. This scenario is not realistic on a single-processor machine, since only one thread can execute at a time, but it is quite possible on a multiprocessor. Moreover, since we will use preemptive scheduling, a thread can be interrupted at any time and moved to the end of the run queue. Without monitors, a thread could be preempted after assigning temp but before incrementing `x`. Another thread will get the same value of `x`, leading to the same result. If a thread is preempted while holding the monitor, the other threads will block at `mon_enter()` and the original thread will quickly advance to the front of the run queue.

Safe Reentry

There is another problem with the code fragment above that is not as easy to solve. The call to `printf()` must be eliminated, because the standard I/O library is not reentrant. The property of reentrancy means that a piece of code can be executed by multiple threads simultaneously. Another term for reentrant is "MT-safe." We added the `mon_enter()` and `mon_exit()` calls and the local variable "temp" to our code in order to make `thread_top()` reentrant. If you make calls to stdio functions such as `printf()` while multithreading, the result can be garbled output or program crashes. To solve this problem, we will store all of our data in an array `points[]`, which we will write to a file after all the worker threads have terminated. To accommodate this change, we will loop in the array index i, rather than the *X* value (see Listing 2).

Listing 2

```
void thread_top()
{
   int index;

   while (1) {
      mon_enter(i_mon);

      if (i < NPOINTS)
         index = i++;
      else {
         mon_exit(i_mon);
         return;
      }

      mon_exit(i_mon);

      points[index].x = index * 0.01;
      points[index].y = f(points[index].x);
   }
}
```

In our main thread, we create worker threads using the `lwp_create()` call, passing `thread_top()` as the entry point for the worker threads. `lwp_create()` requires you to assign a scheduling priority to the thread. We assign all of the worker threads to the lowest priority. This enables the main thread, which runs at higher priority, to periodically interrupt the worker threads and reshuffle the scheduling queue, so that the worker threads execute in round-robin fashion. We also allocate a 5-KB stack area using `malloc()`. There is not sufficient space here to discuss how to choose a stack size, so we use a generous amount to be on the safe side. `lwp_create()` takes a variable number of arguments, so that you can tack the arguments to `thread_top()` onto the end of the `lwp_create()` argument list. In this example, the worker threads make use of the floating point processor. Since the floating point registers are not saved/restored on thread switches by default, you must call `lwp_fpset()` to make this happen. Listing 3 contains the code to spawn a number of threads.

After spawning the worker threads, the main thread waits for the worker threads to complete the computations. The main thread sleeps to permit the worker threads to execute, waking periodically to test whether worker threads remain and to reschedule the worker threads. This is accomplished by the following loop:

```
while (lwp_enumerate((thread_t *) 0, 0) > 1)
{
        lwp_resched(MINPRIO);

        lwp_sleep(&sleep_int);
}
```

Listing 3

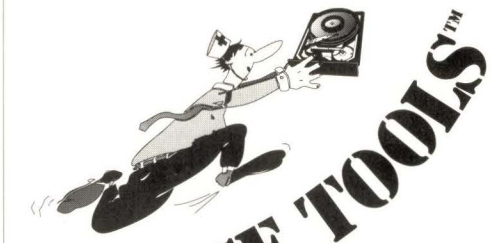
```
for (j = 0; j < nthreads; j++)
{
        lwp_create(&threads[j],                 /* lwp_create returns thread ID here */
                thread_top,                     /* top function for thread */
                MINPRIO,                        /* minimum scheduling priority */
                0,                              /* option flags */
                (char *)malloc(5000),           /* pointer to stack area */
                1,                              /* number of args to thread */
                clients[j]);                    /* arg to thread_top: client handle */

        lwp_fpset(threads[j]);                  /* have thread save/restore FP registers */
}
```

The `lwp_enumerate()` function is capable of returning a vector of thread IDs, but here we are only interested in the number of threads, so we give zero as the arguments. The `lwp_resched()` call moves the thread at the front of the run queue for priority `MINPRIO` to the end of the queue. This gives the next worker thread the opportunity to execute, after the main thread calls `lwp_sleep()`. `lwp_sleep()` takes a standard timeval struct as an argument, which lets you specify the sleep interval in seconds and microseconds. On most Suns, this function has resolution of only 1/60 of a second, or 16,667 microseconds, so you are advised to specify the sleep interval in multiples of this time. The sleep interval is a parameter that you will want to optimize by experimentation. Obviously, rescheduling too often will waste cycles, but remember that a thread that is blocked in an RPC will spin until preempted, so rescheduling too seldomly can also waste time.

Next month, we will implement this application on the network using the RPC mechanism. ⊷

Sean Burke is a senior programmer with Inference Corp. of El Segundo, CA. He has designed real-time monitoring and control systems, using UNIX workstations, embedded processor and UNIX/real-time hybrid architectures in tightly and loosely coupled multiprocessor configurations.



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Circle No. 17 on Inquiry Card

NEW PRODUCTS

The product descriptions are compiled from data supplied by the vendors. To contact them for more detailed information, circle the appropriate reader service number on the card located elsewhere in the magazine.

FreezeFrame from Delta

Software for performing live backups of file systems and databases without noticeably degrading system performance has been introduced by Delta Microsystems. Called FreezeFrame, the product backs up data at the device driver level, requiring no kernel modifications. It is currently available for Sun systems and is expected to be available for Hewlett-Packard Co. and IBM Corp. RISC System/6000s as well.

The product works by freezing the disk. While the disk is frozen, any writes to that desk are intercepted and the original data saved to an alternative disk location before it is overwritten. The saved data is then used to reconstruct a frozen view of the disk for the backup utility. FreezeFrame can be used with a backup utility, such as Delta's BudTool.

Delta Microsystems Inc.
111 Lindbergh Ave.
Livermore, CA 94550
Circle 101

SPARCalike for Resellers

Integrix has introduced a SPARCstation 2-compatible system for resellers and OEM customers. The Integrix SS2 Basic System is a SPARCalike that provides 28.5 MIPS and 4.2 MFLOPS with three SBus slots and up to 128 MB of internal memory. The product also comes with a mouse and an enhanced keyboard.

The Basic System is meant for VARs, OEMs, resellers and other vendors who want a SPARCalike that can be quickly configured for different vertical markets. The Basic System can either be configured by the buyer, or by Integrix, which offers a large variety of SBus products. Pricing on the Basic SS2 begins at $2,995.

Integrix Inc.
1200 Lawrence Drive, Suite 140
Newbury Park, CA 91320-1316
Circle 102

onGo BOPS

An integrated suite of business office productivity software (BOPS) products has been introduced by Uniplex. Called onGo, the suite is unusual in that it is based on what are essentially email facilities for increased communication between users. There are multiple modules in onGo, and the first two of these are onGo Office, a native X.400 mail system, and onGo Write/Paint/Draw, a document processor. Future modules will include additional document management facilities, directories and so on.

