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

SUNEXPERT Magazine (ISSN 1053–9239) is published monthly by Computer Publishing Group, 1330 Beacon St., Brookline, MA 02146-3202. Telephone (617) 739-7001. Second-class Postage Rates paid at Boston, MA, and at additional mailing offices. This publication is free to qualified subscribers as determined by the publisher. Subscription rates are $60 per year in the United States, and $95 (surface mail) and $150 (air mail) outside the United States. Subscription requests can be sent to: Circulation Department, *SUNEXPERT* Magazine, 1330 Beacon St., Brookline, MA 02146-3202 or electronically mailed to circ@expert.com.

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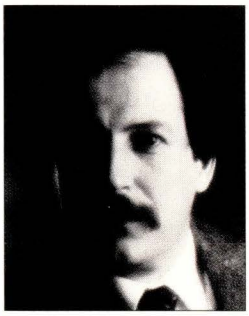
Editorial

Avoiding the Pooh Complex

We as users often get caught up in what I call, for lack of a better phrase, the Pooh Complex. That's the state of mind that makes us feel free to pooh-pooh this and pooh-pooh that, with a rather unconscious whinny. It's easy (often funny). But many of us have taken that attitude to extremes when it comes to the SPARCalike market. It's easy to say it's like the used car trade. Perhaps this month's lead feature, "SPARCward, Ho!" will help dispel that kind of thinking. Mary Jo Foley spoke to countless pioneering resellers who face a rocky business climate. Despite a rough-and-tumble 1992, they report a change is under way: If you've heard that no one is doing anything about the fact that "clones" and "compatibles" are neither clone nor compatible, then you may be surprised by the efforts many resellers say they are undertaking to deliver value-added not only in products and technology but also in channels of distribution and support. And that's a big plus. Another plus is the apparent readiness of SunSoft to make the same Solaris 1.X/2.X that Sun Microsystems Computer Corp. ships available to compatible vendors. Those of us who've unpacked a tape only to find special OS patches will be glad to hear that most SPARCalike makers say this problem will disappear.



SPARC chip specs and the architecture's future, another topic of "pooh-pooh" these days, get Michael Jay Tucker's attention. His State of the Processor report examines a paradox. "Performance, or lack of it, hasn't hurt SPARC's sales," he says. Why? "There are probably more people who are after the broadest possible line of software than there are people who need the fastest possible monoprocessor," explains industry watcher Michael Slater. For more on the road map for SPARC, including Sun's three-tier strategy involving microSPARC, SuperSPARC and, forgive the term, UltraSPARC, see this month's lead news item, "Sun's 64-Bit SPARC Debut."

Doug Pryor

SUNEXPERT Magazine
Serving the Solaris/UNIX Workstation Network
APRIL 1993 VOL. 4 NO. 4

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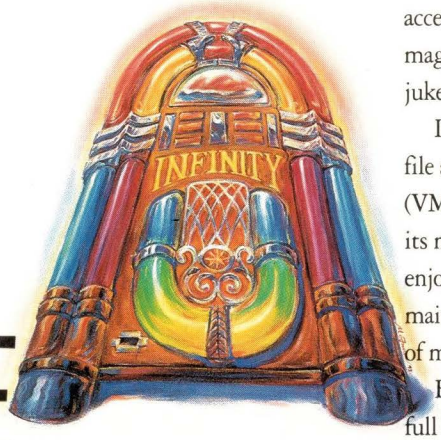

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LETTERS

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

Of Spikes and Men

Dear Mr. Protocol:

Thanks for the great columns. How do I get on the IETF mailing list?

Nick Hennenfent
nicholas@cton.com

Mike O'B replies for Mr. P:

Mr. Protocol is glad you like his columns and would like to know where the cookies are.

Mr. P ranks this one right up there with "How do I drive a railroad spike through my head?" Being a proponent of the free flow of information, he will nevertheless answer your question. Send a request to ietf-request@nri.reston.va.us *containing the email address you would like added to the list. This is also, obviously, the address you will use within a week to have yourself removed from the list, with a message perhaps differing somewhat in tone from the first. You may post messages to the list using the address. Hoo hah.*

More Nonunique

Dear Editor:

I work in a DEC Ultrix/VAX VMS shop and can answer the question [about nonunique Ethernet addresses]. DEC allows the Ethernet network address to be changed to allow DECnet to operate. When DECnet is started, usually early in the `rc.local` script, it changes the physical Ethernet address of the LAN interface to a special DECnet Ethernet number. This Ethernet number encodes the DECnet node number, n.nnn, to something like AA-00-??-??-??-??. Note that these blocks of numbers are assigned to DEC for DECnet, local area VAX clusters, by whoever assigns these blocks (NIC?).

For this reason, you will hear people at DEC talk about the hardware Ethernet address and the physical Ethernet address. The hardware one is blown into the PROM, and for DEC is of the form 08-00-2b-??-??-??.

Since all DECnet addresses on the LAN must be unique, changing the physical address in this way still ensures uniqueness on the LAN. Needless to say, one runs into problems if one assigns the same DECnet address to multiple machines.

Bob Tooth
tooth@husky.on.ca

Dear Editor:

To Mike O'Brien, regarding his answer to the nonunique Ethernet address stuff.

As I understand it (from reading an article in the sun-managers mailing list, or in one of the Sun-related network newsgroups), you will have your Ethernet address changed when you run Sun's DNI software.

From what I understand (from my DEC guru across the hall), non-DECnet devices will boot with their vendors' Ethernet addresses. When the DNI software is started, it will reprogram the Ethernet address so it has a DEC manufacturer code.

I have heard of one problem with this, and I have encountered a second.

The first one was with a Sun. The other devices on the network captured the Ethernet address while the "DNI to be" machine booted. When the DNI software changed the Ethernet address, other machines could no longer reach the machine because the IP-Ethernet address mapping tables had the old (no longer valid) Ethernet address.

The second case was when we had a device on our local network using someone else's (our director's machine's) assigned IP address. We looked at the Ethernet address of the device responding to that IP address and found out it had a DEC vendor code. It turned out that a Mac was running some DNI software which changed the Ethernet address.

As for why they do it, who knows? Maybe DECnet will not talk to devices with non-DEC vendor codes? Anyway, this is the extent of my info.

Donald McLachlan
uunet!mars.dgrc.doc.ca!don

Dear Editor:

I'm surprised that Mr. Protocol isn't familiar with the changing of Ethernet addresses on DEC systems. I don't work for DEC, but I am a network manager where we have many VAXs. The answer is, all Ethernet addresses are preassigned in ROM at the factory–for the network controller interface card. DEC, Ungermann-Bass, Intel, Xerox, etc., are all assigned a set prefix and range (such as 08-xx-xx-xx). Because DEC is very oriented toward networks, and in particular, DECnet (LAT, MOP, LAVC, etc.), the company changes the Ethernet address of the device to reflect the DECnet node address (the last three octets are the DECnet node address).

David Moore
moore@si.com

A Plug for Connectors

Dear Editor:

Richard Morin's article, "A Guide to Workstation Hardware (Part 1)," (*SunExpert*, September 1992, Page 44) was an interesting and informative introduction to the ins and outs of connectors, cabling, etc. I thought of at least one footnote. Some types of connectors are susceptible to damage if inserted incorrectly. If these connectors are inserted upside down, the pins can get pushed back into the plug so that they no longer make contact when reinserted in the proper holes. This underlines the need for caution on the part of users when hooking up equipment, as well as the need for vendors to employ "user-friendly" connectors that prevent incorrect insertion and the problems that ensue.

Paul Eitner
GE Aerospace
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NEWS

Sun's 64-Bit SPARC Debut

Sun Microsystems Computer Corp. (SMCC) is expected early this month to unveil plans for a new, 64-bit version of the SPARC processor. To be called UltraSPARC, the device is said to be able to execute four instructions in a single cycle. Within three to four years, says Sun director of SPARC marketing Derek Myer, "we are looking at a chip that runs 1,000 SPECfp92 and 800 SPECint92."

In addition, Sun has announced what it calls a "road map" for its future processor efforts. Sun foresees the SPARC becoming a family of processors with a high, middle and low range for various applications. At the top will be the UltraSPARC, in the middle will be the existing SuperSPARC in at least three models, and at the bottom will be the microSPARC in three different models of price and performance.

The time frame for these changes remains unclear. However, the company says that most will be implemented before 1997, and some will be finished by 1994. The company has already created a new group within SMCC, the SPARC Technology Business group, to promote SPARC in the industry.

Sun says it will reveal more details of UltraSPARC and the road map within "a few weeks." Moreover, company officials would not comment on who will produce the UltraSPARC or when the processor will be in mass production. However, Sun's Myer says it will conform to Version 9 specifications for SPARC, which has been promoted by SPARC International.

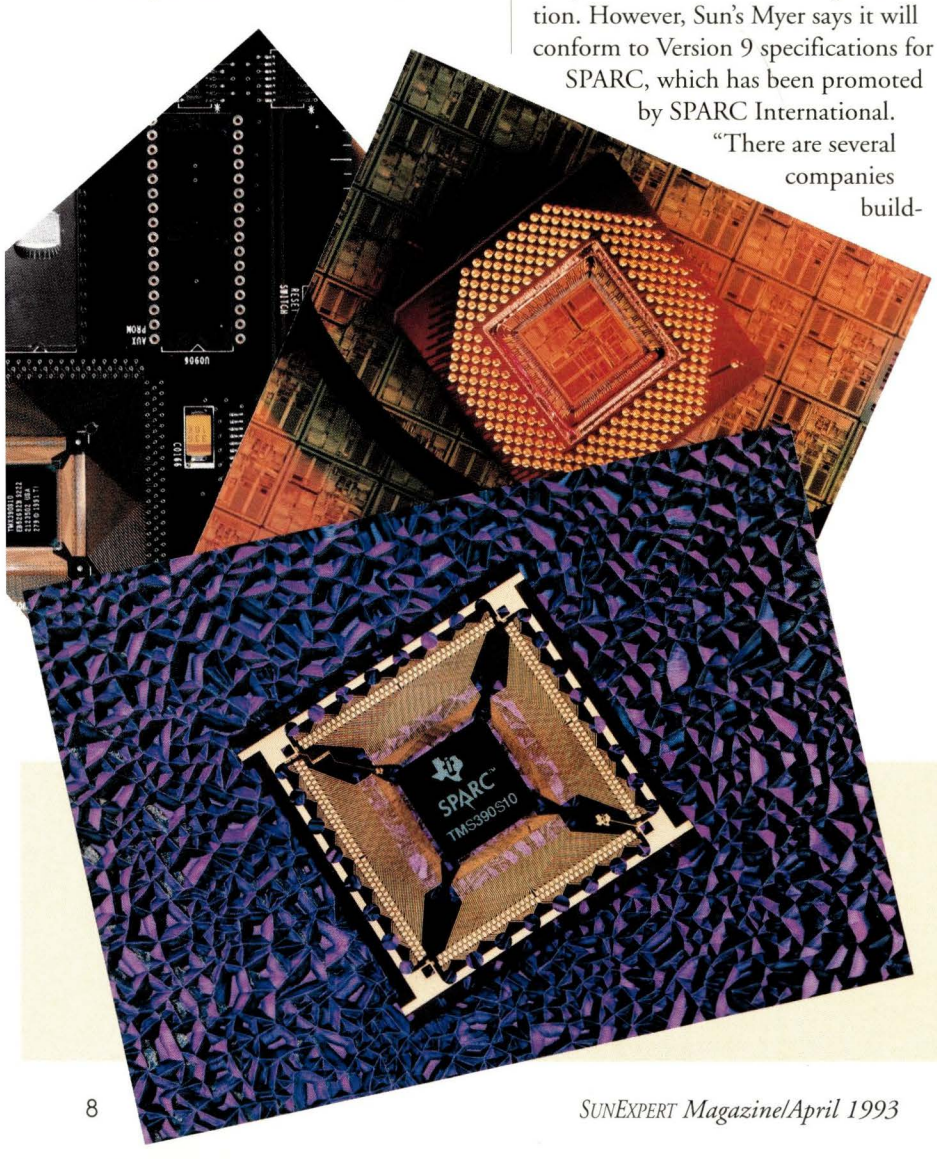
"There are several companies building V9 chips," he says, "and the UltraSPARC is ours."

Meanwhile, according to Sun, the SuperSPARC, which is produced by Texas Instruments Inc., is to be expanded to a three-model line. The existing SuperSPARC is to be the low end of the line, the middle will be occupied by a SuperSPARC Plus, and the top will be a SuperSPARC 2, Sun claims. All will be 32-bit, V8 SPARCs.

At the bottom, meanwhile, the microSPARC will be expanded to three processors, each offering different levels of price and performance, says Sun. The existing microSPARC processor is to be rechristened microSPARC 1 as the low end of the line, with a microSPARC 2 and microSPARC 3 becoming the middle and upper levels, respectively.

Meanwhile, Sun as a company is stressing its own role as the guardian and developer of SPARC. Myer says that, while SPARCs are produced by licensed silicon foundries, Sun itself designs the processor. "We invest very heavily in designing SPARC processors themselves," he says. "The processors in all the systems we ship today were designed in part or wholly by Sun."

It should be noted that this position is radically different from the one that Sun was at least perceived to be taking even a few years ago. At that time, the company was thought by industry watchers to be positioning itself to exploit the inventive genius of silicon designers eager to become involved with the "open" SPARC. In fact, the existence of the road map presents an interesting problem to companies producing SPARC processors that do not lie on the road map itself–such as Cypress Semiconductor Inc./Ross Technology division with its hyperSPARC and the rumored "Thunder" processor from Hyundai/Metaflow Technologies.



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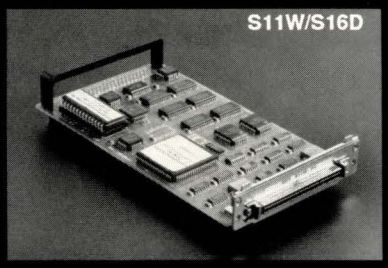

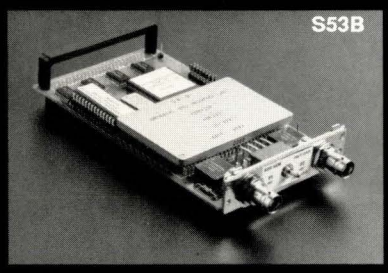

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Myer, however, says that such vendors are still free to produce their rival SPARCs and perhaps even sell them to Sun. "Sun, as a systems vendor, can always augment its product line with whatever processors are out there," he says.–*mjt*

Sun Champions Another Kind of Channel

Sun Microsystems Computer Corp.–along with some unlikely partners, namely, Hewlett-Packard Co. and IBM Corp.–has emerged as a champion of a new networking standard, called Fibre Channel. Sun, HP and IBM have created an informal group, called the Fibre Channel Systems Initiative, to advance Fibre Channel as "an affordable, high-speed interconnection standard for workstations and peripherals used in thousands of commercial and technical applications," according to a statement issued by the group.

The group is positioning the standard as a solution for the existing bottleneck in transmitting data between systems and peripherals at super-high speeds. Fibre Channel transfers data at speeds of up to one gigabit, or 60,000 pages, per second over distances of up to 10 kilometers. The standard also defines specifications for 25- and 50-MB/s quarter- and half-speed varieties.

Fibre Channel is a bidirectional data-transmission facility, unlike SCSI, IPI and block multiplexer channel, which are all unidirectional. The group argues that "because Fibre Channel is capable of achieving slightly more than 100 MB/s in both directions simultaneously, it is really a 200-MB/s channel if usage is balanced in both directions." Fibre Channel is a shared, point-to-point link that can seamlessly connect with other data communications protocols, such as FDDI, serial HIPPI, SCSI, IPI and ATM, according to the group. The Fibre Channel interconnect standard is undergoing public review under ANSI X3T9.3 committee's auspices. Approval is expected by year end.

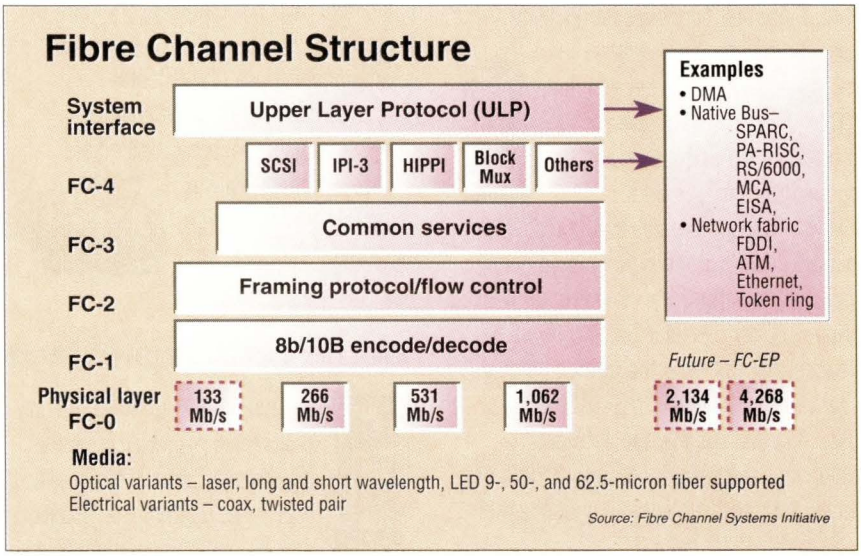
The group plans to make results of its development and standardization work open and freely available to the public. It plans to publish selected sets of Fibre Channel options, called profiles, to aid other companies in building Fibre Channel-based products.–*mjf*

Not Just for Techies

Just in case anyone had any lingering doubts regarding Sun Microsystems Computer Corp.'s intentions to be a key commercial market player, SMCC earlier this year went on a press tour to get the word out that Sun already is a contender. (So, take *that*, NT!)

Sun pointed to several market studies

The Fibre Channel interconnection mechanism from the Fibre Channel Systems Initiative will be able to transfer data at speeds of up to 1 Gb/s over distances up to 10 kilometers.



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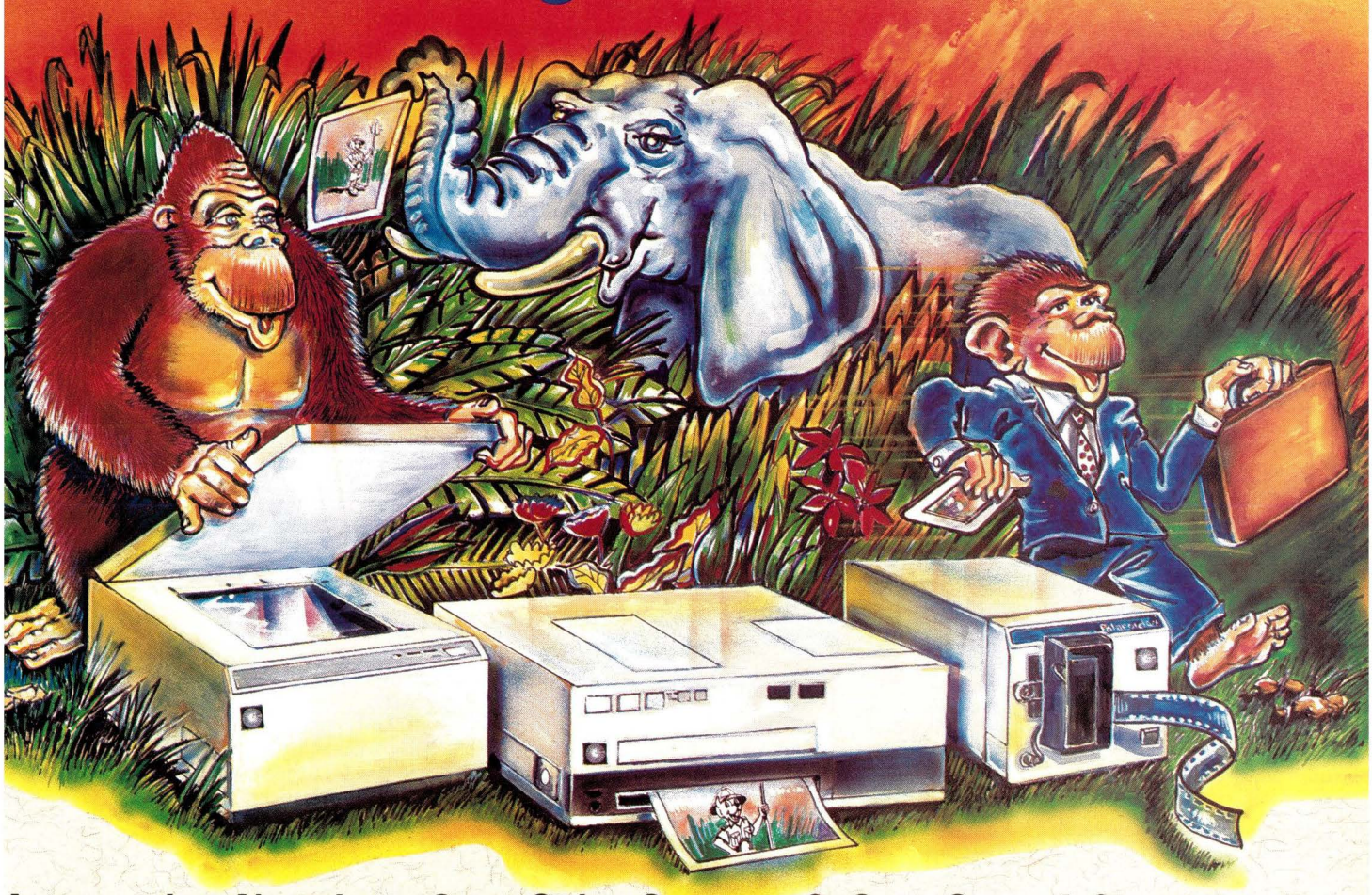

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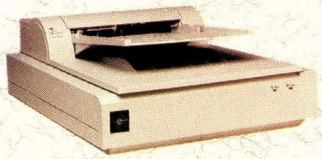

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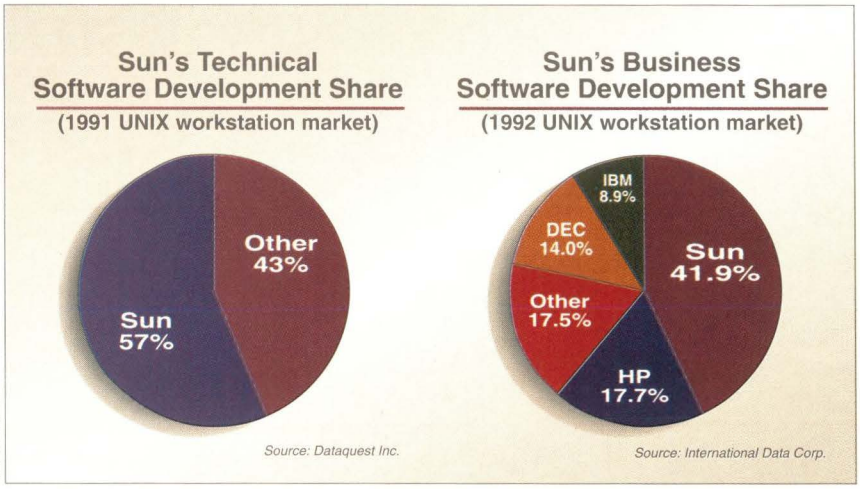

HANNA DYER

that support its theory that UNIX workstations are figuring prominently in not only technical, but also commercial application development. Sun used numbers from Sentry Market Research indicating that UNIX workstations will be the primary development platform by the end of 1993. In 1991, says Sentry, UNIX machines were No. 3, behind mainframes and PC-DOS systems, as the development platforms of choice. This year, however, UNIX systems will usurp the No. 1 spot, with mainframes and OS/2 PCs capturing the No. 2 and 3 spots, respectively.

Sun also used Dataquest Inc. and International Data Corp. data to prove the prevalence of UNIX workstations in both the technical and business software development realms. A 1991 Dataquest study found that Sun systems made up 57% of the UNIX workstation-based technical-software development market. A 1992 IDC study of the UNIX workstation-based business-software development market attributed 41.9% of the market to Sun platforms (see charts above).

SMCC's mission is to "provide the leading development and migration solutions to enable customers to run their business on more productive, cost-effective client/server platforms," the company says. This means enabling new development of client/server applications, cross-development of hosted applications and/or migration of existing host-based applications. As part of this three-pronged strategy, SMCC is publicizing the various transaction monitors under development for the Sun environment, including Encina, Top End, Tuxedo, VIS/TP and UniKix, as well as other 3GL/4GL, CASE and migration tools.–*mjf*

A Leaner and Meaner Reseller Program

One year ago this month, Sun Microsystems Inc. acknowledged what its resellers and other industry watchers had been saying for years: Its indirect channel strategy was in shambles. To its credit, Sun took a stab at fixing what was broken. So far, it looks like it is managing to do just what the doctor ordered.

Sun Microsystems Computer Corp. (SMCC) has trimmed its number of total resellers, reorganized its channel hierarchy, revamped contracts and commenced other cleanup efforts.

"The program they put in place was well-balanced," says Jody Ryden, a senior analyst in the distributed channel strategy group at Santa Clara, CA-based InfoCorp. "They've got good co-op, good technical. They've moved their smaller VARs into a two-tier distribution system" and added solid master VARs, such as Arrow Electronics, to their stable.

SMCC claims to have culled 500 or so resellers from its ranks in the past year, according to Linda Sarles, vice president of marketing for North American and Australian Field Operations and former acting head of the indirect sales organization. Currently, SMCC works with 10 or so systems integrators, 250 hardware and software OEMs, 100 or so VARs, four master VARs (Access Graphics, Arrow, Computerland and Intelligent Electronics) and 600 "indirect" (i.e., second-tier) VARs, she says.

SMCC eliminated the national value-added dealer (NVAD) category and cut MicroAge altogether from its reseller program. "MicroAge fit under a dealer model," explains Sarles. "They're more commodity-oriented." She admits, however, that as Sun focuses more on moving low-end workstations, such as the SPARCclassic, dealers could again become important to its reseller strategy. "We were just premature" in adding dealers to the mix, she says.

SMCC is currently generating more than 55% of its sales through resellers, Sarles says. The company is looking to expand this percentage to 60, tops, she adds.

Sun's current priorities on the indirect front include getting all of its resellers onto its new contract–which requires them to write detailed business plans, among other stipulations, Sarles says. It is also focusing on investing heavily in co-op marketing funds in order to get resellers up to speed on the new platforms and software Sun introduced during the latter half of 1992. In addition, the company is hammering out details regarding how resellers will handle selling Solaris on X86 platforms. "Right now, it looks like if resellers can properly position the two, we will let them handle both [Solaris on X86 and Solaris on SPARC systems]," according to Sarles.

InfoCorp's Ryden says there are some other areas SMCC needs to hone as well. At approximately 28% to 34%, the margins Sun allows its resellers are in the ballpark with other workstation vendors, Ryden says. And the estimated $1 million per year in net revenue Sun demands that its direct (non-master VAR-supplied) VARs generate is not out of line, she says. But Sun's decision to create an entity such as SunExpress, with its aggressive "street" pricing strategy, "has hurt VARs' ability to do postsales stuff," Ryden claims. Rather than buying additional memory, peripherals and upgrades through their resellers, many customers will go to SunExpress. "If SunExpress offered

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list prices"–as other workstation vendors' telesales departments do–"this issue might not be as critical," she says.

Another sore spot is that "Sun still doesn't have a neutral compensation scheme," which would encourage its direct sales force to aid VARs in selling to smaller accounts. But the overriding problem for Sun's indirect organization remains its "cavalier attitude," Ryden claims. "They're arrogant and one-sided in their approach to the channel. Every vendor is like this to an extent, but Sun is just more in-your-face about it."–*mjf*

Solaris Service–From More Than Just SunSoft?

Until now, if you had a problem with your Solaris/SunOS operating system, you went to Sun Microsystems Computer Corp. if you were running it on a Sun, or SunSoft if you were running it on a Sun clone or compatible. Soon, however, if an SMCC pilot program pans out, you could be going to a third-party service provider–maybe even the same one you use for hardware service.

In December 1992, Sun quietly commenced the pilot for its Qualified Service Provider Program for Sun hardware and software products. The first vendor named by Sun to participate in the program is Computervision Services (formerly PrimeService Corp.), which is currently authorized to extend its service offerings by including Sun software support for SunOS and unbundled software including updates and all related documentation.

At press time, an SMCC spokesperson said Sun still had not decided whether to expand the service program. He said the names of other expected participants were not available.–*mjf*

Trade-ups and Upgrades Aplenty

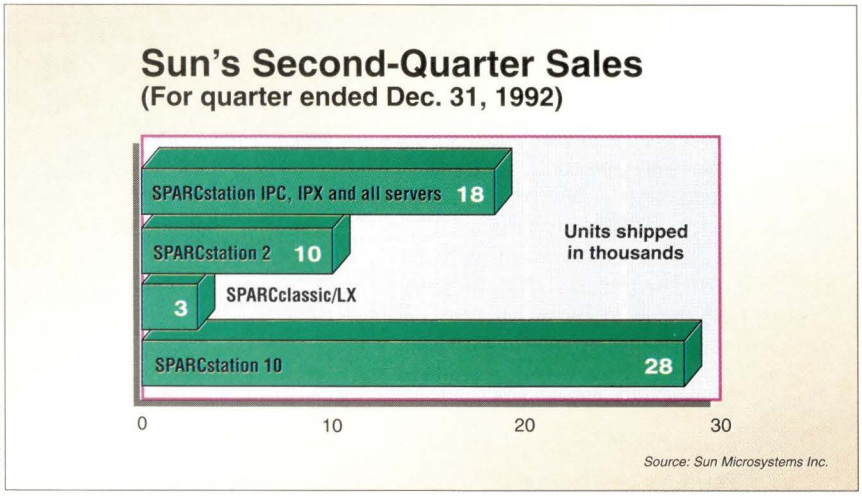
Just when you thought the bargains couldn't get any better, Sun Microsystems Inc. one-ups itself (proving that there's more than one way to "encourage" users to upgrade to Solaris 2.X).

In the past few months, Sun has announced new promotional pricing on all upgrades to its SPARCstation 10s. Now it is extending the campaign to disk and memory products. Sun slashed prices on its 424-MB 3½-inch, 1.05-GB 3½-inch and 2.1-GB 5¼-inch SCSI-2 disk options, as well as on its 8-MB SPARCclassic and LX memory expansion options. Price cuts range from 9% on the 2.1-GB drives, to up to 13% on the 1.05-GB drives.–*mjf*

How Does Sun Do It?

If you still think a SPARCstation 2 looks like a pretty good deal, even compared with the faster and glitzier machines that Sun Microsystems Inc. introduced last year, you're not alone. In fact, during Sun's second fiscal quarter (ended December 31, 1992), Sun sold 10,000 SS2s. This was topped only by the number of SPARCstation 10s (Models 20, 30 and 41) it sold, which was 28,000, according to Sun. During the second quarter, Sun also sold 3,000 SPARCclassic and LX systems, and 18,000 IPXs, IPCs and servers combined. During the same period, SunSoft claims to have distributed more than 176,000 Solaris and UNIX licenses, 131,000 of which were for Solaris 2.

