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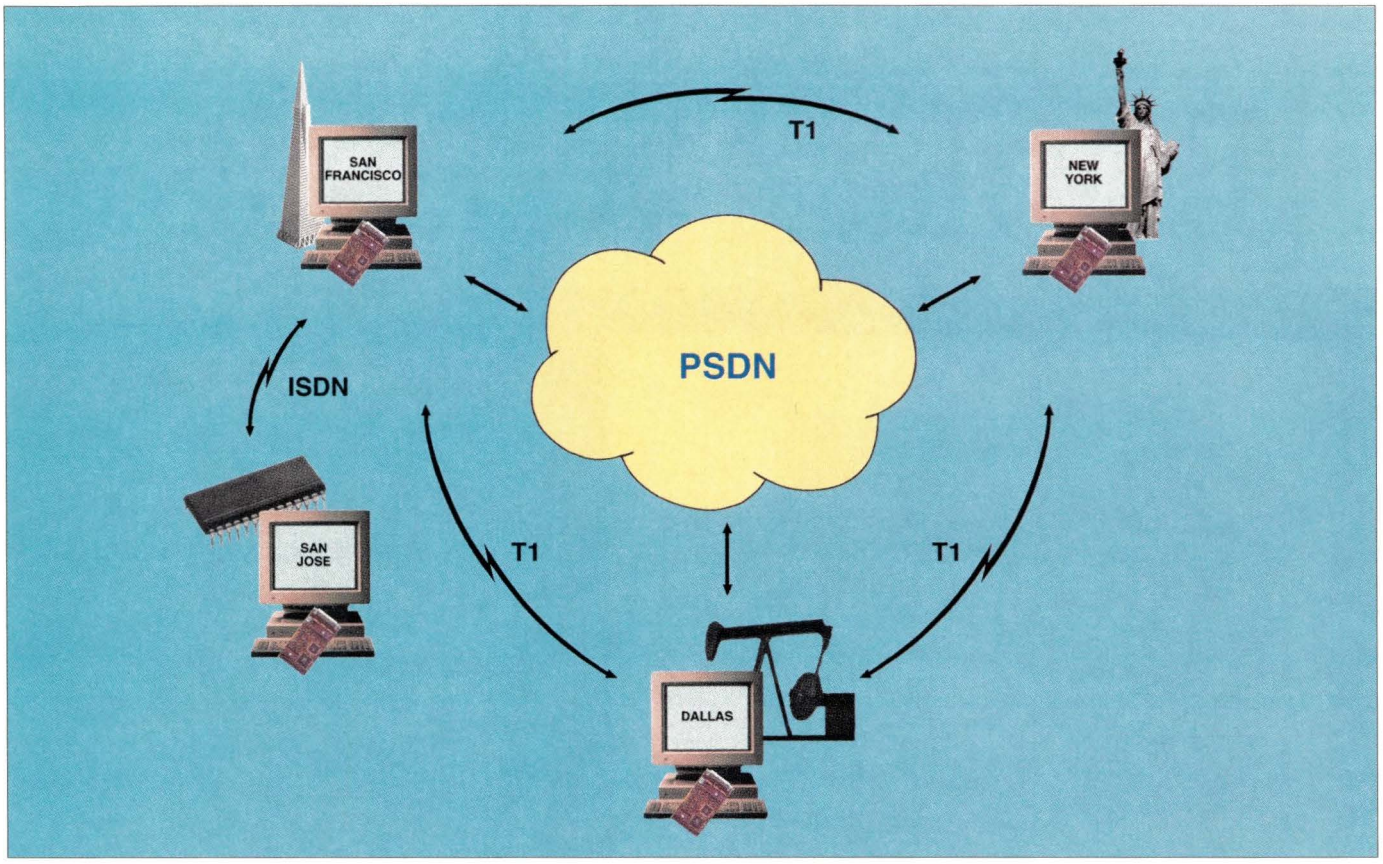

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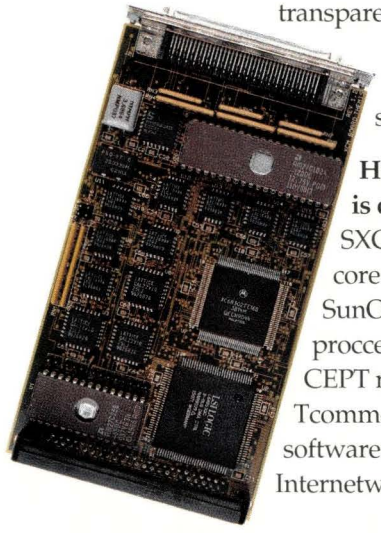

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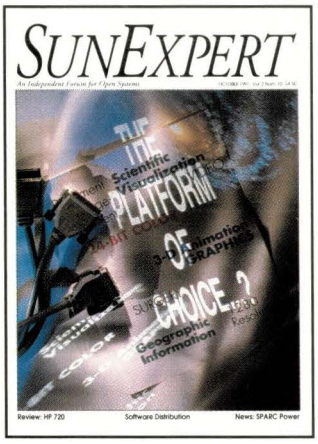

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by Logan Seale

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

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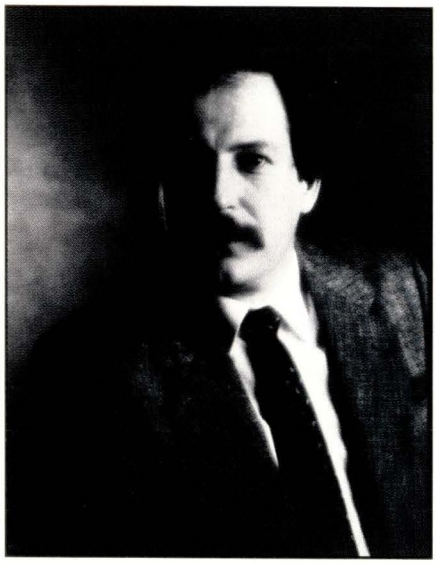

Editorial

It's Your Turn

This issue marks an anniversary for us–that's two years and counting. I want to take this opportunity to thank you for reading *SunExpert* and to call your attention to the Reader Feedback form on Page 39. The information you provide can help us set our future editorial agenda to track more closely with your needs. Please take a couple of minutes to circle some digits. If you feel your reaction can't be reduced to a number, send us email or hardcopy.

Our cover story this month deals with one of those on again-off again markets for Sun Microsystems Inc.: high-performance graphics. Even with the addition of GX performance, standard Sun platforms need assists from the enhancers in the add-in, add-on market. "The High-Tech Hydra," by Michael Jay Tucker explains how some innovators are adding new wrinkles.

Also in this issue, Mary Jo Foley goes looking for UNIX applications (see "Need UNIX Apps?"). She discovers a nascent software distribution market that may evolve to look like the PC/Mac channel. But storefront convenience and mail-order pricing are a long way off.

On the technical side, Barry Shein evaluates the HP 720 and the new HP X-terminal. His advice may help if you're considering one of these boxes for your UNIX network mix. The price-performance is appealing, but be cautious on the software front, especially if you're a BSD devotee.

Doug Pryor

Doug Pryor

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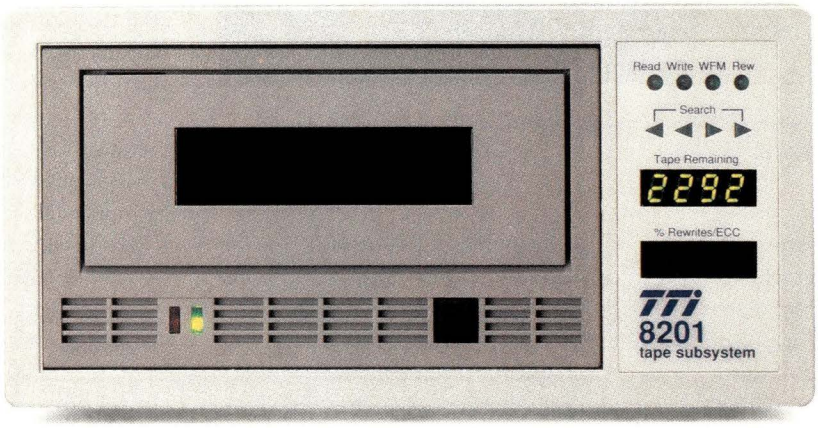

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NEWS

New SPARC Processors Pump Up The Power

Cypress Semiconductor Corp. has manufactured nearly all the SPARCs employed by Sun to date. Now it's got more competition.

On the heels of Sun Microsystems Inc.'s IPX/ELC announcements (*SunExpert,* September, Page 6), the SPARCalike vendors will be unveiling at Comdex Fall at the end of this month their next-generation SPARC-based desktop systems. Powering these soon-to-be-announced machines–as well as the new Sun systems–are next-generation integer and floating-point (IU and FPU) processors, and the various "completion" chips that together make up a full SPARC chipset. These include cache/memory-management units (MMUs), static and dynamic random-access memory (SRAMs and DRAMs), SCSI, graphics and other SBus-interface components.

A number of these processors already have made their public debuts. In conjunction with the IPX/ELC introduction, Weitek Corp., vendor of most of the existing SPARC FPUs, announced that it is manufacturing the integrated IU/FPU that is at the core of Sun's new desktops. The Weitek CPU, known as the W8701, is available in 33- and 40-MHz configurations. The chip is socket- and binary-compatible with existing SPARC IUs. And at press time, the Sunnyvale, CA, company was sampling another new part, the W8720 integrated graphics controller, which allows customers to implement GX-equivalent 8-bit color and 2D graphics directly on the motherboard.

LSI Logic Corp., Milpitas, CA, recently added two new graphics controllers to its repertoire. LSI's L64825 video frame buffer and its L64855 graphics controller each provide a single-chip interface between the SBus and board-level SBus video subsystem. The processors can be used as part of LSI's SparKIT chipsets, or by third-party SBus board developers. The L64825 is a standard component in Sun's own SPARCstation 1 and 1+ systems, and operates Sun monitors with resolutions of 1152 by 900 pixels. The L64855, also part of the SparKIT chipset, supports four monitor types, including Sun's SPARCstation 2 monitor.

LSI's main claim to fame remains the SparKIT. Consequently, there's been much speculation regarding when–and even if (since there's talk that LSI may end up reselling Sun's own chipset)–the company may introduce a 40-MHz SparKIT. In the meantime, a couple of other chip makers have come to the rescue of the SPARCalike vendors and customers that are longing for SPARCstation 2 compatibles.

Fujitsu Microelectronics Inc.'s San Jose, CA-based Advanced Products Division expects to be able to deliver this month (two months ahead of schedule) its long-awaited MB869XX chipset, in 33- and 40-MHz versions. Included in the chipset are an integrated IU/FPU, cache controller/MMU, memory and peripheral controller, DMA and video controller, MBus-to-SBus interface controller and, for VME-based workstations, the MBus-to-VME interface controller.

Cypress Semiconductor Corp.'s Ross Technology Inc. subsidiary is shipping 25-, 33- and 40-MHz multiprocessing and uniprocessing versions of its CY7CXXX to several customers, including Sun. Austin, TX-based Ross and San Jose, CA-headquartered Cypress have yet to announce if and when they will provide a *complete* chipset, including peripheral-management chips. In the meantime, the team–which have supplied nearly all of the processors used in Sun designs to date–are concentrating efforts on developing "module" products for uniprocessor and dual-processor machines, says Matt Gutierrez, senior applications engineer at Ross. The recently announced Sun multiprocessing servers will be among the first new systems incorporating Cypress multiprocessing products.

The new kid on the SPARC-processor block, Tera Microsystems Inc. of Santa Clara, CA, is leaving the high

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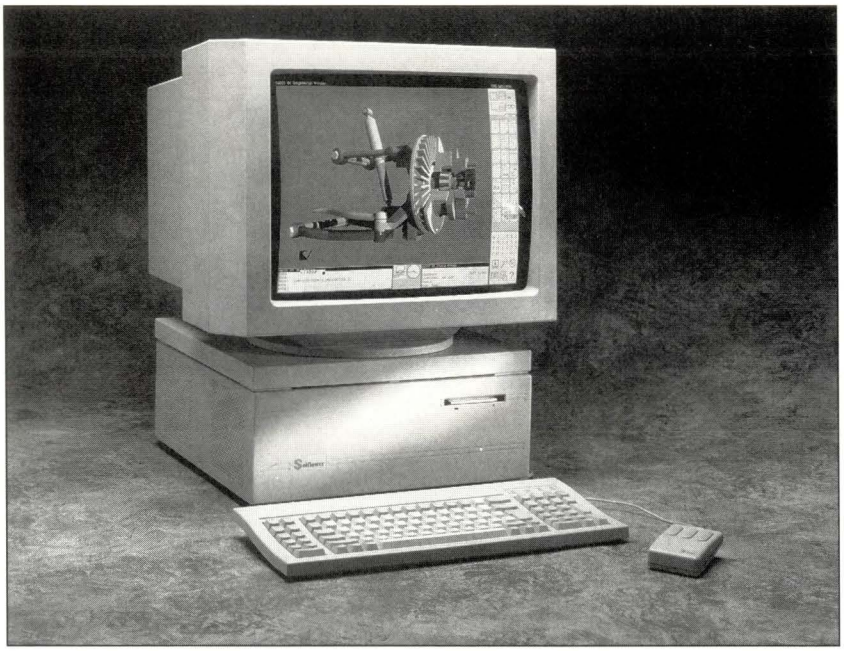

Solflower Computer Inc.'s SFVME 400 is the first SPARCstation 2 compatible.

ground to Fujitsu and Cypress/Ross, and instead is focusing on supplying the low-end of the SPARC market. Tera has introduced a four-part SPARC completion chipset. The product, called microCORE, integrates cache, MMU, DRAM control, I/O, color video-display control, standard bus extension and several peripheral functions. The chipset is available in 25- and 33-MHz frequencies, with a 40-MHz version in the works. All of the 25-MHz components should be available by year-end. An entry-level, 25-MHz system and I/O controller configuration sells for $400 (in quantities of 5,000); a four-chip 33-MHz chipset goes for $700.

"Silicon's always been priced high enough that SPARC boxes have started at $6,000 to $7,000 minimum," says Lisa Quinones, Tera product marketing manager. "Our technology will enable other types of machines–ones with lower component counts, smaller board areas," Quinones adds. Watch for more laptops, notebooks and systems with smaller footprints and lower power-consumption requirements, she says. Another low-end possibility: docking stations, i.e., CPUs that you can detach from your peripherals and carry home with you.–*mjf*

SPARCalikes Move Beyond Sun's Shadow

Whether it's a reaction to Sun Microsystems Inc.'s threats, or just a natural evolution of the market, one trend is certain: Sun clones gradually are giving way to Sun compatibles. Unlike the case for the first SPARCalikes, which began shipping just about a year ago, the newest machines' value-added is readily apparent.

Take, for instance, Solflower Computer Inc.'s new SPARCstation 2 compatible, the SFVME 400. The machine can accommodate both SBus and VME boards in the same chassis. San Jose, CA-based Solflower is offering the SFVME 400 either configured as a complete system, or as a desktop enclosure that OEMs and systems integrators can configure themselves. The complete system is powered by a 28.5-MIPS SPARC 2 CPU.

The Solflower product is the first of a wave of SPARCstation 2 compatibles expected to be unveiled over the coming months. The fully configured machine consists of a double-height pizza box with the same footprint as a standard SPARCstation. The product incorporates two SBus slots, an industry-standard VME backplane that can accommodate up to three 6U VMEbus boards, and room for two 3 1/2-inch SCSI disks, one 3 1/2-inch floppy and one full-height 5 1/4-inch disk, tape or optical drive.

Solflower has written a device driver that allows VME boards to operate "seamlessly" in the eyes of SBus customers.The driver handles the virtual-address translation, interrupt handling and all related routines. As a result, developers and users don't need to write new device drivers for existing VME boards and devices, according to the company.

OEM configurations of the SFVME 400 (without the SPARC 2 CPU and peripherals) list for $5,000. A fully loaded system, including the CPU, 208-MB disk drive and 19-inch color monitor, lists for $19,000.

Meanwhile, Tatung Science & Technology Inc. (TSTI), San Jose, CA, continues its new product onslaught. Its latest SPARCalike is called the micro COMPstation. TSTI is billing the product as "the industry's first color SPARC workstation priced at less than $5,000." The machine is expected to compete with the Sun ELC, high-end PCs and color X-terminals.

The micro COMPstation features a small (15-inch), high-resolution (up to 1280-by-1024) monitor. TSTI is offering all configurations (except diskless) of the machines with $1,500 worth of bundled software for free. Installed on the drives are Motif or Open Look, SunView and X.desktop.

Prices start at $4,290 for a diskless, 15-inch color monitor system running at 20 MHz and 12.5 MIPS. The micro COMPstation 20 adds a 207-MB hard-disk drive and 8 MB of RAM to this configuration, and sells for $4,990. The micro COMPstation 25, which clocks at 25 MHz, is packaged with a 207-MB hard disk drive, 8 MB of RAM and a 15-inch color monitor, and sells for $5,990. The basic micro COMPstation configuration can be expanded with up to 680 MB of hard-disk storage, a 3 1/2-inch floppy drive, and the capability to run DOS and UNIX programs simultaneously.–*mjf*

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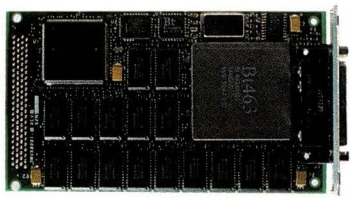

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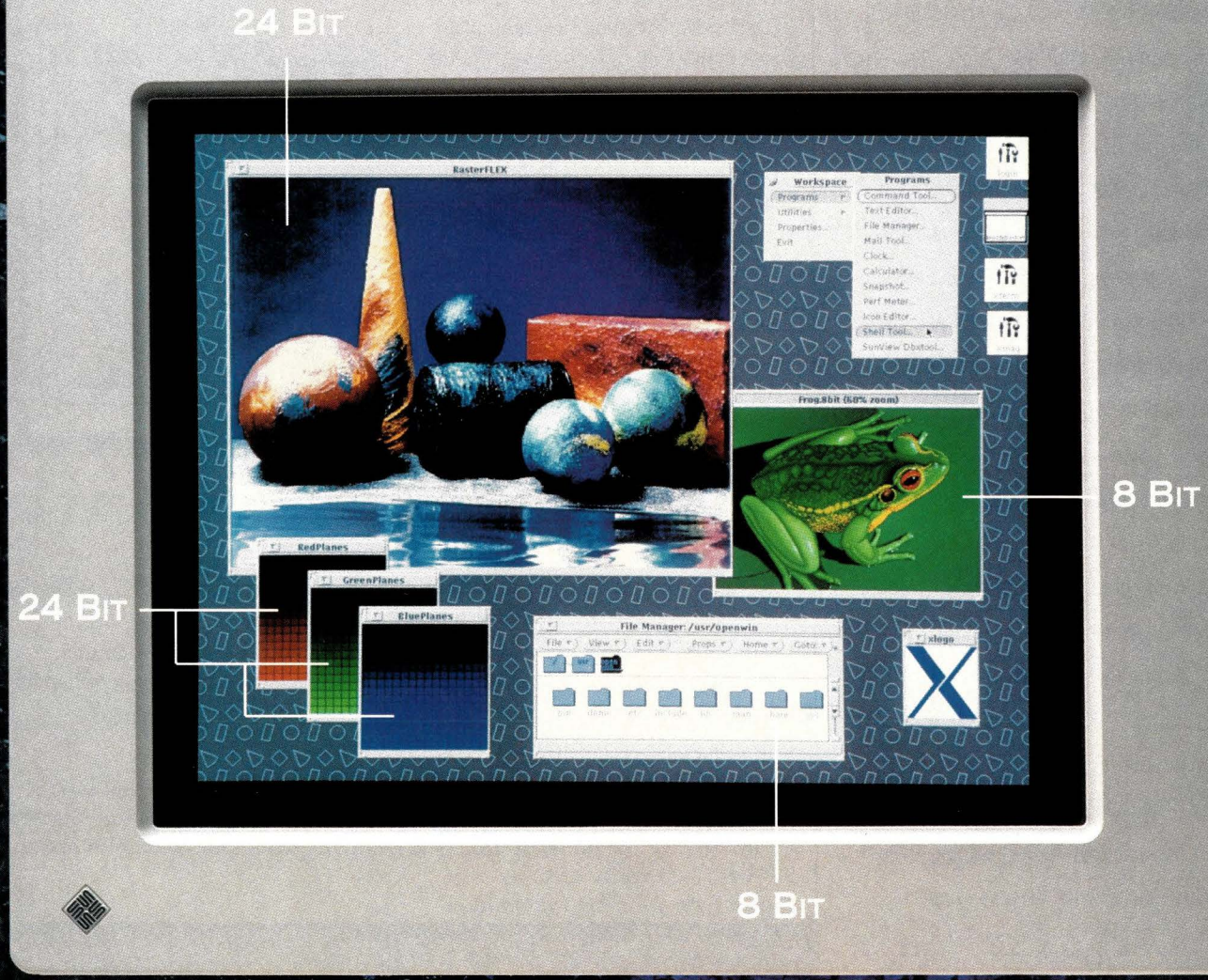

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International Spotlight

TriGem: The Dark SPARCalike Horse

With Tadpole Technology Inc. and RDI Computer Corp. stealing most of the SPARC-based laptop thunder these days, it's easy to overlook TriGem Computer Inc. But TriGem is a behind-the-scenes SPARC systems powerhouse.

TriGem is selling two SPARCalike models: the SLT-100 laptop and the SDT-200 desktop. In addition, TriGem Corp., the Santa Clara, CA, subsidiary of the Korean giant, acts as an OEM supplier for several other SPARCalike vendors, including RDI, CMS Enhancements Inc., Fusion Microsystems and Seiko Epson, a company that is a major stockholder in TriGem but has yet to announce its long-anticipated SPARC-compatible machine.

TriGem says it plans to put between 10,000 and 15,000 of its SLTs and SDTs in the distribution pipeline by December of this year. The company has signed deals with anDATAco Computer Peripherals, Azteq System Technologies Inc., CAL-ABCO Inc., Faraday Electronics and Winchester Technology for private labeling. And end users include AT&T Co., Eastman Kodak Co. and Stanford University's R&D labs, according to L.E. Martin, managing director of TriGem Corp. The scientific community's desire for a portable UNIX box is helping TriGem to carve out a niche, he says.–*hcp*

UI's On The Move

Sunsoft Inc. isn't the only game in town when it comes to unveiling software frameworks. UNIX International Inc. has been pretty busy, too, delivering on promised technologies and technology specs during the past few months.

Since late May, UI has announced the following:

- Its initial release of standard symmetric multiprocessing features that will be included as part of its SVR4 MP, which is due to begin shipping at the end of the year;
- The availability of an application-programming interface (API) spec that will enable software developers to write OSI-compliant SVR4 applications;
- The standards spec that enables hardware and software vendors to design products–including operating systems, windows systems and GUIs–that support the Japanese language;
- The Systems Management

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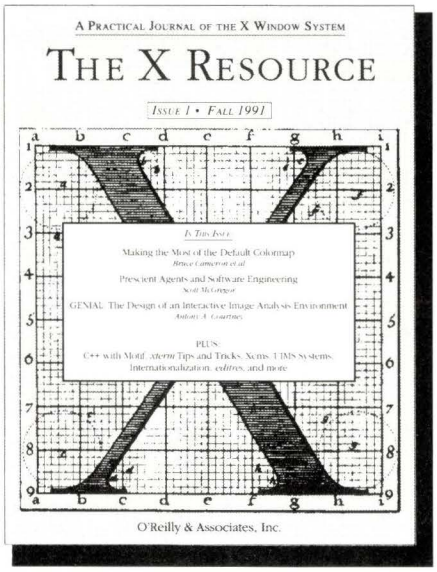

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Requirements spec that will be used to develop a complete distributed systems management framework around SVR4; and
• The preliminary spec for the UI corporate hub computing environment that will be constructed around SVR4.

In addition, UI announced that the new name for its complete open-systems framework (formerly known as OSA, or Open Systems Architecture) is UI-Atlas. Atlas encompasses three environments: distributed computing, desktop computing and corporate hub computing. As more than one Einstein has pointed out, Atlas strongly resembles the Open Software Foundation's Distributed Computing Environment (DCE) in both its structure and goals.–*mjf*

Multivendor Network Backup Is On The Way

Legato Systems Inc. is moving beyond its Sun Microsystems Inc. roots to embrace multivendor networks and platforms.

Networker, the Palo Alto, CA, company's network-wide backup and recovery product, is currently available for SPARC, Digital Equipment Corp. Ultrix, Hewlett-Packard Co. HP-UX, MIPS Computer Systems Inc. MIPS and IBM Corp. PC platforms. This month, Legato is adding the IBM RS/6000 to its list of supported systems. The company also is promising support for Intergraph Corp. and Silicon Graphics Inc. workstations and Apple Computer Inc. Macintoshes before year end.

What's next? "We're putting [Novell Inc.] NetWare 386 on the network-backup chart," says Cynthia Pilkington, director of marketing. This way, a PC can act as a Networker backup server, or ultimately, a Networker client. "Once we've developed this [NetWare 386] capability, we're just a step away from native NetWare and Portable NetWare support," Pilkington says.

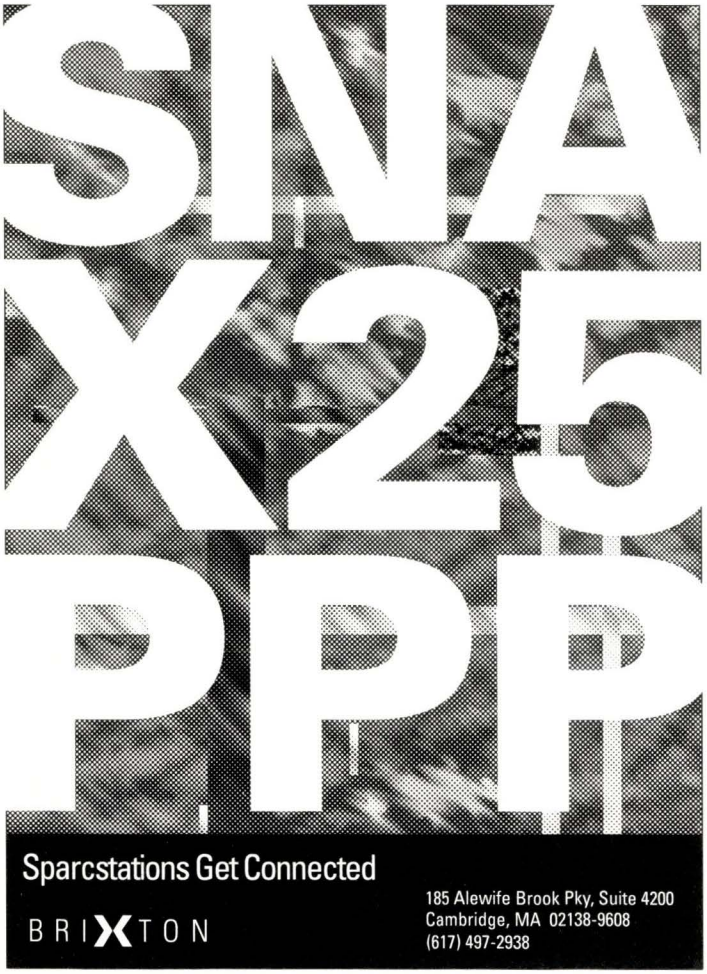
In the interim, Legato is concentrating on moving existing product. At press time, it had just begun shipping its Networker/Summus Computer Systems jukebox combination. The Magnus Jukebox Library holds up to 54 8mm tapes and two tape drives. With the device, users can leave backup and recovery unattended for several months at a time.

