

SUNEXPERT

An Independent Forum for Open Systems

DECEMBER 1991 Vol. 2 Num. 12 \$4.50

Special Report: Network Management



Disk Drive Update

Review: Fingertip Librarian

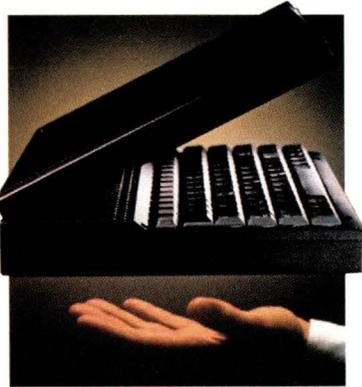
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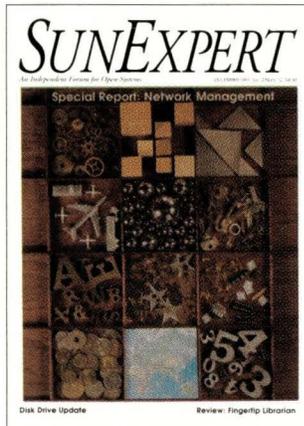
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SunNet Manager Does More Than Manage — With version 1.2, Sun's offering comes closer to providing integration.
There's Something For Everyone — Third-party products are doing more than ever before.
Systems and Network Management: The Twain Meet — The two disciplines both overlap and complement one another.
- 66 **The SCSI Performance Gap** — Despite advances in data-transfer rates, the data-handling gap between workstations and SCSI drives continues to widen. See for information on disk drives, see the **External Hard Disk Drive Survey** on **Page 71**. Kimberly Patch
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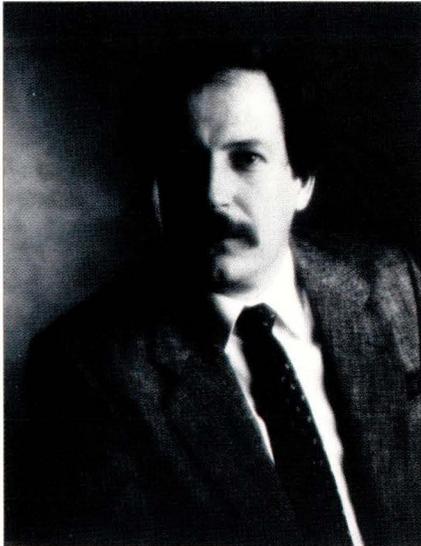
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SUNEXPERT

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

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Editorial

On the Agenda

Network management and mass storage grab quite a few pages of *SunExpert* this month.

Compiled by Mary Jo Foley, our Special Report called "Network Management Blues" is a medley devoted to the problems many of us face in the day-to-day administration and troubleshooting of heterogeneous, complex networks. She has rounded up diverse points of view from the user and vendor community. The story opens with an exposition of the current state of the art, moves to a discussion of the near-term prospects for more versatile products and wraps up with a discussion of the need to look at nets from both the system and net manager's perspectives.

The mass-storage theme surfaces in two places: First, Dinah McNutt's Systems Administration column outlines the key steps in a reasonable disk-drive buying decision, stressing the need to weigh performance against cost. Second, in "The SCSI Performance Gap," Kim Patch surveys the market. She finds that prices will continue to tumble—now down to \$4.08 per megabyte in some cases. However, the chasm between the data-handling capacity of systems versus SCSI disk drives continues to deepen. Also, there are several pages of specs for numerous vendors and manufacturers of SCSI disk drives. We included only those who responded to a recent *SunExpert* survey.

By the way, this month's Systems Administration column is Dinah's last for *SunExpert*. We thank her for the many months of indispensable help and insight she has provided. Dinah will be penning a column for our sister publication—*RS/Magazine*.

Doug Pryor

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9 Out of 10 Software Developers Rely on PVCS for Configuration Management.



What Does This Mean to You?

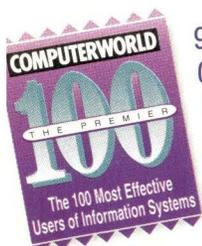
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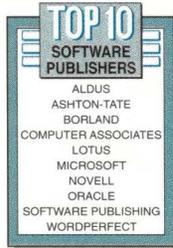
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Geoff Geis, Senior Specialist, MCI



Nine of the ten top software publishers rely on PVCS to ensure product quality.

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*Matt Severski, Senior Engineer
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Total available slots with multiple expansion boxes ⁴	18	12	12
Master/Slave support	Yes	No	Yes
Internal drive slots	Included ⁵ (model SB-3000XD)	\$200 option	Included
Burst mode support on ALL Desktop SPARC CPUs	Yes	No	No
GUI application for easy and flexible configuration ⁶	Yes	No	Information not available
Certified compatible with all of Sun's SBus cards ⁷	Yes	No	1 Year
Warranty	1 Year	90 Day	\$2,595.00
List Price	\$1,995.00	\$2,195.00	\$2,595.00

expansion box used, one CPU host expansion slot will be occupied with a Host Adaptor Card.
¹ The Artecon SB-3000XD supports any 3.5" SCSI fixed and removable media devices.
² SBus Tool™ is bundled free with purchase of Artecon SBus Expansion Boxes.
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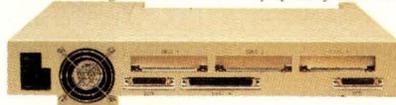
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Modem control on All SBus serial boards	Yes	No	No (Cirrus CD-180)
Based on the latest RISC-based processor	Yes (Cirrus CD-1400)	No (Motorola MC68HC000)	45%
CPU burden ⁴	20-25%	Not Tested	2 Serial/1 Parallel 4 Serial 8 Serial 16 Serial
SBus serial cards available	3 Serial/1 Parallel 4 Serial/1 Parallel 8 Serial/1 Parallel 12 Serial/1 Parallel 16 Serial	4 Serial 4 Serial/1 Parallel 8 Serial	No
Software GUI for easy terminal/modem configuration ⁵	Yes	No	No
Software GUI for easy printer configuration ⁵	Yes	90 Day	1 Year
Warranty	1 Year	\$999.00 to \$1,495.00	\$595.00 to \$1,995.00
List Price	\$495.00 to \$1,295.00	\$999.00 to \$1,495.00	\$595.00 to \$1,995.00

¹ Based on latest vendor specifications dated 3/91 and 7/91 (specifications subject to change without notice).
² Based on latest vendor specifications dated 3/90, 7/90, and 11/90 (specifications subject to change without notice).
³ Based on latest vendor specifications dated 1990 (specifications subject to change without notice).
⁴ CPU burden rates based upon benchmark tests. Artecon's white paper "SBus Asynchronous Serial Card Benchmark" available upon request.
⁵ TTYTool software is bundled free with purchase of an Artecon SBus Card.

With the broadest range and the highest performance serial multiplexor cards available, Artecon's cards give you the winning hand.

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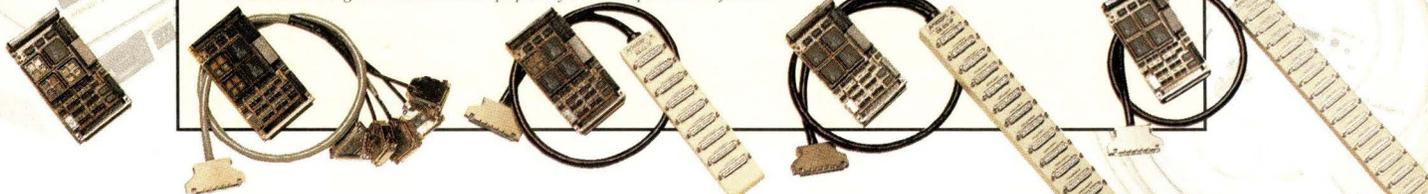
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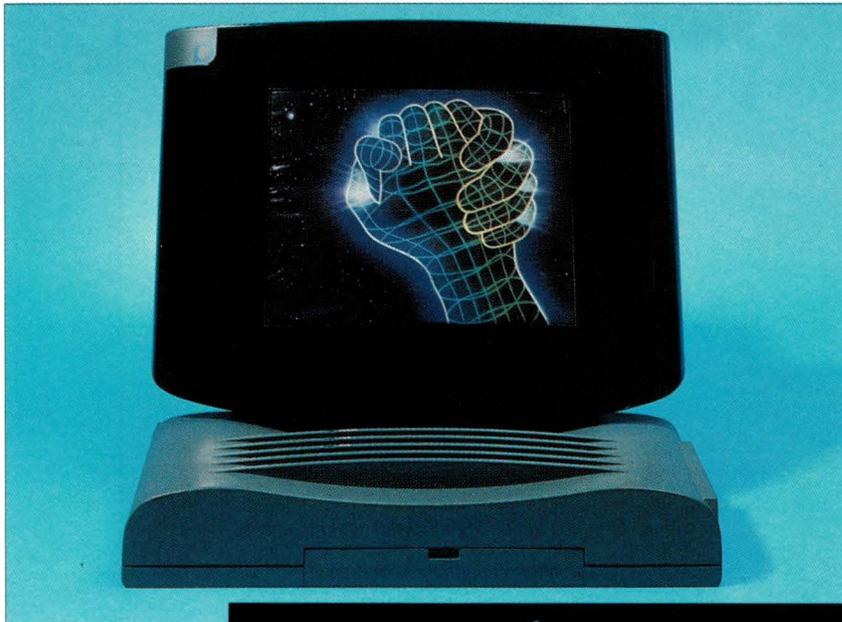
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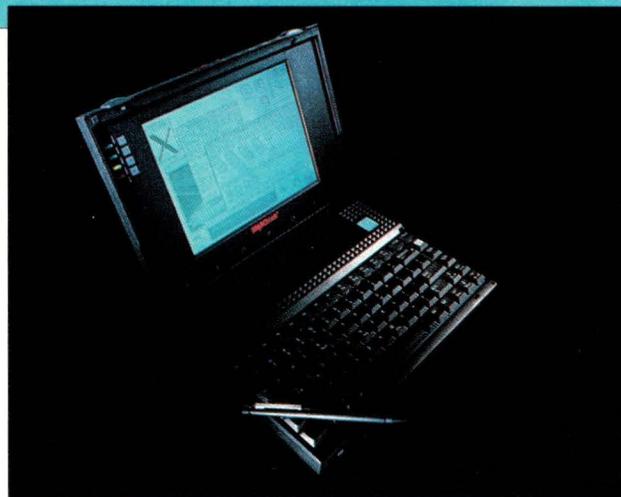
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NEWS

Clones These Are Not



RDI Computer Corp.'s wall-mountable Profile and Tadpole Technology Inc.'s SPARCbook 1 notebook system: Now that's value-added technology.



Two small but powerful new SPARClikes are poised to ship from Tadpole Technology Inc. and RDI Computer Corp. Both are examples of how SPARC-based vendors have truly added value to systems and thus differentiated their products from those made by other SPARClike vendors and Sun Microsystems Inc.

RDI, San Diego, calls the RDI Profile "the world's first convertible workstation." Positioned with the top up, Profile has a 50% smaller footprint than other desktop workstations. By flipping the top down, users can con-

vert the Profile into a wall-mountable system. The entire flat-panel display and processing unit hang on the wall, with only the keyboard taking up desk space. This design works thanks to separate I/O connectors, one for the desktop configuration and one for the wall-mounted version.

The Profile clocks at 25 MHz and 17.4 MIPS. It delivers 2.2 MFLOPS and 11.8 SPECmarks. The product ships with an internal 207-MB hard disk and 3 1/2-inch floppy drive. Standard main memory is 8 MB, expandable to 32. The machine is

offered with either an active matrix color or a high-resolution monochrome LCD display. Ethernet, SCSI-2 and serial-port expansion are all standard. The system was designed by Nissan Design International Inc., San Diego.

Pricing will be in the \$7,000 to \$8,000 range. Machines are slated to ship in January 1992 and will be available from new and existing RDI distributors and OEMs.

Meanwhile, the Austin, TX-headquartered Tadpole, a subsidiary of Tadpole Technology plc, Cambridge, England, has started shipping its celebrated SPARCbook 1 notebook. Features now available with the product that differ from those promised earlier this year by the company include availability of SunOS (in the form of Solaris 2.0) and support for color monitors.

The SPARCbook runs at 25 MHz and 18 MIPS. The machine can be configured with either an 85- or 120-MB hard disk. A second drive of either capacity can be fitted in place of the floppy drive. The machine ships with a white 640-by-480, side-lit LCD display. Color output is available by using an external RGB video-display unit (not provided by Tadpole) to achieve resolutions of 640-by-480 VGA or 800-by-600. The company is promising to unveil a passive matrix color screen with 640-by-480 resolution during the first quarter of 1992.

SPARCbook also comes standard with a force-sensitive-resistor-based "MouseKey" and 2400-baud modem with SendFax capability. The machine also features Ethernet and serial I/O connections. MS-DOS emulation software is available as an option.

Pricing begins at \$4,950 for the 85-MB hard-disk version. For \$12,650, you get two 120-MB hard drives, 32-MB DRAM and an FPU.

In other, related small systems news,

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RDI has made available a 1152-by-900 dpi, screen-display option for the BriteLite portable. The company says the display offers "the highest resolution available for any battery-operated laptop computer in the world." RDI also added three new distributors to its ranks for the BriteLite. These are Access Graphics Technology Inc., Boulder, CO (Sun's one and only masterVAR); Woodland Hills, CA's CAL-ABCO (one of Solbourne Computer Inc.'s primary resellers); and Epson Canada, Toronto, Canada (another of Solbourne's major distributors).—*mjf*

Hereeeeeee's SunTech!

Drum roll, please. Roughly nine months after Sun Microsystems Inc. promised to open its corporate kimono, it has delivered on that promise. We now know there isn't one, big Sun; there are lots of little satellites. Of these, one of the most ambitious is SunTech Enterprises Inc.

SunTech currently encompasses three separate Sun businesses: connectivity, document imaging and software-development tools. (Sun has hinted more may be on the way.) All of this is headed by Eric Schmidt, former vice president of Sun's general systems group.

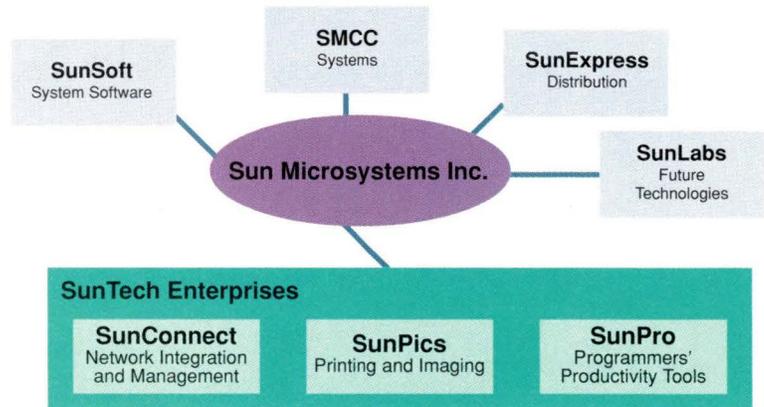
SunConnect

SunConnect is the branch of SunTech charged with offering "products for integrating UNIX systems into large, complex networks, as well as managing those networks." Such a massive mission dictates the need for many, specific solutions. True to form, SunConnect is supplying products as diverse as SunNet Manager, PC-NFS, and a line of SunLink networking software products that allow users to tie Suns to systems from IBM and DEC, as well as PCs and other systems.

SunConnect made its debut in October by introducing a slew of new connectivity products. Among them are:

- NetWare SunLink—a version of Novell Inc.'s Portable NetWare (developed by SunConnect) that

Sun Microsystems Inc. Revealed



Source: Sun Microsystems Inc.

- allows DOS, Microsoft Corp. Windows, OS/2 and Apple Computer Inc. Macintosh NetWare users to share data, files and print services with UNIX systems;
- HSI/S, the high-speed serial interface/SBus card, a four-port, serial-communications card for desktop SPARCstations and servers. The card allows users to achieve T1 and CEPT (2.048 Mb/s) speeds. It works with the SunConnect Internetwork Router, SunConnect X.25, SunLink SNA 3270 gateway and SunLink SNA peer-to-peer gateway.
- SunNet Manager 1.2 (for more information, see "SunNet Manager Does More Than Manage" in this month's Special Report);
- PC-NFS Programmer's Toolkit 2.0, which includes new APIs and libraries allowing users to connect DOS and Windows systems with various Open Network Computing (ONC) implementations; and
- FDDI/S, a network interface card for single-attach FDDI connectivity. Besides selling through its own SunConnect resellers, SunConnect is moving product through local Sun Microsystems Computer Corp. sales offices and SunExpress.

SunPics

"Basically," says Kevin Ohlson, manager of marketing for SunPics, "we are printing for distributed environments."

SunPics—for Sun Printing and Imaging Computer Systems—is devoted

to printing and printing technology for networks. The unit's product line currently consists of the NeWSprint image-control software. In addition, the unit will market Sun's SPARCprinter laser printer and Printer's Palette, a CD-based catalog that contains 170 software and hardware products from third-party vendors.

At its introduction, SunPics also announced a version of NeWSprint for the Japanese market, Nihongo NeWSprint. It also published the F3 Font Format Specification, which defines the format for scalable outline fonts used in the Solaris operating environment.

In Sun's view of hardcopy, the printer is itself without a processor and printing processing takes place on workstations or servers. Sun partisans point, in particular, to this strategy's merits in the Asian markets. "As you move into China, Japan, Korea, the character sets get huge," Olson notes. "The traditional way of dealing with this is to put 40-MB drives on your printers. That does not make for an inexpensive printing solution."

SunPro

SunPro's goal is to focus on tools for the professional programmer. "This doesn't mean end-user programmers. We're not talking HyperCard. We're talking about the people who are writing applications that justify the cost of hardware—who tend to work in groups of 15 to 25—not the lone hacker in the garage," explains Jon Kannegaard,

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general manager for the business unit.

SunPro's existing line consists of compilers and supplemental development tools. Languages supported include ANSI-C, C++, FORTRAN, Pascal, Ada and COBOL. SunPro is offering SPARCCompilers for all of these languages. In September, SunPro released new versions of C (2.0), C++ (3.0), FORTRAN (2.0) and Pascal (3.0). All of the compilers support Solaris 1.0; 2.0 support is expected by mid-1992, around the same time the OS becomes available to end users.

The SPARCworks family of supporting tools, now available as release 2.0, includes a debugger, source browser, analyzer, a make tool, file merge and SPARCworks Manager. But "we leave the CASE space to others," says Kannegaard. Interoperability across languages and tools is achieved via OpenWindows, the DeskSet editor, SPARCworks Manager and ToolTalk, SunSoft's interapplication communication framework, SunPro says.

SunPro is billing its tools as being developed for Solaris 2.0. At the same time, the unit also claims that Solaris 2.0 was written using SPARCworks. Kannegaard admits that tools that support multithreading have yet to make their debuts. "Application-accessible threads won't be available in Solaris 2.0," he points out. "Maybe they will be some time in 1992."

SunPro also is incorporating advanced optimization technology for multiprocessing and superscalar architectures into its SPARCworks products. Other SunPro future developments to watch for: "We're looking at bringing our own tools to other vendors' platforms," Kannegaard says, like Hewlett-Packard Co. In addition, some time in 1992, SunPro will announce next-generation workgroup products based on its Network Software Environment (NSE) technology.—*mjf* and *mjt*

Interop '91 Post-Mortem

While some parts of the computer industry continue receding, interoperable networking remains hot, as this year's Interop '91 Fall in San Jose, CA, demonstrated. Over 35,000 people—

MATCH GAME

Sun's Corporate Reorganization: The Days After Where Do I Go For...?*

- | | |
|---|--|
| A. SPARCprinter | 1. SunExpress |
| B. SunOS CMW | 2. SunSoft |
| C. Solaris 1.0 | 3. SMCC |
| D. Solaris 2.0 | 4. SunPro |
| E. Solarix/4 PW | 5. SunPics |
| F. SPARCserver 600MP | 6. SunConnect |
| G. 16-MB SIMM | 7. SunLabs |
| H. An autographed photo of Scott | 8. Sun Microsystems Inc. |
| I. SunNet Manager 1.2 | 9. Novell Inc. |
| J. A well-used, but operational, 386i | 10. Peter Salus/Sun User Group |
| K. Printer's Palette | 11. Access Graphics Technology |
| L. AnswerBook | 12. Select Sun VARs |
| M. PizzaTool | 13. Dell Computer |
| N. Ivan Sutherland | 14. SPARC International |
| O. SBus board testing | 15. Sun Microsystems Federal |
| P. SPARCworks | 16. Mountain View, CA |
| Q. SunOil | 17. Store24 |
| R. SunShine | 18. Interactive Systems Corp.
(Naperville, IL) |
| S. "SPARCstation 2 Systems
Maintenance" video | 19. End users can no longer buy this
product. Its manufacturer is selling
through OEMs and VARs only. |
| T. The MBus spec | 20. Certain MicroAge and/or Intelligent
Electronics franchises |

* For hints, read "Hereeeee's SunTech!" You can compare your best guesses with ours in next month's issue. NOTE: Items in the first column may have multiple matches in the second column.

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up 50% over last year—came to learn about TCP/IP, OSI, routers, SNMP, LAN/WAN connectivity, X.400/X.500 and more.

For all of you who couldn't find the time, money (or both) to make it to Interop, here's one person's view of the highlights.

The Interop ShowNet continues to be a miracle in itself—the equivalent of a major corporate skyscraper's network, with 35 miles of cabling comprising dozens of "ribs" and several backbones, connecting over 4,000 end devices. Deployed within the space of far too few hours by Interop staff and volunteers from participating vendors, this year's ShowNet was predominantly built using 10Base-T over twisted-pair ribs and a fiber backbone, running the Open Shortest Path First (OSPF) routing protocol for TCP/IP.

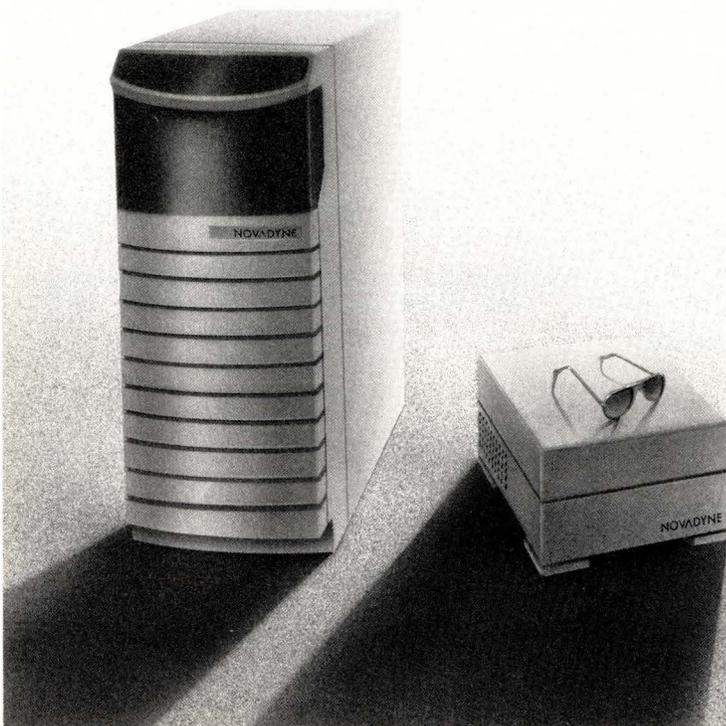
Interop has demonstrably grown beyond (although hardly abandoned) its TCP/IP and Internet beginnings. Exhibits and announcements ranged from UNIX and OSI offerings to connectivity products involving NetWare,

DOS and Windows, Macintoshes and SNA.

Multivendor showcase demonstrations included OSI, ONC/NFS, frame relay, ISDN, SMDS (Switched Multimegabit Data Service), SNMP, FDDI and token ring, including lots of Sun and Sun-related network hardware, software, management and applications, of course. The show floor also featured:

- RadioMail, a service from Anterior Technology (Menlo Park, CA), which lets you pick up email on alphanumeric pagers and do one- or two-way email with "radio-modem"-equipped portable computers (including prototype Poquets) to exchange email with the Internet, corporate LANs, public-access email carriers (Compuserve, AT&T Mail, MCI Mail, etc.) and other UNIX-based mail systems.
 - Encryption-based Secure SNMP from SNMP Research (Knoxville, TN).
 - The return of the Internet Toaster—this year, with an SNMP-controlled
- Lego device to drop and pluck toast and a Lego plotter driven by VAX RPCs to a PC, showing how easy and affordable it can be to create network peripherals.
 - The ETHERphone—packetized voice over UDP, carrying everything from booth-to-booth phone conversations to radio stations on a tuner in Melbourne, Australia, developed by Simon Hackett, Internode Systems Pty. Ltd. of Australia.
 - TCP/IP stacks for use on almost anything, from vendors like Beame & Whiteside Software Ltd., TGV Inc. and FTP Software Inc.
 - Multivendor demos of the RSA public-key-based Privacy Enhanced Mail, from Trusted Information Systems, BBN and MIT.
 - Routers, routers and more routers.
 - Commercial and regional Internet/IP network service providers, including ANS, UUNET (Altnet), PSI, CERFnet (offering buttons and comics for "Truth, Justice and the Internet Way") and BARRnet, plus representatives from the SRI

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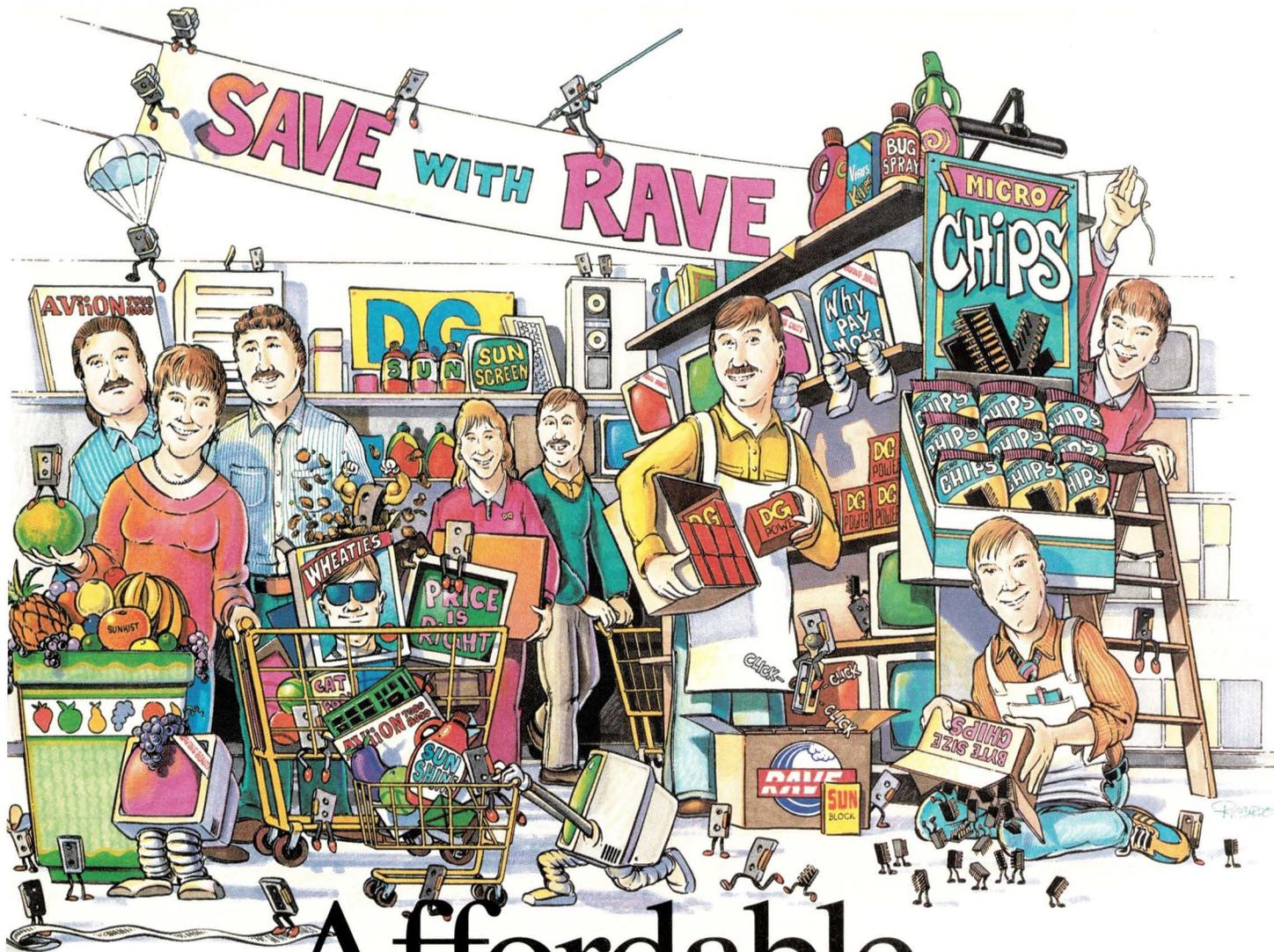
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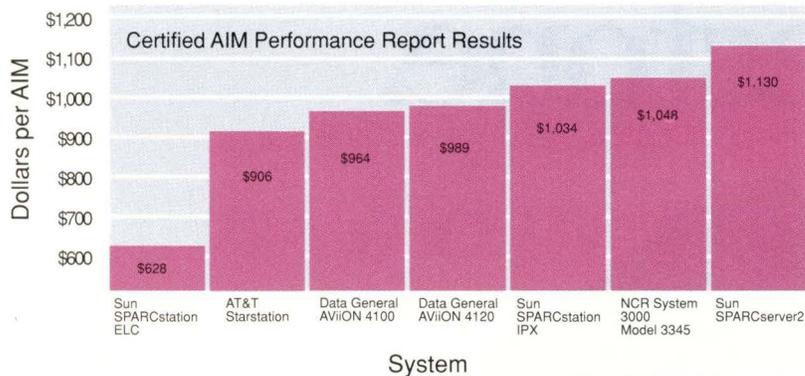


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Best Price/Performers Under \$50,000 by AIMS



Sun Microsystems Inc. seems to be reaching its goal: It's got three of the seven best AIM performers in the \$50,000-and-under race.

