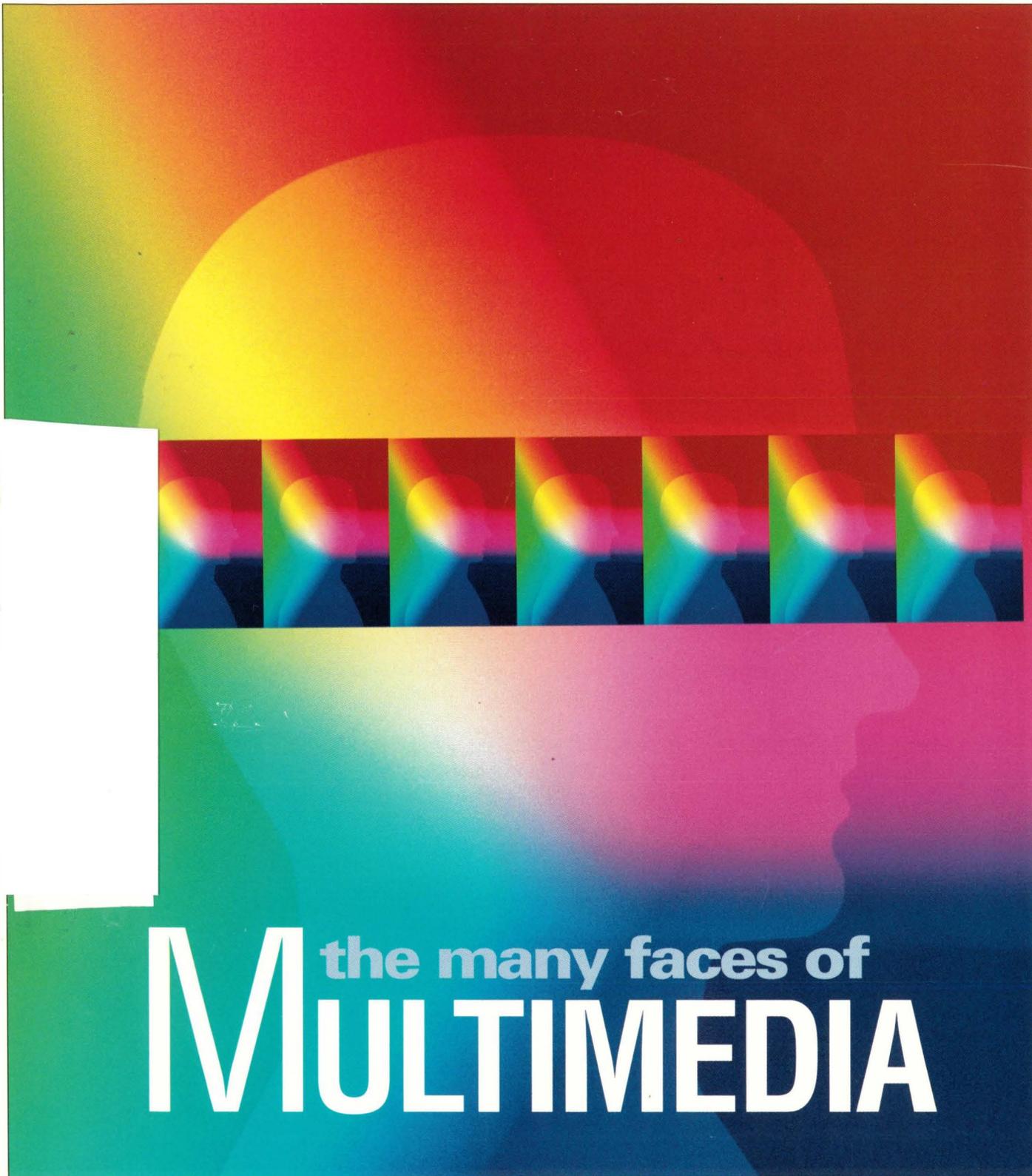


# SUNEXPERT

*An Independent Forum for Open Systems*

FEBRUARY 1992 Vol. 3 Num. 2 \$4.50



the many faces of  
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SUNS IN EUROPE