Legato also is shipping NetWorker Junior, a low-cost version of NetWorker for sites that have a single file server. Junior supports diskless and dataless clients. U.S. list price is $750.–*mjf*

SPARC International Defends Pricing

More than one SPARCalike vendor, SBus board vendor and ISV has complained about SPARC International's membership and compatibility testing fees. In an attempt to seemingly stave off these criticisms once and for all, the Menlo Park, CA, group's chair and CEO, Robert Duncan, has gone on the offensive.

In the June 1991 issue of "SPARCline," SPARC International's member newsletter, Duncan responds



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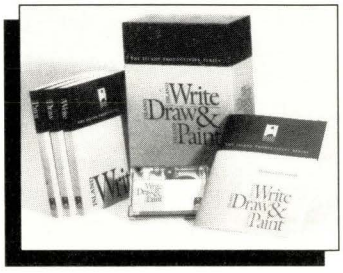
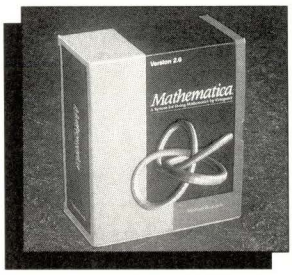
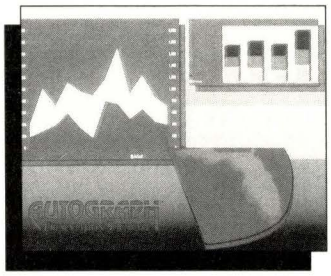
Island Graphics Productivity Series
Includes Island Write, IslandDraw, and IslandPaint. This is an affordable, streamlined set of publishing and graphics tools that let you create and illustrate memos, letters, specifications, and newsletters. Choose from SunView or new OpenLook version for Sun 3,4 and 386i-single user.





Mathematica 2.0 from Wolfram Research
A software system for doing numerical, symbolic, and graphical computation used both as an interactive calculation tool and a programming language. Numerical capabilities include arbitrary arithmetic and matrix manipulation. Users can create "Notebooks" that mix input, graphics, text and sound.

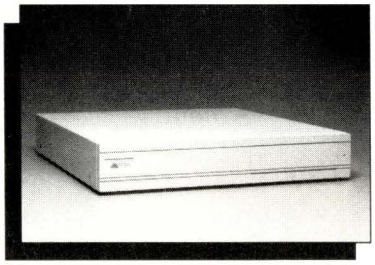


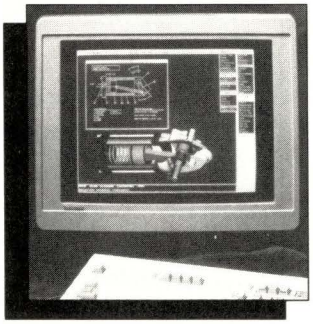
Autograph 3.2 from Ficor, Inc.
This graphics tool will give Sun users under OpenLook similiar capabilities to those using PowerPoint or Harvard Business Graphics on PC's. Included is Chart; a tool with over 25 chart styles, Illustrator; a free-style drawing and composition program and Slideshow; which is used to create slide presentations. Add voice-overs.

HARDWARE

Texas Instruments microLaser Printer
A true POSTSCRIPT laser printer available with either 35 fonts (PS35) or 17 fonts (PS17). Both print up to 6ppm at 300 dpi and come standard with 1.5 MB of memory. An excellent value. Includes cable. microLaser PS 35, **$1699**, microLaser PS17, **$1359**.

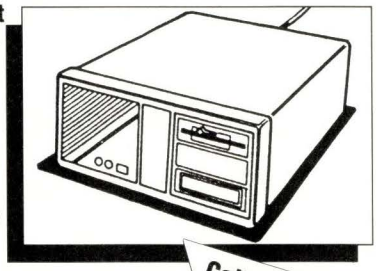
The SBox Expansion Chassis from Aurora
The SBox Expansion Chassis is a fully integrated enclosure that provides four additional Sbus slots (slaves), an internal power supply, cabling and provision for up to two 1/2 ht. SCSI devices. The SBox external dimensions match the "pizza box" form factor of the SPARCstation.





XP27 TekXpress XWindow Terminal by Tektronix
The XP27 is the new performance standard for color Xstations from the leading manufacturer of color Xstations--Tektronix. It offers Sun-compatible high-quality 1152 X 900 resolution in a 19" 256-color display. Comes standard w/5MB memory (expandable to 21 MB), dual processing architecture, X11 R.4 server, 8-bit planes and great international 3-year warranty. Other models available.

Omni-ware for Sun from Logicraft
Omni-ware for Sun is a complete hardware and software system for attaching a PC to a Sun network. It is the first complete solution that allows you to run all IBM PC software and peripheral hardware from your Sun keyboard. Access hundreds of CD-ROM libraries currently available only on PC's.



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SPARC International: A Q2 Update

During the first half of 1991, shipments of Sun Microsystems Inc. clones/compatibles totaled more than 10% of Sun's own unit shipments, according to SPARC International. SI estimates the total installed base of Sun and non-Sun SPARC systems to be 340,000. Total cumulative shipments of SPARC processors grew from 350,000 in Q1 to 465,000 through Q2, SI says.

to the question "Why does SI spend so much?" Duncan maintains that the yearly dues of $25,000 (for a systems vendor), compliance-testing fee of $50,000 per machine, $1.50 per usage for the "SPARC Compliant" moniker plus $1-per-unit use fee for the term "SPARC," and one-time usage fee for SPARC in the product's name of $10,000 are not exorbitant.

Duncan says that SPARC International has committed more than $5 million to develop specifications, create test suites and actually test products. He adds that SPARC International plans to spend more than $400,000 for registration and protection of SPARC trademarks this year alone. In total, he claims, SPARC International has spent nearly $1 million to acquire, develop and promote the SPARC name.–*mjf*

How Open Is Open?

Who's the openest open-systems vendor of them all? That's the question that Forrester Research Inc. recently posed to its Fortune 1000 survey base. On a scale from 1 (closed vendor) to 5 (open vendor), none of the suppliers upon which Forrester collected data scored more than 3.4.

Sun Microsystems Inc. fared better than its workstation competitors in the ranking. Sun scored 3.3, compared to Hewlett-Packard Co.. with 3.2, Digital Equipment Corp.with 2.9 and IBM Corp. with 2.5. The highest ranked vendors in Forresters survey: Sybase Inc., Microsoft Corp. and "PC clones."–*mjf*

Open Windows Versions Creep Onto The Scene

The big software guns are finally bringing out versions of their products that are truly made to work on Sun Microsystems Inc. and other SPARC-based platforms.

Lotus Development Corp. is continuing to enhance 1-2-3 for Sun SPARC Systems so that the product works like a spreadsheet should on a UNIX workstation. Version 1.1, which was announced in June, supported the X Window System, integrated Lotus' C Add-in Toolkit and supported Lotus Real-time, a feature that feeds real-time financial data directly into 1-2-3. Lotus will be adding other Open Look-compatible features to 1.1 at the end of this month.

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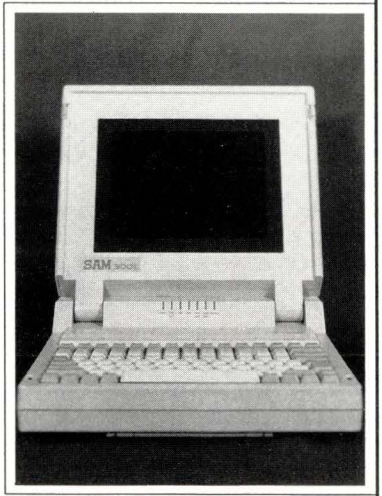

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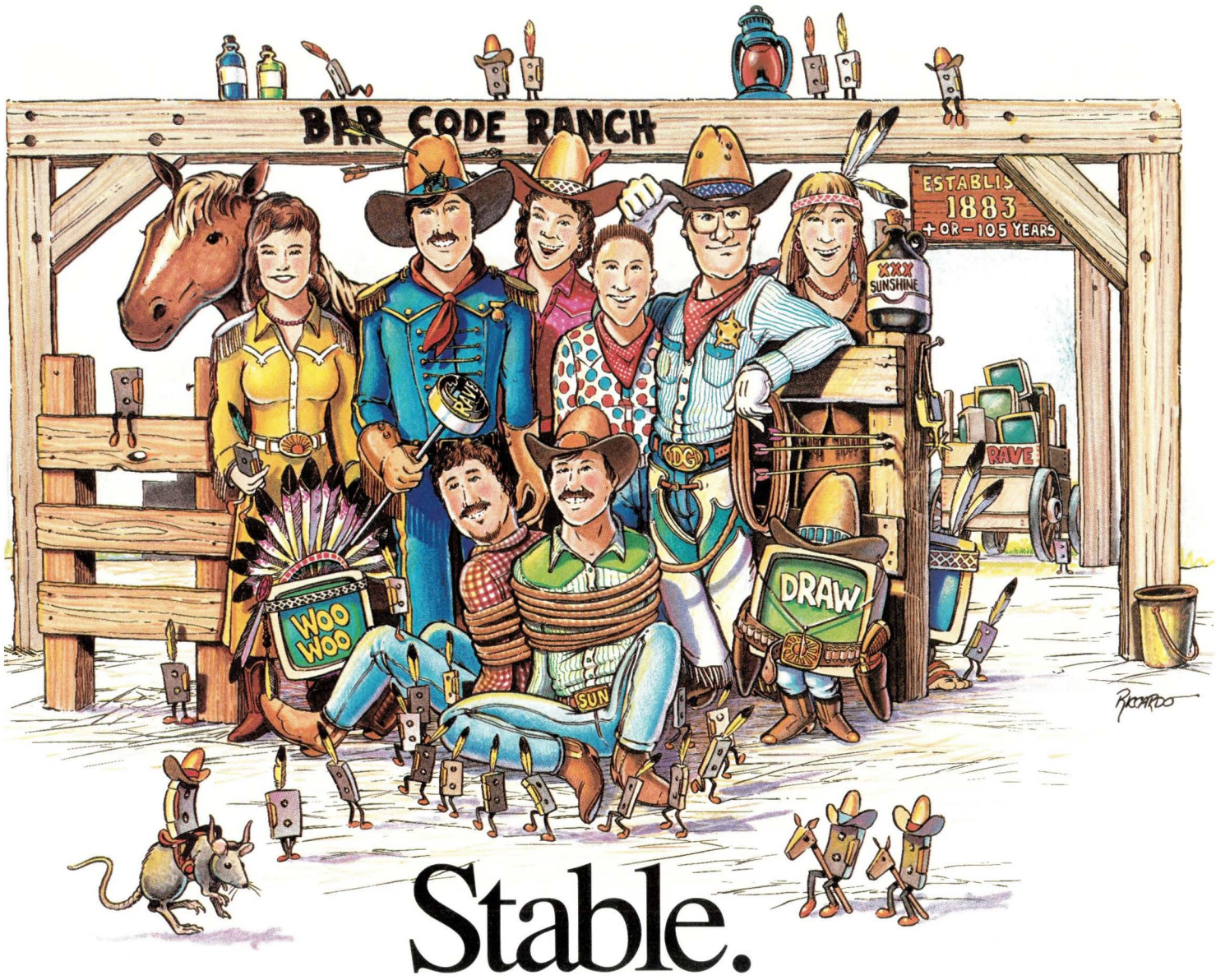

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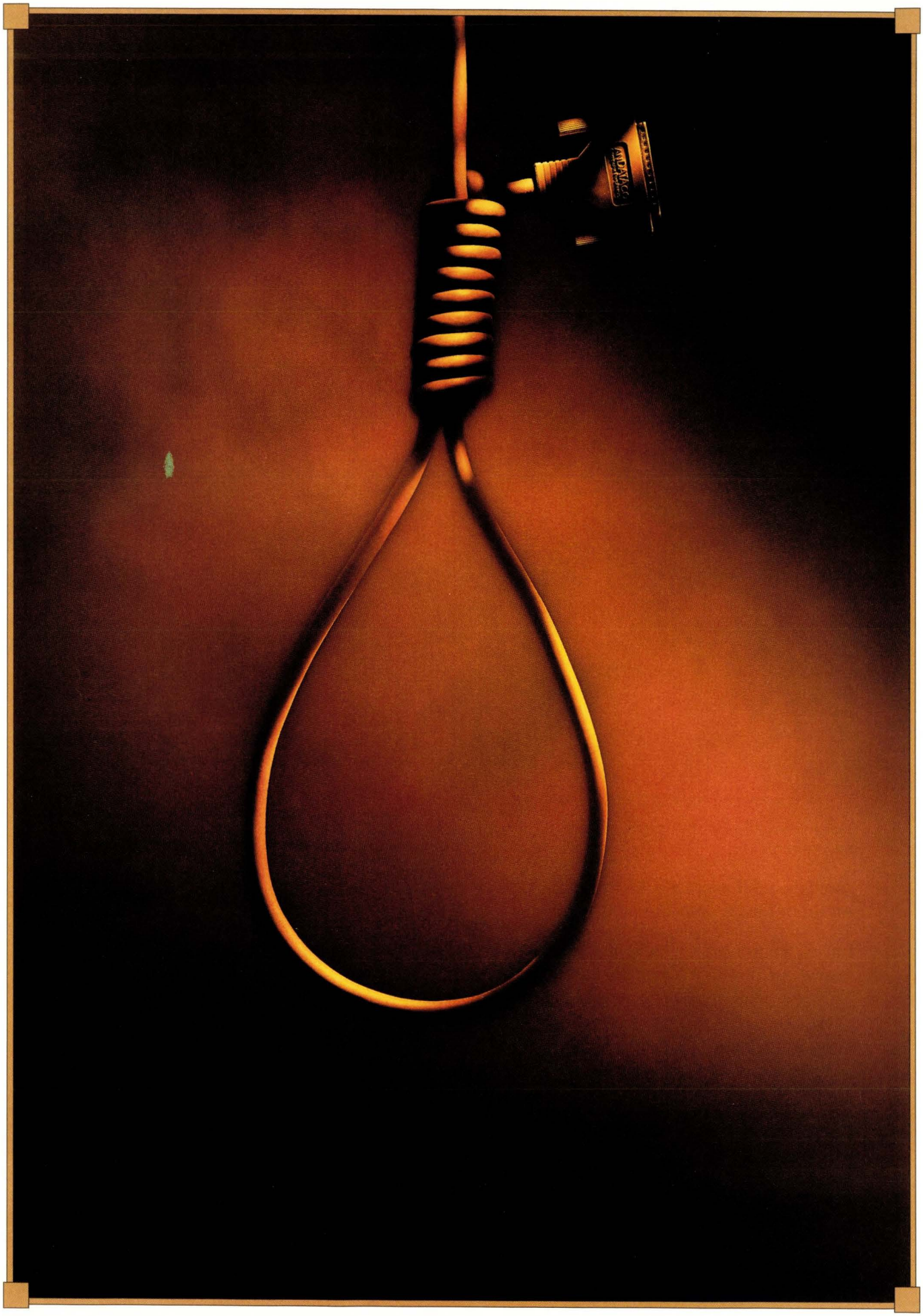

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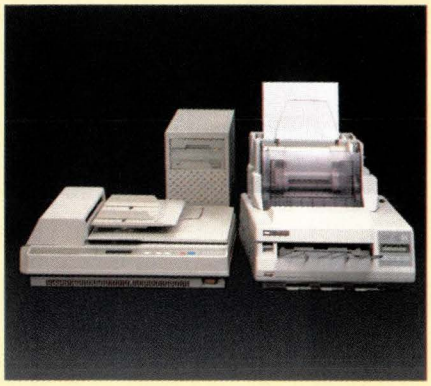

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A fully Open Look-compatible version of 1-2-3 is expected during the fourth quarter. And now that 1-2-3 for Sun SPARC Systems has passed the SACT (Software Applications Compliance Test) 1.0, the program should be able to run with no problems on all SCD (SPARC Compliance Definition) 1.0 machines.

Ashton-Tate Corp., now owned by Borland International Inc., announced in August a new release of dBASE IV for Sun that supported OpenWindows. The original dBASE IV for Sun, announced in January, supported SunView. (At the same time, Ashton-Tate announced its first OEM agreement for dBASE IV for Sun with GNP Computers, Pasadena, CA. GNP will bundle the product with SPARCstations and its own multiport serial product that connects PCs to SPARCstations.)

Earlier this summer, Oracle Corp. announced versions of its SQL*Forms and SQL*Menu tools that supported Open Look, the OpenWindows GUI. Oracle promised at that time that future versions of other bit-mapped Oracle products would also support Open Look. Oracle is relying on its window toolkit technology to maintain application portability across multiple user interfaces. The company is working to include hypermedia and video support within future versions of the toolkit, according to company officials.–*mjf*

Other Open Systems News

Data General Corp.

Edson deCastro, founder and former CEO/president of DG, resurfaced and spoke at a meeting in July before 100 members of the Venture Association of New Jersey. He emerged championing RISC, UNIX and Motif. DeCastro, who now spends his time on outside consulting, teaching and public speaking, had little to say about DG. He did, however, predict that IBM Corp.'s aggressive move into RISC with the RS/6000 will force the replacement of 370 and 390 systems before the decade ends. He also expressed some concern regarding whether IBM understands fully the technical and marketing implications of its recent deal with Apple Computer Inc. As an example, deCastro cited Apple's advances in object-oriented programming, which will give users more flexibility and autonomy–individual advantages that IBM has never promoted.–*hcp*

Digital Equipment Corp.

In what it calls further proof of its commitment to open systems, DEC has announced it will license its graphic-application-development software, known as MapKernal. MapKernal streamlines the creation and editing of 2D graphics, including maps, CAD drawings and architectural designs. The technology includes object-oriented-programming capabilities, which were developed by DEC's Paris Research Laboratory. MapKernal is available for DEC RISC Ultrix systems.

DEC has begun shipping two new applications for Apple Computer Inc. Macintosh users under its All-In-1 Phase II program. The new modules, DECquery for Mac (a database query tool) and All-In-1 Mail for Mac, are both built on top of DEC's Network Application Support (NAS) architecture. Both applications are compatible with Mac System 7 and work with DEC's Pathworks for Mac networking software.

ACC Systems, the Columbia, MD, vendor of single-board devices and multiprocessor network-access products, has developed a token-ring controller for DEC workstations. The ACP 3300 allows Ultrix systems to connect directly to a token ring without the need for an intermediate server. The product utilizes the routing capabilities of the Ultrix kernel, allowing the DEC workstation to perform as an Ethernet LAN gateway for TCP/IP hosts.

Taking a page from the IBM Corp.-

Apple book, DEC announced it has formed an agreement with Philips Electronics N.V. to purchase most of Philips' Information Systems Division. In addition, the companies agreed to jointly explore the possibilities of future cooperation in the areas of personal computers, components, CD-I and other multimedia applications.

Hewlett-Packard Co.

Lotus Development Corp.'s 1-2-3 is now shipping for the HP Apollo 9000 Series 300 and 400 workstations. Lotus is on the record as citing the Model 425e as "a great low-end price point for the commercial UNIX-system-based workstation market." The Series 700 is also "an extremely attractive platform for Lotus," according to Lotus' director of UNIX products, Dave Rome. The product is available through HP Apollo Direct.

Autodesk Inc.'s AutoCAD will be made available for the HP Apollo 900 Series 700, as will 11 other AutoCAD-based products that have been customized for the EDA, MCAD, AEC and GIS markets. AutoCAD for the 9000 is slated to be available some time in early 1992.

At long last, HP has publicly committed to filling the role of systems integrator by forming an international professional services division. The HP Professional Services Division will provide general and product-specific consulting, education and project-management services for HP-only and multivendor sites.

HP has created three self-paced, interactive courses to teach users and information-systems managers how to work with UNIX. The courses integrate audio, text and graphics on a CD-ROM and can run on HP workstations, Vectra PCs or IBM PCs. The three are: "UNIX System: An Introduction for New Users," "UNIX System: Managing Users and Their Environment," and "UNIX System: Transferring Files and Directories." Each course is $500; all three sell for $950.

HP announced that HP OmniBack, its network-backup management system, is now available on the company's workstations and servers under HP-UX. The product was formerly available on HP/Apollo Domain/OS workstations only. In addition, HP released its OmniBack/Turbo high-speed, local-backup solution for its HP 9000 Series 800 business servers. OmniBack provides central backup and recovery for distributed networks. The product can provide for up to 40 GB of unattended backup operations.

IBM Corp.

Lotus Development Corp. has announced that it is working on a version of 1-2-3 (Release 3) for the RS/6000. IBM is providing the equipment and support to developers at Lotus' Dublin, Ireland, facility. Pricing, availability and marketing information will be announced at a later date.

Cadre Technologies begins shipping this month a reverse engineering tool for the RS/6000. Called FORTRAN/Rev, the product is part of Cadre's Teamwork software-development environment. FORTRAN/Rev helps document existing FORTRAN source code via flexible display options, helps formalize software maintenance and simplifies the transition to a CASE development environment. The product consists of a processor for parsing source code and creating call trees and structure charts, and a browser for selecting design-chart modules.

Unisys Corp.

Unisys has established an imaging-consulting program. The collection of consulting services, called InfoImage, is designed to help organizations determine where to apply image technology and to project potential return on investment prior to buying a complete system.

Unisys claims that performance of its UNIX OLTP systems has increased 26%, according to recent results of the TPC Benchmark A. Unisys credits its Open/OLTP suite of products for the success. Open/OLTP includes a Unisys-enhanced version of the UNIX System Laboratories' Tuxedo

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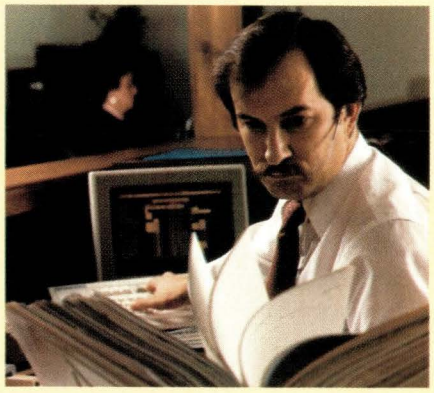

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Transaction Manager (Version 4.1) and Informix Software's Informix-OnLine RDBMS. Unisys clocked its U 6000/85 systems in a 12-processor, local-area-networked configuration.

This Just In...

• **Tivoli Systems Inc.**, Austin, TX, releases the first of its long-awaited systems-management software this month. Running under SunOS 4.1, the first pieces of WizDOM (Wizard's distributed object-oriented management) are designed to handle primary-resource and privilege and security management. The next expected WizDOM modules will streamline printer, mail and file-system/NFS management. In the future, Tivoli is promising to add backup and restore, security-threat and PC-interconnect management capabilities to its environment. According to company officials, WizDOM, in addition to being an integral piece of the Open Systems Foundation's Distributed Management Environment, is a leading contender in the bidding to supply UNIX International with systems-management technology.

• Another one of those great DOS products that's recently made its way onto the Sun is TK Solver Plus from **Universal Technical Systems Inc.**, Rockford, IL. The toolkit can solve algebraic and differential equations, perform statistical analysis, logical operations, matrix manipulation and various types of statistical analyses. TK Solver Plus can import data from other common worksheets (in ASCII, DIF and WKS/WK1 formats). The product incorporates a high-level object-oriented programming language and a graphical environment for plotting and generating images.

• Will the true real-time spreadsheet please stand? Billing its package as the "first 'true' real-time spreadsheet," **ELSID Software Systems Ltd.**, Ontario, Canada, has introduced a product it calls RIPCAM version 2.22. The system runs under the X Window System and Lynx Real-Time Systems' LynxOS. Now there are at least five companies claiming to have the first, if not the best, real-time spreadsheet in the Sun market: Access Technology Inc., Applied Information Systems Inc., Lotus Development Corp., Quality Software Inc. and ELSID.

• Speaking of real time, **Applied Information Systems Inc.**, Chapel Hill, NC, has put the finishing touches on Version 2 of Xess. Xess now allows multiple graphs based on a single spreadsheet to be displayed simultaneously. The new version also allows more interaction with other third-party programs, includes additional graph types as options and allows 3D surface graphs to be rotated. The product runs on the Digital Equipment Corp. DECstation and VAXstation, IBM Corp.'s RS/6000, Star Technology's 910 VP and Sun Microsystem Inc.'s SPARCstation.

• Enabling high-speed file transfers between Suns and IBM Corp. mainframes is OpenConnect/GTO (Gateway Transfer Option) from **OpenConnect Systems**, Carollton, TX. The software resides in part on an

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IBM MVS mainframe and in part on Sun systems with SunLink Channel Gateway installed. The product allows file transfers using the standard SunOS FTP program. Rates up to 450 KB/s (disk to disk) have been claimed.

• **OpenConnect Systems** also plans to demonstrate for the first time this month a version of its software gateway, OpenConnect Server II, for use on Sun Microsystems Inc. platforms. The company's package transforms Sun 4s into IBM SNA-to-TCP/IP LAN gateways. OpenConnect Server can act as a front-end communications server and supports features such as routing IP packets across an IBM backbone and NetView control of TCP/IP nodes.

• One of the first Sun NeWSprint-compatible printers is now available from **SRS Imaging Inc.**, Irvine, CA. The 12-ppm 1200L PostScript laser printer produces 11-by-17-inch-format output. The product is sold bundled with NeWSprint for $11,995.

• An affordable alternative to the phone company's leased-line data services is emerging from **Metropolitan Fiber Systems Inc.**, Oakbrook Terrace, IL. "Anyone who's ever tried to run NFS over T1 will understand the problem we're designed to solve," says Stan Hanks, principal scientist with Technology Transfer Associates, one of the designers of the service. MFS' commercial fiber network offers customers the ability to transmit data across multiple FDDI, Ethernet and token-ring LANs within a metropolitan area–and ultimately, across the country–at speeds up to 100 Mb/s. The MetroFiber services are currently available in Houston. Over the next six to 12 months, they'll also be rolled out in Baltimore, Boston, Chicago, Dallas, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and San Francisco.

• Version 3.0 of **DSP Development Corp.'s** DADiSP scientific spreadsheet is now shipping. Version 3.0 includes new data reduction, mathematical, statistical, Fourier transform, peak analysis and graphical tools. Users can define new functions and automate DADiSP sessions. The Cambridge, MA, developer also has enhanced the product's user interface and added 3D and 4D plotting capabilities to the product, as well as stepping up DADiSP's capability to provide presentation-quality output.

• More software-development developments: **ParcPlace Systems** has upgraded its Objectworks\C++ environment to support team programming and integrate with various UNIX tools including `make`. These capabilities are especially likely to be appreciated by programmers working on large projects with mixtures of programming languages, according to the Mountain View, CA, developer.