At press time, onGo is available on the IBM Corp. RISC System/6000, and the Data General Corp. AViiON line of Motorola 88000-based workstations and servers. Sun 4 availability is planned for later this year, as is availability for The Santa Cruz Operation, Hewlett-Packard Co., Digital Equipment Corp. Alpha, Unixware Intel, and Unixware MIPS systems. Pricing for onGo office is $70 per user for 100 users. OnGo Write/Paint/Draw is $298 per user for 100 users.

Uniplex Integration Systems Inc.
150 West Carpenter Freeway
Suite 200
Irving, TX 75039
Circle 103

Multiple Users on Sun

A board-level product that supports multiple users on a single SPARCstation has been introduced by Megatek. The Esprix CL is a single SBus board with a hardware accelerator, Megatek's X11R5 software, and a keyboard/mouse port. With the CL, a single SPARCstation 10 can accommodate up to four users. In effect, it allows a single workstation to provide minicomputer-style functionality.

The CL supports 12 different user-selectable video resolutions and refresh rates, ranging from 1,152 by 900 to 640 by 480. This makes the CL compatible with a variety of monitors. The CL itself provides graphics performance of one million 2D vectors per second. Pricing begins at $1,495.

Megatek Corp.
9645 Scranton Road
San Diego, CA 92121
Circle 100

SLIP on a Stick

A low-cost dial-up IP router has been introduced by Cogwheel. Called SLIP On A Stick, the product is an Ethernet-to-serial IP router. Cogwheel says that the product is particularly useful for LANs that internetwork inexpensively. Two TCP/IP networks can connect via standard dial-up line, without dedicated routers or lines.

The product supports SLIP and Compressed SLIP. PPP is planned for the

next firmware release. It has a command-line interpreter with optional user- and administrator-level passwords. It bootstraps from its own EPROM. SLIP On A Stick's Ethernet interface is jumper-selectable IEEE 802.3 AUI on a standard D15 socket or thinnet on a standard BNC connector. There are two RS-232 ports. Pricing begins at $1,195.

Cogwheel Inc.
1705 14th St., Suite 308
Boulder, CO 80302
Circle 104

Kerberos for Sun

A commercial version of MIT's Version 5 Kerberos authentication software has been released by Open Computing Security Group (OCSG). Kerberos provides authentication services for verifying the credentials of users, client workstations and servers in a distributed network. OCSG has commercialized the program, naming it OCSG/Kerberos, with a variety of installation scripts, a tool kit based on DEC's generic Security Service Application Program Interface, dual authentication with popular token security cards, and support of symmetric multiprocessor platforms.

As of press time, OCSG/Kerberos was available for Sun, Hewlett-Packard Co. 9000, IBM Corp. RISC System/6000, NCR Corp., Apple Computer Inc. Macintosh and MS-Windows systems. Enhancements planned for the near future include support for GUI-based security administration, public key cryptography and privacy-enhanced email.

Open Computing Security Group
2451 152nd Ave. NE
Redmond, WA 98052
Circle 105

Tatung Shows SPARC Systems

Two lines of SPARC-based servers and workstations have been introduced by Tatung. The servers are the Super COMPserver 10 Series, based on the SuperSPARC chip manufactured by Texas Instruments Inc. Initially, the line is limited to the Model 10/30, an entry-level system based on one 36-MHz SuperSPARC with two MBus slots and four SBus slots. Three other models are planned for later in the year. Pricing on a Model 10/30, with 32 MB of RAM and a 1-GB hard drive, begins at $15,990.

The workstations, meanwhile, are the Color MicroSPARC Series of machines. These are desktop systems based on the TI MicroSPARC, operating at 50 MHz. There are two models: the micro COMPstation LC, with prices starting at $3,790, and the micro COMPstation LX, starting at $4,690. The LC comes with a CG3/SVGA graphics card and a 14-inch SVGA color display offering 1,024-by-768 resolution. The LX, meanwhile, comes

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with a GX accelerator card and a 15-inch color display with a resolution of 1,152 by 900.

Tatung Science and Technology Inc.
2060 Ringwood Ave.
San Jose, CA 95131
Circle 106

High-Performance Optical Library

Unison Information Systems has introduced the Opti/Max Jukebox Series rewritable optical disk library, featuring storage capacities from 10.4 to 100 GB. Unison's proprietary memory cache technology is used, resulting in an access time of 5.5 ms.

Four major components include the target SCSI controller that communicates with the optical disk system, the processor and software that implements the SCSI-to-SCSI controller (SSC), and the cache memory. Direct Memory Access is used to transfer data from the cache to the optical disk. This allows the SSC to flush the cache while processing requests from the host.

Popular applications include CAD, imaging systems and large database manipulation. The series can be attached to any computing platform from the back and operates over any network running NFS.

Pricing is $15,000 for the 10.4-GB version.

Unison Information Systems Ltd.
21 Walsh Way
Framingham, MA 01701
Circle 107

PDP Assembly to C Translator

A program that translates Digital Equipment Corp. PDP-11 assembly language programs to equivalent C language programs has been introduced by Shannon Associates. Called Metamorphosis (Assembly to C), the product turns PDP-11 assembly programs into C code, which can then be ported to Sun Microsystems Inc. or other high-performance platforms. The company says that the product allows the large installed base of PDP-11 code to be reused.

There are also Metamorphosis translators for FORTRAN IV to C, PL/I to C, and CMS-2M to Ada. All the translators run on PC-class systems but output source code that can be ported to SPARC-based devices. The product comes in two parts, a generic Metamorphosis platform for $387 and an Assembly to C package for $134.

J. H. Shannon Associates Inc.
P.O. Box 597
Chapel Hill, NC 27514
Circle 108

Aries Shows SPARCalikes

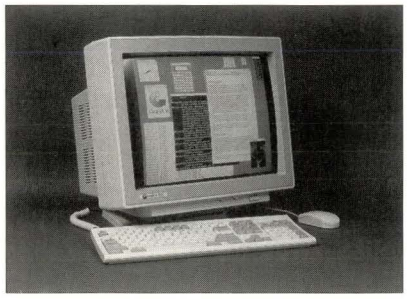
Aries Research has introduced two SPARCstation 10-compatible machines. The first, the MariXX dt MBus workstation, is based on a 36-MHz SuperSPARC. In a typical configuration, the MariXX dt has support for up to 2 GB of internal disk storage, internal CD-ROM, QIC tape or floppy. It has two MBus slots, four SBus and support for up to 512 MB of RAM. For I/O, the machine comes with Ethernet, SCSI, two serial ports and one Centronics parallel port. Pricing begins at $14,995.