Network Information Service Center (formerly the NIC), plus representatives from MERIT, NEARnet, the new (Interim) NIC, the CIX and other Internet organizations strolling the floor.

More than 800 people turned out for The Great Interior Gateway

Protocol (IGP) Debate, to watch leading Internet personalities mix technical issues and humorous zingers over OSPF versus Intermediate System to Intermediate System (IS-IS) and Ships in the Night (S.I.N.) versus Integrated Routing. More a staged (and enjoyable) event than a formal debate, the session was a welcome chance to rest

the feet—and showed that success hasn't turned Interop into a completely "serious suits" show.

Besides all of these events, there were one- and two-day tutorials, keynote speeches, shorter technical presentations, Birds-of-a-Feather sessions—more than any one person could possibly cover. But don't despair: Next year's Interop '92 Fall edges northwards to San Francisco, October 26-30 and the first Interop '92 Spring will hit Washington from May 18-22, 1992.—*dpd*

Think Volume

The clarion call at Sun Microsystems Inc. these days is "Think Volume." On many occasions, Sun executives have said that Sun's goal is to manufacture and market only those products of which they can sell millions of units.

Proof that Sun is achieving its goal comes indirectly from the AIM Technology group in Santa Clara, CA—the people that bring you the AIM UNIX benchmarks. In its Fall

Solve the Electronic Publishing Puzzle with a few pieces from EOS.

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1991 "UNIX System Price Performance Guide," AIM charts price/performance comparisons among UNIX systems under \$50,000; in the \$50,000 to \$100,000 category; in the \$100,000 to \$500,000 range; and in the over-\$500,000 area.

While Sun rarely shows up in the latter three categories, it fares extremely well in the under-\$50,000 market. Of 38 systems ranked in this category, the SPARCstation ELC, SPARCstation IPX and SPARCserver 2 all make it into the top seven in terms of price/performance ratings measured in dollars per AIM (see chart on page 18).

Ergo, if Sun's goal is moving boxes, it's on the right track. You sell more machines when they cost less than \$50,000 than you do if they're priced in the over-\$500,000 range.—mjf

'When You Wish Upon A VAR...'

O.K. O.K. Those aren't the exact words from the Disney classic "Pinocchio." But Sun Microsystems Inc. is wishing its dream will come true in 1992: to augment by 30% over last year its indirect sales of its workstations and budding software offerings in the commercial domain.

To help it do so, it recently hired Dan Shaver, a Silicon Valley executive who spent eight years at Apple Computer Inc. designing that company's channels strategy. More recently he was the vice president of marketing for MicroAge Inc., a leading industry reseller—and not so coincidentally, one of Sun's primary national value-added dealer (NVAD) franchisers.

Shaver, Sun's new U.S. reseller channels director, spent Comdex last month quietly meeting with channel representatives as part of Sun's effort to map its market presence at some 900 "reselling locations" he estimates the company has here in the United States.

"We want to minimize the conflict in the channels," says Shaver. So, Sun is looking at its channel participants—value-added resellers, dealers and OEMs—as customers, not as partners, he says. In addition, Sun will begin

tailoring its reseller programs according to geography, industry specialty (such as health and manufacturing), applications development and networking knowledge. Finally, according to Shaver, Sun plans to give its resellers longer training sessions.

Revamping its sales strategy may come none too soon for Sun, according to Joan Reagan, an analyst with market researcher InfoCorp, San Jose, CA.

Companies' buying patterns indicate a change-over to second- or third-party suppliers because of lower prices, localized service and support and the chance to buy turnkey solutions. While Sun has made its major push into the reseller channel since 1990, Sun will need to make it easier for all of its indirect resellers to sell its newer, more complex, more sophisticated systems, such as the SPARCserver 600MPs.

Sun already has its work cut out for itself vis-a-vis its competition. IBM Corp. has long been a channels player when it comes to computing's low-end; its reps will have little problem selling its low-cost RISC-on-a-desk, the as-yet-unannounced low-end RS/6000. It's still uncertain how IBM will choose to move this product—through its own National Distribution Division force, via independent resellers, or both.

Hewlett-Packard Co., though concentrating heavily on the technical market, is no newcomer to indirect sales, with its expertise in selling personal computers and printers indirectly. Beginning in January, it will offer its Series 700 workstations to business users through MicroAge and Intelligent Electronics, another key Sun dealer franchiser.

Shaver expects to begin "testing" Sun's new indirect sales strategy in January.—hcp

This Just In...

• Cisco Systems Inc. and SynOptics Communications Inc. have allied to create an integrated router/intelligent hub. The new system, called the RubSystem, will allow companies to build larger and more complex net-

works than those used today. The joint venture expects the RubSystem to support supernetworks of 40,000 to 50,000 users. The product will run SunNet Manager from SunConnect. SynOptics is headquartered in Santa Clara, CA; Cisco is based in Menlo Park, CA.

- **SunSoft** is offering an early access program for its Network Information Service Plus (NIS+) enterprise naming service. NIS+ will be part of the Solaris 2.0 environment, which is slated for delivery by mid-1992. The service allows systems administrators to "streamline information across far-flung heterogeneous networks" consisting of up to tens of thousands of worldwide nodes. The product is a redesigned implementation of NIS. Unlike NIS, NIS+ uses a hierarchical-naming model allowing for distributed network administration. NIS+ features an API that allows developers to incorporate NIS+ into their distributed applications.

- **Spider Systems'** portable STREAMS-based X.25 technologies will be integrated into future SunConnect products as the result of an agreement signed between the two parties. Currently, Spider's X.25 implementation, SpiderX.25, supports the SVR4 STREAMS environment. Spider is based in Edinburgh, Scotland.

- **Accurite Technologies Inc.**, San Jose, CA, has developed a number of SBus peripheral-interface products, including what it calls the first universal SBus interface IC, as well as a corresponding 8-bit SBus Developer's Kit and option cards designed around the IC. The product is geared to helping developers save time and money in generating and testing SBus circuit designs and prototypes. The kit sells for \$695; the IC goes for \$30 in sample quantities.

- **New York-based Systems Strategies Inc.** has added SBus systems to the list of platforms supported by its Express SNA software. Using Express, Sun systems can connect to IBM hosts in a point-to-point or networked TCP/IP manner. Price for the product ranges from \$400 to \$4,000 per system,

depending on configuration and quantity.

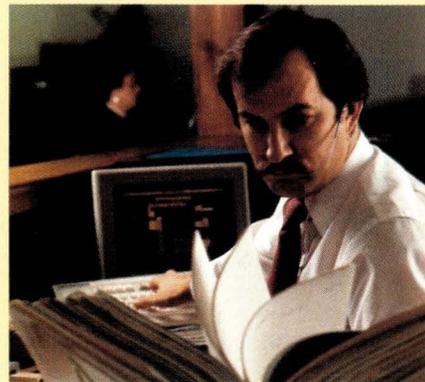
- **anDATAco Computer Peripherals**, San Diego, CA, is now carrying a molecular-modeling software package for SPARC-based systems. Called OpenMolecule, the \$4,995 program provides 3D graphics allowing scientists to dissect, display and measure complex chemical structures. The product is designed to work alongside high-end computational chemistry solutions. The package, which was developed in part by the director of research computing at Scripps Clinic and Research Foundation (La Jolla, CA), is being carried exclusively by anDATAco.

- **Software Components Group** is using the microkernel Chorus/MiX OS from **Chorus Systems Inc.** to produce distributed UNIX-compatible, real-time binaries. SCG plans to enhance the base Chorus product by providing an interface for SCG's pSOS OS, porting MiX to existing and new real-time targets and providing development tools for the host system, among other ways. SCG is based in San Jose, CA; Chorus is headquartered in Beaverton, OR.

- **Computervision** in the news: Bedford, MA-based Computervision has signed an agreement with Sun Microsystems Computer Corp. to purchase more than \$200 million worth of Sun SPARCstations and servers per year over "multiple" years. In addition, Solbourne Computer Inc. and Computervision have signed a worldwide OEM contract, under which Computervision has the right to resell Solbourne's entire line of servers and workstations. The agreement also specifies that Computervision will recommend Solbourne's servers as one of the servers of choice in specific CADDs and Medusa environments.

- **Stratus Computer Inc.** has introduced a System V-based software platform for managing cellular telephone networks with 100,000 or more elements. Called the Stratus Cellular Management System, the product runs data collection, storage and analysis on the Stratus XA 2000.

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International Spotlight

The U.S. Case for CASE

A new integrated set of CASE tools for Sun Microsystems Inc. environments, based on a CASE system built for the European Space Agency, should emerge in the States some time early next year. The developer of Life*CYCLE, Computer Resources International A/S, a Copenhagen-based software house, has been talking to both Sun and Atherton Technology, Sunnyvale, CA, about marketing the software in the United States, where CRI has no direct presence. So says Klavs Skjerbek, marketing and sales manager for CRI's CASE systems division. Skjerbek says Life*CYCLE will be released in the first quarter for Sun and IBM RS/6000 platforms and, that CRI expects to show Sun the product early next year. The agreement with Atherton, apparently, is further along. CRI has been using, marketing and distributing Atherton's Integrated Project Support Environment (IPSE) product, Software BackPlane, in Scandinavia. "It's an example of where we use an American company's technology and we become experts and say, 'Why don't we market your software here and you market our software there?' We have agreed to be their partner and we are finalizing the terms for them to be ours," says Skjerbek. CRI will market the product itself in Europe and indirectly in Japan, as well.—*mwj*

Presentation functions occur on Sun client workstations. PacTel Cellular, a Walnut Creek, CA, subsidiary of PacTel Corp., is evaluating the platform for its network-management applications.

- **UniSolutions Associates** has introduced version 4.2.2 of its UNISOL SysAdmin product. The Redondo Beach, CA, company's product provides account maintenance, multilevel file backup and restore, tape-library management, tape-manipulation utilities, system security and monitoring, network administration and monitoring, resource accounting and reporting, performance monitoring, cron management, email, printer maintenance and file/directory management. The new version provides more automated scheduling and less need for user input. The product also sports a new X11R4 and Motif user interface that supports both ASCII terminals and workstations.

Other Open Systems News

Digital Equipment Corp.

Based on technology from Legato Systems Inc., DEC Network Save and Restore for Ultrix (DECnsr Version 1.0) will be available to DECsystem, DECstation and VAX customers starting next month. The product provides backup and recover services across TCP/IP for multivendor systems. (The current list of supported clients includes DEC Ultrix stations and servers; Sun 3s, 4s or 386i's; Hewlett-Packard Co. 9000 Series 300 or 400; and MIPS Computer Systems-based platforms.) Types of tape media supported include 1/4-inch cartridge, 1/2-inch 9-track, TK50/70, TA90, 4mm and 8mm. Pricing begins at \$940 for a single-system license; networked versions cost from \$2,830 to \$4,710 for a server license, plus \$355 for each client license. Volume discounts are available.

A version of Unify Corp.'s Accell/SQL is now available for VMS, marking the first time the product is available on a non-UNIX OS. The initial version, Accell/SQL Release 1.3 for Sybase SQL Server on VMS 5.4, is designed to operate with Sybase. Unify, based in Sacramento, CA, says it is committed to making Accell/SQL available for all RDBMS engines that support VMS. Product pricing ranges from \$1,770 to \$250,000.

DEC has added new services, products and third-party support to its electronic data interchange (EDI) program. Among the enhancements are: FileBridge for DEC/EDI software, which integrates business applications with EDI systems; a new version of DEC/EDI software, which supports additional EDI standards, communications options and computer configurations and new service packages for planning, designing, implementing and managing EDI, including services delivered with Price Waterhouse.

Hewlett-Packard Co.

HP has added FDDI support for its HP/Apollo 9000 Series 700 workstations. The company's FDDI Series 700 adapter is compliant with ANSI X3T9.5 and SMT 6.2. The product lists for \$5,995.

Three enhanced—yet less expensive—DraftMaster pen plotters have been introduced by HP to replace existing plotters in the family. The DraftMaster SX Plus plotter, a sheet-feed plotter with a 1-MB buffer, lists for \$7,495. The DraftMaster RX Plus plotter, with the same features as the SX, with the addition of roll-feed, automatic media cutter and media tray, lists for \$9,495. And the DraftMaster MX Plus includes the same features as the RX, plus four RS232C ports and a 20-MB spooler and sells for \$10,995. The new products all feature the HP SurePlot Drawing System, which includes a pen-distance monitor, pen-grouping feature and optical-line sensor.

IBM Corp.

IBM LaserPrinters sporting resolutions of 600-by-600 dpi are now available from Lexmark International Inc., Lexington, KY. The 4029 series offers Apple Computer Inc. compatibility and PostScript-printing capability. The series

consists of a five-page-per-minute (ppm) model priced at \$1,595; a six-ppm one at \$1,895; and two 10-ppm models, priced at \$2,395 and \$2,995. The series comes standard with 1 MB of memory, expandable to 9 MB. The products support the IBM Personal Printer Data Stream (PPDS), Hewlett-Packard Co. LaserJet II and plotter emulations as standard; HP PCL5 and HPGL2 emulations and PostScript are options.

Interactive Systems Corp., Naperville, IL, has been named as an IBM Business Partner Authorized Application Specialist. Interactive is charged with assisting IBM with marketing and installing the AIX operating system and RS/6000 hardware, along with its own development services. Interactive, which is part of Eastman Kodak Co., provides licensed UNIX—including SunOS—to developers and OEMs. Sun recently acquired the Santa Monica, CA-based Systems Products division of Interactive to lead its Solaris-on-Intel Corp. charge.

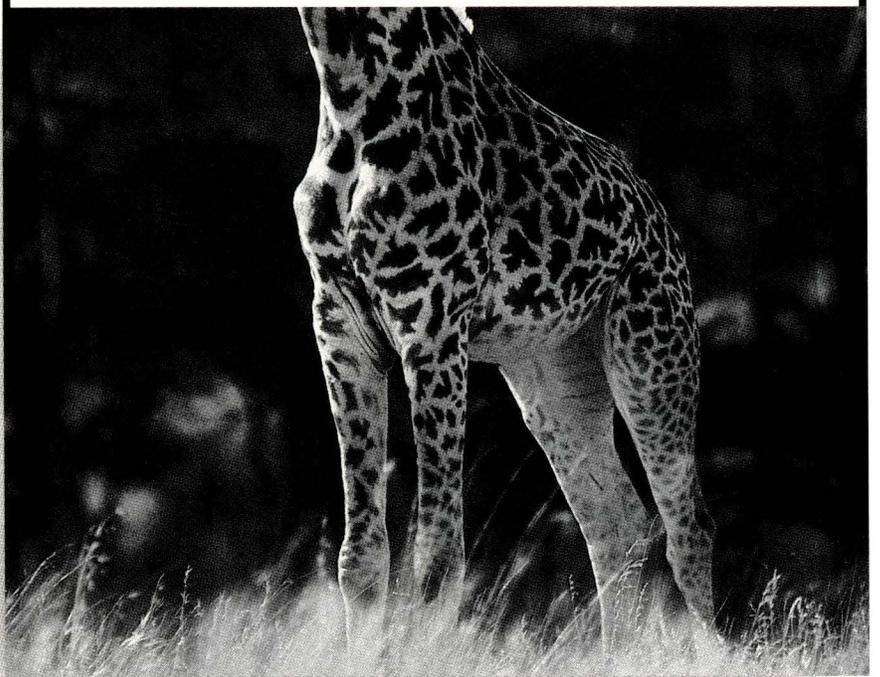
The Torrance, CA-based Ashton-Tate subsidiary of Borland International Inc. has rolled out dBASE IV for the RS/6000. Ashton-Tate says that "most" dBASE applications that currently run on DOS, MacOS, 386 UNIX or VAX/VMS will run unchanged on dBASE IV for the RS/6000. Pricing: \$995 for a single-user license; \$2,995 for a multiuser license (four simultaneous users). The product will be distributed through Merisel Inc. and SBT.

Silicon Graphics Inc.

The IRIS Graphics Library (GL) will be part of the common application-programming interface (API) announced by the ACE initiative for the ACE UNIX environment. The API will ensure that advanced 3D graphics applications will be available to users running ACE UNIX, whether it's based on OSF/1 or USL's System V Release 4. USL also has agreed to license GL and says it plans to support version 5.0 in its SVR4.1 OS.

SGI has licensed Legato NetWorker for the IRISserver family of file servers. Customers can use IRISservers with IRIS NetWorker to back up files on other vendors' systems that also use Legato NetWorker. →

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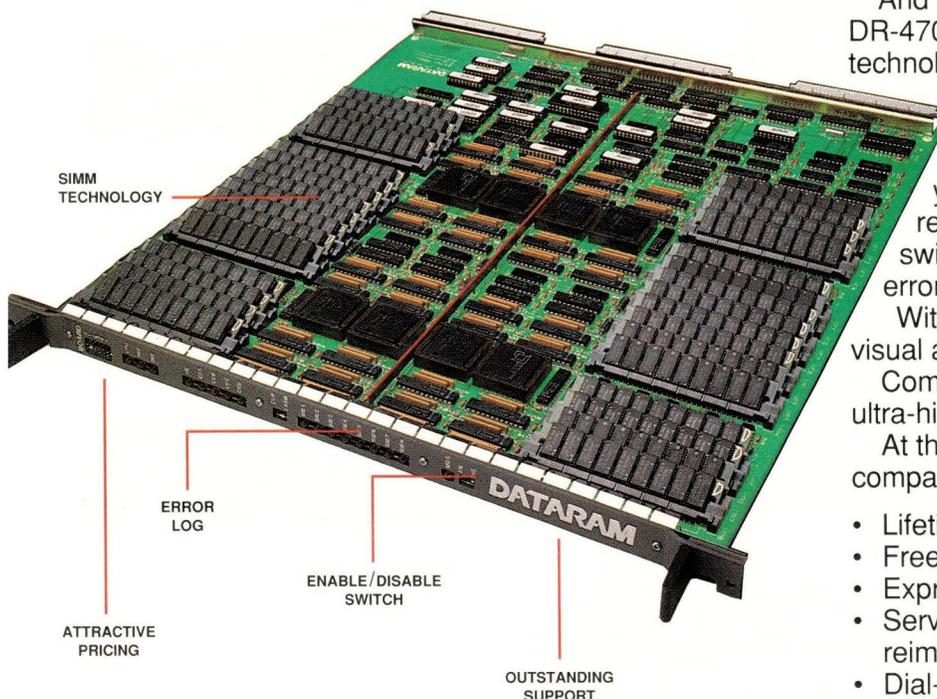
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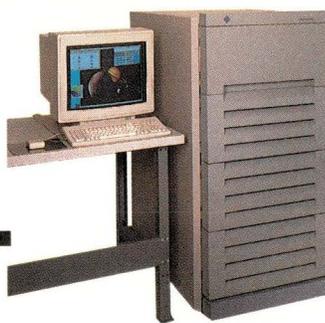
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ILLUSTRATION BY TOM BARRETT

by MICHAEL O'BRIEN

"Unfortunately, 8-bit binary code in CSNET mail messages enjoys the same popularity as rainbow trout in the Postal Service: It packages well, but it gives the mail system fits along the way, and arrives in less than prime condition, when it arrives at all."

—Mr. Protocol, in an earlier incarnation

"I am not bound to please thee by my answers."

—The Bard

'Excuse me, could you please direct me to...'

Q: What is Mr. Protocol doing with all those phone directories? A: Well, in the first place, those aren't phone directories. Notice how they all say "X.500" on them, and how they're completely unreadable—I mean, even more so than regular phone directories? What he's doing is looking up something on the Internet the newfangled way: using directory services. Of course, these services are so newfangled that only little pieces of the Internet are covered so far, but that's the way it goes. It's just as well that the Internet services we're all used to will be around for a while, but it's nice to take a look at what's coming. Let's see if we can decrypt

what Mr. P. is looking at.

Last time, when we took a look at the world of the ISO specifications, we concentrated on the low-level protocols, and promised that a look at the higher-level protocols would show us Mecca, eternal happiness and a cure for warts. Modern merchandising being what it is, what we get are file transfers, message-handling systems, and directory services. On the whole, not such a bad deal, so long as the services provided are up to snuff. Let's take a look at them, and see why anyone would want to use the ISO services, apart from the danger of creating an international incident by ignoring them, not to mention never getting any government work again. The government says in its GOSIP standard that we're all going to be using OSI for

all our work from now on, *aren't* we, and we're going to be *happy* about it, *aren't* we, but why be negative?

Mr. Protocol is pleased to report that there actually are some very good reasons for using the OSI protocols apart from the non-technical aspect of things. First, though, he thinks it would be well to take a look at reality. It is true that the government GOSIP standard states that the OSI protocol suite should be used for new work undertaken for the government, unless there are strong reasons for not doing so. One "strong reason," which at least seems to be adequate in many cases, is the need to interoperate with existing networks that use the TCP/IP protocol suite. The number of such networks is growing, not shrinking, and it is growing rapidly. It is unfortunate from this viewpoint that the rest of the world is not following along and embracing TCP/IP wholeheartedly. But this is not to be, certainly not while networks that have the potential to dwarf the present Internet (like, just about all the national networks of just about all the other countries in the world advanced enough to have a national network) are already using the OSI suite.

However, there is a counter-argument. The high-level applications of the Internet are familiar to most of us—at least, most of us who are actually on the Internet, or who use the Sun networking features. One thing that sinks in is that they are quite old, and built for a world rather different from the one we live in now. Telnet, for example, is just loaded with options for systems that don't exist anymore outside of computer museums. FTP insists that you **MUST** log in to **EVERY** system you use it with, never mind the fact that all systems on a local network are very probably under the same administrative control. The Sun Network Information Service (néé Yellow Pages) is built around this very assumption, but FTP knows nothing of it. Only the advent of "anonymous ftp," which essentially does an end-run around the login process, as an effective means of archiving information across the Internet has saved FTP from

being relegated to the bit backwaters.

The upper levels of the OSI protocol suite, however, have been designed along more modern lines, and are much more relevant to the world as it is today. For true file sharing across networks, there are various ad hoc solutions in the TCP/IP world, but the OSI world has most of them already solved with FTAM...or so OSI thinks.

FTAM stands for File Transfer, Access and Management, and it is

FTAM allows for the existence of files that have structure, which in commercial applications, is a very large win.

intended to be the only protocol one will ever need for working with files across an OSI network. Now, Mr. Protocol, of course, believes that one can never have too many protocols, and is naturally suspicious of such an arrangement. In this case, there are some who feel that his suspicions may be justified. FTAM, they feel, tries to do too many jobs for a single protocol. It replaces both FTP and NFS in a single application, although these two services do not have very much in common, except that they both move files across a network. In the Internet world, FTP is used either interactively or, more rarely, in batch mode. It used to be exclusively interactive, but when the Arpanet and later, the MILNET, came to a screeching halt due to overload, batch FTP programs started to make their appearance. That is the point about FTP: It is designed to

work over slow and potentially chancy networks. Mr. Protocol here makes the editorial comment that FTP badly needs a feature allowing it to pick up a transfer in the middle of a huge file (called "hole-filling") but, notwithstanding, FTP is designed to move whole files from one filestore to another. NFS, on the other hand, is designed to move pieces of a file only, and to move them locally, over rapid, high-reliability networks, to the address space of a running process. The peculiar thing about FTAM is that it is designed to do both of these things.

There is nothing intrinsically wrong with trying to be all things to all people, if you think you can get away with it. FTAM thinks it can get away with it. The jury is still out on whether or not this is true. Certainly the details of the operation of FTAM are complex, and in some ways limited; for example, FTAM allows only one file to be accessed at a time in a given session. This certainly seems clumsy and unworkable if one looks at the number of simultaneous open files in a typical UNIX application, where the number returned by `getdtablesize()` seems to spiral ever upward. However, one can also point out that NFS, while widely available, is far from ubiquitous. FTAM, on the other hand, uses standard OSI session services to do its work, so that on an OSI network, FTAM is guaranteed to work from anywhere to anywhere. Also, FTAM allows for the existence of files that have structure, which in commercial applications, is a very large win indeed. It is probable that the clumsier parts of FTAM will be remedied in time. The benefits of a truly universal file service are large indeed.

All well and good, you may say, but what about the really important applications? What about mail? Mr. Protocol is glad you asked. Electronic-mail applications are undoubtedly the most popular network service, even more so if you count Usenet in that fold. (Mr. Protocol notes some history here: The Usenet message format looks suspiciously like the format in RFC 822, though it now has its own RFC, for a reason. The fellow who

originally laid it out decided that it would be a really nice thing if Usenet messages could be made palatable to the Rand MH mail system. That way, there was a ready-made news reader. It turned out differently: Although MH is designed to handle truly shocking amounts of mail without crumpling, the demands of Usenet readership made it necessary to develop a completely different breed of news-reading software. Netnews activity is, it seems, on a different plane from mail.)