These sales resulted in record quarterly revenues for the company, of $1.051 billion, up 16% over revenues from the corresponding quarter a year ago. For the first six months of fiscal 1993, Sun's revenues were $1.907 billion, up 15% from the corresponding period a year ago. For the quarter, net income declined to $34.3 million for fiscal year '93 from $47.4 million for fiscal year '92. Sun explained the decline this way: "Our gross margins declined during the quarter as the result of Model 41 shortages, as well as the cost of ramping new product production. ...However, our continuing commitment to control spending enabled us to reduce our Selling, General and Administrative expenses as a percent of revenues during the quarter, partially offsetting the decline in gross margins."–*mjf*



Sun to Novell: Let's Make a Deal

Novell Inc. and UNIX System Laboratories aren't the only vendors who can wheel and deal over the future of UNIX and NetWare. Sun Microsystems Computer Corp. (SMCC) and Novell announced in February that the companies will co-develop native NetWare for SMCC's SPARCserver systems.

Sun stressed that the pact marks the "first time that SMCC is making operating system-independent servers available to end users." Novell pointed out that "NetWare users can expect high performance of mission-critical operations because of the power and scalability of the SPARC architecture." The two claimed that the deal will be especially sweet for savvy third-party developers that build NetWare Loadable Modules, network applications and services that can take advantage of NetWare on SPARCservers.

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International Spotlight

Rightsizing the French Way

To study the benefits of "rightsizing" a corporate information system, Sun Microsystems France has set up a "club de reflection" of approximately 40 French directors of information technology, says Eric Saillard, manager of rightsizing marketing at Sun's French subsidiary.

The club is an outgrowth of a rightsizing market study undertaken for Sun France last November by Paris-based market research specialist Whatever (that's the real name). The study of 90 French enterprises, of which 70% were not current Sun clients, determined that the majority (79%) of the respondents see a major evolution in their information technology architecture. Of those who responded "oui," the top three choices were, in order of preference: establishing a new client/server architecture, porting applications onto dedicated servers, and interconnecting networks.

"The idea is to regroup these MIS directors and have them discuss how they judge the profitability of a new IT architecture and to talk about the results they may have had from rightsizing changes," Saillard says. "We want to try and model the economies that can be realized from rightsizing by studying particular cases." Saillard says the results of the group's study would be used first by the participants and then by Sun.

Sun France is gratified by the early results, according to Saillard. The findings "correspond exactly to our strategy," he says. "We are the defender of client/server architecture, and installing dedicated servers on UNIX is our way of attacking the mainframe," he noted.–*mwj*

tion between Novell and Sun. The two have cooperated in the development of Novell's NetWare NFS and SunSelect's NetWare SunLink and NetWare client support in SunPC 3.1.

Industry watchers were pleased with the deal, citing NetWare for UNIX's mixed reception in the Sun environment.–*mjf*

This Just In...

• Is partnering with ***Microsoft Corp.*** the equivalent of selling your soul to the devil? If so, SunSelect has recently passed through the gates of hell. The two rivals have inked an agreement by which the two will ensure enhanced interoperability between PC-NFS and Microsoft Windows products, including Windows for Workgroups and NT. Under the agreement, both Microsoft and SunSelect will support PC-NFS and Windows users. SunSelect will be shipping Windows for Workgroups drivers as part of its next PC-NFS release, and Microsoft will add PC-NFS software to the list of networking systems supported by Windows for Workgroups and NT by the third quarter of 1993 (developers will be supported as of the second quarter). Both companies plan to provide product support to customers needing help integrating the two environments.

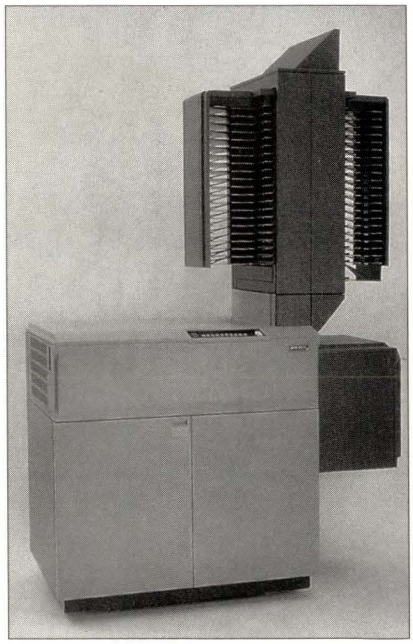
• The long and winding road (map): ***UNIX International*** has released its 1993 Roadmap for UNIX Systems and Related Technologies. While UNIX System Laboratories will continue to provide the reference technology for the base UNIX OS and related components (such as Tuxedo, DCE, Distributed Manager and the like), other vendors also will be supplying reference technologies. SunSoft will be providing ONC+ as the distributed services component of the UI architecture. And UI is seeking other reference technologies in the areas of object-management environment, multimedia support package, Windows emulation package, LU6.2 interoperability system, NetWare interoperability system, AppleTalk interoperability system and federated naming service.

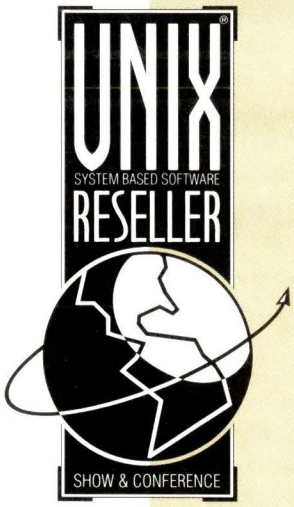
• IBM's ***Cadam Inc.*** subsidiary is shipping its Micro Cadam software for SPARCstations, marking the first time Cadam has supported non-IBM platforms. Release V1R5 products available for the SPARCstation include Micro Cadam Plus, the mechanical design tool; Data Transfer, for exchanging model data with mainframes; Alternate Character Sets, for drawing annotation in non-English characters; and Micro Cadam Access, software that enables Micro Cadam users to write programs that interface Micro Cadam data with that of other business processes, such as bill of material generation, parts management and the like. Cadam is based in Burbank, CA.

• Menlo Park, CA-headquartered ***Lucid Inc.*** has rounded out its product family by introducing a low-cost version of its Energize programming environment specifically for C; rolling out major new releases of its Energize system for C++ and C and its Lucid C++ optimizing compiler; and creating a support program for Lucid Emacs, Lucid's implementation of the GNU Emacs editor.

• In the printer-news queue: The 4525 Print System for QMS is Mobile, AL-based ***QMS Inc.***'s new, high-end 45-ppm printer. The system features the QMS Crown print-system architecture, advanced paper-handling

The QMS Inc. QMS 4525 Print System clips along at 45 ppm.





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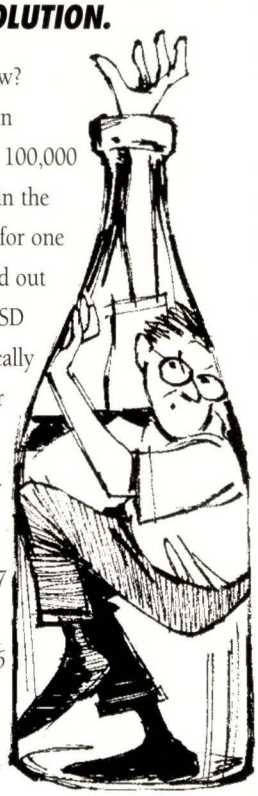

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capabilities and two configurable network interface slots in addition to the standard serial, parallel and LocalTalk ones. Other features include job accounting, remote console, control terminal, soft-loadable firmware and context-switching support. Meanwhile, Irvine, CA's ***CIE America Inc.*** has made available a NeWSprint driver for its C. Itoh CI-250, CI-500 and CI-1000 printers. The driver is on the SunPics Printer Palette, Volume 2.

• ***MainSoft Corp.***, San Francisco, has introduced a tool that allows software publishers and in-house developers to rapidly port MS-Windows applications to UNIX. Developers can convert any MS-Windows application written in portable ANSI C to any UNIX system supporting POSIX and the X Window System, the company says. MainWin uses the MS-Windows API and is natively implemented on Xlib. MainWin software development kits, dedicated to specific UNIX architectures, are out for Solaris 2.1, UnixWare 1.0, AIX 3.2 and HP-UX 8.0. Support for Windows 3.1 is due in the second half of 1993.

• Two additional customer services designed to make information retrieval and product ordering easier are available from ***SunExpress***, Chelmsford, MA. FaxInfo allows SunExpress customers to access product information and order product via their fax machines. Another program, still in beta test, will allow SunExpress customers to "unlock" applications directly from SunSoft's Catalyst CDware demo CD. The program is slated to be available later this year, when CDware Volume 5.0 ships.

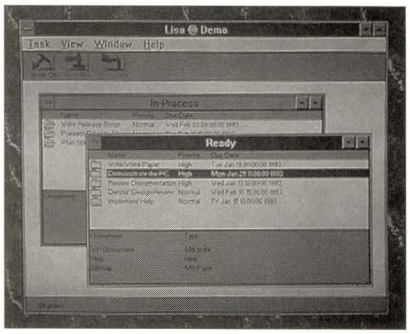
• More NetWare-related news comes from ***Puzzle Systems Corp.***, Morgan Hill, CA. Puzzle has announced a companion product to its existing SoftNet Utilities NetWare server emulation family. SoftNet Client allows UNIX workstation to directly log on and access Novell Inc. file servers as a NetWare client. The client product is available for SPARC, Hewlett-Packard Co. 9000, Santa Cruz Operation and Silicon Graphics Inc. platforms; RS/6000 support is scheduled to be added by this summer.

• ***Sun Microsystems Computer Corp.*** is making its ShowMe conferencing software available in High-Volume Multiuser License Packs. A 100-user pack, which includes 10 10-user licenses, is available for $165 per user. A 500-user pack, which includes 25 10-user licenses and 10 25-user licenses, sells for $156 per user. Prices are nondiscountable.

• SPARCalike vendor ***Tatung Science & Technology Inc.*** has taken the X terminal plunge. The San Jose, CA, company has unveiled one monochrome and four color systems, none of which is based on SPARC. (The Texas Instruments Inc. 340X processor is at their hearts.) The TXT X Terminal Series ranges in price from $1,790 to $4,390. The company is positioning the systems as complements to its COMPstation SPARC systems, rather than as standalone units that operate with any and every vendor's computer systems.

• Xerox Corp.'s Palo Alto, CA-based ***XSoft*** division has unveiled a document work flow-management application for distributed computing environments, called InConcert. The product models and coordinates all components of a work process, including the people,

InConcert from Xerox Corp.'s XSoft division is a work flow-management application for distributed multi-vendor environments.



procedures and information involved, for UNIX and PC users. The system interoperates with SQL databases (Oracle and Sybase, initially). The server portion runs on SPARCstations and RS/6000s; the client runs on SPARCstations, RS/6000s and 386- and 486-based PCs. ➸

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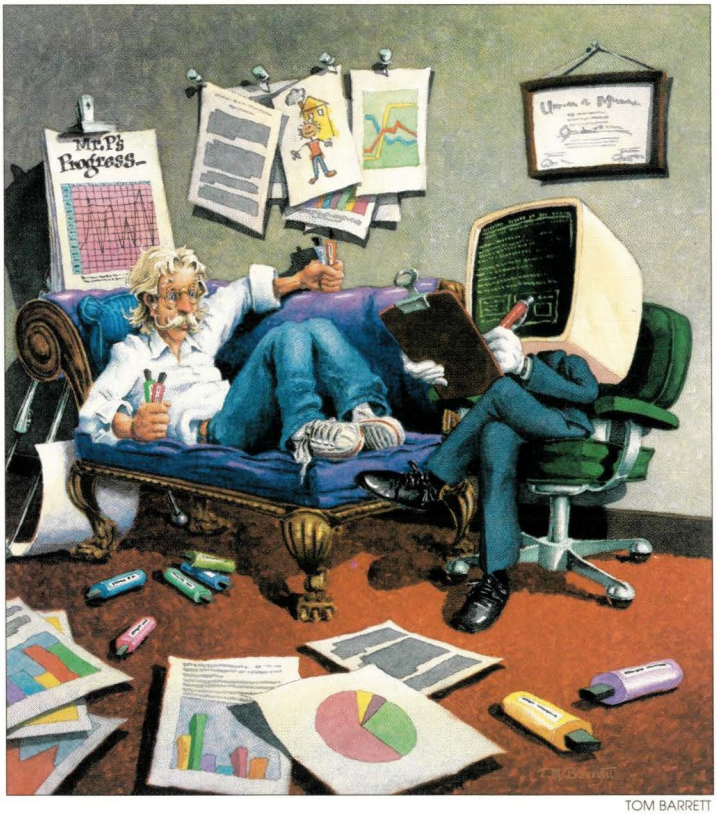

TOM BARRETT

Mr. P Consults His Analyst

by MICHAEL O'BRIEN

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–Some Austrian fellow

Q: My new project is so tough it makes beef jerky look like cotton candy. I have graphs, I have maps, I have pictures, I need a spreadsheet for the numbers, I need graphs for the pictures, I need graphs for the spreadsheet and a spreadsheet for the pictures, and Mr. Protocol is just lying there on that silly old-fashioned couch, and I want to know *why.*

A: Mr. Protocol is beyond words. Well, all right, that's his normal condition, which is why I'm here, but he's had a particularly awful day. He was forced by some unnatural person to watch the reunion show of "Laugh-In," and Arte Johnson's Dirty Old Man character seems to have cut just a little close to the bone. I'm sure he'll be all right after a little rest.

As best we can determine, the couch is an advertising promotion from some outfit that appears to have nabbled, or will nabble, the contract for producing replicators for Starfleet. They've been spreading promotional material up and down the continuum, and since they can reproduce anything, and seem to have no taste whatsoever, Mr. Protocol's mailbox has become an even more frightening place than usual. The couch is one of the more innocent manifestations. It does look like one of those repulsive Victorian numbers from Vienna, doesn't it?

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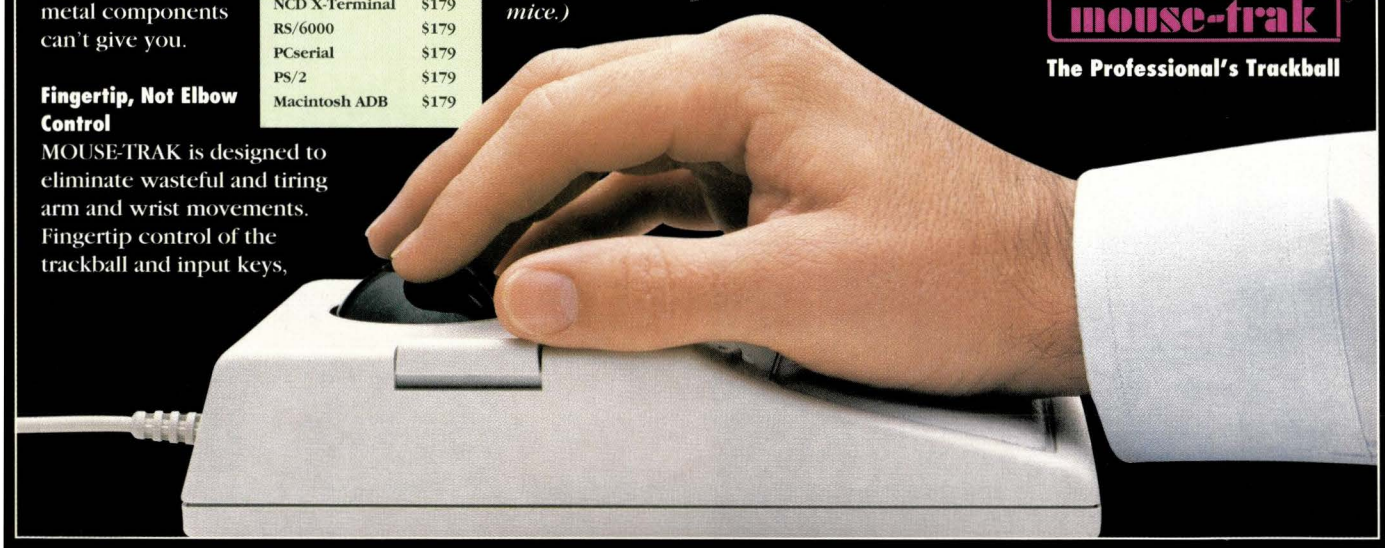

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first *claimed* that it was a marketable commodity), software was sold in discrete little chunks, each piece doing a particular task. Sometimes the pieces fit, more often they didn't, and in this rosy atmosphere the consultants and the contract shops reigned supreme and got fat. This era still reigns in most places, and the market has solidified around it. Many companies are attempting to buck the trend with products such as Windows and Windows NT, or with strategies such as Open Look or Motif, all of which are designed to provide a unifying user interface over differing products.

Those who have worked in such an environment are aware that the benefits of such an approach are limited. Depending on the skills of the software developer, not to mention the possibility that the developer may think that They Have A Better Idea in terms of a user interface, the product will exhibit greater or lesser degrees of idiosyncrasy. In the case of user interface standards, as opposed to integrated operating systems products such as Windows NT or the Mac OS, the degree of cooperation is often more apparent than real.

In recent times, this has led to an attempt to create all-in-one packages which, being single, integrated efforts, provide a much greater degree of interoperability than individually developed packages can hope to meet. This might be called the "there is more to life than a clipboard" approach. Such packages are, of course, huge, and generally quite expensive. It is necessary to overcome a large amount of up-front resistance to the price point, and the hardware requirements of the package may also be substantial.

UNIX, of course, evolved as a semi-integrated system. The basic utilities were created by a single team of people, but the user interface standard in use was rather different from the common full-screen point-and-click interfaces in common use today. Also, the degree of interoperation was not an overriding design concern. It was allowed for in those cases where it appeared natural.

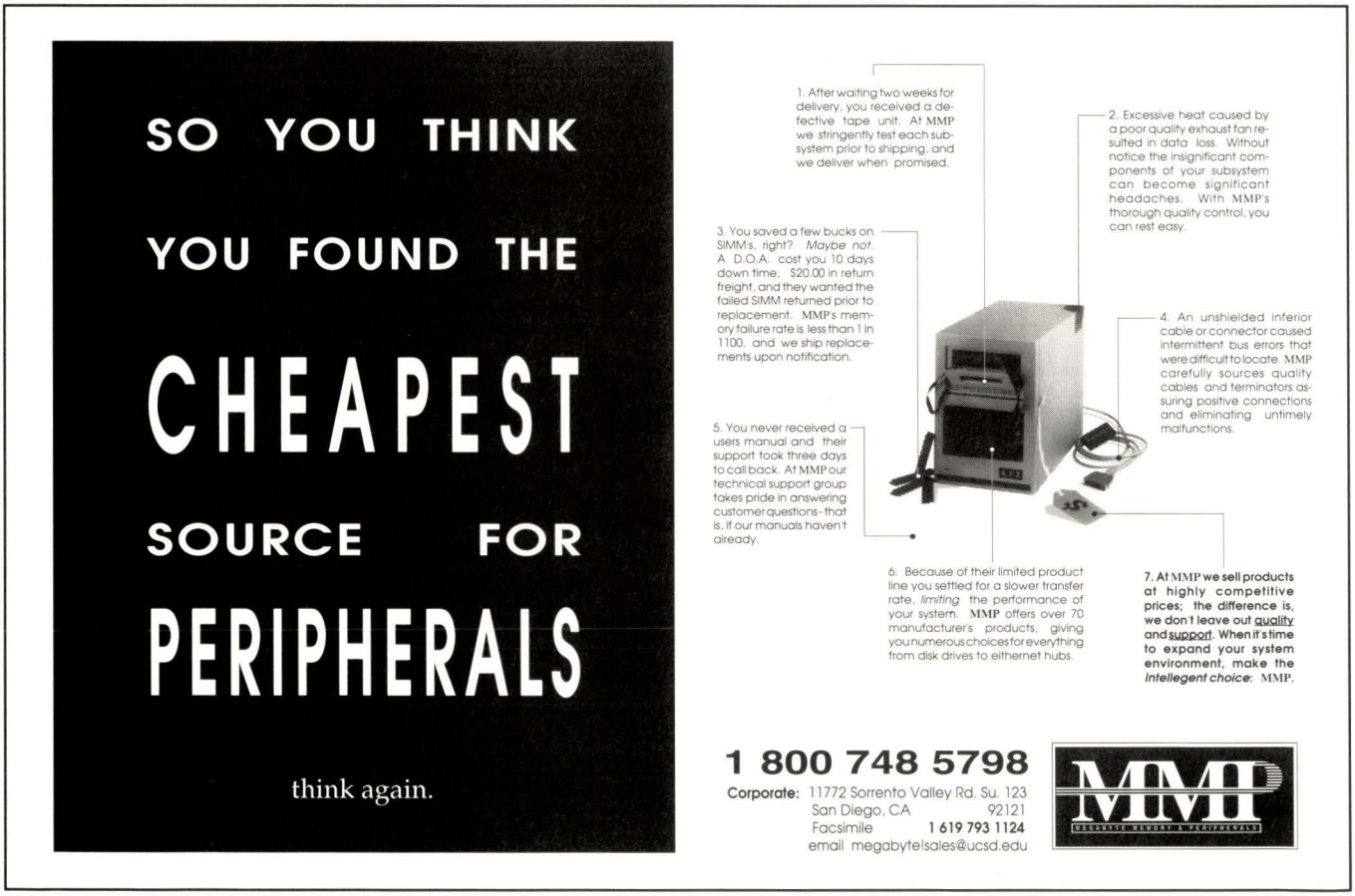
In sharp contrast are the current integrated data management systems, where just about any data item can be used in conjunction with any tool. Naturally, there are limitations in what will operate with what, but the main design criterion appears to be to allow the largest possible degree of interoperability, requiring as little muss, fuss and brainwork as possible.

However, as can be imagined, first attempts at this sort of all-in-one-and-one-for-all tool have often been unfortunate. Most of the market still belongs to the individual tools, which are working on ever more sophisticated ways of exchanging data.

What does this have to do with Mr. Protocol reclining languidly on his couch? Mr. Protocol is glad you asked.

Mr. Protocol's Austrian couch is reminiscent of The Analyst, a product of Xerox Corp.'s Special Information Systems, a division made up of apparent survivor types.

The time was when Xerox fancied itself a computer company, and the Xerox Palo Alto Research Center was chartered with finding the future, which Xerox, in a continuation of its corporate history, was going to own.



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As students of computer history will note, this did not happen. However, computer science history was made at Xerox PARC not once, but several times. In addition to inventing the scientific personal workstation, PARC also developed the first integrated programming environment, combined with one of the earliest object-oriented languages: Smalltalk.

As can be imagined, first attempts at this sort of all-in-one-and-one-for-all tool have often been unfortunate.

For many years, Xerox continued to act as if it were a major player in the computer hardware arena. Even when it was apparent that the Xerox processor line was undistinguished in the marketplace, despite a unique hardware architecture that included application-specific microcode, Xerox continued to produce processors for internal consumption. The division that is now Special Information Systems was the group that was responsible for the advanced development of software on the Xerox line of processors. Even when ParcPlace Systems spun off from Xerox to bring Smalltalk to the beleaguered masses, the Special Information Systems division continued to support Smalltalk within Xerox, on Xerox hardware, under a variety of division names.

Eventually, Xerox ceased production of its processor line, and Special Information Systems found itself a division without a mission. They made themselves useful by capturing what must have been a sizable contract with a government agency, to do something the details of which aren't clear even today.

Government intelligence agencies find that the job descriptions of most of their analysts read like that of a librarian. They must handle massive amounts of incoming information from massive numbers of sources, all in different formats, and assemble from this a coherent whole. The contract that XSIS negotiated appears to have been that of a data-management front end to what must be a truly massive back-end database system of unknown dimensions but of undoubted power.

Once this contract was completed, XSIS was left with a large body of software that it was free to market, and it did so, under the product name of The Analyst. The original versions of this product suffered from two major problems: First, the gigantic database back end that the system was designed to serve was not part of the product, leading to a number of interesting-looking wires hanging out the back, where the database system apparently used to connect in the original application. Second, the product exhibited the same problems as the rest of the "all-singing, all-dancing" all-purpose applications. It tried to do everything for everyone, but there just wasn't enough software there to do everything.

One remaining problem is price. The Analyst is not an inexpensive product, and in its full-blown development form, it requires prior purchase of Smalltalk from ParcPlace to support it. This is in itself far from a cheap product. If the final system is intended to be deployed to a large number of users, there are ways to lower the per-station price substantially, but no matter which way you slice it, the initial outlay will be substantial.

Smalltalk was originally designed as the software engine for Alan Kay's Dynabook project, which was an early (and still startling) vision of a truly personal, truly portable notebook computer. Real PC notebooks are finally starting to approach the Dynabook vision in power, but Smalltalk has all but ceased to be a personally affordable software system. ParcPlace is reasonable when approached for a personal copy of Smalltalk alone, and for that Mr. Protocol is grateful (they have not entirely lost the Smalltalk "vision"), but the thought of an individual being able to afford both Smalltalk and The Analyst is laughable–or would be, if it were not so tragic. ParcPlace and XSIS have both determined that their only viable future lies in selling to a relatively small number of relatively huge accounts.

This is unfortunate, as The Analyst has always had some corresponding benefits. First, there has not been a product like this for the UNIX market. Other all-purpose integrated systems have been targeted more explicitly at the PC marketplace, and, to a lesser extent, the Macintosh. UNIX, including Sun UNIX, has to date remained the same melange of distinct applications it has always been.

The Analyst is written in Smalltalk, which immediately presents an integrated object-oriented environment for data handling, with platform independence (among Suns, Macs, PCs, HPs and RS/6000s, at least) thrown in as a bonus. This means that the degree of interoperability among the tools available in The Analyst is greater than in any package of which Mr. Protocol is aware. The spreadsheet tool, for example, can have cells occupied by images, with the rules associated with the image cells performing image manipulation. Cells may also be occupied by charts and graphs that are assembled from the contents of other cells, and which are in turn linked into the document system.

The arsenal of tools presented by the current release of The Analyst, which is built on the current release of Smalltalk from ParcPlace, is impressive, even by the standards of integrated systems.

There are several ways of slicing up the Analyst pie. Taking the tool-based approach, the core of the system, insofar as it has one, is probably the spreadsheet tool. This is the most general tool available. It operates in much the same way as any other spreadsheet tool, with cells holding values that are either input values, or the results of rule-based calculations. However, the shorthand language of

the cell rule system is actually a thin syntactic sugar over arbitrary Smalltalk expressions. All of the other data types in The Analyst, being objects themselves, are able to respond to messages sent in the rules, so any Analyst data type is fair game for treatment by the spreadsheet tool.

Charts and graphs are available and do pretty much what you'd expect. They may be embedded in a document system, which is of the style sheet flavor, complete with utilities to map screen fonts onto PostScript fonts for printing. Just about everything in The Analyst can be embedded in a document, including hot buttons, allowing Analyst documents to be used as hypertexts in their on-line version.

There is a type of database available, which in previous releases of The Analyst was a bit of a weak point, since it was difficult to load or extract large volumes of information. Mr. Protocol suspects that the database facility was actually more of a staging area to allow data to be held in structured fashion after being extracted from the main database system for which The Analyst was originally designed as a front end. In the current release, however, there is a facility to allow Analyst-style databases to be interfaced to an Oracle database.

Maps and images are first-class Analyst data types and may be manipulated separately, or integrated into other tools.

There is a separate XSIS product, the HUMBLE expert system shell, which is also written in Smalltalk. Although this is designed as a standalone application, it may be folded into The Analyst and used to perform expert system-style reasoning about arbitrary data items. This is a powerful system in its own right and would require a separate column to discuss adequately. Although HUMBLE is not as fancy as other expert system shells, it is more than adequate, and certainly easier to combine with other applications, given its object-oriented nature. Consider, for example, the power of a spreadsheet whose cell rules are actually rule-based productions. An expert spreadsheet? An expert bar chart? A document that writes its own conclusions? (No, not likely, that last one, Mr. Protocol ruminates.)

Slicing the pie the other way (yes, it has pie charts too), the current release has a number of welcome features. These include a much expanded user administration system and an expandable on-line help system. Also, file management has finally been rationalized, so that each user's files may be kept in different places around the file system–earlier versions of The Analyst were allergic to the host file system and more or less insisted that all Analyst files be kept in the same place.

Probably the most interesting feature of The Analyst is the one that most betrays its origins. This is the linking facility. The Analyst, being fully object-oriented, allows links between

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data items as first-class data types in their own right. Polymorphism permits the objects of links to be of arbitrary type, independent of the link system. This allows dynamic links, which may be established and followed on the fly. In fact, a secondary product, The Assistant, allows links to be established based on rule sets, so that as new data are entered into the system, links are automatically established between items that satisfy the conditions of the rules. This means, for example, that if the rules for correlation of data can be expressed as rules, the data can be correlated as they are entered.

In addition, bucking the "object-code only" trend that has been hitting even the Smalltalk market lately, The Analyst makes available a development environment that includes full source code for the system. Also, the cost for this version is not 10 times the cost of the binary version, as one might expect–it is much more reasonable.

The availability of the Analyst source code is, to Mr. Protocol's way of thinking, the product's single most important feature. It turns over the keys to the kingdom in a way that products such as Access and Wingz can never do. Even the "macro" languages now being touted for such products cannot do what a Smalltalk programmer can do with The Analyst. This is because the source for The Analyst is in addition to the full Smalltalk source code that is an intrinsic part of the Smalltalk programming environment. No matter what bizarre requirement The Analyst may be called on to satisfy, the raw material is there to allow a Smalltalk programmer, or programming team, to change the system as needed.

Mr. Protocol does not for one moment dream that he can pull the wool over your eyes and make you think this would be an easy thing to do. He merely points out that it is a *possible* thing to do, which puts The Analyst far ahead of the rest of the pack, boy howdy. The base code of the Smalltalk system is polished and tight, because for many years it was a labor of love, and has been honed by much experience. Additional stuff put in there in recent years by ParcPlace is rather less so, because it is supported by real-world economics. Code developed for The Analyst, both as part of The Analyst proper, and as changes to the base Smalltalk system in support of The Analyst, has the same problem. It is not refined and polished to the nth degree. There are still some wires to be spotted hanging out the back by those with the patience to look for them.

But the fact is that the source code is there, commented and documented, with the entire power of the Smalltalk programming system present to support it. Mr. Protocol feels that it will be a cold day in a warm place before you ever see that in a Microsoft product. ⊸

The thought of an individual being able to afford both Smalltalk and The Analyst is laughable–or would be, if it were not so tragic.