The other SPARCalike, the MariXX ds, is based on a 66.7-MHz HyperSPARC module from Cypress Semiconductor Inc. It is a deskside device that, in a typical configuration, would have 1 GB of disk, internal 644-MB CD-ROM, and 150 MB of QIC tape, the company says. It has room for a total of eight half-height devices. It also has one MBus slot, three SBus slots, a Centronics parallel port, two asynchronous serial ports and a thick/thin Ethernet connector. Pricing begins at $17,947.

Aries Research Inc.
46791 Fremont Blvd.
Fremont, CA 94538
Circle 109

GraphOn Shows Remote X Terminal

A large-screen X terminal meant for remote operation has been introduced by GraphOn. The new terminal, known as the GraphOn 19S, is designed to operate over serial lines. The



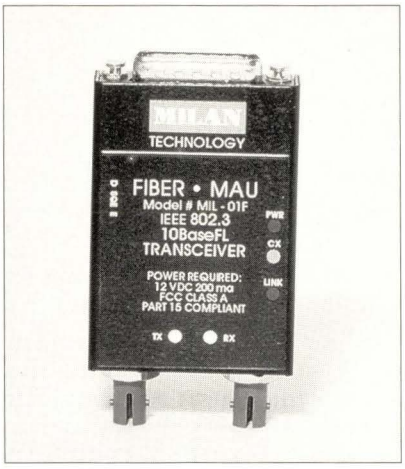
company says that its proprietary technology makes it possible for remote users to access X clients as if plugged into an Ethernet directly, rather than working over common telephone lines.

The GraphOn 19S has a 19-inch screen with 1,280-by-1,024 resolution and a 70-Hz refresh rate. It meets the Swedish MPR II standard for low field emissions. In addition, the product includes built-in VT100 and 220 emulation for fast session start-up. Pricing begins at $1,595.

GraphOn Corp.
1506 Dell Ave., Suite C
Campbell, CA 95008
Circle 110

Fiber-Ethernet Connectors

MiLAN Technology has introduced two connectivity products for Ethernet networks running over fiber cable. The first is a transceiver measuring $2^{1}/_{4}$ by $1^{1}/_{2}$ by $^{3}/_{4}$ inches. The second,



Fiber•Twist, is a twisted-pair-to-fiber converter that connects a segment of fiber cable to an existing twisted-pair network. The company says this allows a systems administrator to use fiber cabling in noisy or remote areas of an installation while using inexpensive twisted-pair cable in other areas.

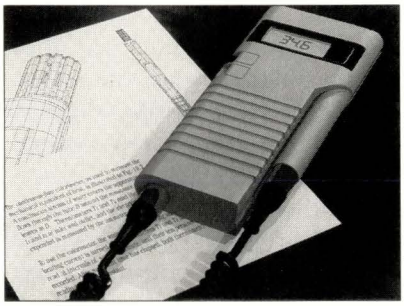
The transceiver is designed to meet the IEEE 802.3 10Base-FL specification and supports fiber cabling up to 2 kilometers long. It is $299. The Fiber•Twist connector costs $499.

MiLAN Technology
894 Ross Drive, Suite 105
Sunnyvale, CA 94089
Circle 111

Photorealistic CAD

Nth Graphics has introduced a 3D computer-aided industrial design program with built-in photorealistic rendering. Called DeskArtes, the product runs on SPARCstations to provide free-flowing, easily edited 3D surfaces and curves. For photorealistic visualization, the product comes with its own ray tracer, which can produce such effects as shadows, reflection and refraction.

In addition, the ray tracer has a GUI that allows the user to set scene variables, such as perspective, light source



location, highlights and background options. Data exchange with other CAD/CAM packages is supported through DXF, IGES, TIFF, SLA and VDA-FS.

DeskArtes runs on a Sun SPARC workstation with a GX, GXPlus, GS or GT graphics adapter under the X Window System. Pricing begins at $14,995.

Nth Graphics
1908 Kramer Lane, Suite A
Austin, TX 78758
Circle 112

Tektronix Color Printers

Tektronix unveiled its next generation of 300-dpi, thermal-wax color printers. The Phaser 200i and the 200e are designed for shared use in work group environments. Improvements in print engine mechanisms and print head design enable more efficient paper handling as well as output speed of 2 ppm with enhanced color registration. Tektronix's ColorCoat process allows printing on common laser paper.

To meet the needs of work group environments, the printers provide parallel, serial and AppleTalk ports, with automatic switching among these interfaces. TCP/IP and DECnet connectivity is available via Tektronix's 4511A network interface. For those who need faster throughput of graphic-intensive files over networks, an EtherTalk interface is available.

Phaser 200e is priced at $3,695; the Phaser 200i, at $5,995.

Tektronix Inc.
Wilsonville Industrial Park
P.O. Box 1000
Wilsonville, OR 97070-1000
Circle 113

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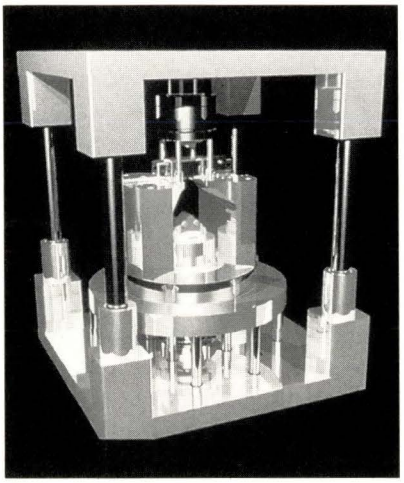
Circle No. 43 on Inquiry Card

I-DEAS Rearchitected

The I-DEAS MCAD package from Structural Dynamics Research (SDRC) has been substantially rearchitected and reintroduced as a new product.



Now called the I-DEAS Master Series, the product is said to have been extensively re-engineered for ease of use. The company says the product will appeal to designers who are unfamiliar with MCAD techniques. It has a streamlined command structure, and most of the remaining commands can be executed with a drag and click of a mouse. In addition, the company says the new I-DEAS supports concurrent engineering for multiuser, multiapplication product development teams.

The product comes in several software modules (including 30 that are completely new to this release). There is a Master Modeler for solids modeling; a Generative machining module to generate tool paths and define optimum processor parameters to precisely machine parts; a Simulation Advisor module to simulate product performance and manufacturing; and several others. Pricing ranges from $6,000 to $69,000 depending on which software modules are selected.

Structural Dynamics Research Corp.
2000 Eastman Drive
Milford, OH 45150
Circle 114

Alphatronix Workgroup Jukeboxes

Alphatronix has introduced two rewritable optical jukeboxes for UNIX platforms. They are the 10- and 20-GB Inspire II systems. The 10-GB jukebox has a footprint of less than two square feet and can sit on a desktop. Both machines have average access times of 23 milliseconds. The jukeboxes are available for Sun, IBM Corp. RISC System/6000, Digital Equipment Corp., Apple Computer Inc. Macintosh and Scitex America Corp. systems. Prices begin at $14,900.