The OSI Mail Handling System application bears a family resemblance to what we know in the Internet world, though the resemblance stops at the familial. Messages are handled by a collection of entities for which we don't have any commonly known names in the Internet world, where we talk about specific programs such as "MH" or services such as "SMTP." In the world of MHS, users deal only with *User Agents*, which in turn talk to *Message Transport Systems (MTS)*. While equivalent services exist in the Internet world, the world of MHS contains additional services devoted to message routing and format translation that have no equivalents in the Internet. MHS Messages consist of a transport envelope and a body; the MTS usually does not examine, nor does it understand, the body. What is interesting is that the options for what goes in the body are huge. MHS is a multimedia system from the start. It can handle not only a blizzard of international character sets, but also fax, voice, graphics and so forth. Furthermore, the body can be split up into parts, so that several different kinds of data can be included in a single message. The advantage here should be obvious: for one thing, `uuencode` and `uudecode` are history when MHS comes along.

The MTS can also be charged with providing translation of the body, if it is necessary. In this single case, the MTS will at least look at the body. One can consider the case of turning a fax image into a GIF image, for example. In addition, the envelope can specify the body as consisting of any random sort of data, without insisting

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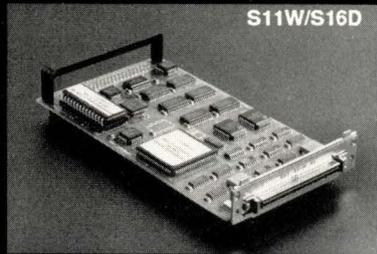
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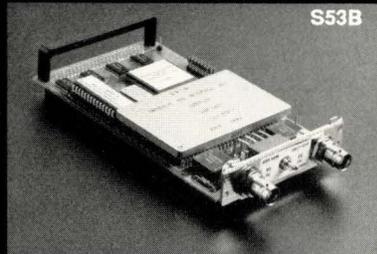
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that the MTS or anybody other than the UA at the far end know what is really going on in there. There are more than a few people who think this beats the current memo-based text mail system all hollow.

To deliver the mail, and to know where to find files—indeed, to know where to find anything—a directory service is needed. This is currently a very active area, since for there to be any hope of interworking between OSI networks and the TCP/IP-based Internet,

The OSI Directory is a type of database system that is lacking on the Internet.

there must be directory services spanning the two, containing information on how and where to go to bridge the gap. This makes the OSI Directory a very important part of the near-term interoperability of the Internet and the OSI networks of the world.

The OSI Directory is a type of database system that is lacking on the Internet. Just as FTAM is a general service covering the ground of several independent Internet services, the OSI Directory covers the ground of Sun's NIS, the Domain Name Service (which NIS can be made to use—let's be fair), and the `aliases` file, all rolled into one.

If it is close to anything, it is the Domain Name Service. The database is expected to be distributed and hierarchical, and the service as a whole consists of Directory User Agents, acting on behalf of users (or other applications) making contact with Directory System Agents, which have access either to the actual information, or to other Directory System Agents. Just as in the Domain Name Service, a

Directory System Agent can either refer a request to another DSA, or pass on the request itself, and return the answer. The interesting feature here is generality. This setup can be used for host names, for alias files, for mailing lists, and, undoubtedly, for a whole raft of services as yet undreamt-of. People are currently doing some fairly hefty dreaming, at that. Mr. Protocol figures that in years to come, browsing the OSI Directory service will be as interesting as going fishing. There are liable to be some strange fish to be caught.

Credits and Cookies

A plateful again to Marshall T. Rose and *The Open Book*, not to mention all those Internet Drafts and RFCs appearing at the rate of dozens per month, or so it seems. →

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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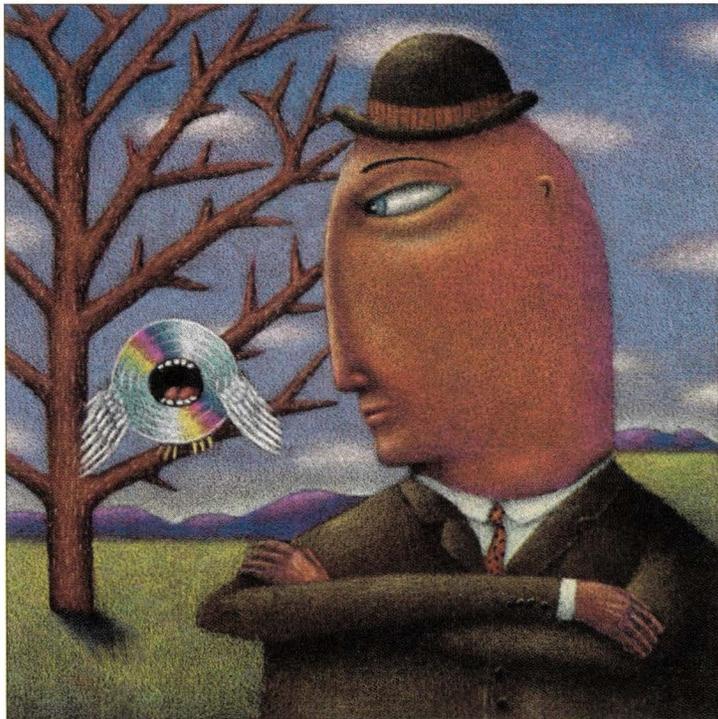


ILLUSTRATION BY KEITH GRAVES

Is That CD-ROM Any Use?

by PETER COLLINSON, Hillside Systems

It's no great secret that Sun has decided that in the future all software distribution will be on CD-ROM. Sun has been "encouraging" customers by selling the drives cheaply. For cheaply, you should read "reasonably priced." This is fair enough. Many people have bought drives that perhaps would not have done so. For instance, I have one.

The whole promotion on this side of the water is tinged with humor. First, I burst into fits of laughter one morning when a cardboard popup CD-ROM drive appeared in the mail. It's great for practical jokes. I rushed up to the University here and we carefully replaced a real CD-ROM drive with the cardboard one. We waited in great glee for the poor person who normally plugs his headphones into the drive to arrive. Confusion reigned.

In the United Kingdom, they have been giving away a hypertext-linked encyclopedia as encouragement to first-time purchasers. I haven't managed to get a copy. I am not too sad because it needs a color screen and that I don't have. I played with a copy on a demo machine at the Nashville

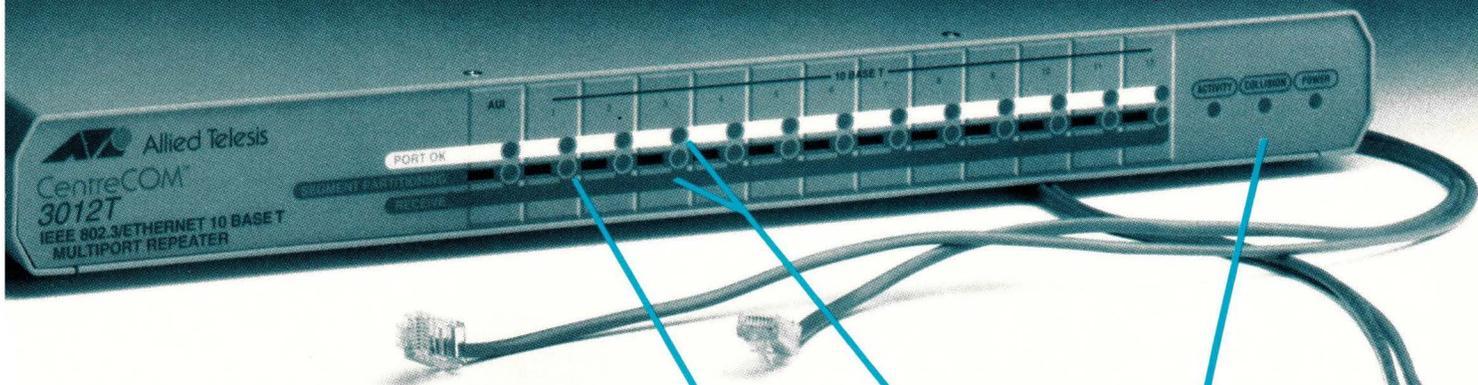
Usenix. I found a nice picture of Stonehenge.

I then learned that some of the hypertext links are decidedly shaky. I thought I would try something obscure so I looked for "Morris Dancing." This is an English folk dance performed on the street, if you haven't come across the term. Well, wonder of wonders, there was a screen full of information. It ended with the fact that a man called Cecil Sharp was responsible for its survival. The word "Sharp" was a hypertext link, and I clicked expecting more on the man and got... a description of sharps and flats in music. Interesting—`grep` at work?

Since then I got my drive and looked at the demo disks, but I soon was bored with that. Until recently, I had only used the drive in anger to deal with SunOS 4.1.1 and OpenWindows 2.0. It has mostly sat there, whooshing air out the fan on the back. I had a period of playing audio CDs through it, but have reverted to the old trusty Sony Discman. The Sun drive could do with a socket supplying audio "line-out" so I can plug it into a stereo amplifier. The drive had begun to sit there doing nothing, not even

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whooshing because I had turned it off.

Then along came some CDs. The purpose of this article is to look at a few CD offerings that have come my way in the last year. As such, the sample is biased. If you think that you have a CD that I should have looked at, then send it to me. Maybe next time.

What's On the CD?

CDs are written in a variety of formats. Sun often simply prints a standard SunOS UFS file system onto the plastic. This is convenient for proprietary information. You then have to attach the disk to the system using the standard file system `mount` command:

```
mount -r /dev/sr0 /cdrom
```

The CD is now accessible through the `/cdrom` directory. The disk must be mounted read-only, using the `-r` flag. Otherwise the system will try to update the file access times on the disk when files are read. This has dire consequences, and you will have great difficulty in dismounting the disk. The system has been known to hang, resulting in the need to reboot it.

You can remove the disk by:

```
umount /cdrom
```

This will only work if no one is using the CD. Remember that nobody must have a current directory on the drive. You get the CD from the drive by using

```
eject cd
```

Actually, the `eject` command will handily run `umount`, so two commands are not really necessary. It's best to get into the habit of ejecting the CD by software, since that way you know where you are. Also, if the file system is mounted, the eject button on the drive itself is disabled. Another handy feature.

I find all this typing of mount commands boring, so I insert a line into `/etc/fstab`:

```
/dev/sr0 /cdrom 4.2 ro,noauto 0 0
```

You can then say:

```
mount /cdrom
```

without having to remember any other magic.

There's a snag with all this. It has to be done by the almighty super user. This may be convenient if you wish to lock a particular CD into the drive. It may be very annoying if you wish to make your CD drive into a sharable resource accessed by mortals.

One instant thought is to place appropriate commands into a shell script and make this setuid to root. For security reasons, don't do it. There are now many well known ways of using a setuid script to gain root access.

It's safer to create a C program containing the needed C actions, and make that binary setuid. Make the command do one thing: Mount a known filesystem at a known point in the file system. Don't permit user-supplied arguments. Be careful with the `system()` routine, though. It uses the shell to process its arguments.

Standard Formats

Writing a private format on the disk is one way to go. However, there is an international standard for the format of file systems placed on CDs. This has several benefits, the best one being that it means that the CD is suddenly a system-independent entity. It can be loaded and the files read on any operating system.

The standard is called ISO-9660. It was closely based on an earlier format called "High Sierra." A ISO-9660 compliant driver can read High Sierra disks. Sun provides you with a method of mounting CDs using these formats as if they were normal SunOS file systems.

```
mount -rt hsfs /dev/sr0 /cdrom
```

mounts the CD read-only using the `hsfs` High Sierra file system. You can now `cd` into `/cdrom` and zoom around using the normal UNIX commands. Again for convenience, you can place a line in `/etc/fstab`:

```
/dev/sr0 /cdrom hsfs ro,noauto 0 0
```

For UNIX systems, there are problems with the ISO-9660 format. The standard was put together by people with PC, VMS and Macintosh file systems burned into their brains. The needs of UNIX were not considered. As a result, the standard makes it hard to take a UNIX file system and transfer it transparently onto CD. The file names stored on the CD are all in capital letters and are forced into the `file-name.ext` mold from the PC world. UNIX users long ago bounded out of that particular straightjacket. A more subtle problem is that the directory structure cannot be greater than eight levels deep. There are other problems.

This problem has led to the invention of another oddly named format: the Rock Ridge format. You should know that Rock Ridge is the name of the town in the movie "Blazing Saddles." The idea is to work *within* the ISO-9660 standard. Rock Ridge defines meanings for several fields in the ISO-9660 standard that exist for private use. The result is an ISO-9660 compliant CD that can be read using currently standard drivers *as well as* being mounted as a UNIX file system if you possess a Rock Ridge driver. Unfortunately, Sun doesn't have one of these for SunOS 4.1.1. It will be released with SunOS 4.1.2 later in the year.

The 1991 SUG CD-ROM

My first exposure to Rock Ridge format disks was the 1991 Sun User Group CD-ROM. This CD was engineered by Young Minds Inc. who are the field leaders in this technology. They took a disk image that had been put together by the Houston User Group for Suns with help from others.

The idea was to generate a CD containing the vast quantity of publicly available software and information of relevance to Sun users.

A large portion of the disk is 245 MB of archive material. I found that the most useful part of the archive was the complete set of official SunOS patches. I fixed lots of bugs in my system. The remaining material is archives of several mailing lists: sun-managers, sun-movies, sun-nets and sun-spots.

The archive is an invaluable source of information, helping to answer questions like: If I overwrite the start of a 1/4-inch cassette tape containing something precious, can I get any of the important stuff back? Answer: The tape is written in a serpentine form starting with track one until the end of the tape is reached, and then moving to track 2 and recording in reverse and so on. No—the data has gone. You must protect valuable cassettes by using the safety switch.

The remainder of the disk contains much software and its source. The bulk of this is code from the GNU project as of May 10 and X11R4 from the X Window System team at MIT. There is also considerable software from other sources, T_EX for instance. People were urged to contribute their programs and did so.

The group that created the disk added an enormous amount of value for SPARC users by making the software directly usable. The disk contains running, tested binaries of much of the software. This means that you can run the code and see if you like it. You don't have to cope with the complexities of compilation and the problems associated with that. The programs use libraries and data files on the CD. If

you want to install the code on your system, you might want to recompile things so that these references are relocated.

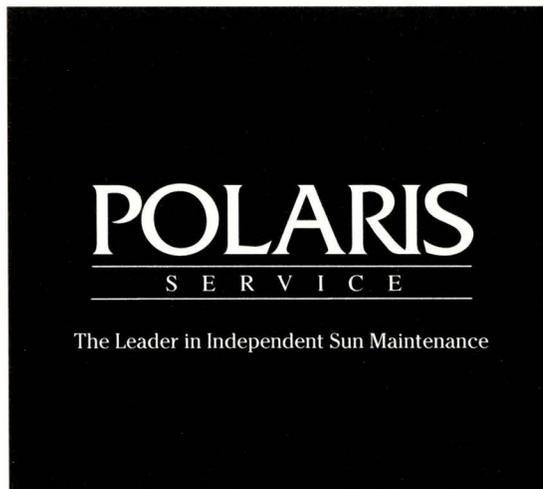
Data Access

The SUG disk comes with two access programs supplied by Young Minds. The first, `cd_link`, is used to build a sub-tree of directories and symbolic links pointing to the CD. This allows you to avoid the problems caused by the ISO-9660 format. You access the CD by a parallel tree of symbolic links using the original names of all the files on the disk. The disk is mounted on `/sugcd`, but accessed through a nest of symbolic links stored in `/usr/sug`. You do this by a simple command:

```
cd /usr/sug
/sugcd/cd_link. -r /sugcd
```

The program is executed from the CD. The ISO-9660 name of all files without specific extensions ends with a period, following PC practice. This command takes around 2 1/2 hours to run to completion on my Sun. The resulting set of symbolic links occupies 31 MB of disk space. This seems odd at first, until you realize that each symbolic link must occupy one fragment on the disk. Each fragment on the disk in question is 1 KB.

When I first got the CD and did this, I was not prepared to use this much disk acreage. I immediately deleted the whole tree of links. I tend to just create the ones that I want to use for the time that I wish to use them. This is easy with



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the `cd_link` program. For example, if I want to create links to `/sugcd/man/man1`, I type:

```
cd/usr/sug
mkdir man; cd man
/sugcd/cd_link. -r /sugcd/man/man1
```

The second program supplied by Young Minds is the `viewtool`. It comes in several versions depending on the architecture of the workstation and the flavor of window system. Using some prebuilt indexes that exist on the CD, `viewtool` allows you to search for files containing text strings. This is the way to deal with all those archives. It's easy to find a conversational thread and follow it. I found the snippet about 1/4-inch tape by using `viewtool`.

I think that most of the problems with this CD are caused by the lack of a Rock Ridge driver under SunOS 4.1.1. This problem will go away in time.

Sun's AnswerBook

Sun's product, the System Software AnswerBook, replaces Sun manuals and documentation with a single CD. The yards of shelving that were needed to support a typical Sun manual set have always been held up for derision by the "it's not UNIX; you cannot get it in your briefcase" school of thought. A CD will certainly fit into your briefcase. It's perhaps unfortunate that you will not be able to squeeze the machine needed to read the CD into the case, too. Maybe this is not far off.

The AnswerBook CD contains a normal SunOS UFS file system. The contents are PostScript-formatted documents. You can throw these at the laser printer in the corner of the room and get bits of paper. You are only permitted by the license to make one hard copy of each page. The PostScript can also be viewed by an OpenWindows application called `Viewer`, which in turn can be guided by an application called `Navigator`.

`Navigator` can be run in three different modes. First, it can be used in contents mode. Figure 1 shows this. The idea here is that you use `Navigator` to access a particular book, a chapter within a book and a section within a chapter. The top window displays where you are in the hierarchy at the moment. The bottom window displays the options that are open to you. In Figure 1, I have selected a set of documents helpfully called "All Sun Titles." The list of titles is shown in the bottom window, which I have scrolled up a bit looking for the document that I want. Clicking in the highlighted area, "OpenWindows Version 2 Reference Manual," will display a list of manual pages in the bottom window. In contents mode, then, the `Navigator` provides direct access into a set of documents.

The second mode allows you to search for words or phrases in the documents. This is shown in Figure 2. I have typed the word "Hypertext" into the search window. The program then goes away and searches a set of indexes for the word or phrase. It displays a list of options in the bottom window. The boxes give a level of relevance; black is most relevant and white, least. There are three intermediate levels of gray.

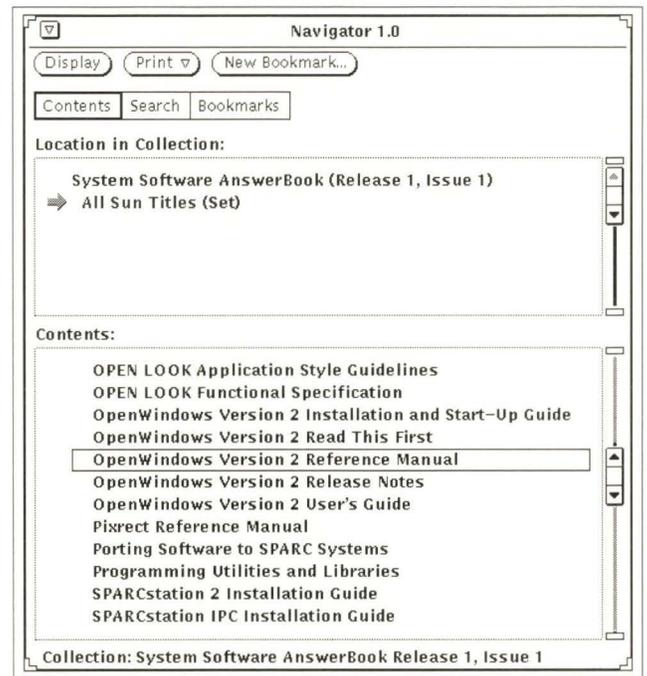


Figure 1: AnswerBook's Navigator application

I have clicked on the second line down and the manual page for `docviewer` is displayed in the `Viewer` window.

The third mode is Bookmark mode. This allows you to store your current position in the document set as a marker. The marker can be annotated, so you can remember why you stored the mark. Later the bookmark can be used to give direct access into the data. I must confess that I haven't used this mechanism much.

While you are moving about the documents using the `Navigator`, the contents of the `Viewer` window will change to follow you. You can also page through a document using Previous Page/Next Page buttons on the `Viewer`. The `Viewer` image can contain hyperlinks to other related documents. These are shown by words or phrases being enclosed in a rectangular box. Double clicking on the box takes you away from the current page and onto a related one. You can return by using the "Go Back" button, but positions are not stacked, so you can get lost if you are unwise.

Getting Lost

Getting lost and not knowing where you are is the biggest problem with the whole system. All the various positional information should be interlinked. When you move using a "Page Forward" on the `Viewer`, or a hyperlink, or search mode, or even Bookmark mode, then your current position should be updated in the `Navigator` contents window. Currently, it isn't.

If you are reading a book a page at a time, not exactly an unnatural event, the `Navigator` should track your movement through the book. It doesn't. You can reach a new chapter, but the contents in the `Navigator` do not change.

You can dive into the documentation using the search option, find an interesting page and want to know where

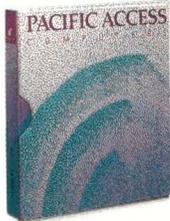
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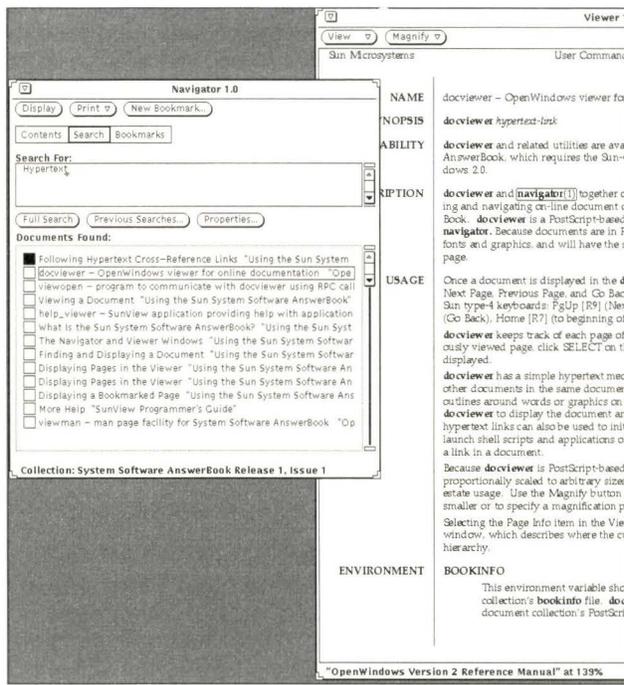


Figure 2: AnswerBook's Navigator and Viewer applications

you are. Well, the Viewer does provide a button giving positional information, and this is better than nothing. Sadly, if you leave this box up on the screen, it is not updated if you use the Navigator window to change your location.

To be fair, I think the system is fine for finding some piece of information quickly. You are using it as a reference tool and need fast access into a huge amount of material. It's less good at helping you read a document or book in more than one sitting because the signposts don't change as you move through the material. They lie about where you are. There should be better and more effective communication between the Navigator and Viewer. The whole thing needs a little more thought.

Installation and Operation

The installation process is well thought out, however. You can install it, as I have, with most things on the CD. This places the binaries for the software and some small data files on the hard disk. The system is perhaps a little slow; that's because access to CD-ROM disks *is* slow. If you can see the green light on the CD player blinking, then you know that it's waiting to access the data and you don't worry too much about speed. I am quite happy with the performance on my system. After all, I know that I have lost only 4 MB of disk space to it.

Alternatively, you can install AnswerBook with more files on the hard disk. This improves search speed and costs you 50 MB. Finally, you can put the whole thing on hard disk, costing you 240 MB. This is suitable for server use. Once you have done that, then you should worry about Sun's single-user license.

The programs need OpenWindows 2.0 because they use the NeWs part of the server to process the PostScript. It's about time Sun stopped doing this. The whole spirit of X is

one of Open Systems. Sun is selling systems flying the X banner, while developing so-called X applications that won't run on anyone else's server. If you have an X-terminal, and you want to look up how to write that application that will sell \$1 million worth of hardware for Sun, forget it. Sun thinks that you should use paper to find things out about their system.

Anyway, I run OpenWindows 2.0 on my machine and I am happy with the AnswerBook. In fact, the CD lives in my drive most of the time. I am beginning to use the `viewman` command rather than `man`. The command takes the same parameters as `man`, but starts a Viewer window on a manual page from the CD-ROM. On my system, access is slower than `man`, but you are repaid by legibility. "See-Also" entries are hyperlinks allowing mouse controlled access for follow-up information.

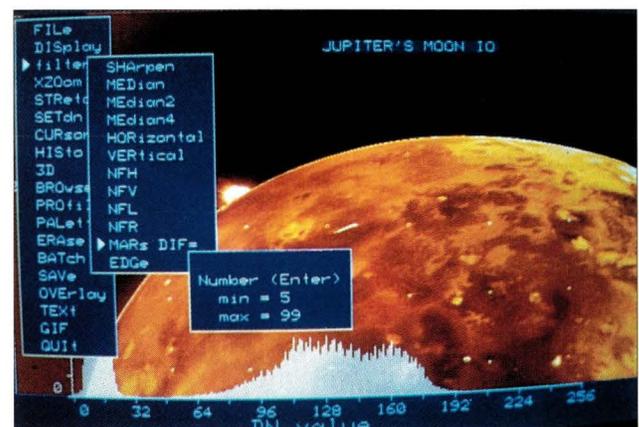
I have eliminated the paper copies of the manual in those three-ring binders. And I have learned that you can alter the keyboard-repeat speed, something that I have wanted to do ever since I moved onto a Sun workstation from my trusty Atari-ST windowing system. If you want this information, fire up AnswerBook and look for "Repeating Keys" in a search window.

Voyage to the Planets

Next to my Sun in the back room of our house is a 386 PC with a VGA color monitor. It's mostly used for DOS applications, but I do have a copy of PC-NFS for it. It's connected by thin Ethernet to the Sun. It occurred to me that since you could mount a High Sierra (ISO-9660) CD as a file system, then you should be able to export that file system to the PC.

In our house, we are somewhat interested in space and astronomy. I noticed that a company in the United States called "The Astronomical Research Network" was selling three CDs containing images from the probes to Saturn, Jupiter, Uranus and Mars. There are pictures of planets, rings, moons, craters, ice, volcanos and so on. The CDs come with a processing program called PROVISION. This

Astronomical Research Network's CD-ROM contains images of the universe, including a view of a volcanic eruption on IO, one of Jupiter's moons.



is a PC binary and needs to run on the PC. I took the risk that NFS would work and sent off for the disks.

When they came, I first had to export the /cdrom directory by placing it into /etc/exports. You then have to wave a magic wand by typing:

```
exportfs -a
```

You now move to the PC. It seems that PCs expect to use drive L, so do this. It's not mandatory. After booting NFS, you type the appropriate "NET USE" command. You must mount it read-only on the PC, otherwise the NFS server on the Sun gets upset.