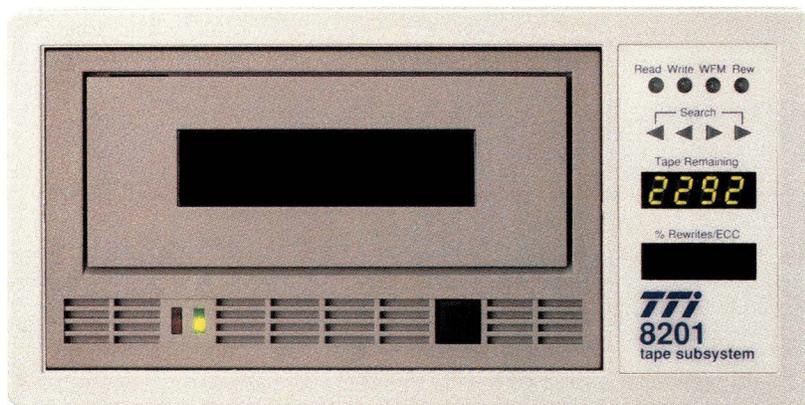
NEWS: UNIX AND NETWORK

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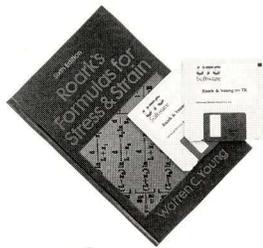
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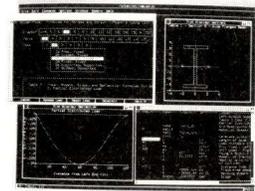
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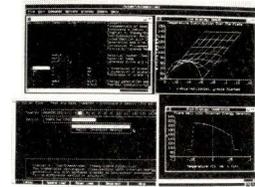
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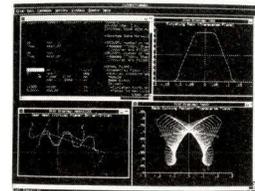
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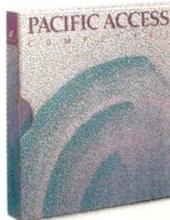
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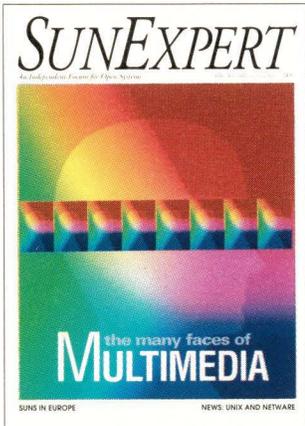


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## FEATURES

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Michael Jay Tucker
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**Collaborative Multimedia** – Which way to the promised land?  
Dave Stewart
- Bringing Multimedia Technology to the SPARCstation** – The degrees of multimedia readiness.  
John A. Malleo-Roach
- 66 **Miles and Miles and Miles...** – In some ways, the European SPARC-systems market is just like its North American counterpart. In others—like its almost total reliance on resellers—it's far, far away.  
Marsha W. Johnston



Cover Photograph  
by Earl Glass/Stock Boston

## NEWS

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Peter Collinson
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### SUNEXPERT

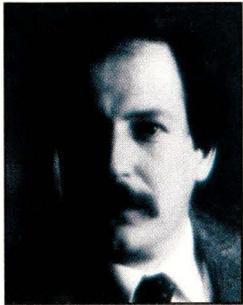
serves the UNIX workstation environment, emphasizing Sun, SPARC and Sun-compatible systems.

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# Editorial

## Boon or Boondoggle?

Multimedia has become a conjure word for many in the industry. To some, it's what computing should be—infinately malleable data from any conceivable source, right at the desktop. To others, multimedia seems more hype than reality. Somewhere in between these extreme views, there is something closer to the truth, an answer to the question, “Boon or Boondoggle?”



Our Special Report, “Multimedia, More Than a Ghost of a Chance,” is devoted to multimedia, or mixed media, or whatever term appeals to you. It attempts to find a middle ground, keeping in mind that the term has a different meaning for networks of workstations than it does for PCs—those standalone, single-user pack mules. This section is truly a collaborative effort in the best sense of both words. Orchestrated by

Executive Editor Michael Jay Tucker, the feature brings together various perspectives on the current state of the market and technology. Sun's own Dave Stewart attempts to define “Collaborative Multimedia” and asks what technologies are necessary to make it real. John A. Malleo-Roach of Paradise Software Inc. details what will make a workstation multimedia-ready.