In addition, Alphatronix has announced file management software for the products. Called Emissary, this user-controlled file migration manager provides client workstations with the ability to archive and back up files from local hard disks to the optical jukebox, either manually or automatically on a scheduled basis. The user retains control of where the file goes and when.

Alphatronix Inc.
P.O. Box 1367
Research Triangle Park, NC 27709-3687
Circle 115

Alternative to NeWSprint

Software that is an alternative to Sun's NeWSprint has been introduced by Colorsoft. Called OPENprint, the software resides on a networked workstation or server and enables printing to a printer within that network. The company says that it is superior to NeWSprint because it can be run on a Sun, or SPARCalike, directly from X11/Motif, rather than OpenWindows. OPENprint is also available on Hewlett-Packard Co., IBM Corp. RISC System/6000, and (within the year) Silicon Graphics Inc. and Digital Equipment Corp. workstations as well.

In addition, the company says that OPENprint deals with raster images better than NeWSprint because it does not have to convert them to PostScript files the way Sun's product does. OPENprint also includes a suite of X-based imaging, editing and printer control tools. Pricing begins at $495.

Colorsoft Inc.
7733 Herschel Ave., Suite E
La Jolla, CA 92037
Circle 116

Cray Shows Data Storage

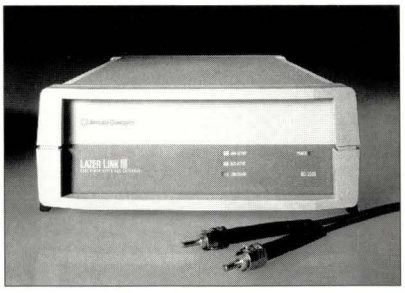
Supercomputer vendor Cray Research has shown two data storage software products for users of its machines. These are the Cray Data Migration Facility (DMF) and the Cray/REELlibrarian. The DMF software is a hierarchical storage manager that continuously tracks file system space. It automatically moves inactive or infrequently used files from more expensive disk storage facilities to less expensive tape. Pricing begins at $35,000.

Cray/REELlibrarian, meanwhile, is a volume management and cataloging system that administers large tape libraries. It can track millions of tape volumes as well as manage security and access control. With it, a user can access data or tape volumes simply by specifying a file name. The user doesn't have to specify a volume name. Pricing begins at $33,000.

Cray Research Inc.
655A Lone Oak Drive
Eaglan, MN 55121
Circle 117

Fast SCSI Fiber-Optic Extender

A SCSI fiber-optic bus extender that can extend SCSI distances up to 3,000 feet has been introduced by Applied Concepts. The Lazer Link III is a chassis that allows the user to make SCSI



devices into remote peripherals via fiber-optic cable. The company says it can support peripherals up to 3,000 feet (1 km) from the host at a maximum data rate of 10 MB/s in synchronous and asynchronous mode.

The product does not require a SCSI device address or additional software. Pricing begins at $1,695. PC/ISA and Micro Channel board versions are also available.

Applied Concepts Inc.
5350-H Eastgate Mall
San Diego, CA 92121
Circle 118

MS-Windows to Motif Translator

A product that allows Microsoft Corp. Windows applications to run as native UNIX/Motif applications has been released. Called Wind/U, from Bristol Technologies, the product allows a developer to take existing MS-DOS code, recompile it for SPARC-based UNIX systems, and then link it to the Wind/U library of UNIX and Motif functions. The result is an application that runs on Motif, but which maintains the functionality of the MS-Windows application.

Moreover, the product includes certain functions that are not standard in Motif, but which are in MS-Windows. These include on-line help and PCL printing support. The company says the product is meant for MS-Windows developers who want to enter the Motif market quickly. Pricing for a single developer's license is $9,950, plus another one-time distribution fee of $55,000 for each product using Wind/U. The company notes that the $55,000 distribution fee can be spread over time payments for smaller companies.

Bristol Technology Inc.
241 Ethan Allen Highway
Ridgefield, CT 06877
Circle 119

Tape Libraries, Management Software

Contemporary Cybernetics has enhanced its 8mm tape libraries with the intoduction of backup management software for its CY-CHS10i and CY-CHS120. Designed for multivendor UNIX networks, the software automates backup and restore operations and gives users direct access to between 25 GB and 3 TB of data without manual intervention.

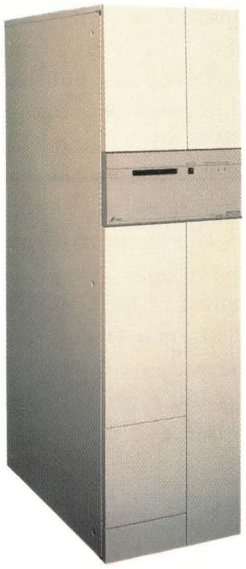
The CY-CHS10i features one 8mm tape drive and 10 tapes in a desktop cabinet, and the CY-CHS120 features up to four 8mm tape drives and 116 tapes. Unattended backups, either full or incremental, can be scheduled to run automatically at any time or date, and backups can be performed with users on-line.

The software catalogs each backup, creating an audit trail for recordkeeping and security. Designated users can easily locate and restore their own files, without ever touching a tape. The software labels tapes and recommends a tape for each backup. Tapes are rotated to ensure even wear, and they are recycled automatically. Multiple backups can be written to a single tape.

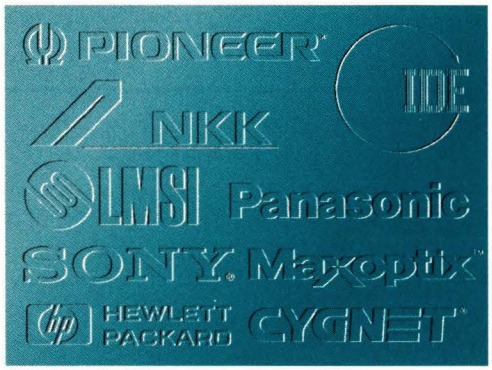
Pricing varies with configuration.
Contemporary Cybernetics Group
11846 Rock Landing
Newport News, VA 23606
Circle 120

RAD Shows ScreenPlay

A product that allows for the recording, editing and playback of screen



Mass storage.



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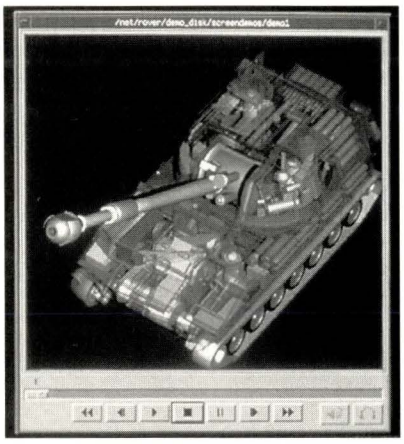


sequences from any Sun SPARCstation has been introduced. Called ScreenPlay, from RAD Technologies, the product allows users to create on-line sequences incorporating sound, animation, drawings and text, as well as materials generated from workstation applications. The company says that potential applications of the product include computer-based training materials, on-line documentation, electronic publications and so on.