The software that is supplied with the CDs is fun to use. The images are mostly eight bits per pixel and are really grey levels. You can look at the images using false color bringing out different details. There is also some mathematical image-processing operations provided to clean noise from images and to sharpen or blur edges. You can also position the cursor at a point in the displayed image and zoom in to magnify some feature that is interesting.

We have enjoyed these three CDs and are still doing so. The gamble that the CD player on the Sun could be mounted with NFS on a PC has paid off. Please be careful. It is certainly the case that the CDs are ISO-9660 and state that clearly. Secondly, the software simply reads DOS files from a DOS file system. It does not expect to mess with a CD-ROM drive. There are undoubtedly other DOS CD products that will not work in this way.

Availability

The 1991 SUNG disk is available from the Sun User Group, Ste. 315, 1330 Beacon St., Brookline, MA 02146; phone (617) 739-0202. The price is \$250 for members and \$290 for non-members, plus shipping.

The Sun AnswerBook is available from Sun. It is priced about \$400 in the United States, (£400 in the United Kingdom; this makes me cross). It comes with a single user license.

The three space CDs are available from the Astronomical Research Network, 206 Bellwood Ave., Maplewood, MN 55117, (612) 488-5178. The price is \$300 for all three CDs and includes the PROVISION program for image processing.

Thanks

Thanks to Tom Stapleton from Young Minds who supplied me details of Rock Ridge formats and other background material when no one else seemed interested. He also sent me Young Mind's latest offering, a CD containing the fully indexed sources of GNU and X11R4. ➡

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 1+. He is the Usenix Standards Liaison. Email: pc@expert.com.

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Words, Words, Words

by RICHARD MORIN, Technical Editor

As an occasional book reviewer (or at least mentioner), I get to look at a fair number of technical books. Here is a rundown of some of the more interesting books to cross my desk in 1991. (See *SunExpert*, October 1990, Page 41, for comprehensive suggestions on required reading for UNIX.)

Bits & Biology

"A Look at Genetic Algorithms" (*SunExpert*, November 1990, Page 43) discussed an interesting and useful optimization technique, borrowed from nature. Genetic algorithms (GAs) encode sets of parameters into strings of bits, then use crossover, mutation and other biological techniques to "breed" new generations. Several volumes have been added to

the GA literature since then, and they deserve examination.

The Fourth International Conference on Genetic Algorithms has produced a substantial (576 pages) volume of proceedings. It includes a mixture of theoretical and practical articles on GAs. "Don't Worry, Be Messy" (Goldberg, et al.) is a very readable discussion of the evolving (:-) field of "messy GAs," which I find analogous to fuzzy logic. For an interesting and useful application of GAs, try "Tracking a Criminal Suspect Through 'Face-Space' with a Genetic Algorithm." The researchers supplant the traditional (Photofit, Identikit,...) methods with an interactive, user-driven, face-drawing system.

The Handbook of Genetic Algorithms is both more and less than the title

implies. The book covers only a small part of the techniques used in the field, so it is not a comprehensive handbook. On the other hand, it does a very good job of presenting methods of using GAs in practical optimization. The approach is pragmatic: What can we do to improve upon existing (non-GA) results?

Much of the work on GAs has been pragmatic. Enough time has passed, however, for the theoreticians to get involved. The first workshop on the foundations of genetic algorithms and classifier systems (FOGA/CS-90) allowed these folks to get together and discuss the theoretical underpinnings of GAs. *Foundations of Genetic Algorithms*, an edited set of proceedings from the workshop, thus contains a useful collection of theoretical papers on GAs.

Books In Print

C: A Reference Manual (3rd ed.)
Samuel P. Harbison
Guy L. Steele, Jr.
Prentice Hall, 1991
ISBN 0-13-110933-2

C++ Primer (2nd ed.)
Stanley B. Lippman
Addison-Wesley, 1991
ISBN 0-201-54848-8

(Child of All Ages)
Nebula Award Stories, #11
Ursula K. LeGuin, ed.
Harper & Row, 1977
ISBN 0-06-012564-0

*Computer Graphics:
Principles and Practice* (2nd ed.)
James D. Foley, Andries van Dam,
Steven K. Feiner, John F. Hughes
Addison-Wesley, 1990
ISBN 0-201-12110-7

Computer Security Basics
Deborah Russell
and G.T. Gangemi Sr.
O'Reilly and Associates, 1991
ISBN 0-937175-71-4

*Computers Under Attack:
Intruders, Worms, and Viruses*
Peter J. Denning, ed.
Addison-Wesley, 1990
ISBN 0-201-53067-8

Foundations of Genetic Algorithms
Gregory J.E. Rawlins, ed.
Morgan Kaufman, 1991
ISBN 1-55860-170-8

Handbook of Genetic Algorithms
Lawrence Davis, ed.
Van Nostrand Reinhold, 1991
ISBN 0-442-00173-8

Practical UNIX Security
Simson Garfinkel and Gene Spafford
O'Reilly and Associates, 1991
ISBN 0-937175-72-2

*Proceedings of the Fourth International
Conference on Genetic Algorithms*
Richard K. Belew
and Lashon B. Booker, eds.
Morgan Kaufman, 1991
ISBN 1-55860-208-9

Technobabble
John A. Barry
The MIT Press, 1991
ISBN 0-262-02333-4

The Algorithmic Beauty of Plants
Przemyslaw Prusinkiewicz
and Aristid Lindenmayer
Springer-Verlag, 1990
ISBN 0-387-97297-8

The C++ Programming Language (2nd ed.)
Bjarne Stroustrup
Addison-Wesley, 1991
ISBN 0-201-53992-6

*The Cuckoo's Egg: Tracking a Spy
Through the Maze of Computer Espionage*
Clifford Stoll
Doubleday, 1989
ISBN 0-385-24946-2

The Hacker's Dictionary
Guy Steele, ed.
Harper & Row, 1983
ISBN 0-06-091082-8

The New Hacker's Dictionary
Eric Raymond, ed.
The MIT Press, 1991
ISBN 0-262-68069-6

The RenderMan Companion
Steve Upstill
Addison-Wesley, 1990
ISBN 0-201-50868-0

The Standard C Library
P.J. Plauger
Prentice Hall, 1992
ISBN 0-13-131509-9

*Theory Change in Science:
Strategies from Mendelian Genetics*
Lindley Darden
Oxford University Press, 1991
ISBN 0-19-506797-5

UNIX System Security
Patrick H. Wood and Stephen G. Kochan
Hayden (now Macmillan), 1985
ISBN 0-8104-6267-2

*UNIX System Security: How to Protect
Your Data and Prevent Intruders*
Rik Farrow
Addison-Wesley, 1991
ISBN 0-201-57030-0

Take a look at this book, if only for its beauty. You may be seduced into buying (or even reading) a copy.

Now C Here!

There are literally dozens of books on C, C++ and other variations. They may all be wonderful (but most probably aren't). In any case, I have found a few recent offerings to be noteworthy. (C++ enthusiasts should also look at the reading list in "Fundamentals of Object-Oriented," *SunExpert*, August, Page 39.)

Several classic works on C are now in second (or third) editions. Most cover some or all of the ANSI extensions and standardizations. *C: A Reference Manual* (3rd ed.), continues to be a readable and useful guide to the language. Kernighan and Ritchie, more formally known as *The C Programming Language* (2nd ed.), is still clean, sharp and definitive, but now has expanded examples that may make it more useful as an introductory work. Interestingly, the first edition of K&R is still selling quite well, perhaps to folks who don't want to bother with the ANSI material.

The C++ Primer and *The C++ Programming Language*, now out as second editions, are both worth a look. They are greatly expanded from the first editions, and the additions make sense. Lippman is quite readable, and Stroustrup is, of course, definitive.

P.J. Plauger is well known as a writer on programming topics. He is also the author of a wonderful story called "Child of All Ages." *The Standard C Library* is wonderful, but in a very different manner. It contains an entire implementation of the C library, with extensive discussion, references, etc. Get it.

System Security

Wood and Kochan's *UNIX System Security* has been around since 1985, so it is showing its age in spots. In particular, the section on network security is much too small. Nonetheless, it is still a very good book, with lots of useful advice. In the past year, however, there have been several interesting additions to the security literature.

If you have gotten this far, you may wish to look at *Theory Change in Science: Strategies from Mendelian Genetics*. Combining historical analysis and philosophical speculation, the book discusses what the early geneticists discovered and postulates how they might have discovered and verified their theories. Although nothing in the book is directly related to GAs, it

should be both good background and a fertile source for ideas on GA hackery.

GAs encode real-world problems as bit strings, using genes and chromosomes as a (loose) model. *The Algorithmic Beauty of Plants* talks about encoding the structure and form of plants as bit strings, raising interesting questions about the relationship of mathematics and nature.

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I/OPENER

Rik Farrow's offering, also called *UNIX System Security* (why do people do that?), is very approachable and readable. Unfortunately, it is pretty light on content. Network security, for instance, is covered in a mere fifteen pages.

Practical UNIX Security provides substantially more coverage (about 80 pages) on network security. The writing style is readable, but it is also short and to the point. I suspect that most UNIX networks could benefit from the advice given in this book.

Computer Security Basics looks like a very good overview of security issues

For a definitive collection of essays on security, try *Computers Under Attack.*

and strategies. It covers a broad range of security issues: communications, encryption, the Orange Book, biometrics, etc. It also contains a substantial glossary and pointers to more information, making it a useful desk-side reference.

Clifford Stoll is practically a household name by now, but his book, *The Cuckoo's Egg*, is still worth reading. It is light on technical content, but reads like a detective story. The subtitle, *Tracking a Spy Through the Maze of Computer Espionage*, is a bit overblown, but the events did happen, and could well happen again.

Finally, for a definitive collection of essays on security, try *Computers Under Attack*. With contributors like Peter Denning, Donn Parker, Pamela Samuelson, Eugene Spafford, Richard Stallman and Ken Thompson, it should be (and is) a dynamite book.

Pretty Pictures

When I first started programming, the most interesting output devices

were Tektronix storage terminals and Calcomp pen plotters. Drawing interesting sets of lines was fun stuff; the idea of doing believable image generation was, like, far out. Several software packages (I haven't looked at all of them) now allow any high-school dweeb (with sufficient cash) to put together very believable images on a personal computer.

Some knowledge is still useful, however. For a solid treatment of the basic issues, try *Computer Graphics: Principles and Practice* (2nd ed.), by Foley, et al. It is a big book (1,174 pages), full of information, advice and beautiful illustrations.

For a slightly more cookbook approach, consider *The RenderMan Companion*. It shows how to make RenderMan draw realistic bowling pins, light bulbs and other interesting objects. Be warned, however, that the book could be dangerous to your hardware and software budgets.

Fun Stuff

Technobabble is a pleasant and sometimes astringent discourse on the ways in which technology (and techies) have transformed the language. Heavily footnoted, it also contains a substantial glossary of technical terms. Mostly, however, it spends its time on acronyms, noun verbing and other ways in which our language is getting munged.

For a definition of munge (an alternate form of mung), turn to *The New Hacker's Dictionary*. The dictionary traces its heritage to the Jargon File, started at Stanford in 1975 by Raphael Finkel. In 1983, Guy Steele published a snapshot of the file as *The Hacker's Dictionary*. Assorted edits, additions and reworks later, we now see another snapshot coming to light. It is accurate, irreverent, funny and essential reading for anyone interested in hacker culture. ➡

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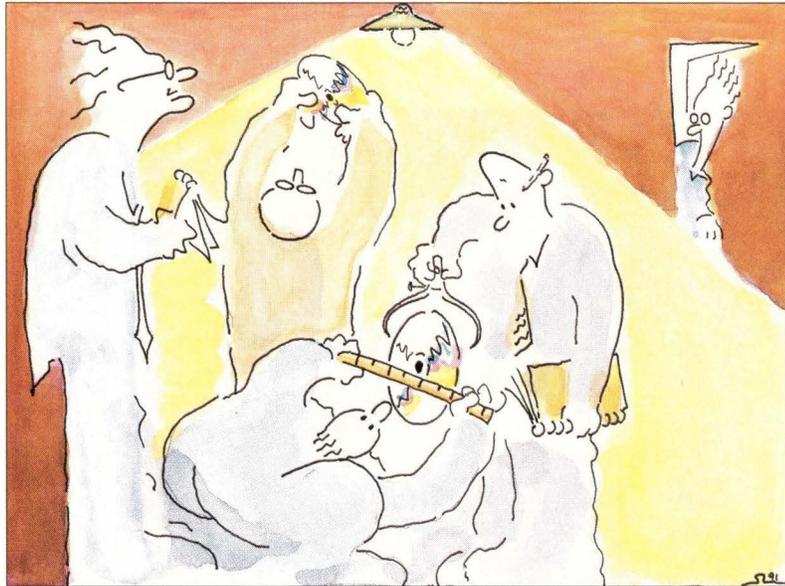


ILLUSTRATION BY S. H. LEE

by PETER H. SALUS

Look What I Found!

I need to make a confession: After more than five years and many thousands of pages of reading, I found a standards body in October that I didn't know about. NISO—the National Information Standards Organization, formerly Committee Z39—is a 52-year-old body accredited by ANSI to develop voluntary technical standards for the library, information sciences and publishing communities.

Fifty NISO standards are in print and (I understand) 10 more are scheduled for publication.

I admit that many of the things that NISO concerns itself with may not be of interest to the computer expert, but (as I'll enumerate below) some things are.

At last September's NISO meeting at the Harvard Club, Boston, MA, Linda Garcia of the Office of Technology Assessment of the U.S. Congress said that Congress was interested in standards and in "the relation-

ship of standards to the nation's economic growth and the United States as a force in international-standards development.

"The Congress believes that it is time to address our policy making with respect to standards in order to understand the relationship between standards and the structure of the coming Information Age."

NISO is an outgrowth of ANSI Committee Z39, founded in 1939. (Recall, the Computer Languages are X3J subcommittees: X3J16 is C++; X3B11.1 is WORM file systems; the Z committees are parallel for other areas. See *SunExpert*, September 1990, Page 43, for a list of ANSI committees.) NISO was incorporated in 1983 and took its new name in 1984.

Right now, NISO is working on standards for CD-ROM interoperability, common command language and computer-software description—areas certainly of interest to the readers of *SunExpert*. As I write this, on my desk

is a copy of NISO's draft ANSI Z39.19-199X, a proposal for the "Construction, Format and Management of Monolingual Thesauri," which I expect will be of interest to all who work with office and text-processing systems. There is a functional specification for thesaurus-management systems, which is important to anyone designing things like spelling checkers.

Also beside me is the draft for Z39.58-199X, the "Common Command Language for Online Interactive Information Retrieval." This draft specifies the vocabulary, syntax and operational meaning of commands in a command language for use with online interactive information-retrieval systems. I consider this of great importance because the only hope we have of truly expanding computer use is to make the information accessible to more people. This does not mean teaching vi or GNU Emacs or mh to everyone. It means

making commands uniform and relating them to natural language. The two Z39 draft standards are OS- and machine-independent. BACK is a command to go to a previous entry of some sort. It can be abbreviated BAC. And the BNF looks reasonable to me.

But here's a problem: While NISO appears to be doing important and valuable work, I note that only IBM and Unisys among the major manufacturers, are voting members. The American Chemical Society, the American Psychological Association, the Library of Congress, the National Library of Medicine, OHIONET, PALINET, the Department of Commerce, the Department of Defense and about 60 other companies and institutions are there. But Sun, DEC, Microsoft, Kodak, Sony, Ford Aerospace, OSF, UI, USL, Wang and many, many others aren't.

Cassandra in ancient Troy was not heeded in her warnings about the besiegers. Years ago, I pointed out that the ANSI office systems committees were doing things that (for example) 1201 was interested in. Yet even in

Contact for NISO

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 NISO@NBSNH.BITNET

1989, there was hardly an overlap between the companies with delegates at P1201 and those with members at ANSI X3V1 Text: Office and Publishing Systems or X3T9 I/O Interface.

We can make as many jokes as we want about the multiplicity of standards, but things that IEEE does go upward to ANSI. Ms. Garcia is telling the computer community that Congress wants us to stop playing these games with standards. If ANSI approves a data-interchange standard or an interface standard or a windowing standard that is recommended by one of its committees, the 1003 or

1201 group will be moot. We may have standards for 8-, 5 1/4- and 3 1/2-inch floppies; but I doubt we will end up with more than one standard for data-interchange formats.

I'll write more about NISO in a few months. In the meantime, the Standards are published by Transaction Publishers, Rutgers University, New Brunswick, NJ 08903, (908) 932-2280. Drafts are available from the NISO office, (301) 975-2814.

Christmas Competition

Complete the following:

On the first day of Christmas, ISO sent to me,

A standard from POSIX-dot-three.

Best entries (to peter@sug.org) will be published in a future issue of *SunExpert*. There will be a first prize. ➡

Peter H. Salus is the executive director of the Sun User Group. He has attended both ISO and P1003/P1201 meetings and expects remission of time in purgatory as a result. Email: peter@sug.org.

Reader Feedback

To help *SunExpert* serve you better, take a few minutes to close the feedback loop by circling the appropriate numbers on the Reader Service card located in the back of this magazine. Rate the following column and feature topics in this issue.

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- Ask Mr. Protocol—'Excuse me, could you please direct me to...'
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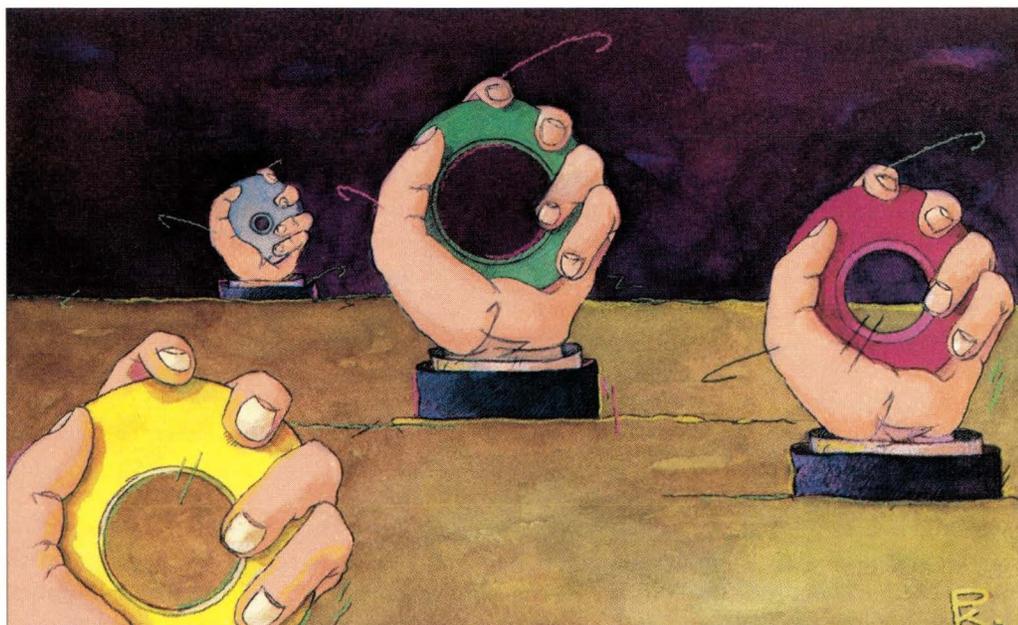


ILLUSTRATION BY PETER KALABOKIS

Buying a Disk Drive

by DINAH MCNUTT, Pencom Software Inc.

This month I will talk about a subject that may on the surface appear to be not very technical: buying disk drives. That's something the purchasing department does, right? Or you call up your local sales representative and a disk shows up. Well, read on. If you've been through this process before, some of the issues discussed here will sound familiar. Let the buyer beware. ...

Do You Really Need a Disk Drive?

You really should make sure that adding more bytes really is the solution to your problem. In other words, are you solving the right problem? An I/O bottleneck may be caused by the disk controller or I/O bus. Adding another disk may not help and could in fact add to the problem.

Understanding the problem in greater detail can help you make intelligent decisions about which drive to buy and how to configure it.

Identifying the Problem

Do you need more bytes or more I/O? The first problem is relatively straightforward and I'll not spend much time on it. My main advice is to take time now to put scripts and

tools in place to track changes in how your filesystems are being used so you can predict a crunch before it happens. If you have read some of my previous columns, you've heard this before.

You may suspect an I/O problem. In my October column, I discussed system performance and how you can identify your bottlenecks. In summary:

- Use `iostat 5` to see if I/O is a problem.
- Note whether disk activity is fairly distributed among the disks. Note that this is different than being evenly distributed. Make the fastest disks do their share of the work.
- Is activity concentrated in part of the disk? Don't put your swap space on one part of the disk and a busy filesystem on another part of the same disk.

Which Disk to Buy?

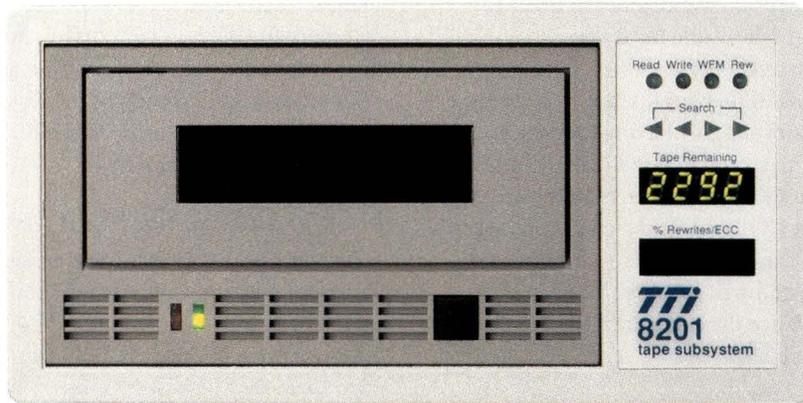
There are many issues to be considered when deciding which drive to buy. I prefer to approach this decision from a technical standpoint and apply any restrictions such as budget constraints after I identify the perfect disk drive. In other words, I don't like to make compromises up front. Let's look at some of the major issues:

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- *Manufacturer specifications*—The most important ones are *seek time* and *raw transfer rate*. The seek time is how long it takes for a disk head to move from one location to another. The minimum seek time is how long it takes a head to move from one track to an adjacent one. The maximum seek time is the time it takes to move from the innermost track to the outermost. Manufacturers usually supply the average seek time and include the minimum and maximum as well.

The raw transfer rate is the speed at which the disk can move data. This number is only an indication of the speed of the disk since most applications do not read and write data this fast, particularly if you have many processes accessing small amounts of data. However, if you do have a single application accessing large amounts of data, this number is a good indication of the performance you will see. Otherwise, use the average seek time.

- *Performance and capacity criteria*—Performance and capacity problems often have conflicting solutions. If you have a performance problem, don't try to fix it by buying a large disk because smaller disks usually have faster seek times. You may want to add a controller in order to increase the total bandwidth available for disks.
- *One large disk versus two smaller disks*—This is a variation on the issue discussed above. You may need space to store large files. If your system does not support having file systems span multiple disks, you may have to buy the biggest disk you can afford in order to meet your space requirements. If you are trying to avoid an I/O bottleneck, using two disks may increase your performance because you now have two sets of disk heads reading and writing data. If uptime is a concern, two disks will reduce the exposure since the chance of both disks being unavailable is less.

Features

- *Easy configuration*—Disks will vary in complexity depending on the type of disk and your vendor. Typically, SCSI disks are the easiest to configure. You need only figure out which SCSI ID to use. (There are only eight possible targets, so your potential for making a mistake is relatively small.) You should make sure your total cable length does not exceed six meters. SMD drives and IPI drives can be more complicated because you have to figure out what disk IDs you are already using (if you are adding the disk to an existing controller) or you have to calculate the address for both the controller and disk drive.

Configuration applies not only to installing the hardware, but to formatting and labeling the disk. Using a disk drive supported by your system vendor (or one that you have previously installed) can save time and effort.

- *Diagnostics*—Diagnostics tools such as external LED displays (if you have to take the cover off to see the display, it is only of marginal use) can be a big win when it comes to trouble shooting. All other things being equal, choose the drive that will be easier to support.
- *External termination*—SMD controllers support daisy

chaining disk drives and this is an inherent feature with SCSI devices. In both cases, the chain or bus must be terminated. Look for drives that support external termination so you do not have to take one disk drive apart to add another one to the chain. This will also make trouble shooting easier. You can add and remove devices from the chain simply by moving the terminator and changing a few cables.

- *Fusing*—Fuses should be accessible, and it should be easy to detect if a fuse has been blown.

- *Cabling*—With perfect cables and connectors, the maximum SCSI cable length is six meters. Since neither cables nor connectors are perfect, you want to try to stay away from maximum runs of cable. Request short SCSI cables (many vendors ship six feet as a default) and use cabinets that can house multiple disks so you can use shorter cables. If you buy disks already packaged, be sure to ask the vendor how much cabling to allocate. If you are close, you may have to add another SCSI controller or swap out two small disks for one larger disk.

- *Packaging*—Support and maintenance are the big issues. Look for disks with accessible write-protect switches (if that feature is available on your disk). Also consider where the disks will be located. Noise may be an important factor.
- *Manuals*—Ask for a copy of the disk and controller manual. They will prove invaluable in the future, especially if your disk becomes unsupported.

How to Choose the Right Vendor

- *Support issues*—Will your vendor support the drive you have chosen or will you have to find a third-party source or consider having a hot spare on site? You may save money on the purchase price of the drive now, but, without vendor support, there may be hidden support costs down the road.

- *Cost*—Cost usually is an important factor, but you need to weigh all the costs: purchase price, installation costs and maintenance. Good maintenance can well be worth the extra price.

- *Installation issues*—Are you going to install the disk yourself, have the vendor do it or is either option available? I once found myself in the situation where business requirements dictated using a disk that our vendor did not support and I had to learn how to install disks the hard way.

Knowing how to do this is useful, but it doesn't mean you have to do it yourself every time. Issues to consider if you plan to do the install yourself include: Will you void the warranty or support contract of any of your existing equipment? What will you do if you run into problems during the install? Do you have the resources to resolve them (personal knowledge, vendor support, etc.)? If you've never done this, you will want good documentation or experienced assistance. You can learn by trial and error, but there are better ways.

All things being equal, have your vendor do it. Sometimes vendors will provide additional services like making sure there is enough power available, enough cabinet space, etc.



These services can well be worth a little extra expense.

- *Warranty*—Vendor warranties can be confusing and misleading. Read the fine print on the warranty and make sure you have the warranty in writing. The warranty may be from the vendor or distributor and not from the manufacturer. Find out and factor this into the decision making process. You may not be able to get your disk repaired if the company you are dealing with goes out of business.

One year seems to be standard length of a warranty, but how fast can you get a replacement? Same day or 24 hours? Make sure you don't have to send your disk before you get the replacement disk.

- *Cost to repair*—Do you have to pay shipping for depot service maintenance? What about down time? Disks that are cumbersome to install and de-install can add to your down time and your costs. Check into the failure rate for each drive you are considering as well as talking to current customers of the vendors.

- *Local versus non-local service*—Try to get local service if at all possible. Troubleshooting remotely can be ineffective at best. Someone would either need to travel to service your disk (time consuming) or you would need to have on-site expertise (costly).

- *Real-world constraints*—Your system may have some physical limitations that can be a deciding factor in which disk to buy. For instance, if your IPI controller can support another disk drive, but your SCSI bus cannot, budget constraints may dictate buying another IPI drive even though the hot new SCSI drive is much faster.