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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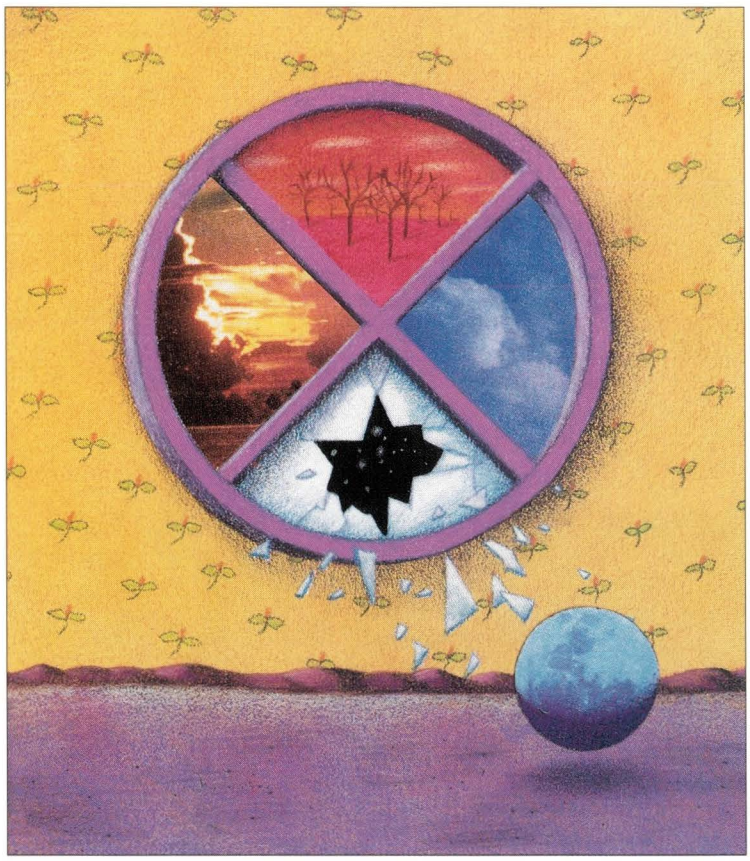
KEITH GRAVES

The X Window System

by **PETER COLLINSON**,
Hillside Systems

If you are using a Sun as a workstation, then the chances are good that you are also using a window system to display multiple images on your screen. These days, that window system will probably be some flavor of OpenWindows. Older workstations may still be using SunView, and people with access to the net may be using "real X11." Some people may even be using Sun's NeWS system, although this is less likely. Its rival, X, is now the de facto standard. Many people wish that was not the case; NeWS is based on display PostScript and provides a dynamically programmable system.

However, Sun saw the writing on the wall, and they generated OpenWindows. Market forces dictated that they needed to provide the ability to use X. They did this by implementing an X server in the NeWS system. The resulting server can do both. They are now planning to phase this out in favor of a "true" X server and will take Adobe's extensions to support the need to display PostScript on the screen.

The X Window System was created and is being developed by a group of workers at MIT, assisted by several companies and other universities. The group is collectively known as the X Consortium. The code is all freely available, so it's possible to obtain the source to the public releases. As usual, I have rushed ahead. Let's backtrack a little to see the problems X11 tries to solve.

Sun was one of the first companies to realize that the workstation was going to be an important cornerstone of computing. The creators of Sun set out to build and market a workstation. It was conceived as a personal computing engine connected to a network. A key feature of the workstation is the bit-mapped screen and the flexibility that this gives to the process of displaying data.

Perhaps it was more of a revolution to be able to display the output from several programs at once. To make this happen, programs need to be constrained to use only part of the screen. They need to be able to alter their section of the screen asynchronously from any other activity on the system.

Once we can display the output from several running processes, we require a mechanism that allows the user to select which process is to receive the characters from the keyboard. This is done by adding a pointing device to the workstation. Conventionally, this is a mouse, but other analog devices like tracker balls are also used. The pointing device controls a cursor that is allowed to roam over the whole screen and is used for selecting the current input process. Increasingly these days, the mouse is used as a primary input device to press buttons, select from menus or drag and drop objects.

I suspect that I am lagging behind these developments and still use my Sun as a terminal multiplexer. I don't have many

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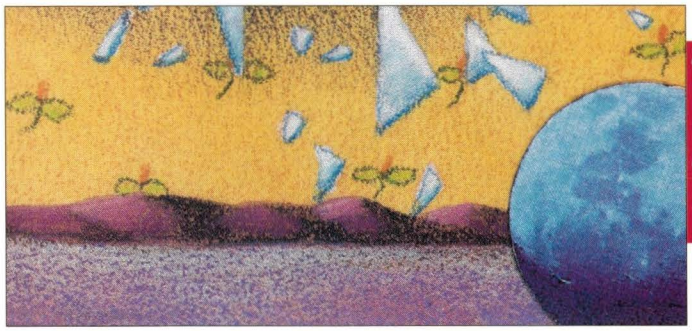
programs that could be called "graphical" on the screen, apart from the traditional `xload` and `xclock`. The remainder of my screen is covered with several overlapping windows, all showing some text.

Servers

When we want to manage a single resource like a screen or perhaps a disk drive, it makes sense to have one piece of code doing the managing. Otherwise communication between the different users of the resource is difficult. Also, it's better to write the code once, get it working and forget about it.

In traditional UNIX, it was usual for the kernel to manage system resources. For example, the single piece of management code for the disks is placed in the kernel. The kernel takes requests from user processes and translates them into requests for disk activity. UNIX wants to allow its processes to deal in files and directories, rather than having knowledge of the raw disk layout, so the kernel code provides a "model" of a file system for the user processes. It takes file-system requests from the processes and translates them into actions on the disk.



In traditional UNIX, it was usual for the kernel to manage system resources.

The kernel interface (often called "system calls") provides a way to control access to the various system resources. It also provides a way of modeling desired high-level behavior. When Sun designed SunView, it was natural to think along these lines. They ended up with a system where the operating system kernel contained specialized drivers managing screen partitioning and window control. SunView applications used a library to talk to the kernel drivers accessing their own window on the screen. The library and the kernel code provided a way of modeling needed higher level behavior for the applications. For example, an application thinks that it is displaying data on a workstation with no other screen users; it sees a "virtual" workstation.

As time has gone on, the notion that you place shared code into the kernel has been replaced by the idea that much of the work can be done in a program running in user space. The program sits waiting for something to do, does it and then loops waiting for the next task. UNIX has always had programs like these and calls them *daemons*.

Many UNIX daemons wait for some input event to make them start doing something. Usually, the daemon waits for a physical event like the character appearing from the keyboard or a packet appearing at a network interface. The code in the daemon is locked into waiting for a particular event. In traditional UNIX systems, it's not too easy to make a program wait for events from many different sources. The way that the system calls work means that the daemon will tend to read from a device and be locked into reading from that single source.

Instead of this scenario, let's make the daemon wait for a *message*. The message contains an event number saying what has happened and perhaps some associated data. All messages are transferred into the daemon using a single system call; this overcomes the difficulty of listening to several different sources. Messages are created by some process and passed into the kernel with a destination address; the kernel ensures that the required message switching takes place. We do need some code to encapsulate a physical event into a message that is passed into the daemon. Once the daemon is listening for messages and dealing with them, it becomes easy to send messages from several sources into the daemon.

In turn, messages are available as a natural byproduct of the networking code. On networks, we are used to the idea that we pass messages between machines to communicate some information. What is really happening is that we are passing messages between two processes, one on each machine. We can also make the messages stay on one machine where they are used to communicate between two local processes. Once we have accepted the idea that messages form a rational basis of communication between processes, then suddenly we can write position-independent servers. If we encapsulate some event as a message, we can send it anywhere. It can reach a server on the local machine or one on the other side of the world. Frankly, as Rhett Butler nearly said, we don't give a damn.

How does all this apply to windowing systems? If we move all our windowing code into a server, then it can control the appearance of the screen. Data from the outside world then flows in as messages. When we start processes that are to talk to our screen, they can send data as messages into the server. We generally call these processes *clients* of the server. The server handles the hardware, loading data into the screen bit map. It will also handle the system input devices, turning their data into messages that are sent to the relevant client for processing.

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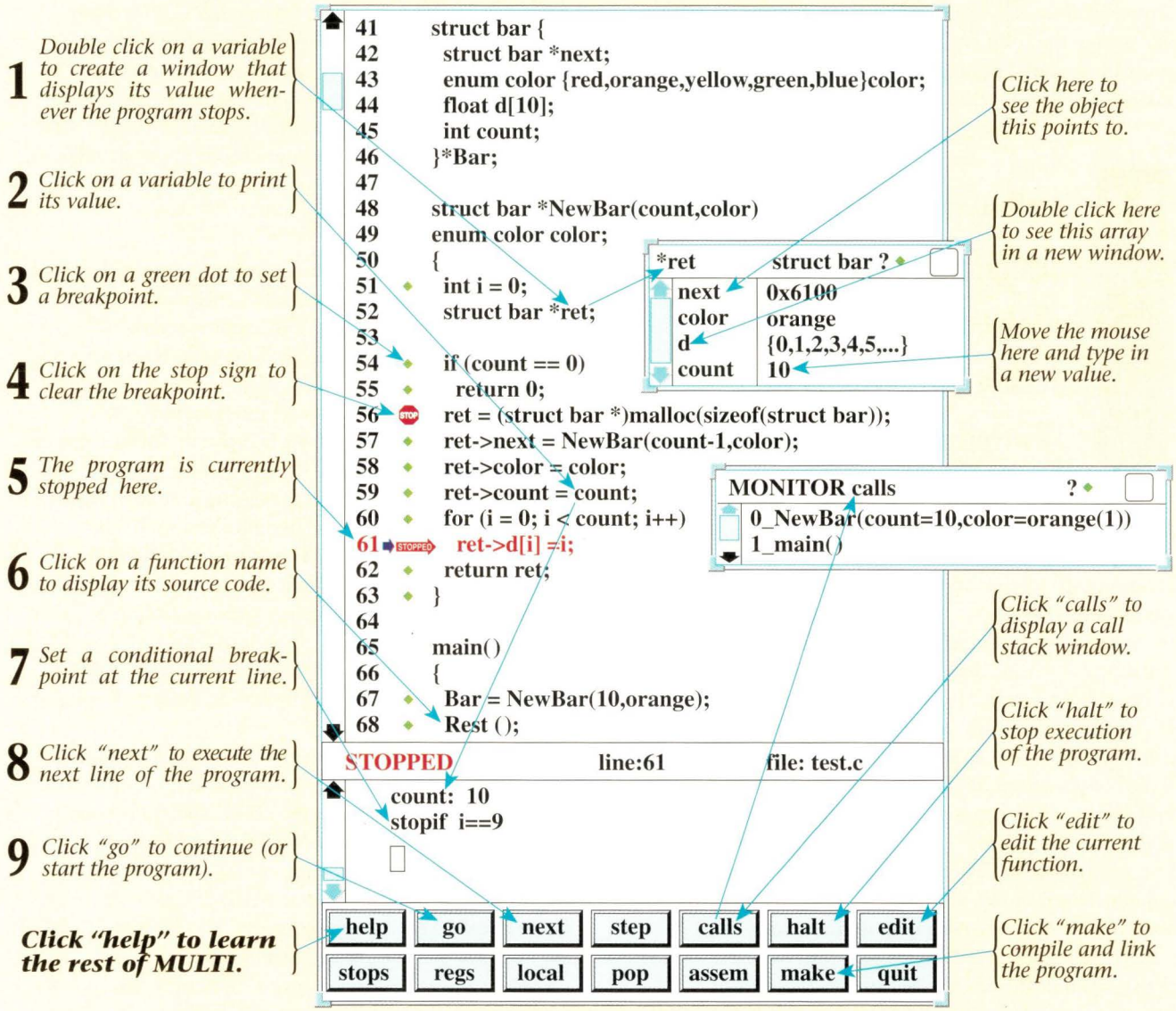

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X Protocol

The X Window System was designed with this client/server model in mind. The "X" is the name of the protocol used for communication between clients and the server; strictly, it's the "X protocol." Clients can be local or remote. They use a TCP/IP connection to the server to send and receive X protocol messages. This has allowed the development of the cheap X terminal, which is simply an X server running locally in a dedicated machine. All clients are expected to be running somewhere else.

The X server also follows good operating system practice and hides the type of the output device from the clients. The same client can talk to the monochrome screen on my Sun and also to the color SVGA screen on my PC. The user is probably aware of passing color selection information into the color screen but doesn't need to be. The code in the client probably does not even mention the possibility of color output; it relies on the other parts of the X system to get things right.

By allowing the flexibility, the designers of X have perhaps allowed the marketplace to decide, or perhaps they allowed room for experiment.

The clients are responsible for controlling a piece of screen real estate. They are not allowed to say where their piece of screen should be placed nor how big it is. They can give hints, but that's all. It's the job of a special client program called the *window manager* to dictate the appearance and layout of the screen. It also provides some policies about how the user interacts with the system. The window manager is just another client program, but it has special responsibilities. Typically, it allows the user to start new applications, to move and resize windows and control the way that windows are dealt with on the screen.

Previous systems had bundled the window manager in with the server, but this was rejected by the designers of X. The idea was that a user could choose which window manager they wished to use. For example, I use Sun's OpenWindows server on my machine, but I don't use `olwm`, the standard window manager. Instead, I use the MIT-supplied `twm` window manager. I didn't have to compile this; it came as part of the standard OpenWindows 3.0 package.

Also, vendors are able to implement their own manager using some internal "house style." This was probably a key notion helping the commercial acceptance of X; vendors can provide their own value-added piece they hope will make you buy their equipment rather than the competition's.

However, it is true to say that the rights of the user are important to the designers of X; the X Window System is supposed to supply "mechanism but no policy." As we have seen, an application cannot specify where it is to be placed on the screen; it must be able to operate anywhere. It must also be able to cooperate with the window manager. This imposes a set of constraints on providers of applications. I think these constraints benefit users.

Another good reason for insisting on flexibility was (and still is) that no one is really sure how to write a window manager. People still have different ideas about what a window manager should and should not do. By allowing the flexibility, the designers of X have perhaps allowed the marketplace to decide, or perhaps they allowed room for experiment. Certainly, they have ensured that you can replace the rubbish system supplied by your vendor with something that you consider worth using. Naturally, the terms "rubbish" and "worth" are subjective, deeply religious topics.

Clients

So the server talks to the hardware and controls the physical display, keyboard and mouse. The window manager controls the layout and appearance of the screen. What of the clients? An X client or application talks to the server using routine calls that access a library called `Xlib`. These routines provide a very low-level interface to the server. You can write programs using them, but you are encouraged to use one of the various tool kits, of which more later.

The library routines enable the clients to send messages to the server, making things happen on the screen. The messages are called *requests*. The messages contain a code that is used to determine which type of request is being made. Some requests may elicit a response from the server; some may not. The library tries not to send a message for every operation that the client code requests; instead the messages are buffered in the client. The buffer is flushed at appropriate times.

To try to make things happen at a reasonable speed, the designers of the X protocol worried about limiting the amount of information that the client sends to the server. The X server stores state for its clients, and this state is accessed by the requests. For example, to draw a line, the client only sends the end points of the line to be drawn. The server already has a "graphic context" that gives the width of the line, whether it is dashed or solid, etc.

The server is the natural place to store things that are of interest to all clients. The server will store bit maps in a drawable form so that the client can refer to them later by using reference numbers. The server will store all the fonts that can be used, so that the client can talk in characters and have them quickly translated into an image on the screen. The server will store various "properties"; this is a general-purpose database used to store various pieces of information.

In turn, the server communicates with the clients using the same protocol. It sends *events* wrapped in messages. If you look at the way a typical client works, it will first set up the screen and will then sit in a loop waiting for events from the

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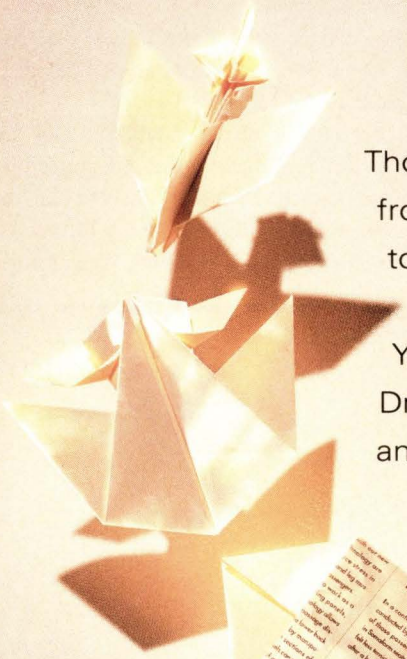

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server. The events encapsulate keyboard button presses, mouse movements, mouse button presses and so on.

Clients are responsible for maintaining the images of their own windows. I use the plural here because each client will have a great many separate windows that are part of the display. We think that the client has one window that is one area of the screen. In fact, X windows are hierarchical; windows sit inside windows, that in turn sit inside windows. For example, think about a window being used for a dialog box; inside that window will be windows containing buttons that hold windows with bit maps in them. The dialog box may also contain a window that permits text editing to take place. X treats all these windows in the same way, providing hierarchical connections and visual properties.

The server does not maintain any state about the graphical contents of all these windows. It relies on the clients to create and update their own images. A single click on the screen may cause a window or a portion of a window to become suddenly visible. A message, an exposure event, will be sent to the client saying that it needs to redraw all or part of its screen area. What actually happens depends on how clever the client is. The client may elect to redraw the whole of its visible area or just the portion that has been exposed.

The redrawing can be an expensive, time-consuming business, especially if the exposure event was caused by a pop-up menu or dialog box. There are mechanisms to save the bits of the screen "under" such a box so that the repainting is not needed. These are not guaranteed to be present in all servers.

In my small exposure to X programming, I found that it was not too easy to manipulate windows in a dynamic way. X really wants to make you create an image from a set of windows and then use that image statically. It's hard to rearrange windows on a live application in a way that is comfortable to the eye. I suppose the power of the machine that I am using now is many times the power of that original machine. Maybe I should try this again.

Tool Kits

It was never the intention that the authors of clients should write in the raw `Xlib` calls. The idea was to place a tool kit on top of the library, giving the client access to ready-made higher level functions like sliders, menus, text-editing areas and so on. In X, these functions are known as *widgets*. The base X11 distribution is provided with a set of widgets known as the Athena widget set. Sun has a set in the Open Look tool kit. The Open Software Foundation created, promotes and distributes the Motif tool kit.

I have long thought that this is an area where X falls down. As an application developer and also a user, I want to be able to write and use a program that will run on every platform, irrespective of the look and feel of the native X implementation. Unfortunately, this is just not possible. My application

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is designed to work with a particular widget set, and this locks me into a specific look and feel. There are packages (XVT is one) that provide a portable programming layer. The applications writer needs to be prepared to choose some middle line of functionality that avoids the contentious pieces of the different widget sets. With due respect to the XVT folks, I think this is bolting on the botch after the design is closed.

On the other hand, one cannot be too scathing about the designers. They were working in a poorly understood area and have generated something that will last. The Athena widget set led the way and designed a style for writing widgets. Widgets are "objects" in the computer science sense. An object physically consists of some data that defines its state and some code that are the "methods" performing actions on the data. There is clearly defined private data and code that no one else is supposed to touch. External access to the widget is via well-defined public entry points and data.

Complex widgets are created from simpler ones, with the complex ones inheriting the methods of the simpler ones. When you place a widget on the screen, you are creating an "instance" of the widget. This will generate some unique physical data for the widget.

This all sounds very grand. It has the flavor of the triumph of dogma over sense, especially when you realize that this is all achieved in C, a language more noted for its ability as a high-level assembler than its capability as an object-oriented programming language.

However, there are some definite benefits for the end user. First, the complexity of widget creation has meant that you must follow the rules and buy into the whole package. This has enforced some consistency and a measure of portability on the X system as a whole. For example, most applications are user configurable using the resource package.

Secondly, widgets do make things easier for the applications programmer, once the culture shock of how to understand what is happening is overcome. It you treat widgets as "black boxes" that operate independently from your code, then you can create credible applications reasonably quickly.

More Reading

I have two books by Niall Mansfield that might help: *The X Window System, A User's Guide* provides a good basic introduction, although its contents have aged somewhat. Also, Niall has recently written the cutely named *The Joy of X.* Both books are published by Addison-Wesley.

For programmers and people who like to understand the full gory detail of how things work, I must recommend the O'Reilly series of X books. Much of the introductory material is very well written and worth a read. ⊸

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+. Email: pc@expert.com.

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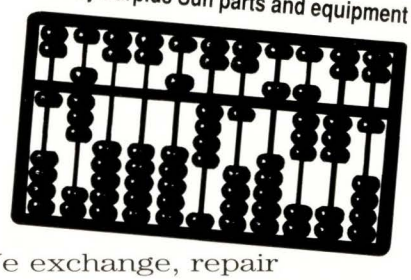

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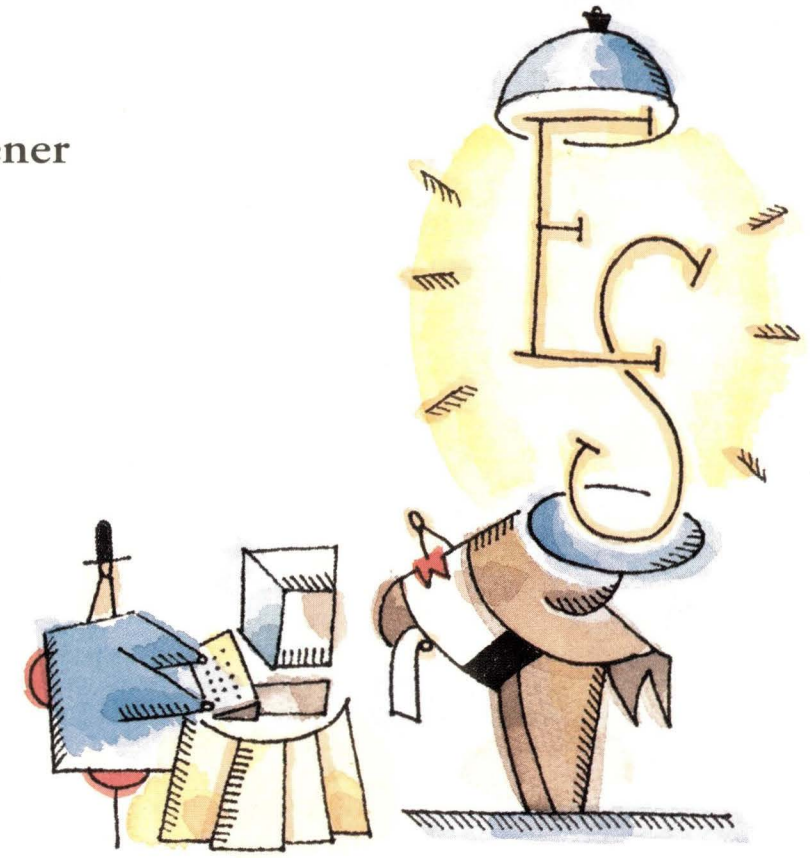

ROBIN JAREAUX

by **RICHARD MORIN**,
Technical Editor

Elegant Simplicity

UNIX is a very large and powerful operating system. Much of its power, however, comes not from its size but from the elegance and simplicity of its interfaces. The UNIX file system is the traditional example.

The idea of files as character streams is a good example of elegant simplicity. You can treat UNIX files as if they were record-based, indexed or random access. The underlying definition, however, rests on sequences of characters. A file is a sequence of zero or more bytes.

Despite its apparent complexity, `/dev` hides another example of simplification. It contains a wide variety of items, all posing as "files." Among these are several kinds of memory (`eeprom`, `kmem`, `mem`...), raw and cooked devices (`rsd0a`, `sd0a`...), terminals and windows (`ttya`, `win0`...), and even a couple of convenience "files" (`null`, `zero`).

By treating all of these as files, UNIX makes life significantly easier for both programmers and users. One set of interfaces works for all of them, and special cases can be handled by a workaround system call (`ioctl`).

The Shell

The UNIX shell also has moments of elegance and simplicity. The file redirection operators can get a bit baroque at times, but their basic forms are quite clean, mnemonic and usable. The pipe operator is so deceptively simple that Doug McIlroy had to lobby very hard to convince the UNIX developers to include it.

Sadly, none of the shells are very elegant, overall. The Bourne shell (`sh`) syntax borrows heavily from Algol-68. The `case`...`esac` and `if`...`fi` constructs reflect this, even though `do`...`od` was dropped in favor of `do`...`done`. Algol-68 is not a command language, however, so `sh` includes a variety of quoting rules, magic characters and other paraphernalia.

Despite this, `sh` still lacks a number of useful interactive and programming features. The Korn shell (`ksh`) adds many of them in but does little to clean up the underlying mess. The C Shell (`csh`) abandons simplicity entirely in its search for new, interesting and (sometimes) useful syntactical goodies.

I find `csh` to be very convenient for interactive use, but awful for programming. The converse applies to `sh`. I haven't looked closely at the GNU Project's Bourne Again SHell (`bash`). I am told, however, that the syntax is that of `ksh`, augmented in part from `csh`. If so, I would expect quite a bit of power, but little elegance. Plan 9's `rc` shell is a bit more elegant than any of the above, but it doesn't add much in the way of power.

If SunOS 4.X supported `ksh`, I might have switched over to it, despite the loss of the `csh` "`!`" notation. (SunOS 5.X includes `ksh`, real-time features and bugs. It removes familiar system administration, speed of execu-

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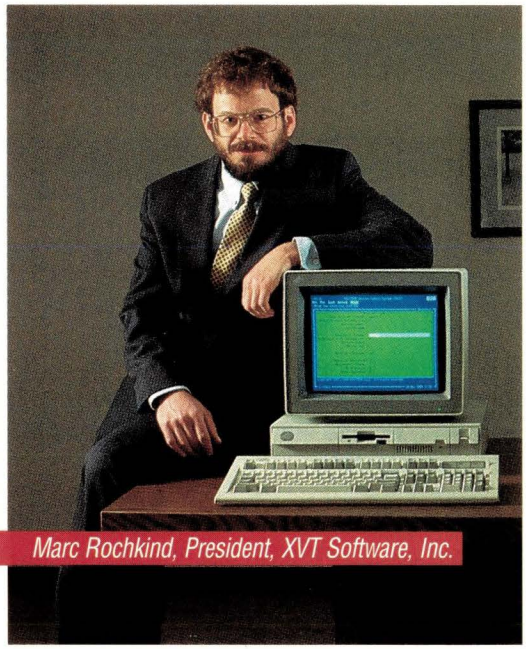

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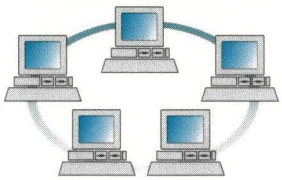

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tion and the entire C development suite. Count me out for now...)

Larry Wall's perl language can be used for many scripting jobs. It is extraordinarily powerful, combining much of the power of sh, awk, sed and C. Unfortunately, it also combines their syntax, so it loses badly on elegance and simplicity.

Given the paucity of really interesting shells, I've been sitting this one out. I use csh at the keyboard and sh for scripting. Not a wonderful solution, but functional and *very* portable. I've been hoping strongly for a better answer, however.

Es Ist Gut!

I was therefore very pleased to read the recent paper "Es: A shell with higher-order functions" (Paul Haahr and Byron Rakitzis, 1993 Winter Usenix, Page 53). When I attended the session, I became even more excited. These guys have given serious thought to what a shell should do, how it should look, and what the underlying structure should be. Although es is still very experimental, it shows enormous promise.

es (extensible shell) appears to provide more power than any other shells I've seen to date. It does so, not by adding new syntax, but by folding syntactic elements together. Here is a simple bit of es code; it lists the names of subdirectories in the current directory:

```
for (f = `ls)
  if (test -d $f) {
     echo $f
  }
```

The for command runs ls, putting its output into a list. The elements of the list are assigned, one at a time, to f. Note that a *single* back-tick (`) is used for command substitution. This allows arbitrary nesting of command substitutions (e.g., echo `{echo `{echo foo } }). Braces are used to group sets of tokens into single arguments.

The if command executes its first argument, executing the second if the first succeeds. A third, optional argument is run if the first argument fails. This is similar in concept to the handling of if in sh, but I like the es syntax better.

The for list need not come from a command substitution. An explicit list or even a variable will do. The list can also contain commands instead of data. Here's another example, which runs three commands against the set of files whose names start with "a":

```
l = sum wc file
for (c = $l)
  $c a*
```

The same result can be gained by using a "lambda." Lambda bindings, borrowed from Lisp and its relatives, define ways of binding values into code. In the example below, the list of filenames (a*) is bound to the variable f:

```
@ f {
  sum  $f
  wc   $f
  file $f
} a*
```

By assigning a lambda binding to a specially named variable, you can create an es shell function. The code above can be made into a function in either of two ways:

```
fn-foo = @ f {
  sum  $f
  wc   $f
  file $f
}

foo a*

fn bar f {
  sum  $f
  wc   $f
  file $f
}
bar a*
```

Because es uses *lexical scoping*, variables inside lambdas (or functions) cannot conflict with variables outside. es also has a couple of variations on scoping, allowing very fine control. For an explanation of these, as well as a number of other fine points, I refer you to the paper.

es supports a special class of *settor* functions, which can be bound to es variables. Whenever the subject variable is set, the settor function is executed. I'm not quite sure how I'd use this feature in programming, but it sure looks handy for debugging.

es has a nifty exception-handling mechanism. I can imagine using it to make my scripts a bit more user-proof. I also like the fact that just about anything can be returned by an es function. As the authors describe it: "UNIX programs exit with a single number between 0 and 255 reported as their statuses. es supplants the notion of an exit status with "rich" return values. An es function can return not only a number, but any object: a string, a program fragment, a lambda or a list which mixes such values."

The es paper shows an impressive, if arcane, use of rich return values to implement hierarchical lists. My own interests are a bit more mundane. Nonetheless, if es lets me return arbitrary data from a function, I'm *sure* I'll find ways to take advantage of the feature.

Spoofing

Much of the real extensibility of es comes from the fact that the shell syntax it presents to the world is a fake. Just as es rewrites function definitions as lambdas, it rewrites every command it sees into calls to built-in functions. The pipes, redirection arrows and other shell magic are all converted into mundane, if invisible, es syntax.

So what? Well, these underlying functions can be rewritten, giving them added or even different functionality. The paper shows a nine-line es script that rewrites the pipe(1) operator to time(1) each process. The mechanism even allows for *layers* of rewriting. This means that all the built-in commands and operators are up for grabs. I could have fun with this!

Futures

The authors of es are looking at ways of extending it. They are interested in making the basic syntax even more extensible, improving some implementation inefficiencies, and converting the shell into a library, similar to Tcl.

I love the latter idea, particularly if they can bring in the windowing aspects of Tk. A "windowing es" (wes?) could be a lot of fun to use. A

battle involving wes, wish and WKSH would bring a lot of interesting ideas to light, improving the final results for all three.

Meanwhile, I'll play with es, bug the authors for fixes and improvements, and try using it for some serious work on occasion. I don't think I'll make a total switch to it quite yet, however. I like the interactive features Bill Joy put into csh, and es doesn't have these yet. I also miss a few programming features from sh (e.g., switch). Finally, es is a bit too unpolished in its error-handling for my taste.

All of these problems are readily fixable, however. Some of them can be resolved by writing es scripts. The basic structure of es, unlike that of the other shells I've seen, encourages this kind of experimentation. This makes me eager to join the party, and to see what design decisions the authors make next.

So Where Is It?

The Usenix paper on es, a copy of the es mailing list archive and several incarnations of the source code can be found in directory /pub/es on FTP server ftp.white.toronto.edu. To join the list, send mail to es-request@hawkwind.utcs.toronto.edu. The list address is es@hawkwind.utcs.toronto.edu.