ScreenPlay will run on a SPARCstation running Solaris 2.X and OpenWindows or Motif. Hardware requirements include an 8-bit color or grayscale frame adapter, 16 MB of RAM, 4 MB of disk for installations and another 20 MB of disk for video capture. Pricing begins at $895.

RAD Technologies Inc.
2639 Terminal Blvd.
Mountain View, CA 94043
Circle 121

SCH Shows System Administration Tools

SCH has released a number of UNIX systems administration tools. Called SCH:SAM, the products present a consistent interface across multiple platforms so that systems administrators can more easily manage networks of dissimilar machines. The product consists of four modules: SAM:print, an interactive print manager; SAM:Batch, which is a batch job scheduler; SAM:Archive, a tape backup and retrieval tool; and SAM:Control, a user interface to UNIX system administrative functions.

SCH:SAM runs on X Window System displays and character devices. It can be purchased as a single unit or in individual pieces. Pricing for the entire suite begins at $9,758. Pricing on individual modules ranges from $1,495 (for SAM:Control) to $3,995 (for SAM:Archive).

SCH Inc.
895 Central Ave.
Cincinnati, OH 45202
Circle 122

SVR4/Solaris 2.1 Command Summary

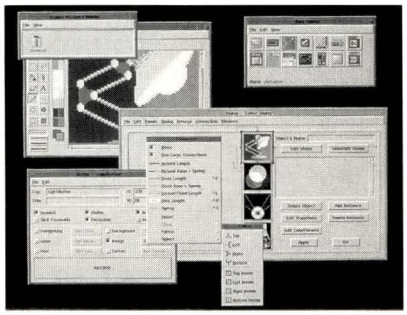
For programmers in need of a quick reference text, Specialized Systems Consultants (SSC) has published a book that summarizes the commands for both UNIX SVR4.2 and Solaris 2.1. The product merges SSC's previous publications, which summarized UNIX and Solaris commands separately. The combined book shows the common commands of both systems, as well as the commands and options unique to one or the other.

The book is 160 pages. It comes in a lay-flat binding and is pocket-size. Pricing is $10.

SSC Inc.
P.O. Box 55549
Seattle, WA 98155
Circle 123

Distributed Application Environment

Visix has released Galaxy, which it is calling a distributed application environment. That is to say, Galaxy is a common software environment that



runs on several different platforms and allows developers to produce applications that will run on them all. To this end, it is a direct, one-to-one replacement for the Macintosh Toolbox, Windows SDK, Motif and Open Look tool kits. Visix says that Galaxy provides a superset of the capabilities of these tool kits and enables Galaxy-based applications to be compiled and run across UNIX, OS/2, Microsoft Windows 3.1, Microsoft Windows NT, Macintosh and VMS platforms with no code changes.

As of press time, Galaxy for UNIX was shipping. Galaxy for Microsoft Windows and OS/2 was planned for release in March. Galaxy for Windows NT, Macintosh and VMS was planned for second-quarter 1993. Pricing ranges from $7,800 to $9,600 per developer, per seat, depending on the platform. There are no run-time fees.

Visix Software Inc.
11440 Commerce Park Drive
Reston, VI 22091
Circle 124

LDI Concentrates

LDI's new LD-208T Ethernet 10 Base-T Concentrator includes eight RJ-45 ports, a BNC port and an AUI port in a compact 1.5-pound chassis (8.1 inches by 1.4 inches by 6.8 inches). Twenty diagnostic LEDs show link integrity, receiving (source), port selection, collision, etc. The LD-208T complies with 802.3 over unshielded twisted pair and coaxial cabling. RJ-45 cable can extend up to 100 meters; BNC, up to 185 meters per segment; AUI, up to 50 meters between concentrator and transceiver or adapter.

Larabie Distributing Inc.
609 Old Country Road
San Carlos, CA 94070
Circle 125

Troubador Shows SBus Interfaces

Troubador Technologies has introduced a family of SBus interface devices. These devices simplify the task of developing add-in products for many SPARC/UNIX workstations and servers. Furthermore, the company announced that because the devices are PLD-based (instead of gate arrays or ASICs), it will offer both "off-the-rack" and "custom-tailored" solutions.

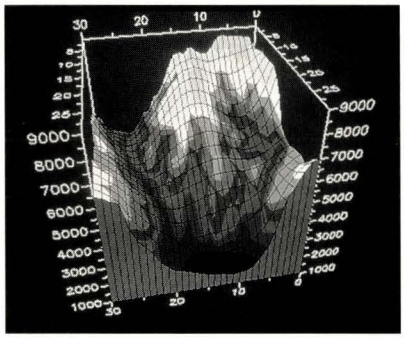
The first member of the family is the SBSIF-08. This part combines all the logic and data buffers necessary to connect most standard 8-bit microprocessor peripherals to the SBus. All in a sin-

gle 44-pin PLCC package, it is available immediately and costs less than $15 in production quantities. Future products will include a 32-bit coprocessor interface (now in test), a configurable slave interface and a DVMA master interface.

Troubador Technologies
P.O. Box 2606
Santa Clara, CA 95055-2606
Circle 126

3D Graph Widget

A 3D and contour graphics widget for Motif has been announced by KL Group. Called XRT/3d for Motif, the product allows applications developers



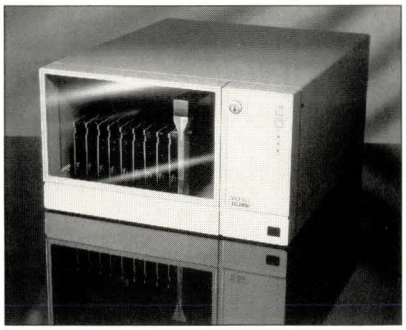
to produce software that displays 3D data in X11-based applications. The company says that XRT/3d is thus a cost-effective alternative to PEX-based approach, which still requires somewhat esoteric hardware.

The product can be used on its own, or in conjunction with the company's XRT/graph products for 2D display. XRT/3d can display surface data as a wire-frame grid or a smooth shaded surface. The surface may be rotated and scaled in any direction. XRT/3d also provides programmatic control of the number of zones, contouring colors, line widths and line patterns. Pricing begins at $1,495 for a development license. There are no royalties or run-time fees.