Summary

The bottom line is that there is no one answer to which disk you should buy. Your vendor(s) can help, but they won't be familiar with your particular system and your performance needs. By learning more about how your system performs and the hardware technology, you can make educated decisions about what to buy and when. I'd like to thank Mike Pearlman at Rice University for some helpful comments on this column. Once again, *System Performance Tuning* by Mike Loukides (O'Reilly & Associates) was a valuable reference. (Everyone has a copy by now, right?)

A Final Note

This is my last regular system-administration column. I now turn the keyboard over to S. Lee ("Slee") Henry. I've enjoyed the past year and appreciated all the questions and words of encouragement you all have sent me. It's not easy coming up with a column month after month, especially knowing there are sophisticated readers watching what you do. I now begin a Q&A column in *RS/Magazine*, a new publication by the folks who bring you *SunExpert*. ➔

Dinah McNutt is on the board of directors of the Sun User Group and is employed by Pencom Software Inc., a consulting and software-development company headquartered in Austin, TX. Her email address is dinah@expert.com.

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NETWORK MANAGEMENT

by MARY JO FOLEY,
Senior Editor

BLUES

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In the fullest sense of the term, network management means managing all aspects of networks, from cabling through applications. Even though most users are far from satisfied with the status of their network configurations, internetworking devices and transport protocols, they don't have the luxury of waiting until they have untangled these lower-layer messes before moving on to the thorny upper-layer issues of making interoperable their user interfaces and applications. This is why network-management application software has been adopted by users—in whatever state and form it has been available—since vendors first began rolling it out in the late 1980s.

For those increasingly rare single-vendor sites, most of the 50 or so network-management products that are available today are adequate. By the same token, if Suns dominate your network, SunNet Manager, especially when coupled with

one or more third-party, SunNet Manager-based offerings, is likely to satisfy most of your net-management needs (see "SunNet Manager Does More Than Manage"). But if you have PCs, Macs, workstations from companies other than Sun Microsystems Inc. and/or bridges, routers, hubs or other networking devices that aren't supported by your primary vendor—and you need to monitor these pieces of your network—welcome to bedlam.

Better Than Nothing

The majority of SPARC-compatible network-management suppliers claim that their products work in heterogeneous environments and support multiple protocols. The degree to which they achieve either of these goals varies widely (see "Lights At The End of the Tunnel"). Even products that purport to be compatible with the Simple Network Management Protocol (SNMP) often times don't work together because vendors don't support all systems and devices equally.

Add to these shortcomings the other common complaints with today's network-management products and you begin to wonder why customers have attempted to gerry-rig their networks to accommodate these packages. Lack of integration hooks, configuration-management capabilities, intuitive user interfaces, facilities for working around downed networks and com-

Why do users put up with these headaches? In short, because they have no alternative.

plete and thorough network-mapping are only a few of users' problems with network-management software as it exists currently.

Why do users put up with these headaches? In short, because they have no alternative. "Until a year ago, we managed with telnet windows in a very command-line-driven way," says Roy Gignac, network engineer for Motorola Inc.'s LAN Mobile Products Sector's networking group. This may not sound too terrible, until you realize the size of the network Gignac manages. The main facility, located in Schaumburg, IL, houses 140 hub concentrators from SynOptics Communications Inc.; 10 bridges from Digital Equipment Corp. and 3Com Corp., among others; and eight routers from Cisco Systems Inc.—all tying together more than 3,000 workstations and hosts from every vendor imaginable, Sun included. LAN Mobile Products systems on the net handle everything from office automation to software design.

The LAN Products Sector was handling integration and management of its devices on a case-by-case basis until recently. "We managed most of our

net with proprietary DOS stuff [SynOptics' LattisNet for DOS product], coupled with some SNMP management of our token-ring [networks]," Gignac explains.

The LAN Products Sector has been beta-testing SynOptics' new LattisNet Network Manager for UNIX. Motorola has coupled this product with Sun's SunNet Manager to cover its entire net. LattisNet is managing the SynOptics equipment, and SunNet Manager is handling the rest, Gignac says. LattisNet for UNIX still relies on a lot of proprietary GUIs, Gignac concedes. The product also could be improved by SynOptics integrating more tightly their monitoring modules with the base product, he says. And "SunNet Manager still needs a better front-end for routers, the most complex piece on the network," he adds. But all in all, network-management software has evolved considerably, even in just the past year or so, Gignac claims.

There are more babes in network-management land, like Motorola, than there are seasoned veterans. Case in point: St. Jude Children's Research Hospital in Memphis, TN. St. Jude's is a complex multivendor site if there ever was one. Fiber cable running TCP/IP and Banyan Systems Inc.'s VINES connects 2,000 nodes throughout the hospital. These nodes range from IBM AS/400s running payroll, to Sun servers



and DEC VAX systems in research. The three SPARCserver 2s, which will grow to 13 soon, collect and process magnetic-resonant imager data.

Except for VINES' MNET—"which doesn't really break down packets or let you do routing," according to Albert Herrington, communications manager for the hospital—there is no overarching network-management

package running across the network. "There's been no time to install one," laments Herrington. He's got plans, however: VAX utilities and SunNet Manager will handle the VAXes and Suns, respectively, and Chipcom Corp.'s ONline network-management modules will manage the hospital's Chipcom concentrator and the attached Ethernets. "We looked at other systems and their abilities to handle Type 1 cable, their ability to grow and the ease with which they can be configured," Herrington says. Chipcom won.

Views From A Bridge

Other sites are running SunNet Manager underneath or in addition to competitive offerings from other workstation vendors, such as DECmcc from Digital, OpenView from Hewlett-Packard Co. and NetView from IBM. The air courier DHL Airways Inc. is taking this approach.



DHL maintains an application-development environment for its worldwide operations in Redwood City. On its X.25 network (which runs proprietary, in-house developed communications software, rather than TCP/IP-based, standard software) are all kinds of PCs, workstations and servers, including Intel Corp.-based clones running Santa Cruz Operation Xenix and UNIX, HP 9000s, IBM RS/6000s, Prime Computer Inc. minicomputers, a Pyramid Technology Corp. server and a handful of Sun workstations.

The company's current network management strategy is "piece-meal, at best, or none," says communications architect for the systems architecture group, John Payne. But Action Request from Remedy Corp. (which runs in conjunction with SunNet Manager) is the leading candidate for systems management, while HP's OpenView Network Node Manager is the most likely network-management choice. The company has been testing

both of these packages for some time.

"OpenView is more robust than SunNet Manager," says Payne. "HP takes a broader view of enterprise network management, and is a leader in object management." DHL also is impressed by the number of demanding customers, such as telecommunications companies, which are standardizing on OpenView, he says. Finally, unlike the other users contacted by *SunExpert*, DHL has been looking for a network-management vendor with concrete OSI Common Management Information Protocol (CMIP) upgrade plans. HP has said it will support CMIP with version 3.0 of its product. At DHL, "we're moving toward OSI/CMIP as fast as we can run," says Payne. "Our speed depends on vendors making products available."

(Unlike DECmcc, NetView and SunNet Manager, HP's OpenView Network Node Manager isn't limited to running on its developer's systems only. It also runs on SPARCstation 1s, 1+s, 2s and IPCs. More recently, IBM announced it is licensing portions of OpenView, specifically the HP OpenView Network Node Manager and Network Manager Server, and is evaluating the software for use as part of the foundation for its promised AIX-based network-management system. And OpenView Network Management Server is one of the technologies selected by the Open Software Foundation as part of its Distributed Management Environment.)

Meanwhile, at the St. Louis, MO, mortgage/guarantee subsidiary of Citicorp (part of its Global Consumer Bank Division), network management is accomplished via a combination of SunNet Manager and IBM's NetView. Mortgage Guarantee's Amdahl Corp. 5595 mainframe is linked to the company's LAN backbone through Sun 3/70 and 4/70 gateways running Brixton Systems Inc. Brx/SNM software and networking cards. PCs at the local level, which handle mortgage-origination processing, are connected to the backbone over 3Com bridges. Other devices on the net include SynOptics 10BaseT hubs and 3Com NetBuilder routers.

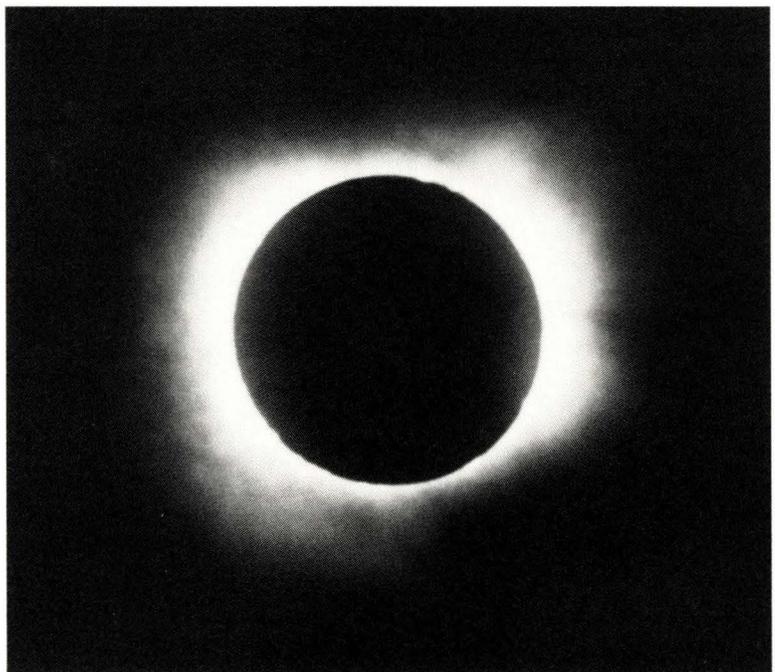
The problem for Citicorp was find-

ing a way to pull together its LAN and host management under a single, common management console. After a year of searching for a solution, senior data-communications analyst Scott Hellrung decided upon NetView's NetCenter GUI. Now, "anything that can be reported reasonably and generate an SNMP alert shows up on the console," says Hellrung. "Deeper trouble-shooting takes place at the SunNet Manager point, where there are more robust tools." Citicorp also is running SynOptics' LattisNet net-

work-management product as an agent under SunNet Manager.

"We still need a good integrator for all of these tools. NetCenter isn't it." He says he's pinning his hopes on IBM's Graphic Monitor Facility, the enhanced version of which will enable customers to manage both IBM and other vendors' devices from a single OS/2 workstation. Echoing the cry of many a network manager, Hellrung concludes: "There's got to be a better way of managing the enterprise-wide network."

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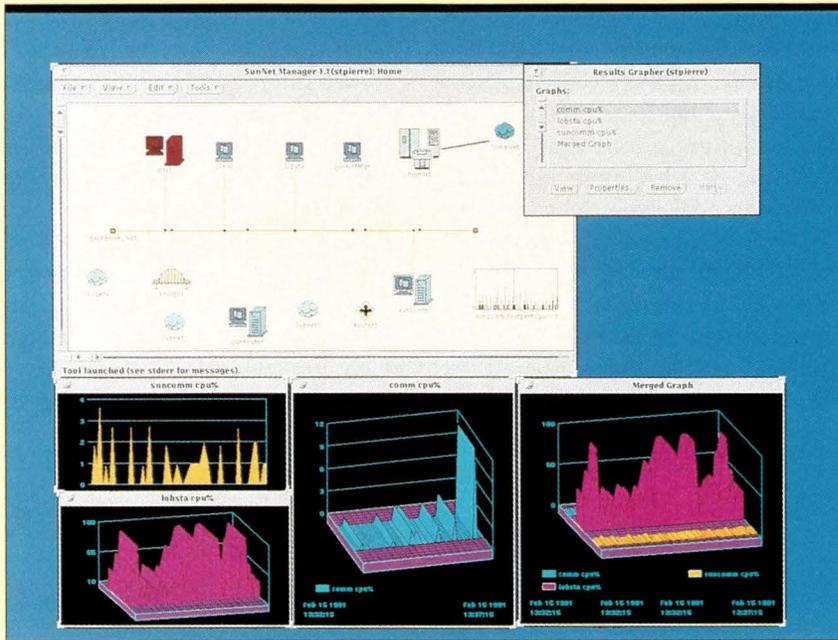
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SunConnect's SunNet Manager 1.2 offers users the ability to take data from multiple inputs and graph the values over time using "Results Grapher."

SunNet Manager Does More Than Manage

by MARY JO FOLEY, Senior Editor

With version 1.2, Sun's offering comes closer to providing true network-management integration.

Sun Microsystems Inc. doesn't bill SunNet Manager as a network-management package. Nor should it. Users rely on SunNet Manager to act more as a framework, or as Sun claims, "an integrated platform for heterogeneous network management," than as a network manager, per se. And with the release of version 1.2 in mid-October, SunNet Manager comes even closer toward fulfilling Sun's vision of it as network-management central.

In the wake of its corporate restructuring, Sun has decided to make SunNet Manager a product of SunTech Enterprises Inc.'s SunConnect subsidiary. SunConnect touts the product as being based on the OSI framework. But this doesn't mean that SunNet Manager supports the OSI management standard, CMIP, the Common Management Information Protocol. (It does support CMOT, CMIP Over TCP/IP, but only via provision by a third party, Net-Labs, of Los Angeles, CA.)

In fact, prior to version 1.2, Sun offered a partial implementation only of SNMP; it supported the TCP/IP network-management protocol as a proxy. Now, under 1.2, SNMP software from Santa Clara, CA's Epilogue Technology Corp is integrated into SunNet Manager, so that SNMP is supported as an agent, not just a proxy. SunConnect still supports other protocols as proxies, including X.25, FDDI Station Management (SMT), NICE (Digital Equipment Corp.'s network-management protocol) and NetView (IBM Corp.'s network-management protocol). "We have all of the major protocols supported now," claims Stewart Noyce, marketing manager for SunNet Manager.

And There's More...

SunNet Manager can be used as an independent, entry-level network manager, acting more as a diagnostic tool than anything else. But SunConnect is developing the product to be more of a framework for integrating network-manage-

ment packages from other vendors. Under its recently announced SunConnect Partners Program for Network Management, SunConnect will be working with other vendors to add support for additional networking protocols and network-management packages. SunConnect will be offering its system-integrator, application-developer and porting partners SunNet Manager marketing and engineering assistance. At press time, SunConnect had signed up 35 such partners.

At the request of its partners, SunConnect has added other new features to SunNet Manager. The new SunNet Manager database application programming interface (API) "lets value-added applications access and modify data in a SunNet Manager database at run-time," according to SunConnect. The SunNet Manager database is a run-time NetISAM database. "The new API will allow other companies to put their own databases underneath SunNet Manager's," explains Noyce.

In version 1.2, SunConnect also allows users to manage their SPARCstations and SPARC-servers from any SNMP management station by bundling SNMP agents for SPARC-based systems into SunNet Manager. SunConnect is allowing users to copy and distribute these agents for no charge. SunConnect has improved the communications capabilities of its Manager and Agent Services Libraries, the services that sit between the user tools and the devices they manage, according to Noyce. SunConnect has also added on-line help to the product. Now, SunNet Manager manual pages are accessible from the administrator's workstation. Finally, Sun has added OpenWindows 3.0 support to the product. Retail price for SunNet Manager, which includes a single license, a CD and documentation, is \$3,000.

At the same time, SunConnect continues to offer a handful of tools with SunNet Manager. "Discovery" enables users to draw default configurations of their network, showing a hierarchy of domains, subnets and local segments. "Results Grapher" is a 2D/3D charting tool that lets users take data from multiple input streams and graph the values over a period of time. "Results Browser" allows users to review multiple log data streams and analyze the information as ASCII reports using basic filters.

SunConnect's basic philosophy in regard to SunNet Manager remains constant, says Noyce. "We have two classes of users: developers and non-developers." Developers don't need a lot of extras, he says, and non-developers can rely on third-party products that integrate with SunNet Manager for features not provided in the base SunNet Manager product.

Managing large multivendor networks with large numbers of nodes, different protocols and multiple platforms has never been easy. Reliance on the Simple Network Management Protocol (SNMP), the de facto TCP/IP standard for the storage and communication of diagnostic and management information, helps. However, even SNMP is not a panacea.

An alternative solution eventually may be OSI's Common Management Information Protocol (CMIP). But this standard still has not reached maturity. Meanwhile, a protocol upon which many had pinned their interoperability hopes—CMIP Over TCP/IP (CMOT)—seems to have died a premature death without having spawned a single successful product.

In heterogeneous environments today, users seem to be relying on SNMP, if they are using any standard protocol at all, to monitor their disparate networking products, computing systems and peripherals. But one problem with SNMP is the difficulty of integrating multiple, private (non-standard) Management Information Bases (MIBs), i.e., databases of network events or data objects. Some network-management vendors do offer

Lights At the End of the Tunnel

Network-management products built to handle multivendor environments are making their long-overdue debuts.

by PAULA JACOBS

graphical user interfaces (GUIs) for trouble-shooting their own products, including their proprietary MIBs. But vendors tend to offer more cumbersome text-based interfaces for third-party products.

According to George Colony, president of Forrester Research Inc. (a Cambridge, MA-based research firm), "There are three important elements for network-management tools today: First, systems that can control more than one system; second, a graphical look and feel; and third, an object-oriented approach, providing the ability to add to the scheme."

While there is still a shortage in the availability of applications that meet all these criteria, an encouraging sign is the recent introduction of several new network-management tools that are more genuinely multivendor. SNMP management tools, such as SunConnect's recently enhanced SunNet Manager, aid in the seamless integration of third-party MIBs. Other, more open third-party tools include the Trakker Network Communications System from Concord Communications Inc. and Action Request Software System from Remedy Corp.

Tracking Down Problems

Trakker is a new class of product, called an Internet monitor, that is said to obsolete conventional network monitors and analyzers. Trakker is unique because it is the first product with enough power and intelligence to enable network managers to observe all the events occurring on all nodes, all segments, and all protocol layers of interconnected LANs—all the time in real time—from a central workstation.

According to Jim Hertenstein, director of marketing at Concord Communications, "Our system is based on SNMP at the basic level, but we have gone one step beyond by providing system managers with the capability to manage every node of the installation."

"What differentiates Trakker," says Hertenstein, "is that it is the first system that allows you to listen to protocols on multiple levels. While protocols such as TCP/IP are very robust, until now there was no way to see what was

Concord Communications Inc.'s Trakker: A new class of product called an Internet monitor.



actually happening on the network.”

Trakker consists of two major subsystems: distributed, intelligent RISC-based microcomputer units (manufactured currently by Concord Communications and called “segment monitors”) that attach to each segment of the internetwork, and an operator console providing the human interface. Trakker’s

‘To date, there are very few people-assisting tools to notify people of the problems.’

segment monitors capture information and report alarms back to a central console. At present, the sole, supported console is a Sun workstation running an application based on Open Look.

Trakker performs in-depth analysis of TCP/IP, NFS, DECnet and LAT protocols. It also provides link-level monitoring of Xerox Corp.’s XNS, Novell Inc.’s NetWare, Apple Computer Inc.’s AppleTalk and IBM Corp.’s PC-NET protocols. Trakker features an enhanced SNMP-based MIB that contains over 4,000 objects, a history for each station and subset of everything that occurs on all protocol layers. Other standard SNMP MIBs can be added to the console to manage other network devices, such as routers and bridges, from other vendors. Trakker provides information about retransmissions, duplicate network addresses, time outs and disconnects, flow-control messages, failed connection attempts, server usage by application protocol type, and sources of network usage.

Hertenstein claims that this approach delivers much more information about network usage than previ-

ously available on large internetworks. “SNMP is necessary but not sufficient. As distributed networks become more like corporate assets in the conventional sense of the word, the challenge becomes asset management. Trakker now allows the network manager to really unlock what is going on, what applications are really being used and on what servers.”

Trakker provides a suite of management tools for network diagnosis and problem isolation. The system is also available when the network is down, since path redundancy is built into the segment monitor to ensure data needed for diagnostics is available to the console even when the LAN is not. Trakker software is priced at \$18,000. Also required are a Sun SPARCstation IPC (\$9,995) and a segment monitor (\$5,200).

A Client/Server Cure

Remedy Corp. introduced in September a new product called Action Request, a software system that runs on multiple management and operating systems. Action Request is a client/server application that manages

who keep the network running. It is an umbrella that relates to all management. It covers the people processes of keeping the network up and running, integrating with SNMP platforms such as SunNet Manager. To date, there are very few people-assisting tools to notify people of the problems.”

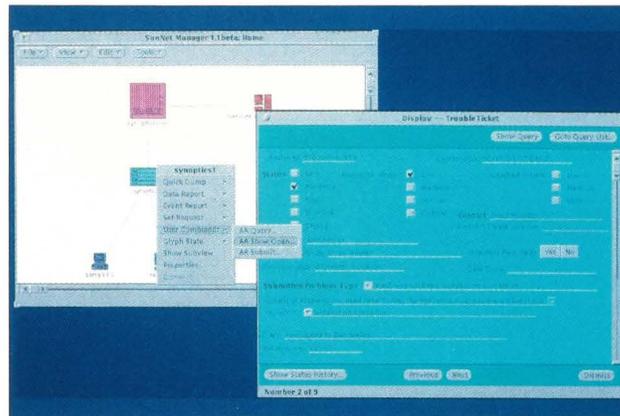
According to the company, a secondary benefit is that Action Request System gathers information about the network and stores it in a database, from which it can later be extracted. The result is a very valuable database for the organization, providing information related to how the system resolves problems. Action Request is targeted both at the system manager and the network manager who use either the SunNet network map or email and need an efficient problem-resolution tracking system.

The first product release (this month ship) supports the SunNet Manager platform and includes UNIX-based server software and three client software packages running on Sun SPARCstations or MS-DOS computers. The Action Request server uses Sun’s Open Network Computing

remote procedure calls to communicate with client stations and Structured Query Language databases. The user interface is based on Sun’s Open Look technology; Action Request supports both the Remote X Window System and Microsoft Corp. Windows 3.0.

Action Request 1.0 Server software is priced at \$6,500 (includes three support staff clients) and client software (supporting up to 5 clients) is priced at \$4,000.

Paula Jacobs is a freelance writer and marketing consultant based in Framingham, MA, who specializes in the implementation of new technologies.



Remedy Corp.’s Action Request is a cross-platform, work-flow network manager.

the resolution of problems and support requests for UNIX and PC networks. Action Request sports a database capability and a host of traditional trouble-ticket features. It integrates with popular management systems, such as SunNet Manager.

According to Remedy CEO Larry Garlick, “The Action Request System is a workflow application for people

Systems and Network Management: *The Twain Meet*

The two disciplines both overlap and complement one another.

by FRANK MOSS, Tivoli Systems Inc.

Distributed systems management, or DSM, is the natural evolution of network management. DSM is the capability to plan, organize, administer and control all the resources in a networked environment in a secure manner.

DSM resources differ from network-management (NWM) resources in that they include system-level resources, such as users, hosts, files, printers, disks and software, rather than network-level resources like gateways, routers and bridges.

NWM has taken functional multi-machine resource access and control and applied it to low-level resource management. DSM approaches the application arena known as systems administration, and applies it across the network. A key objective of DSM is to unify and distribute the means to manage the system to users throughout the network. With the complexity of networked systems, the advent of more distributed applications and users' increased sophistication and higher expectations of system perfor-

mance, no longer can the systems administrator and/or network manager manage all these tasks alone.

DSM approaches network security in a somewhat different fashion than NWM. Both approaches use some sort of authentication technology, such as Kerberos from MIT's Project Athena. After authentication, however, the approaches vary somewhat in resource authorization. NWM focuses on controlling user access to the network at the physical-connection level. DSM addresses which system administration tasks can be performed on which resources by which users.

The two also use different communications protocols for performing various functions. NWM tends to use de facto standards such as SNMP or CMIP. DSM uses traditional system-level protocols, most notably TCP/IP.

It's important to note that NWM and DSM are approaching the same problem: managing all resources in the network easily and completely, albeit from different directions. NWM solutions have focused on establishing and managing the connections, and enhancing the technologies to include additional network-oriented resources and services. DSM solutions focus on system-level resources and managing an increasing number of networking services with respect to those resources. Both approaches are critical if today's distributed systems are to be effective.

Cooperative efforts such as the Distributed Management Environment (DME) from the Open Software Foundation and the UI-ATLAS roadmap from UNIX International have unified these two perspectives into a common foundation for distributed systems and network management.

Frank Moss is president of Tivoli Systems Inc., a developer of an object-oriented framework and applications for distributed systems management. Tivoli's framework and technology were selected by both OSF and UNIX International as part of their solutions for distributed systems and network management.

NWM

- **Identifies** communications devices and services.
- **Makes use of** as its primary resources communications devices and services.
- **Identifies users** to the network.
- **Represents** network devices graphically.
- **Uses** network-usage information to monitor success/failure and to tune the system.
- **Configures** network devices.
- **Secures access** by users to the network and network resources.

DSM

- **Identifies** system-level resources in a network.
- **Makes use of** as its primary resources system-level devices, services and entities, including users, files, disks, printers and software.
- **Identifies users** to the network and identifies users to administrative tasks that access system-level resources.
- **Represents** system-level resources graphically.
- **Uses** resource-usage information to monitor success/failure and to tune the system.
- **Configures** system resources and applies administrative policies to those resources.
- **Secures access** by users to the network and system resources.

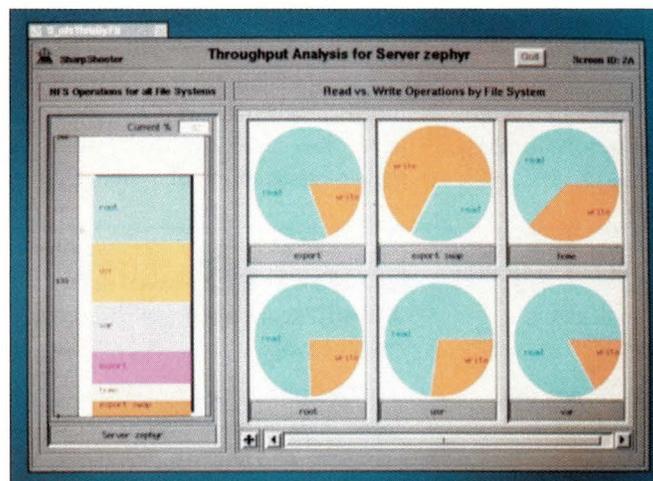
There's Something For Everyone

*From managing
enterprise-wide FDDI
nets, to handling both
TCP/IP and OSI,
third-party
management products
are doing more than
ever before.*

by PAULA JACOBS

A number of third-party network management products are currently available for Sun Microsystems Inc. and other SPARC-based environments. These tools are designed to help system managers configure, install and monitor each network device from a central location; detect and isolate faults; create audit trails to track errors and resolve all faults with minimum service interruption; maintain high system performance by monitoring information such as transmission speeds, network traffic and network loads over extended periods of time; and ensure that network security is not breached.

What follows is a list of some of the newer third-party SPARC network-management tools:



AIM TECHNOLOGY

SharpShooter

AIM SharpShooter is a network-performance-management tool that analyzes and troubleshoots NFS throughput and mass storage devices on multivendor, distributed networks. One unique capability of SharpShooter is that it correlates packets by source and network service type (email, telnet, the X Window System, etc.) and shows the source from which the client generates traffic. This product features an Open Look interface and a wide range of color graphical displays, providing an on-line snapshot of workstation and

server throughput, network activity and storage capacity.