Be prepared to fiddle a bit with the package before you can install it. The es code is written with function prototypes, which SunOS 4.X cc doesn't handle. The authors suggest gcc as a readily available alternative. There is also a substantial configuration file (config.c) which must be tweaked before things will build. Ease of installation usually comes along with increased use of freeware packages, so I expect some of these these nits to be resolved over time. ⊷

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

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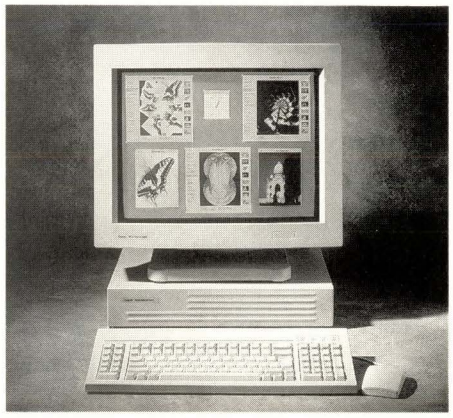

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Your Standard Column

JOHN W. KELLEY JR.

Standards and FTP Revisited

by PETER H. SALUS

In my November and December columns last year, I mentioned just why most standards weren't available by FTP and also the tragic tale of Bruno, as recounted by Carl Malamud.

Well, I received a great deal of mail concerning these columns, including a number of items I'd like to share with you.

First of all, you may recall that I quoted a Dr. Zakharov of ISO (in Geneva) from Malamud's *Exploring the Internet*. Dr. Zakharov has objected to my remarks:

"I was astonished at your article on pp. 40-41 of the December 1992 issue (Vol. 3, No. 12) of the *SunExpert* magazine, and its reference to what I do or do not think about Standards. I know it is always dangerous to deny anything to Journalists, but here, for the record, is my position.

"I have never said to Mr. Malamud (or anyone else), nor do I think, that Standards, those of ISO or others, are unreadable and that others should not read them. Nor have I said anything about who should interpret them or how this should be done. In short, I deny having said or implied anything like the words attributed to me; I refrain from commenting on the rest of your article.

"I have not yet seen a copy of the Malamud book in question, and will comment when I have seen the precise words you claim to be reporting. In the meantime, I would ask you to make it clear in your pages that I vigorously deny having said what you claim I have said, and I do not subscribe to the views so expressed."

I wrote Dr. Zakharov that I was sorry if Mr. Malamud misrepresented his words or attitudes. However, I felt obligated to allow Malamud to respond. He replied:

"I took extensive notes during my encounter with the venerable Dr. Zakharov and wrote a draft for my book very soon thereafter. The rendition of our meeting in *Exploring the Internet*, if not altogether charitable, is a highly accurate description.

"While the good Doctor is certainly 'on' the Internet, it is worth pointing out that ISO uses a Novell network which connects to an X.400 gateway which in turn connects to the Swiss ARCOM X.400 system. In Zurich, the message reaches an X.400 gateway where it is translated into RFC 822-compatible mail and traverses the rest of the world using TCP/IP protocols. Boasting about this level of connectivity is much like a person who has successfully installed the MKS Toolkit on MS-DOS bragging on about being a 'UNIX System Administrator'."

Carl S. Jensen wrote pointing out that there were now CCITT documents on-line:

"I just read 'Your Standard Column' in *SunExpert* 12/92. It left the impression that 'Bruno' was a failure and no documentation is available via the Internet. The following mail from the beginning of December indicates that the On-Line Standards Retrieval is up and running. I don't know if this is the implementation of 'Bruno' or some derivative, but it looks like it solves the problem."

The "press release" referred to began:

Wide Range of ITU* Documents Now Available On-line: ITU Standards to Become Electronically Accessible in Early 93

What you get from the site is:

T E L E D O C
Auto-Answering Mailbox (TAM)

CCITT DOCUMENT
RETRIEVAL USER'S GUIDE

CCITT
International
Telecommunication Union
Place des Nations
1211 Geneva 20
Switzerland

[700 lines deleted]

Unfortunately, as John R. Levine pointed out to me: "Teledoc is not as cool as it purports to be. In particular, the standards themselves are not available, just one-page summaries–barely enough to decide whether to shell out the bucks to the Swiss printers."

I had not meant to imply that Bruno was a failure–that's why I put "failed" in quotes last December. It was shot down. However, there is hope: IEEE is putting all but the final draft of various of the POSIX items on-line. Those of you who are IEEE CS members may have your investment justified.

I'll let Mike MacFadden have the last word: "Fear of FREE access is the problem."

Yet another book: *Networking Standards*, by William Stallings (Addison-Wesley, 1993; 646 pp.; ISBN 0-201-56357-6) is a fascinating and valuable volume. Subtitled *A Guide to OSI, ISDN, LAN, and MAN Standards*, it is exactly that. (MAN standards are "Metropolitan Area Networks"–ISO 802.6.)

The problem, if it is a problem, is that we are now into a mess of alphabet (and number) soup that has so many things floating in it that no one–not even standards kooks–can keep track of all the relevant ones. The inside front and read covers of Stallings are devoted to lists of acronyms. There is a 10-page list in Lynch & Rose's *Internet System Handbook*, a 28-page glossary in Quarterman & Wilhelm's *UNIX, POSIX, and Open Systems*, and we haven't even gotten to the ANSI, IEEE, ISO, etc. numbers yet.

But, getting back to Stallings, though my distaste for OSI is well-known, this is an excellent guide to exactly what's out there and what isn't. Stallings finally even admits that "OSI implementations have been slow to come to market" (Page 587), attributing this to the "well-established proprietary architectures" (e.g., IBM's SNA) and "a limited but widely used multivendor architecture" (TCP/IP). The problem (to me) is that this is the only place where TCP/IP is mentioned. I recognize that it is not a standard. But it is more than merely widely used–it is virtually universally used. Even the PTTs that have nominally adopted OSI run TCP/IP in parallel. This is not what ISO intended; nor is it what DARPA intended when it went to Berkeley, because AT&T's UNIX didn't have stuff like TCP/IP (or the Cerf-Kahn Protocol, as it was once called).

Stallings book is important, because it gives an accurate and up-to-date view of the standards and their implementations. Insofar as what is *used* is concerned, you'd best head for Comer & Stevens, *Internetworking with TCP/IP*, Vol. 3 (Prentice-Hall, 1993) or Lynch and Rose. ⊸

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

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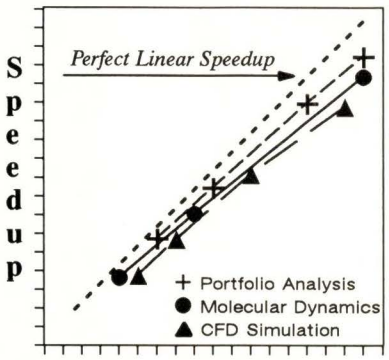

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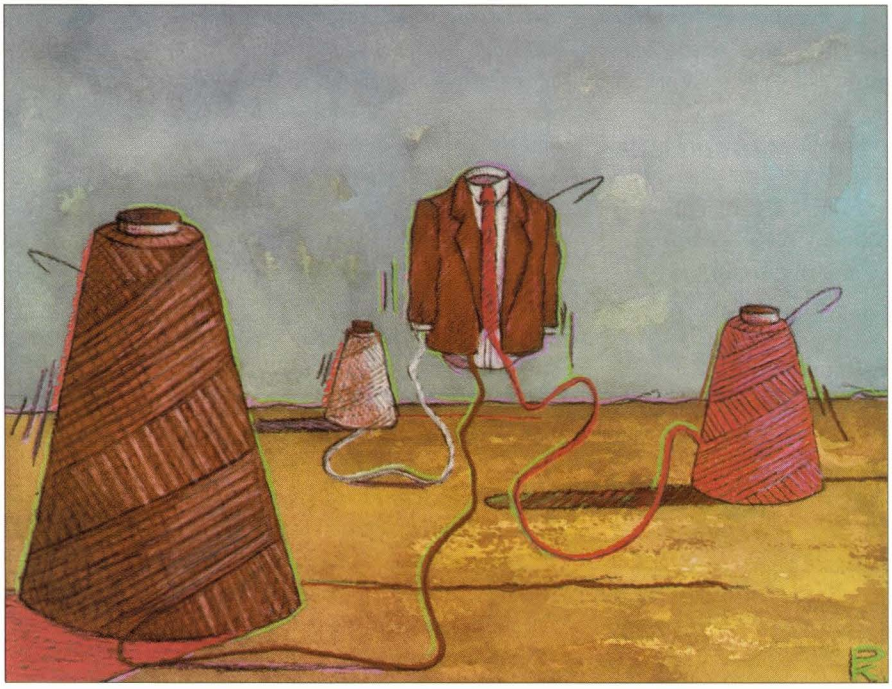

PETER KALABOKIS

The Emperor's New Clothes? Distributed Systems Administration

by S. LEE HENRY

There is a quiet revolution taking place, a revolution that promises to change the look of systems administration in major ways. Yes, I know, many of us are still hand-entering lines in `/etc/passwd` files, often because our networks are too heterogeneous to take advantage of scripts and programs that might otherwise make our jobs simpler and more uniform. Nevertheless, this quiet revolution may have some surprises in store for even the network with 20 Suns, three SGIs, two RS/6000s, a Macintosh running AUX, and a VAX running Ultrix.

Someone out there is spinning the fabric for your next wardrobe.

One Size Fits All?

Not yet. Not today. Our networks and our responsibilities vary considerably, and our jobs as systems administrators range from manageable to nearly impossible based on several key factors. One is the variety of systems for which we are responsible. Properly managed, a network of several hundred SPARC systems can be a piece of cake compared with a network of a dozen systems that are all different. The differences in commands and tools across UNIX platforms, never mind non-UNIX platforms, keep those of us responsible for managing heterogeneous networks always on our toes.

The sophistication and diversity of our user population is another factor. More diverse than the workstations we manage, our users come from many different backgrounds and have computer skills ranging from naive to expert. The site, which has hundreds of users all performing the same basic task, is far easier to manage than one that has half a dozen user populations, all with very different requirements.

Third, and equally important, the range of things that we are responsible for determines the complexity of our jobs. Some systems administrators are responsible for maintaining user accounts and performing backups. Others must track down user complaints, diagnose and solve network problems, configure gateways and debug systems software.

The tools for assisting us–this diverse group of people responsible for diverse users of diverse systems–have, not surprisingly, been slow to evolve. Sun gave us NFS to greatly simplify management of file systems and NIS (né Yellow Pages) to avoid the duplication of `/etc` files as our networks

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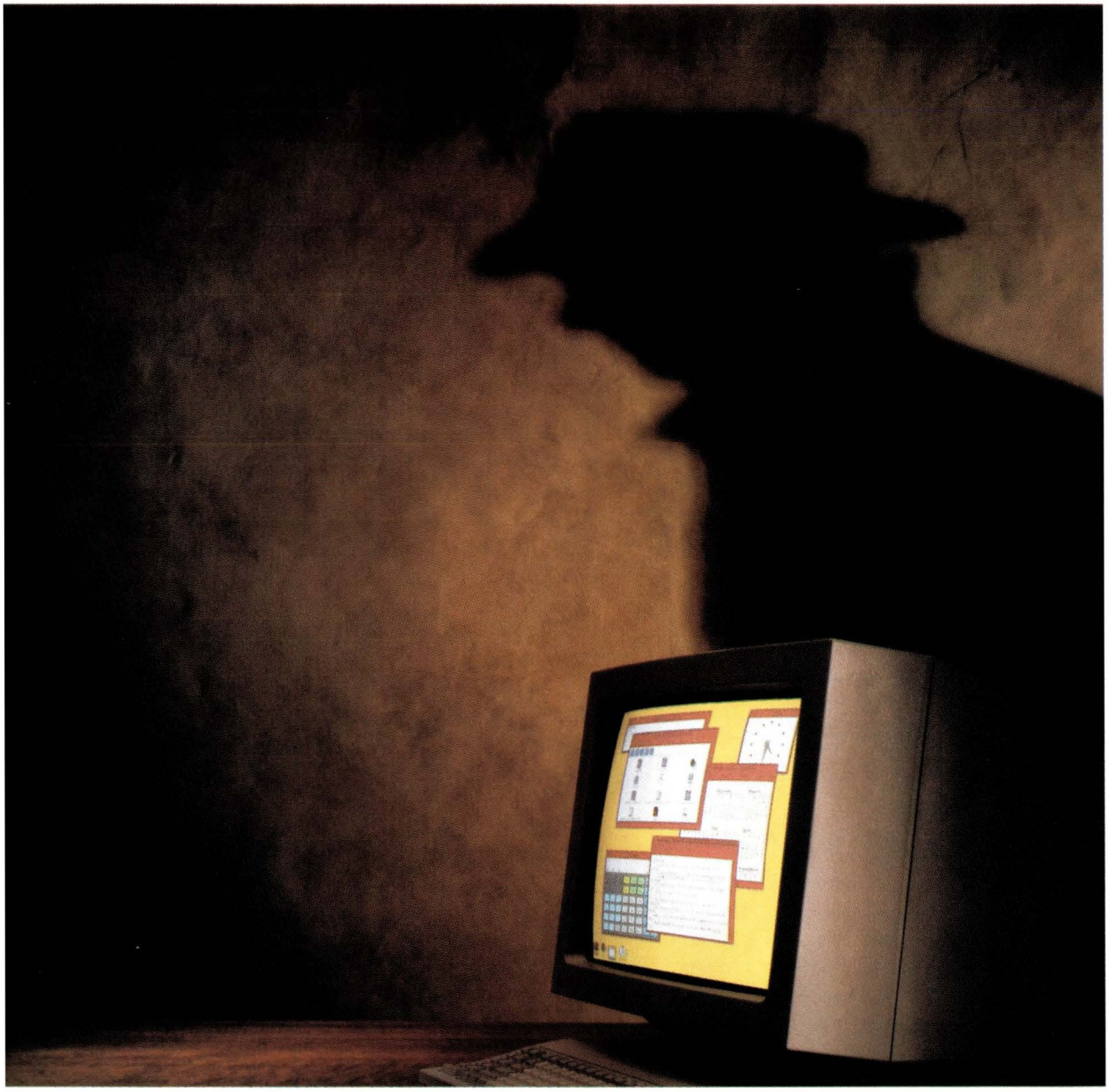

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grew larger and larger. And a number of vendors ported NFS and NIS to give us this capability across additional platforms. Later, automounter appeared on the scene, further simplifying the work of managing NFS mounts in environments with mobile users.

Solaris 2.X now brings us SVR4 tools like `useradd`, `userdel` and `usermod`, and the use of skeleton directories for preconfiguring accounts. Add to these admintool for managing users, hosts and printers from a single tool; JumpStart technology for configuring clients; and autoconfiguration. Wow. These are all very welcome gadgets in our wizard's bag of tricks, but they have limited influence on networks that include a hodgepodge of vendors' offerings. At least today.

But maybe not for long. A tremendous groundswell of effort is going into tools for managing heterogeneous networks. SunSoft and a growing number of innovative companies have brought management of heterogeneous networks to the front line of their development goals, and products are already appearing that promise order-of-magnitude changes in the way we do business.

Threads of Interest

What factors are most important to you?

A Pretty Interface

One issue in designing a tool for managing diverse resources is what kind of face to put on the tool. I, for one, prefer to work with GUI-based tools. On the other hand, I sometimes have to work on dumb terminals.

Programmatic Execution

As much as I like GUI-based tools, there are often occasions when I would prefer to use command line tools that allow me to perform repetitive tasks using lists of users or hosts.

An Under-One-Roof Design

Another important issue in the design of systems administration tools is whether or not they can be organized under a single umbrella. If all systems administration functions can be accessed via one tool or menu, it is easier to access the tools and far easier to train a new systems administrator or weekend emergency operator in their use. Any "one roof" tool should also be simple and consistent. If tools are organized under one roof, do you need to be able to give a different list to users, managers and sysadmins?

Extensibility

Another important characteristic of systems administration packages is whether or not you can add functionality to suit the needs of your site. The basic UNIX account setup (create user login, home directory and configuration files) is rarely enough. Most sites will also have to add users to application access lists, and create symbolic links or subdirectories in their homes. Most systems administrators will also find that they have to keep track of a great deal more than their user accounts–support contracts, phone numbers, server configurations and software licenses are just a few.

Sun's New Look for SysAdmin

Admintool in Solaris 2.1 is only a beginning. Described by some as a pretty interface for NIS+, admintool goes a bit deeper. With its object-oriented underpinnings (yes, admintool thinks of users and directories as objects), admintool is just beginning to change the character of systems administration. A pretty face on a set of utilities for managing hosts, users and printers, admintool also "understands" how to manage updates to NIS, NIS+ or `/etc` files and can set up accounts on remote systems as easily as it can locally.

Admintool is only a first step, but it represents a move on SunSoft's part toward systems management from a common platform point of view. Operational consistency within this common framework is a driving force that should be applauded. What today is implemented on top of ONC will be implemented in a strictly object-oriented framework. At that point, the sophistication of tools we will see and the ease of extending this operational consistency across diverse platforms will bring the message of open systems home for many of us.

Today's Fashions

Tools and de facto standards for distributed systems administration to facilitate management of diverse systems are still evolving. Yet products are already appearing both in "prepackaged" form and as development frameworks that provide tools for building custom applications.

Read the ads. Software for distributed systems administration, distributed printing and distributed backup are appearing in greater number. Increasingly, these tools claim object-oriented underpinnings and an enlarged base of supported platforms.

Making a Quilt

Figures 1 and 2 illustrate one company's approach to managing distributed systems. Applied Innovation Management's Info-Power provides a single-focus approach to sharing information, delegating tasks and managing resources across diverse systems. Info-Power includes tools for tracking problems, assets (inventory), support and service agreements and systems configurations. It also provides systems administration tools for adding (or removing) users, hosts and printers, archiving and retrieving files, monitoring network file systems and scheduling jobs (via `cron`). Info-Power also provides a tool for software distribution.

Info-Power runs on various UNIX platforms (including Sun, HP, DEC, RS/6000, SGI and Solbourne), and non-UNIX platforms (including Macintoshes and IBM compatibles) running TCP/IP.

The figures illustrate the initial screen and entry of the curses-based product and entry of information about a service support agreement. Although it may not be clear in the screen shots,

Figure 1.

```
| ============================INFO-POWER 2.1============================== |
|          THE ORIGINAL NETWORK DISTRIBUTIVE INFORMATION SYSTEM            |
|                                                                          |
|                     SYSTEM ADMINISTRATION FRAMEWORK                      |
|                                                                          |
|                                                                          |
| User: root                                                Date: 01/08/93 |
|       |=============IP (15)============ |                                |
|       |SERVICE & SUPPORT AGREEMENTS    |                                |
|       |ASSET TRACKING                  |                                |
|       |SYSTEM CONFIGURATION            |                                |
|       |USER PROBLEMS                   |                                |
|       |SYSTEM ADMIN. RESOLUTIONS       |                                |
|       |USERS & HOSTS ADMINISTRATION    |                                |
|       |PRINTER MONITORING              |                                |
|       |NETWORK FILE SYSTEMS            |                                |
|       |SCHEDULER TOOL                  |                                |
|       |CUSTOM TOOLS                    |                                |
|       |================================|                                |
|                                                                          |
|                                                                          |
|                        Hit <ESC> to exit...                              |
| AIM...Applied Innovation Management...AIM...Applied Innovation Management |
|==========================================================================|
========================================================================== |
```

Figure 2.

```
|============== SERVICE & SUPPORT AGREEMENTS-ADD====================== |
|                                                                       |
|=======================================================================|
| Name: Gidget Gets Widgets                          P.O. #: 1234       |
| Description: Teeny Widgets                       Serial #: 4321       |
| Model/Version: WID001                          License #: 135-001     |
| Contract: 92-H560-1234x                  Contract Cost $:   1500.00    |
| Department: ADP                            Purchased: 10/15/92        |
| Media Type: CD ROM                           Expires: 09/31/93        |
|                                          Last Modified: 10/15/92      |
|            Vendor                    |=====MANUFACTURERS (12)======  |
| Name: Widget Inc.              Name: |Applied Innovation Management   |
| Address: 123 Widgit Drive     Address: |DEC                           |
|    Widgitville, WG 12345               |Donnell Systems, Inc.         |
| Phone #: 408-123-2334         Phone #: |Exabyte                       |
| Fax #: 507-123-9875             Fax #: |Harris Corp.                  |
| Contact: Mr. Walter Widgit    Contact: |Hewlett-Packard               |
|=================================================|Hewlett-Packard      |
|=======License/Warranty Information <DETAILS> (h|Highland Digital      |
|                              |IBM                                     |
|                              |Inmac                                   |
|                              |======================================= |
|                                                                       |
|======================================================================= |
```

Info-Power fills in fields in these forms from its database whenever it can, reducing the amount of information the user has to enter. Lists of priorities and manufacturers from the Info-Power database are examples; the latter appears in one of the figures. The user makes a selection and one or more fields are filled in with the appropriate information.

Easy to use, Info-Power provides not only administrative control but also creates a form of institutional memory as problems and their resolutions, contracts and their performance, vendors and their reliability build up in the database. In addition, the platform-specific expertise is not lost but tucked securely in scripts and commands that operate on individual hosts.

Spinning New Fabric

Tivoli, another innovator in distributed systems administration, focuses on interoperable standards-based technology. Tivoli offers both ready-to-use products and an object-oriented framework for developing custom applications. Tivoli's tools for managing users and servers, monitoring security, system monitoring and troubleshooting, and software distribution are all based on a licensable framework called TME, for Tivoli Management Environment. TME runs on Sun and HP workstations and is being ported to IBM's MVS. The TME framework has been adopted by SunSoft, USL and OSF.

Tivoli's offerings include Tivoli/Works, core applications for primary resource and security management including users, clients, NIS, and security; Tivoli/Courier for distributing software; and Tivoli/Sentry for monitoring systems for problems.

Weaving It all Together

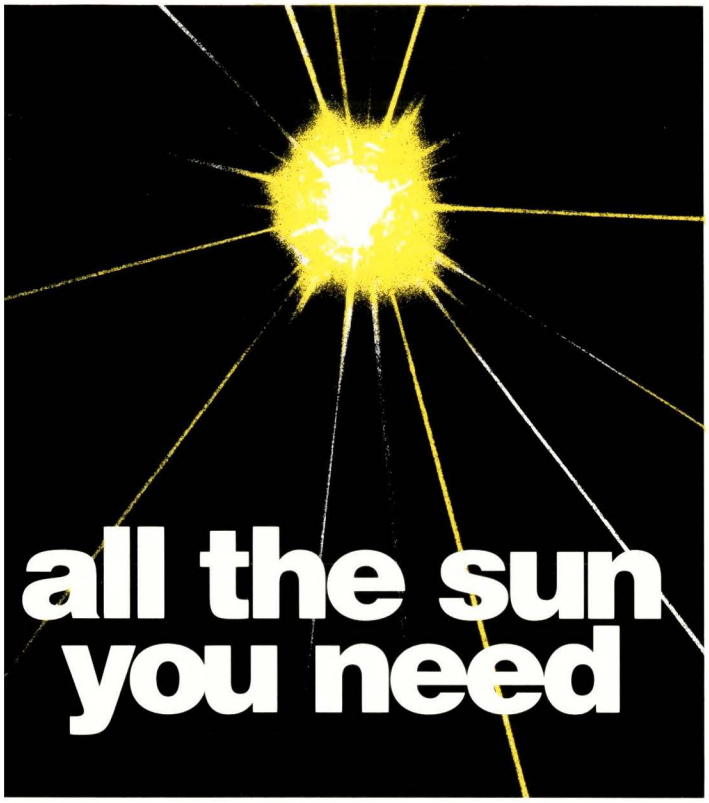
Although it may still seem a bit far-fetched to some of us, the chance that we will soon be adding users to Suns, SGIs and RS/6000 systems with the very same tool is not unreasonable. Existing tools and increasingly important standards are ready to take some of the burden of diverse systems off our shoulders ➸

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

For More Information

Info-Power
Applied Innovation Management
46540 Fremont Blvd., Suite 502
Fremont, CA 94538
Phone: (510) 226-2727
Fax: (510) 226-7990
Price: from $10,000

Tivoli Management Environment
Tivoli Systems Inc.
6034 West Courtyard Drive, Suite 210
Austin, TX 78730
Phone: (800) 284-8654
Fax: (512) 794-0623
Price: $30,000 for a 50-node start-up package



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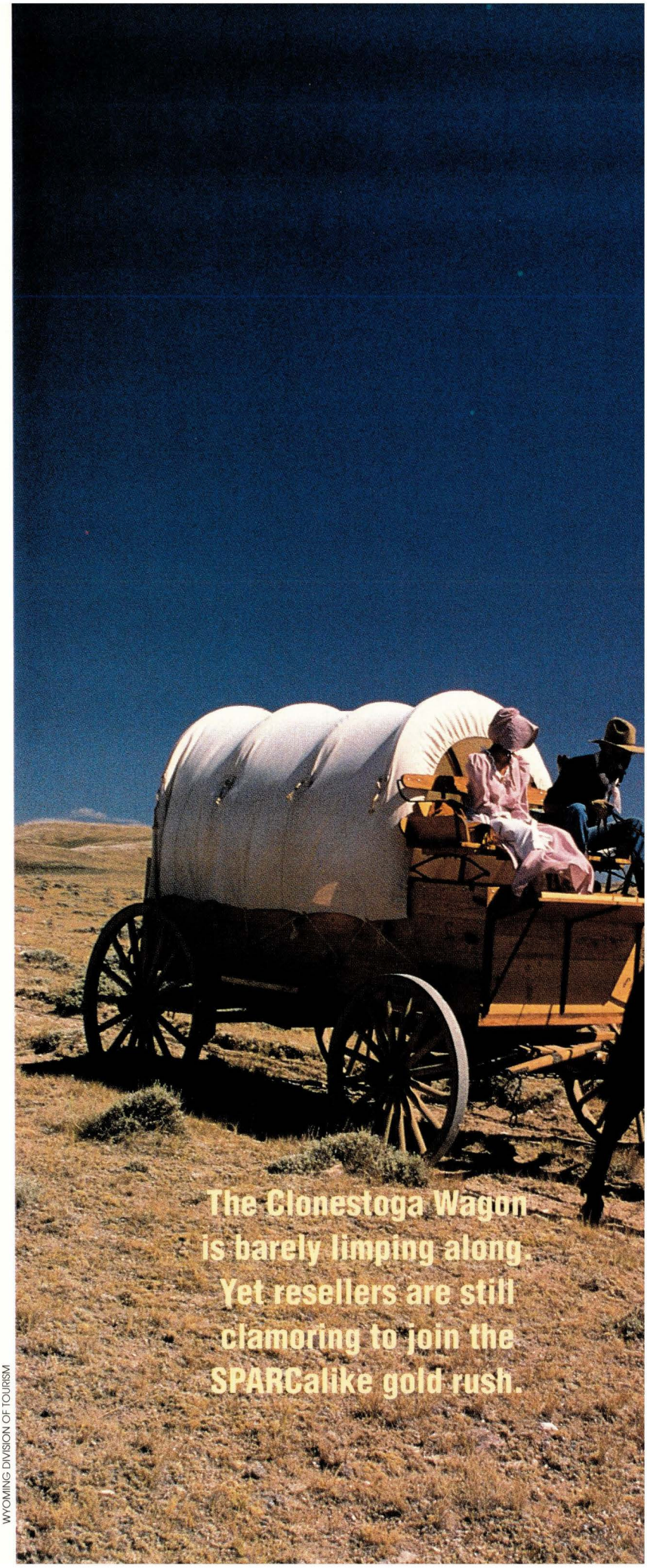
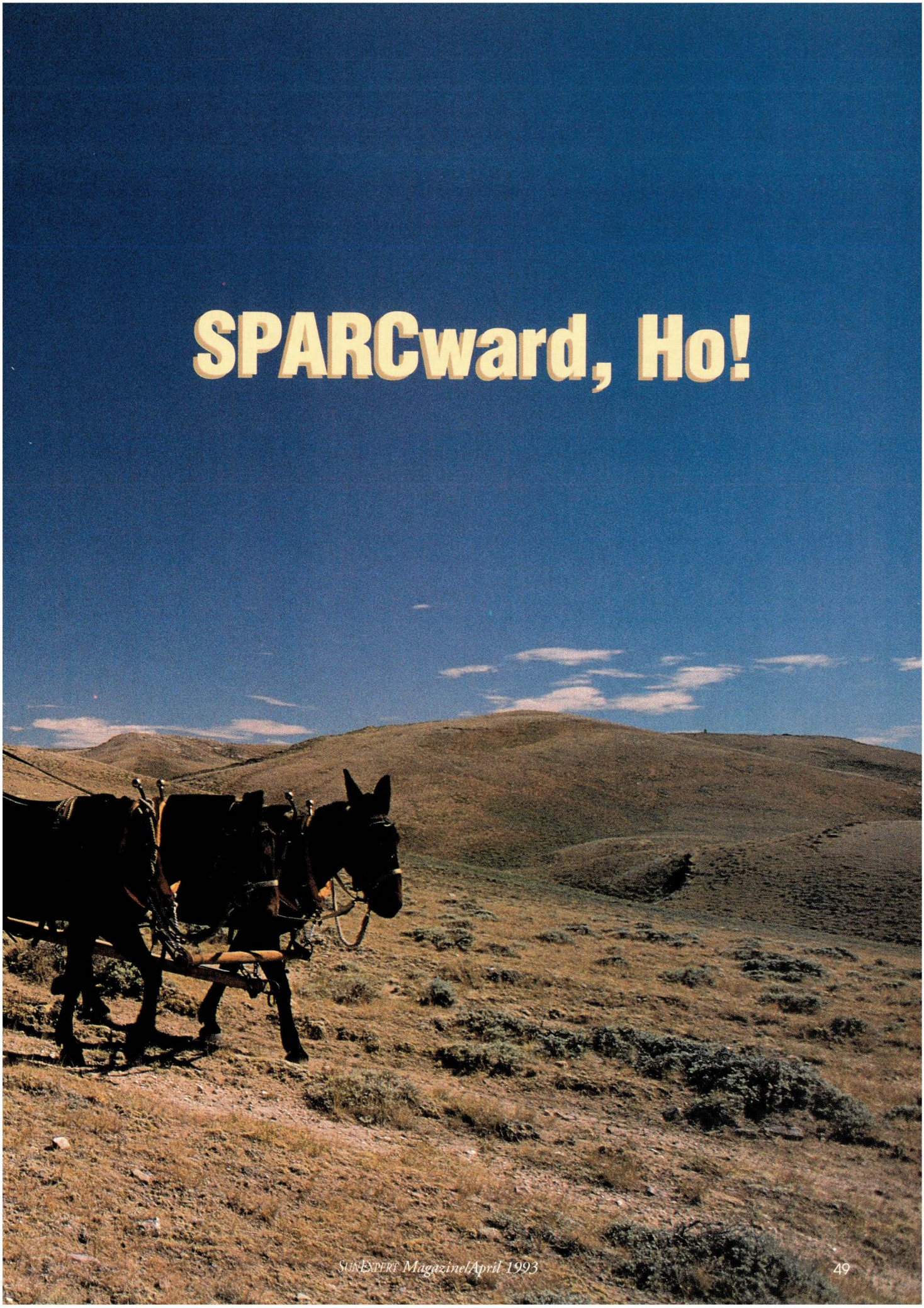
At first glance, the resellers of SPARC clones and compatibles look like quite a crew of ragtag ruffians. Some are former Sun Microsystems Inc. VARs so upset with Sun's own sales tactics that they could spit. A few current Sun VARs are testing Sun's boundaries by hawking clones–despite Sun's edict that resellers caught doing so will lose their Sun authorization. Older UNIX minicomputer resellers are looking to downsize and fledgling PC resellers attempting to upsize. And a handful of well-heeled systems integrators and distributors are offering SPARC-based systems as just one of many workstation and peripheral products in their stable.

by **MARY JO FOLEY**, Senior Editor



WYOMING DIVISION OF TOURISM

SPARCward, Ho!