• Two new color SBus frame buffers are available for Sun systems from **Integrix Inc.**, Alhambra, CA. Model SFB 200 is for high-end (up to 1280-by-1024) industrial-standard resolutions; the SFB 220 is for lower-end, more price-sensitive environments that allow for super VGA resolution. The latter can be configured for reso-

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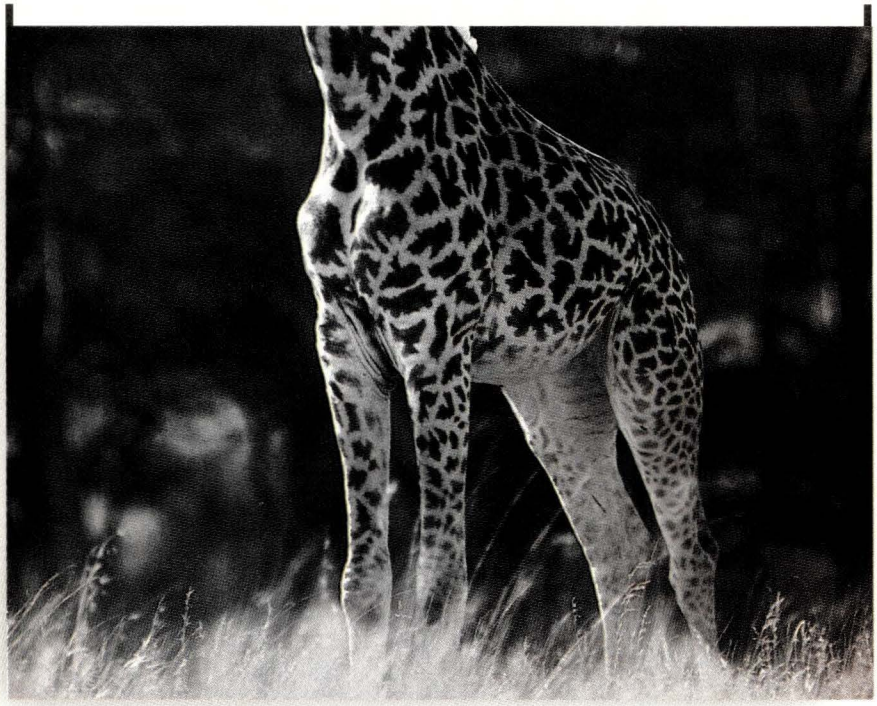

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lutions of 1152 by 900 or 1024 by 768. Integrix also is offering a new external expansion chassis, the SEC model 100, that adds five additional SBus slots to Sun's desktop family.

• Other new SBus cards have been introduced by **Aurora Technologies Inc.**, Cambridge, MA. FirstScan interfaces with the Hewlett-Packard Co. ScanJet scanner. FirstScan can create TIFF format files that can be used by OCR software to create ASCII text from scanned documents. And the company's new SBus Token Ring Card allows Sun workstations to be integrated into 802.5-compliant token-ring networks. Aurora has introduced complementary TCP/IP interface software to enable SPARC workstations to link up with other systems running TCP/IP over token ring. Future software modules will support NetBIOS, NetWare, SNA, LU6.2, LU6.0 and Lan Manager, says Aurora.

• **Sun Microsystems Inc.** is making available for its growing number of commercial and office-automation accounts a fully IBM PC-AT-101-compatible keyboard. The Sun 101-A keyboard has full connector compatibility with the Sun Type 4 keyboard.

• **Empress Software Inc.** has released Version 4.6 of the Empress RDBMS and fourth-generation language. "The newest release includes performance enhancements based on using shared memory in a multiuser environment," according to the Greenbelt, MD, company. New features include locking, global buffers and mapped files.

• Tired of the GUI wars? Then build your own UNIX interface, using **Graphical Software Technology**'s Xtra XWidgets toolkit. Xtra XWidgets integrates with the X Window System, Motif and Open Look environments. The product goes beyond building interfaces with simple list boxes of textual options, by providing an object-oriented library of reusable user-interface components, including pie charts, bar graphs, forms, icons and hypertext. The toolkit is implemented in C and sells for $795 per single-user workstation from the Hermosa Beach, CA, company.

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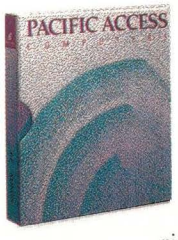

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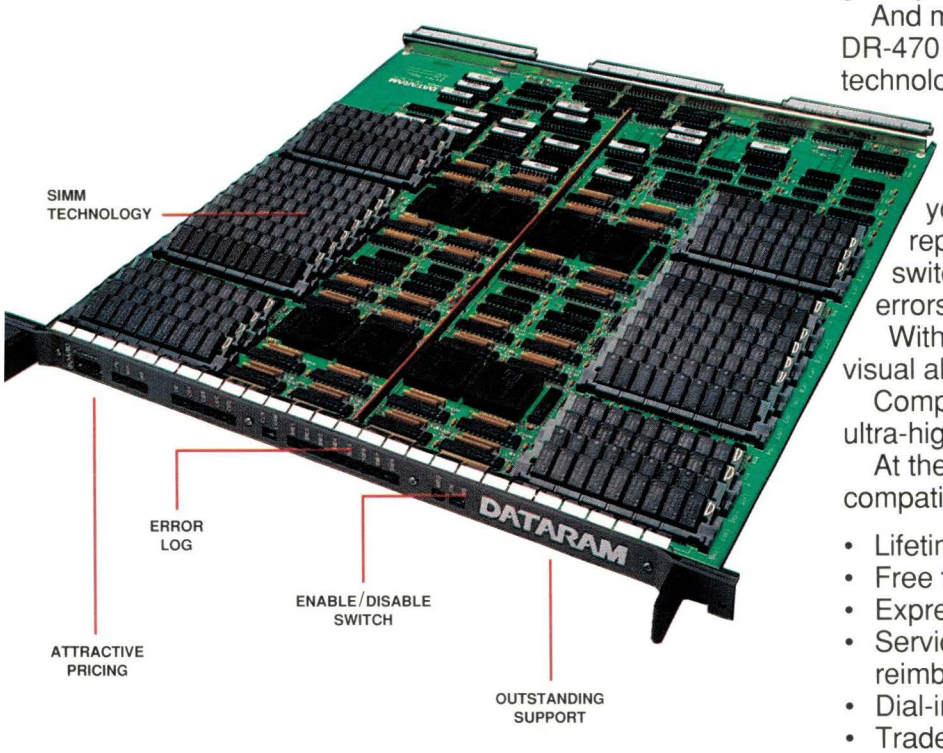

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ILLUSTRATION BY TOM BARRETT

Window Algebra: Solving For X

by MICHAEL O'BRIEN

"X - The Unknown"
–A very old movie concerning a man who saw any number of things he didn't like

"Was this creature we saw today outside my window that night?" "It, or one very like it."
–*The Stress of Her Regard*, Tim Powers

"...and I don't do windows!"
–Any intelligent person hired to clean up the local mess

Q: Why is Mr. Protocol dressed all in white and hanging out the window like that?

A: Well, Billy, because he's just mixed potassium chlorate with the sugar for the chocolate chip cookies again, and he's afraid the explosion might...What? Oh, sorry, wrong persona.

No, he's wearing that outfit because he's cleaning windows. To be more precise, he's cleaning window protocols. Someone told him they need it. Me, I'm reserving my opinion. Mr. Protocol, however, believes that a protocol can never be too thin or too clean, which is probably why he rates so highly in upper-crust New York society, which for some reason thinks that protocols have to do with diplomats, or something equally ill-informed. I'll never understand it. Most of the diplomats I've seen have been rather chubby, and, as for what they keep in those pouches, well...

Oh yes. Windows. Believe it or not, this time this is not a tangent. Window systems and protocols are no longer unrelated. In fact, in at least one case, they're much more closely related than most people are prepared to believe. That case is the X Window System.

Mr. Protocol has been heard before (the word "ranting" comes to mind) discussing the value of the layered approach to networking. The ISO reference model discusses seven layers of networking, ranging from the physical-link layer up to the application layer. While these seven layers don't necessarily line up exactly with the layers pre-

sent in a particular network, they do provide an excellent background to use in talking about it. Hence the use of the word "reference"–it is useful only in talking about real networks, and doesn't describe any one particular network. And this is where the fun starts.

The X Window System is, from one perspective, an application in and of itself. It is network-based. The entire idea is to provide a window in which some useful program can paint bits on a bit-map screen, the work being divided between the application, which must have some sort of knowledge of what the program wants to paint, and the machine with the screen, which must actually paint the bits. When window systems were first invented, the application actually opened the window directly on the local screen. If you wanted to run an application over the network to another system, you first opened a window locally, which was usually a terminal window with a shell in it. Then you ran some independent network service, such as Telnet, to make the network connection, and proceeded to run the remote application. Since Telnet doesn't understand bitmap graphics (or any other kind of graphics, for that matter), this rather limited the running of remote graphics applications. Various special network protocols for graphics have been promoted over the years, but none have caught on.

Until X.

The one really clever thing about X is that it is not defined as a window system. The lowest level of X is defined as a network protocol. Everything else–absolutely everything else–is defined on top of, and in terms of, this protocol. No doubt this is why Mr. Protocol is willing to use it.

The X protocol is, like almost everything else in networking, based on the client-server model. In this case, the client is the program you're trying to use, and the server is the program responsible for drawing bits on the screen. Other window systems don't have a server. Programs just draw bits on the screen. In the case of (the original) Suntools, the windows were managed by the Suntools program, but the multiplexing of data to and from the windows was actually handled by the kernel, which had an intimate knowledge of the existence of windows. Under X, the server reserves all such knowledge, and the most the kernel has to do is give access to the frame buffer so the server can paint the bits.

Let's look at the server first. This is the program that winds up doing all the real display work, and is definitely the most important program in the X distribution. No holds are barred when it comes to making the X server run as fast as possible. If there are bottlenecks in the server, all applications are slowed down. The X server distributed by MIT has been called a "sample server implementation," intended to demonstrate how someone else could write a really *good* server. Various people have, but others have worked on making the original MIT server for Suns as fast as it can be.

There are other servers, of course. All of the X-terminal manufacturers have their own servers. Some run directly on the terminal; others depend on a larger host to run the full-blown X server, and implement a private-network protocol to communicate between the X server and the terminal. Of course this means the X server is also a client, and there is a proprietary server running on the terminal that is presumably smaller and simpler than the X server, which leads to some people saying "Harrumph!" and to others saying "Not so!" and then the religious wars start.

Pay this no mind, says Mr. Protocol. The real tradeoffs are between performance and network bandwidth. Of course there is a third pole, prominently labeled "Money," which relates to the raw speed of the hardware. That's a tough one.

"But what about actually running an application?" you may ask. Mr. Protocol is glad you asked. Check your supply of cookies, because this is where things get voluminous.

It is one of the primary aims of the lower levels of the X Window System to provide a mechanism, and not policy. This means that the X server will support the creation and destruction of windows, the presentation of text and graphics, and so forth, but it will not determine the appearance and style of interaction, variously called "look and feel," or "the way things work." What the buttons look like, whether windows have title bars, how you place the windows and drag them around the screen, and so forth, are matters for the client programs, not the server. Not surprisingly, this means that there is lots and lots of code over on the client, or application, side.

At the lowest level, the client has to be able to talk to the server, and make requests for things to appear in windows. This level of communication is handled by calls to the *Xlib* library, which is a set of routines that sends protocol requests over the network to the server. Programming at this level is painful, to say the least. That's why it's not done much. The Xlib routines, plus those in a library just a bit more advanced, called *Xmu*, are used mostly

to build higher-level library routines that are (at least supposedly) somewhat easier to use. If the "mu" in Xmu doesn't stand for "maintenance utilities," it probably should.

Above the Xlib level, the possible pathways begin to diverge, and diverge substantially.

In the MIT release, the next step up is the "Athena toolkit library," *Xtk*. This library is a standard library that may be used by all comers to develop the next step up, namely a "widget set." The MIT version of widgets is the "Athena widget-set library," *Xaw*. Widgets are the sorts of things that actually begin to sound familiar to users of window systems: They are scrollbars, buttons, text-entry fields and the other accoutrements of a windowing interface. The toolkit library consists of routines for building such things out of the language of raw X requests.

The Athena toolkit library is meant as a standard, meaning that it is supposedly "policy free," but there are those who do not use it. Certainly, the toolkit library is meant to possess a unique "look and feel," albeit a very basic one. There are certainly other toolkits in use, each one representing a different look and feel. The one supported by Sun is called *XView*. It implements the *Open Look* style of interface, perhaps best identified by the funny-looking little push-pins up in the corners of many of the windows.

For obvious reasons (the first three all read "backward compatibility"), the XView interface reference manual looks suspiciously like the old Suntools manual. It is possible, at least according to Sun, to go through a semi-mechanical conversion procedure to turn old Suntools (a.k.a. "SunView 1") programs into XView programs. All the old panel and button calls are there, but they cause the creation of X window entities instead. The Sun OpenWindows software package, which includes the XView toolkit, also includes a special server that combines the features of an X server with those of a NeWS server, allowing one window to speak X protocol while another speaks Display PostScript. Mr. Protocol thinks this is a Neat Trick and is glad he didn't have to try to do this.

Other styles of interface exist as well, of course. The obvious competitor is called *Motif*. Motif is the name of both a style and a software package, created by the Open Software Foundation, based in Cambridge, MA, which in turn is a consortium basically consisting of all the UNIX vendors except Sun and AT&T. The Motif style is also quite distinctive, and sports a 3D appearance for the widgets. Interestingly, the Motif release runs just fine on Sun workstations, and the source may be licensed from OSF for not very much money at all. Mr. Protocol has always approved of such arrangements.

A third interface toolkit is called *InterViews*. InterViews is extremely inexpensive, being available by anonymous FTP from the host `interviews.stanford.edu`. Mr. Protocol has always found that price hard to beat. The only thing you have to pay

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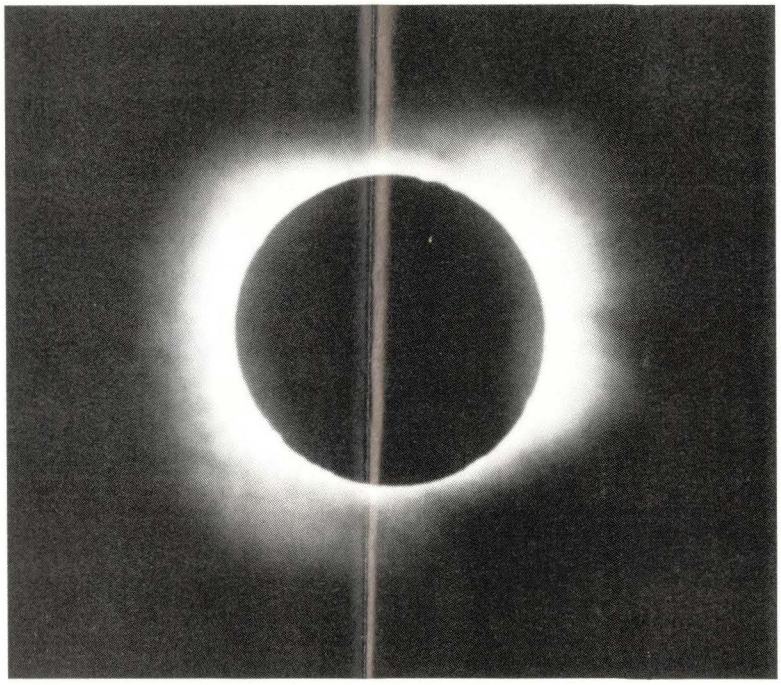

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is many megabytes of disk space, but then, that goes for all of these packages. InterViews is a complete X toolkit written in C++, which gives it a couple of advantages over the other packages.

The first is that it is a truly object-oriented package. Reading the documentation on the other toolkits quickly makes it obvious that the various widgets exist in a class hierarchy, with behavior inherited (sometimes multiply inherited) from ancestor classes. The C language, however, is not notable for its support of object-oriented programming, so the various messages and attributes must be passed around by means of opaque tokens, with the usual lack of error checking. With InterViews, such checking is taken care of at compile time, by the C++ compiler.

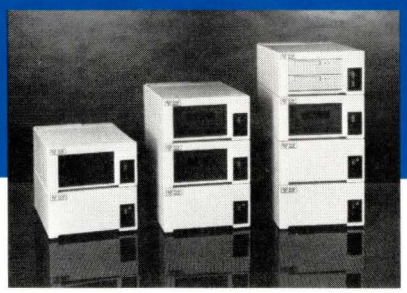
The other major advantage of a real object-oriented approach is that, in InterViews, windows that are placed as subwindows inside other windows are notified via message-passing whenever a higher-level window is resized or uncovered. In the case of resizing in particular, Mr. Protocol was impressed by the proportional resizing of all of the entities at all levels of the window tree.

The flaw here is that, like all truly object-oriented programs, complex InterViews applications have a tendency to be both large and slow. (Parenthetically, Mr. Protocol notes that one researcher has made the observation that as C++ programs are made more and more truly object-oriented, by means of virtual functions, the closer they come to running at object-oriented speeds, i.e., slow. Mr. Protocol, eternal optimist that he is, does not feel that this is a handicap. It is a research topic.)

So far, you may have noticed, we've talked about painting the screen. How does the user actually get anything done? The answer is that the client-server communication channel is a two-way street.

The user is actually communicating most closely with the server. It is the server's job to watch the mouse and keyboard, and turn whatever local events they generate into a canonical `XEvent`. The server then figures out which window has the so-called *input focus*, and ships the characters out over the network to the client at the other end of the window (clients that terminate, bomb out, or otherwise exit cause this network connection to close, thereby causing the server to delete any windows owned by that client). The client program actually spends its time either computing, or waiting for `XEvent`s to come from the server. This style of program construction should be familiar to those who have ever created a Suntools program. Library routines provide an event-handling function similar to the old Notifier.

Interestingly, the window manager, which handles screen-level operations like iconifying windows, title bars, window movement and so forth, is a user-level program under X, and there are several to choose from. Some of the more advanced X packages expect similarly advanced window managers



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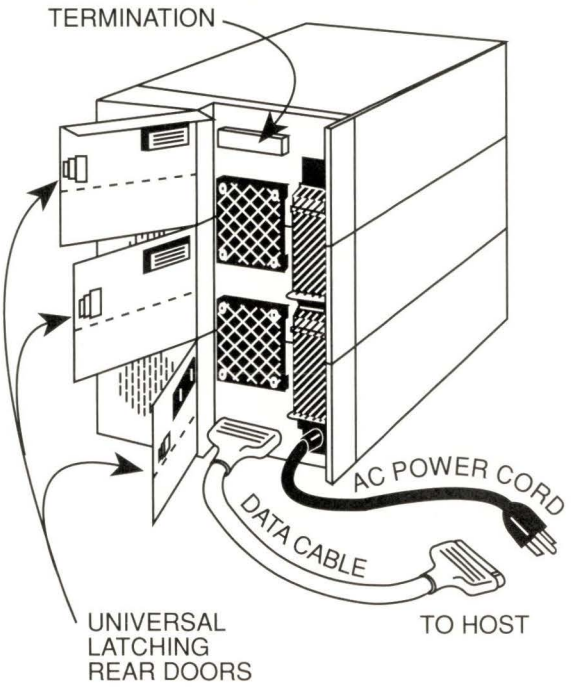

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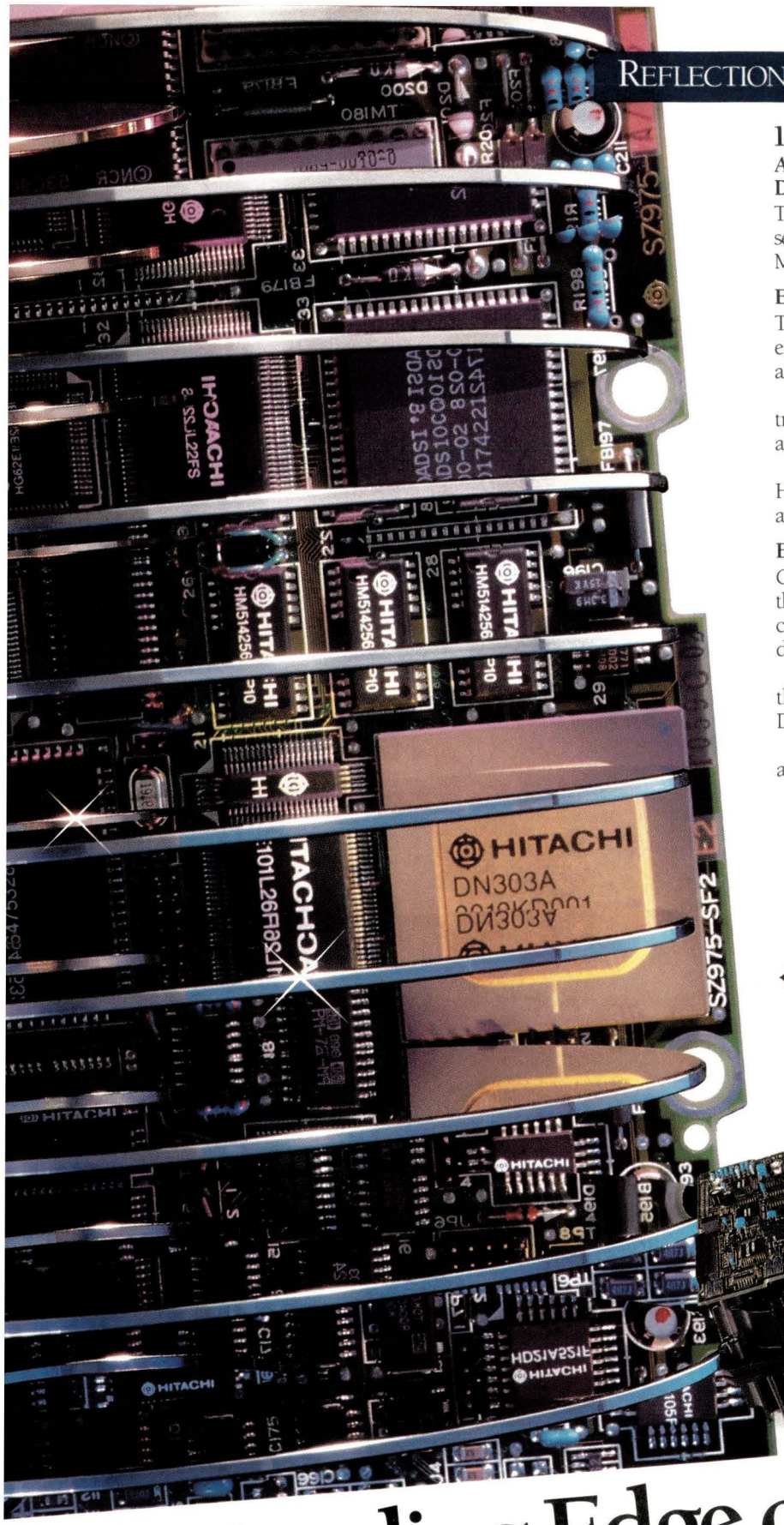

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before everything will work right, but it is usually possible, when necessary, to create a screen that looks like Frankenstein's creation, with different window styles all mixed in together.

What can be expected from X in the future? Well, Mr. Protocol feels that X will eventually be replaced. X has many shortcomings, and is not, overall, a thing of great beauty. Its success is due mostly to having the right features at a time when those features were so sorely needed that a great deal of pain was acceptable on the part of the programming community trying to build it up.

However, the last great advantage of X is that it is extensible. Three-dimensional extensions have already been proposed and implemented, and other things are eternally in the works. Half the opcode space has been reserved for extensions, so it's not likely that space will run out soon. In the near term, a new base release, X11R5, will have made its appearance by the time you read this. Mr. Protocol feels that, even with simultaneous availability from a number of archive machines around the net, the Internet will be a warm place on the magic day. X can safely be called a network-oriented window system if for no other reason than the effect it has on the Internet when a new release appears. ⊸

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

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

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

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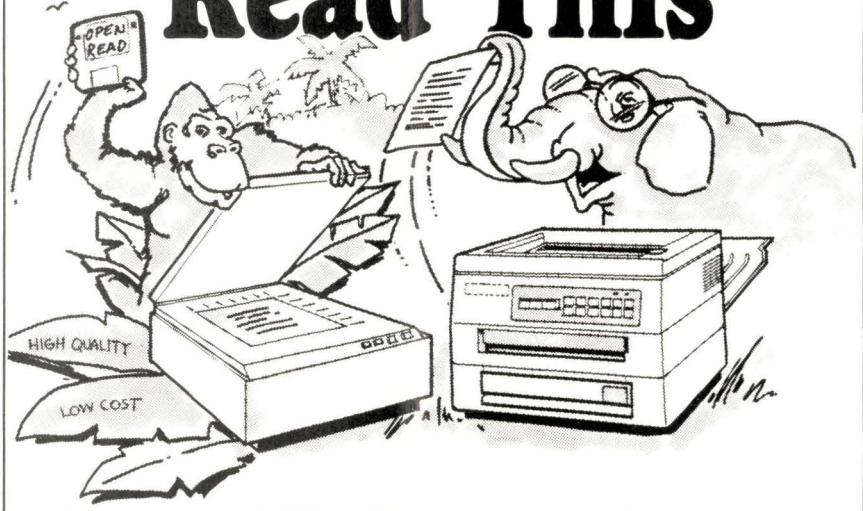

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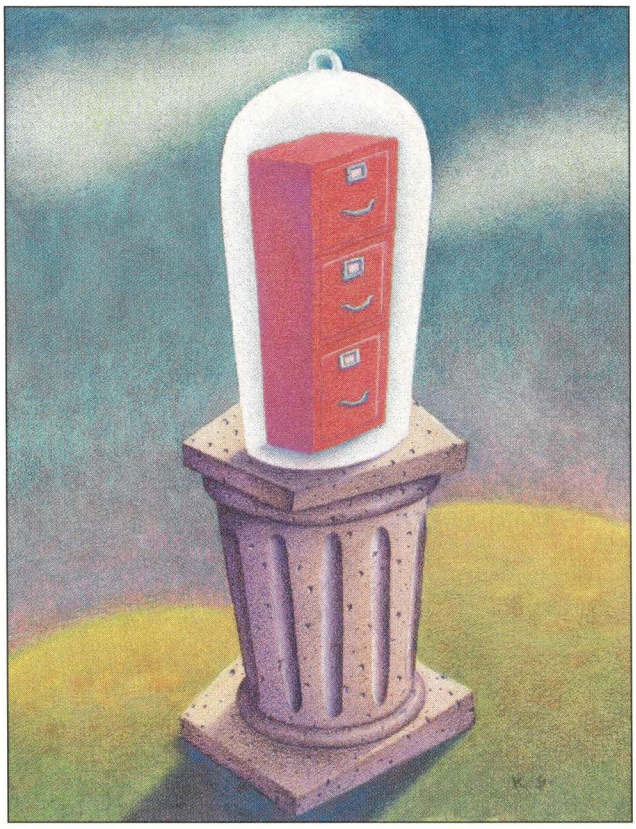

ILLUSTRATION BY KEITH GRAVES

by PETER COLLINSON,
Hillside Systems

Controlling Source

I would guess that most UNIX systems spend most of their time with users engaged in text creation and editing. The text can be program source or documentation. It can be articles for publication or control files for the system. There are many people using text editors to create data on UNIX systems.

There's a problem with this. It's as easy to change a text file as it is to create it. Once changed, the original state is gone. Unless you have some backup, the original state has gone forever. If you do have backup, then how old is it? When was the last valid change made to the file? If I accidentally delete a file and restore it from backup, how can I really know that the file I recover has the same contents as the file I just deleted? If I am editing a file, how can I ensure that someone else is not changing it too–at the same time?

These problems affect all users of text, but programmers who noticed them first supplied a solution. The Source Code Control System (SCCS) came out of AT&T Bell Labs in the early days of UNIX. Unfortunately, it was not part of UNIX Version 7 or UNIX 32V. This meant that it was not "part of standard UNIX" and many sites could not get access to it. The alternative Revision Control System (RCS) was written by Walter Tichy from Purdue, largely because he wanted the facilities of SCCS without an expensive UNIX source license. SCCS became part of the "standard" UNIX world when it was released on UNIX System V.