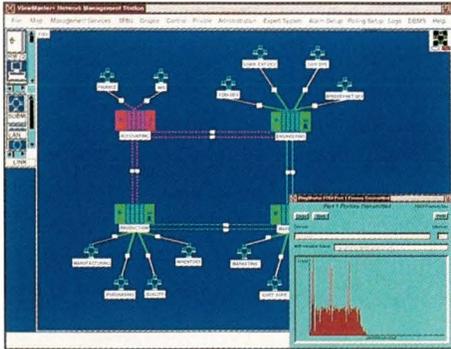
SharpShooter offers analysis at the server, file system, application and client levels, and utilizes user-definable alarms and events to alert the network administrator to problems. Scalable to any size network, SharpShooter runs on Sun file servers and workstations, and can interface with SunNet Manager.

The base option, priced at \$6,500, supports three file servers and as many as 100 workstations. Also available is a starter pack, priced at \$2,750, which supports one server and up to approximately 35 clients.

FIBERCOM INC.

ViewMaster+

Fibercom's ViewMaster+ is a standards-based network-management system for managing extended FDDI enterprise networks. Using SNMP, ViewMaster issues queries and commands to SNMP agents residing



within network devices such as bridges, routers, file servers or hubs.

The ViewMaster+ software provides an X Window System-based graphical user interface, as well as an SQL database capability. The system integrates network-management tools into

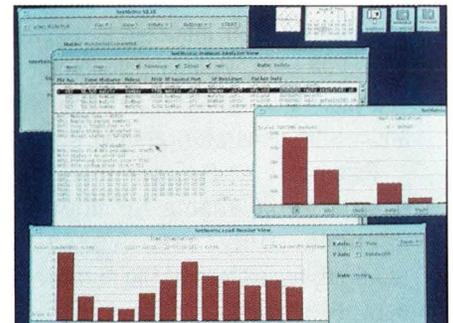
one core application, which provides a graphic presentation of the network being managed, displaying status information in real time. From the network topology map, users can monitor network performance; detect network faults, including cable breaks; modify Management Information Base (MIB) variables, such as error statistics on remote machines; and generate data for the package's relational database. ViewMaster+ includes a performance-management graphing utility, which displays real-time graphs of network traffic and various types of errors, enabling network managers to quickly determine overall network health, identify heavily loaded network segments and focus on intermittent problems. An optional SQL database facility turns MIB variables into usable information, such as trend analysis and reports.

The ViewMaster+ software runs on a Sun SPARCstation under SunOS 4.03 or greater (with Sun OpenWindows or X11R4) and is priced at \$15,000. The SQL database software option is priced at \$5,000.

METRIX INC.

NetMetrix

Metrix's NetMetrix is a highly distributed monitoring and analysis software package that runs on any SPARCstation in a network. NetMetrix features a distributed architecture that can display remote segment monitors across gateways, routers, T1 links, etc., on any X display station under Open Look, Motif, or X. NetMetrix can seamlessly integrate with an SNMP management console like SunNet Manager, but uses the X Window System to communicate with the



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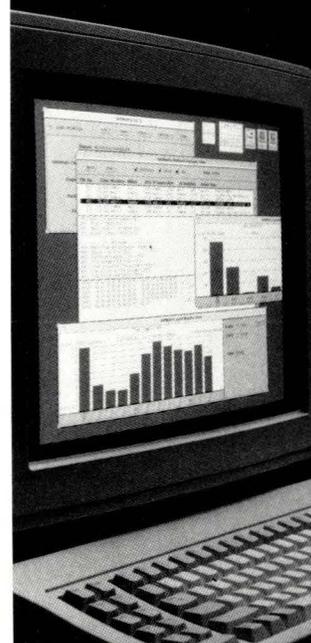


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remote segment monitors, providing graphical displays of remote analyzers, but without consuming excessive bandwidth. NetMetrix also incorporates load and NFS monitors with the capability to provide correlational analysis of network traffic—information such as which station generated how much of a load, at what time interval and under what application.

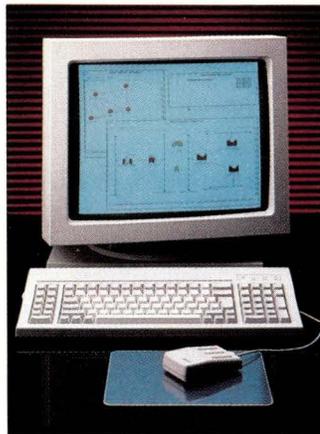
With this product, Metrix (formerly Matrix Computer Systems) has expanded its family of products beyond Etherview, a Window-based tool that monitors Ethernet and displays results in graphical format. NetMetrix is a family of tools that provides a consistent user interface and setup across all tools, including the protocol analyzer, load monitor, NFS monitor and traffic generator, among others.

Pricing is \$1,995 per tool; discounts are available for multiple licenses. Only one license is required, regardless of the number of network segments.

RETIX

5025 Network Management Center

The Retix 5025 Network Management Center, which runs on Sun SPARCstations, now combines Version 1.1 of SunNet Manager with



advanced graphics and configuration capabilities. Based on SNMP, the Network Management Center is a system that allows administrators to manage and monitor heterogeneous networks.

The system provides a comprehensive view of network operations and includes an integrated set of monitoring and diagnostic capabilities. The 5025 gives users the network information they need to isolate faults, maximize network performance, pinpoint and correct errors or problems on the network and plan for future network enhancements. By controlling the bridges and routers that interconnect LANs and WANs, the 5025 allows network administrators to monitor traffic levels and error rates, configure system parameters, determine traffic flow around the network and plan for changes, including increased link capacity, network positioning, and selective traffic filtering.

The 5025 also features a graphical interface, with automatic alerts that eliminate the need to continually watch the network.

The 5025, which includes SunNet Manager, is priced at \$10,950. There is also an unbundled version for \$5,950.

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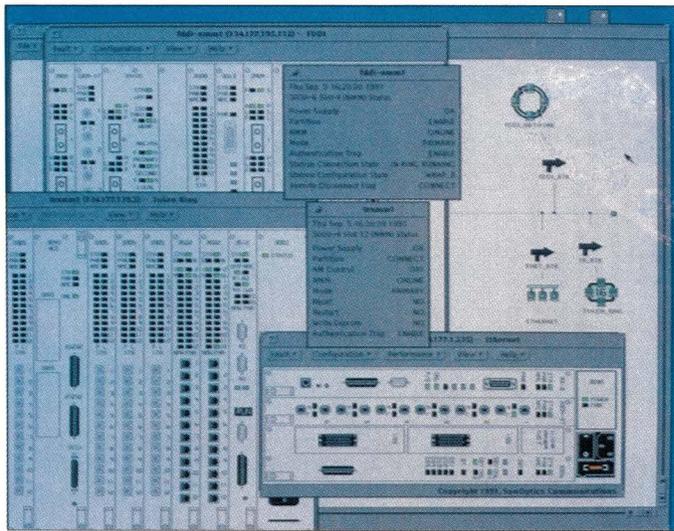


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SYNOPTICS COMMUNICATIONS INC.

LattisNet

SynOptics' LattisNet Network Management allows network managers to perform advanced planning, data monitoring, problem determination and fault isolation from a centralized console. The system runs on Sun SPARCstations under SunOS Version 4.1.1.

The system was recently enhanced with the introduction of a SPARC-based LattisNet Model 3040 Network Control Engine (NCE). The NCE extends the company's concept of distributed management intelligence to be as close as possible to the source of network problems. The NCE is priced at \$9,995. Also available is optional protocol-analysis and load-profiler software.

SynOptics also has introduced LattisNet Network Management for UNIX, a new SNMP-based network-management application that integrates with SunNet Manager. LattisNet Network Management for UNIX can be implemented by itself on a wide range of Sun platforms or in conjunction with the LattisNet NCE. When implemented with the NCE, LattisNet Network Management for UNIX can segment large networks into domains.

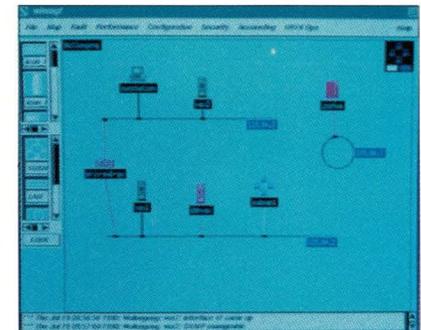
LattisNet Network Management is priced at \$7,000, which includes the cost of SunNet Manager.

Paula Jacobs is a freelance writer and marketing consultant based in Framingham, MA, who specializes in the implementation of new technologies.

THE WOLLONGONG GROUP INC.

Management Station

The Wollongong Group Management Station Release 2.0 is a network-management product that provides the network manager with a set of tools to monitor and manage both TCP/IP-based and OSI networks. Management Station's Network Map displays the current status of each network element, as well as the current topology of the network, regardless of the size of the network. Management Station also provides a sepa-



rate accounting form for each network device; this information can be stored in a relational database and used for designing reports.

Release 2.0 also includes an interface to the Ingres Corp. Ingres relational database. Management Station operates on Sun 3s and 4s, and SPARCstation workstations and servers using SunOS 4.0 or greater.

Price is \$10,000. ➔

Connectivity Companies Mentioned in this Article

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Banyan Systems Inc.
120 Flanders Road
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Circle 101

Brixton Systems Inc.
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Cambridge, MA 02140
Circle 102

Chipcom Corp.
118 Turnpike Road
Southboro, MA 01772
Circle 103

Cisco Systems Inc.
1525 O'Brien Drive
Menlo Park, CA 94025
Circle 104

Concord Communications Inc.
753 Forest St.
Marlboro, MA 01752
Circle 105

Digital Equipment Corp.
Maynard, MA 01754-2571
Circle 106

FiberCom Inc.
P.O. Box 11966
Roanoke, VA 24022-1966
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Colorado Networks Division
3404 East Harmony Road
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IBM Corp.
1133 Westchester Ave.
White Plains, NY 10604
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The SCSI Performance Gap

by KIMBERLY PATCH

Despite advances in data-transfer rates, the data-handling gap between workstations and SCSI drives continues to widen.

The good news for Sun Microsystems Inc. workstation users seeking new disk drives is the price per megabyte for disk storage continues to drop steadily and will likely decrease even more steeply in the coming year. In addition, an array of disks will be available at still lower prices through the mail. An increasing number of sophisticated users are taking advantage of lower mail-order prices and installing drives themselves.

But the bad news is disk-drive transfer rates, always sluggish compared to CPU speed, are continuing to lose ground. CPU speeds simply outstrip the ability of disk drives to pump data. For users craving speedier disks, the news is they are getting faster, but not nearly fast enough.

According to Bob Katzive, vice president at Disk/Trend, a market research and consulting company in Mountain View, CA, the workstation market will likely see a 2-GB, 3 1/2-inch drive before the end of the year. According to Vijay Jaswa, executive vice president of Exsys Storage Systems in San Jose, CA, the increase in capacity should drive prices down as much as 80% within a year.

High-capacity 5 1/4- and 3 1/2-inch disk drives are selling today at about \$2 per megabyte in OEM quantities, which increases to \$4 to \$7 per megabyte on the street, says Katzive. Sun recently announced a 1.3-GB, 5 1/4-inch disk drive that sells for \$4.08 per megabyte. This price slashes Sun's price per megabyte nearly 50%, according to

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Ed Turner, Sun marketing manager for I/O subsystems.

Gaining Intelligence.

"Drives are getting smarter. They have more internal functions," says Katzive. The SCSI intelligent interface is increasingly taking over detailed drive functions from the controller or host. In addition, drives are gaining self-test and maintenance abilities, he says. "Some drives have a lot of self-test functions that keep track" of drive health and efficiency on the fly, he says.

In future drives, users will see manufacturers take advantage of intelligent functions like tag queuing that are already architected into SCSI, Sun's Turner says.

Tag queuing allows the disk to handle multiple commands. Commands are tagged to allow the host to identify which data stream they belong in. "This allows the drive to queue up commands and execute them intelligently. Once the drive gets the data from one command in its buffer, it can immediately fire off the next seek in its queue—it can overlap seeking with data transfer. This is more parallelism and consequently a faster I/O," Turner says. "The drives we bring out in 1992 are likely to support things like tag queuing."

In order to keep up with the disk drive's increased capabilities and generous cuts in prices, manufacturers are getting more efficient, according to Alan Kivnik, president of American Digital Systems Inc., Sudbury, MA. "Manufacturing yields are going up. The amortization of R&D and tooling is being completed. After you're done paying for those tools, you can continue to sell your products, lower the price a bit and still make the same profits," he says.

Disk-drive demand will also likely shore up manufacturers despite the price cuts, according to Disk/Trend's Katzive.

This is a long-term trend: Demand for 100- to 300-MB drives will increase from 1.8 million in 1989 to 10.1 million by 1993, according to Katzive. Demand for 300- to 500-MB

drives will increase from 840,000 in 1989 to 2 million in 1993. About 15% of those drives will go to workstation users.

Despite disk-drive intelligence advances, which will speed data-transfer rates some, and some other innovations, substantial increases in data-transfer rates remain difficult.

A continuing decrease in the price of memory, for instance, will make it more cost efficient to speed drives by using large caches. "Because RAM is so cheap and Winchester performance is so bad, [people] compensate with large caches. That's going to be almost mandatory," says Exsys' Jaswa.

Transfer rates today range from 2.4 to 4 MB/s and will likely creep up only to 3 to 4.5 MB/s in the next year, according to Jaswa.

But there are some other options for users willing to pay more for higher disk speeds: the use of many smaller disk drives working together in larger disk farms, called redundant arrays of inexpensive disks (RAID), or the use of IPI interfaces.

The use of RAID subsystems has been growing slowly since sales began in 1989. RAID takes advantage of dropping disk prices to provide users with increased reliability and, in some applications, with speedier transfer rates. Because the setup involves several disks, RAID is generally used on larger workstations and servers. It also costs anywhere from 40% to 50% more per megabyte than single disk drives, according to Katzive.

There are different levels of RAID, ranging from simple disk mirroring at level one, to parallel data transfer in level three, to disk striping at level five. Level three increases disk I/O for large block transfers only. RAID level five uses striped parity to allow higher data I/O for a wider range of transfers, but is speediest with high-bandwidth applications like imaging. "You get a much higher bandwidth because you are transferring data off of multiple disks simultaneously rather than just one disk," says Jaswa. At the same time, the way in which information is written to the multiple disks allows for data recovery if one disk fails.

It is also possible to increase bandwidth further if the added reliability is not needed. Katzive says, "You can either operate the group of drives in parallel high data transfer rates or in reliability mode and slow down a little so you can have one drive fail and can recover data."

Despite the advantages, RAID technology currently does not have a large market share. "I'd say one in a thou-

The use of RAID subsystems has been growing slowly since sales began in 1989.

sand is using RAID," says Jaswa, who adds that in a year, RAID use could increase to "a few real percentages."

American Digital is getting ready to offer RAID subsystems, but any kind of volume sales are still fairly far in the future, according to Kivnik. "It's a little ways off in terms of customer acceptance and customer demand. I would give it a year before customers are out there saying 'we want this.'"

According to Dataquest, a market-research company in San Jose, CA, under 5,000 RAID subsystems shipped in 1990. Shipments will increase moderately to just over 100,000 by 1994.

Interface Face-off

The IPI interface, as opposed to the wildly popular SCSI interface, also allows for increased disk-transfer speed. The IPI interface, designed originally for larger machines, made a splash in the market a couple years ago. It is still used by some companies, including Sun in its high-end SPARC-servers. But, partly because it is more expensive than SCSI, and partly

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S. Henry Sacks
Publisher

MASS STORAGE

because SCSI is gaining many of IPI's intelligence advantages, it has not gained the popularity SCSI enjoys.

IPI is currently faster than SCSI because it uses information about disk rotation to read from the disk more efficiently—something that SCSI is not yet able to do. Current top-of-the-line IPI2 interfaces from Seagate Technology, Scotts Valley, CA, and Fujitsu America Inc., San Jose, CA, boast data-transfer rates from the disk surface as high as 10 MB/s for the 8-inch disks that could be used on workstation servers, according to Exsys' Jaswa.

Despite its superior speed and higher levels of data integrity, IPI is not likely to challenge SCSI. Neither is it likely to go away. "Every time it seemed like you had to have [IPI], the SCSI people came up with something that reduced the need to switch over to IPI," says Jaswa.

American Digital's Kivnik agrees: "In the workstation arena, IPI is a moderately complex, very high performance, moderately expensive interface. I'm not seeing IPI as a force. At the very high end, IPI is a much more serious contender."

IPI's sophisticated data-integrity features—and its higher price—are products of its history: "It's not a small computer system interface like SCSI. It's designed for the high end and moved down to the workstation, so it has the data-integrity features absolutely required for larger computers," Jaswa says. An IPI interface commands a cost premium of about 50% over SCSI drives, according to Jaswa.

"The performance and the costs [of SCSI and IPI] are merging, and that tends to drive the market towards SCSI, which is a broader interface than IPI," Sun's Turner says.

It's In The Mail

For those users who want standard SCSI drives at very low prices and have some mechanical prowess and patience, another option to consider is the mail-order market. An increasing number of workstation users are turning to mail order, long the dar-

ling of PC users looking to save a buck. Workstation users who are willing to roll up their sleeves and install a part themselves are doing so in exchange for considerable cost savings.

According to Disk/Trend's Katzive, it is difficult to track mail-order sales, but "the sense we have is people could do that and it would probably" work out OK. "Larger companies who have fairly good-sized staffs who can take care of networks would do it. Smaller companies might be intimidated."

In an answer to that trend, Sun recently announced a subsidiary called SunExpress. Much like the mail-order companies, SunExpress is designed to offer users quick, easy service with a toll-free number, extended business hours and delivery in two to five days. "I don't see anything wrong with mail order per se," says Sun's Turner. "People are constantly finding ways to lower distribution costs. That's the way to do it."

Other disk suppliers also acknowledge the mail-order trend. "I imagine it's happening more and more. We have a tremendous number of extremely competent customers," says American Digital's Kivnik.

Kivnik and Turner both point out the risks of mail order. "Unless you know what you're doing, or have somebody nearby who can devote the time to help you, you're always at risk in buying anything that has to be installed," Kivnik says. ➤

Kimberly Patch is a business and technology writer based in the Boston area.

The table following this article summarizes information from companies that responded to a SunExpert questionnaire. If your favorite vendor is not listed, the company may not have supplied the information. Let us know which vendors we should add to our database. The criterion: The drive should be a self-contained, external 5 1/4- or 3 1/2-inch SCSI or SCSI-2 unit.

MASS STORAGE SURVEY

compiled by MAUREEN MCKEON

Company and address Model	Manufacturer	Capacity	Form factor	Interfaces	Average seek time (ms)	Transfer rate (MB/sec)	MTBF (POH)	SUN format dat entry	ROM/firmware upgrades	Warranty (years)	Enclosures	List Price (\$)
American Digital Systems Inc. , 490 Boston Post Road, Sudbury, MA 01776. Circle 119												
MZE 157-X	Seagate	1.35 GB	5 1/4	SCSI	15	2.9	150,000	call	no	5	yes	7,980
MZE 156-X	Seagate	1.05 GB	5 1/4	SCSI	15	1.9	150,000	call	no	5	yes	6,100
MZE 155-X	Seagate	676 MB	5 1/4	SCSI	15	1.9	150,000	call	no	5	yes	4,995
MZE 154-X	Seagate	612 MB	5 1/4	SCSI	15	1.5	150,000	call	no	5	yes	4,600
anDATAcO Computer Peripherals , 9550 Waples St., San Diego, CA 92121. Circle 120												
ADT/705A	Maxtor	1.7 GB	5 1/4	SCSI	13	5	150,000	yes	yes	5	yes	3,500
ADT/703A-5	Seagate	1.6 GB	5 1/4	SCSI, IPI	11	6	150,000	yes	yes	5	yes	3,900
ADT/702A	Maxtor	1.2 GB	5 1/4	SCSI	13	5	150,000	yes	yes	5	yes	3,000
ADT/509A	Maxtor	760 MB	5 1/4	SCSI	16.5	1.9	150,000	yes	yes	5	yes	2,500
Apunix Computer Services , 5575 Ruffin Road, Ste. 110, San Diego, CA 92123. Circle 121												
HP97560T	Hewlett-Packard	1.3 GB	5 1/4	SCSI	13.5	5	150,000	yes	yes	5	yes	3,440
M2266S	Fujitsu	1 GB	5 1/4	SCSI	14.5	5	200,000	yes	yes	5	yes	2,824
HP97549T	Hewlett-Packard	1 GB	5 1/4	SCSI	16	5	150,000	yes	yes	5	yes	2,757
HP97548S	Hewlett-Packard	660 MB	5 1/4	SCSI	16	5	150,000	yes	yes	5	yes	2,085
Artecon Inc. , 2460 Impala Drive, Carlsbad, CA 92008-7236. Circle 122												
DSU1-391	Micropolis, Artecon	2 GB	5 1/4	SCSI	14	10	150,000	yes	—	1	yes	7,295
DSU1-371	Micropolis, Artecon	1 GB	5 1/4	SCSI	14	4	150,000	yes	—	1	yes	4,495
DSU1-351	Micropolis, Artecon	668 MB	5 1/4	SCSI	16	4	150,000	yes	—	1	yes	2,995
DTU-SD1	Maxtor, Artecon	492 MB	3 1/2	SCSI	14	4	150,000	yes	—	1	yes	2,895
ATTO Technology Inc. , Baird Research Park, 1576 Sweet Home Road, Amherst, NY 14228. Circle 123												
HD1600	Seagate	1.6 GB	5 1/4	SCSI, SCSI-2	11	5	150,000	yes	yes	1	yes	6,995
HD 760	Seagate	760 MB	5 1/4	SCSI, SCSI-2	11.9	4.8	150,000	yes	yes	1	yes	5,495
Aviv Corp. , 4 Fourth Ave., Burlington, MA 01803. Circle 124												
SM 1650 SS	Hitachi	1.6 GB	5 1/4	SCSI	13.5	3	150,000	yes	yes	3	yes	3,900
SM 1200 SS	Maxtor	1.2 GB	5 1/4	SCSI	13	5	100,000	yes	yes	3	yes	2,900
SM 1780 SS	Hitachi	780 MB	5 1/4	SCSI	16	4	150,000	yes	yes	3	yes	2,400
CMS Enhancements Inc. , 2722 Michelson Drive, Irvine, CA 92715. Circle 125												
SSE 1200F	Fujitsu	1.2 GB	5 1/4	SCSI	14.5	4.8	150,000	yes	yes	5	yes	5,790
SSE 1200I	Seagate	1.2 GB	5 1/4	SCSI	15	4.8	150,000	yes	yes	5	yes	5,570
SSE 1200M	Micropolis	1.2 GB	5 1/4	SCSI	14.5	4.8	150,000	yes	yes	5	yes	5,430
SSE 766I	Seagate	766 MB	5 1/4	SCSI	15.5	4.7	150,000	yes	yes	5	yes	4,172
Core International , 7171 North Federal Highway, Boca Raton, FL 33487. Circle 126												
CPR 400 (array)	Core	4 GB	5 1/4	SCSI-2	17	5	—	no	yes	1	yes	64,600
CPR 200 (array)	Core	2.6 GB	5 1/4	SCSI-2	17	5	—	no	yes	1	yes	43,500
CPR 100 (array)	Core	1 GB	5 1/4	SCSI-2	17	5	—	no	yes	1	yes	32,500
Delta Microsystems Inc. , 111 Lindbergh Ave., Bldg. C, Livermore, CA 94550. Circle 127												
SS-1291	Hewlett-Packard	1.3 GB	5 1/4	SCSI	13.5	1	40,000	no	yes	5	yes	7,750
SS-1003D	Seagate	1 GB	5 1/4	SCSI	16.5	2.6	40,000	no	yes	5	yes	6,750
SS-995D	Hewlett-Packard	955 MB	5 1/4	SCSI	13.5	1	40,000	no	yes	5	yes	6,750
SS-644D	Seagate	644 MB	5 1/4	SCSI	16	1.8	40,000	no	yes	5	yes	5,020
Eakins Open Systems , 67 East Evelyn Ave., Mountain View, CA 94041. Circle 128												
EABG1.6	Seagate	1.6 GB	5 1/4	SCSI-2	15	5	150,000	yes	yes	1-5	yes	2,660
EAFV1.2	Seagate	1.2 GB	5 1/4	SCSI	15	4.8	150,000	yes	yes	1-5	yes	2,280
EAOF.6	Seagate	766 MB	5 1/4	SCSI	15	4.7	150,000	yes	yes	1-5	yes	1,633