Common links among this lot do exist, however. Across the board, their SPARCalike sales have fallen far short of the levels they and the vendors anticipated a year or two ago. Among resellers, moving five or 10 SPARCalike machines per month is considered a coup. Nonetheless, with only a couple of exceptions, resellers remain upbeat about the prospects for SPARCalikes.

"The market is very competitive, and we've met with only moderate success," says Gary Pruitt, vice president of marketing and sales for C-Data Corp., a Tatung Science & Technology Inc. OEM. "But there is growing credibility [for SPARCalikes]. We've got lots of strong reference accounts now. And we don't just have to go around throwing around cheap hardware."

"Our Sun base is really starting to accept the clone market," claims Norbert Witt, president of Parity Systems Inc., a reseller of RDI Computer Corp. and Hyundai Electronics America's Axil Workstations systems. "SunSoft is licensing the exact same operating system that Sun is using. So now we can bring out things long before Sun runs them through their test and documentation facilities."

Of Bulls and Bears

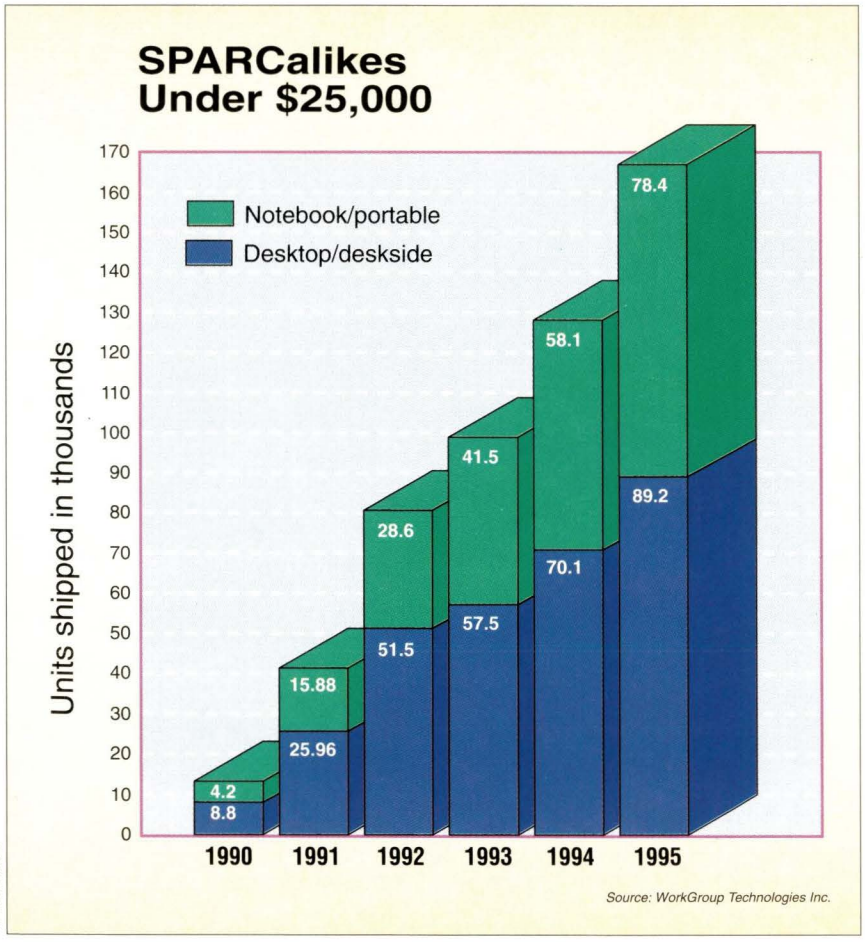
Framingham, MA-based market researcher International Data Corp. (IDC) is bullish about the potential impact of indirect sales. IDC predicts that by next year, half of all U.S. workstation sales will happen via the indirect channels–master VARs, VARs, systems integrators, dealers and other distributors.

But other industry watchers, for example, Robert Gilkes, principal of Robert Gilkes Associates and director of international operations for the Hampton, NH, market-research firm Workgroup Technologies Inc., are less enthusiastic. Gilkes has an interesting take on the clone and compatible arena, having served until recently as chief executive officer of SPARCalike-industry darling Tadpole Technology Inc. "I expect there will be a shakeout among [SPARCalike] vendors by the end of 1993," Gilkes says. "And simultaneously, I'd expect resellers to be cutting back on the total number of products they're selling due to the tough economic conditions and razor-thin margins." He adds that internationally based SPARCalike vendors are operating on a faulty assumption: that resellers in the States are just like resellers abroad. "Overseas, resellers offer tremendously high technical content. But many of the ones here don't have the same numbers of people, the self-sufficiency and the like."

A rocky business climate isn't the only potential pitfall. As many resellers–and customers–have found out the hard way, sometimes "clones" and "compatibles" have proven to be neither. Operating systems have required special patches in order to run on non-Sun hardware (although this problem should disappear now that SunSoft is making available to SPARCalike vendors the same Solaris 1.X/2.X that Sun Microsystems Computer Corp. ships). Screen resolutions have fallen short of promises. Peripherals have required special, custom drivers that weren't provided with base configurations.

These kinds of complaints seem to be dwindling, as the clone and compatible vendors focus on improving existing product, rather than on rushing more models out the door. Tatung and Integrix Inc. reseller Zzyzx is pleased with its suppliers' products, says President John Carey, especially those from Tatung. "Tatung has got great technology, support and warranties. They deliver the products they promise. Even if you add third-party products, Tatung will still support you," rather than invalidate system warranties, as some other vendors do, Carey says.

OpenLink Systems Inc. is equally enamored of the Stealth Computer Systems Inc. machines it resells. "We went with Stealth because it truly is 100% Sun-compatible," says OpenLink President Jim Zapapas. "Stealth doesn't modify the OS in any way, shape or form. One of our first customers, Evans & Sutherland, couldn't make it hiccup."



HANNA DYER

Parity is considerably more skeptical about one of its suppliers, RDI. "In the past, RDI has had some major quality problems," concedes Witt. "We had 100% failure rates on their 1,152-by-900 monochrome monitors [provided with the Britelite IPC and IPX products]. They just tried to push the technology too far." In fact, he says, "we lost some customers due to our RDI sales." Over the past two years, Parity has sold fewer than 200 RDI machines, Witt says.

But other RDI resellers seem to believe that RDI has gotten its technology act together. "The weight of the machine prevents it from being a true laptop, rather than a portable," notes Steve McAllister, director of marketing for Andataco, one of RDI's original distributors. "But now they've got a variety of displays–high- and low-resolution, color, monochrome, TFT–and a 450-MB internal drive." Another selling point for the RDI systems is "that they are based on Sun motherboards and use standard Sun memory for some of the models," he says.

No Stone Unturned

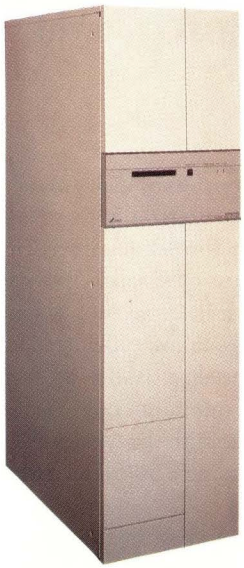
As important to resellers as technology are the marketing strategies and channels espoused by their respective suppliers. Whether or not SPARCalike vendors can and should field direct salespeople and/or telemarketing types in addition to resellers is a bone of contention among all parties concerned.

Current vendor marketing policies range from 100% via direct sales (like Apogee Systems Inc. and CompuAdd Corp.) to 100% via indirect (like Axil Workstations). Most SPARCalike companies, like Sun itself, seem to be adopting something in between the two poles. At the same time, the clone/compatible vendors are endeavoring to avoid the direct-indirect channel wars that have plagued Sun and its resellers.

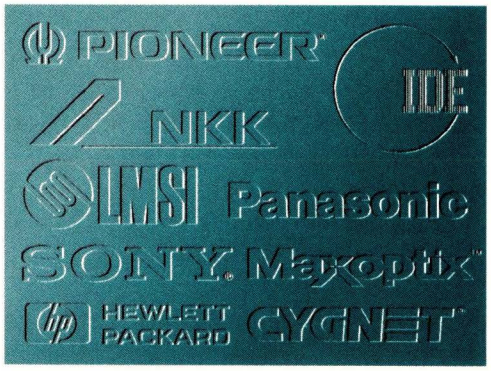
For those opting for indirect, not just any reseller will do. "With fairly complex technologies, such as SPARC, networking and Solaris, ordinary resellers aren't appropriate," opines Workgroup Technologies' Gilkes. "Because the critical element is support, there aren't many companies who can handle [SPARCalikes]," he says, with the exceptions of some high-level systems integrators and true value-added, niche VARs. "And there just aren't many of these," he says.

Such pessimistic predictions don't seem to be frightening off the SPARCalike vendors, who are leaving no stone unturned in their search for the perfect VAR. Stealth Computer has found success in amassing "former Sun resellers and other people who are disgusted with Sun," in the words of President Michael Hilgenberg. The company currently sports 12 resellers and a handful of telesales and direct sales representatives.

Integrix, too, is employing a combi-



Mass storage.



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nation of direct and indirect sales to sell its system board and full-system configurations. "We have a lot of do-it-yourself-type direct customers," says Integrix President Jason Lo. On the other side, Integrix has about 20 OEMs and small systems integrators that take the basic Integrix configuration and add value to it.

nels to create some semblance of order. "Resellers like it that we're not trying to compete with them," Ackermann points out. "We're allowing resellers to set their own prices, following Sun's precedent."

Before the end of the year, Axil is planning to bring on board a total of 140 U.S. resellers and another 50 to

Axil signed a deal in March with a reseller that Sun itself would love to claim as its own: Dickens Data Systems.

At press time, Integrix was expected to finalize a deal with GBC Technologies Inc., one of Novell Inc.'s top four NetWare distributors, to carry the Integrix system. If the contract is inked, it will be a real feather in Integrix' cap, since GBC plans to make the Integrix SS2 and SS2+ systems available to any of the authorized 13,000 to 16,000 Novell distributors to which it sells, according to GBC Executive Vice President and Chief Operating Officer Harvey Kane.

"We're signing an exclusive agreement to become Integrix' master distributor," says Kane. "We're impressed with their engineering excellence and that they are manufactured domestically." The SS2 or 2+ would make a great DOS/NetWare server, Kane says, or a power-user box that could compete well with 486- or Pentium-based systems. GBC plans to configure the bare-bones Integrix system and integrate it with NetWare, peripherals and other "high-end UNIX products" that GBC already distributes, Kane adds.

Axil Workstations is taking a different tack. Until last September, the company was in a direct sales mode, says Senior Manager of Corporate Marketing Lauren Ackerman. But beginning in March, Axil decided to go the indirect-only route.

"Our goal is to have the most pure reseller program in the industry," she says. This is in stark contrast to Sun's and most other vendors' policies of maintaining both direct and indirect sales forces and then policing the channels to create some semblance of order. "Resellers like it that we're not trying to compete with them," Ackermann points out. "We're allowing resellers to set their own prices, following Sun's precedent."

Before the end of the year, Axil is planning to bring on board a total of 140 U.S. resellers and another 50 to 75 international ones, Ackermann claims. Axil's criteria is fairly stringent. To become a domestic Axil reseller, a company must offer solid UNIX and systems/network integration expertise; be a vertical-solution provider; sport a contented installed base; and provide a value-added minimum of 35% of sales from services, with the ideal Axil reseller providing a 50/50 hardware/services split.

As if to put to rest the theory that there just aren't that many qualified resellers left out there, Axil signed a deal in March with a reseller that Sun itself would love to claim as its own: Dickens Data Systems. Dickens is IBM Corp.'s No. 1 reseller of RISC System/6000 workstations. It functions as a systems integrator, VAR and master VAR (supplying product to between 600 and 700 smaller VARs).

"We looked at carrying Sun [products] when we started our workstation division," says Dickens Vice President of Marketing and Technical Services Jack Smith. "But we decided against it because of the margins. Besides, most of our resellers were already reselling Suns. But now we're looking to diversify beyond the RS. That's getting to be a real competitive market. And we're very fond of RISC technology, having added HP to our lineup last February.

"Axil was well-funded and in the right place at the right time," Smith continues. "They're a mainstream clone vendor planning to differentiate their products [from Sun's] over time. We really didn't look at anybody else."

Value Added = Valuable Additions

As per Axil's specifications, Dickens is contributing a substantial amount of value-added to the Axil products it is offering. In addition to its own SCSI subsystems, I/O cards and networking software, Dickens is offering all of its customers the full gamut of integration/right-sizing services, according to Smith.

Another recent Axil convert, CAD National's The NetWorks! division, is making available a full complement of peripherals, software and consulting/training services. NetWorks! sells Crescendo Communications Inc.'s CDDI network adapters, Xerox Imaging Systems Inc.'s ScanWorx scanning package, Excalibur Technologies Corp.'s PixTex document-retrieval software, not to mention 10-GB to nearly a terabyte worth of miscellaneous optical-disk libraries–seemingly quite a bit of value-added. This makes it all the more surprising that the company at the end of 1992 ended its term as a Sun VAR, at least in part because of quibbles with Sun over what constituted sufficient value-added, according to CAD National CEO Douglas Hebbel.

Within a month of signing up with Axil, The NetWorks! had sold eight or 10 systems, he says, with another $1.5 million worth of outstanding quotes. On the reseller's impressive list of customers are Cypress Semiconductor Inc., GEC Plessey Semiconductor, LSI Logic, National Semiconductor, Sony Microelectronics and Zilog.

Other vendors' resellers are likewise seeking to parlay value-added into additional sales. OEMs, such as Tatung's C-Data, are providing value-added from the ground up. "We get raw product [from Tatung] with minimal or no memory–basically, just a motherboard, chassis and power supply," explains C-Data's Pruitt. C-Data adds peripherals, an "ultra high-quality" monitor from Idekiyama and its own name to the base Tatung configuration.

With the systems, C-Data is pursuing high-end workstation markets, such as document processing, medical, CAD/CAM, photorealistic rendering

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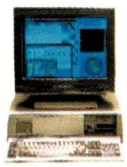

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and artificial intelligence/neural networks, Pruitt says. "My customers are the ones looking at SGI [Silicon Graphics Inc.] and HP [Hewlett-Packard Co.]," he adds, "the ones who want more bang for the buck."

Tatung reseller Zzyzx also sees the high-end document-processing market as a potential gold mine. Zzyzx bundles Xerox's ScanWorx, Advanced Archival Products' jukeboxes and Frame Technology Corp.'s Frame document-processing package, among other software and hardware, with the Tatungs it sells, says Zzyzx President Carey. Carey claims to have sold 50 or 60 Tatungs in the first 15 months he carried the products and says he currently sells between eight and 10 COMPstations per month.

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- Price/Functionality Wars
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Serving the Solaris/UNIX Workstation Network

Resellers that carry the RDI SPARC laptops and Tadpole SPARC notebooks seem to have a lot less trouble differentiating themselves from other SPARCalike vendors, as well as from Sun. Yet even these VARs and integrators are pushing the value-added envelope. With the RDI (and Axil) systems it resells, Parity offers Parity-designed memory, Seagate Technology Inc. and Micropolis Corp. drives and a panoply of software, ranging from Legato's NetWorker backup and restore program, AIM Technology's Sharp Shooter performance-management tool and its own Miraflex RAID software, says Parity's Witt.

Other RDI distributors, including SunBurst Computers, Andataco and OEM Orange Systems Inc., are all having luck coupling BriteLites with projection technology. SunBurst offers various manufacturers' LCD projection panels, presentation software and interactive pointing devices, plus its own integration services, to RDI customers. Andataco bundles BriteLites with Proxima Corp.'s Ovation LCD display panels, along with Andataco-manufactured low-profile SIMMs for the IPX-based machines and a variety of small, external 3½ -inch drives, says Andataco's McAllister. Orange Systems offers its own portable presentation system (using Ovation display panels) to its SPARC laptop customers. It also resells high-speed modems and communications software and a variety of drives, including flopticals and a portable, ruggedized 1-GB hard drive, says Bruce Burroughs, division manager for special products.

Integration services seem to be the most common value-added on the Tadpole SPARCbook front. The Can Am Computer systems integration unit of Genstar (one of the Big Five PC rental companies, which, incidentally, also rents SPARCbooks) does systems and network integration for banking/finance, insurance, pharmaceutical, retail and defense customers, according to Can Am General Manager Stanley Kuchar. Can Am also is a Sun VAR, which poses no problem in terms of violating Sun's SPARC clone exclusivity policy (see *SunExpert*, March 1992, Page 51) "because Sun

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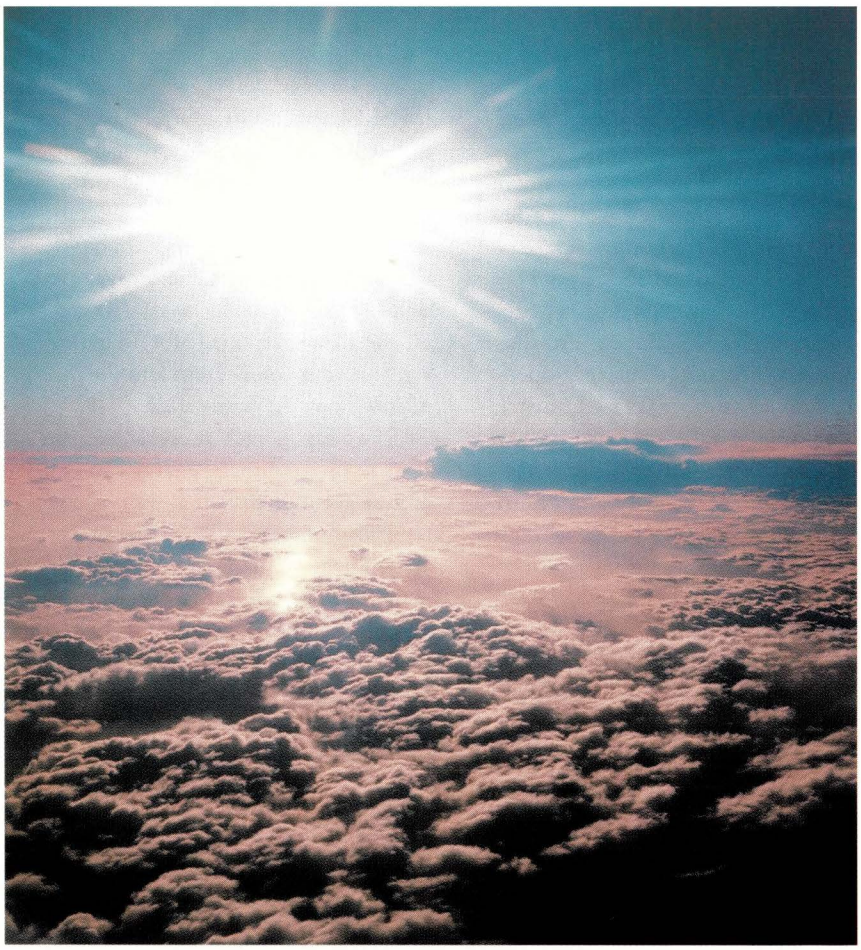

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doesn't consider the Tadpole a clone," notes Kuchar.

One example of the kind of integration challenges that Can Am handles comes from the insurance field. "They want the true office in the briefcase," Kuchar explains. "They can take it [the SPARCbook] to disaster areas, because it's battery-operated. Add a battery-operated printer, modem and cellular phones," and an agent can call the home office with quotes long before power and phone service is restored to an area, he says. Less specifically, Can Am does everything from load modified SunOS/Solaris onto SPARCbooks to help its customers configure and install their notebooks on networks. It also provides SPARCbook training, Kuchar adds.

Another major East Coast systems integrator, ERI, like Can Am, is both a Sun and Tadpole reseller. "We flesh out solutions with third-party hardware, software, peripherals and services," says Stephen Basile, manager of technical resources. ERI focuses on "application environments that are enhanced by the [SPARCbook's] portability," Basile says. Consequently, ERI makes available to its SPARCbook customers network tools, such as diagnostic/analysis software and high-end graphics applications, such as those that allow users to do 3D in real time, he says. "The interest has grown, especially for Tadpole's active-matrix color screen and the SPARCbook 2," Basile adds.

ERI's Tadpole customers range from ISVs to programmers, analysts and all-around technologists that want the systems for home use. "Wall Street firms are embracing it as a desktop replacement, with an add-on monitor," he says. "We don't expect to see commodities brokers trading on the beach, but only because you can't get all the data feeds at this point."

If Tadpole adds features such as point-to-point protocol (PPP) and wireless communications support, as many industry watchers predict it will, however, "there is a real possibility of trading on the beach," Basile says. And if this happens, he says, "I'm quitting my job and moving to Wall Street."

Companies Mentioned in This Article

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CAD National/ The NetWorks! division
1680 Civic Center Drive
Suite 208
Santa Clara, CA 95050
Circle 178

C-Data Corp.
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Circle 179

Dickens Data Systems
1175 North Meadow Pkwy.
Suite 150
Roswell, GA 30076
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ERI
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GBC Technologies Inc.
444 Kelley Drive
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Genstar/Can Am Computer
300 Route 17 South
Mahwah, NJ 07430
Circle 183

OpenLink Systems Inc.
4600 S. Ulster, Suite 930
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Circle 184

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Parity Systems Inc.
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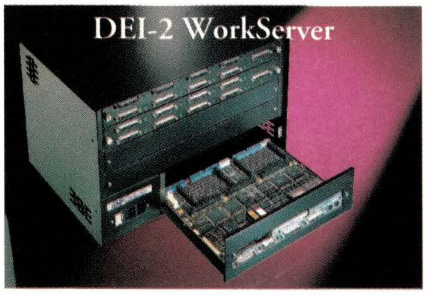

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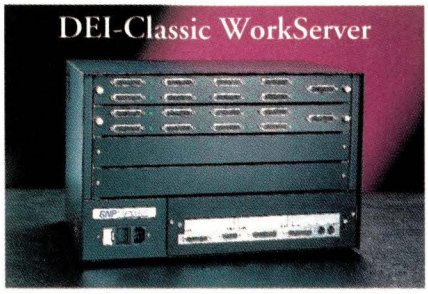

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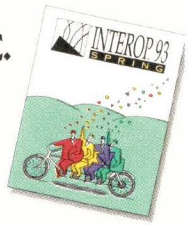

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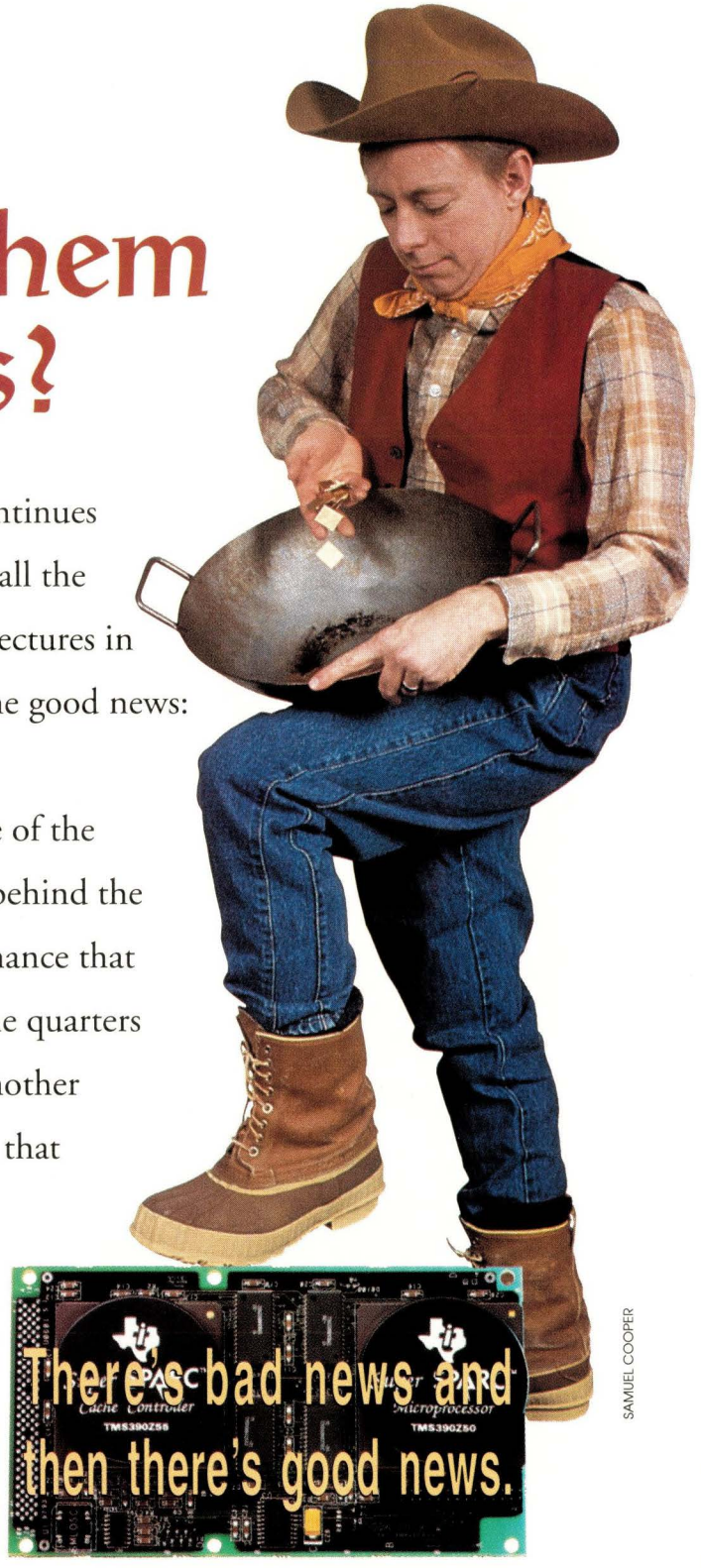
State of the Processor:

Gold in Them Thar Hills?

The bad news: SPARC continues to lag drastically behind all the other major RISC architectures in terms of speed and performance. The good news: Nobody cares.

When we last did our annual "state of the SPARC" article, SPARC was so far behind the other processors in terms of performance that there was serious speculation in some quarters that Sun might actually switch to another architecture. At that time, we wrote that SPARC's only hope might be in the superscalar versions of the processor that were just then about to be released.



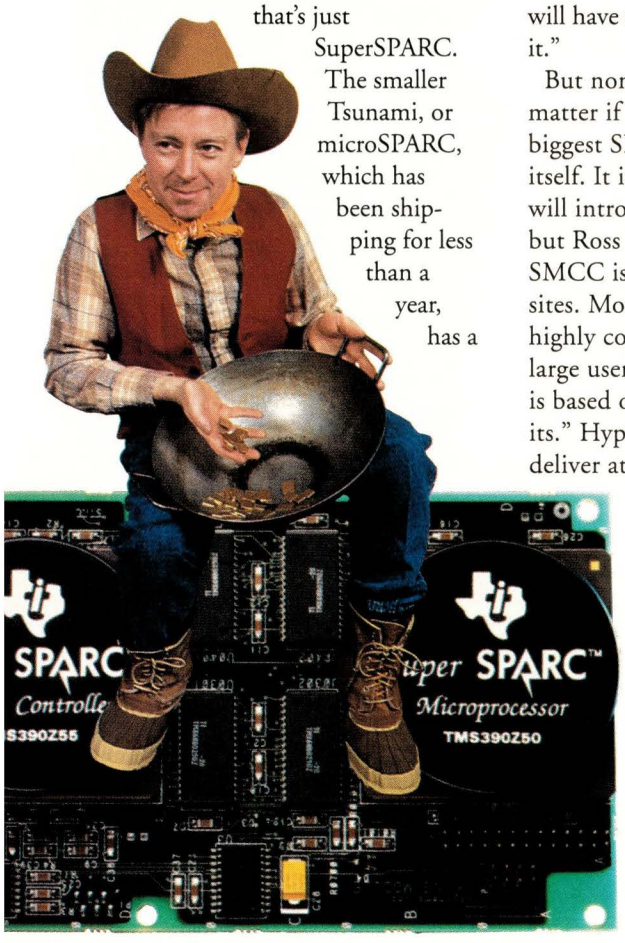
SAMUEL COOPER

by MICHAEL JAY TUCKER,
Executive Editor

A year later, Texas Instruments Inc. has its superscalar SuperSPARC on the market. And Ross Technology Inc., part of Cypress Semiconductor Inc., is just about to release hyperSPARC. Yet, neither of these, say the critics, really solves SPARC's performance problems. "Things haven't gotten better at all," says Michael Slater, president of the Odessa, CA-based market research firm MicroDesign Resources. He notes that, even at its fastest, SPARC is outclassed by everything from Hewlett-Packard Co.'s Snake to Digital Equipment Corp.'s Alpha. "The key problem is that they haven't been able to get the clock rates they want."

All that Glitters

But here's the rub. Performance, or lack of it, hasn't hurt SPARC's sales. "We've shipped 70,000 SuperSPARCs since introduction," says Phil Campbell, SPARC marketing manager for TI. "By the end of the quarter, it will be 100,000." And that's just SuperSPARC. The smaller Tsunami, or microSPARC, which has been shipping for less than a year, has a population of "between 10,000 and 20,000."



There would seem to be a bit of a paradox here. So, let's go to the good news. "There are probably more people who are after the broadest possible line of software than there are people who need the fastest possible monoprocessor," explains MicroDesign's Slater. He argues that for most customers, the issues of software availability, multiprocessing capabilities and low cost more than compensate for middle-of-the-road performance. "If Sun isn't going to be a performance leader, it has got to be a cost leader... and that may be, in fact, a better route to getting higher volumes."

Thus it is that the SPARC vendors remain a relatively busy bunch. At the high end, TI's SuperSPARC is about to be joined by the Ross/Cypress hyperSPARC. "It is sampling," says Steven Goldstein, Ross Technology's vice president of marketing. "And it is an extremely solid design." He says that within six months, "a half dozen vendors of workstations and servers will have announced product based on it."

But none of those names will much matter if they don't include the biggest SPARC consumer of all–Sun itself. It is not yet clear whether Sun will introduce hyperSPARC systems, but Ross has said publicly that SMCC is among the chip's alpha sites. Moreover, says Goldstein, "I am highly confident that Sun will be a large user of hyperSPARCs...and that is based on hyperSPARC's own merits." HyperSPARC is expected to deliver at least 60 SPECint92 and between 80 and 90 SPECfp92 at 66 MHz.

Companies with other high-end SPARCs include HaL Computer Systems Inc., which is working on a SPARC variant optimized for mainframe-like transactions. Slater notes that it may be "the most interesting SPARC right now," but that it is irrelevant to the issue of SPARC as a merchant chip because Hal doesn't intend to sell the chip without a system around it.