KL Group Inc.
134 Adelaide St. East, Suite 204
Toronto, Ontario
Canada M5C 1K9
Circle 127

4-GB ¼-inch Tape

Archive Technology today introduced its 4-GB Anaconda 2860 ¼-inch



cartridge tape drive. Archive will also offer the drive with on-board hardware data compression as the Anaconda 2865 model, featuring QIC-standard DCLZ data compression to boost average capacity to 10 GB on a single cartridge. For even higher capacity requirements, these drives can be coupled with the Anaconda data library autochanger. The data library accommodates nine cartridges for unattended capacity of 36 GB when used with the 2860 drive and 90 GB with the 2865 drive.

These tape drive platforms will operate with a mean time between failure

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of 80,000 hours. The new drives provide full backward read and write compatibility with five previous product generations. The half-height 5¼-inch drives can be configured for both SCSI-1 and SCSI-2 and can support burst rates of up to 10 MB/s.

Pricing for the Anaconda 2860 is $795, and the Anaconda 2865 lists at $1,000.

Archive Technology
1650 Sunflower Ave.
Costa Mesa, CA 92626
Circle 128

Rack-Mount RAID from Falcon

Workstation networks using disk arrays for mass storage now have a rack-mount option. Falcon Systems has given the market the DV350 disk

array subsystem, an eight-bay, 3½-inch drive cabinet with fixtures for standard 19-inch rack mounting. Data security features include dual power supplies, ventilation fans, controllers and SCSI ports. Dual SCSI ports allow for splitting of the chassis and operation as two independent disk arrays should failure occur.

The DV350 can be configured with four 3½-inch drives and one full-height 5¼-inch drive. This unit joins another rack-mountable disk array from Falcon, the DV525 with five 5¼-inch drive bays.

The basic cabinet price for the unit is $850. Users specify controllers (separately priced).

Falcon Systems Inc.
1417 West North Market Blvd.
Sacramento, CA 95834
Circle 129

Space-Saving Mass Storage

R-Squared has addressed the need for space-saving mass storage for the UNIX environment with the introduction of The Infinity IFS 700T and the IFS 9000T. These products are the latest releases from R-Squared's Infinity Data Management System product line. These optical storage devices are

Upgrades, Enhancements, Additions...

• Aurora Technologies has reduced the prices of its SPARC system expansion products by 25%. The repriced products range from the Multiport Model 10S (down from $395 to $295) to the Dual SBox expansion chassis (down from $3,995 to $2,995). **Aurora Technologies Inc.**, 176 Second Ave., Waltham, MA, 02154. **Circle 130**

• a/Soft Development has ported its nu/TPU programmable text editor to Motif for Sun. Previously, the editor was available under OpenWindows. **a/Soft Development Inc.**, One Executive Park Drive, Bedford, NH 03110-6913. **Circle 131**

• PhaseII Software has released Version 2.0 of its ClockWise groupware calendar product. The new version features improved capabilities in handling Name lists in an address book style, and an enhanced database design for interoperating between UNIX and Novell Inc. environments. **PhaseII Software Corp.**, 444 Washington St., Suite 407, Woburn, MA 01801. **Circle 132**

• Prices on the AutoPlotter XP and OmniPlotter have been reduced by Japan Digital Laboratory. The AutoPlotter has been reduced from $3,495 to $2,495, while the OmniPlotter is down from $6,690 to $4,995. **Japan Digital Laboratory Co. Ltd.**, U.S. Sales Division, 4770 Calle Quetzal, Camarillo, CA 93012. **Circle 133**

• Advanced Visual Systems, the software survivor of the newly defunct Stardent Workstation company, has announced educational discounts on its AVS scientific visualization package. Qualifying educational institutions can now obtain AVS for as low as $750. **AVS Inc.**, 300 Fifth Ave., Waltham, MA 02154. **Circle 134**

• Empress Software has ported its RDBMS to the Solaris 2.1 operating system. The company also says that its recent contract with Cray Research Inc. led it to develop 64-bit versions of its product that will prove useful when a 64-bit version of the SPARC ships. **Empress Software Inc.**, 6401 Golden Triangle Drive, Greenbelt, MD 20770. **Circle 135**

• RasterFLEX, a color raster accelerator from VITec, is now available for the SPARCclassic. In addition, VITec has announced that RasterFLEX has been ported to Solaris 2.1. **Visual Information Technologies Inc.**, 3460 Lotus Drive, Plano, Texas 75075. **Circle 136**

• **Ceram Inc.** has introduced TurboCache for its solid-state storage device, TurboCard. With the TurboCache software, Sun users will be able to both cache and swap data locally on a TurboCard, an SBus card with capacities of 40 to 960 MB of solid-state storage. **Ceram Inc.**, 2260 Executive Circle, Colorado Springs, CO 80906. **Circle 137**

• Unisol SysAdmin, a systems administration program, has been ported to Solaris 2.1. A product of UniSolutions Associates, SysAdmin includes utilities for such things as account maintenance, multilevel file backup and restore, tape library management and so on. **UniSolutions Associates**, 2103 Mathews Ave., Suite 1, Redondo Beach, CA 90278. **Circle 138**

• **Xylogics** has reached out to VAX users. The company has given a Reverse LAT feature to its Annex family of terminal and communications servers. This will allow VAXes to access and share peripherals attached to Annex machines. **Xylogics Inc.**, 53 Third Ave., Burlington, MA 01803. **Circle 139**

THE JUKEBOX FOR THE BLUES

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10000 Old Katy Road, Suite 150, Houston, Texas 77055

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ideal for near-line, on-line and archival storage requirements.

Storage capacity for the IFS 700T is scalable up to one terabyte, all contained in a unit about the size of a household refrigerator. Only slightly larger in size, the IFS 9000T is scalable up to 11.7 TB of data. Because of the fast-access compressed information tape system, both systems have data transfer rates of up to 2.5 MB/s.

Media cost per GB for both units is around $1.

R-Squared
11211 East Arapahoe Road
Englewood, CO 80112-9947
Circle 140

Perfecting the Work Group

Popular PC developer WordPerfect is expanding its UNIX presence, specifically for AIX and HP-UX. The company released its Office 3.1 three-in-one package for electronic mail, a personal calendar and group scheduling for the two additional UNIX platforms.

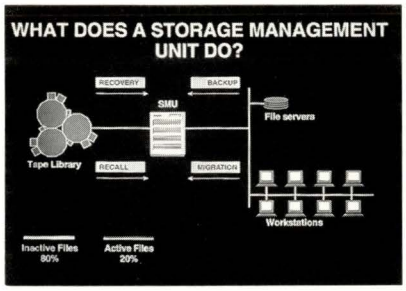
WordPerfect Office 3.1 lets users share information across platforms including DOS, Windows, Macintosh, Data General Corp., VAX and UNIX. Users can send electronic mail messages with as many as 100 enclosures attached. Users can save, print, forward and reply to mail messages. Other email features include a user ID directory with system and personal groups, security notices, message retraction, message tracking, password protection and encryption. Users can make schedules for individuals, groups and resources. The calendar lets users track and prioritize memos, activity lists and appointments.