We are left now with two systems with roughly equivalent facilities. SCCS will generally be available on your system while RCS is available in source form from many archives. My version of RCS came from the recent SUG CDROM. Which system to pick is a religious issue that I will not deal with in this article. Fanatics from the other camp will undoubtedly burn me at some stake or other if I dared to pick one as the "best."

However, I will only discuss SCCS in this article. First because it is the system that I am most familiar with. Second, because that is the system that is sitting as a program suite on all those Suns out there. That said, it makes sense for you to look at both systems if you are looking at this for the first time.

Basics

The first step in using SCCS is to place the source file into the tender loving care of the SCCS system. This creates a new file, the *history* file. It contains the original contents of the source file and some administrative information. The original file can now be deleted since it can now be recreated from the history file. Go on, be brave. You mustn't touch the history file using any standard tools, it should only be manipulated using commands in the SCCS suite.

When you want to use the source, you obtain a "top" copy from the history file. If you want to edit the file, you use a command that tells the SCCS system what you want to do. You are presented with a copy of the file for editing. The system will create a lock file that will prevent anyone else from trying to edit the file at the same time. The lock file contains your name, so it is possible to identify who "has" the file.

After you are happy with the changes that you have made to the file you give it back to SCCS. This is called "making a delta" because SCCS stores the changes that you have made as differences from the previous version. The history file contains the original file, and a copy of all the lines that have been altered. It is possible, then, to recreate the original file *and* the one that you have just made. Finally, you get the new file out as a "top" copy for use in your program or system.

SCCS uses file permissions intelligently to try to make sure that precious files are not deleted or changed in an uncontrolled way. History files are always read-only to stop you from editing them directly. Similarly a "top" copy file will have write permission turned off to make you remember to go through the motions of getting the file for editing.

SCCS consists of several commands and the basic set all operate in the current directory. If you use the basic set then you will find source files, history files and lock files all littering the workplace. This is painful. Suddenly you find that your tidy source tree is a mess of oddly named files.

You really want to ensure that all the administrative files are hidden out of harm's way. For this reason, most people use Eric Allman's control program called `sccs` to invoke all the commands. This ensures that all the control files are stored in a subdirectory called `SCCS` in the current directory. The working directory contains only the set of files that are relevant to the task. All the nuts and bolts of SCCS are hidden in a directory that is rarely entered.

Using the Control Program

The control program has many built-in commands that make SCCS much more friendly. The commands often combine several basic SCCS programs making SCCS easier to use.

The first built-in command makes a new history file. Let's imagine that you have an empty directory containing a single source file `clever.c`. To start things off you would:

```
% sccs create clever.c
clever.c:
No id keywords (cm7)
1.1
147 lines
No id keywords (cm7)
% ls -l
total 11
-rw-r--r-- 1 pc  4369  Aug 6 09:46   ,clever.c
drwxr-sr-x  2 pc   512  Aug 6 10:23   SCCS
-r--r--r-- 1 pc  4369  Aug 6 10:23   clever.c
% ls -l SCCS
total 5
-r--r--r-- 1 pc  4513  Aug 6 10:23   s.clever.c
%
```

Loads of things have happened. First the `sccs` command has created a new directory called `SCCS` used for storing control files. Second, it has invoked the SCCS `admin` command to create a history file in the subdirectory. The history file `SCCS/s.clever.c` is made read-only. The name of the history file is derived from the name of the source file but the characters `s.` have been prepended to it. History files are often referred to as *s-files* because of this. SCCS creates many files for various purposes and always uses this prefix mechanism to derive the file name.

After the history file has been successfully created and to reassure the fainthearted, the old source file is renamed to start with a comma. This can be deleted when bravery is replaced by the knowledge that you can recreate the file. Finally, the `sccs` program gets a top copy of the source file. The warning message `No id keywords` will be explained below. To make things a little simpler, I have chosen to remove them from the examples below.

If you want to edit the source, you now need to get the file `clever.c` back for editing:

```
% sccs edit clever.c
1.1
new delta 1.2
147 lines
% ls -lR
total 6
drwxr-sr-x  2 pc   512  Aug 6 10:36   SCCS
-rw-r--r-- 1 pc  4369  Aug 6 10:36   clever.c

SCCS:
total 6
-rw-r--r-- 1 pc    29  Aug 6 10:36   p.clever.c
-r--r--r-- 1 pc  4513  Aug 6 10:23   s.clever.c
```

You can see that the file `clever.c` has been recreated and made writable by the owner. The s-file has not altered but a new lock file, the *p-file*, has been created. You can see into the lock file:

```
% sccs info
   clever.c: being edited: 1.1 1.2 pc 91/08/06
      10:36:54
```

You can now merrily edit the source creating a new version of the file. When you are done, you will want to

make a delta. The `delta` command does this:

```
% sccs delta clever.c
comments? Add sensible info here
1.2
3 inserted
2 deleted
145 unchanged
%
```

You are first asked to supply a reason for the change that has been made. Typing newline at the end of this text line terminates input in an annoying way. If you want to add a second line, you will need to think ahead and end the first line with a backslash. The information text is placed in the history file and can be viewed later. The text should be as descriptive as possible so that the change that you have made can be easily identified. The `delta` command also tells you what was changed on the file. Finally, the delta command will delete the edited copy. You can get the file for re-editing using `sccs edit`. To get a top copy, you type:

```
% sccs get clever.c
1.2
148 lines
% ls
SCCS clever.c
```

Numbering Versions

Each delta is numbered using a decimal point scheme. The manual pages and much of the literature refer to this number as the SID, the SCCS identification number. If you look back to where the `create` command was issued, you will see that the number `1.1` was printed as part of the information from the command. This is the initial SID of the file. Later, we made a delta and the number changed to 1.2.

The intention is that the first digit is the release number of the file and the second number denotes the change number to that release. This second digit is often known as the "level" of the release. When a delta is made, the second number is increased automatically by one. Look back and you can see that happening.

The SID names a particular version of a file. To obtain the initial version of `clever.c`, we can say:

```
% sccs get -r1.1 clever.c
1.1
147 lines
```

and the file in the current directory is replaced by the original version. All SCCS commands take the `-r` argument to specify the SID of the file. If none is given, the top copy of the file is used, so

```
% sccs get clever.c
1.2
148 lines
```

will retrieve the most recent version.

To make a new release, you simply get the file out for editing, supplying a new release number with no level:

```
% sccs edit -r2 clever.c
1.2
new delta 2.1
148 lines
```

This file is now open for editing, but at release level 2.1. I normally put the file back at this point making no further change.

```
% sccs delget clever.c
comments? Up to release 2
2.1
0 inserted
0 deleted
148 unchanged
2.1
148 lines
```

This uses another built-in composite command, `delget`: "do a delta then get a top copy." The other useful command is `deledit`, this runs `delta` and then gets the file for editing.

It is possible to make branches to a release and you will sometimes see SIDs containing three decimal points: for example 4.3.1.2. This is release 4, level 3, branch 1, sub-level 2. In SCCS, branches don't work as well as they should and merging branches back can cause difficulty.

Keywords

We have seen that a source file is either being edited, or is in "top copy" form. You can arrange that the source file contains keywords that are expanded by the `get` command when it creates the top copy. When the file is in edit mode, you will see the keywords; when in top copy form, the keywords will be expanded. This is useful since it allows you to identify the version of the file that is being used.

I usually load a piece of text at the start of my C source

```
#ifndef lint
static char *sccsid = "%W% (Hillside) %E%";
#endif /* lint */
```

If I add this into `clever.c` making delta 2.2, then the top copy would show:

```
#ifndef lint
static char *sccsid = "@(#)clever.c 2.2
                      (Hillside) 91/8/6";
#endif /* lint */
```

The `%W%` keyword has been expanded to a magic marker `@(#)`, the name of the file `clever.c`, and the SID of the file, now 2.2. The `%E%` keyword is replaced by the date that the delta was created. There are many other options, see the

manual page for `get` (`man sccs-get`).

The magic marker is used by the `what` program. This program scans any files for the marker and prints out any following string.

```
% what clever.c
clever.c:
        clever.c 2.2 (Hillside) 91/8/6
```

The `what` command can also look at binaries, and that is the reason for the static string storage in the program.

```
% what /bin/ls
/bin/ls:
   Copyright (c) 1980 Regents of the University
       of California.
   ls.c 1.26 89/08/01 SMI
```

This tells you the version of the command that you are running and can be useful if you want to know exactly what binaries are running on the machine. I am under the impression that Sun is a little naughty and will release patched binaries with the same SIDs as previously broken ones. Beware.

The use of keywords is an important part of SCCS, and this is why all commands complain bitterly when none are found. I tend to put keywords into header file comments so at least you can see what version of a module is being included when the program is compiled. If I am using SCCS to manage a control file like `inetd.conf` then I will place a keyword string in a comment line.

Keywords can be an annoyance. It is possible to get percent-character-percent sequences in normal text and these can be expanded when you don't wish them to be. Also, you cannot make SCCS manage a file that is intended to be inserted at the start of another SCCS controlled file.

Multiple Files

Examples in articles like this tend to be small to get the points across. SCCS can be used to control any number of files. All the commands above can be given several filenames as arguments. You can also easily make commands operate on all the files in a particular SCCS directory.

```
% sccs get SCCS
```

will get the current versions of all the files.

If I have a program that consists of several files, I do tend to treat them all as individual files and don't attempt to keep all their SIDs in step. I try to make one logical change to the file set and then make deltas that reflect that one change. The `sccs` program helps here. The `tell` command will print the names of files that are currently being edited. The output is a list with one file per line. To make deltas of all the files that are being edited, type:

```
% sccs delget `sccs tell`
comments? Relevant information
```

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This makes the `tell` option generate a list of files that are to be checked in. This list is then passed to the `delta` program and then to the `get` program. The comments field should contain relevant information so that later you can spot all the files that have been changed to make that particular revision to the source.

Information From SCCS

SCCS is important to me as a way of protecting the work I am doing. I can make deltas of files and this preserves the work to that point. It can also be an important way of auditing the changes that are made to a file. If you retain a source tree for several years, then the history of changes made to the file can be important. SCCS provides several useful tools that can aid in this.

You can dump out the raw untreated information from the history file by using the `prs` command. Alternatively, the `prs` command can be provided with a format in a program argument. This uses keywords to show where the information that is wanted is to be inserted into the output. This is a great way of making little enquiry programs that print just the information you are interested in. Look at the manual page (`man sccs-prs`).

Another useful feature is the ability to see what lines have just been altered in a file. If you say

```
% sccs diffs clever.c
```

This will run the `diff` command on the version of `clever.c` sitting in the top directory and the top version in the history file. As usual, you can give a specific SID to select an earlier version from the history file. Supplying the `-C` flag to `diffs` will generate a context diff.

You can compare different versions *inside* the history file with a different command:

```
% sccs sccsdiff -r1.1 -r2.2 clever.c
```

This is useful if you want to see what changes were made between two versions.

Finally, if you want to see which releases contributed what lines to a version you can say

```
% scss get -m -p clever.c | more
```

The `-m` switch prefaces each output line with the SID that contributed it and the `-p` option pumps the data onto standard output. You can see exactly which line of text was contributed by a specific SID. This can sometimes be a great help in tracking down a bug.

Versions

SCCS doesn't give you great help if you want to maintain a versioning scheme on a whole program comprising several program modules, header files, documentation and a makefile (don't forget that). RCS does a better job of this. It is not difficult to do with SCCS, but needs a couple of shell scripts to do the work.

Circle No. 42 on Inquiry Card

The basic idea is that a release of a whole program is characterized by a list of SIDs and file names. If you have that list for a program version, then you can recover the program as it was at some particular time.

I have a script that does this. First, it ensures that all the files in the work directory are top copies. It then uses the `prs` program to generate a list of SIDs and file names. The list is placed as a C comment at the end of the file `version.c`. The file is compiled into the C program and contains the version string for the whole program. Actually, I make the SID of `version.c` be the release number of the program.

To get a specific version of the program back, I delete all the files in the top directory and get the appropriate release of `version.c`. The information of SID and filename that it contains is used as data to retrieve all the other files at their correct release level.

Odd Thoughts

If you release a program, then don't supply the SCCS files. Someone may generate a new version of the source with the same SID as your changes and this just complicates version control.

If you get a top copy of someone's program, then use SCCS if you change it. I generally only use SCCS for the files that I alter. You can trivially generate a list of the changes that you have made to the old version. If you get an update sometime later, you can perhaps then use Larry Wall's excellent `patch` program to apply your changes automatically to the new source.

I use SCCS for everything that I do. I never send a top copy of a document or program to anyone without making sure that it has a version number that I can identify at a later date. This has always paid off.

Further Reading

The manual pages on your system provide a terse guide to the SCCS suite. There is a manual page for the `sccs` program and all the other related pages are named `sccs-`*`something`*, like `sccs-get`. Sun has some documentation on SCCS.

Eric Allman, the author of the `sccs` control program has a paper in the Berkeley 4.3BSD manual set. It's document 14 in the "UNIX Programmer's Manual Supplementary Documents 1" with the yellow spine. There's a paper on RCS there too. ➸

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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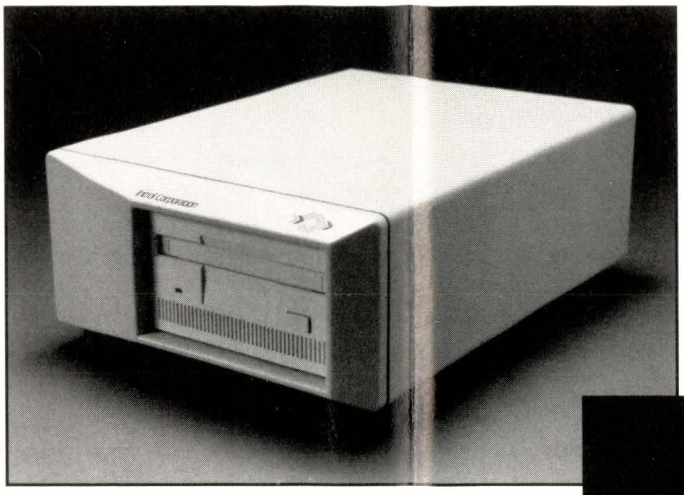

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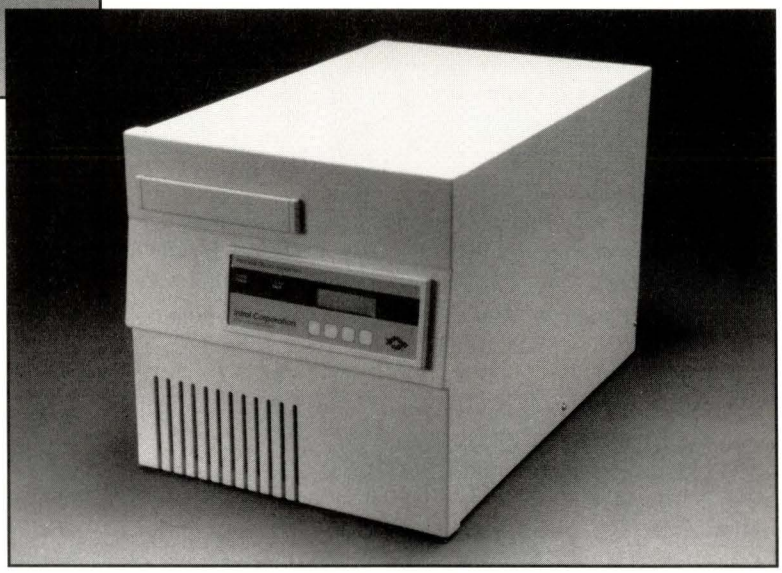

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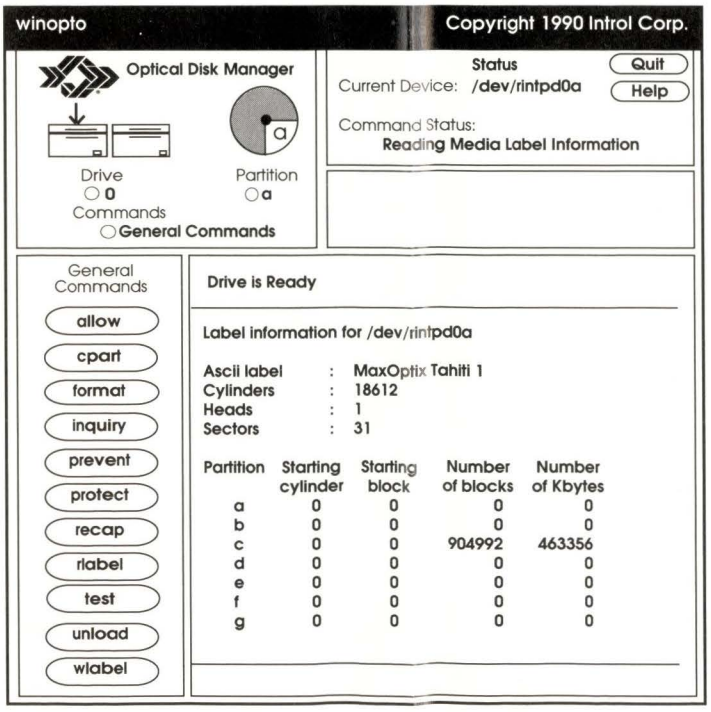

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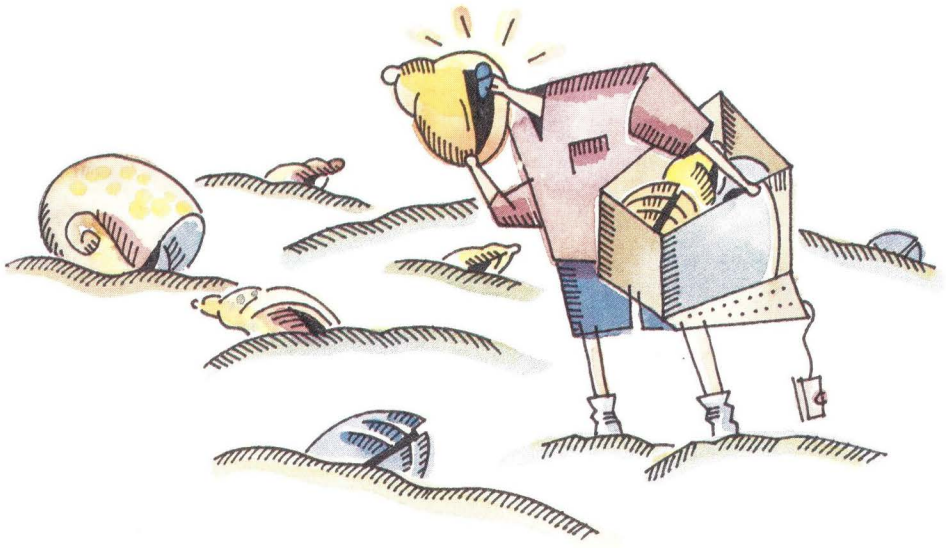

ILLUSTRATION BY ROBIN JAREAUX

A Grab Bag of Adminiscripts

by **RICHARD MORIN**, Technical Editor

Every seasoned UNIX administrator has a few favorite shell scripts. Here are some of mine, with (I hope) enough commentary to make them comprehensible.

The `last(1)` command is not as useful as it might be. The description "indicate last logins by user or terminal" seems to imply that you can use it to find out each user's last login. Instead, the command spills out an enormous list of logins. Fortunately, the fix is simple:

```
: lu - last, uniqued

last |nawk '{
    if (m[$1] != "") next
    print $0
    m[$1]++
}'
```

The output is a list of logins, uniqued by username. We use `last`, but pipe its output into a simple `nawk` filter. The filter skips any lines whose usernames (field 1) have shown up before, but prints (and flags) any new ones.

Note the use of `nawk`. `nawk` is not a new language; it is merely the latest version of `awk`. It has cleaned-up syntax rules, better error checking and a host of enhancements, but it seems to be totally compatible with `awk`. Use it!

A similar principle (filtering for uniqueness) can be applied to the `csh` history list. If you are doing a repetitive set of commands, the history list quickly fills up with junk. By printing only unique commands, you can increase the range of history's memory, while limiting the output list to interesting commands.

First, because history must be run under the current shell, we need an alias:

```
alias \! 'history -r | uhl'
```

aliases an exclamation point (mnemonic enough?) to a backwards history listing, piping the result through a filter:

```
: uhl - unique history list

limit=${1-20}

nawk '
  {
    ss = substr($0,8)
    if (mx[ss] == "") {
    mx[ss]       = "*"
    mn[++cnt]    = $1
```

```
    ms[cnt]      = ss
    if (cnt == '$limit')
      exit
  }
}
END {
  for (i=cnt; i>=1; i--)
    printf("%6d\t%s\n", mn[i],ms[i])
}'
```

uhl works like lu, but ensures uniqueness by characters 8-N, rather than by the first field. In addition, it searches backwards through the history list, but prints forward. Consequently, it is a bit more convoluted, using nawk's associative arrays to find and retain matching information. I set my history variable to 300, and get good results.

Mail Watching

The mail/uucp system is made up of a number of files and directories. Chasing after the information is tedious, so it may not get done as often as it should. To get a useful overview, I run the following script.

```
: us - uucp status

t1=/tmp/us.$$.1; t2=/tmp/us.$$.2
trap "rm -f $t1 $t2" 0 2 15

host=`hostname`
h5=`expr substr $host 1 5`
line=---------------------------------------
u=/usr/spool/uucp
clear
date | nawk '{ printf("%52s\n", substr($0,1,16)) }'

echo $line                                  locks
ls -Fq /usr/spool/locks

echo $line                                  traffic
for i in `ls $u`; do
  if [ -n "`ls $u/$i`" ]; then
    ls $u/$i                                |
    nawk '
       /^C\./      { C++; next }     # control
       /^D\.'$h5'/ { L++; next }     # local
       /^D\./      { R++; next }     # remote
                   { O++; next }     # other (?)
       END         { printf("%-30s %5d%5d%5d%5s\n",
                       "'$u/$i'", C, L, R, O) }'
  fi
done
echo $line                                  errors
if [ -n "`ls $u/.Status`" ]; then
  (
    cd $u/.Status
    grep -l -v SUCCESSFUL *                 |
    while read i; do
      cat    $i   # get status line
      ls -al $i   # and date/time info.
    done                                    |
    nawk '
      NR%2 == 1 { save = $0; next }
                { printf("%s %2d %s\t%s\n",
                  $5, $6, $7, save) }'
  )
fi

echo $line                                  mail
lu > $t1
nawk '
  /^[^U]/ { printf("%-10s %s\n", $1, substr($0, 37)) }
' $t1 | sort                                >$t2

ls -l /usr/spool/mail                       |
nawk '
  NF > 2 && $4 > 0 {
    printf("%s %d %s %d %s \n", $3, $4, $5, $6, $7)
}'                                          |
join -a1 - $t2 | nawk ' {
  printf("%-8s %8d %s %2s %-5s   %s %2s %s\n",
    $1, $2, $3, $4, $5, $7, $8, $9) }'

echo $line                                  logins
nawk '
  /^U/ {
    if (save != "" && save != $3 "_" $4 "_" $5)
      print ""
    print $0
    save = $3 "_" $4 "_" $5
}
```

us clears the screen (normally a small window), then prints the current date and time. The rest of the output is divided into sections by annotated divider lines, e.g., locks. The peculiar formatting of the date and time allows them to match up with corresponding values on following lines.

The "locks" section is simple: List the contents of the locks directory. Locks can be left around after a tip or uucp session, keeping uucp from using modems, etc. If this section stays full for a while, check it out.

Next, we look at "traffic." Tallying several different kinds of spool files, we summarize the control and data files for each neighboring system. The expr fiddling at the start of the script is necessitated by the fact that host names are truncated to five characters when they are used as part of spool file names.

If a machine's counts stay high for an extended period of time, there may be cause for concern. Watch other indicators to see if the source is a bottleneck or merely a lot of traffic.

The "errors" section looks for unsuccessful uucp sessions. For each (.Status/*) file that doesn't contain the word SUCCESSFUL, we build up and print a summary line. The nawk script saves the lines from cat, appending them to

selected parts of the ls output.

The next two sections depend upon a local convention. All of CFCL's UUCP neighbors call in as Uhost, rather than as uucp, host or whatever. This allows me to track them separately in programs like lu and us. If this convention is not followed at your site, you will have to modify these parts of the script.

The "mail" section keeps track of unread mail. If mail seems to be piling up for a user, the administrator may want to see if something is wrong. This summary gives the username, the size and modification time of the mail file, and the time of the user's most recent login.

We use lu (described above) to get the users' last login times. After sorting these, we can join them with information about the mail files. A pass through nawk selects and formats the desired fields.

Finally, the "logins" section tracks logins by UUCP neighbors. Concentrating on the lu entries for UUCP accounts, it prints them, inserting blank lines between entries falling on different days.

The next script is tiny, but it works very well with us. It runs a command every N seconds, as: every 300 us. By running this command in its own window, I get a continuous report on mail and UUCP, with very little overhead.

```
: every  - do something every n seconds

delay=$1; shift
while true; do
  $*
  sleep $delay
done
```

A Cautious rm

The system file remover (rm) is a bit heavy-handed, removing files with a dispatch that can cause real pain. The normal workaround, alias rm 'rm -i', is far too tedious on multiple removals:

```
rm: remove foo? y
rm: remove bar? y
```

Vicki Brown, of Apple Computer, has written a script that effects an elegant compromise. crm removes single files without complaint or question. If presented with a list of files, however, it prints the entire list to the screen, asking for a single confirmation. You only get one chance to stop it, but that seems to be enough in most cases.

```
: crm - cautious rm

case $# in
  0|1)
    exec /bin/rm "$@"
    ;;
  *)
    case $1 in
      -f*|-i|-rf)
        exec /bin/rm "$@"
        ;;

      -r)
        shift
        echo -n "remove..."
        for word in "$@"; do
          if test -d "$word"; then
            list=`ls -aF "$word" |
              sed 's@\.\./@@
                   s@\./@@'`
            echo "$word/($list)"
          else
            files="$files $word"
          fi
        done
        echo "$files ? "
        read answer
        case $answer in
          y*|Y*)
            exec /bin/rm -r $*
            ;;
        esac
        ;;
      *)
        echo -n "remove $@? "
        read answer
        case $answer in
          y*|Y*)
            exec /bin/rm "$@"
            ;;
        esac
        ;;
    esac
  ;;
esac
```

In use, one will normally alias crm as rm, although this isn't strictly necessary. The sed magic is there to keep crm from listing . or .. as members of a subsidiary directory. Note that the directory expansion only goes one level deep.