Meanwhile, another high-performance SPARC may or may not be coming from Hyundai, which is supposed to be working with Metaflow Technologies on a very fast SPARC code-named Thunder. There have been repeated unconfirmed reports that Thunder is stalled for a variety of political and economic reasons. However, Fayé Briggs, vice president of R&D at the Hyundai workstation company, Axil Workstations, insists that Thunder is alive and well. "The development effort is ongoing," he says. "It is expected that the performance will be between 120 and 150 SPECmarks."

In the middle of the SPARC performance range are the companies such as LSI Logic Corp. and Fujitsu Microelectronics Inc. Both these companies, which have historically targeted workstation vendors with their SPARC products, remain in the market. However, they seem to be seeking alternatives to workstations.

"I think the [Sun workstation] clone sales will continue for a little while," says John Burns, project marketing manager for SPARC systems and Graphics Products at Fujitsu. "But it will be increasingly difficult for people to get into the clone business with designs from Sun. For one thing, there's a pretty hefty fee for licensing from Sun. That's pretty much done in the little guys."

He says he thinks the SPARCalike is largely dead. "The clone guys are sweeping up the confetti...The party's over." But that isn't to say that he's given up on SPARC. "I have a little market going," he says. "That's SPARC on VME."

Carat and Shtick

In fact, for the midlevel performance SPARCs, the real market is VME. "I think, in the United States alone, there's probably about $40 million worth of VME RISC boards that can be sold in the next 10 months," says Walter Snell, director of sales and marketing for Themis Computers. Themis sells SPARC-based VME boards into a variety of markets, one of them being the military. "Sun has largely backed

out of VME, explains Snell, "but the trouble is, the military is still enamored with the VMEbus."

Equally enamored of VME are buyers in medical imaging, ruggedized systems, industrial control and embedded systems in general. In fact, in embedded systems, the whole issue of SPARC's relative lack of performance vanishes entirely. Embedded systems, after all, remain mostly CISC. And, "SPARC is much, much, much faster than the CISC architectures that have been the center of the industry," says Tom Griffiths, manager, product marketing, for another SPARC VME vendor, Force Computer Inc., which in fact licensed Sun's own VME designs.

Moving, finally, to the low end, SPARC has now spawned several low-end variants. These include TI's microSPARC, which the company says is meant for inexpensive workstations, laptops, embedded computers and so on. The embedded microSPARC is a concept that has excited quite a few vendors, particularly after Sun itself re-entered the board business (after abandoning the VME) with plans for SBus and standalone Tsunami-based products. "We are anxiously awaiting those new boards," says Tony Barbagallo, director of product marketing at Wind River Systems. Wind River makes VXworks real-time OS. "I think it's going to be very important. Sun has made such a commitment [to the embedded market]. They're even building boards again."

Below microSPARC are still smaller versions of the processor meant for microcontroller-style applications. The most famous of these variants is probably Fujitsu's SPARClite. "It has only been shipping for a year and a half," says Peter von Clemm, a strategic marketing manger at Fujitsu. "But in 1992, we had already sold 15,000 SPARClites." He adds that the company expects to ship more than a million of the processors in 1993.

The buyers, says von Clemm, are a mixed group. "In the United States, it has been the data-comm companies–vendors of bridges, routers, converters and so on, while in Japan, it has been makers of copiers, laser printers, a general category that might be called imaging." A third group, he says, is industrial-control companies.

So it is that 1993 finds the SPARC a relatively happy, healthy and prosperous CPU. At least as far as commercial success is concerned, SPARC has done well by following Sun's own traditional strategy of being the VW beetle rather than the Jaguar of computing. And, happily for SPARC, there seems to be nothing that will radically change that situation before *SunExpert*'s next annual "state of the SPARC" story in 12 months.

But there is one possible cloud on the horizon beyond that. If SPARC is winning by being the low-cost, middle-range performance processor of choice, then there are other architectures that might someday be able to play the same game. Intel Corp. processors, for example, continue to be produced in volumes that dwarf all of the major RISC processors combined, and with every passing year they offer greater power. SPARC's continuing challenge will be to stay just ahead of those architectures in performance, while not giving up the volumes that make it profitable. ➸

For most customers, the issues of software availability, multiprocessing capabilities and low cost more than compensate for middle-of-the-road performance.

Companies Mentioned in This Article

Cypress Semiconductor Inc.
3901 North First St.
San Jose, CA 95134
Circle 131

Force Computers Inc.
3165 Winchester Blvd.
Campbell, CA 95008-6557
Circle 132

Fujitsu Microelectronics Inc.
77 Rio Robles
San Jose, CA 95134-1807
Circle 133

HaL Computer Systems Inc.
1315 Dell Ave.
Campbell, CA 95008
Circle 134

Hyundai/Axil Workstation Division
166 Baypointe Pkwy.
San Jose, CA 95134
Circle 135

LSI Logic Corp.
1551 McCarthy Blvd.
Milpitas, CA 95035
Circle 136

Metaflow Technologies
4250 Executive Square, Suite 300
La Jolla, CA 92037
Circle 137

Ross Technology Inc.
7748 Highway 290W, #480
Austin, TX 78736
Circle 138

Themis Computer
6681 Owens Drive
Pleasanton, CA 94588
Circle 139

Texas Instruments Inc.
Semiconductor Group
12203 SW Freeway
Houston, TX 77251-1431
Circle 140

Wind River Systems
1010 Atlantic Ave.
Alameda, CA 94501
Circle 141

A SAMPLING OF

SPARCalikes

compiled by MAUREEN MCKEON

Company / Model	Date announced	Date shipped	Packaging	Processor (clock speed-MHz)	MIPS/SPECmarks	MFLOPS	Graphics accelerator	Internal disk	Monitor type/vendor	Resolution	Memory slots	I/O slots	Base configuration	Base price ($)
Apogee Systems Inc., 1815 S. Gadsden St., Tallahassee, FL 32301. **Circle 200**														
Orbiter II	4/92	5/92	desktop, tower	LSI (40)	28.5/ 24.7	4.2	GX, GX+, CG3	208 MB-8 GB	17-, 19-inch M; 16-, 20-inch C; Sony, Hitachi	1,152x900	16	3	32 MB RAM, 424 MB HDD, 19-inch C monitor, CG3, Solaris	11,295
Orbiter II+	1/93	2/93	desktop, tower	LSI (50)	35.6/ 30.8	5.3	GX, GX+, CG3	208 MB-8 GB	17-, 19-inch M; 16-, 20-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	16	3	32 MB RAM, 424 MB HDD, 19-inch C monitor, CG3, Solaris	12,295
Orbiter III Model 55	2/93	4/93	desktop, tower	Cypress (55)	110/ 58	26	GX, GX+, CG3	208 MB-8 GB	17-, 19-inch M; 16-, 20-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	6	3	32 MB RAM, 424 MB HDD, 19-inch C monitor, CG3, Solaris	19,295
Orbiter III Model 66	3/93	4/93	desktop, tower	Cypress (66)	133/ 70	32	GX, GX+, CG3	208 MB-8 GB	17-, 19-inch M; 16-, 20-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	6	3	32 MB RAM, 424 MB HDD, 19-inch C monitor, CG3, Solaris	21,295
Aries Research Inc., 46791 Fremont Blvd., Fremont, CA 94538. **Circle 201**														
Parrot II	1/92	2/93	desktop pizza box	LSI (40)	28.5/ 24.7	4.2	GX	20 GB	17-inch M; 16-, 19-inch C; Sony, Hitachi, Toshiba	1,152x900	16	3	16 MB RAM, 424 MB HDD, FDD, CG3, Solaris 1.0.1, keyboard, mouse, 19-inch C Hitachi monitor	7,895
Marixx dt	3/93	4/93	desktop	TI Super-SPARC (36)	86.1/ 44.2	10.6	GX	424 MB-2 GB	19-inch M; 16-, 19-inch C; Sony	1,152x900	8	4	32 MB RAM, 424 MB HDD, CG3, 19-inch M display, keyboard, mouse, SPARC10 clone	14,995
Marixx ds	3/93	4/93	deskside	Cypress (66)	133/ 66	32	GX	424 MB-8 GB	19-inch M; 16-, 19-inch C; Sony	1,152x900	16	3	32 MB RAM, 1.2 GB HDD, 150 MB tape, 15-inch monitor, Solaris 1.0.1	17,947
Axil Workstations, (A Div. of Hyundai Electronics America), 166 Baypointe Pkwy., San Jose, CA 95134. **Circle 202**														
HWS-210	4/92	4/92	desktop	LSI, (40)	28.5/ 21.0	4.2	GX	207 MB-2 GB	14-, 20-inch C; Sony, Hyundai, Hitachi,	1,024x768, 1,152x900	16	3	32 MB RAM, 535 MB HDD, 20-inch C display, Solaris 1.1, GX	12,500
HWS-230 (3.0)	9/92	10/92	desktop	TI Super-SPARC (36)	101.6/ 45.2	20.5	GX	424 MB-2.6 GB	17-, 20-inch C; Sony, Hitachi,	1,152x900	4	2	32 MB RAM, 540 MB HDD, 20-inch C display, Solaris 1.1, GX, software for on-board fax/modem	14,000
HWS-310 (3.0)	9/92	12/92	desktop	TI Super-SPARC (36)	101.6/ 45.2	20.5	GX	424 MB-2.6 GB	17-, 20-inch C; Sony, Hitachi,	1,152x900	8	4	32 MB RAM, 540 MB fast SCSI disk, 20-inch C display, GX, Solaris 1.1	15,850
HWS-310 (4.1)	9/92	Q2/93	desktop	TI Super-SPARC (40)	109.5/ 53.2	22.4	GX	424 MB-2.6 GB	17-, 20-inch C; Sony, Hitachi,	1,152x900	8	4	32 MB RAM, 540 MB internal fast SCSI disk, 20-inch C display, GX, Solaris 1.1	21,000
CCL/ITRI, x100, Bldg. 14, 195 Sec. 4, Chung Hsing Road, Chutung, Hsinchu, Taiwan 310, R.O.C. **Circle 203**														
CCLstation/ Classic	2/93	3/93	desktop	TI (50)	59.1/ —	4.6	GX	207 MB-424 MB	—	1,152x900, 1,024x768	6	2	—	4,295
CCLstation/ M10	6/92	9/92	desktop	Cypress, TI (40)	31-76/ 21.5	—	GX, XAGC (proprietary)	240 MB	17-inch C Tatung	1,152x900	—	2	—	—

C = color M = monochrome G = gray scale
HDD = hard disk drive FDD = floppy disk drive

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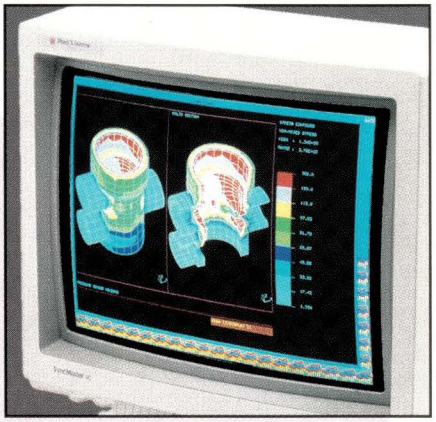

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Circle No. 31 on Inquiry Card

Company / Model	Date announced	Date shipped	Packaging	Processor (clock speed-MHz)	MIPS/SPECmarks	MFLOPS	Graphics accelerator	Internal disk	Monitor type/vendor	Resolution	Memory slots	I/O slots	Base configuration	Base price ($)
CompuAdd Computer Corp., 12303 Technology Blvd., Austin, TX 78758. **Circle 204**														
SS.2	1/92	3/92	desktop	LSI (40)	28.5/ 24.7	4.3	optional GX	240 MB-3.66 GB	19-inch M; 16-, 19-inch C; Sony Trinitron	1,152x900	16	3	8 MB RAM, 525 MB HDD, FDD, 19-inch M display, Solaris 1.1, one-year on-site warranty	6,995
SS.10	3/93	5/93	desktop	TI (40)	—/ 52	—	GX	525 MB-3.66 GB	19-inch M; 16-, 19-inch C; Sony Trinitron	1,152x900	8	4	32 MB RAM, 525 MB HDD, FDD, 19-inch M display, Solaris 1.1, one-year on-site warranty	15,495
Datatech Enterprises Ltd. (DTK), U.S.A. Headquarters, 17700 Castleton St., Suite 300, City of Industry, CA 91748. **Circle 205**														
Classic+	3/93	4/93	desktop	TI (50)	59.1/ 26.4	4.6	SVGA, CGA	240 MB-2.2 GB	20-inch C Philips	1,280x1,024, 1,024x900	3	3	16 MB RAM, 240 MB HDD, FDD, 14-inch C monitor, CG3	3,700
SPARC 10/M30	3/93	5/93	desktop	TI (40)	101.6/ 45.2	20.5	GX	525 MB-4.1 GB	20-inch C Philips	1,280x1,024, 1,024x900	2	4	32 MB RAM, 525 MB HDD, FDD, 20-inch C monitor, GX	15,000
EOS Technologies Inc., 3032 Coronado Drive, Santa Clara, CA 95054. **Circle 206**														
EOStation 1030N	11/92	12/92	desktop	TI (36)	86.1/ 44.2	10.6	GX	424 MB-2 GB	19-inch C Hitachi	1,152x900	—	2	32 MB RAM, 424 MB HDD, FDD, 19-inch C monitor, Solaris 1.1, C compiler	15,225
EOStation 1030L	11/92	3/93	desktop	TI (36)	86.1/ 44.2	10.6	GX	424 MB-2 GB	19-inch C Hitachi	1,152x900	—	4	32 MB RAM, 424 MB HDD, FDD, 19-inch C monitor, Solaris 1.1, C compiler, GX	17,421
Integrix Inc., 1200 Lawrence Drive, #150, Newbury Park, CA 91320. **Circle 207**														
SS2B	9/92	9/92	desktop	LSI (40)	28.5/ 21.8	4.2	GX, GX+	207MB-3.2 GB	17-, 20-inch C; Sony Trinitron	1,024x768, 1,280x1,024, 1,152x900	16	3	system board, chassis and power supply, enhanced keyboard, mouse	2,695
SS2+B	2/93	2/93	desktop	LSI (50)	35.6/ 27.3	5.3	GX, GX+	207 MB-3.2 GB	17-, 20-inch C; Sony Trinitron	1,024x768, 1,280x1,024, 1,152x900	16	3	system board, chassis and power supply, enhanced keyboard, mouse	2,995
SS10B	4/93	5/93	desktop	TI Super-SPARC (40)	96.2/ 52.6	17.2	GX, GX+	424 MB-3.2 GB	17-, 20-inch C; Sony Trinitron	1,152x900, 1,280x1,024, 1,152x900	8 8	4 4	system board, chassis and power supply, enhanced keyboard, mouse	—
SS10S	4/93	5/93	tower	TI Super-SPARC (40)	96.2/ 52.6	17.2	GX, GX+	424 MB-10.8 GB	monitorless	—	8	9	system board, tower chassis and power supply, SBus expansion unit	—
Marner International Inc., 1617 93rd Lane N.E., Blaine, MN 55449. **Circle 208**														
Cheetah Tower	11/92	11/92	tower	Cypress (66)	133/ 70	32	optional	520 MB-8 GB	17-, 21-inch C; Toshiba	1,152x900	6/8	—	32 MB RAM, 32 MIPS MBus CPU (upgradable)	9,995
Data Security Vault 100	12/92	3/93	deskside	Cypress (66)	133/ 70	32	optional	4.2-15 GB	17-, 21-inch C; Toshiba	1,152x900	6/8	2	32 MB RAM, 32 MIPS MBus host CPU (upgradable), CD-ROM, fault-tolerant power supply	29,995
Mobius Computer Corp., 5627 Stoneridge Drive, Bldg. 312, Pleasanton, CA 94588. **Circle 209**														
Mirage IPS/2	10/91	10/91	pizza box	LSI (40)	28.5/ 22	4.2	CG3, GX optional	210 MB-1.2 GB	17-inch C; Idek	1,152x900	16	2	16 MB RAM, 17-inch flat screen display, Solaris 1.0.1, Motif with X11R5	5,605
Open Concepts International Inc., #107 2841-109 St., Edmonton, Alberta, Canada TGJ-GB7 **Circle 210**														
Fire 4000 SPARC II	2/92	4/92	desktop	LSI (40)	28.5/ 21	4.2	GX	525 MB-2 GB	17-inch C; Hitachi	1,152x900	—	3	16 MB RAM, 525 MB HDD, FDD, 17-inch C Hitachi monitor, GX accelerator, SPARC IV keyboard, Logitech SPARC mouse, Solaris 1.X	8,160
Fire 10,000 SPARC 10	2/93	3/93	desktop	TI (50)	85/ 44.2	10.6	GX	525 MB-2 GB	19-inch C; Sony	1,280x1,024	2	1	32 MB RAM, 525 MB HDD, FDD, 19-inch C Sony monitor, GX accelerator, SPARC IV keyboard, Logitech SPARC mouse, Solaris 1.X/2.X	17,500
Performance Technologies Inc., Performance Computer Group, 315 Science Park Way, Rochester, NY 14620. **Circle 211**														
PT-sys5k	7/92	1/93	rack-mount/ embedded	LSI (40)	29/	22	—	200-500 MB	monitorless	—	8	8	16 MB RAM, 480 MB HDD, FDD	9,190
Pinnacle Data Systems Inc., 1350 W. Fifth Ave., Columbus, OH 43212. **Circle 212**														
SPARC II	1/92	1/92	desktop	LSI (40)	28.5/ 21.8	4.2	SVGA, CG3, GX, GX+	207 MB-2 GB	19-inch M; 16-, 19-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	16	3	32 MB RAM, 525 MB HDD, FDD, 16-inch C monitor, GX	11,395
SPARC III-3	11/92	12/92	desktop	TI (33)	78.9/ 48.5	9.7	SVGA, CG3, GX, GX+	525 MB-2 GB	19-inch M; 16-, 19-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	4	2	32 MB RAM, 525 MB HDD, FDD, 16-inch C monitor, GX	14,395

C = color M = monochrome G = gray scale
HDD = hard disk drive FDD = floppy disk drive

Company Model	Date announced	Date shipped	Packaging	Processor (clock speed-MHz)	MIPS/SPECmarks	MFLOPS	Graphics accelerator	Internal disk	Monitor type/vendor	Resolution	Memory slots	I/O slots	Base configuration	Base price ($)
Pinnacle Data Systems Inc. (continued)														
SPARC III-6	11/92	12/92	desktop	LSI (36)	86.1/ 52.9	10.6	SVGA, CG3, GX, GX+	207 MB-2 GB	19-inch M; 16-, 19-inch C; Sony	1,152x900, 1,280x1,024	4	2	32 MB RAM, 525 MB HDD, FDD, 16-inch C monitor, GX	15,395
Data Guard Server	2/93	2/93	tower	LSI (40)	28.5/ 21.8	4.2	SVGA, CG3, GX, GX+	2-8 GB RAID	19-inch M; 16-, 19-inch C; Sony, Hitachi	1,152x900, 1,280x1,024	16	3	32 MB RAM, RAID incorporated, 16-inch C monitor, GX	50,000
RDI Computer Corp., 6695 Mesa Ridge Road, Bldg. A, San Diego, CA 92121. **Circle 213**														
BriteLite IPC	3/91	3/91	portable	IPC (25)	17.8/ 13.8	1.8	—	240-450 MB	10 ½-inch M backlit, supertwist LCD	640x480	12	3	8 MB RAM, 240 MB HDD, 10 ½-inch M monitor, SunOS, SunView	5,995
BriteLite IPC	3/91	9/91	portable	IPC (25)	17.8/ 13.8	1.8	—	240-450 MB	11 ½-inch M backlit, supertwist LCD	1,152x900	12	3	8 MB RAM, 240 MB HDD, 11 ½-inch M monitor, SunOS, SunView	7,995
BriteLite IPC Color	11/92	11/92	portable	IPC (25)	17.8/ 13.8	1.8	—	240-450 MB	10 ½-inch C active matrix TFT backlit	640x480	12	3	8 MB RAM, 450 MB HDD, 10 ½-inch active matrix C LCD monitor, SunOS, SunView	9,995
BriteLite IPX Monochrome	12/91	1/92	portable	IPX (40)	28.5/ 21.5	4.2	GX	240-450 MB	11 ½-inch M backlit, supertwist LCD	1,152x900	4	3	16 MB RAM, 240 MB HDD, 11 ½-inch M monitor	12,500
BriteLite IPX Color	12/91	1/92	portable	IPX (40)	28.5/ 21.5	4.2	GX	240-450 MB	10 ½-inch C active matrix	640x480	4	3	16 MB RAM, 240MB HDD, 10 ½-inch active matrix C LCD monitor, SunOS, SunView	14,995
BriteLite LX	11/92	11/92	portable	LX (50)	59.1/ 21.0	4.6	GX+	450 MB	10 ½-inch active matrix C LCD monitor	640x480	6	3	16 MB RAM, 450 MB HDD, 10 ½-inch active matrix C monitor, Solaris 2.1	15,995
Sidus Systems Inc., 25 Minthorn Court, Thornhill (Toronto), Ontario, Canada L3T-7N5. **Circle 214**														
SPARC 40 MHz	1/91	1/91	pizza box, desktop, tower	LSI (40)	28.5/ —	4.2	GX	210 MB-6.3 GB	20-inch M; 16-, 20-inch C	1,152x900	16	3	32 MB RAM, 560 MB HDD, FDD, 20-inch G monitor, pizza box, GX, Solaris	6,900
Super SPARC 40	6/92	6/92	pizza box, desktop, tower	Cypress (40)	32/ 28	7.0	GX	210 MB-6.3 GB	20-inch M; 16-, 20-inch C	1,152x900	6	2	32 MB RAM, 560 MB HDD, FDD, 20-inch G monitor, pizza box, GX, Solaris	8,490
Super SPARC TI	6/92	6/92	pizza box, desktop, tower	TI (36)	86.1/ —	10.6	GX	210 MB-6.3 GB	20-inch M; 16-, 20-inch C	1,152x900	6	2	32 MB RAM, 560 MB HDD, FDD, 20-inch G monitor, pizza box, GX, Solaris	9,950
Hyper SPARC 55	11/92	2/93	pizza box, desktop, tower	Cypress (55)	110/ 58	26	GX	210 MB-6.3 GB	20-inch M; 16-, 20-inch C	1,152x900	8	2	32 MB RAM, 560 MB HDD, FDD, 20-inch G monitor, pizza box, GX, Solaris	11,400
Hyper SPARC 66	12/92	Q2/93	pizza box, desktop, tower	Cypress (66)	133/ 70	32	GX	210 MB-6.3 GB	20-inch M; 16-, 20-inch C	1,152x900	8	2	32 MB RAM, 560 MB HDD, FDD, 20-inch G monitor, pizza box, GX, Solaris	12,350
Solflower Computer Inc., 2362-A Qume Drive, San Jose, CA 95131. **Circle 215**														
SFVME-450	7/92	7/92	desktop	LSI (40)	28.5/ 24.2	4.2	GX, GX+	424 MB-3 GB	16-, 19-inch C; Sony	1,152x900	16	4	16 MB, 424 MB HDD, 19-inch C monitor, SPARC IPX workstation with built-in VME connectivity	17,495
SFVME-400	7/91	7/91	desktop	LSI (40)	28.5/ 24.2	4.2	GX, GX+	424 MB-7.4 GB	19-inch M; 16-, 19-inch C; Sony	1,152x900, 1,280x1,024	16	5	32 MB RAM, 424 MB HDD, FDD, 19-inch C monitor, SPARC 2 workstation with built-in VME connectivity	21,795
SFVME-800	7/92	7/92	rack-mount	LSI (40)	28.5/ 24.2	4.2	GX, GX+	424 MB-1 GB	19-inch M; 16-, 19-inch C; Sony	1,152x900, 1,280x1,024	16	2	32 MB RAM, 424 MB HDD, 19-inch C monitor, SPARC 2 workstation with built-in VME connectivity	23,995
SF 410	11/92	11/92	desktop	TI (—)	96.2/ —	17.2	GX, GX+	424 MB-7.4 GB	19-inch G; 16-, 19-inch C; Sony	1,152x900, 1,280x1,024	8	5	32 MB RAM, 424 MB HDD, 19-inch C monitor, SPARC 10 workstation with built-in VME connectivity	27,995
SF 810	11/92	11/92	rack-mount	TI (—)	96.2/ —	17.2	GX, GX+	424 MB-1 GB	19-inch G; 16-, 19-inch C; Sony	1,152x900, 1,280x1,024	8	16	32 MB RAM, 424 MB HDD, 19-inch C monitor, SPARC 10 workstation with built-in VME connectivity	28,995

C = color M = monochrome G = gray scale
HDD = hard disk drive FDD = floppy disk drive

Company Model	Date announced	Date shipped	Packaging	Processor (clock speed-MHz)	MIPS/SPECmarks	MFLOPS	Graphics accelerator	Internal disk	Monitor type/vendor	Resolution	Memory slots	I/O slots	Base configuration	Base price ($)
Solid Computer Corp., 1450 Oakbrook Drive, #300, Norcross, GA 30093. **Circle 216**														
SPARC 40	10/91	10/91	desktop	LSI (40)	28.5/ 24.7	4.2	—	524 MB	17-inch M, 17-, 19-inch C; Sony	1,152x900, 1,280x1,024	16	3	16 MB RAM, 525 MB HDD, SPARC 2, 19-inch C Trinitron, GX, SunOS	10,995
Stealth Computer Systems Inc., 1980 Cumulus Ct., Thousand Oaks, CA 91362. **Circle 217**														
Stealth Station II	4/92	6/92	desktop	LSI (40)	28.5/ 24.7	4.2	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	16	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	7,495
Stealth Station X Model 10	11/92	1/93	desktop	Cypress (40)	28.5/ 26.7	4.2	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	6	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	7,995
Stealth Station X Model 30	11/92	1/93	desktop	TI (36)	86.1/ 53	50	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	6	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	10,995
Stealth Station XI Model 55	11/92	4/93	desktop	Cypress (55)	86.1/ 53	50	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	6	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	12,495
Stealth Station X Model 41	2/93	3/93	desktop	TI (40)	—/ —	—	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	6	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	12,995
Stealth Station XI Model 66	2/93	6/93	desktop	Cypress (66)	110/ 66	60	GX	207 MB-2.4 GB	19-inch M; 17-, 21-inch C	1,152x900, 1,280x1,024	6	3	32 MB RAM, 425 MB HDD, FDD, 17-inch C monitor, Solaris 1.1	14,495
Super Workstation Inc., 2190 Paragon Drive, San Jose, CA 95131. **Circle 218**														
Super Workstation II	11/91	11/91	desktop	LSI (40)	28/ —	4.2	GX	207 MB-2 GB	17-inch C; Trinitron	1,280x1,024	16	2	535 MB RAM, HDD, FDD, 17-inch C monitor, SunOS 4.1.3	5,570
Super Workstation II+	11/92	11/92	desktop	LSI (50)	—/ —	5.25	GX	200 MB-2 GB	17-inch C; Trinitron	1,280x1,024	16	—	535 MB HDD, FDD, 17-inch C monitor, SunOS 4.1.3	6,800
Super Workstation X/30	12/92	3/93	desktop	LSI,TI/ (—)	86.1/ —	10.6	GX	535 MB-2 GB	17-inch C; Trinitron	1,280x1,024	8	2	32 MB RAM, 535 MB HDD, FDD, 17-inch C monitor; GX, 2 external speakers	9,140
Super Workstation X/41	12/92	3/93	desktop	LSI, TI (—)	96.2/ —	17.2	GX	535 MB-2 GB	17-inch C; Trinitron	1,280x1,024	8	2	32 MB RAM, 535 MB HDD, FDD, 17-inch C monitor, GX, 2 external speakers	12,140
Super Workstation X/52	12/92	6/93	desktop	LSI, TI (—)	200/ —	38	GX	535 MB-2 GB	17-inch C; Trinitron	1,280x1,024	8	2	32 MB RAM, 535 MB HDD, FDD, 17-inch C monitor, GX, 2 external speakers	25,875
Super Workstation X/54	12/92	6/93	desktop	LSI, TI (—)	400/ —	76	GX	535 MB-2 GB	17-inch C; Trinitron	1,280x1,024	8	2	32 MB , 535 MB HDD, FDD, 17-inch C monitor, GX, 2 external speakers	36,250
Tadpole Technology Inc., 12012 Technology Blvd., Austin, TX 78727. **Circle 219**														
SPARCbook LC	12/92	12/92	notebook	Cypress (25)	18/ 12.6	4.4	—	180 MB	9 ½-inch M; 8-inch C	640x480	—	—	8 MB/180 MB, G LCD monitor	3,950
SPARCbook 1	9/91	2/92	notebook	Cypress (25)	18/ 12.6	4.4	—	120 MB-360 MB	9 ½-inch M; 8-inch C	640x480	—	—	16 MB RAM, 180 MB HDD, FDD, G LCD monitor	6,450
SPARCbook 2	1/93	2/93	notebook	Cypress (40)	28/ 18	4.0	—	250 MB-500 MB	9 ½-inch C	640x480	—	—	16 MB RAM, 250 MB HDD, 9 ½-inch C active matrix display	10,950
Tatung Science & Technology Inc., 2060 Ringwood Ave., San Jose, CA 95131. **Circle 220**														
microCOMP LC	3/93	4/93	desktop	TI (50)	59.1/ 21.0	—	CG3, SVGA	207 MB-1 GB	14-inch C; Tatung, Sony	1,024x768	4	3	16 MB RAM, 207 MB HDD, FDD, 14-inch C monitor, CG3+	3,890
microCOMP LX	3/93	4/93	desktop	TI (50)	59.1/ 21.0	—	GX	207 MB-1 GB	15-, 19-inch C; Tatung, Sony	1,152x900, 1,280x1,024	4	3	16 MB RAM, 207 MB HDD, FDD, 15-inch C monitor, GX	4,790
COMPstation 40	10/91	10/91	desktop	LSI (40)	28.5/ 24.7	4.2	GX	207 MB-1 GB	17-, 19-inch M; 14-, 19-inch C; Tatung, Sony	1,152x900, 1,280x1,024	4	3	16 MB RAM, 520 MB HDD, FDD, 19-inch C monitor, GX	8,990
Welltronix Co. Ltd., 3 F, No. 36-1, Hwang Hsi St., Taipei, Taiwan, R.O.C.. **Circle 221**														
Ellcon Station 2	1/92	3/92	desktop	LSI (40)	28.5/ 21	4.2	GX	424 MB-1 GB	19-inch C; Sony	1,152x900	16	5	FDD, 19-inch C monitor, SunOS	—
Ellcon Station 10 Lite	6/92	8/92	desktop	TI (40)	102/ 50	20	GX, XAGC	424 MB-1 GB	19-inch C; Sony	1,152x900	16	4	FDD, 19-inch C monitor, SunOS	—
Ellcon Station 10	4/93	6/93	desktop	TI (40)	109.5/ 53	22.4	GX, GX+, GT	424 MB-1 GB	19-inch C; Sony	1,152x900	16	4	FDD, 19-inch C monitor, SunOS	—
Ellcon Station Classic/LX	3/93	5/93	desktop	TI (50)	585/ 74	4.0	XAGC	424 MB-1 GB	17-inch M; 17-inch C; Sony	1,280x1,024, 1,152x900	16	3	FDD, 17-inch C monitor, SunOS	—

C = color M = monochrome G = gray scale
HDD = hard disk drive FDD = floppy disk drive

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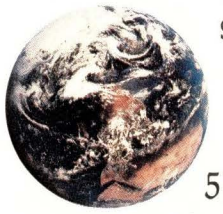
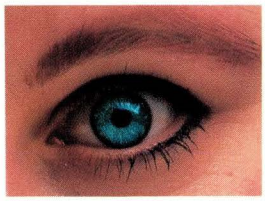
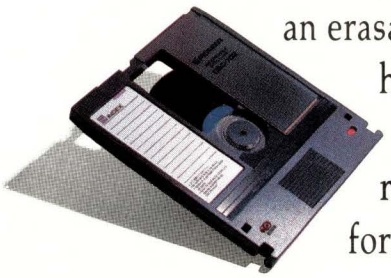


standard half-height computer bay. And Pioneer engineers did it. Presenting the **world's first** 5¼" half-height multifunction (rewritable/WORM) drive. *The DE-UH7101.*



This feature packed **optical** drive gives you everything. Half-height form factor, fast seek time, dust protection mechanism, high reliability, and removable media with 650 MBytes on a single 5¼" **optical disk.** The multifunction capability allows use as



an erasable, rewritable work-horse drive. And as a WORM (write once read many) archiver for mass storage.