A five-station package of WordPerfect 3.1 for workstations is PC-priced at $495. Additional user pricing ranges from $75 for a single user to $1,295 for 20 users.

WordPerfect Corp.
1555 N. Technology Way
Orem, UT 84057
Circle 174

Networked UNIX Workstation Storage

StorageTek has entered the network storage management market with the announcement of NearNet network



storage manager. NearNet simplifies the management of data found on networks of servers and workstations that use UNIX. Also announced was LibraryStation, a software product that enables the MVS operating system, NearNet and other clients to share a StorageTek Nearline 4400 Automated Cartridge System.

This initial release will support Sun, Digital Equipment Corp., Hewlett-Packard Co., Intergraph Corp., IBM Corp. and Silicon Graphics Inc. systems. In addition, other networked systems that can make their files available via the Sun Network File System can be backed up by the NearNet system. NearNet will connect servers and workstations via an Ethernet LAN or FDDI network.

Pricing for NearNet depends on configuration. With an existing library, the average cost of configuration will be approximately $200,000.

Storage Technology Corp.
2270 South 88th St.
Louisville, CO 80028-0001
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Printer Sharing Network

Telebyte Technology has just introduced its Model 142 Multi Print-Net Printer Sharing Network. Printer sharing networks can be assembled to support a multiplicity of printers, plotters and PCs, all without any software or drivers.

Ethernet techniques of collision avoidance allow for up to 36 PCs and a maximum of six printing devices, including laser, dot matrix, ticket printers and plotting devices. The Print-Net allows for simultaneous sharing of all printers and is compatible with all existing software print spoolers.

Transmission is processed at 10 KB/s. Telebyte offers a starter kit called the Model 142SK to simplify installation. The kit includes two Model 142C transmitters (for two PCs) and one Model 142P receiver (for printer). The Model 142SK sells for $225.

Telebyte Technology Inc.
270 Pulaski Road
Greenlawn, NY 11740
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Direct-Drive Gray-Scale Printer

Lasertechnics has introduced a new DIR/Direct Drive Gray Scale Printer. The printer features new internal components that have increased its life span,

a new four-zone heater blanket to provide better heat control and greater consistency in image, and a new international power supply that allows frequency-independent operation.

Page-size, high-resolution continuous tone images are produced with photographic quality in near real time. The printer can easily be adapted to paper or film use. A diverse range of electronic image processing applications include meteorological imaging, fingerprint identification, electron microscopy, and electronic-picture-desk systems to process newspaper wire photos.

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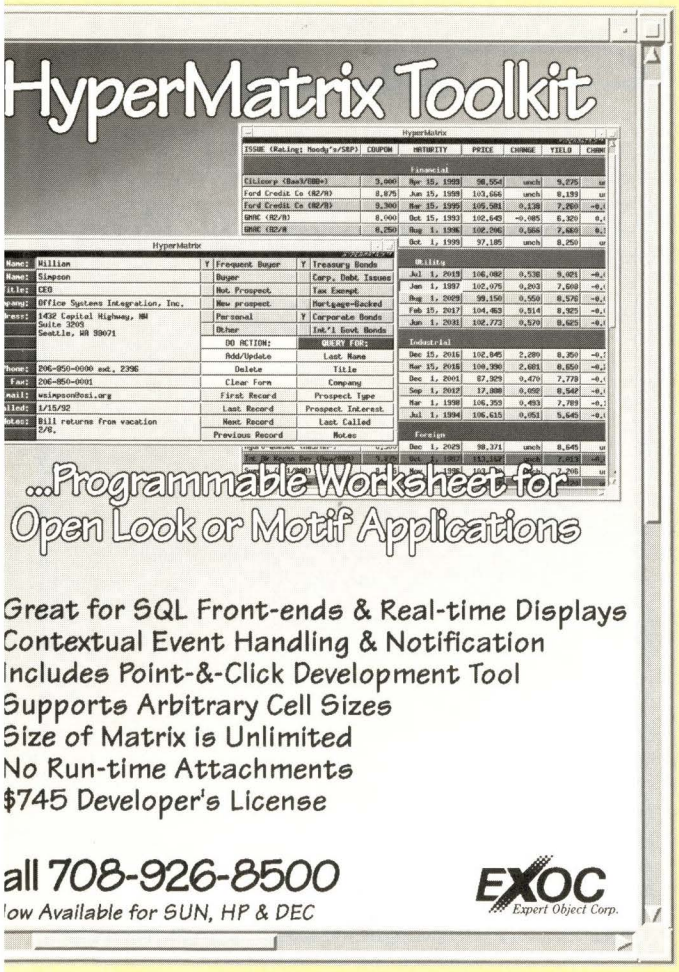

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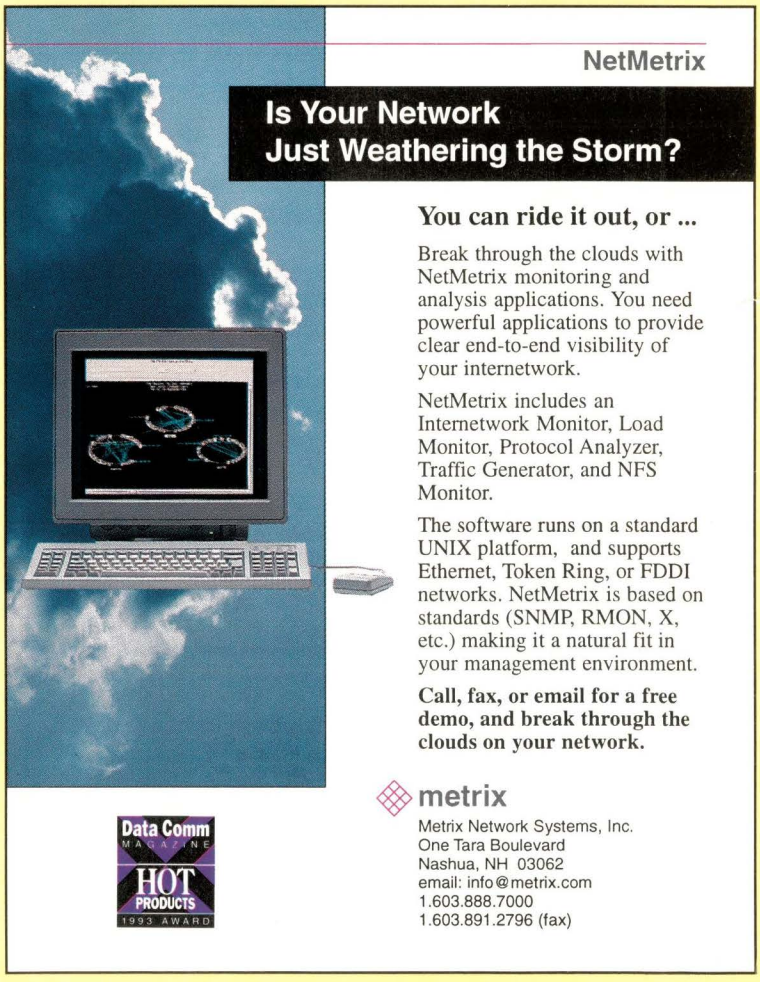