For more information on shell scripting, or awk in particular, in general, try *The UNIX Programming Environment* (Kernighan and Pike, Prentice-Hall) and *The AWK Programming Language* (Aho, et al., Prentice-Hall). Peter Collinson's column on awk (*SunExpert*, January) is also a good place to start. A more complete list of books may be found in "A UNIX Reading List" (*SunExpert*, October 1990, Page 41). ⊸

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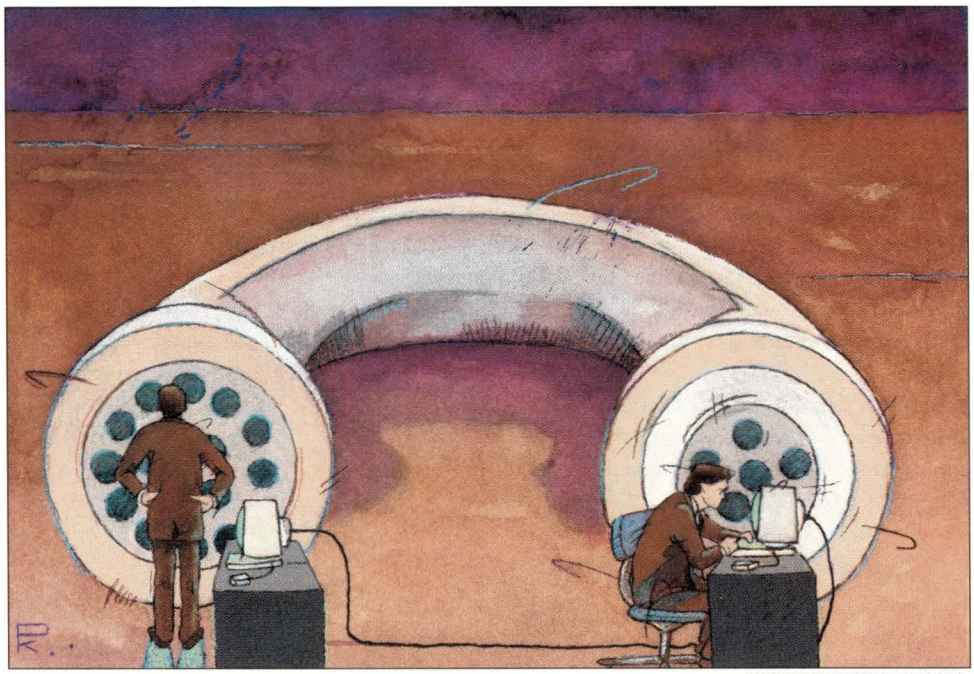

ILLUSTRATION BY PETER KALABOKIS

System Performance

by DINAH MCNUTT,
Pencom Software Inc.

A user calls you up complaining that the system is "slow." What do you do? The user probably cannot quantify "slow," but maybe you can determine if there really is a problem and how it can be fixed.

The word "system" includes all the resources required to support the user's environment: workstations, file servers, the network, etc. Most people don't care that the problem is on a file server five buildings away. If it is impacting them, it might as well be a problem on their desktops. So, in these complicated times of distributed computing, you have to know a little bit about everything in order to meaningfully troubleshoot performance problems.

Strategy

Like all system administration tasks, you are usually better off if you spend a little time up front putting some scripts in place to get you started:

- Enable accounting by uncommenting the following line in `/etc/rc`: `#/usr/lib/acct/startup`.
- Add a command (`/usr/etc/sa -s > /dev/null`) to compress accounting files to root's `crontab` file.
- Add commands to create periodic reports to root's `crontab` file.
- Use `watcher` in combination with `iostat`, `vmstat` and `uptime` to monitor system load and report on abnormal activity. We'll discuss these commands in more detail later.
- Using output from the reports created above, identify your system's bottlenecks. These will be areas to check first when problems occur. Know which applications are the troublemakers.

Finding time to do all this is left as an exercise for the reader.

Troubleshooting

OK, you're prepared. You've identified the bottlenecks and the problem areas. Now you get a call from an irate user complaining that the system is "slow." First, do some triage and ask if everything is slow or if it is just one application. Your answers will vary depending on the expertise of your users.

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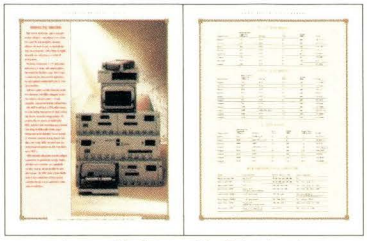

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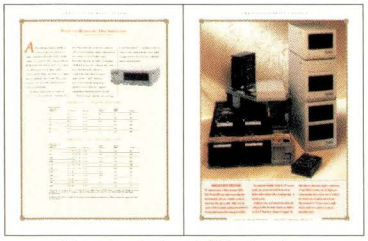

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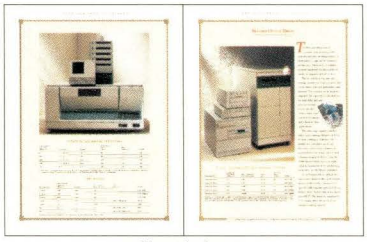

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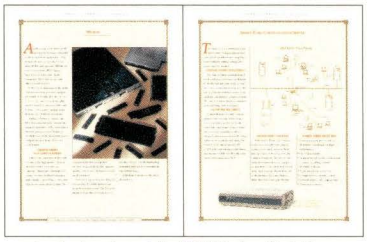

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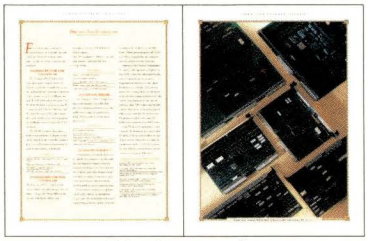

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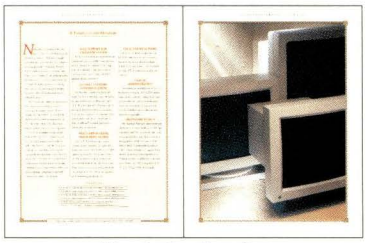

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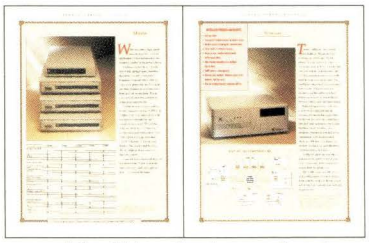

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Circle No. 2 on Inquiry Card

```
procs   memory            page              disk              faults     cpu
r b w   avm   fre si  so  pi  po  fr  de  sr  d0  d1  d2  s3  in  sy  cs  us  sy  id
0 0 0   0     640 11  62  57  44  0   0   0   0   0   0   0   0   0   2   2   1   9
0 0 0   0     584  5   0  0   0   0   0   0   0   0   0   0   4   22  1   0   0   0
0 0 0   0     544  0   0  0   0   0   0   0   0   0   0   0   0   9   0   0   0   0
```

Figure 1. Troubleshooting Memory

Log onto the offending machine and see what programs it's running. Notice connections from other systems. The user could be running a remote program and displaying the results back to the workstation via the X Window System.

If you know your trouble areas, go ahead and tackle those using the commands and tools described in the next sections. Otherwise, identify potential problems using the steps outlined below:

• Run `uptime`. Is the system load high? (This is one reason you need to know what is "normal" for your system.) If so, CPU overload may be your problem.
• Run `ps -aux` and look for processes waiting for disk access or paging. Look at the STAT field and search for processes with a D (waiting for disk I/O) in the first position. Now check for CPU-intensive processes. Look at the %CPU and TIME fields. A program with a consistently large %CPU value should be looked into. Next, look at %MEM, SZ and RSS, which are keys to identify memory-intensive processes. These are the keys to identifying memory hogs. Also look for processes with a W (indicating the process is swapped out) in the second position of the STAT field.
• Use `iostat 5` to eliminate I/O as a possible problem:

```
    tty              sd3         cpu
tin tout  bps  tps  msps  us    ni    sy     id
0   2     1    0    0.0   0     0     0      99
0   7     0    0    0.0   0     0     0      100
```

Look for unusually high values for `bps` and `tps`. (Your output will vary depending on how many disks your system has.)

If you cannot find a problem with memory or I/O, then chances are your problem is either CPU overload or a network problem. You can diagnose a network problem using the tools discussed below. However, the CPU performance is affected by so many other constraints (memory, I/O, etc.) that sometimes you cannot prove it is the culprit. You must eliminate all other resources as the source of the problem, leaving only the CPU to blame.

CPU Overload

Here are some guidelines for relieving your overworked CPU:

• Eliminate unnecessary processes and daemons.
• Run jobs off-hours with `cron` or `at`, if possible.
• Use `nice` and teach your users to be nice.
• Work with your applications programmers to identify bottlenecks in applications.
• Look for ways to balance the workload. If you have several machines available, run CPU-intensive programs on the faster machines.

Buying more hardware may be the long-term solution, but some of these steps will help relieve the immediate crunch. More and more vendors are coming out with multiprocessor systems that can provide a low-cost migration path to a faster system.

Memory Problems

To further troubleshoot suspected memory problems, use `vmstat -S 5` (see Figure 1). The first line shows averages since the system was booted and should basically be ignored as unreliable. By taking five-second intervals, you can get a good snapshot of what is going on on your system right now. The fields of interest are:

`r` - Number of runable processes.
`b` - Number of processes waiting for I/O. A high number here may indicate an I/O problem.
`w` - Number of swapped out processes.
`fre` - The amount of memory in kilobytes.
`pi` - Number of pages/second that have been paged in. New processes always cause a page-in to occur and a large number here may point to many processes being created. (Ever have a noisy terminal line that causes `gettys` to be created over and over again?)
`po` - The rate at which page-outs are occuring. This field should be non-zero most of the time.
`de` - The "anticipated short-term memory shortfall." This field should always be zero. You are definitely having memory problems if you find anything but a zero here.
`d0, d1, d2` - I/O operations/second on each disk drive.
`id` - Percentage of total CPU that is idle.

Look to see whether page-outs or swap-outs are occuring constantly. Either one of these will indicate a memory problem.

Again, the real answer is buy more memory! We are living in the age of $150 for 4-MB SIMMs. That doesn't help if your system doesn't use SIMMs, however. Here are a few steps that may help in the interim. Trim down your kernel. Last time I looked, the default GENERIC kernel from Sun took up almost 2 MB of memory. Spending some time con-