Along with great features, Pioneer continues to build **reliability** into every drive. By improving existing technology and reducing the number of parts, we achieved an astounding 32,000 hours mean-time between failures.

The DE-UH7101 is available in internal or external units.

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Circle No. 41 on Inquiry Card

SunExpert Presents –

Presentation Software

A trio of tools for cooking up a smorgasbord of presentation graphics.

by S. LEE HENRY

Feast your eyes on presentation graphics! With DECpresent, IslandPresents and Orator vying for your favor, boring viewgraphs are a thing of the past.

Presentation software has greatly matured since the introduction of the classics–PowerPoint, which long dominated the IBM market, and MORE, which was a stunning success on the Macintosh. Today, presentation software is much more powerful and, lacking animation and video, falls only a little short of what people define as multimedia. Inclusion of features such as sound segments, impressive clip art and palettes of fades to whisk you from one slide to the next blur the distinction.

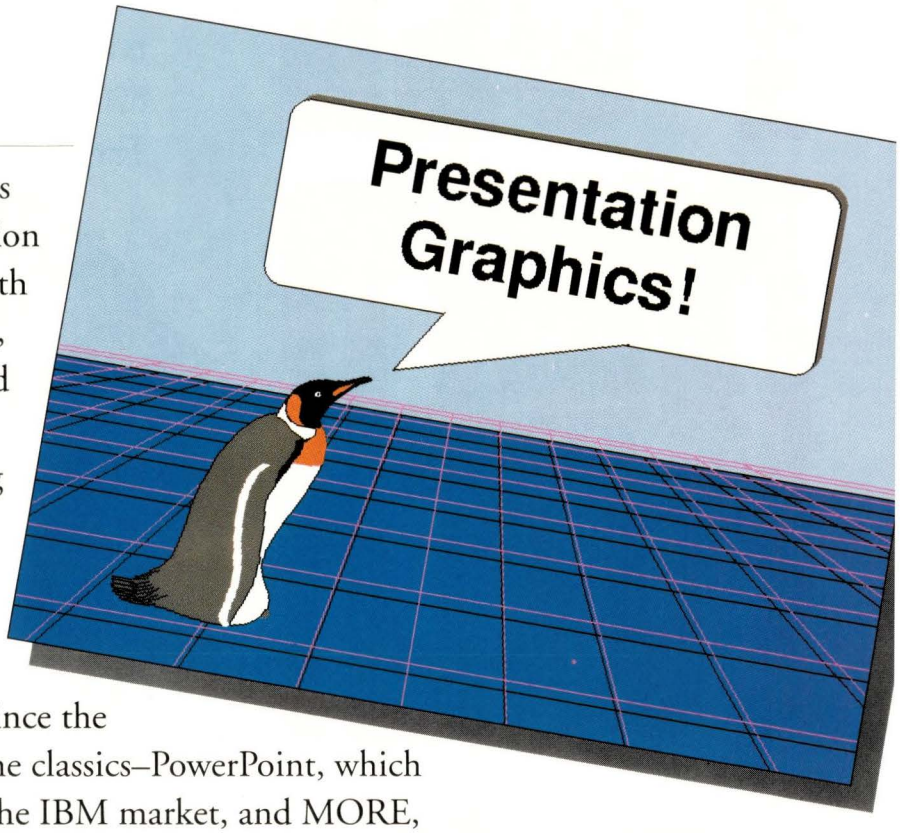

Figure 1. Orator from Soft-Tek International Inc. can add color and pattern to backgrounds and includes an extensive clip-art collection.

THE SUN ENQUIRER

Volume XXII No. 19 | Special Edition | One Dollar

8MM TAPE DRIVE TELLS ALL!

Built-In Display Reveals The Most Intricate Details Of Backup.

After delivering the keynote address at a recent trade show, the TTi 8501 granted The Sun Enquirer an exclusive backstage interview.

Sun Enquirer: We hear your built-in display is the greatest thing since transistors replaced tubes!

8501: Well, I wouldn't go that far. But DP managers sure love it. It tells you if there's enough unused tape in a cartridge to complete your backup. It lets you know if the tape is in good condition. And it even reminds you when it's time to install a cleaning cartridge.

Sun Enquirer: That's terrific! But fill us in on some basics. What's your speed and capacity?

8501: I can hold five gigs on a standard 8mm cartridge and my sustained data transfer is up to 500 kilobytes per second.

Sun Enquirer: How about your average seek time?

8501: In high-speed search mode I can find any file on a tape that contains 5,000 megabytes in about 60 seconds.

Sun Enquirer: That's fast! But I think our readers would really like to know if you're still doing work with some of the top CPUs in the business?

8501: You better believe it! I'm compatible with all kinds of SCSI-based systems. Not to drop names, but some of my best friends are VAXes, Sun SPARCstations and servers, IBM PCs and RS/6000s, HP/Apollos, and Macs.

Sun Enquirer: Boy, you really do get around! Is it hard to get along with so many different hosts?

8501: Not really. You see, the engineers at TTi designed me with 12 little switches on my back panel. By changing the settings I can speak almost any language.

Sun Enquirer: That must really come in handy in a multi-host environment. Do those switches do anything else?

8501: Of course! Besides setting the emulation, they change my SCSI address and let the user choose options like fast file search, short file mark enable and more!

Sun Enquirer: I suppose those switches also help you get along with 2.3 gigabyte 8mm drives?

8501: You got it. I can read tapes that were written by 2.3 gigabyte drives and write tapes in EXB-8200 mode, so they can be read by any 2.3 gigabyte drive.

Sun Enquirer: Mr. 8501, thank you for talking with us today. If folks want to learn more about you, what should they do?

8501: Either call (714) 693-1133 or drop me a line at TTi. I take all my calls and I always answer my mail. Well, gotta' go, but I hope I'll be talkin' to you soon!

Backup so easy, you can do it with your eyes closed.

TTi TRANSITIONAL TECHNOLOGY, INC.

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Phone: **(714) 693-1133** FAX: (714) 693-0225
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Circle No. 42 on Inquiry Card

This month's sampling of goodies for Sun users takes us on a tour of three presentation packages from three vendors. Digital Equipment Corp., longtime Sun competitor, brings its DECpresent software over to the Sun Microsystems Inc. platform. Island Graphics Corp., known for the IslandWrite, IslandPaint and IslandDraw trio, offers a new member of the Island series, IslandPresents. Soft-Tek International Inc., a relative newcomer to the Sun software community, but with two established products (Grafsman and Tactition), introduces Orator.

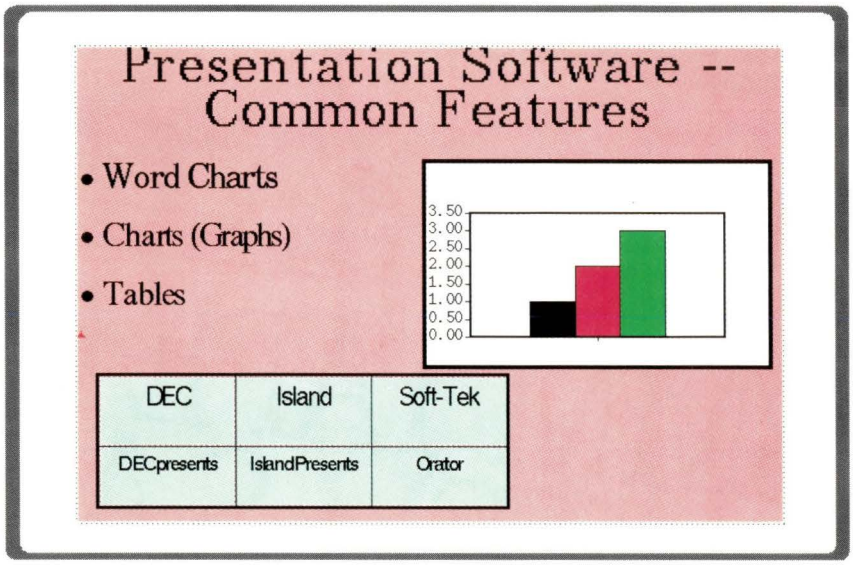


Figure 2. DEC's DECpresent, although difficult to install, makes it easy to include charts, graphs and tables in your presentation.

Common Features

Presentation software, in order to qualify as such, must have certain features. Text and bullets and some way to dress up slides with color, borders and art are basic. It should also include such things as a way to organize slides, thus creating a presentation.

Beyond the basics are a host of features that determine the character of the particular presentation package and how well it fits your requirements. These include outlining, sound, charting, tables, hooks to other software (whether through cut-and-paste operations or common file formats), the particular GUI and output formats supported.

I have been using and abusing the three presentation packages for weeks to tell you something about how they work and how they differ in basic operations, how easy they are to learn and use, and the expectations the designers had about the software and file environment in which they would be used.

Let's look briefly at how each of the packages operates.

DECpresent

When I started DECpresent, three windows opened (this is controllable through a preferences form)–an outliner, a slide and a Learn window in which I can page through training modules that teach me how to use the software. The outliner and slide viewer are linked so that I can type in either and see the text simultaneously appearing in the other. Outline operations, like collapse and expand, which control how much detail of the outline is visible at any time, are invoked through pull-downs from the top menu bar.

DECpresent includes numerous palettes for selecting graphics options (color, patterns, line widths, etc.), browsable clip art, which I found very useful though somewhat primitive, and the kinds of draw operations (grouping, aligning and distributing) characteristic of well-designed draw software.

Text, TIFF and DTIF (Digital Table Interchange Format) files can be imported into the outline or slide windows.

Of the three packages, DECpresent was the most difficult to install, but I managed without having to call DEC. I had to remove `/usr/5bin` from my search path to prevent misinterpretation of the `echo -n` commands in the installation script since this prevented the software from being installed. Then I had to fuss with my `/usr/openwin/bin/openwin` file to get the fonts working correctly after pondering whether I was using 100- or 75-dpi fonts.

DECpresent was also the hardest of the three to learn: Using the control key and my middle mouse button on one of the graphics' handles to duplicate an object, and the shift key with the left mouse button and a drag to select all objects in a given area are not my idea of intuitive. As a matter of fact, after I had used these operations several times, I still had to go back and look them up again. The manual that I received with the software is clearly out of sync and is, therefore, only marginally useful. And, to complicate matters, while I'm used to Open Look, the software uses the Motif GUI; my fingers, which normally know things my brain doesn't, trip over the mouse buttons. In its defense, DECpresent includes a wonderful set of Learn modules. These I keep on my screen at all times and quickly flip through them whenever I need help. The modules are well organized and have just the right amount of information on each page.

DECpresent also includes many advanced features, such as autosave, journaling, hot links to volatile files, a built-in equation editor that uses TeX syntax, spell checking with a modifiable dictionary, and the ability to create a presentation with a variety of output, including speaker notes, in addition to the slides themselves. The graphical operations, although not intuitive to me, include features that I love to use: grouping, ungrouping and duplicating operations as well as colors and patterns. The only thing I didn't like about the exercise was that I

couldn't figure out how to stop slide titles from sticking to the very top of the slides. Figure 2 was created using DECpresent and illustrates inclusion of a table and chart. These were easily set up and included in my slide.

Overall, I found the DEC product to be very powerful. I think it might take me a while to "get natural" with the control-button sequences. I would have like more control over the fine-tuning of my slide text.

IslandPresents

IslandPresents opens with an outliner and, like DECpresent, synchronizes data entry between the outliner and slides so that text can be modified in either window. Outline operations, like expand and collapse, are selected through icons in the tool bar on the side. I was quickly able to learn and remember what all the little symbols represented.

Moving from outline to slide is an easy operation; I click on a little slide icon on the top of the outliner window. From here, I can dress up my slide using the palette of draw tools. I can easily move text or graphics around to get the best balance and import graphics from other Island products as well as TIFF, EPS Image, EPS Objects, PICT, HPGL, CGM and PostScript.

The clip art that arrived in my IslandPresents box includes more than 1,100 pieces of high-quality vector files–some color, some black and white–on a CD. I reduced one of these files, slightly modified by a clever colleague to colorize it, to a size small enough to print on business cards. Printed on a Canon color printer, it looked crisp enough to steal business from the print shop.

One feature of IslandPresents I found especially useful is its ability to use Sun raster files. Read into IslandPaint and pasted on my slides, this capability literally makes the displayed output of all applications on my workstation available to my presentation. By using SnapShot tool, I can capture any part of my display and use it to illustrate my slide. Inclusion of maps and imagery adds tremendous value to my presentation.

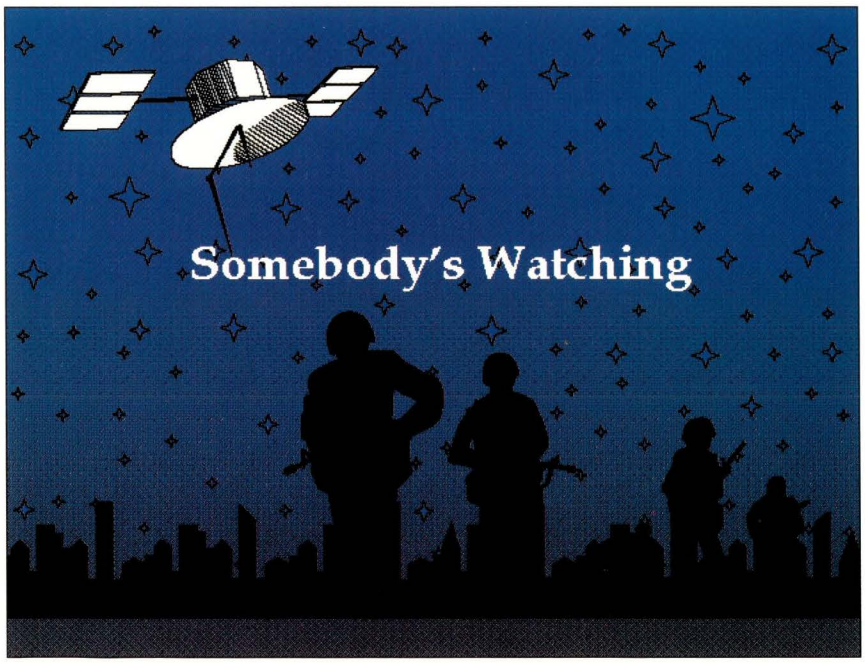
The only problem I had using IslandPresents was learning to think of my presentation as existing on three separate planes–the text, the slide and its graphics, and the background. Once I viewed my work in this way, I had a much easier time creating and saving my own templates in my personal template set. And I must add, they were sharp! Neither of the other packages included anything that duplicated the sophistication of the Island template collection. Consisting of background, graphics and text placement, the Island templates are very attractive. Browsable through a scrollable window, they range from simple designs with artful splashes of color to space-age monolithic slabs with classical perspective. Only the most complicated of these significantly slow down my presentation; this seems to me a fair trade-off. Figure 3, which uses a more complicated background and clip art with very little text, illustrates the powerful messages that templates can add to your presentation and the value of sophisticated clip art.

IslandPresents also comes with a charting tool, IslandChart, a table builder, IslandTable, and a powerful paint program, IslandPaint. Cut-and-paste between the Island products and the ability to import files created with these applications made the synergy between them one of the key selling points of Island's packaging of their software. IslandPaint adds an order of magnitude of graphical finesse.

IslandPresents was the only package to include sound as an option, though several of the selections provided did get on my colleagues' nerves after several dozen repetitions. (Sorry, Sue.) I recorded and modified additional sounds and voice-overs using the OpenWindows Version 3 Audio Tool.

Island's manuals are nice to handle, easy to use and understand, and nicely indexed. The generous set includes a manual on each of the software tools–IslandPresents, IslandTable, IslandChart and IslandPaint, and a catalog of the included clip art.

Figure 3. IslandPresents from Island Graphics Corp. allows you to use complicated backgrounds and clip art to punch up presentations.



Orator

With the Orator software, unlike either of the other packages, the user does all of his work within the slide editing tool, and there is no outliner at all. The only exception to this rule is that there is a separate tool for organizing slides into a presentation, called OratorPB (for Orator Presentation Builder).

Charting and table operations are initiated through the menu bar of the slide, and appropriate forms open up to allow entry of text and data. Draw operations and inclusion of clip art also take place in this single window.

Due to this single-input focus of the Orator software, and the simplicity and consistency of its operations, the Orator software was the most intuitive of the three software packages. Though it lacks some of the features of the other two packages (no outliner, no sound), it provides me with a lot of control over my final slide and a couple options (shadows behind graphics and text, captions) that are unique.

The Orator manual is a single softback book which is nice to handle, well written and includes numerous screen shots.

The clip art is much the same as that included with IslandPresents. As a matter of fact, it is almost the same art collection, but the images are stored as encapsulated PostScript (EPS) files rather than vector files and are loaded on your hard disk. Although I didn't receive one, there is a catalog for the clip art; I found I could peruse the art using `pageview` or splash them onto the screen with `psh`, the NeWS PostScript shell. Orator imports graphics in either EPS or CGM format.

Elements of Orator slides, other than graphics, include word charts (for which there are six templates that specify how the text elements relate and are formatted), charts, tables, text blocks and captions. Captions differ from text blocks in that they are surrounded by borders; these can be rectangles with square or rounded corners or those cute little quote shapes that cartoonists use to make their characters talk.

Orator includes the ability to add color and pattern to the background as well as a set of background graphics. Part of the clip art collection that Orator has in common with IslandPresents, these backgrounds, as well as a set of borders, provide a lot of slide customization.

Summing up the Differences

✔ yes
▼ yes, but...
✯ exceptionally yes

Vendor	Digital	IslandGraphics	Soft-Tek
Cost	795	995	495
Easy to Learn and Use	▼	✔	✯
OpenLook		✔	✔
Motif	✔	✔[1]	✔[1]
Documentation	▼	✯	✯
OnLine Help	✯	✔	✔
Macros	✔	▼	
Outliner	✔	✯	
Spell Checker	✔	✔	
Sorting in Outline	✔		
Charts	✔	✔	✯
Tables	✔	✔	✔
Draw Tools	✯	✯	✯
Paint Tools	✔	✯	
Graphic Input Formats	✔	✯	✔
Text Input Formats	✯	✔	✔
Warm Links	✔	✔	✔
Clip Art	✔	✯	✯
Templates	✔	✯	text only
Background Effects	color	color, gradations	color, gradations
35 mm Slides	✔	✔	✔
Letter/Legal	✔	✔	✔
Outline	✔	✔	
Speaker Notes	✔	✔	✔
Handouts	✔	✔	same as above
Sound		✯	
Shadows/3D		with Charts	✯
Zoom	✔	✔	✔
Slide Sorter	✔	✔	✔
Fades	5	12	8
Global Fade/Timing	only	✔	✔
Slide Show Preview	✔	✔	✔
Regression		✔	✔
Equations	✯	w add'l SW	

[1] Available as of first-quarter 1993.

Voila!

Each of the presentation packages includes a huge variety of features–far too many to describe. I've summarized much of this detail in the table at left–created, by the way, in IslandTable.

In evaluating the software, I attempted to gauge overall functionality and ease of use without worrying too much about how functionality is split across tools unless it affects how easy the software is to use or adds considerably greater functionality, like IslandPaint. I also paid considerable attention to how attractive a presentation I was able to create given the backgrounds, clip art and formatting control at my disposal. The figures in this review should give you some feel for this.

All of the packages perform well and provide considerable control over the look of my presentation and lots of tools for adding interest. A user with a good graphic sense can become adept at making attractive presentations with any of these tools.

The choice of which package is best for you probably hinges on what other software you use or need, whether your presentations naturally flow from outlines or you prefer to think a slide at a time, and how much you want to customize the package for your organization by setting up your own symbols, logos and templates. ⊸

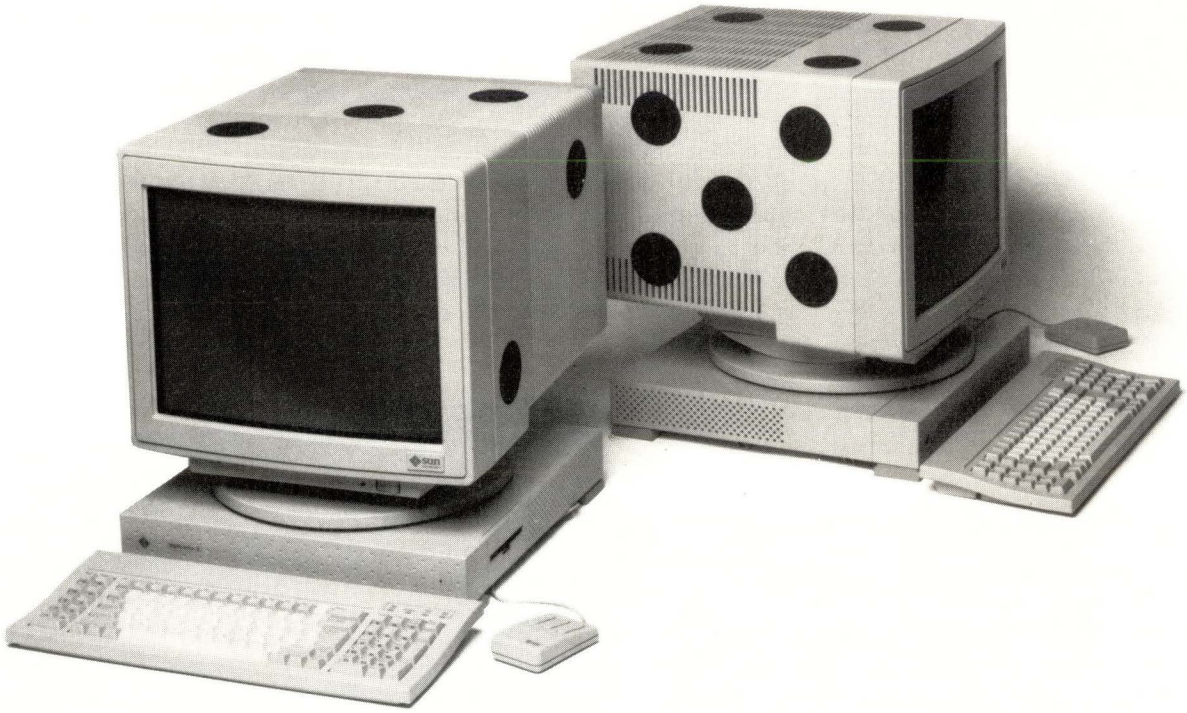
S. Lee Henry is on the Board of Directors of the Sun User Group and is a system administrator for a large network of Suns in the federal government. Her email address is `slee@expert.com`.

Companies Mentioned in this Article

Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
Circle 189

Island Graphics Corp.
4000 Civic Center Drive
San Rafael, CA 94903
Circle 190

Soft-Tek International Inc.
1999 N. Amidon, Suite 340
Wichita, KS 67203
Circle 191



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

SPARCclassic Engine

Sun, which not that long ago said it was getting out of the board business, has introduced a SPARCengine board for embedded applications using the same board as the SPARCclassic workstation. The SPARCclassic engine, which is being sold to the OEM market, is a single-board computer for embedded applications in medical imaging, communications, factory floor automation and so on. The company sees it as a low-cost–at $3,100 for a bare-bones engine–means of bringing SPARC performance to applications that might otherwise go to 386 and i486 boards.

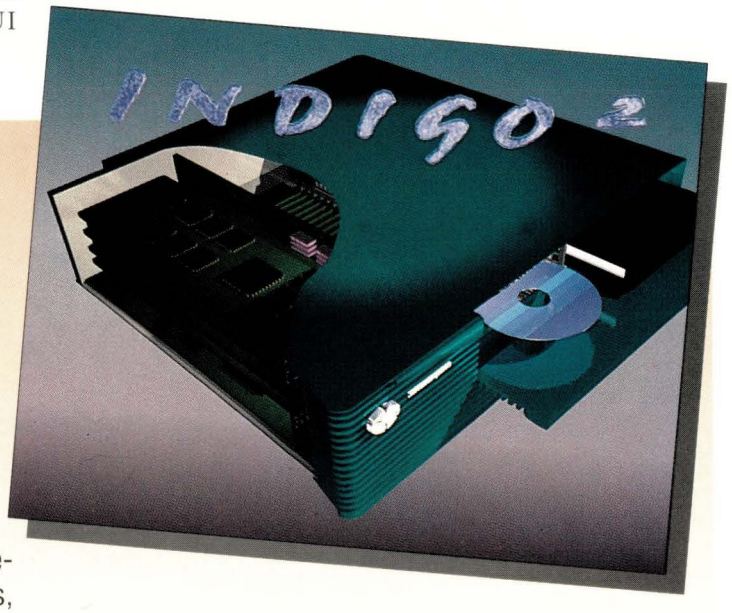
The SPARCclassic engine comes with a 50-MHz processor offering 26.4 SPECint92 and 21.0 SECfp92, or 59.1 MIPS and 4.6 MFLOPS. It comes without memory but can support up to 96 MB of on-board RAM and has two SBus slots. I/O includes two SCSI-2 connectors, two serial ports, a parallel port, twisted pair and AUI Ethernet, and 8-bit audio ports. The board runs Solaris 2.1 and Solaris 2.X.

Sun Microsystems Computer Corp.
2550 Garcia Ave.
Mountain View, CA 94043-1100
Circle 101

64-MB Memory Board

Dataram has introduced a 64-MB memory board for SPARCstation 10 and compatible workstations. The DR10/64 is a single board with multiple 16-MB DRAM chips. With the boards, users can boost a SPARCstation 10's memory up to the theoretical maximum of 512 MB. A SPARCstation 10 normally comes standard with 32 MB of memory.

SGI Goes to Extremes



Silicon Graphics has introduced two new workstations and a graphics package, Extreme, which the company says is among the highest performance graphics systems in the industry. The first of the new workstations is the Indigo^2. This system, which the company says is meant to fit at the high end of its current line of desktop systems, is based on the MIPS Technology Inc. R4400. The machines are a departure from the company's existing "cube" design and more closely resemble a large PC. This, the company says, was done so that they could accommodate an EISA bus in addition to SGI's own GIO.

The Indigo^2 machines come standard with 16-bit DAT-quality audio, 1,280-by-1,024 resolution, 60- and 72-Hz refresh rates, built-in Ethernet, a 19-inch color monitor, 32 MB of memory, two Fast SCSI-II channels, three internal mass storage bays (which can accommodate up to 3.6 GB of internal storage), and space for an internal CD-ROM. The machines come with SGI's Magic graphics environment and IRIX operating system.

But Indigo^2's real graphics punch comes from Extreme. SGI says that this graphics package provides the power of up to eight of the company's Geometry Engine processors. Extreme comes standard with a 24-bit color frame buffer, 24-bit hardware z-buffer, 1,280-by-1,024 resolution support, and 60- or 72-Hz refresh rate. It delivers 620K shaded polygons and 415K Gouraud-shaded, lighted, z-buffered polygons.

The second workstation is a new low-end offering, the Indigo XZ. This product, too, supports the Magic environment and comes with a graphics subsystem with two Geometry Engine processors. It delivers 160,000 z-buffered polygons and 50,000 quadrangles per second. In addition, the Indigo XZ comes standard with a 24-bit color frame buffer, 24-bit hardware z-buffer, 1,280-by-1,024 resolution and 60- or 72-Hz refresh rates.

The Indigo^2, available in one configuration that includes 1-GB disk, 32-MB memory and the Extreme graphics option, is $35,000, and the XZ is $23,000.

Silicon Graphics Inc.
2011 N. Shoreline Blvd.
Mountain View, CA 94043
Circle 100

It is a direct replacement for Sun's own X164F memory expansion product and provides simultaneous access to 36 DRAMs. Pricing begins at $8,200, with quantity discounts available.

Dataram Corp.
P.O. Box 7528
Princeton, NJ 08543-7528
Circle 102

SBus-to-Datakit Connection

An interface that links SBus systems to AT&T's Datakit VCS/Datakit II VCS network has been introduced by Texas Microsystems and Pacific Access Computers, Rancho Cordova, CA. With the interface, any SBus system running SunOS 4.1.2 or higher can access a Datakit network via a direct fiber-optic connection. In fact, the interface can provide up to 256 network connections on a single fiber-optic cable.

Datakit is a high-speed, high-performance network meant mostly for telecommunications. Texas Microsystems will offer the interface package bundled with its Model 9100 SBus expansion box and its Model 9632 Telephony systems. Pacific Access will market the product separately. Pricing begins at $14,100.

Texas Microsystems Inc.
10618 Rockley Road
Houston, TX 77099
Circle 103

SBus Graphics Accelerator

A multiuser graphics accelerator for SBus systems has been introduced that offers a "dial-in resolution" feature. The GXTRA/2, from Tech-Source, is a single-slot SBus board that supports multiple resolutions, from 1,600-by-1,280 down to 640-by-480. The company says this allows users to support multiple kinds of monitors from a single system, including both high-resolution displays and inexpensive PC monitors. In addition, the GXTRA/2 can be used to allow a single workstation to support multiple users by driving a second monitor.

The GXTRA/2 comes with a SunOS CG3-compatible device drive; an optimized OpenWindows X11/NeWS server; a Weitek W8720 integrated controller; a 2-MB, 8-bit color frame buffer; a hardware cursor; and a Sun-4-style keyboard/mouse port. Pricing begins at $2,250.

Tech-Source Inc.
442 S. North Lake Blvd., Suite 1008
Altamonte Springs, FL 32701
Circle 104

3Com Terminal Servers

Two new terminal servers have been announced by 3Com. The CS/3000, a diskless server, and the diskfull CS/3100 offer up to 48 RS-232-C or RS-423 ports plus one parallel printer port in a chassis 3.8 inches high. They support up to eight simultaneous sessions per port and support TCP/IP,

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210S	1 Parallel, 2 Serial
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400SX	4 Serial, up to 115Kb
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800S	8 Serial Ports
1600S	16 Serial Ports

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SNA3270	3270 Emulation
SNA3770	3770 Emulation
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PPP	RFC 1171/72 Std.

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Dual SBox	8 slots

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Socrates OCR for SPARC	Quick, accurate text entry from text image files, point-and-click using OPEN LOOK

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Circle No. 4 on Inquiry Card

OSI, LAT and TN3270. Both also support Serial Line Interface Protocol (SLIP) for dial-up users.