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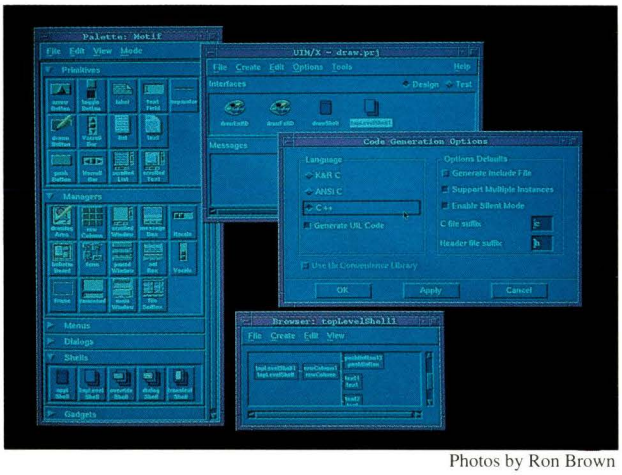

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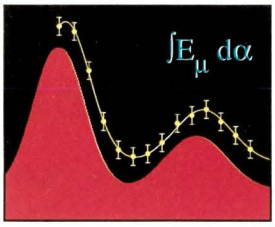

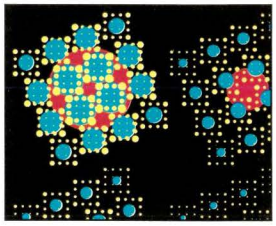

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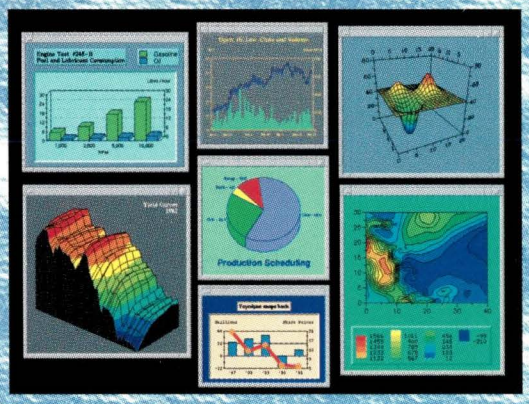

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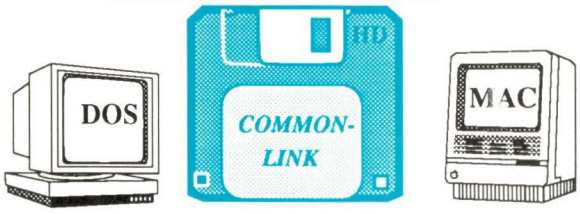

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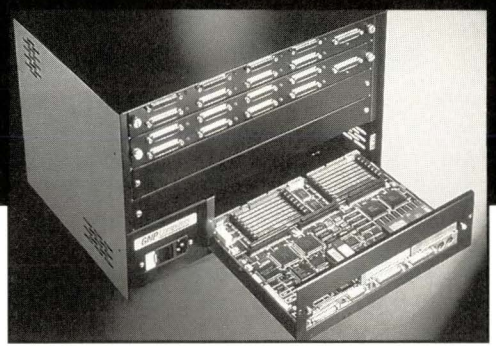

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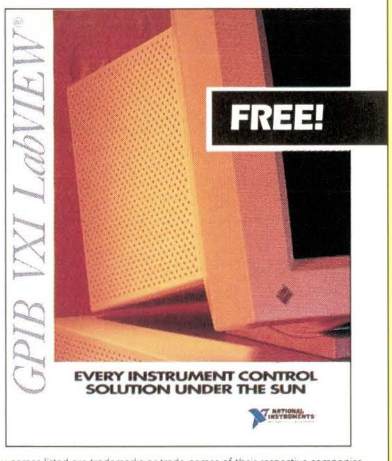

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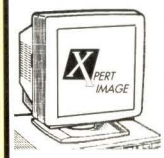

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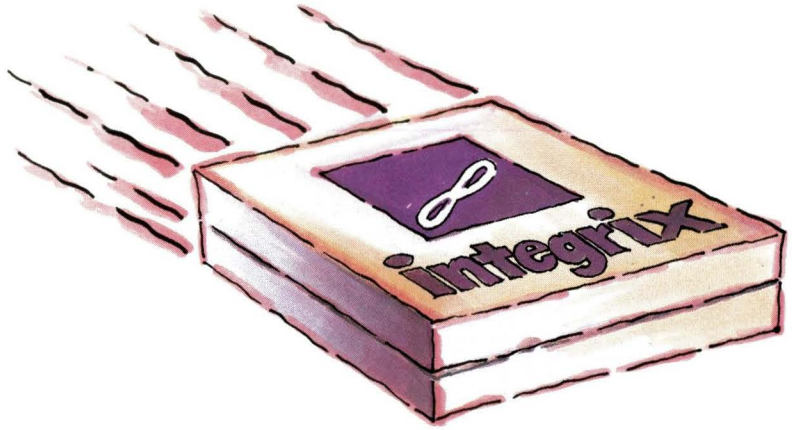

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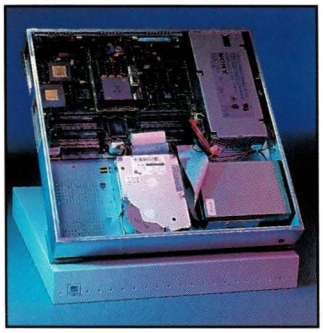

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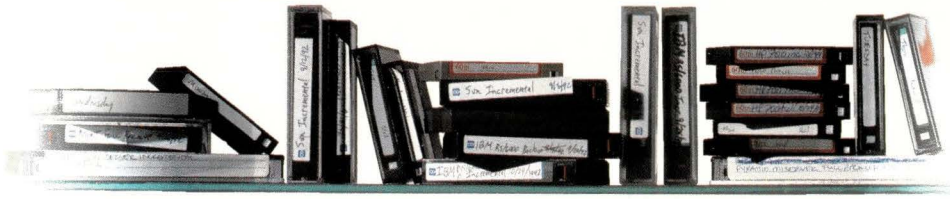

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