The report concludes with a first for us: A Top 10 List our editors put together without the help of David Letterman. The list will amaze you, I think, or at least irritate you. *SunExpert* hopes you will send along your complaints, suggestions and maybe even nominations for next year's list.

Also, check out “Miles and Mile and Miles...” in the Features section. *SunExpert's* Paris-based contributor, Marsha W. Johnston, explores the progress of SPARC vendors in Europe.

*SunExpert* would like to thank Scott McNealy for guiding Sun Microsystems through an interesting and challenging 10 years. And we wish everyone at Sun the best over the next 10 years. Happy birthday on the 24th.

*Doug Pryor*

Doug Pryor

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-**BYTE Magazine**, *May 1991*

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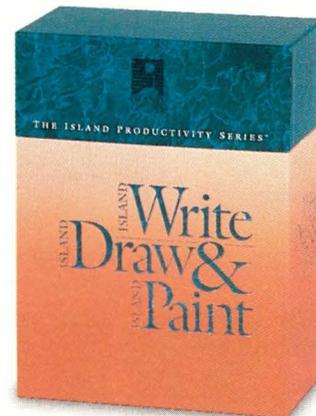
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Internal drive slots	Included <sup>5</sup> (model SB-3000XD)	\$200 option	Included
Burst mode support on ALL Desktop SPARC CPUs	Yes	No	Yes
GUI application for easy and flexible configuration <sup>6</sup>	Yes	No	No
Certified compatible with all of Sun's SBus cards <sup>7</sup>	Yes	No	Information not available
Warranty	1 Year	90 Day	1 Year
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expansion box used, one CPU host expansion slot will be occupied with a Host Adaptor Card.  
<sup>1</sup> Based on latest vendor specifications dated 7/91 (specifications subject to change without notice).  
<sup>2</sup> Based on latest vendor specifications dated 1991 (specifications subject to change without notice).  
<sup>3</sup> Based on latest vendor specifications dated 3/15/91 (specifications subject to change without notice).  
<sup>4</sup> Total slots available using a SPARCstation 2. For each SBus expansion box used, one CPU host expansion slot will be occupied with a Host Adaptor Card.  
<sup>5</sup> The Artecon SB-3000XD supports any 3.5" SCSI fixed and removable media devices.  
<sup>6</sup> SBus Tool™ is bundled free with purchase of Artecon SBus Expansion Boxes.  
<sup>7</sup> Contact Artecon for a complete list of third party SBus cards that have been verified.

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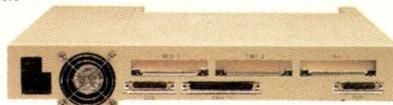
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Modem control on All SBus serial boards	Yes	No	No
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CPU burden <sup>4</sup>	20-25%	Not Tested	45%
SBus serial cards available	3 Serial/1 Parallel 4 Serial/1 Parallel 8 Serial/1 Parallel 12 Serial/1 Parallel 16 Serial	4 Serial 4 Serial/1 Parallel 8 Serial	2 Serial/1 Parallel 4 Serial 8 Serial 16 Serial
Software GUI for easy terminal/modem configuration <sup>5</sup>	Yes	No	No
Software GUI for easy printer configuration <sup>5</sup>	Yes	No	No
Warranty	1 Year	90 Day	1 Year
List Price	\$495.00 to \$1,295.00	\$999.00 to \$1,495.00	\$595.00 to \$1,995.00