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```
Name  Mtu   Net/Dest  Address    Ipkts    Ierrs  Opkts   Oerrs  Collis  Queue
le0   1500  my_net    houston    1218687  4      450975  16     2915    0
lo0   1536  loopback  localhost  662      0      662     0      0       0
```

Figure 2. Troubleshooting Net Performance

figuring system-specific kernels may free up a little bit of space. Second, make sure your programmers are as generous with `free()` as they are with `malloc()`. Also, use shared libraries whenever possible.

Disk I/O

To further isolate an I/O problem, let's revisit the output from `iostat 5` listed above. Make sure the I/O is distributed proportionally among the disks. Are the fastest disks doing their share of the work? Note that a user may report a problem accessing a remote file system. The problem may be an I/O bottleneck on the server or a network problem. Using `iostat` will help you decide if disk I/O is the problem.

A caveat: What is first identified as an I/O bottleneck may turn out to be a memory shortage. A memory problem could be causing an increase in disk activity due to swapping or paging, so you need a good understanding of how your disks are being used.

You could buy more disks, but this won't necessarily help. This is one area where there is quite a bit you can do to help the problem, but it may require a lot of work:

- Reorganize your file systems to distribute I/O activity. (My personal favorite. I love spending a weekend doing this.) Use your fastest drives for the I/O-intensive programs.
- Make sure all non-critical files are removed. A full file system will not perform as well as one with room to breathe. I have a `cron` job that weekly searches the system for core files and sends the owners a mail message notifying them of the location of the files. (I don't like to arbitrarily delete files that don't belong to me.) Also, search for orphaned files that may belong to a user that is long since gone. The program `find` is nifty once you get the hang of it.
- Use a smaller block size on file systems with lots of small files (like your news server) and vice versa.

Network

If you can't blame anything else, there is always the net-

Some Sun users remember the old days very fondly.

work. That is an especially good candidate if someone other than you administers it. Actually, your network administrator will probably appreciate it if you can supply some useful data in addition to reporting that the network is "slow."

Using `netstat -i`, you can display some useful network statistics (see Figure 2). `Ipkts` indicates the number of input packets since boot time. `Opkts` is the number of output packets. `Ierrs` and `Oerrs` refer to input errors and output errors, respectively. These values should be less than 0.025% of the number of input or output packets. Check the `Collis` column to see how many collisions have been detected since boot time. (This is another example of where you need to know what is normal for your system.)

You can check for dropped packets by running `spray` to a remote system and checking the number of dropped packets against the change in the number reported by `netstat -s`.

Use `nfsstat -c` to report statistics on NFS requests made by a system. Compare `badxid` to `retrans`. If they are close, you are having problems with one of the NFS servers. If `retrans` is much higher than `badxid`, then the problem is probably the network itself. You can use the `-z` option for `nfsstat` to zero the counters. This feature is useful in determining if a problem is occuring now.

Summary

Sometimes the answer is "spend money." The reality may be that you will have to work with the resources you have, so use the tools available to you to understand the problems and work around them (or with them) when possible. Also, use `accounting` and `watcher` to help collect data so you have a history of trends and can possibly even predict these problems before they happen. This data is especially valuable for networks that are evolving. Excess network bandwidth today may disappear tomorrow and the network will become a bottleneck to the "system" as we have defined it. Aided by your toolkit, you can predict performance degradation and warn the appropriate folks in advance. Finally, I cannot stress enough the importance of understanding how your system normally behaves. Run `iostat` and `vmstat` when the system isn't loaded in order to understand how to interpret the data when the system is loaded.

References

If you don't have these books, get them. They are both excellent. I used the ideas presented in *System Performance Tuning* as the basis for writing this column.

1. Loukides, *System Performance Tuning*, O'Reilly & Associates, Inc., 1991.
2. Nemeth, Snyder, & Seebass, *UNIX System Administration Handbook*, Prentice Hall, 1989.

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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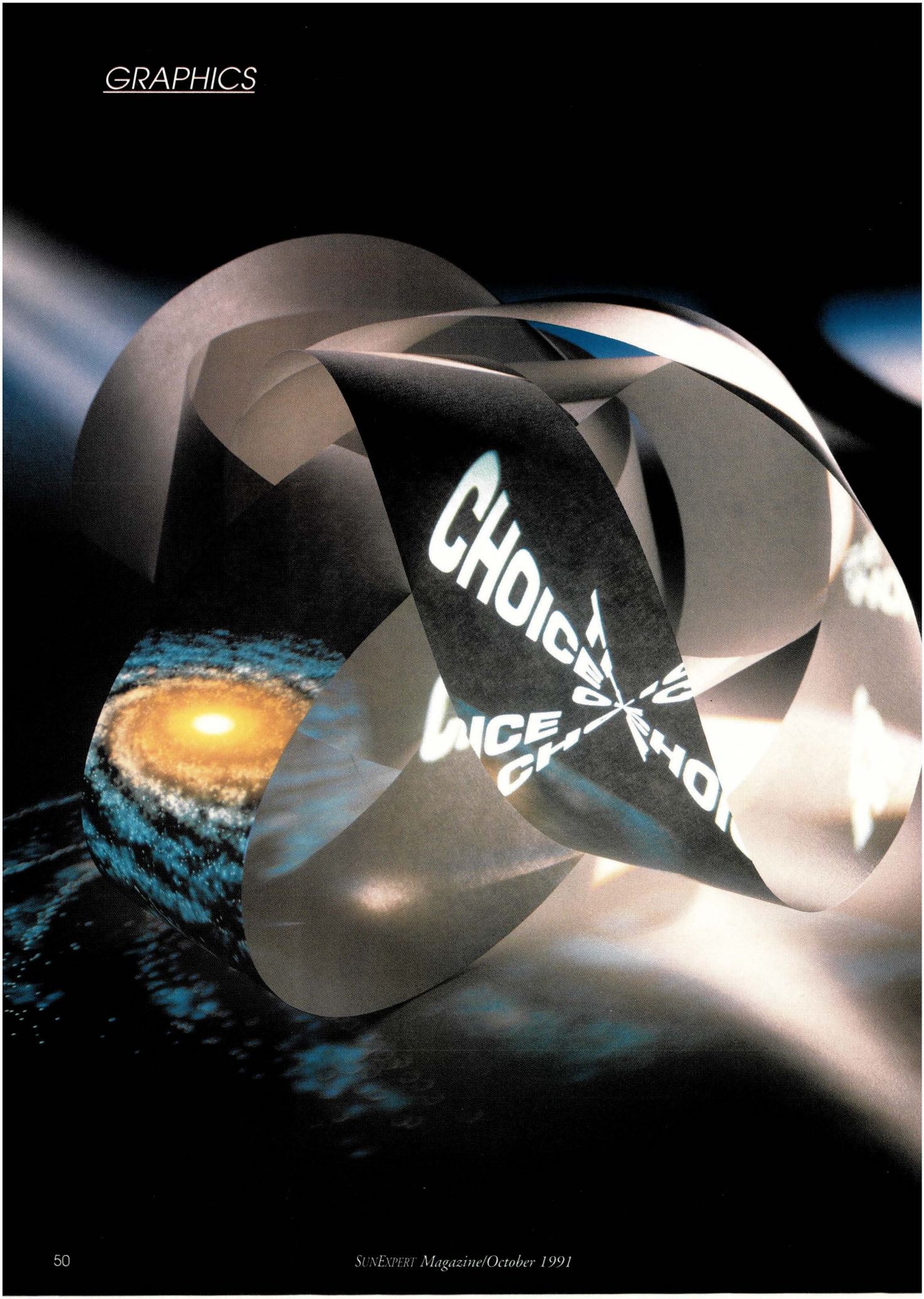
CHOICE

Graphics Hardware: The High-Tech Hydra

by **MICHAEL JAY TUCKER**,
Executive Editor

Suns are not famous as graphics boxes, but increasingly they're the platform of choice for many different graphically oriented applications.

Sun Microsystems Inc. isn't good at graphics, and is *proud* of it.

It's a cliche to say that Sun workstations and compatible SPARCalikes are middle-of-the-road graphics boxes at best. It also happens to be true. An average, fresh-from-the-box Sun workstation has nothing like the resident graphics hardware you might find on a similar machine from Silicon Graphics Inc. The SPARC processor, though it increasingly incorporates more and more functionality into itself, has nothing like the graphics capability developers are discovering with other RISC chips, for example, the Intel Corp. i860.

And Sun makes absolutely no apologies for it. "Our business is volume," says Larry Hambly, Sun's vice president of marketing. The company's

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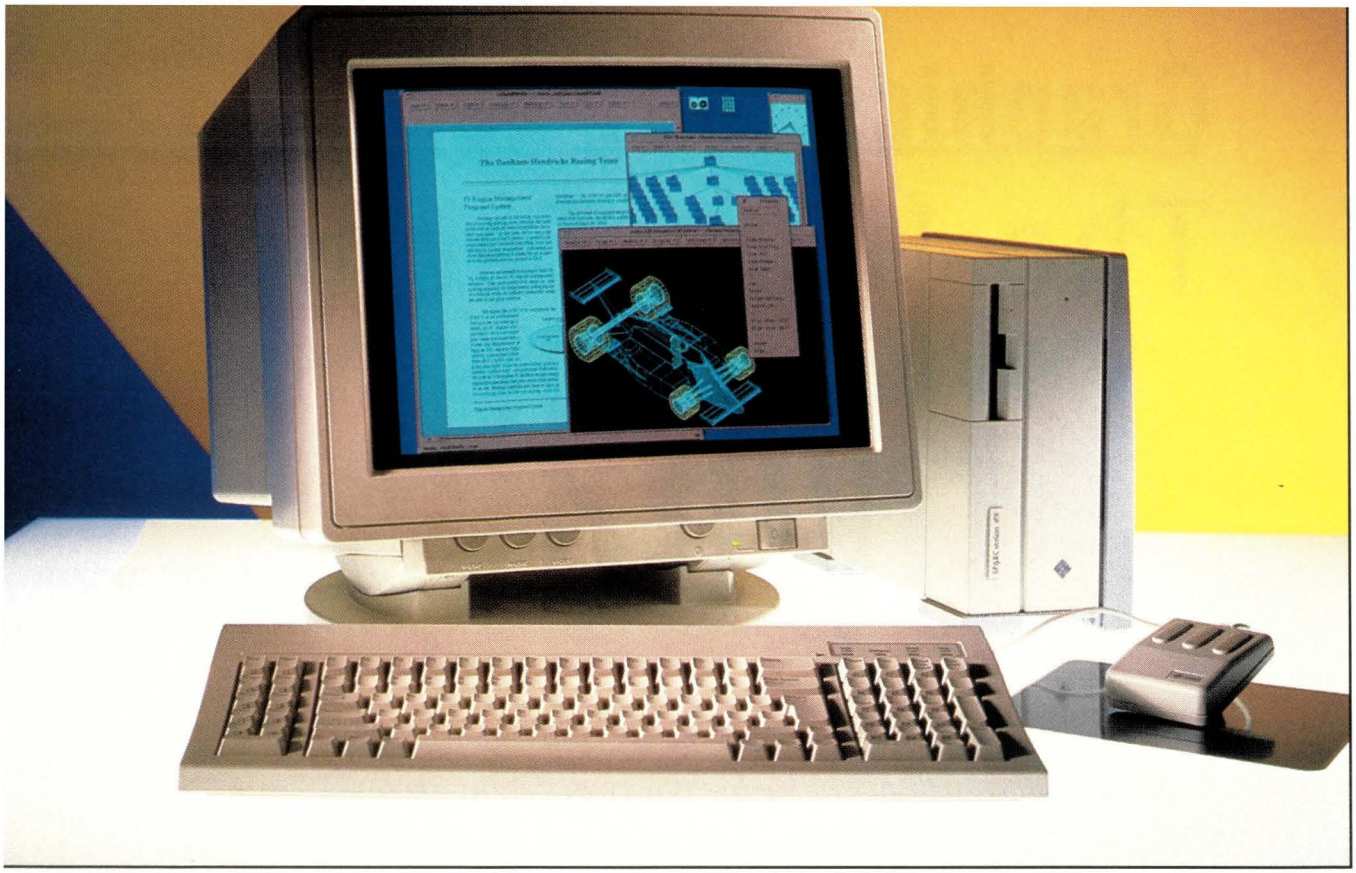
Editor's note: The following is the first of a two-part series on graphics on Sun and compatible machines. This month, we'll look at hardware; next month, software.



The IPX is Sun Microsystem Inc.'s current low-end graphics box. It incorporates on the motherboard GX technology that used to be merely an option.

machines are meant to cover the broadest possible spectrum of applications, and that means the products have to be generic and unspecialized. And, in Sun's opinion, very-high-end graphics is the stuff of specialization. "I don't think you'll be seeing very much coming down from Sun that is too narrow anymore," Hambly says.

But, that can be an advantage as well. That Suns are generic means they can be almost infinitely adapted. Users who have Suns, but who also wish to do high-end graphics, can turn to a growing number of add-in, add-on or otherwise attached products.

Indeed, some analysts say that Suns could become the platform of choice for computer-graphics specialists–not for what they have, but for what can be added to them.

Going Like Fury

First of all, it's important to note that graphics as a technology is ill-defined. For some computerists, graphics means high-end, 3D photorealistic animation. For others, the occasional bar chart more than fits the bill for a technical wonder. Worse, as a term graphics has been applied to applications in many, many disciplines–some only faintly related. Thus, "graphics" has been used to refer to scientific visualization, geographic-information systems, video, document management...even imaging.

Yet, if graphics can be difficult to pinpoint exactly, what is clear is that workstations are going there, wherever that happens to be. "We've recently done a major survey of graphics people," says Dan Baker, research director of the Computer Graphics Research Institute, a market-analysis firm based in Sudbury, MA. "In the traditional computer-graphics market, the buying power is going to workstations. Something like 43% of our respondents were planning purchases of workstations, rather than PCs or dedicated systems."

In fact, he notes, there are specific markets within graphics where workstations do even better than that. While business and presentation graphics are still very much the property of PCs, workstations dominate in all the higher-end applications–animation, video and scientific visualization among them.

Moreover, among those workstations, Suns are doing surprisingly well. "Sun is tied with Silicon Graphics for the lead," says Baker, which is rather amazing given SGI's traditional graphics focus. "Some 21% of our respondents were using Suns or planning to do so, with SGI at about the same...IBM Corp.'s RS/6000 was about 16%."

What sort of a market does Sun have 21% of? "Well, it's growing like fury, and yet it is a disaster in many ways," answers Robi Roncarelli, president and founder of Pixel Inc., a market-research firm based in Toronto. "There are parts of the market that are suffering because of the recession." He notes in particular that producers of high-end computer graphics for TV commercials have had their problems of late, as have developers of products for industrial design. On the other hand, there are places they flourish. "The value of, for example, commercial animation broke the $1-billion mark in 1990-91," he says.

Moreover, Roncarelli argues that the dominant theme of the graphics industry is rapid expansion–though, paradoxically, the success of vendors in that market isn't guaranteed. "There are more [graphically oriented] machines installed because their prices are coming down so dramatically," he notes. "But, any one machine will be doing less."

Industrial Illumination

So, if you mean to do high-end graphics on a Sun, what can you buy to make the business a bit more appealing? Well, Sun itself offers a number of board-level products for SBus-based systems, like the SPARCstation and the IPC. "For the low-end, there's the GX [board]," says Ingrid Van Der Hoogan, Sun's product manager for 3D graphics systems. "And, frankly, for most people, that's enough."

The GX is an SBus board that offers 8-bit color planes, a resolution of 1152 by 900, 450,000 2D vectors per second, and 240,000 3D vectors per second. Until this year, it was the entry-level graphics product for Sun. It is still one of the few 8-bit options for owners of existing IPCs and SPARCstations.

It is also, however, doomed. During the summer of 1991, Sun announced that the GX board had been shrunk to a single chip that will now come standard on the motherboards of many Sun systems. Sun's IPC product line, for example, is to be replaced by the IPX, which is essentially the IPC with the GX graphics chip as a standard part.

"If," continues Van Der Hoogan, "the user wants to do 3D solid modeling...and they don't want to spend a whole lot of money, they can move to the GS, which is a triple-wide, 3-slot SBus board." With the GS, a SPARCstation 2 becomes the SPARCstation 2GS. It is a 24-bit color device with a resolution of 1152 by 900, a 12-bit double buffer, and a 16-bit Z buffer. It performs 150,000 2D vectors per second and 150,000 3D vector per second.

To go above the GS in Sun's current product line, you then have to go outside the SBus to a tower-configuration product. "That's the GT model," says Van Der Hoogan. "The GT standing for Graphics Tower...we haven't been able to fit it in a pizza box. At least not in this generation." She hints, though, that very shortly this will change.

In today's technology, however, the GT tower gives a SPARCstation 24-bit color with a resolution of 1280 by 1024. There is also a 24-bit double buffer and a 24-bit Z buffer. It can perform 500,000 2D vectors per second, and an equal number of 3D vectors per second. In addition, it can provide 100,000 shaded 3D polygons per second.

The Xerox Copy

What is a *volume* application where graphics and Sun Microsystems Inc. workstations meet? One such is document-image processing, that combination of technologies by which text and graphics can be digitized, where necessary modified, and then pumped through corporate networks.

Increasingly, document processing is being seen as the next major use of computers in the commercial world. And, also increasingly, the name people associate with that document processing is Xerox Corp., which markets an entire document-processing system based on Sun hardware.

"The relationship actually began several years ago," says Joe McGrath, Xerox's vice president of worldwide marketing, integrated systems. "Xerox came to recognize the need to move off proprietary systems." But, given the complexity of the application, Xerox also knew it needed a powerful, RISC platform. "The processor requirements were particularly high...everything we did was client/server, and graphically based."

Xerox turned to Sun, and in fact, McGrath says that Xerox assisted in the decision process that ultimately resulted in the IPC. "We'd been in the business long enough to have a pretty good idea of what they needed to do...we knew what size the system had to be, the amount of heat it could generate, its power requirements, and so on."

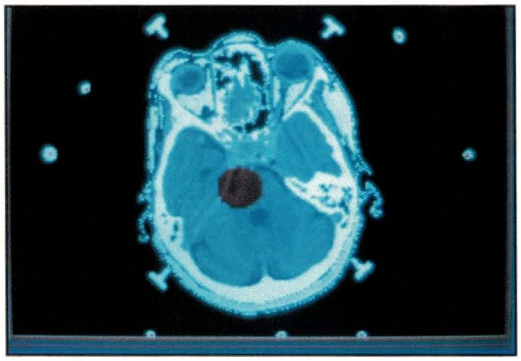
Xerox then ported its software to the IPC–no small task. "The total number of lines [of code] was over a million," says McGrath. But, he says, the project was worth the effort. He says that Xerox has been particularly successful in places where documentation is vital. "There is a direct correlation with paper-intensive industries," he notes. "We are most successful in those industries where the documentation becomes as important as the actual product,"–as in, for example, the pharmaceutical industry, where knowledge of a drug's side effects can result literally in a life-or-death situation.

The Stardent Alternative

One option for Sun Microsystems Inc. users who need high-end graphics is to actually move off Sun platforms and onto alternative UNIX hardware. In an age of increasingly standardized networks, when data can flow from one node to another and back again, this is less difficult than it once was.

Among the companies that have made a stab at the high-end graphics and visualization market is Stardent Computer Inc., the former Steller and Ardent computer companies. The company has taken as its chief focus the visualization market.

Currently, the company actively markets products based on the MIPS Computer Systems Inc. processor. However, this year it announced the Vistra 800 line, workstations based on the Intel Corp. i860. "It is now possible," says Paul Esdale, Stardent's director of visualization marketing, "for a desktop system [to have] many times the power, at a quarter of the price of large boxes just two years ago."



Medical imaging may be the most dramatic of all applications of computer graphics. Here, XKnife, an application from Radiosurgical and Stereotactic Applications Inc., allows physicians to visualize and later treat otherwise inoperable brain tumors.

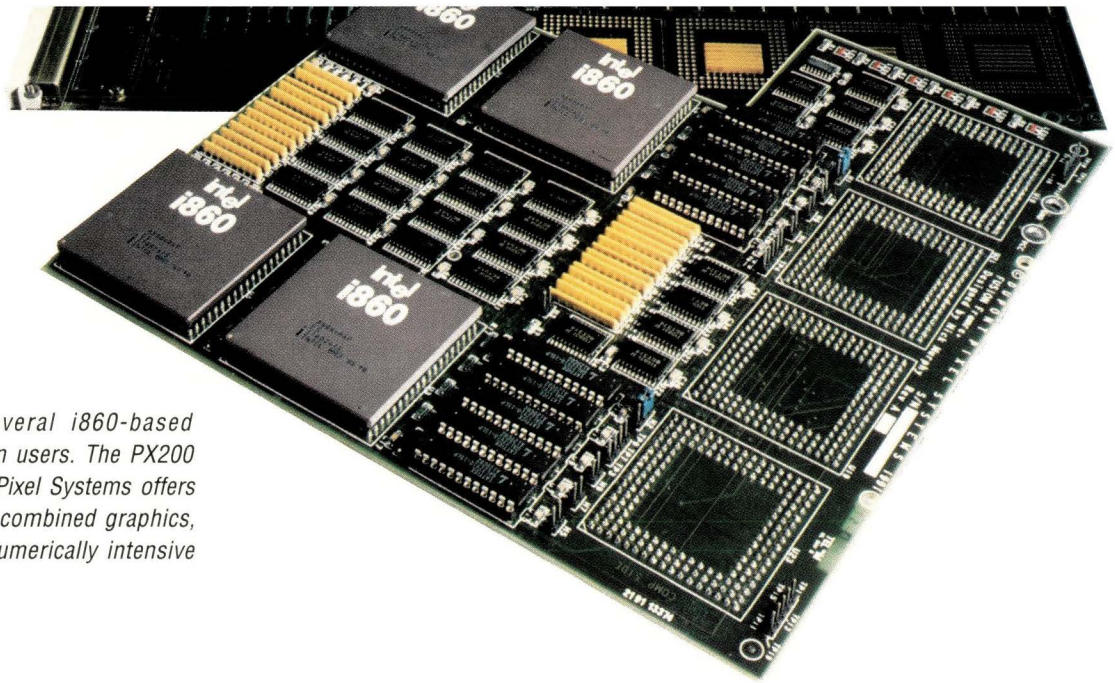
In addition, Stardent has developed a software environment–the Application Visualization System, or AVS–which is becoming something of a de facto standard for scientific-visualization applications. It has been ported to other UNIX machines including Suns. (AVS will be covered in more detail in next month's issue.)

Stardent, and AVS, have some rather dramatic users. Consider Radio Surgical and Stereotactic Applications Inc. (RSA), Brookline, MA. "XKnife is our product's name," says Mark Dopheide, RSA's vice president, "for knife-less surgery." Specifically, RSA is making available techniques originally developed at Harvard Medical School for the treatment of otherwise inoperable brain tumors.

Normally, such tumors are treated with radiation over a long period. However, this can also damage healthy tissue. RSA's method is to use a variety of imaging techniques to very precisely locate the tumor, and then to kill it with a single burst of radiation. "It is necessary for the physician and a physicist to determine if they are going to deliver a lethal dose to the target structure, without harming other, critical structures in the brain," says Dopheide.

He says that the i860-based Stardent has exactly the characteristics they need for their application. "We ruled out Suns fairly quickly," he notes. "Honestly, the graphics performance wasn't adequate."

But, one of the reasons he went with the Stardent was that the AVS environment, in which RSA did its application development, was also available on multiple platforms, including Suns. If RSA ever had to jump from Stardent, it could. "If Silicon Graphics' GL had run on other platforms, we'd have looked at them more closely," he says. "But, it didn't."



There are several i860-based options for Sun users. The PX200 from Du Pont Pixel Systems offers four i860s for combined graphics, imaging and numerically intensive operations.

The GT does all this via a number of ASICs. It also has an i860 on board, though Sun claims that the i860 is not involved with graphics performance. "It is basically just a front end," says Van Der Hoogan. "It doesn't do any real graphics." If that's true, then the GT is a curious machine indeed, using the i860–famous as a graphics device–as little more than a controller. Why have it at all? "That thought's been going through our minds as well," Van Der Hoogan admits. She adds that in future versions of the product some simpler processor may take the place of the i860.

Where the i860 definitely has a role is outside the SBus line. For VME-based products, Sun has the VX and MVX boards. A VX is based on a single i860 and provides 32-bit color, 1280-by-1024 resolution, a 32-bit double buffer, a 32-bit Z buffer, 300,000 2D vectors per second, 165,000 3D vectors per second and 15,000 3D shaded polygons per second.

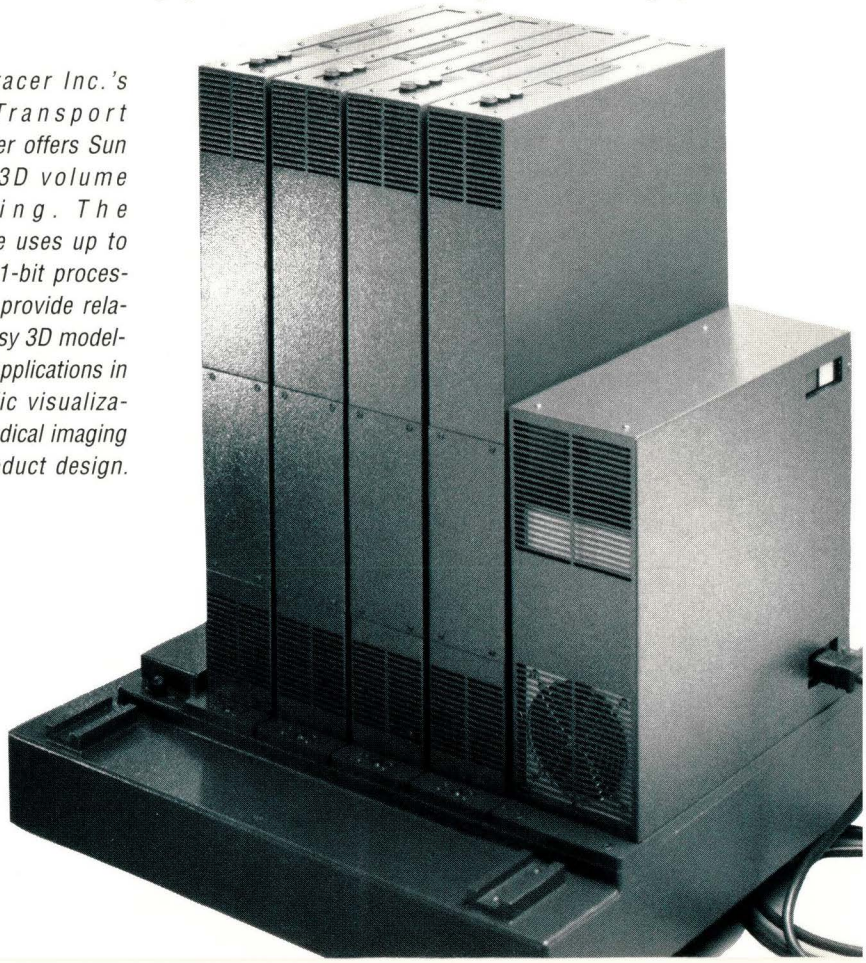
"And, for those who want still more power, you can add another board, the MVX, with four more i860s," says Douglas Schiff, Sun's acting manager for visualization, product marketing. This results in a system with 32-bit color, 1280 by 1024 resolution, a 32-bit double buffer, a 32-bit Z buffer, 350,000 2D vectors per second, 185,000 3D vectors per second and 15,000 shaded 3D polygons per second.

"I should add," concludes Schiff, "that the VX and MVX will be available in a tower, so that you will be able to use them with a desk [i.e., SBus] system…in the near future."

Whither GX?

Thus Sun, itself, offers products with significant graphics capability. What is not so clear, however, is the long-term direction of GX, GT, VX or MVX products. While Sun is actively promoting them, and continuing their development, there are hints that Sun doesn't want to be in the graphics-accelerator business. High-end graphics is, after all, somewhat at a variance with Sun's own professed goal of being the next generation PC–the generic, inexpensive, volume workstation that can adapted to everything but is specialized for nothing. "We are moving toward the less technical user," says Sun's Hambly. "Those people are much more price sensitive [than traditional graphics users]."

Ask him why Sun, then, developed its VX through MVX line of graphics



Wavetracer Inc.'s Data Transport Computer offers Sun users 3D volume imaging. The machine uses up to 16,384 1-bit processors to provide relatively easy 3D modeling for applications in scientific visualization, medical imaging and product design.

products, and he answers, "That's a good question."

He will not say that they were a mistake on Sun's part. He will, however, say "In the long run, they were a good investment, in that they taught us what we needed to know." In other words, they provided Sun with the technical know-how to implement what will eventually be not high-end graphics, but the base-level graphics power that will, in time, be the very minimum acceptable to workstation users. That minimum will always be shifting upward as price and technology dictate–just as processor power keeps racing ahead–but in the meantime, Sun has no need or desire to dash ahead of the market.

In that case, notes Hambly, "We'd be interested in finding third parties to help us deliver that high end [of graphics performance]."

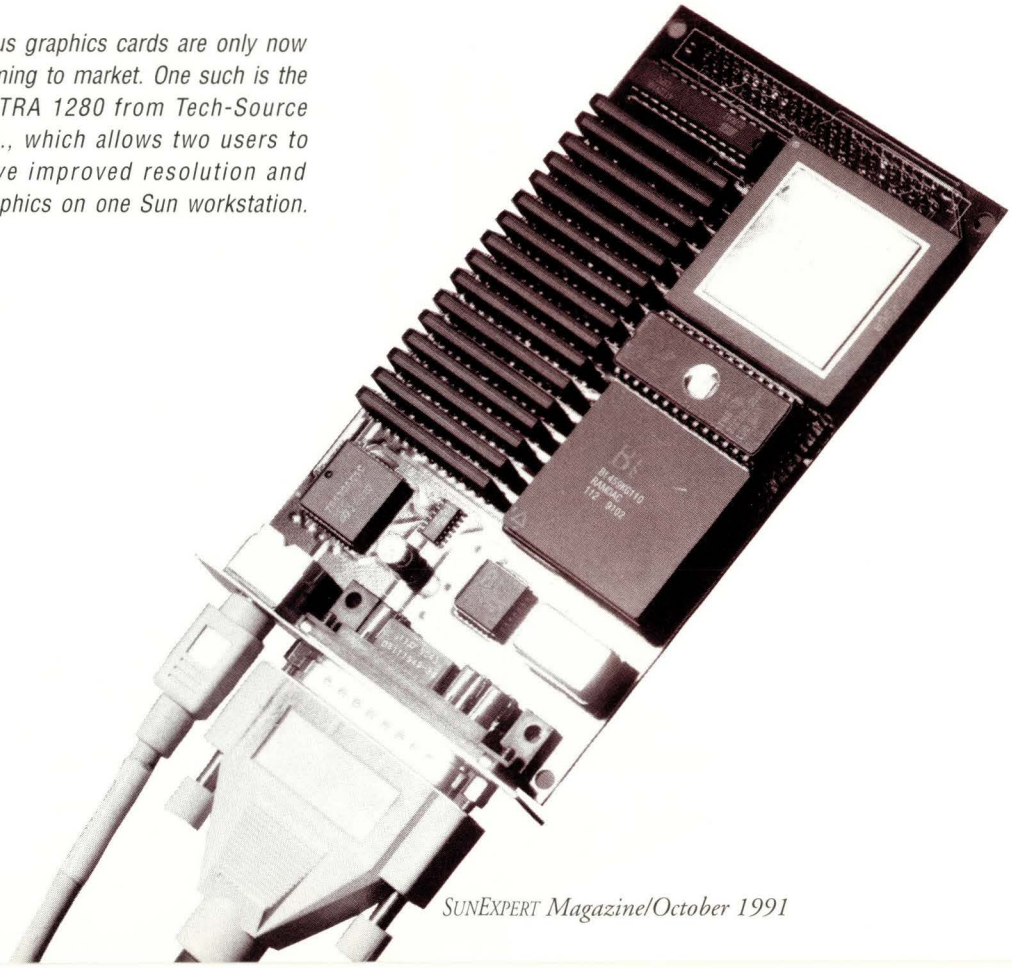
Indeed, there is already a flourishing market for third-party graphics boards and accelerators. Players in the SBus-board-level side of things include, for example, Megatek Corp. Its products include the X-Cellerator/SBus, a 2-slot device meant to accelerate both text and graphics in the X Window System environment on Suns and compatibles. The X-Cellerator uses the Texas Instruments Inc. 34020 graphics chip to produce 8-bit color and flicker-free animation at several different resolution options–including 1280 by 1024 at 60 MHz to 1152 by 900 at 76 MHz. The company says the product will accelerate almost any X-based application that runs on OSF/Motif or Open Look. Users are not required to do any programming on their own.

Other SBus-based graphics devices are coming on line–albeit, somewhat slowly, given the fact that many board companies are only now acquiring the tools and technology to develop on the small scale required by SBus cards. However, among those that are coming to market are some unusual twists on the theme. Tech-Source Inc., for instance, has introduced the GXTRA 1280 SBus graphics controller. This device takes the display from one SPARCstation or SPARCalike and feeds it out to two displays, each with a resolution of 1280 by 1024. Tech-Source also has a line of VME graphics boards.

Another player about to enter the SBus world is Du Pont Pixel Systems. The U.K.-based division of Du Pont Co. offers several i860-based boards for VME and, soon, SBus systems. Known as the Fusion product line, these range from the relatively small PX10, with two i860s, to the PX200, a VME device with no less than four i860s. It thus rivals Sun's MVX product, and may surpass it in some respects. "Most companies offer either graphics, or imaging, or numerical [processing]," says Mike King, Du Pont's marketing manager. "We offer all three in the same product." The company has also announced an emulation of SGI's famed GL library on its systems, thus allowing Sun users to access at least some GL-based applications.

VME graphics boards, for which Sun drivers already exist or can easily be developed, are generally more common than SBus ones. They include the 6U VCT-V and VCF-V from Peritek Corp. The VCT-V provides 24-bit true color, while the less expensive VCF-V offers 8-bit. Both are 6U VME boards based on the TI 34020

SBus graphics cards are only now coming to market. One such is the GXTRA 1280 from Tech-Source Inc., which allows two users to have improved resolution and graphics on one Sun workstation.



Companies Mentioned In This Article

Du Pont Pixel Systems
Du Pont Co.
2000 Edmund Halley Drive, Ste. 590
Reston, VA 22091-3436
Circle 100

Megatek Corp.
9645 Scranton Road
San Diego, CA 92121
Circle 101

Octree Corp.
7337 Bollinger Road
Cupertino, CA 95014
Circle 102

Peritek Corp.
5550 Redwood Road
Oakland, CA 94619
Circle 103

Silicon Graphics Inc.
2011 N. Shoreline Blvd.
P.O. Box 7311
Mountain View, CA 94039-7311
Circle 104

Star Technologies Inc.
Graphicon Products Divison
P.O. Box 13951
Research Triangle Park, NC 27709
Circle 105

Stardent Computer Inc.
6 New England Tech Center
521 Virginia Road
Concord, MA 01742
Circle 106

Sun Microsystems Inc.
2550 Garcia Ave.
Mountain View, CA 94043
Circle 107

Tech-Source Inc.
442 S. North Lake Blvd., Ste. 1008
Altamonte Springs, FL 32701
Circle 108

Univision Technologies Inc.
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Burlington, MA 01803
Circle 109

Wavetracer Inc.
280 Great Road
Acton, MA 01720
Circle 110

32-bit graphics processor, which is increasingly becoming a standard in graphics. Still another player in the market is Univision Technologies Inc., which has VME products for Suns, as well as other systems. In recent years, Univision has targeted image processing and video.

A recent entrant, with a very new approach, is Octree Corp., which offers a VME board to do interactive volumetric modeling. The SolidsEngine, along with the company's software, allows users to render objects very precisely in 3D. Primary applications include scientific visualization and medical imaging, though the company says CAD and simulation are logical ends as well.

Ride The Wave!

But it is outside the chassis that you find real exotica. Consider, for example, the Data Transport Computer (DTC) from Wavetracer Inc. The DTC is a relatively low-cost (under $100,000) tower that links to a Sun or compatible via a SCSI connection. It also contains 4,096 to 16,384 individual processors. Each processor is extremely simple–they are 1-bit parts–but each is massively interconnected to every other. In fact, each processor has no less than six links to its neighbors.

But, the DTC is not some experimental box for parallel-processing research. Instead, it is designed to simulate and then display 3D problems, with each processor modeling one small aspect of the model in question. In a material-science application, for instance, a researcher could simulate, on an atomic level, the behavior of a test substance. Each processor could model one atom of the material. The research could then apply stress to the model and watch as each atom effects its neighbors.

This style of computing isn't unique to Wavetracer, but the company has gone out of its way to make it both affordable and easy. The company offers a variant on C–multicC–for developing 3D simulations, as well as software kits for various applications and support for workstation-based visualization software. As a result, the DTC is probably never going to be a big winner in the commercial animation market, but it will be very difficult to beat in those areas of scientific visualization Wavetracer cares to address.

The operative term here, though, is "cares to address." Wavetracer's products are meant to provide scientific visualization and modeling functions to technical users, that is to say, a subset of the total potential market for graphics products. Thus, while the DTC has a horizontal market–meaning one that covers many different industries and professions–you don't have to go very far from Wavetracer before you start running into actual vertical-market products.

Indeed, if there is a theme to high-end graphics hardware, it seems to be Balkanization. As general-purpose systems come up in performance and drop in price, the market for specialized hardware moves up, in turn, to high-performance niches.

For instance, there are flight simulators. Star Technologies Inc., a maker of supercomputer-like devices that also incorporate SPARC processors, has recently announced the HP2000/PTX. "It is basically an image generator for real-time simulation," explains Brad Wyckoff, senior marketing engineer at Star. "It's based on three boards we make, plus a SPARC board." In other words, it is a Sun-compatible virtual-reality machine.