MASS STORAGE SURVEY

Company and address Model	Manufacturer	Capacity	Form factor	Interfaces	Average seek time (ms)	Transfer rate (MB/sec)	MTBF (POH)	SUN format.dat entry	ROM/firmware upgrades	Warranty (years)	Enclosures	List Price (\$)
Exsys Storage Systems Inc. , 1430 Tully Road, San Jose, CA 95122. Circle 129												
DK516C-16	Hitachi	1.6 GB	5 1/4	SCSI	13.5	5	150,000	yes	yes	1	yes	call
ST41600N	Seagate	1.6 GB	5 1/4	SCSI	11.5	4.5	250,000	yes	yes	1	yes	call
General Microsystems Inc. , 3220 118th Ave. S.E., Ste. 100, Bellevue, WA 98005. Circle 130												
WN/D 220	Seagate	7 GB	5 1/4	SCSI	15.5	4.7	150,000	yes	yes	1	yes	call
WN/D 220 GB-1.6	Seagate	1.4 GB	5 1/4	SCSI	11.5	5	150,000	yes	yes	1	yes	call
WN/D 220 GB	Seagate	1 GB	5 1/4	SCSI	15	4.8	150,000	yes	yes	1	yes	call
Helios Systems , 1996 Lundy Ave., San Jose, CA 95131. Circle 131												
SCSIBox	Hewlett-Packard, Seagate, Fujitsu	.18-1.6 GB	5 1/4, 3 1/2	SCSI	14.5	1.3-22.8	150,000	yes	yes	1-5	yes	995-3,995
IEM Inc. , P.O. Box 8915, Fort Collins, CO 80525. Circle 132												
5067S	Hewlett-Packard	670 MB	5 1/4	SCSI	16.5	1.6	150,000	no	yes	2	yes	4,495
5033S	Hewlett-Packard	330 MB	5 1/4	SCSI	16.5	1.6	150,000	no	yes	2	yes	3,795
LaCie Ltd. , 19552 S.W. 90th Court, Ivalatin, OR 97062. Circle 133												
Tsunami	Quantum	210 MB	3 1/2	SCSI	14	4	50,000	no	no	2	yes	1,699
Liberty Systems Inc. , 160 Saratoga Ave., Ste. #38, Santa Clara, CA 95051. Circle 134												
22514GEL	Seagate	1.6 GB	5 1/4	SCSI, SCSI-2	11.5	5	150,000	no	no	1	yes	3,999
22514GW8	Seagate	1.6 GB	5 1/4	SCSI, SCSI-2	15	5	150,000	no	no	1	yes	3,499
70425Q	Quantum	425 MB	3 1/2	SCSI, SCSI-2	10	4.5	50,000	no	no	2	yes	2,299
Luctor Corp. , 21436 N. 20th Ave., Phoenix, AZ 85027-2612. Circle 135												
DMS-7000	Luctor	1.2-2.46 GB	5 1/4	SCSI	14	3	150,000	no	yes	4	optional	3,947- 11,700
Mass Memory Systems Inc. , 1414 Gay Drive, Winter Park, FL 32789. Circle 136												
1.05 GB	Mass Memory	1.2 GB	3 1/2	SCSI	12-19	5	50-150,000	no	yes	1	yes	5,490
426 MB	Mass Memory	426 MB	3 1/2	SCSI	12-19	5	50-150,000	no	yes	1	yes	3,990
340 MB	Mass Memory	340 MB	3 1/2	SCSI	12-19	5	50-150,000	no	yes	1	yes	3,490
210 MB	Mass Memory	210 MB	3 1/2	SCSI	12-19	5	50-150,000	no	yes	1	yes	2,190
MicroNet Technology Inc. , 20 Mason, Irvine, CA 92718. Circle 137												
SBT-2600S	Seagate	2.6 GB	5 1/4	SCSI	11.5	3.7	100,000	no	no	1	yes	14,990
SBT-2022S	Seagate	2 GB	5 1/4	SCSI	15	2.5	100,000	no	no	1	yes	10,690
SB-1350S	Seagate	1.4 GB	5 1/4	SCSI	15	3.2	100,000	no	no	1	yes	6,095
SBT-1338S	Seagate	1.33 GB	5 1/4	SCSI	15	1.4	100,000	no	no	1	yes	7,690
Micropolis Corp. , 21211 Nordhoff St., Chatsworth, CA 91311. Circle 138												
Microdisk 1750	Micropolis	1.7 GB	5 1/4	SCSI	14	10	150,000	yes	yes	5	yes	7,195
Microdisk 1340	Micropolis	1.3 GB	5 1/4	SCSI	14.5	5	150,000	yes	yes	5	yes	5,495
Microdisk 1030	Micropolis	1 GB	5 1/4	SCSI	14.5	5	150,000	yes	yes	5	yes	4,495
Microdisk 670	Micropolis	670 MB	5 1/4	SCSI	16	5	150,000	yes	yes	5	yes	3,295
Pacific Microelectronics Inc. , 201 San Antonio Circle, C250, Mountain View, CA 94040. Circle 139												
PMHDE	Pacific Micro, Maxtor, Seagate	1.2 GB	5 1/4	SCSI	10	3.6	100,000	yes	no	1	yes	2,899
Peripherals Design , 3060 Business Park Drive, Norcross, GA 30071. Circle 140												
ST41650N	Seagate	1.65 GB	5 1/4	SCSI	15	4	150,000	yes	no	1	yes	call
ST41600N	Seagate	1.6 GB	5 1/4	SCSI-2	11.5	4.3	150,000	yes	no	1	yes	call
ST41200N	Seagate	1.2 GB	5 1/4	SCSI	15	2.8	150,000	yes	no	1	yes	call
ST4766N	Seagate	766 MB	5 1/4	SCSI	15.5	1.9	150,000	yes	no	1	yes	call

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R Squared , 11211 East Arapahoe Road, #220, Englewood, CO 80112. Circle 141												
H3700	Hitachi	3.7 GB	5 1/4	SCSI	12	10	150,000	yes	yes	5	—	call
H2600	Hitachi	2.6 GB	5 1/4	SCSI	12	10	150,000	yes	yes	5	—	call
S2400	Seagate	2.4 GB	5 1/4	SCSI	11.5	10	150,000	yes	yes	1	—	call
F2000	Fujitsu	2 GB	5 1/4	SCSI	12	12	200,000	yes	yes	5	—	call
Relax Technology Inc. , 3101 Whipple Road, Union City, CA 94587. Circle 142												
Vista 1600	Seagate	1.4 GB	5 1/4	SCSI	15	5	150,000	yes	yes	1	yes	2,749
Vista 1000	Seagate	1 GB	5 1/4	SCSI	15	2.8	100,000	yes	yes	1	yes	2,099
Vista 960	Fujitsu	960 MB	5 1/4	SCSI	14.5	1.7	200,000	yes	yes	5	yes	2,399
Vista 660	Seagate	665 MB	5 1/4	SCSI	11.9	3.0	100,000	yes	yes	1	yes	1,799
Specialized Systems Technology , P.O. Box 420489, Houston, TX 77242-0489. Circle 143												
SSD-3700	Hitachi	3.7 GB	5 1/4	SCSI	12	10	150,000	yes	yes	5	yes	7,495
SSD-2600	Hitachi	2.6 GB	5 1/4	SCSI	12	10	150,000	yes	yes	5	yes	6,495
SSD-1600	Hitachi	1.65 GB	5 1/4	SCSI	14	3.03	150,000	yes	yes	5	yes	5,660
SSD-1400	Hitachi	1.4 GB	3 1/2	SCSI	10.4	10	150,000	yes	yes	5	yes	2,950
Storage Dimensions , 1656 McCarthy Blvd., Milpitas, CA 95035. Circle 144												
SUN1-1350S1-N2	Seagate	1.35 GB	5 1/4	SCSI	11.5	4.4	250,000	call	—	2	yes	call
SUN1-1035S1-N2	Seagate	1 GB	5 1/4	SCSI	15	2.9	150,000	call	—	2	yes	call
SUN1-665S1-N	Maxtor	665 MB	5 1/4	SCSI	15	1.8	150,000	call	—	2	yes	call
SUN535S1-N	Maxtor	535 MB	3 1/2	SCSI	12	2.6	150,000	call	—	2	yes	call
Sun Microsystems Computer Corp. , 2550 Garcia Ave., Mountain View, CA 94043. Circle 145												
X571	Seagate	1.3 GB	5 1/4	SCSI	11.5	4.5	100,000	yes	—	1/4	yes	5,500
X540	Seagate	424 MB	3 1/2	SCSI	14	3	100,000	yes	—	1/4	yes	2,100
X552	Maxtor, Quantum	207 MB	3 1/2	SCSI	16	1.8	50,000	yes	—	1/4	yes	1,700
System Technology Associates , 15111 Mintz Lane, Houston, TX 77014. Circle 146												
S41650	Seagate	1.6 GB	5 1/4	SCSI	15	5	150,000	yes	yes	1	yes	3,650
S41600E1	Seagate	1.6 GB	5 1/4	SCSI, IPI	11.5	5	150,000	yes	yes	1	yes	4,250
S1200N	Seagate	1.2 GB	5 1/4	SCSI	15.5	4.8	150,000	yes	yes	1	yes	3,100
Trimarchi Inc. , P.O. Box 560, State College, PA 16804. Circle 147												
TN-01G0000-0	Seagate, Micropolis	1.05 GB	5 1/4	SCSI	15	2.9	100,000	yes	no	2	yes	3,695
TN-01F0000-0	Seagate, Micropolis	676 MB	5 1/4	SCSI	15.5	1.9	100,000	yes	no	2	yes	2,695
TN-01E0000-0	Seagate, Micropolis	340 MB	5 1/4	SCSI	16.5	1.9	100,000	yes	no	2	yes	2,195
Unbound Inc. , 17951 Lyons Circle, Huntington Beach, CA 92647. Circle 148												
STOR2.0-R	Unbound	2 GB	5 1/4	SCSI, SCSI-2	11	10	150,000	yes	no	2	yes	5,960
STOR1.2-R	Unbound	1.2 GB	5 1/4	SCSI, SCSI-2	14.5	4	150,000	yes	no	2	yes	3,980
STOR760-R	Unbound	760 MB	5 1/4	SCSI, SCSI-2	16	4	150,000	yes	no	2	yes	3,270
STOR400-R	Unbound	400 MB	3 1/2	SCSI, SCSI-2	19	3	50,000	yes	no	2	yes	2,820
Unisun Peripherals , 5893 Oberlin Drive, San Diego, CA 92121. Circle 149												
PL-175	Maxtor	1.7 GB	5 1/4	SCSI	13	3	100,000	yes	—	2	yes	2,725
1528-1S	Micropolis	1.5 GB	5 1/4	SCSI	14.5	4.8	150,000	yes	—	5	yes	2,530
97549T	Hewlett-Packard	1.2 GB	5 1/4	SCSI	17.5	5	250,000	yes	—	5	yes	2,300
2266SA	Fujitsu	1.2GB	5 1/4	SCSI	16	4	200,000	yes	—	5	yes	2,145
U.S. Design , 4311 Forbes Blvd., Lanham, MD 20706. Circle 150												
Q-Stor 1700	U.S. Design, Maxtor	1.7 GB	5 1/4	SCSI	14	1.5	40,000	yes	yes	2	yes	5,083
Q-Stor 1200	U.S. Design, Maxtor	1.2 GB	5 1/4	SCSI	14	1.5	40,000	yes	yes	2	yes	4,125
Q-Stor 760	U.S. Design, Maxtor	760 MB	5 1/4	SCSI	13	1.5	40,000	yes	yes	2	yes	2,875
Q-Stor 340	U.S. Design, Maxtor	340 MB	3 1/2	SCSI	16	1.5	40,000	yes	yes	2	yes	2,458

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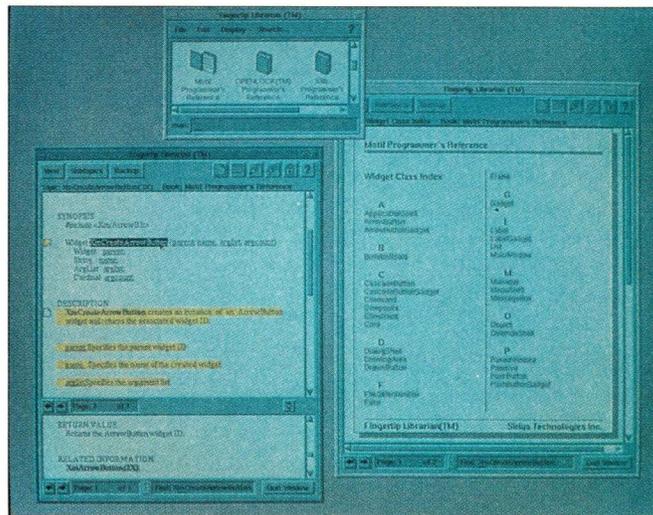
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New Tip for Old Books



Fingertip Librarian allows you to browse, search, annotate and customize man pages with ease.

by MARY RIENDEAU, Software Tool & Die

Fingertip Librarian from Sirius Technologies Inc. is the latest in a series of hypertext document interfaces to appear on the market. In addition to providing speedy viewing of on-line manual pages, Fingertip provides annotation capabilities. UNIX manual pages, called Books, can be marked up, dog-eared and highlighted much like your favorite reference book. But, unlike with a reference book, your annotations may be shared with other users. Likewise, you may find other people's annotations in your manuals.

On-line manual pages have always been available on UNIX systems and now, Fingertip offers modern, sophisticated access to this information. If you use UNIX manual pages,

this product will save you time while providing a convenient way to share your comments with other members of your office. After a few hours with the easy-to-use Fingertip Librarian, you will discover many new ways to use your existing documentation.

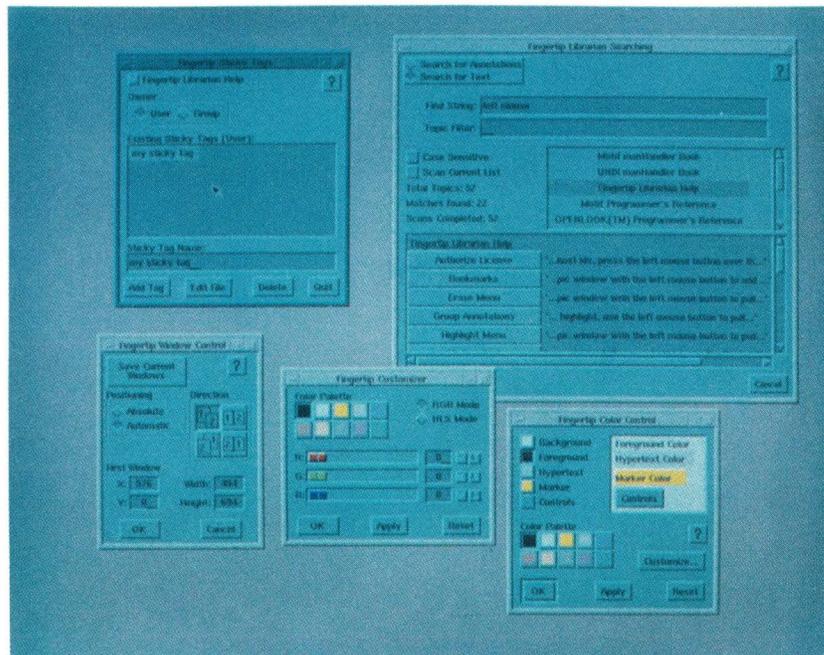
The basic unit of Fingertip is a Book. These Books comprise manual pages called, in Fingertip parlance, "topics." One selects a Book by clicking on the book icon and choosing a hyperindex for that Book. Books can have one or more hyperindexes. For example, the Fingertip Librarian Help Book has three hyperindexes: Alphabetic Index, Introduction and Table of Contents. By default, the Introduction hyperindex is displayed in a newly created "topic window."

Once you begin reading a Book, you may read from cover-to-cover as with a traditional printed book by using the Next Topic selection under the View menu. In fact, Fingertip only sent me an installation manual. But by following the Next Topic selections I was able to get a very thorough introduction to Fingertip while using the software.

In Fingertip, hypertext is displayed with gray highlighting, or on a monochrome display, as outlined text. When you select a hypertext item, the hyperlink activates a new topic window with the linked information.

Fingertip hyperlinks can be associated with icons. For instance, the Fingertip On-line Help system icon (a question mark) is a hyperobject. If you select the icon with the left button, the hyperlink will open a new topic window that displays the appropriate help document. This is extremely useful during the initial learning phase because the manual for Fingertip is right there at your fingertips.

In addition to a view of the current topic, the "topic window" has three menus, four annotation tools, a lock button and a help button. The first menu is the View menu from which you can select Next Topic, Previous Topic, Next Bookmark, Split Screen, or one of the hyperindexes. The Split Screen selection provides a two-window view of the current topic. Each



The Search menu, available through the Main Librarian window, provides access to searches throughout the entire library.

You can
compare two
related manual
pages with a
quick button-
click.

window may be scrolled separately to compare sections of the same topic.

The second menu, Subtopics, provides direct access to an associated subtopic. The final menu, Backup, keeps a chronological list of each topic you view, allowing you to return to a previously viewed page, the text positions are untouched. You can compare two related manual pages with a quick button-click.

Dog-eared man Pages

On the upper right of the topic window are the annotation tools. The

first is a dog-eared page, the bookmark tool. The second appears to be a torn piece of paper that represents the attachment of a "sticky note." The third is a pencil tip and the fourth an eraser. To make an annotation, select the text that you wish to annotate by holding the middle button and dragging the mouse. The selected text will be inverted, and a click with the right button while on the tool will set the annotation type.

The pencil tip provides highlighting and text copying. Highlight marks will show up as yellow text. Highlights may be made for yourself or for groups of users. While there is a copy-to-clipboard function in the pencil-tip tool, the clipboard is only available to other Fingertip text fields. You can not paste your clipboard to a text file, nor to another UNIX file. You will definitely want to enclose text from the manual pages in other documents such as a mail message or a non-Fingertip reference file. Sirius assures me that this problem is a bug in OpenWindows and a fix will be added to Fingertip Librarian. Other X servers should be able to use this feature with any other X application.

The eraser removes annotations. Select the annotation and click the eras-

er. The bookmark tool is used to set bookmarks. Multiple bookmarks may be set per topic and will appear as dog-eared squares in the left-page margin.

The sticky-note annotation is the most sophisticated annotation tool. Sticky notes allow a file to be linked to the selected text. When the sticky note is created, a new window pops up that allows you to select an existing sticky tag, modify a sticky tag or add a new sticky tag. Your sticky-note file, the sticky tag, contains your comments and details about the selected item in the existing manual page. Your sticky tag can be referenced later by clicking on the yellow sticky note that appears in the left margin of the topic window. The sticky tag can be associated to one or more sticky notes and may be set for the individual or for group access.

When creating a new sticky note, the default editor is activated on the file specified by the sticky tag. The editor window must be completed and exited before you can return to Fingertip or to any other window on your desktop.

Fingertip offers a wide selection of customizable features, even GUI styles.

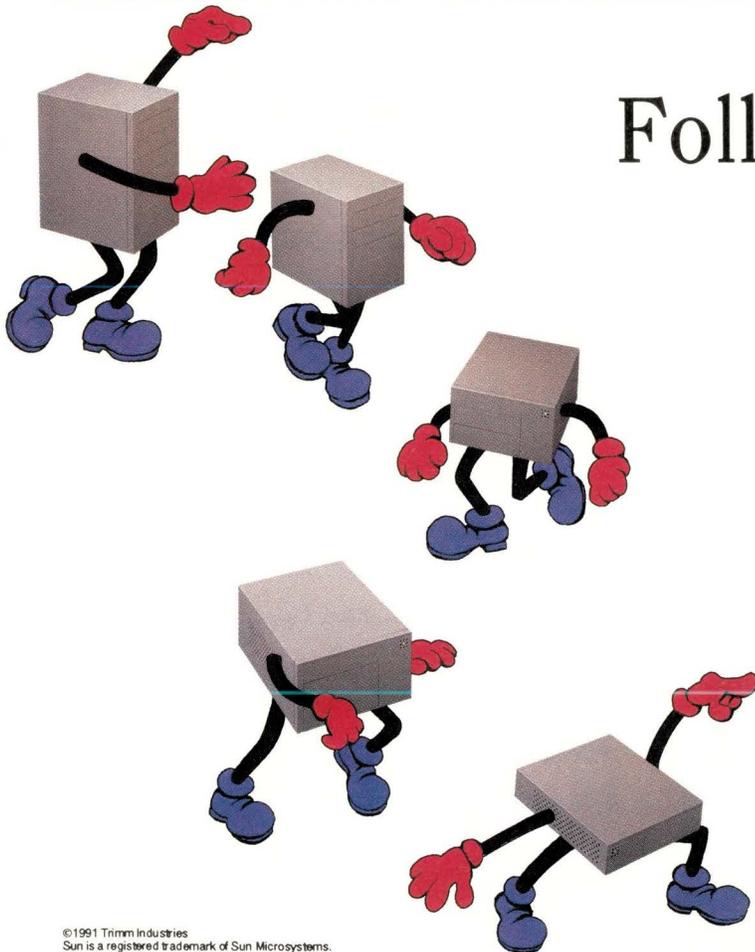
Each Book opens in a topic window. Once a Book is open, a new topic will be displayed in the same topic window. To return to the previous topic, you may use the Backup menu. However, you may want additional topic windows for the same Book. To force the creation of a new window, change the window-lock status by clicking on the padlock icon in the upper right of the topic window. The icon changes from an open

lock to a closed lock to show you the status of the topic window.

Any previous topics located on the Backup menu will still be available to the locked topic window. Any other action will result in the creation of a new topic window or the replacement of another unlocked window's contents, if available.

A left arrow and right arrow at the bottom of the topic window may be used to flip pages. A page number may be entered to move directly to that page. A text field is available to search for strings in the current topic window. The text field has up and down arrows that allow for forward and backward searching. This search is limited to the current topic window only.

Back in the Main Librarian Window, the Search menu provides access to searches throughout the entire library. This is one of the best characteristics available in the software. At last, you can search all manual pages for a specified text string. No more incomplete man -k searches. Such



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large searches may take some time. While you are waiting, Fingertip updates the status list to show you the number of total topics, matches found and scans completed. This will reassure you that the software is still doing what you requested. In case your patience wanes, a stop button is available. To reduce search time, you may restrict the search to a specified Book and you may even limit the topics by using a topic filter. The topic filter sets a string that must appear in the topic and the search will be limited to the contents of those topics. This reduces the search range and provides a faster response.

Searches may also be limited to a number of previously found topics by selecting the Scan Current List option. This limits a search to the set of topics previously selected. For example, a topic search on the string "date" produced a topic list of four items: `date(1)`, `rdate(8)`, `update(8)` and `ypupdated(8)`. A follow-up search on the string "adjust" produced a topic list of one

item: `date(1)`. It contained both "date" and "adjust" strings.

How to Search

Let's say you know the topic you want to view. Go to the Search menu, enter the topic as the topic filter and select the Book. Fingertip will quickly look up the selected topic and a "click" in the display window will bring up the topic window immediately. You can eliminate the search through the index or command summary and get directly to the manual page.

The indexes, known as hyperindexes, are perhaps the weakest characteristic of Fingertip. While the hyperindexes do allow for quick access to the topic, they are not comprehensive indexes. For example, the SunOS Book hyperindex is merely the topics (the manual page name) ordered by Command Summary, Maintenance Commands and User Level Commands. No alphabetical index is available nor is a global index. At least the search capabilities are broad enough to make up for some of this. Of course,

large searches will take longer than a pre-built permanent index.

Sirius says the search capabilities will be expanded to include the ability to search for annotations. This function will be extremely useful when you want to locate a previously made bookmark or sticky note. Presently, annotations are available from the topic window only. You must remember where you put sticky notes and highlights. Dog-eared pages are not visible from an index, and presently, the scope of a bookmark is limited to the topic, not the Book. Subsequent searches with Next Bookmark will only locate bookmarks in the current topic. While the idea of bookmarks is here, the functionality is not yet sufficient.

Fingertip offers a wide selection of customizable features. Perhaps the most humorous is the ability to shift between the Open Look and the Motif GUI. The mere selection of Interface Style under the View menu quickly sets your GUI style.

The remaining customizations are



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more**Fingertip Librarian****Sirius Technologies Inc.**3456 Mt. Ariane Drive
San Diego, CA 92111**Circle 153****System requirements:**SunOS 4.0.3 or compatible,
OpenWindows 2.0 or X11R5,
approximately 6 MB of
free disk space**Price:**\$495 CPU, including manHandler
utility and the Technical Library,
(UNIX, Motif, and Sun programming
books). Call for pricing on the
developer's kit (starting at \$3,200).

found in the Edit menu. If you have a color screen, you can customize color. With a quick use of the RGB sliders, the highlighter marker can be changed from the traditional bright yellow to the fashionable bright green. Fonts, windows and text editors can all be set to your liking. The final option is the setting of Groups that allow for different people to access different bookmarks, highlights and hyperlinks.

Fingertip has limited keystroke shortcuts that may be used in place of mouse buttons. In many cases, the control sequences are more efficient than using the mouse. For instance, scrolling can be activated with CTRL-F, CTRL-B, CTRL-R and CTRL-L for forward, backward, right and left, respectively. It would be useful to have more extensive keystroke shortcuts especially for annotation commands and an extra bonus would be user-customizable keystroke shortcuts.

For this review, the media was installed on a color IPC with 32 MB of memory. Our review copy included the three Fingertip On-line Books, Xlib, XtIntrinsics and Motif. The disk space for these three books and the software was about 6 MB of which 4 MB was the three books. Users must have SunOS, Open Look and DeskSet man pages already installed on their

systems. This software is available for SunOS 4.0.3 or compatible, OpenWindows 2.0, with monochrome, grayscale and color monitors supported. The supported platforms include Sun 4, SPARCstations and X-terminals. Fingertip is available from your X Window System over the network. A monochrome Network Computing Devices Inc. X-terminal had no difficulty using the software from the IPC server and was able to support the copy and paste functions that did not work in OpenWindows. Our review copy of the media did not require a license. Licenses are purchased for each Book in the Library and are installed with the License Authorization selection in the File menu.

Bundle of Utility

Originally developed as an additional product, the manHandler has been incorporated into Fingertip Librarian. This run-time utility uses a custom file filter that lets you automatically build Fingertip Books from the contents of any man page directory. The hyperindexes are created based on the directory contents. ManHandler automatically adds hypertext links to the "See Also" and "Related Information" references. To create a Book, you must add the following entry to the file name .manHandler:

```
<Book Name>:<Man Pages  
Directory Path>
```

Fingertip searches the specified directory for regular man subdirectories (i.e., man1, man2, etc.), defines a new Book with the name specified and registers indexes in that document for each of the subdirectories. If there is anything non-standard about the manual page contents or filenames, Fingertip may not be able to locate or interpret the man page contents. Annotations in your newly created Book will be saved across Fingertip sessions in the same way as licensed Book topics. If your documents are not currently in man page formats, Sirius Technologies offers engineering services to port existing documents into the Fingertip Librarian environment.

Additionally, Fingertip Librarian Developer's Kit is planned for future release. The developer's kit will allow OEMs to fully integrate product documentation with the Fingertip Librarian application by adding hyperlinks and customized hyperindexes.

While the basic techniques of Fingertip are powerful and easy to use, the Books included with Fingertip have limited hyperlink capability. If you are buying licenses for Books, you would expect them to be formatted to make extensive use of the Fingertip facilities. The only hyperlinks in SunOS manual pages are those for the "See Also" and "Related Information" commands. Sirius has made no attempt to add hyperlinks to the contents of the manual pages nor to provide global indexing. Both of these features would add value to this product.

Fingertip provides an easy to use interface for browsing, searching, annotating and customizing your manual pages. With very little effort, you will be able to increase the utility of your existing on-line documents and provide much needed notations for other manual page readers. You may even be able to reclaim some of those three-ring binders and that much needed shelf space. After all, the goal of today's information society is to make knowledge available at the tip of your finger. ➡

Mary Riendeau is vice president of information systems at Software Tool & Die. Previously, she managed a large, academic computing environment for several years at Boston University's Department of Computer Science. In her "spare" spare time, she studies Japanese language and culture.

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NEW PRODUCTS



Tabloid-Sized Printer

Tektronix has revealed its tabloid-sized color printer, the PhaserJet PXi. The 300-dpi PhaserJet produces a high-resolution color output on nearly any type of paper in sizes up to 12 by 18 inches. Full-color pages print in two minutes, and monochrome pages print in 40 to 60 seconds, depending on text density.

Multiple-platform environments are easily accommodated due to an intelligent multitasking interface that provides parallel, serial and AppleTalk ports that are automatically switched as needed. The base memory configuration of the product is 10 MB, expandable up to 18 MB with two 4-

MB upgrades.

Suggested price is \$9,995, including a one-year warranty.

Tektronix, Graphics Printing and Imaging Division, P.O. Box 1000, Wilsonville, OR 97070-1000.

Circle 184

DAT Stacker With Random Access

Apunix has announced a 4mm digital audio tape (DAT) stacker with random-access capability. With a total storage of 80 GB, the product consists of a DAT stacker from Soltronics, a WangDAT 4mm drive and the Network Backup Daemon software developed by Apunix.

The product offers both automatic sequential back and random-access retrieval. In sequential mode, the product loads a new tape cassette automatically once the previous cassette is filled, without operator intervention. In random mode, Network Backup Daemon determines which tape a file resides on and issues the proper retrieval commands to the hardware. Access to any tape in the machine can be achieved in 10 seconds or less.

Pricing begins at \$6,500 for an 8-cassette version and \$6,900 for a 16-cassette version.

Apunix Computer Services, 5575 Ruffin Road, Ste. 110, San Diego, CA 92123.

Circle 185

CBT Authoring Tools For UNIX

A computer-based-training [CBT] authoring system for UNIX systems has been introduced by Softwords Research International. Called Quatrain, the product allows CBT courseware developers to produce material on DOS Window systems, and deliver it on UNIX machines.