<sup>1</sup> Based on latest vendor specifications dated 3/91 and 7/91 (specifications subject to change without notice).  
<sup>2</sup> Based on latest vendor specifications dated 3/90, 7/90, and 11/90 (specifications subject to change without notice).  
<sup>3</sup> Based on latest vendor specifications dated 1990 (specifications subject to change without notice).  
<sup>4</sup> CPU burden rates based upon benchmark tests. Artecon's white paper "SBus Asynchronous Serial Card Benchmark" available upon request.  
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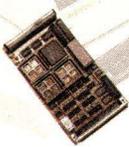
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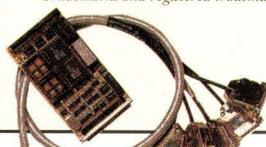
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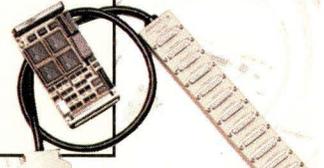
Part Number: SB-400P  
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Parallel Port - \$695.00



Part Number: SB-800P  
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Parallel Port - \$895.00



Part Number: SB-1200P  
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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.

## Job Control Patrol

Dear Peter Collinson:

This is just a thank you for an informative article on a practical subject.

I'm referring to your article in *SunExpert*, September 1991, Page 28. I now understand some concepts about job control that were quite difficult to glean from operating-system reference books. It also helped me see job control in a different perspective. Thank you.

Capt. James W. Cole

jwcole@logdis1.oo.af.mil

## International Intrigue

Dear Mr. Protocol:

You missed one fundamental point of how the whole ISO process works, by making a mistake on the "name" of ISO. The letters "ISO" are not an abbreviation or acronym for anything. The names of the organization are:

- English: International Organization for Standardization, and
- French: Organization Internationale de Normalisation.

Note that neither of these match the "ISO" acronym. To do that would have meant agreeing on which language they would use as the basis for the acronym, which would be favoring one language. Such compromise or favoritism was unacceptable to the organization, so the acronym chosen is "alingular." Quite interesting, since this is the organization that is supposed to be able to compromise and agree on standards.

I also have a technical nit, but nits are inevitable in trying to describe the indescribable that is ISO OSI. (Indeed, getting two interpreters of the ISO OSI standards to agree on the same nits can be difficult.)

In particular, X.121 (at least the Red Book version I have studied) is not the be-all and end-all of addressing. I'd say that addressing is the realm of ISO 8348:1987/Add.2:1988 "Network Layer Addressing." It cites seven different IDI formats, of which X.121 is only one. (The other six are ISO DCC, F.69, E.163, E.164, ISO 6523-ICD and Local.) I challenge any newcomer to OSI to read this standard without degenerating into uncontrollable babbling. If you can explain "abstract syntax" and how that differs from "encoding," you are starting to understand it.

John Shriver  
Proteon Inc.  
Westboro, MA

## An Archive to Steer By

Dear Peter Collinson:

I've just finished reading your excellent (again!) column in the October 1991 *SunExpert* (Page 34) in which you discuss SCCS. You mention Eric Allman's management tool `sccs` as being very worthwhile. I've poked around in the `uunet` archives `comp.sources.misc` and `comp.sources.unix` and can't find the program anywhere.

Do you have an address as to where I might obtain the program?

Thanks for any assistance. And thanks for writing an extremely useful and enjoyable column in *SunExpert*.

Tim Lynch  
Systems and Network Manager  
Mann Library  
Cornell University  
lynch@albert.mannlib.cornell.edu

*Peter Collinson replies:*

*Eric Allman's `sccs` program is on `uunet` in the BSD sources. Look in `bsd-sources/usr.bin/sccs`. There are four files. For more information on SCCS, see *SunExpert*, January, Page 26*

## Splitting Sources

Dear Peter Collinson:

I just finished reading your article about SCCS (*SunExpert*, October 1991,

Page 34, and found it very interesting. I do have a couple of questions though.

I have been charged with the task of placing source code in the neighborhood of 80 MB under source control. It has never been done before! My choice is to use RCS because I can get the current version out of the stored file more easily. In your article you alluded to the fact that RCS is easier to maintain a program of this magnitude and keep it at the same rev level. I was wondering if you could expand on that point, because that is one of the major issues I am contending with at this time. Also where do you suggest I find *UNIX Programmer's Manual Supplementary Documents I*?

Thank you in advance for your help, and if you have any suggestions or ideas about pitfalls I might find, please add them.