"Our product is very specific to a very narrow market," says Wyckoff. "We only deal with real-time simulation...we don't try to do a million polygons a second...we just worry about how you look at 60 frames a second." At $120,000, though, it is a cheap real-time simulation device, and it's finding markets in flight simulation. "The machine reproduces out-the-window graphics very well," Wyckoff says. Not as well, perhaps, as a dedicated system from GE, but well.

Thus it is that even here SPARC-based generic technology finds a place. In fact, the question that comes up is will Sun push into yet another horizontal market–that is, nothing less than applied Virtual Reality. ⊸

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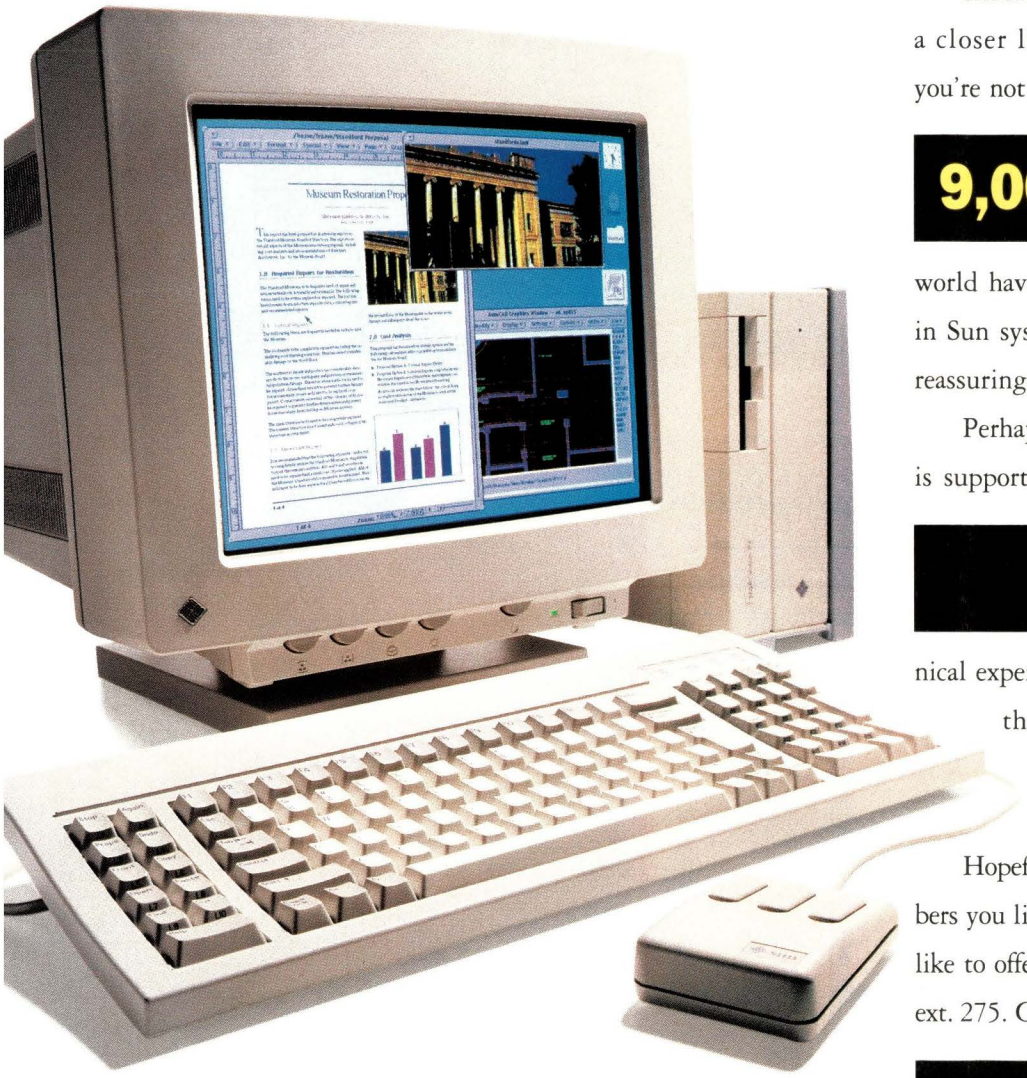

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Need UNIX Apps?

Have We Got A Deal For You

by **MARY JO FOLEY,** Senior Editor

Taking a cue from their PC/Macintosh counterparts, a handful of companies are making a bid to become suppliers of horizontal UNIX packages.

Where do you go for software when you can't beg, borrow or ftp an application you desperately need?

If you're a PC or Macintosh user, you have all kinds of options, ranging from mail-order catalog outfits to software superstores. But UNIX users have had, until recently, only two choices: VARs and independent software vendors (ISVs) themselves. These are fine channels for complex vertical packages, but far from satisfactory ones for tools and simple "personal-productivity" applications.

Several companies, aware of this shortfall, have launched themselves as UNIX software distributors. Some, such as Unipress Software Inc., have come from the software publishing business to the software distribution business. Others, such as Qualix Group Inc. and UNIX Connection, are startups specializing in UNIX application distribution. Sun Microsystems Inc.'s masterVAR Access Graphics Technology Inc. has jumped into the software-distribution fray, with its deal with Ashton-Tate Corp. (now part of Borland International Inc.) to distribute dBASE IV for Suns. Then, there are the businesses more geared to *physically* distributing UNIX software, using CD-ROM as their media of choice. These companies include Fulcrum Technol-ogies Inc., Highland Software Inc. and Young Minds Inc. (see "CD-ROM: The Distributor's Distribution Medium").

It remains to be seen, however, whether these new software providers can break ingrained buying–or, more accurately, non-buying–habits among UNIX users. In a study performed for Qualix, Computer Intelligence, the La Jolla, CA, market-research firm, found that typical UNIX customers are "not aware of, or actively seeking, products." By and large, they view workstations as systems designed to perform a single function, Computer Intelligence found. The average workstation user has bought one or fewer applications, compared to the average PC user, who has purchased three or four, and the average Mac user, who has bought more than seven, according to Computer Intelligence.

UNIX Users: A Breed Apart

Software distributors maintain that UNIX users would buy more applications if they: 1.) knew about them, and 2.) had an easy way to obtain them. They say this is especially true of horizontal software–items like system utilities, networking tools and personal-productivity/office software that typically sell for less than a couple of thousand dollars per user, and is more in the ballpark of many PC/Mac applications.

At the same time, "the nature of the UNIX-workstation user is different from that of the PC/Mac user," points out Richard Thau, chief executive officer of Qualix. "UNIX users are more like minicomputer or mainframe buyers. They're not shopping for the neatest, latest, greatest product at the lowest price."

UNIX Connection sees the same kind of market segmentation going on, according to president Bill Shott. "We're not focusing on being the price leader. Our goal is to merchandise, promote and sell to UNIX customers,

who often aren't aware of this kind of horizontal, off-the-shelf software."

Because they are targeting this kind of software, UNIX distributors' tools of the trade look a lot like those of PC/Mac software outlets. This means software catalogs, telemarketing salesforces and on-line product databases. But the way that UNIX distributors use these tools differs slightly from the way their PC/Mac counterparts use them, insist the UNIX distributors. For example, even though UNIX Connection relies for sales on a direct-mail catalog, "we aren't a catalog house," says Shott. "Our catalog is our shelf space, our storefront. It's a sales tool for our [direct and telemarketing] salesforces."

These cautions aside, there are an awful lot of commonalities between the PC/Mac and UNIX distribution businesses. Consequently, there is a growing pool of PC/Mac software distributors that gradually are moving over into UNIX territory, mostly by way of the Santa Cruz Operation's Xenix and/or SCO UNIX. Softmart Inc. and Software Resource are examples.

But unlike most of the traditional PC/Mac software distributors, UNIX software distributors support direct salesforces and usually some fairly substantial type of service and support organization. Some, such as Unipress, are even in the software-publishing business themselves.

"The development, marketing and distribution of UNIX software constitutes 100% of our business," says Mark Krieger, Unipress' president. All of the 15 software products Unipress distributes are "horizontal," Krieger says. Nine of them were developed by third-party ISVs. The other six are "in-house-managed" software, which means they are either products developed from scratch by Unipress or packages developed by third parties on which Unipress has done some engineering.

Unipress sells the more technical products (i.e., Designer C++, Emacs, IDL and various compilers) directly to end users. But more than 50% of its more commercial personal-productivity and networking offerings, such as XVision and PC-Connect, are going to resellers, Krieger says.

In fact, several UNIX-software distributors are moving product either partially or entirely through resellers. (One benefit of selling to VARs, cited by a number of distributors, is the less stringent requirement for the distributor to provide comprehensive service and support. Instead, the VARs seek help directly from the ISVs.)

Software Resource, which claims that about 10% of its business currently is attributable to UNIX software (primarily Xenix package) sales, is selling all of its applications–UNIX, PC and Mac–to resellers. "We supply what our dealers are asking for," says Linda Upcraft, director of marketing. And

CD-ROM: The Distributor's Distribution Medium

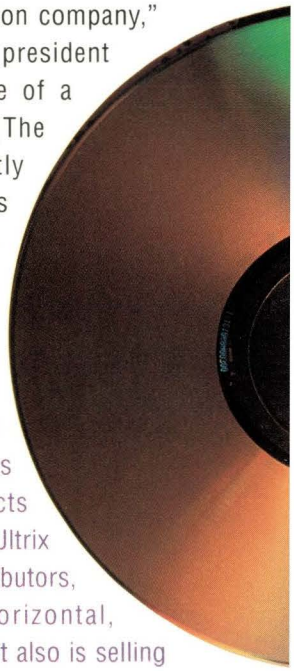
Move over tape and floppies. CD-ROM rapidly is becoming the preferred medium for distributing not only operating systems, but also application software for UNIX workstations.

The new crop of UNIX-software distributors say they are starting to see requests trickle in from customers for applications on CD-ROM. This is good news for companies such as Young Minds Inc. and Fulcrum Technologies Inc., which are in the business of providing CD-ROM media and related technologies–such as text-retrieval tools–to ISVs and hardware OEMs.

Fulcrum has incorporated its text-retrieval software into Sun Microsystems Inc.'s CD-ROM-based, on-line documentation product, called System Software AnswerBook. Among Fulcrum's other clients are Data General Corp., Hewlett-Packard Co., ICL plc, NCR Corp. and Unisys Corp. Young Minds, which sells a CD-ROM publishing tool called Makedisc, counts among its clients NeXT Inc., HP, Interleaf Inc., several major universities and the Sun User Group.

Another one of Young Minds' customers, Highland Software Inc., is emerging as a pioneer of CD-ROM UNIX-application distribution. Highland is marketing collections of UNIX applications from multiple ISVs for Sun, HP and Digital Equipment Corp. platforms. It calls its program the Software Store.

"We're not really a software publisher, which collects royalties, and not really a promotion company," explains company executive vice president Richard Mirabella. "We're more of a marketing-services business." (The Software Store program currently comprises only a third of Highland's business. The company also is in the software tools and software/license management businesses.)



Like other UNIX-software distributors, Highland acts as an interface between ISVs and end users. Currently, the company is distributing more than 80 products total for its Sun, HP 9000 and DEC Ultrix collections. Unlike other UNIX distributors, Highland isn't moving just horizontal, personal-productivity applications; it also is selling some vertical applications, such as CAD/CAM/CAE packages from AutoDesk Inc., CADshare Resources, CIMLINK Inc., Viewlogic Systems Inc. and others. "The only markets we don't address are workstations in an embedded environment," Mirabella says.

To test-drive an application on a Software Store disk, a user

"many of our UNIX products are DOS originals now available on UNIX."

Software Resource relies on an outside sales force for much of its PC/Mac business, and a telemarketing force for its UNIX software business–a strategy that is the exact opposite of the one followed by the majority of UNIX distributors. The company is also counting on catalogs to bring in software business, Upcraft says.

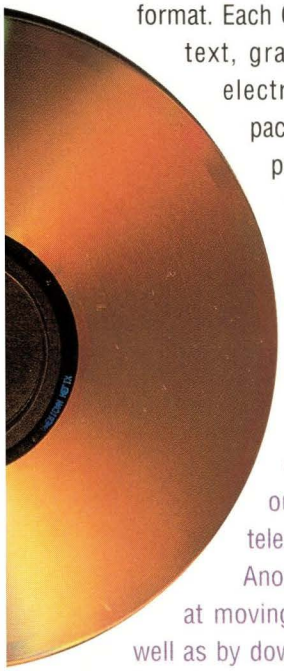
Another PC-software distributor that is increasing its UNIX representation, Softmart, is selling more than 300 UNIX-system products and applications, according to Trish Herlan, vice president of marketing and technical services. About 100 of these are SunOS packages; nearly all of the rest are Xenix applications. The company is a member of Sun's Catalyst program. Unlike Software Resource, Softmart directly supports the packages it stocks.

Softmart sells directly to large corporations and the government. It employs telemarketing salespeople to reach companies with fewer than 200 computers. Through its Advanced Operating Systems group, Softmart also offers its customers cross-platform porting, compatibility testing and product-recommendation services.

Like Softmart, other UNIX distributors are placing a strong emphasis on the services side of their businesses. With UNIX, "you have to do more than just provide product," agrees Qualix Group's Thau. "You need to provide support throughout the sales process," as well as during the post-sales process, he says.

On one side, Qualix supports the ISVs that have written the 14 applications it distributes. It even helps smaller ISVs put the finishing touches on products, write documentation, create advertisements and perform other technical and marketing chores. On the other side, Qualix supports the end users to which it distributes product. Once the company is operating at full tilt, Thau says, it expects to offer its customers 24 primary and between 12 and 24 secondary UNIX and DOS packages. Among the products Qualix currently carries are Applix Inc.'s Asterix, Insignia Solutions Inc.'s SoftPC emulation package, Legato Systems Inc.'s NetWorker and PrestoServe, and Visix Software Inc.'s Looking Glass interface.

In a similar vein, UNIX Connection provides services ranging from installation through maintenance for both ISVs and its end-user customers. The company currently has 50 products from 40 or so vendors in its fold. Among its offerings: dBASE IV from Ashton Tate, FrameMaker from Frame Technology Inc., Wingz from Informix Software Inc., Island Write, Draw & Paint from Island Graphics Corp., X.desktop from IXI Ltd., Lotus 1-2-3 from Lotus Development



needs a CD-ROM disk formatted according to the ISO 9660 format. Each CD, which can hold up to 550 MB of text, graphics and software, contains an electronic catalog of UNIX-application packages, applications themselves (with password protection), demonstration versions and on-line documentation. Highland also provides a toolkit, technical support and software-installation procedures on each CD. If users find applications in which they are interested, they contact the ISVs directly. "We don't take the order," explains Mirabella. "We're an outlier in the traditional catalog/direct/telemarketing channels."

Another distributor which is taking a stab at moving UNIX applications via CD-ROM–as well as by downloading them electronically–is RAD Technologies Inc. RAD Technologies is a year-old software publisher and marketeer comprised of a number of former Apple Computer Inc., Microsoft Corp. and Sun employees. Its CD-ROM Integrated Desktop (CDID) falls somewhere between Young Minds' Makedisc and Highland Software's Software Store technologies. Applications on CDID volume 1 are fully functional, with save and print functions disabled. To place an order for any product on the disk, customers simply call the ISV that developed it.

The CDID interface allows customers with DEC, HP, IBM Corp. and Sun workstations to sample from more than 30 commercial UNIX applications, including Applix Inc.'s Asterix, BBN Software Products' BBN/Slate, Frame Technology's FrameMaker, Insignia Solutions Inc.'s SoftPC, Island Graphics Corp.'s Island Write, Draw & Paint, and Precision Visuals Inc.'s PV-Wave Point & Click, among others. "We're focusing on the UNIX software that my mother could use," explains company president J. Jeffrey Morgan.

A number of packages that RAD Technologies plans to add to its list next year will be developed by RAD itself, Morgan says. For the Sun platform in particular, there currently is a dearth of "good point products and products that take advantage of networking," Morgan claims. "DOS and Mac packages that have been ported to the Sun aren't sufficient." At press time, RAD Technologies also was planning to allow users, via its Infonet service, to download applications from RAD over the Internet, rather than accessing them on CD-ROM. And it had signed a joint marketing/technology agreement with Sun reseller AVCOM Systems Inc., Palo Alto, CA, to help it develop the CD-ROM-based sales channel.

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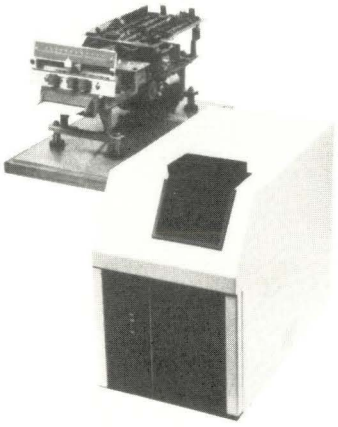

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Corp., and WordPerfect from WordPerfect Corp.

Advocates To The Rescue

Forrester Research Inc., the Cambridge, MA, market-research concern calls the new UNIX-software distributors "advocates." In Forrester's model, horizontal, personal-productivity software is known as "hybrid-ware." Three groups of companies will need to form close alliances in order to market hybrid-ware, Forrester says. These groups are builders (ISVs), advocates (software distributors) and specialists (consultants/systems integrators).

According to the Forrester view of the world, "Advocates cluster around a limited number of builders that they do business with–in essence forming a consortium of chosen builders. The advocate will offer a single point of support and account management for a user–integrating a lot of diverse technology in the process."

In short, "clusters" will emerge as a new software-distribution channel, supplementing existing direct, VAR, retail and mail-order methods of operation. While these current channels have worked fairly well for the past ten years, "cracks are appearing," Forrester notes. So advocates are arriving on the scene none too soon.

Employing a single source as your primary software supplier has other advantages. Channel Strategies Inc., a Palo Alto, CA, market-research company, has identified the numerous problems from which systems administrators and chief information officers are suffering in their attempts to manage large amounts of software from many providers in today's distributed environments. Software distributors/advocates can help reduce difficulties in managing software licensing, version control, compatibility and the like.

For the time being, the UNIX-software distributors themselves are seemingly content just to get the word out about their existence and their stock. But if they have their way, there may be more software applications running on your workstation in the not-too-distant future. ➸

Companies Mentioned In This Article

Access Graphics Technology Inc.
1426 Pearl St., 4th Floor
Boulder, CO 80302
Circle 113

Fulcrum Technologies Inc.
785 Carling Ave.
Ottawa, Canada K1S 5H4
Circle 114

Highland Software Inc.
1001 Elwell Court
Palo Alto, CA 94303
Circle 115

Qualix Group Inc.
1900 S. Norfolk St., Ste. 224
San Mateo, CA 94403
Circle 116

RAD Technologies Inc.
2660 Marine Way
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Circle 117

Softmart Inc.
Oaklands Corporate Center
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Exton, PA 19341-2508
Circle 118

Software Resource
8 Digital Drive, Ste. 100
Novato, CA 94949
Circle 119

Unipress Software Inc.
2025 Lincoln Highway
Edison, NJ 08817
Circle 120

UNIX Connection
474 Potrero Ave.
Sunnyvale, CA 94086
Circle 121

Young Minds Inc.
308 W. State St., Ste. 2B
Redlands, CA 92373
Circle 122

Snake Oil Here!

The HP 720 workstation and the HP 700/RX X-Station signal Hewlett-Packard Co.'s price/performance intent.

by BARRY SHEIN,
Technical Editor

Hewlett-Packard Co. takes workstation products seriously. This sincerity has pushed it to the number-two slot among workstation manufacturers, just behind Sun Microsystems Inc. and ahead of Digital Equipment Corp. These two products from HP are convincing testimonials to just how determined HP is about staying leading-edge in this breathtakingly competitive market.

SunExpert decided to review these products for two reasons: One, the price/performance is outstanding and, two, the machines might show up as nodes on your Ethernet. We also wanted to verify the performance numbers. They were either snake oil, or we were getting a glimpse at the near future of workstations. We thought you'd also be curious about these products.

Two new workstations, the HP 720 and HP 730 were recently announced as the first members of a new product line from HP. They are based on the HP/Apollo PA RISC CPU architecture. The performance claims are an eye-popping 57 and 76 MIPS, respectively.

We received an HP 720 color workstation for review. I'll admit that I was a bit skeptical about the performance claims compared with what I would actually find with these systems. HP's claims are about double (for the 720) and triple (for the 730) the performance of the SPARCstation 2. That's quite a leapfrog even in this industry.

The HP 700/RX is a new X-terminal from HP based on the Intel Corp. i960CA RISC CPU running at 22.7 MHz. Color models support eight graphics planes and 256 colors out of a palette of 16.7 million. Base price for the terminal we reviewed is $5,995 (with 4 MB memory). They're available in Tempest models. They support from 4 MB (2 MB monochrome) to 18 MB of memory. The unit we reviewed had 16 MB installed.

The HP 720 workstation is based

The HP 700/RX family of X-terminals includes 16- and 19-inch models and offers resolution up to 1280 by 1024 pixels.

on the HP 50-MHz PA RISC. It can support from 16 MB to 64 MB (the unit here had 32 MB). You can also get an optional EISA slot (standard on the 730). All models come with SCSI-2, Ethernet (thin and thick), two serial ports and a parallel port. Disks can be mounted internally, externally or both. Base price for the 720, diskless 19 inches, is $11,990. The 730 (72.2 SPECmarks) is $19,990. HP claims 17 MFLOPS for the 720, and 22 MFLOPS for the 730.

First Impressions

I've always liked HP engineering. These systems are no exception. The HP 720 just looks and feels solid, and that shiny metal back cage with its handles and well-designed layout has a real hands-on look to it. The color screen is crisp and clear. The keyboard is a little softer than I like, and has a decidedly "unique" layout, to be generous (the Escape key is just to the left of the left-shift key), but is usable.

The HP 700/RX X-Station is very similarly designed, on the outside, to the HP 720 workstation. Like the HP 720, it exudes the solid, professional engineering that has been HP's hallmark for decades.

CPU Performance: HP 720

Running Dhrystones 2.1 (register) was my first attempt to see if the performance claims were plausible. The result was the HP 720 clocking in at a very impressive 83,333 Dhrystones, or about 55 MIPS (relative to a VAX/780). I've benchmarked multimillion-dollar machines that can barely do half that.

Perusing my list of reported Dhrystone measurements, I see the fastest result is the Amdahl 5990-700, a mainframe by any definition, which ran at 91,463 Dhrystones. This is barely distinguishable on this benchmark from the HP 720. In all fairness, there's a lot more to a mainframe than sheer CPU speed (like earth-shaking I/O performance), but it is an event when an under-$15,000 workstation outperforms a reasonably current multimillion-dollar system on any significant benchmark. There's someone out there

Table 1 - Remote X Performance

	HP 700/RX	SGI 4350, color	NCR X-Station, color	Visual X-19, monochrome
Graphics	1.00	7.13	9.65	18.56
Text	1.00	2.10	3.72	2.26
Window	1.00	0.92	3.80	8.05

x11perf client run on HP 720 in all tests

who's going to find that interesting.

You can feel this performance when using the machine: Various utilities (such as uncompressing a large file) just run faster than one is accustomed to on other systems. The window system is more than snappy. Almost anything I try starts up instantly.

For comparison, HP's SPECmarks claim for the 720 is 55.5, and 72.2 for the 730. The IBM RS/6000 model 520 claims 24.6 SPECmarks and the 530, 32 SPECmarks. Sun reports 21.0 SPECmarks for the SPARCstation 2.

Table 2 - Local X Performance

In thest tests, the HP 720 had 32 MB of memory; the SGI 4350, 8 MB; and the Sun IPC, 24 MB.

	HP	SGI	Sun
	HP 720	4350, color	IPC, color
Graphics	1.00	40.20	6.62
Text	1.00	7.69	4.67
Window	1.00	2.97	4.00

x11perf client run locally on each system

Graphics Performance

To compare these two HP systems with other machines, I used a package called "x11perf" written by Joel McCormack, Phil Karlton, Susan Angebranndt and Chris Kent at DEC. X11perf performs 268 different graphics tests (each repeated several times after a calibration run, and the best time is summarized).

I arrived at just three numbers by breaking the test results into three categories: general graphics tests (lines, rectangles, fill regions, etc.), text (character, scroll), and window (map/unmap, pixmap, move window, etc.) tests.

I then took one of the systems (in these tables, the HP 720 workstation and HP700/RX X-Station) and treated it as the reference result. To do this, I normalized all other tests on a scale that places the reference system at 1.0. This prevents scale differences between tests used in the average from throwing off results. Only relative percentages are averaged within each group. For example, if a system measures 2.0 in a particular area then, on average, it's running half as fast as the reference system on that set of tests.

Table 1 compares the HP700/RX X-Station with a Silicon Graphics Inc. 4D/35 (color, 8 MB) being used as a remote X-Server, an NCR Corp. X-Station (color) and a Visual Technologies Inc. X-19 Turbo (monochrome).

The HP700/RX does significantly better than all systems tested on all results except window operations, where the SGI is about even in performance. I should point out that a test like this uses few, if any, of the special capabilities of SGI's machines. Operations like real-time 3D Gouraud shading of a bouncing gelatinous cube just aren't exercised at all. SGI's have special graphics hardware for performing such feats. But the SGI is the sort of system someone might consider for remote use with X11 in a data-visualization environment (perhaps viewing data in real-time coming off a supercomputer), so I felt the comparison was worthwhile. Another caveat: SGI runs X11 on NeWS. Now that SGI is switching to straight X11, it would be interesting to retry these tests, but that new SGI/X11 server wasn't available as of this writing.

The NCR and Visual do significantly poorer on the graphics portion of the tests, when compared to the HP 700/RX. Text performance isn't that shockingly different on all systems, and the Visual does surprisingly well (about half the performance of the HP700/RX). Considering that the Visual is intended to be a low-cost X-terminal, it has nothing to be ashamed of from the text results.

On window operations the SGI and HP 700/RX are similar in performance, the NCR does "OK" and the Visual falls behind.

Comparing the HP 720 workstation with the SGI 4D/35 and Sun/IPC (Table 2) we see significantly better performance on all of these tests for the HP 720. Again, let me point out that these are not the kind of graphics most people buy an SGI for. But for common, simple graphics, text and window operations, it's clear that HP is doing something right.

All in all, both HP systems show impressive performance results at less than exotic prices. It is clear from these results that HP's PA CPU has set a new standard in general performance when compared with modern competitors.

Software

This is one area that I find HP's systems a little weak. I will freely admit that I am a BSD Bigot, and HP distributes a version of UNIX with a distinctly System V flavor to it. Most BSD features have been provided, such as `csh`, socket libraries and various networking utilities. As far as System V-based systems trying to support BSD features go, this one is pretty good, but that System V-style of system administration and other little differences show through. In all fairness, some people prefer this. Particularly in the area of system administration, SunOS users, accustomed to a BSD model, will find a lot of tools and files that need to be understood anew.

More importantly, I found that many of my favorite freely redistributable software packages just didn't recompile easily at all. In at least some cases, it looked like it was going to be a significant amount of work to make certain favorites run (such as GNU Emacs). One common culprit was the lack of the MIT/Athena widgets library. HP's own X11 libraries may have a much slicker set of widgets and programming environment, but sometimes software just wants the old standbys and it's not worth adapting these to the new widget sets (the easier approach would be to get the Athena Widget sources from MIT and recompile them). I'd strongly suggest that HP get some internal freeware fanatics

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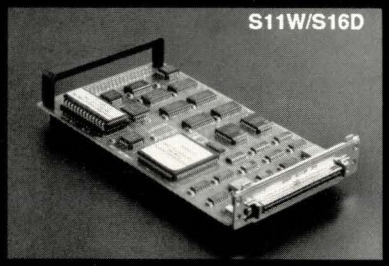

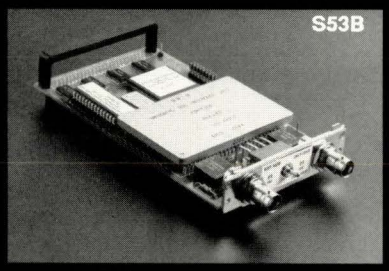

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to go over the system and make life a little easier for those of us who have come to rely on those programs.