The CS/3000 with 48 ports is $6,500. The CS/3100 similarly configured is $6,000. Terminal server software is priced separately. For servers running TCP, TN3270 and OSI, software is $800. However, for those who must also run LAT, an additional $650 LAT license is required.

3Com Corp.
5400 Bayfront Plaza
P.O. Box 58145
Santa Clara, CA 95052-8145
Circle 105

Clean Heads, but No Shampoo

Maxell has introduced a line of head cleaners for quarter-inch tape drives.

According to the company, the increased use of quarter-inch media for backup has brought a corresponding increase in data-backup problems as a result of dirty read/write heads.

The cleaning cartridges work much like consumer audio-tape cleaners, simply slipping into the drive to clean the drive heads with nonabrasive pad and an "ozone-safe" cleaning fluid.

The cartridges come in two formats: DC-600 (5¼-inch) and DC-2000 (3½-inch). The DC-600 is $36, while the DC-2000 is $34. Each is good for 40 to 60 cleaning cycles.

Maxell Corp. of America
22-08 Route 208
Fair Lawn, NJ 07410
Circle 106

HIPPI-to-SBus Interface

An interface that links SBus systems to HIPPI, the accepted standard channel for supercomputer class systems, has been announced by CHI Systems.

The CHI Interface, which conforms to ANSI standard X3T9.3 (currently supporting a bandwidth of 100 MB/s), includes software drivers for SunOS 4.1.3 and Solaris 2.0. With it, an SBus system can connect at burst rates approaching 80 MB/s to HIPPI peripherals, switches and computers. The company says the product will be of particular use in such markets as graphics and visualization, where Sun and other SBus workstations may need to connect to powerful vector processors and HIPPI peripherals originally developed for Cray-class machines.

The CHI Interface product consists of a double-width SBus card consuming two SBus slots. The card has one HIPPI source and one HIPPI destination channel, with bidirectional data flow through dual simplex channels. FIFO size is 1K word (4 KB). Pricing is $6,500.

CHI Systems
5860 West Las Positias Blvd.
Suite 25
Pleasanton, CA 94588
Circle 107

SBus Terminal and Peripheral Servers

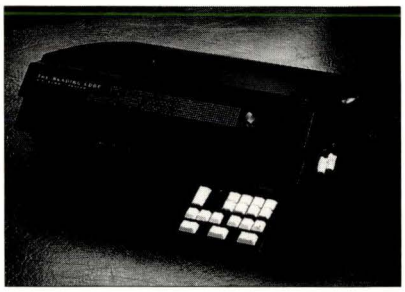
Aurora has introduced two intelligent serial terminal and peripheral servers, the 3200S and the 3200SX. Each provides an SBus system with 32 serial ports for terminals, modems and other RS-232-C devices. Each is a chassis that comes in either pizza box- or the much smaller break-out box-style enclosures. Each connects to a host system by a cable and a single SBus connector.

The 3200S offers buffered I/O of 32 bytes per channel at up to 38.4 Kb/s. The SX, meanwhile, offers 1,024 bytes of buffered I/O per channel at up to 128 Kb/s. Both machines have drivers that support Solaris 1.X or 2.X. The 3200S is $3,995; the 3200SX, $4,995.

Aurora Technologies Inc.
176 Second Ave.
Waltham, MA 02154
Circle 108

SPARC-Based Reader for the Blind

A SPARC-based machine that converts written text to speech for the visually handicapped has been introduced by Xerox Imaging Systems (XIS). The Reading Edge is a small, relatively lightweight (20 pounds) device that can scan books, magazines and other text and then produce synthesized speech.



Reading Edge is not the first such reader, even from XIS. But it is said to be one of the lightest and most ergonomic to date. It is also relatively inexpensive, at $5,495. The relatively small market for such devices has kept their prices high. However, "relatively" is the operative word. XIS notes that in the United States alone there are an estimated 3.1 million people who are blind or visually impaired and at least another seven million individuals who are so dyslexic they cannot normally read.

The Reading Edge comes with a book-edge scanner, which can scan books and other bound materials; a keypad that also incorporates Braille editing capabilities; and a DECtalk speech synthesizer. It also supports Smart Card PCMCIA cards.

Xerox Imaging Systems
9 Centennial Drive
Peabody, MA 01960
Circle 109

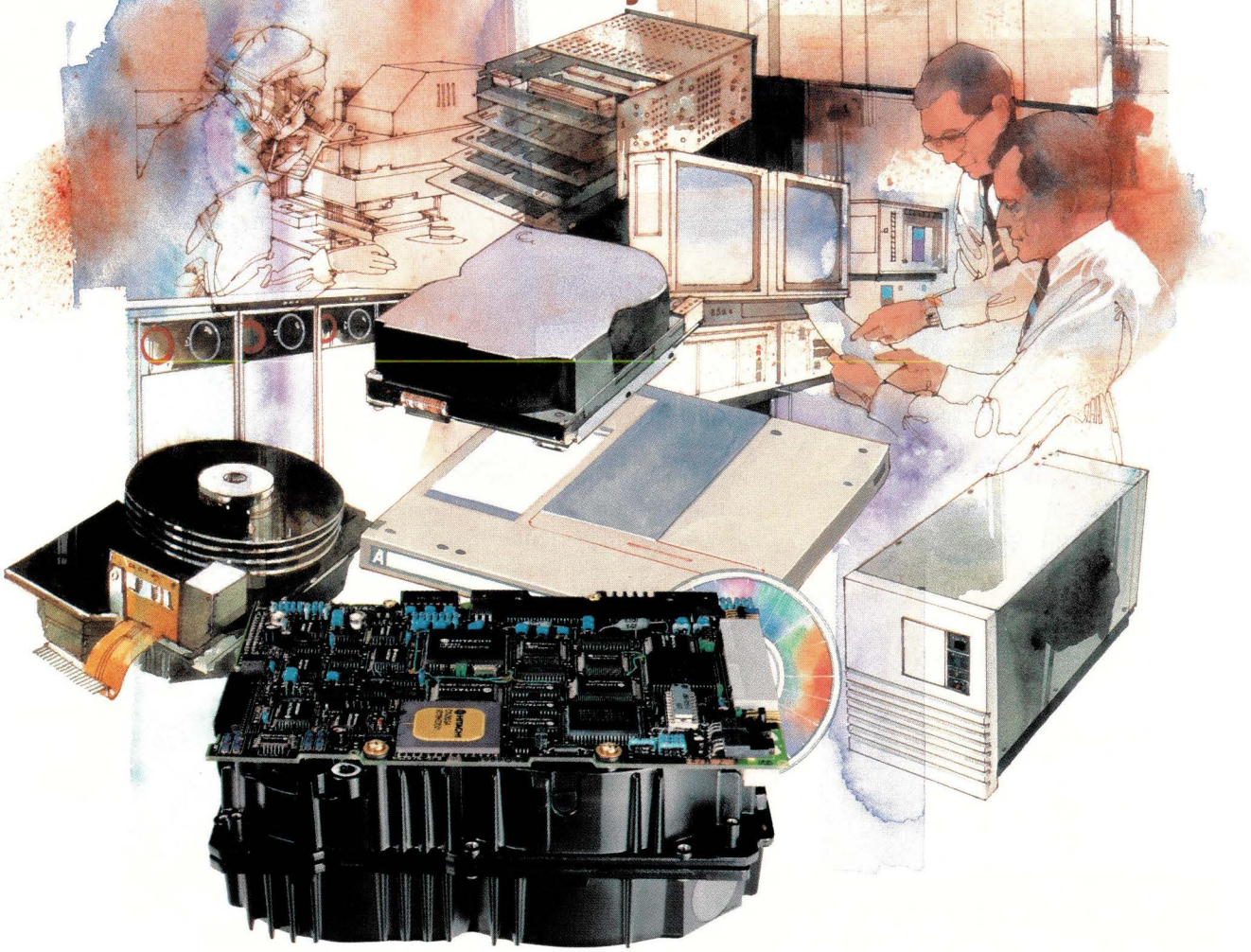
SBus System Expander Boards

SBus system owners can now expand their machines with a new line of serial and parallel port boards. The Magma product line, from Mesa Ridge Technologies, consists of seven SBus boards that provide from one parallel port to 16 serial ports. The company has also announced an SBus board with four serial DMA ports.

A board with one parallel port is $175. With two parallel ports, the price is $350. Two serial and one parallel ports on a board are $325. A board with four serial ports is $425.

LEGENDARY RELIABILITY

Hitachi's 5.25" 1.65-Gbyte Hard Disk Drive.



The DK516C-16 Winchester is another legend in a distinguished tradition of Hitachi mass storage products. Hitachi believes that product development starts with the pursuit of maximum reliability. That's why all of the DK516's key components are designed, built, and tested in-house by Hitachi.

Legendary Performance

Hitachi backs up this reliability with equally-impressive performance. The DK516C-16's SCSI interface provides a maximum data transfer rate of 5.0 Mbyte/sec (synchronous), with a 256-Kbyte data buffer and read look-ahead cache. Average seek time is a quick 13.5 ms.

For ESDI applications, choose the DK516-15. This 1.54-Gbyte drive provides a 14 ms average seek time and a 2.75 Mbyte/sec data transfer rate.

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Call Hitachi for a free copy of the survey.

Circle No. 19 on Inquiry Card

An eight-serial-port board is $695. One with two parallel and eight serial ports, meanwhile, is $1,095. And, finally, the DMA board is $675.

Mesa Ridge Technologies
6725 Mesa Ridge Road
San Diego, CA 92121
Circle 110

Dye Sublimation Printer

The Imaging Group of Mitsubishi Electronics has introduced a high-speed color dye sublimation printer that prints on a wide variety of U.S. and metric paper sizes up to a full-bleed image of 11 by 17 inches. The S6600-30U delivers a resolution of 300 dpi from images produced on UNIX workstations, Macintoshes and MS-DOS computers.

Applications touted have been desktop publishing, prepress, packaging design, scientific, CAD/CAM, medical imaging and 3D modeling.

The S6600-30U is equipped with a four-color, 32-MB full-frame buffer that allows multicopy printing. It allows users to make color corrections, calibration adjustments, and contrast and sharpness adjustments from the front panel. The printer has both Centronics parallel and SCSI-2 interfaces and offers support for monochrome, three-color and four-color ink sheets.

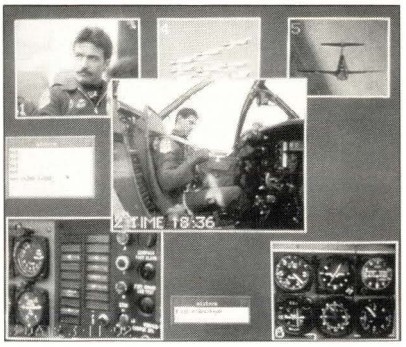
Mitsubishi offers software drivers that allow the S6600-30U to be controlled by UNIX workstations, Macintoshes and MS-DOS computers.

Retail price is $19,995.

Mitsubishi Electronics America Inc.
Professional Electronics Division
800 Cottontail Lane
Somerset, NJ 08873-6759
Circle 111

Multiple Video Windows for Sun

A product that allows multiple video windows to be displayed on a workstation screen has been introduced by RGB Spectrum. The Watchdog 250 allows up to 15 different video input signals to be shown as monochrome windows on a single computer screen. These windows can be positioned, overlapped and scaled from 1/64 to full screen. The company says that Watchdog is targeted at such applications as



surveillance, process control, training and medical applications.

Watchdog is a chassis that attaches between a computer and its monitor. There are two models, the 250, which has a front control panel, and the 150, which does not. The Model 150 is priced at $5,995, while the 250 is $6,995.

RGB Spectrum
950 Marina Village Pkwy.
Alameda, CA 94501
Circle 112

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Circle No. 12 on Inquiry Card

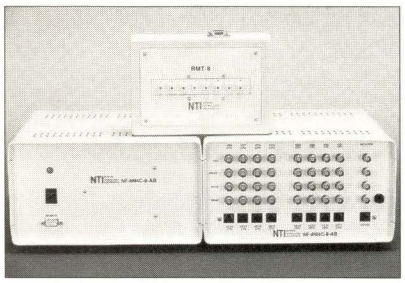
with Sun systems, Tek has launched Version 6.0 of its software.

With it, Tek's XP10 X terminals are said to be uniquely well integrated with Sun hosts. The software even comes with a Sun Optimization Kit featuring an implementation of Sun's Open Look Window Manager as a local client.

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

Eight Suns with One Keyboard

A switch that allows a single keyboard, monitor and mouse to access up to eight Sun SPARCstations and servers has been introduced by Network Technologies. The SE-8M4C-8-AB connects between the workstations and the single keyboard and monitor, and the company says that by using extension cables and an additional piece of equipment, the RMT-8 Wired Remote, the switch can be up to 500 feet away from the workstations and servers it controls. The company also



says the product would be particularly useful in situations where multiple file servers are in place but space for multiple keyboards and monitors is limited.

The SE-8M4C-8-AB comes in a 10.2-by-9.8-by-5.6-inch case and is priced at $1,754. The RMT-8 is 7.5 by 5.5 by 1.8 inches, comes with a 25-foot cable, and costs $230.

Network Technologies Inc.
1275 Danner Drive
Aurora, OH 44202
Circle 114

SBus Graphics Accelerator

A graphics accelerator for use with the Hitachi 21-inch flat-screen monitor for SPARCstations has been announced by Integrix. The SGX160, coupled with the monitor, delivers 1,600-by-1,280 resolution at a 76-Hz refresh rate. It is a single-slot SBus board and supports both 2D and 3D applications. It does not, however, require any additional device drivers.

The SGX160 is register-level-compatible with Sun's CG6 graphics standard and is, in fact, powered by Sun's own GX chip. It is available either by itself, or bundled with the Hitachi 2 mega-pixel resolution screen. Pricing begins at $3,295.

Integrix Inc.
1200 Lawrence Drive, Suite 150
Newbury Park, CA 91320-1316
Circle 115

Long-Distance Fast SCSI

Paralan has introduced a product that allows SPARCstations and compatibles with single-ended SCSI ports to support differential SCSI devices and do so at a distance of more than 100 feet.

The Parallel-SD10 SCSI single/differential converter allows users to connect single-ended SCSI systems to dif-

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USI *Uni Solution, Inc.*

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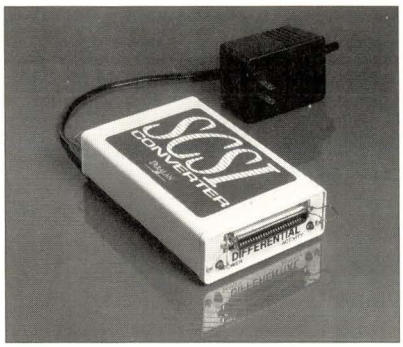
Circle No. 43 on Inquiry Card

ferential SCSI systems, which Paralan says are becoming increasingly popular because of their improved noise immunity, drive stability and longer available



cable lengths. The SD10 can attach to the single-ended system on one side and then link to a differential peripheral on the other.

Moreover, it can do so at some distance. On the single-ended connection side, the SD10 can support a cable up to 20 feet in length. On the differential side, it can support a cable length of 82 feet. Thus a peripheral may be 102 feet from its host. Moreover, two SD10s can be connected for a grand total of 200 feet. Pricing is $475.

Paralan Corp.
7171 Ronson Road
San Diego, CA 92111
Circle 116

Disk Array Product Line Expansion

The LAN Array, a new midrange RAID storage subsystem, has been introduced by Core International. Available in 2- or 4-GB capacities, the subsystem uses five 3½-inch, hot-pluggable drives. Fault tolerance is further enhanced by two load-sharing power supplies.

Each of the five 3½-inch drives included supports a data transfer rate of 5 MB/s, providing 10- to 12-ms access time, and a 200,000 MTBF reliability rating. The unit is powered through the use of a 32-bit, 25-MHz RISC processor with 1 MB of RAM and 256 KB of flash memory. Also included is a 2-MB hardware error-checking/correcting cache memory for caching reads and writes of data.

The LAN Array will work with virtually any server whose operating system supports SCSI-2, with no need to purchase host-dedicated storage. It is compatible with Novell Inc. NetWare, DOS, UNIX and OS/2. The product is backed with a five-year, full replacement warranty on drives and one year on chassis and components.

The 2-GB subsystem lists at $15,495, and the 4-GB version lists at $19,995.

Core International Inc.
7171 North Federal Highway
Boca Raton, FL 33487
Circle 117

Communications Front End for SPARC

A front-end processor that allows OEMs and developers to offload communications functions from SPARC-based systems has been announced by Simpact Associates. The ICP 3320 is an SBus board that supports the company's communications development tool kit, SBTools. With SBTools, users can develop their own protocols or use a suite of industry standards. Currently available protocols include X.25, HDLC, DDCMP and ADCCP.

The ICP 3320 is based on a Zilog

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Circle No. 27 on Inquiry Card

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(617) 232-0514 voice
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office@sug.org email

Circle No. 38 on Inquiry Card

Z16C35 Integrated Serial Communications Controller and a Motorola Inc. MC68340 processor coupled with 2 MB of on-board memory. The product supports communications rates up to T1/E1 on two ports. Pricing ranges from $1,595 to $1,695, depending on the electrical interface. SBTools, meanwhile, is $4,950.

Simpact Associates Inc.
9210 Sky Park Court
San Diego, CA 92123
Circle 118

SBus SCSI and Ethernet Cards

Four SBus SCSI and Ethernet cards have been introduced by Artecon. The SB-FS200 and the SB-DS200 both provide a second fast SCSI port to SPARCstations and compatible SPARCalikes. Both cards support a SCSI synchronous transfer rate of 10 MB/s. The SB-FS200 is a single-ended SCSI bus that allows a cable length of up to 6 meters (19.7 feet). The SB-DS200 is a differential SCSI bus allowing up to 25-meter cables. Both cards provide the necessary I/O capability required in SPARCstation servers and/or other applications that demand intensive high-speed disk support. The SB-FS200 is $445, and the SB-DS200 is $495.

The SB-SE200, meanwhile, provides a second Ethernet port to SPARCstations and SPARCalikes. This would be a valuable application in a situation where the primary Ethernet port is connected to a heavily loaded network. The SB-FSSE200 combines both a fast SCSI (single-ended) and Ethernet with thick and twisted pair on a single-width, multifunction SBus card. The SB-SE200 is $345, while the SB-FSSE200 is $795. All cards come wtih a one-year, on-site warranty and will work on all SPARC platforms running Solaris 1.0 or higher.

Artecon
2460 Impala Drive
Carlsbad, CA 92008-7236
Circle 119

MIPS' R4000 for PCs

A version of the R4000 processor, this one meant for PC-sized systems, has been introduced by MIPS.

The MIPS R4400 is a 150-MHz device that is said to deliver 95 SPECint89 and 126 SPECfp89. It comes in three versions, the R4400PC for desktop systems, the R4400SC for larger "technical" systems and the R4400MC, which contains multiprocessor features.

MIPS Technologies Inc.
2011 N. Shoreline Blvd.
Mountain View, CA 94043-1389
Circle 120

Japanese/English Translation Software

Software that translates English text to Japanese has been announced by Language Engineering. Called Logo-Vista E to J, the program runs on a SPARCstation or SPARCalike and features a 78,000-word main dictionary. The main dictionary, in turn, can be supplemented by 19 optional technical dictionaries. Users can also create their own dictionary as well as "train" the system for their particular preferences in translation.

The product requires at least 8 MB of RAM and 40 MB of hard disk. A

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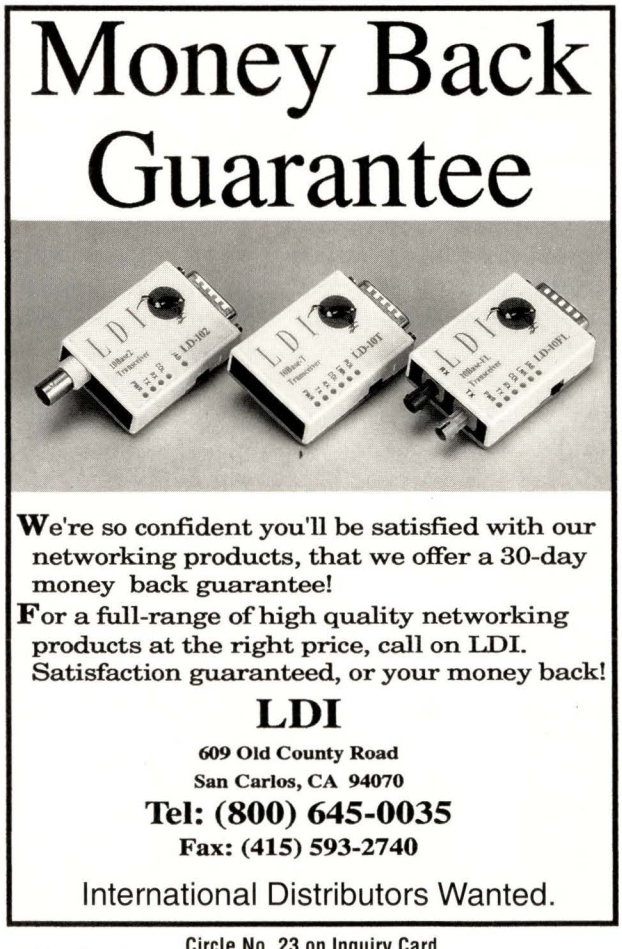

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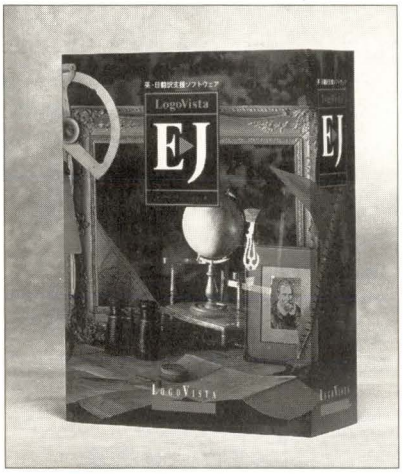

single-user license is $1,995. A multiple-user version, for a maximum of five users, is $5,995. The 19 technical dictionaries have their own prices. The general business, general science and technology, electrical engineering and mechanical engineering directories are $995 each. The aerospace engineering, agriculture, applied chemistry, applied physics, architecture, biology, chemistry, civil engineering, earth science, information science, materials science, naval architecture, physics, urban engineering and zoology dictionaries are $495 each.

Language Engineering Corp.
385 Concord Ave.
Belmont, MA 02178
Circle 121

NCD X Terminals

NCD has lowered the prices of three of its X terminals.

The entry-level NCD15b, a 15-inch monochrome unit, has been reduced from $1,495 to $1,195. The NCD14c, a 14-inch color unit, is down from $3,000 to $2,495. Finally, the NCD19c, a 19-inch color unit with 1,280-by-1,024 resolution, has been reduced from $6,395 to $5,995.

Network Computing Devices Inc.
350 North Bernardo Ave.
Mountain View, CA 94043
Circle 122

Correction

In *SunExpert*, February, Page 61, the correct name of the president of RC Electronics is Rudy Corrales, not Ray. RC Electronics is one of the country's largest service and support operations for tape drives.

Upgrades, Enhancements, Additions...

• VXworks, the real-time operating system from Wind River Systems of Alameda, CA, is now available on Force Computers' SPARC-based VME boards. **Force Computers Inc.**, 3165 Winchester Blvd., Campbell, CA 05008-6557. **Circle 123**

• Visual Solutions has introduced Version 1.2 of its VisSim package. VisSim is a continuous and discrete multirate simulation package for scientists and engineers. The new version features such things as Fast Fourier Transform plots of simulation results for analysis in the frequency domain and transfer function blocks that support both continuous and discrete functions. **Visual Solutions Inc.**, 487 Groton Road, Westford, MA 01886. **Circle 124**

• Version 2.1.5 of MathTensor has been introduced by MathSolutions. MathTensor is an advanced tensor analysis system running atop Mathematica. The new version features several new functions (such as the Ttransform function, which permits very general coordinate transformations of tensorial objects) and upgrades of others. **MathSolutions Inc.**, P.O. Box 16175, Chapel Hill, NC 27516. **Circle 125**

• A new version of the Minitab statistical analysis software for Sun has been released. Release 9 of the product will come in two versions, a Standard version with a variety of statistical and analysis features, and an Enhanced version, which also has significant graphics facilities. **Minitab Inc.**, 3081 Enterprise Drive, State College, PA 16081-3008. **Circle 126**

• Tera Technologies has added Windows 3.x support to its UNIX-to-PC gateway. Called Network PC Access Version 2.0, the product allows users of X-based displays to remotely access DOS and Windows applications. **Tera Technologies Inc.**, 7755 SW Cirrus Drive, Beaverton, OR 97005. **Circle 127**

• Sky Computers, a vendor of application accelerators and array processors, has extended the warranties to its products to 12 months. **Sky Computers Inc.**, 27 Industrial Ave., Chelmsford, MA 01824. **Circle 128**

• A series of price reductions have been announced by quarter-inch cartridge subsystem vendor Maynard Electronics. The company will drop prices on its Archive ST line of 1.35-byte QICs by as much as 15%. The Archive ST1350E external 1.35-GB QIC, for example, will go from $1,850 to $1,575. **Maynard Electronics Division**, Archive Corp., 36 Skyline Drive, Lake Mary, FL 32746. **Circle 129**

• MTI Technology has frozen development of its Lance+ network management software product. From now on, the company will focus its efforts on the "network-attached, system storage computing marketplace." **MTI Technology Corp.**, 5065 East Hunter Ave., Anaheim, CA 92807. **Circle 130**

• Joining the rush to Sun platforms, Software AG announced on February 1 that it will offer versions of its Natural fourth-generation language, Adabas database and Entire Net-Work communications software on Sun Systems. **Software AG**, 11190 Sunrise Valley Drive, Reston, VA 22091. **Circle 192**

• In another port to Sun story, Promis Systems has said that it too will move to SPARC platforms. The company's Promis software–which is a plant floor and manufacturing executive package that runs atop the Oracle database–will be available by June 1993. **Promis Systems Corp. Ltd.**, 1731 Technology Drive, Suite 250, San Jose, CA 95110. **Circle 193**

• Lone Star Software has announced Version 1.2.2.3 of Tape-Tell, its archiving and restore utility. The company says that the new version can handle most SCSI tape drive conflicts. **Lone Star Software Corp.**, 13987 W. Annapolis Court, Mount Airy, MD 21771. **Circle 194**

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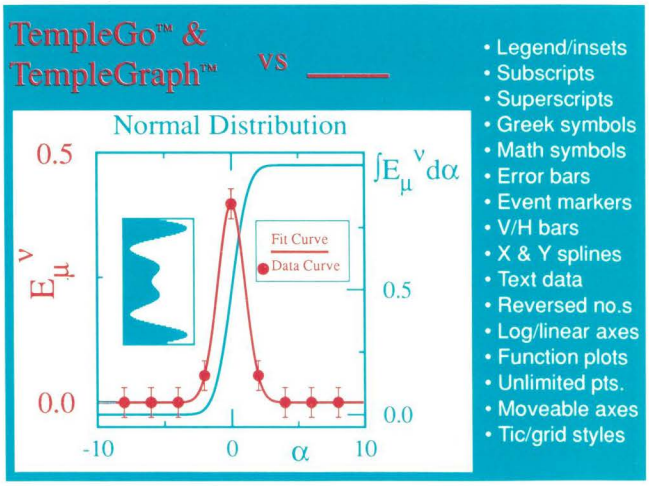

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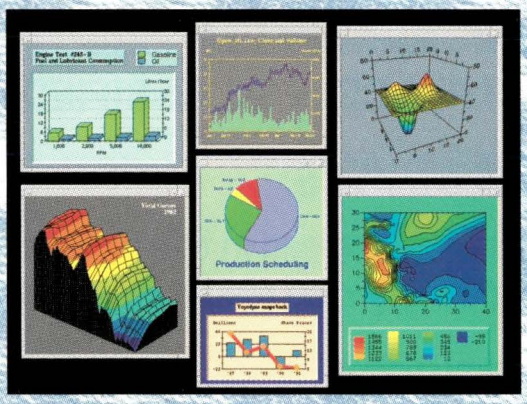

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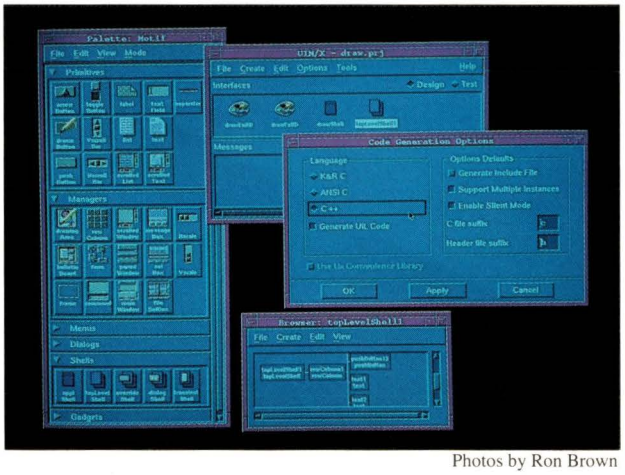

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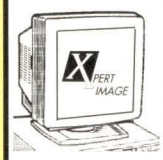

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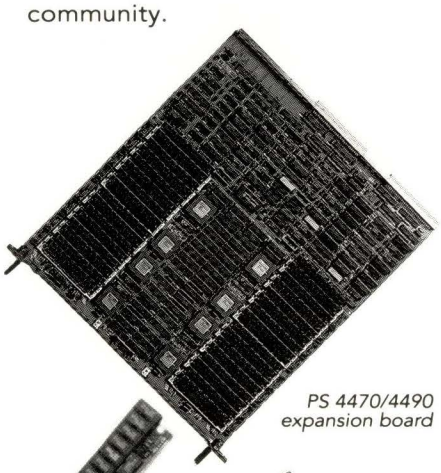

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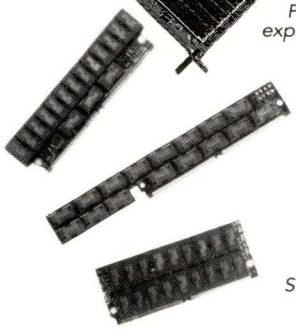

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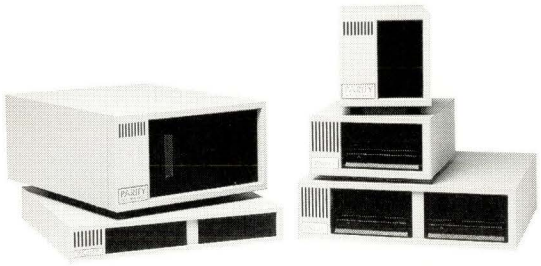

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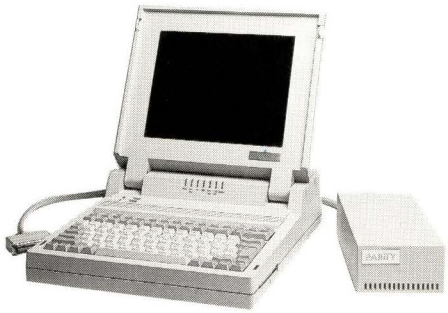

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