John Swindell

jswindel@sparrow.webo.dg.com

*Peter Collinson replies:*

*I really cannot comment on RCS vs. SCCS. I have never used RCS in anger—I have just tinkered with it. If the source is a single 80-MB file, then my suggestion is to split it! If it's in separate files, then things like that have been done before—all BSD source is SCCS controlled.*

*The main thing to realize is that SCCS/RCS are only tools and you should develop a set of your own procedures using the control tools as the primitives.*

*The answer to your second question is a little easier. You can still buy a set of 4.3 Manuals from the Usenix Association. I think that you can buy subsets and just obtain the Programmer's pair. Give them a call:*

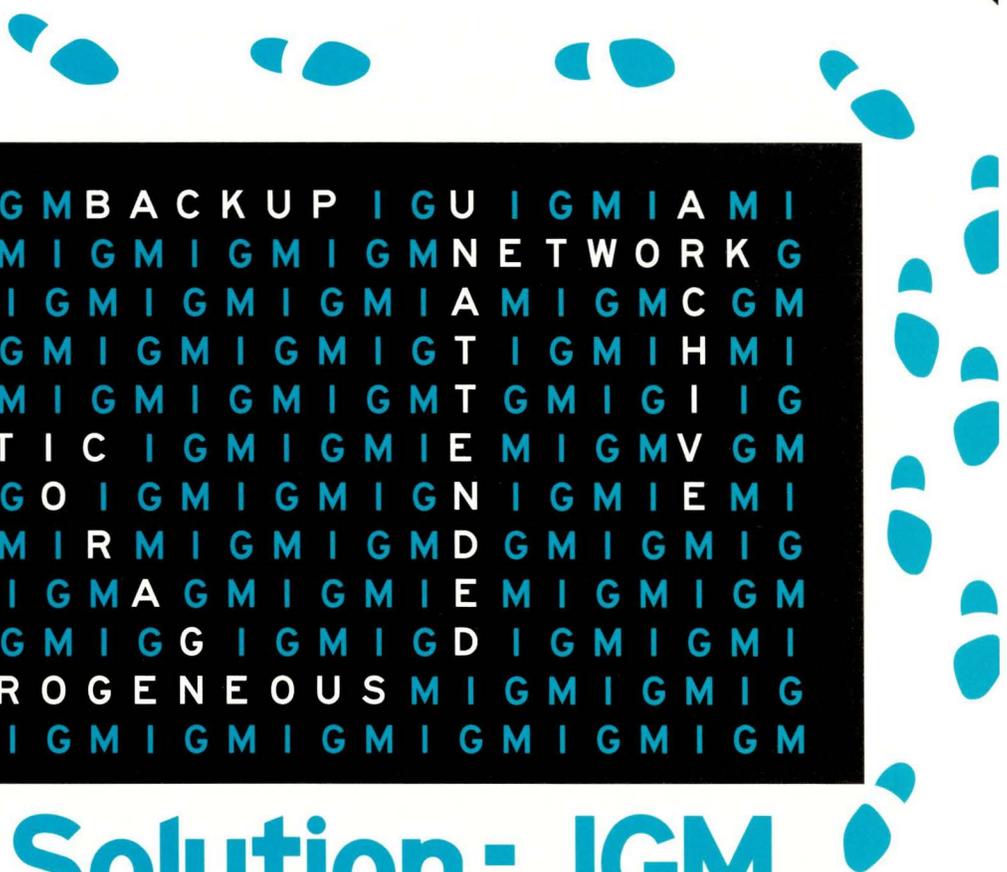
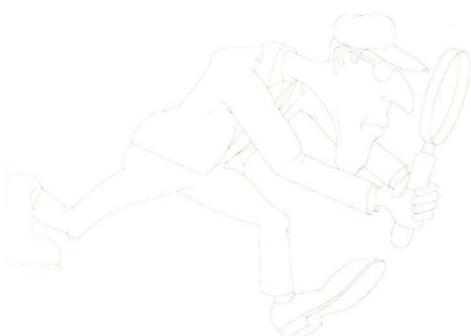
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Fax: (510) 548-5738  
office@usenix.org*

## More Source Options

Dear Peter Collinson:

I have been reading your articles in *SunExpert* magazine. They are very helpful. In one of the recent issues (*SunExpert*, October 1991, Page 34), you talked about how SCCS works and

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some useful functions. There is a problem I have come across related to a project I'm working on. I hope you can give me an answer.