I was disturbed that there were no on-line manuals on this system. I consider on-line manuals to be essential and don't like getting along without them. Users get very dependent on being able to call up a manual page on the screen.

more

HP Apollo 9000 Series 720

Processor: 50-MHz PA-RISC

Operating system: HP-UX

Memory: 16 MB-64 MB (ECC)

Mass storage: up to 840 MB internal, up to 10-GB disk capacity, CD-ROM, 4mm removable DAT

Interfaces: Ethernet (thick and thin), SCSI-2, EISA (optional)

Base configuration: 16-MB RAM, 19-inch monitor, diskless

Price: $11,990

Hewlett-Packard Co.
Apollo Systems Division
300 Apollo Drive
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HP 700/RX

Processor: 22.7-MHz i960 RISC

Memory: 4 MB (maximum 18 MB) user; video memory, 2 MB

Monitor: 19-inch color

Resolution: 1280 by 1024 pixels

Planes: 8

Refresh: 72 Hz

Price: $5,995

Hewlett-Packard (Canada) Ltd.
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The printed manuals were handy and well organized. Most are perfect-bound, 7 by 8 1/2 inches. They are easy to handle compared to full-sized binders (although each style has its advantages). The documentation style was reminiscent of better PC or Macintosh guides.

Overall, the quality of the software and documentation seems to be top-rate. The system never crashed nor did anything peculiar the entire time I had it.

X11

HP's own X11 environment, HP VUE, is beautiful and well designed. I particularly liked the "workspace manager," a (moveable) bar usually across the bottom of the screen that consolidates launching of many utilities and service operations (such as setting background patterns) into one neat area. It has little 3D buttons, clearly marked, to start up terminal windows, screen lock, a color scheme manager and other programs that are launched with a mouse-click.

The workspace manager also has six buttons (labeled one through six) that let you switch between workspace areas. These are separate screen-sized areas, each of which can be set up as if it were a separate X11 display. This is handy, for example, to set up multi-windowed areas for different remote hosts you use or just to switch between different application environments (development, spreadsheet, CAD/CAM), avoiding the usual cluttered screen. You can also specify that certain windows remain static no matter which workspace area you switch to (the workspace manager panel itself is one such window, and never disappears from view).

Summary

These are fast systems, about the fastest systems of their class (perhaps of any class) I've had my hands on. In fact, that's the right word to use: class. The HP 700 RX X-Station and HP 720 workstation are classy systems. Impressive performance, modest prices, good software and solid hardware explain why HP has become a company to be reckoned with in the workstation market. ⊸

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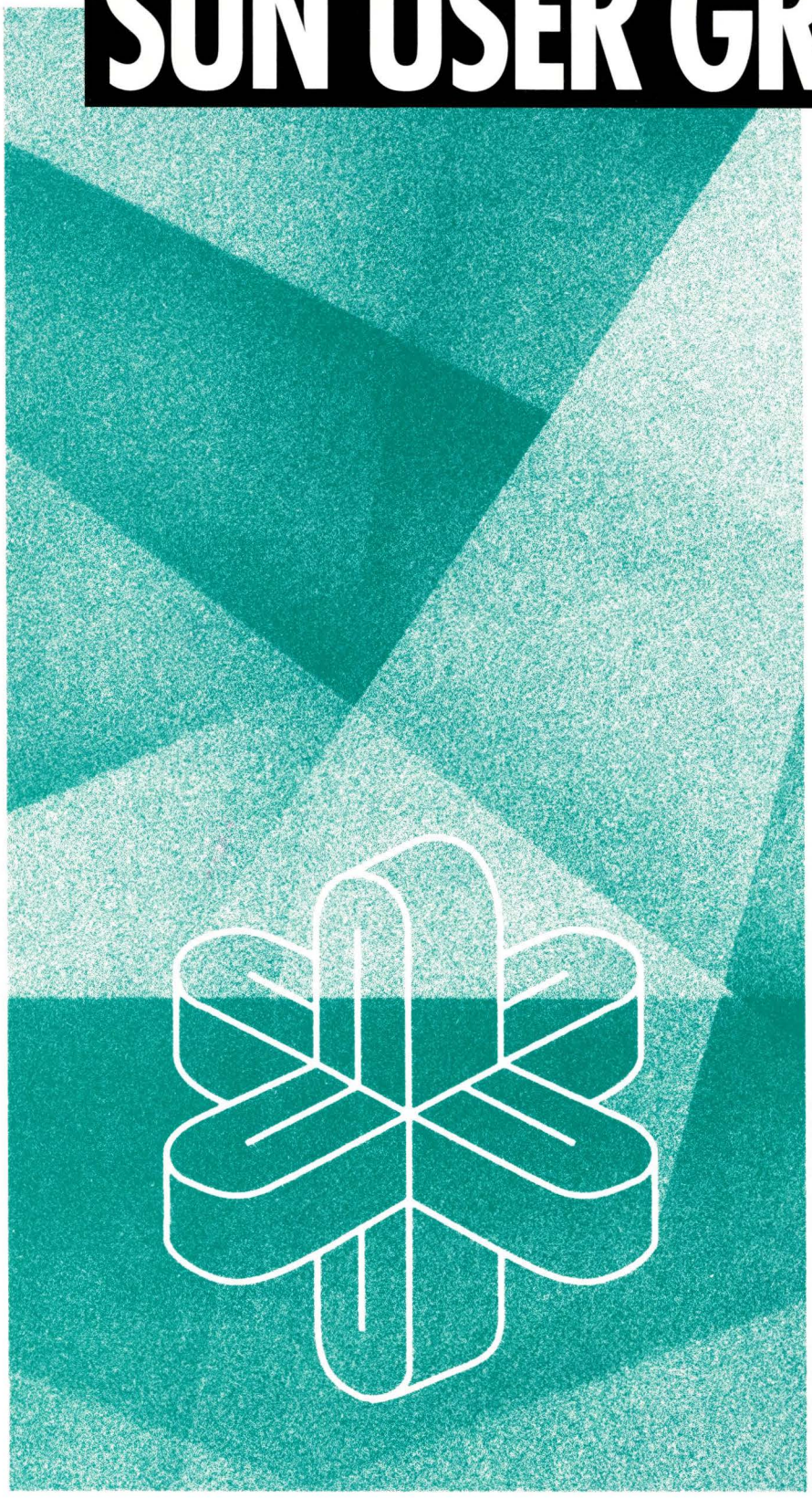

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The theme for this year's conference is, "Distributed Applications and Multiprocessor Technology" and will feature...

...Nearly 100 sessions and panels. In addition to presentations centering on the theme of the conference, also featured will be talks in the following five categories: Instructional, System Administration, Performance Analysis, Scientific Computing, and Commercial Applications.

...Tutorials will run all day Sunday, December 8. There will be eight tutorials which will run concurrently. Tutorial topics are:

- PERL
- Writing Distributed Applications Using the ONC Platform
- Micro-Kernel Technology
- Basic X Concepts
- Introduction to the Domain Name System
- UNIX Administration for VMS System Managers; or, VMS + UNIX = Oil + Water?
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NEW PRODUCTS

Transportable Solbourne

Solbourne has announced a desktop, transportable SPARCalike. The S3000 is a Sun-compatible with a gas-plasma display seven inches deep, 16 inches on a side. It offers a resolution of 1152 by 900.

As a system, the S3000 weighs only 25 pounds. Its dimensions, meanwhile, are 3 1/2 by 10.1 by 7 inches. This means it can fit onto very small desktops. Indeed, the product was originally developed with Solbourne's major investor, Matsushita Electric Industrial Co. Ltd., for sale in Japan, where any real estate is at a premium.

Otherwise, the S3000 closely resembles the company's other desktop product, the S4000. It has a 25.5-MIPS Panasonic MN10501 SPARC CPU, a 3 1/2-inch 500-MB hard disk and a 3 1/2-inch, 1.44-MB floppy drive. Memory ranges from 8 MB to 104 MB. The S3000 has two open SBus slots and can support external color monitors, in addition to its own orange plasma display.

Pricing begins at $14,995.
Solbourne Computer Inc., 1900 Pike Road, Longmont, CA 80501.
Circle 123

PlanetX Circles Sun

A product that allows Sun workstations to remotely control Macintosh computers over TCP/IP has been introduced by InterCon Systems.

Called PlanetX, the product is a software package that allows any X Window System device to show the same screen as displayed on a client Macintosh. The X-workstation user can then manipulate the Mac as though it were a local system.

A copy of PlanetX runs on a Macintosh with 1 MB of RAM for black-and-white operation, 2 MB for color and 3 MB under the System 7 version of the Mac OS. MacTCP is bundled with PlanetX.

Prices start at $29. The product will be sold in bundles to support 10, 25, 50 or 100 users.
InterCon Systems Corp., 950 Herndon Parkway, Ste. 390, Herndon, VA 22070.
Circle 124

Real-time Tools

Talarian has released version 2.0 of RTworks, a development environment for real-time systems developers. According to the company, 2.0 offers improved knowledge-based development tools for creating, testing and debugging applications designed to manage time-critical systems in process control, network management, transportation systems control, utilities and aerospace.

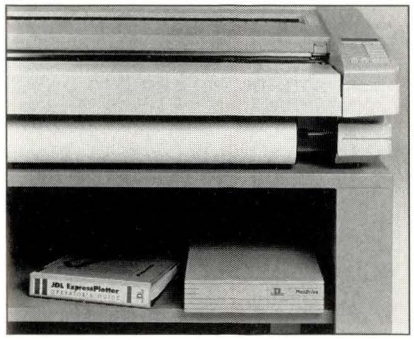
RTworks uses a point-and-click Motif graphical interface to control its seven modules that include an Interprocess Communications Server, Inference Engine, Human-Computer Interface, Data Acquisition, Data Generation, Archive and Playback. Because RTworks' architecture is based on the client-server model, RT modules can be distributed over a network.

RT works runs under UNIX and VMS and is licensed on a floating-license basis: $8,000 for a run-time version; $28,000 for the complete development system.
Talarian Corp., 1043 Shoreline Blvd., Ste. 201, Mountain View, CA 94043.
Circle 125

Force Shows 16-MB SPARC

Force Computers has announced a 16-MB version of its SPARC CPU-1E single-board computer. Meant for the embedded-systems market, the CPU-1E/16 consists of a SPARC processor plus 16 MB of RAM. This removes the need for an additional memory board in many applications.

The CPU-1E/16 offers 12.5 MIPS at 20 MHz. Pricing begins at $7,995.
Force Computers Inc., 3165 Winchester Blvd., Campbell, CA 95008-6557.
Circle 126



Hard Drive For Plotter

The JDL PlotDrive hard disk for the company's large-format plotters connects to the ExpressPlotter or OmniPlotter via the plotter's SCSI port and provides additional plot-spooling memory. This means that when transmitted data from a large file fills the plotter's own buffer, additional data can be sent over to the drive.

PlotDrives come in 20- and 45-MB formats. Prices start at $795.
Japan Digital Laboratory Co. Ltd., U.S. Sales Division, 4770 Calle Quetzal, Camarillo, CA 93012.
Circle 127

Sun Security

SunSoft introduced two additions to its SunSHIELD software-security product family: Account Resource Management (ARM) and Automated Enhanced Security Tool (ASET). Both

enable MIS and network administrators to create customized security solutions that help protect their UNIX networks from security breaches.

ARM and ASET are compatible with SunOS Release 4.1.1 and other UNIX software platforms that comply with SPARC Compliance Definition 1.0.

Pricing is $295 for a single user and $4,500 for a site license; both include CD and documentation.

SunSoft Inc., 2550 Garcia Ave., Mountain View, CA 94043.
Circle 128

SCSI SmartBox

The SCSI SmartBox, a small, embedded circuit, monitors the internal temperature and voltage of any SCSI-peripheral-storage device.

Standard with the company's subsystems are features such as a SCSI address display, a high-temperature alarm, and a 5V and a 12V power alarm. The SCSI address is visible via an LED display on the front of the subsystem. Red indicator lights and an audio alarm will be activated on the front of the unit in the event of a high-temperature alert or power failure.

By signaling and tracking intermittent subsystem irregularities, the product can eliminate data loss and improve drive performance.

RSquared, 11211 E. Arapahoe Road, Ste. 200, Englewood, CO 80112.
Circle 129

Sun User Group presents the

1991 SUG CD-ROM

In a continuing effort to provide freely distributable software, the Sun User group is proud to present this year's software collection on a compact disc. The collection includes over 300 MB of source code, mailing list archives, and compiled binaries plus 200 MB of Sun software patches. A complete table of contents is available from the Sun User Group office.

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Brookline, MA 02146

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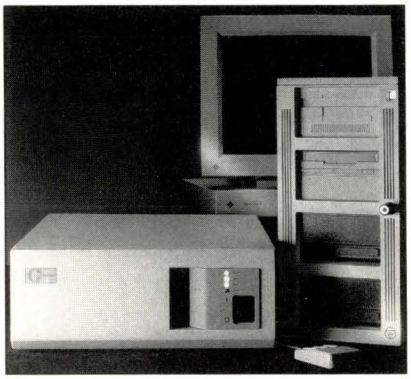

Super Juke For Sun

An 8mm-tape jukebox has been announced by Delta Microsystems. Known as GigaGuard, the product holds one or two drives and up to 45 8mm tapes. This gives the machine the ability to store up to 225 GB of backup data.

GigaGuard runs on a SPARCstation 2 or compatible, and can back up and retrieve files on a UNIX network through its Sun server.

Price is $110,000 for a fully configured system.

Delta Microsystems Inc., 5039 Preston Ave., Livermore, CA 94550.
Circle 130

AddressWriter Printer

CoStar's small (8.7 by 8.5 by 8 inches) impact dot-matrix printer is specifically designed for printing envelopes, postcards and labels. The printer allows for normal text as well as postal bar-code printing, which prepares mail for automated sorting.

The AddressWriter comes standard with interface cables, software and documentation supporting both PCs and Macs.

Both the 120V version and 220/240V version are priced at $595.
CoStar Corp., 22 Bridge St., Greenwich, CT 06830-5238.
Circle 131

88K-based X-Terminal

An X-terminal based on the Motorola RISC processor, the 88100, has been brought to market by NCD.

The NCD 19c is a 19-inch terminal with a resolution of 1280 by 1024. It displays 256 colors simultaneously from a palette of 16.7 million. The 88K has an on-chip floating-point processor, which gives the product an integral floating-point capability.

The product is priced at $6,395, including 6-MB DRAM (upgradable to 40 MB), mouse, serial port, keyboard and Ethernet. There is a $50 license fee for the resident software.
Network Computing Devices Inc., 350 N. Bernardo Ave., Mountain View, CA 94043.
Circle 132

CD-ROM Formatter

A product that allows software publishers to place binaries for multiple computer platforms on the same CD-ROM has been introduced by Young Minds. The company's Makedisc, a formatting utility for creating compact disks, is now available in a form that supports the Rock Ridge specifications for handling POSIX file names and other file-system semantics on CD-ROMS while remaining compliant with existing CD-ROM standards

Makedisc is available for Sun 3, Sun 4, SPARCalike, HP 9000, IBM RS/6000, DEC, NeXT and 88000-based workstations, as well as Intel processors running SCO or Interactive

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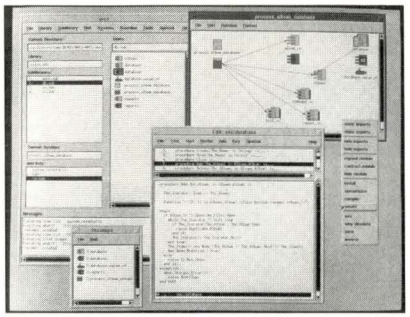
Circle No. 5 on Inquiry Card

operating systems.

Prices start at $6,995.

Young Minds Inc., 308 W. State St., Ste. 2B, Redlands, CA 92373.

Circle 133



New Ada For Old

The RISCAda development environment is optimized for the development of Ada applications on RISC workstations. It includes an optimizing compiler and a set of OSF/Motif-based programmers' tools.

There will be multiple versions of the product–one for each architecture–but the first to ship is RISCAda/SPARC for SPARC-based systems.

Prices range from $6,000 to $12,000 per workstation or server, depending on the configuration.

TeleSoft, 5959 Cornerstone Court West, San Diego, CA 92121.

Circle 134

Tek Hot Wax

The Phaser II PXI 300-dpi, color thermal printer is based on the AMD 29000 RISC controller and implements Adobe's PostScript Level 2. The company says that it is the first printer in its class to directly support Level 2 of PostScript.

The Phaser II also supports the HP Graphics Language (HP-GL) and comes standard with 6 MB of memory. It is also equipped with an SCSI port that connects to an optional hard disk for font storage and caching.

Prices begin at $7,995.

Tektronix Inc., Graphics Printing and Imaging Division, P.O. Box 1000, 26600 SW Parkway, Wilsonville, OR 97070-1000.

Circle 135

Radical Raster for SBus

The VXA raster accelerator is a single-slot SBus card that provides a Sun machine or SPARCalike with 24-bit true-color display, an 8-bit pseudocolor display, eight configurable overlay tag bits, two lookup tables, and double and triple buffering of pseudocolor windows.

The product supports OpenWindows or the company's own implementation of X11R4. It offers 2D graphics acceleration, a pixel depth of 32 bits, and resolutions of 1152 by 900 or 1024 by 1024.

Pricing was not available at press time, but the company indicated that it would be "roughly" $4,000.

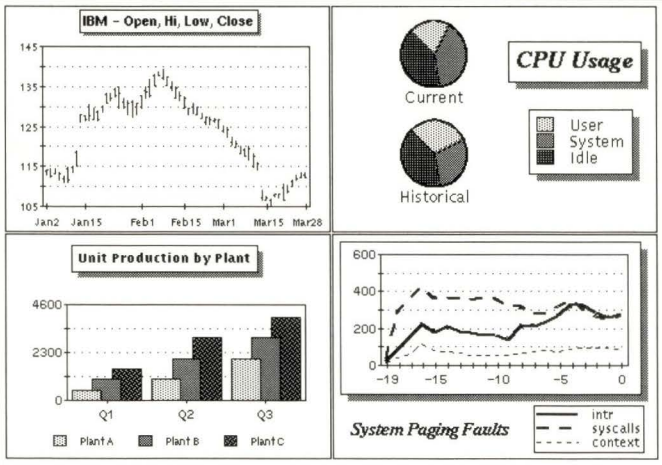
Visual Information Technologies Corp., 3460 Lotus Drive, Plano, TX 75075.

Circle 136

Mail and More From Applix

Applix has unveiled an electronic-mail component for its line of the X Window System office-integration software.

XRT/graph™ Widget



An easy, inexpensive way to add real-time plots, bar charts and pie charts to your X applications. The XRT/graph widget extends the XView, Motif and OLIT toolkits. XRT/graph is loaded with features, including user-feedback, markers and printing support.

And XRT/graph comes with the *Builder* point-n-click widget development tool. Builder saves graph descriptions in text files, and generates application code automatically.

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XView version is available today. Motif available 11/91. OLIT available 12/91.
XRT/graph is a trademark of KL Group Inc. XView is a trademark of Sun Microsystems, Inc. Motif is a trademark of OSF, Inc.

KL Group Inc. (416) 594-1026
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Circle No. 11 on Inquiry Card

Called Asterix Mail, the module allows Asterix and non-Asterix users on PCs, Macintoshes and various workstations to exchange information. Users can build their own global and personal user, alias and distribution lists. Users also can organize their messages using Mail's advanced query facility to sort messages by sender, keywords, dates or user comments.

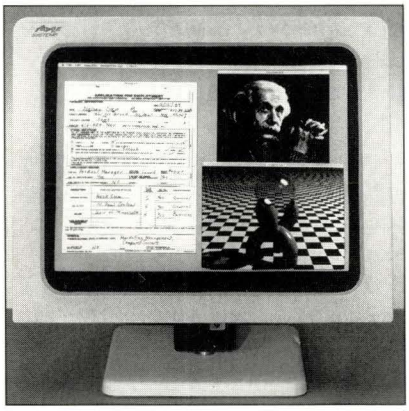
Mail supports both Motif and Open Look, and can make use of Asterix' Extension Language Facility (ELF) tool for customizing environments. A single-user copy is priced at $195. The product is slated to ship during the third quarter.

At the same time, Applix also has announced a number of new Filter*Packs that allow users to import and export data to and from non-Asterix packages. Asterix's filters now include Words*Pack (for Word, WordPerfect and other word processors); Graphics*Pack (for CGM, DXF, IGES); Publishers*Pack (for FrameMaker and Interleaf) and standard filters (for ASCII, WKS/WK1, SYLK, DIFF, TTFF, XWD and fax).

The standard packs come with Applix; others sell for $295 each.

Applix Inc., 112 Turnpike Road, Westboro, MA 01581.

Circle 137



Color Monitor for Imaging

The C21LV-65MAXZ color monitor operates at speeds ranging from 15 kHz through 65 kHz in either interlaced or non-interlaced mode. Thus the monitor can support applications requiring the relatively low speeds of standard television (15.75 kHz), or the high speeds of high-resolution displays.

Onboard circuitry allows the monitor to adjust automatically to a range of horizontal- and vertical-scan frequencies, providing compatibility with many different display controllers. The screen size itself is 21 inches, with a display area of 16 inches horizontal by 12 inches vertical.

Pricing begins at $4,695.

Image Systems Corp., 11543 K-Tel Drive, Hopkins, MN 55343.

Circle 138

IPI Disk Drive Subsystem

Artecon has released the first removable, 5 1/4-inch, 1.2-GB Intelligent Peripheral Interface disk drive that is compatible with Sun workstations.

The new subsystem is available in the company's DataVault subsystem. Up to 4.8 GB (four IPI drives) of online, removable storage is available in a single rackmount DataVault. The IPI drive uses Sun's IPI controller and is fully compatible with Sun's IPI

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drives.

Price varies upon configuration.
Artecon Inc., 2440 Impala Drive, Box 9000, Dept. 5500, Carlsbad, CA 92008-7236.
Circle 139

PPP and 3770 Emulation Cards

Two new BrxLink SBus cards are available from Brixton Systems.

BrxPPP (Point-to-Point Protocol) enables SPARCstations to utilize dial-up/leased phone lines for connecting remotely located machines. Two SPARCstations equipped with BrxPPPs can communicate through a PPP router located elsewhere. Or a SPARCstation hosting BrxPPP can interconnect all systems on geographically dispersed LANs.

Brx3770/SRJE provides data communications between UNIX machines and IBM mainframes using TCP/IP and IBM's Systems Network Architecture (SNA). The board emulates the full functionality of a 3770 SNA controller, and can be used in conjunction with Brixton's BrxPU2 SNA Server.

The boards sell for $1,950 each.
Brixton Systems Inc., 185 Alewife Brook Parkway, Ste. 4200, Cambridge, MA 02138.
Circle 140

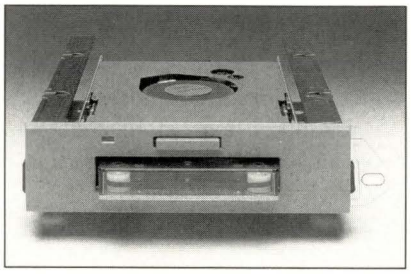
eNFS Boosts NFS Performance

Interstream has enhanced its eNFS software so that it boosts the performance of NFS even further. It also has added TCP support and a graphical-display feature to the product.

The latest version of eNFS boosts NFS write performance two to five times, according to the company. eNFS/TCP uses asynchronous RPCs to initiate an unlimited number of NFS requests without slowing user applications.

eNFS/Display supplies the user with five panels, which offer information about the write mix performed by the NFS server. eNFS dynamically loads on Sun workstations in 10 minutes, and comes with a 30-day money-back guarantee and a one-year maintenance agreement.

eNFS/TCP for 200 servers is priced at $3,995; for 100 workstations, $2,495; and for clients, $245.
Interstream Inc., 1501 Reedsdale St., Pittsburgh, PA 15233.
Circle 141



250-MB Tape Drive

CAL-ABCO has announced the availability of Backtrax Phantom 250, a new 5 1/4-inch, 250-MB QIC tape drive.

The product uses both DC2080 and DC2120 mini data cartridges and includes data-compression software. Features include a 2.4-MB-per-minute backup rate, network and Xenix support, and comes with an 18-month warranty. The Phantom 250 plugs into any standard AT floppy interface.

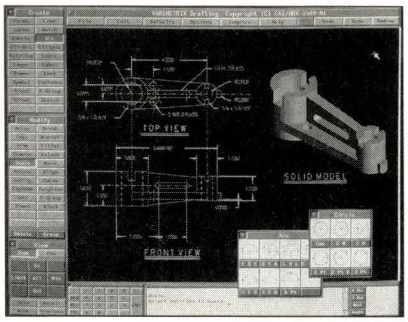
Price is $379.
CAL-ABCO, 6041 Variel Ave., Woodland Hills, CA 91367.
Circle 142

SPARCstation/server 2s Get More Memory

The first third-party-provided 32-MB memory upgrade for SPARCstation and SPARCserver 2 systems is now available from Dataram.

The DR-475 is available as a standalone 32-MB expansion board, but also comes with an optional 32-MB double-sided expansion card. Together, the board and double-sided card occupy one SBus slot, expanding the memory capacity of Sun 2s to their maximum 128 MB.

The DR-475 sells for $4,480, with quantity discounts available. The product is supplemented by a lifetime guarantee, free trial period and dial-in help.
Dataram Corp., P.O. Box 7528, Princeton, NJ 08543-7528.
Circle 143



New Drafting Software Allows Conversions

Two new drafting products that allow users to convert their 2D drawings to solids models will be available next month from Varimetrix. The handiwork of the company and NKK Corp. of Japan, the products are the first in a line of Sun CAD/CAM/CAE tools from the two partners.

Varimetrix Drafting provides direct two-way associativity with its 3D modeling and CAM counterparts. Drafting generates PHIGS graphics and provides features built on top of a distributed-processing architecture.

Gateway, an option to Drafting, provides a bridge between 2D and 3D. Gateway generates a B-REP solid model from 2D line drawings. Solids resulting from the Gateway option are sent directly to the 3D Modeler and generated in NURB form.

Varimetrix Corp., 2350 Commerce Park Drive, Ste. 4, Palm Bay, FL 32905.

Circle 144

TCP/IP Print Server Debuts

MiLAN has unveiled an intelligent print server for UNIX LANs. Called Esprint, the print-serving device is the size of a paperback book.

It can support two printer connections and three different types of Ethernet cabling (10Base-2 thin coax, 10Base-T unshielded twisted pair and 10Base-5 thick coax). Esprint has one parallel and one serial port, and features an error status report for common print errors.

The product is priced at $899 and is available this month.

MiLAN Technology Corp., 67 East Evelyn Ave., Ste. 3, Mountain View, CA 94041.

Circle 145

Unchained Memories For IPX, ELC

Clearpoint has begun shipping the first 16-MB SIMM for Sun IPX and ELC systems.

The board-level product, called CPSM-33A/S16, enables customers to reach the 64-MB system maximum for these systems (by populating the three slots left over once Sun installs its 4-MB SIMM board).

List price for the CPSM-33A/S16 is $2,200; the price for its 4-MB cousin, the CPSM-36A/4 MB, is $405.

Clearpoint Research Corp., 35 Parkwood Drive, Hopkinton, MA 01748.

Circle 146

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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MEDIA INTELLIGENCE

BPA

SUGnotes

San Jose Express

by PETER H. SALUS

Well, a lot has been going on where the Sun User Group is concerned over the past few months!

First of all, the long-awaited CD-ROM finally began shipping in mid-June. Produced by Young Minds Inc., the 1991 SUG CD-ROM contains 300 MB of source code, software archives, compiled Sun 4 binaries and nearly 200 MB of Sun Microsystems Inc. software patches. You must be a member of SUG or Usenix to purchase the CD-ROM. The price of the CD is $250 for members [Shipping and handling: Add $10 (U.S.A.) or $25 (International)]. If you are not a member of the Sun User Group, add $40 (U.S.A.) or $55 (international) to the above sums for 1991 membership. For full information, email `office@sug.org`, phone (617) 232-0514 or fax (617) 232-1347.

Also in June, SUG held its first technical conference in Atlanta–that is, tutorials and conference sessions without an exhibit. While over 300 Sun and SPARC users attended, it was felt that meetings are enhanced by an exhibit floor, and that in the future, SUG conferences should have vendors showing their wares, hard and soft. Among the presentations that attracted the greatest attention in Atlanta were Keith Bierman's on Sun's compilers, Stuart McRobert's on converting Imperial College of London from a centralized system to distributed computing, Hal Stern's on building and debugging SunOS kernels, Brian Rosen's on the Mars Microsystems Inc.'s Mariner, and Chet Britton's on EDT's high-speed asynchronous I/O.

December's conference and exhibit (in the San Jose, CA, Convention Center, December 9-11) is already shaping up. The theme will be "Distributed Applications and Multiprocessor Technology," and the program committee is chaired by S. Lee Henry. There will be eight all-day tutorials offered on Sunday, December 8th:

- Tom Christenson (Convex Computer)–Perl
- John Corbin (University of Texas, El Paso and Sun)–Writing Distributed Applications Using the ONC Platform
- Lori S. Grob & Marc Rozier (Chorus Systemes)–Micro-Kernel Technology
- Berry Kercheval (Intelligent Decisions)–Basic X Concepts
- William LeFebvre (Northwestern University)–Introduction to the Domain Name System
- Ruth Milner (NRAO/VLA)–UNIX Administration for VMS System Manager; or, VMS+UNIX = Oil+Water?
- Dinah McNutt (Pencom Software Inc.)–X and the Administrator
- Eugene Spafford (Purdue University)–Topics in UNIX Security

Last year, SUG had to turn away vendors who wanted space at the exhibit. This year, we have double the floor space, and as of July, there were already more vendors signed up than last year. We are looking at the active participation of SPARC International.

The Sun User Group and Usenix Association boards have agreed on an exchange of member benefits. Thus, members of each organization will be charged member rates for conference registrations, Usenix members can purchase the SUG CD-ROM at member rates, and SUG members will be able to subscribe to *Computing Systems* at a reduced price.

A further member benefit is a new arrangement with Addison-Wesley and O'Reilly Associates for SUG members to receive a discount on technical-book purchases. The SUG office hopes to expand the list of publishers offering our members discounts.

Details of these offers appear in the September issue of our redesigned quarterly newsletter, *README*. In addition to SUG membership, we currently ship 900 copies of each issue to the Sun U.K. User Group, 300 to the Netherlands, 500 to Germany, and 100 each to Finland and Sweden. We have made an arrangement with Nihon SUG, to translate *README* into Japanese for their 1,500 members.

In February, SUG will be cooperating with PCI, the firm that has run a number of Sun Expos in the past, on an Expo in Chicago. SUG will be offering four tutorials and a track of technical presentations in Chicago. We anticipate entering into other such arrangements, with SUG supplying the technical expertise, for future Sun Open Systems Expos.

Finally, as happens every autumn, there will be an election for the board of directors of SUG this year. As of September 1, every SUG member is eligible to vote.

The SUG board of directors is made up of nine members, three of whom are up for re-election each year. 1991 sees the expiry of the terms in office of Stan Hanks, Frode Odegard and Barry Shein.

For those of you who actually want to reach the Sun User Group offices, email to `office@sug.org` works just fine (as do the voice and fax numbers above). If you want conference information, get in touch with our Conference Office (415) 948-0998 (voice); (415) 948-6802 (fax).

See you in December in San Jose for the best (and biggest) Sun User Group event ever.

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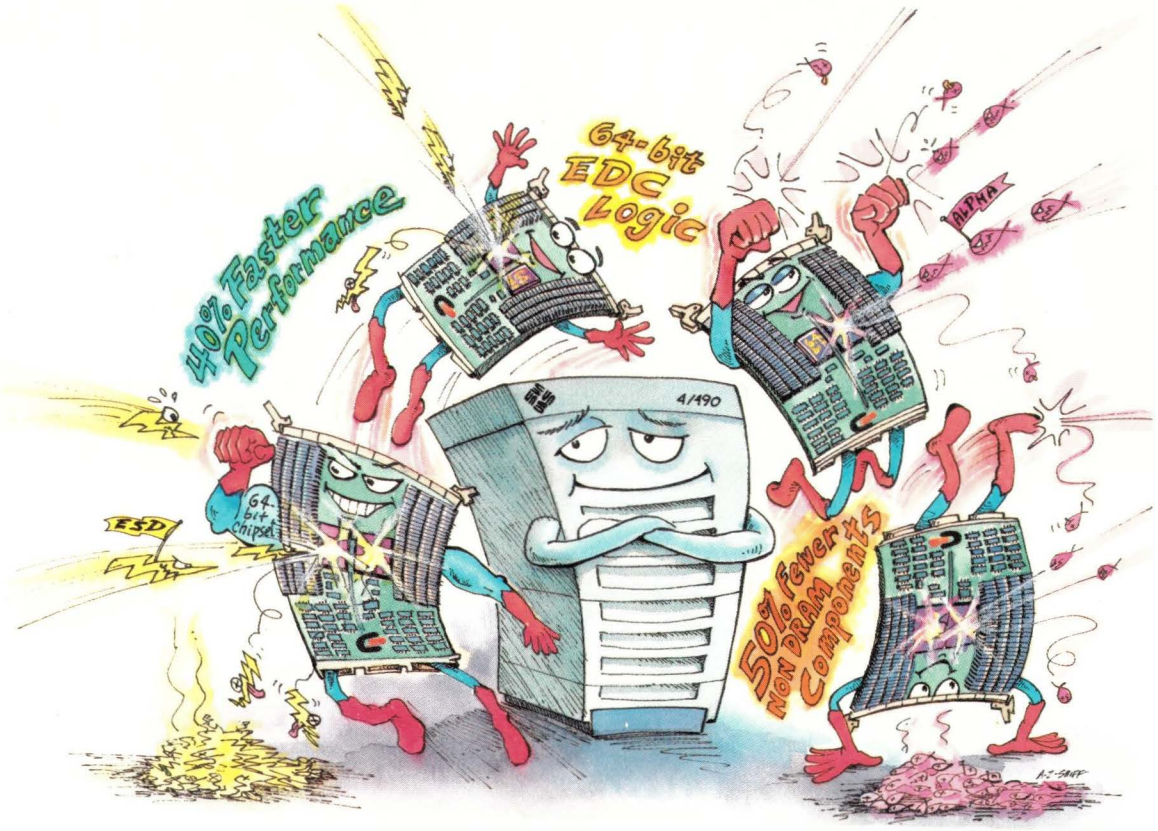

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