Quatrain is divided into two parts, an authoring module that runs on the DOS system and delivery module that runs on the target system. The authoring module is \$3,500, and, for Sun SPARCstations, the delivery module is \$1,500. Quatrain includes its own word-processing, animation and graphics facilities; however, it can also allow for other tools.

Softwords Research International Ltd., 4242 Commerce Circle, Victoria, BC, Canada.

Circle 186

Cognos On Suns

The PowerHouse 4GL and PowerHouse StarBase relational database system have been ported to the Sun SPARCstation and compatibles by Cognos. The two products had been used before on midrange systems.

PowerHouse 4GL is currently used at some 18,000 installations, particularly as an alternative to COBOL. StarBase features on-line transaction- and distributed-processing capabilities.

The products are available together at prices ranging from \$6,000 to \$22,500 depending on the number of users.

Cognos, 67 S. Bedford St., Burlington, MA 01803.

Circle 187

FDDI on Twisted Pair

Two networking products that provide FDDI over standard twisted-pair wire have been introduced by Crescendo Communications. Based on an underlying technology called Copper Distributed Data Interface (CDDI), the products are the Crescendo 1000 Workgroup Concentrator and SBus CDDI adapter. The Concentrator is a communications hub that links into an existing Ethernet or token-ring LAN. The adapter is an SBus card that links SBus-based workstations to the hub.

The company says that the products provide 100-MB/s transmission over standard twisted pair. Base prices for the connector begins at \$7,995, which includes eight CDDI ports. An SBus adapter is \$1,494.

Crescendo Communications Inc., 710 Lakeway Drive, Sunnyvale, CA 94086.

Circle 188

Module Links Thin Wire, Concentrator

Chipcom has unveiled an Ethernet BNC module that enables customers to connect their thin-wire Ethernet LANs to the company's ONline system concentrator family of wiring hubs.

The module features six BNC connectors. Each of these ports supports Ethernet segments up to 185 meters in length, and from one to 30 users.

The module also supports the company's TriChannel Architecture (which can handle up to three Ethernets in a single chassis) and a fourth-channel isolation capability. The ports automatically partition in a heavy-collision environment and automatically reconnect once the environment stabilizes.

The ONline Ethernet BNC module, model number 5106M-BNC, lists for \$1,995.

Chipcom Corp., Southboro Office Park, 118 Turnpike Road, Southboro, MA 01772-1886.

Circle 189

C++ For Embedded Systems

Microtech Research, in association with Sun, has introduced C++ development tools for embedded SPARC processors. The Microtech Research Tools include an optimizing C++/ANSI C cross compiler, an assembler/linker, a C++ source-level debugger and a C++ symbol name inspection tool.

Currently the products support application development for target-embedded SPARCs from SPARCstation hosts. The company says an IBM PC host version of the product is forthcoming.

Pricing begins at \$6,600.

Microtec Research Inc., 2350 Mission College Blvd., Santa Clara, CA 95054.

Circle 190

Soltronics Stacker

The PROTEC product series of 8mm automated stackers has been announced by Soltronics. These products offer sequential and random-access capability and software-interface compatibility for stacker control of 4mm and 8mm tape drives.

The PROTEC 50 is designed for desktop use and the PROTEC 55 is a rackmount version. Both will allow for tape exchange, resident in the stacker's 10- to 16-tape magazine, in

less than 10 seconds.

The pricing on these products will be \$4,500.

Soltronics, 11558 Sorrento Valley Road, San Diego, CA 92121.

Circle 191

Mil-Spec Data Storage For Suns

Multi Access Data Devices has announced a series of data-storage and backup subsystems that exceed military specifications (Mil-STD 810D) for tolerance of shock and vibration. Called the MADDbox series, the products consist of a line of HP hard-disk drives enclosed within an armored casing equipped with special polymer isolations.

MADDboxes are available in several sizes, ranging from 200 MB to 1.6 GB. In addition to the mil-spec versions, there is also a "commercially ruggedized" line of MADDboxes. Pricing depends on installation.

Multi Access Data Devices, 1061 South Melrose Ave., Placentia, CA 92670.

Circle 192

Secure OS For Suns

A secure version of SunOS has been announced by Sun Federal. Called SunOS Compartmented Mode Workstation (CMW), the product is functionally identical to SunOS, except that it provides information on a need-to-know basis to users working with classified data. Moreover, it provides this security in a distributed environment.

SunOS CMW is designed for government, intelligence, military and commercial users working with sensitive information. It can be run on Sun's TEMPEST system for additional security.

Pricing begins at \$3,000 per right-to-use license.

Sun Microsystems Inc., 2550 Garcia Ave., Mountain View, CA 94043.

Circle 193



X-Terminals from Samsung

A line of RISC-processor-based X-terminals has been introduced by Samsung. The color model SGS-17C and the monochrome model SGS-19M are based on the AM29000 processor from Advanced Micro Devices and use XoftWare A290 X-terminal software from AGE. The SGS-17C offers 47,000 Xstones and the SGS-19M offers 70,000 Xstones.

The SGS-17C has a 17-inch color display with 1024-by-768-pixel resolution with 256 simultaneous colors out of a palette of 16.7 million possible colors. The SGS-19M has a 19-inch display with a 1,280-by-1,024 resolution.

Pricing on the SGS-17C is \$3,995; the SGS-19M, \$2,999.

Samsung Information Systems America Inc., 3655 North First St., San Jose, CA 95134-1708.
Circle 194

Mac-to-UNIX Links

A suite of products that help connect Macintosh systems with UNIX and X has been announced by Alisa Systems. The three offerings are an X Window System display for the Mac, a file-sharing and transfer facility, and a terminal emulator.

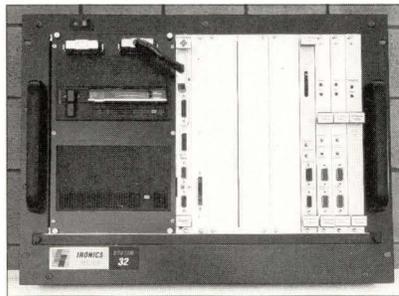
The X Window System display is Echo X, which functions as a display server that interacts with X-based applications running on a variety of host computers, including the SPARCstation and SPARClikes. An X11.4 implementation, Echo X uses the native Mac desktop and toolbox for managing windows created by remote X applications. It is priced at \$295.

The file-transfer product is an

upgrade of the company's existing AlisTalk product. AlisTalk for UNIX runs on a Sun (or other UNIX) platform and provides file sharing and high-speed file transfer between it and the Macintosh. AlisTalk also allows for Mac-to-UNIX email. Pricing begins at \$4,595 for unlimited users on a SPARCstation or \$5,595 for SPARCservers.

The terminal emulators are the Echo 330 and the Echo 340. These allow a Macintosh to emulate VT 330/340, VT240/241, VT220, VT125, VT100 and VT52 character terminals and the Tektronix 4010/4014 graphics terminals. The 340 also supports VT340 displays on Macintoshes with color monitors. The 330 is \$199 and the 340 is \$299.

Alisa Systems Inc., 221 East Walnut St., Ste. 175, Pasadena, CA.
Circle 195



Real Time and Rugged

A ruggedized SPARCengine platform for real-time applications has been introduced by Ironics. The Galaxy 32 Series machines are combined development and target platforms. The Galaxy 32+ consists of a Sun SPARCengine housed in a 20-slot (19 user available) VME system enclosure. The enclosure, which is the company's Icebox product, is a ruggedized 16-gauge steel structure. Into the Icebox, integrators can fit their own VME cards, or Ironics real-time modules. Ironics also offers real-time software for the system, including third-party real-time executives.

The 32+ also includes a 16-inch monitor, a 760-MB hard disk, a 150-MB cartridge tape drive, a keyboard and a mouse. There is also a lower-end version, the Galaxy 32, based on the

lower-performance SPARCengine 1E VME board. Pricing starts at \$19,995.

Ironics Inc., 798 Cascadilla St., Ithaca, NY 14850.

Circle 196

Synergy II Debuts

An Intel 80486-based SBus card that provides DOS functions to SPARCstations has been introduced by Puzzle Systems. The product, the Synergy II 80486-33, uses a 33-MHz 486 to provide what amounts to a PC on an SBus card, to give SPARCstation users access to DOS 3.3. DR DOS 5.0 comes bundled with the system. The card also has a built-in math coprocessor.

Synergy II is actually a product line ranging from an 80386SX-based system to the 486. The boards can be upgraded to higher-capacity Intel processors by the exchange of a CPU module.

Prices range from \$1,495 for the SX to \$4,295 for the 486.

Puzzle Systems Corp., 16360 Monterey Road, Ste. 250, Morgan Hill, CA 95037.

Circle 197

Parallel Ports

Emulex's P2501 single-port print server offers a flexible way to share high-speed parallel devices. This design enables workstations with no parallel port access to utilize printers and plotters.

The print server is available with either a standard Centronics or Dataproducts parallel port, and is compatible with both TCP/IP and LAT protocols. The P2501's single-processor architecture has 1 MB of RAM.

List price is \$1,195.

Emulex Corp., 3545 Harbor Blvd., Costa Mesa, CA 92626.

Circle 198

OOD CASE Tool

Cadre Technologies introduced a version of its Teamwork CASE tool optimized for object-oriented designs. Called Teamwork/OOD, the product is aimed at developers working in Ada, C and C++. It offers a graphics editor,

a C++ code frame generator, a C++ code capture utility and an operational interface to the Saber-C++ programming environment.

Teamwork CASE products run on workstations and servers running under SunOS, Ultrix, AIX, HP-UX, other forms of UNIX, VMS, Apollo HP Domain and OS/2.

Teamwork/OOD is currently available on the Sun 4 at \$2,775. **Cadre Technologies Inc.**, 222 Richmond St., Providence, RI 02903. **Circle 199**

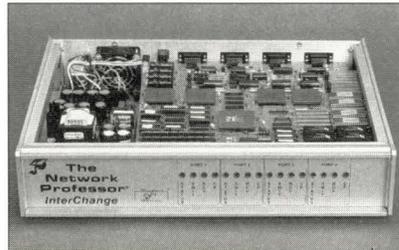
FDDI Family From SynOptics

A complete suite of FDDI products is available across a variety of cable types from SynOptics.

System 2000 workgroup hubs deliver FDDI-workgroup connectivity over fiber-optic cable or shielded twisted-pair wire, and can accommodate up to 14 single-attached stations. System 3000 hubs allow users to access FDDI/Ethernet/token-ring LANs, with or without a redundant power supply.

When configured with SynOptics' LattisNet Network Management for UNIX, the 3000 can support 40 FDDI single-attached workstations. **SynOptics Communications Inc.**, 4401 Great America Parkway, P.O. Box 58158, Santa Clara, CA 95052-8185.

Circle 200



i960-based LAN Bridge

A RISC-based local LAN bridge has been announced by Technically Elite Concepts. Available in two-, three- and four-port versions, the Network Professor InterChange product links multiple Ethernet LANs simultaneously in one hub. The product is based on the Intel i960 embedded

processor.

InterChange interfaces to networks via Intel 82593 coprocessors running at 33 MHz. Each LAN Bridge uses one coprocessor per port. InterChange can process, filter and forward messages, with forwarding delays at less than 22 msec. The two-port version is \$8,600; the three-port version, \$11,600; the four-port version, \$14,700.

Technically Elite Concepts Inc., 2615 Pacific Coast Highway, Ste. 332, Hermosa Beach, CA 90254. **Circle 201**

Two New CD-ROM Drives

Toshiba America has introduced two new CD-ROM products: the TXM-3301P portable CD-ROM disk drive and the TXM-3301A4 multiple CD-ROM drive. The TXM-3301P portable unit weighs 3.8 pounds and measures 2 by 8.7 by 9.5 inches. It comes with an optional battery pack that provides up to four hours of drive operation. Pricing begins at \$999.

The multiple-drive product, the

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For more information contact: Carol Flanagan at (617) 738-3402.

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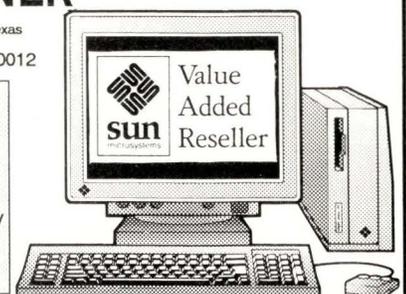
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Circle No. 18 on Inquiry Card

TXM-3301A4 enclosure, houses two to four drives. Two enclosures can be daisy-chained for up to eight CD drives. The product measures 12 by 7.5 by 12.5 inches. Pricing begins at \$3,170 for a four-drive unit.

Toshiba America Information Systems Inc., Disk Product Division, 9740 Irvine Blvd., Irvine, CA 92718. **Circle 202**

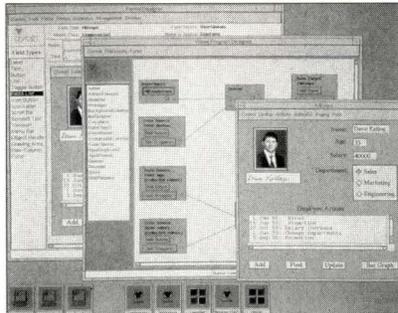
Disk Accelerator

A disk accelerator that can speed hard-disk access up to 50% has been introduced by ECCS. The Turbo Accelerator is a SCSI add-in card that attaches to a target controller inside a disk drive to upgrade its performance. The company says that a hard drive with an average seek time of 16 msec will access data in as little as 8 msec with the product.

The company says that the code is transparent to the hard drive and the operating system software. Thus it will work with any SCSI system, including those running UNIX, DOS or VMS. Pricing begins at \$995. In addition,

the product will be available with the company's own drives under the name of Space Module Turbo.

ECCS Inc., One Sheila Drive, Building 6A, Tinton Falls, NJ 07724. **Circle 203**



GeODE Codeless Coding

Servio has introduced a suite of development tools for graphically developing applications based on the company's object-oriented database. Servio says that the product allows programmers to develop applications without writing code. Instead, they construct database applications from forms and images.

GeODE is composed of our parts: a forms designer, a visual program designer that allows developers to describe and change program flow, an applications designer that allows components of an application to be assembled into a single application, and system programmer tools for developing outside the graphical environment.

Currently available on the SPARCstation, GeODE has a price of \$5,000 for a four-user license.

Servio Corp., 1420 Harbor Bay Parkway, Alameda, CA 94501. **Circle 204**

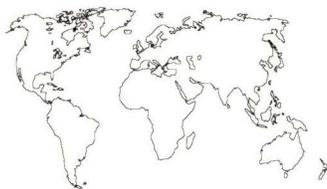
Network Analyzer

A software product designed to help system administrators keep networks up and running has been announced by Qualix Group. Called netScope, the product provides a view of network traffic and helps pinpoint problems. The product is currently available for SPARCstations running Open Look, but does not require any special hardware.

NetScope provides tools to monitor

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SUNEXPERT
Magazine

network loads, to perform packet analysis and to check connectivity between hosts on the network. It can also monitor and decode packets of assorted types, such as IP, UDP, ARP, ICMP, DECnet and AppleTalk.

Pricing begins at \$2,995.

Qualix Group Inc., 1900 S. Norfolk St., Ste. 224, San Mateo, CA 94403.
Circle 205

DB Connectivity for Smalltalk

Ensemble Software Systems has introduced a connectivity package that provides an objected-oriented interface to relational databases for applications written in ParcPlace Systems' Objectworks Smalltalk. Called InfoWare Version 1.0, the product provides an alternate SQL for Smalltalk users.

InfoWare converts data between object and relational forms, and translates queries and updates expressed in Smalltalk into statements in the host server's SQL dialect. The product comes in two parts: base-level software and a database connector that provides

the actual interface to a target RDBMS.

Pricing on the base product is \$1,250, while the connectors are \$500 each. Currently, there is a database connector for Oracle on Sun 4 systems, with a Sybase connector planned for next year.

Ensemble Software Systems Inc., 555 Bryant St., Ste. 347, Palo Alto, CA 94301.
Circle 206

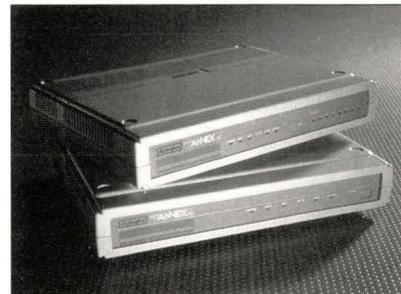
SPARCStation Accelerator

TurboSwap, an accelerator card for Sun SPARCstations and SPARClikes, has been introduced by Ceram. The card expands the system's fast access memory and interfaces directly to the 25-MHz SBus. Performance is boosted approximately 10,000 times.

This card requires one SBus slot, and up to four TurboSwaps can be installed in a single system, providing up to 320 MB of fast swap space. It is user installable, and a supplied installation script automatically configures the system for optimum performance.

Two configurations are available. The TS4000 40MB TurboSwap is priced at \$1,745. The TS8000 80MB TurboSwap is priced at \$3,395.

Ceram Inc., 2260 Executive Circle, Colorado Springs, CO 80906.
Circle 207



More Annexes

Xylogics has expanded its Annex family of UNIX communication servers with the Micro Annex ELS and the Micro Annex XL. Both are designed for small workgroups and remote sites are available with eight or 16 ports. By connecting terminals, modems, printers and other serial devices to an Ethernet, network users

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can share limited resources such as laser printers and plotters.

Both models include features such as network management via SNMP, full modem controls and port password security. The XL provides additional features including SLIP and CSLIP for supporting remote X-terminals, PCs and Annexes, TCP/IP to LAT gateway, and remote diagnostic capability. Both models are 2.5 by 9 by 13 inches, weigh less than five pounds and fit easily on a desktop.

The Micro Annex ELS lists at \$1,895 for the 8-port server; \$2,495 for the 16-port. The Micro Annex XL lists at \$2,295 for the 8-port server; \$2,795 for the 16-port. **Xylogics Inc.**, 53 Third Ave., Burlington, MA 01803. **Circle 208**

FDDI Network Management Software

The FX8520 programmable filter, a product of Fibronics International, is a FDDI network troubleshooter and controller.

The product allows managers to organize an FDDI ring into subnets of varying grades of security. The product is equipped with a "storm stopper," an algorithm for detecting and filtering messages of pending broadcast storms. The FX8520 is enabled in the FX8210 FDDI bridges through Fibronics' network management system.

FX8520 is priced at \$4,000 for one to six nodes, and \$10,000 for seven or more nodes.

Fibronics International Inc., One Lowell Research Center, 847 Rogers St., Lowell, MA 01852. **Circle 209**

Ricoh ROM Library

Ricoh has announced HyperSpace Shuttle, a 3.25-GB compact desktop library solution based on their HyperSpace rewritable optical disk drive. Utilizing removable optical media, storage capacity is expandable in increments of either 650 MB (per cartridge) or 3.25 GB (per five-cartridge magazine). The library is available for NetWare 386, Sun, DOS 5.0

and Windows 3.0 workgroup environments. It is designed to function as near-line storage for networked workgroup environments, operating in conjunction with primary storage devices.

The DOS and Windows version connects directly to a PC server. The Sun version will support both NFS and standalone environments. The Netware connects directly to the server and includes file server, file management and utility software.

List prices are: NetWare 386, \$8,990; DOS 5.0 and Windows, \$7,990; Platform-independent OEM version, \$7,490.

Ricoh Corp., File Products Division, 5150 El Camino Real, Ste. C-20, Los Altos, CA 94022. **Circle 210**

Entry Level HUBs

A family of Ethernet 10BASE-T repeaters has been introduced by St. Clair Systems. These fully compliant repeaters will connect small groups of up to 12 users over unshielded twisted-pair wire.

Sun Storage Devices

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Classified Section:

Ads sold per column inch (2 1/4" x 1")

For more information contact: Carol Flanagan at (617) 738-3402.

The Model SN1400 is a non-manageable low-cost repeater with 12 UTP ports, one AUI connection and one BNC connection. Model SN1500 is a SNMP manageable repeater with 12 UTP ports and one AUI connection. The SNMP function supporting MIB II is optional and it provides centralized monitoring of network activities on a per-port basis, in band and out of band.

Both models offer CLAIRview diagnostic LEDs to find problems with the system. They can be rackmounted or standalone and are Netware- and UNIX-compatible.

Pricing on the SN1400 begins at \$595; the SN1500 begins at \$1,295. **St. Clair Systems Corp.**, Network Products Group, 2680 Marshfield Drive, Pittsburgh, PA 15241. **Circle 211**

Connecting Sun and IBM Over Token Ring

Two products that connect Sun SPARCstations together and to IBM's Systems Network Architecture (SNA) over an IBM token-ring network are available from Brixton Systems.

The two products, BrxTR/IP and BrxTR/SNA are being marketed as bundled products, including software and a token-ring card. BrxTR/SNA provides transparent support for all SNA services via a logical-link control, as well as local network-management capabilities. BrxTR/IP interconnects remotely located SPARCstations utilizing TCP/IP networks over token ring, NFS, file transfer, mail and remote login all operate seamlessly, according to the company.

Both products plus a token-ring card sell for \$995.

Brixton Systems Inc., 185 Alewife Brook Parkway, Cambridge, MA. 02136
Circle 212

PC-X Window Software

Software that turns PCs into X-terminals has been introduced by Starnet Communications. MicroX runs under DOS 3.1 (or higher) on a Intel 80286, 386 or 486 PC. The PC can then function as a standard X-terminal if it

also has an Ethernet card, mouse and VGA or SVGA supporting 256 colors.

MicroX comes in a 286 and a 386 version. The 286 version gives the user either six color, or eight monochrome windows. The 386 version gives the user more than 10 color windows or more than 15 monochrome windows.

The 286 version is \$195; the 386 version is \$345.

StarNet Communications Corp., 3073 Lawrence Expressway, Santa Clara, CA 95051.
Circle 213

Software Takes Advantage

Visix Software has introduced Looking Glass Advantage, a development environment for its Looking Glass graphical user environment for Motif and OpenWindows. The product allows systems integrators, programmers or end users to develop graphical front-ends for UNIX shell commands, utilities and programs. Advantage-derived applications developed on one Looking Glass system can be used by other Looking Glass systems.

Advantage includes a command editor that allows users to create graphically macro commands, called dialogs, that contain such things as text and pop-up menus as objects. There is also a Restriction Editor that allows system administrators to generate customized versions of Looking Glass that restrict specified groups of users from accessing certain parts of the product.

Pricing begins at \$2,495. **Visix Software Inc.**, 11440 Commerce Park Drive, Reston, VA 22091.
Circle 214

Quickening High-Speed Routers

Cisco Systems' router/bridges can now interconnect multivendor LANs at DS-3, or T3, speeds. (DS-3 consists of bandwidth equal to 28 T1 lines multiplexed together, providing a full-duplex rate of 45 Mb/s or at the international alternative speed of 34 Mb/s, which is known as E3.)

To achieve this performance, the company has introduced a high-speed serial interface (HSSI) card, which operates in the Cisco high-end, nine-

slot AGS+ router/bridge. The card, known as the HSSI/DS-3/E3 board, provides a single-port, full-duplex synchronous serial interface, and a 52-Mb/s maximum data transfer rate. Like other company interface products, the board routes 16 communication protocols.

Price is \$8,000, which includes a back-panel applique board that creates on-the-fly HDLC datagrams.

Cisco Systems, 1525 O'Brien Drive, Menlo Park, CA 94025.
Circle 215

Fiberoptic Repeater Provides More Ports

Racal-Datacom's INTERNExT fiberoptic inter-repeater link module (INX-FOIRL) provides six fiberoptic ports for backbone and desktop connections.

The INX-FOIRL also offers users increased security, better noise immunity and greater cable lengths compared to twisted-pair. The product provides Ethernet over fiber, allowing users to forgo FDDI, which can cost up to four times as much per port. (The company promises future FDDI products.) The INTERNExT 5000, an intelligent wiring hub, integrates Ethernet, 10Base-T and LAT/TCP terminal servers in a fault-tolerant configuration with SNMP network-management support.

INX-FOIRL lists for \$2,500; INTERNExT units begin at \$2,550 for a three-slot chassis, and \$4,250 for a 12-slot chassis.

Racal-Datacom, LAN Internetworking Division, 155 Swanson Road, Boxboro, MA 01720.
Circle 216

Correction

The starting price of InterCon Systems Corp.'s Planet X software package featured in the October issue of *SunExpert* is \$295.

FYI

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 at the end of the magazine.

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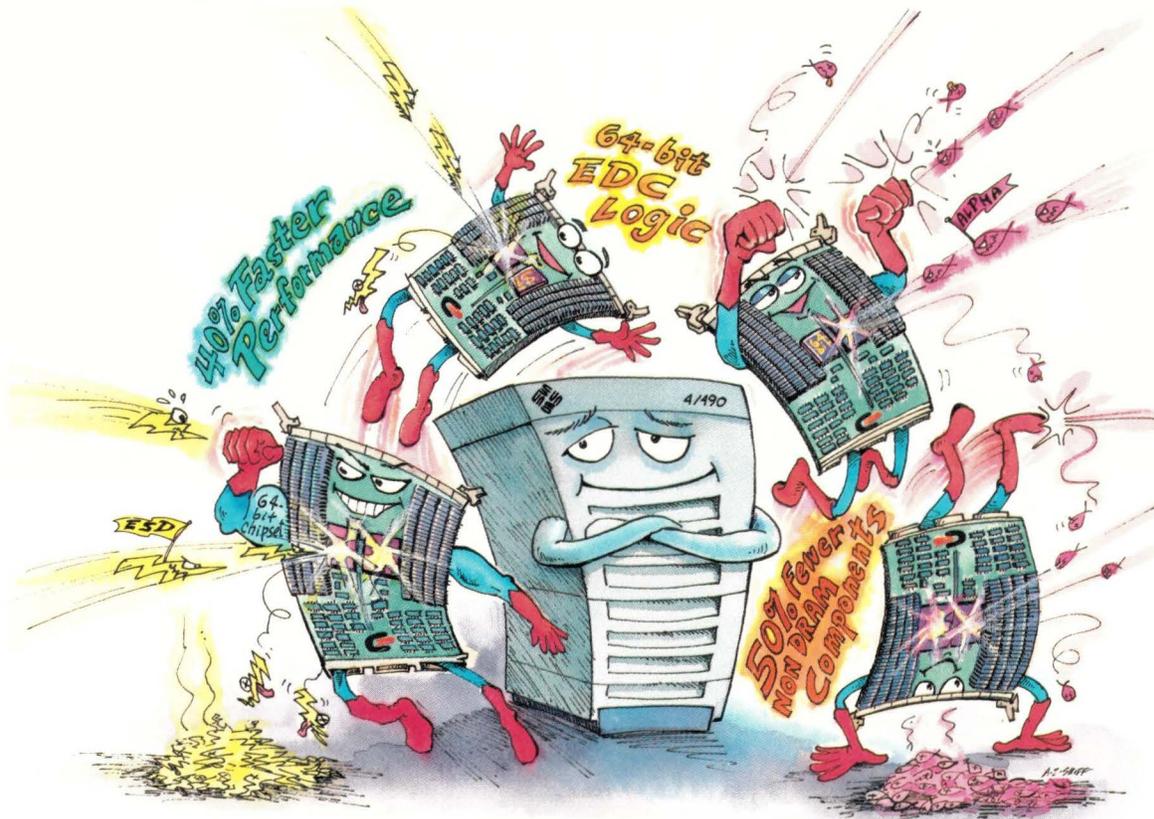
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