The problem: If I put a shell script file under SCCS, the %H will be converted to a date, which changes the contents of my shell script file. Is there a way to specify any options when I execute a `sccs` command to suppress the conversion of %H without changing the shell script?

Monica Li  
ml08379@mustang.sbi.com

*Peter Collinson replies:*

*I agree that this aspect of SCCS is a pain. It should be possible to select the characters that wrap around keywords. That way a user who knows that %H is legal in the top-copy could select say \$H\$ to be expanded in the particular file.*

*But no, if you have %H as real data (or any other %<letter>%), then SCCS will expand it. One solution is to use the -k switch to get. This will get the top copy without the keywords expanded. This may not be what you want.*

*If you only want %H to appear in the*

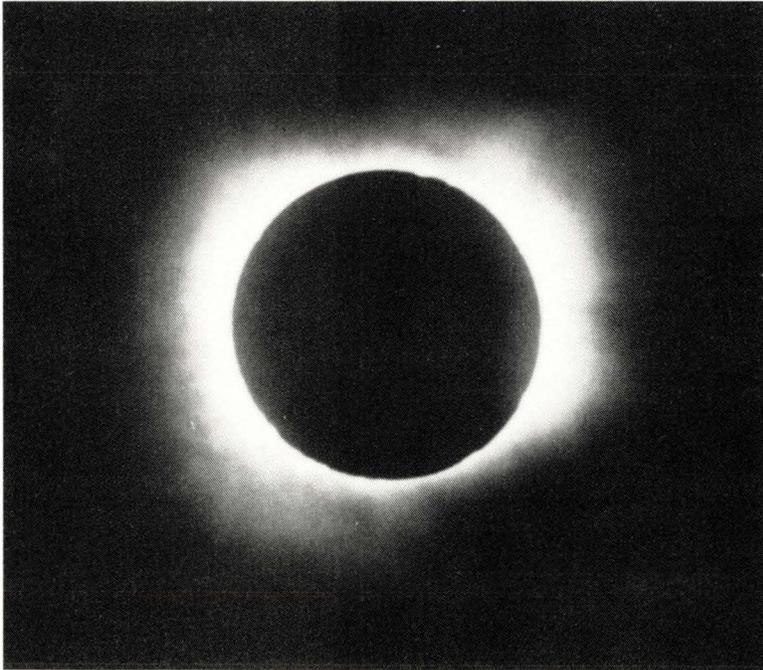
*top document, then you can kludge things. First say:*

```
sccs admin -fq%H% file
```

*This sets the Q text field to contain %H%. Then check out your source and replace %H% by %Q%. Check it in and get a top copy. The %Q% text will have been replaced by %H%. This is gross, but it works.*

*Look at the manual pages for `sccs-admin` and `sccs-get` for more detail on these options.*

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## Horse of a Different Color

Dear Editor:

I am writing to inform you of some misinformation that was printed in "TriGem: The Dark SPARCalike Horse" (*SunExpert*, October 1991, Page 10).

TriGem and RDI are involved in a strategic partnership in which TriGem licenses from RDI the technology and design for its SLT-100 SPARC-compatible laptop computer. TriGem, in turn, assists RDI in manufacturing the BriteLite, as well as RDI's other workstation products. It is incorrect to say that RDI is an OEM of TriGem.

In addition, some of the TriGem distributors listed in the article are actually RDI resellers and do not carry the TriGem line of SPARCalike products. For example, anDATAco was listed as a TriGem distributor when in fact it is an RDI reseller.

Tracy Coughlin  
Marketing Representative  
RDI Computer Corp.  
San Diego, CA

*Editor's note: RDI now sells TriGem SLT-100 laptops.*

### Correction

In our December feature "Network Management Blues," we misidentified the Motorola Inc. Land Mobile Products Sector as the LAN Mobile Products Sector. Land Mobile Products is based in Schaumburg, IL.

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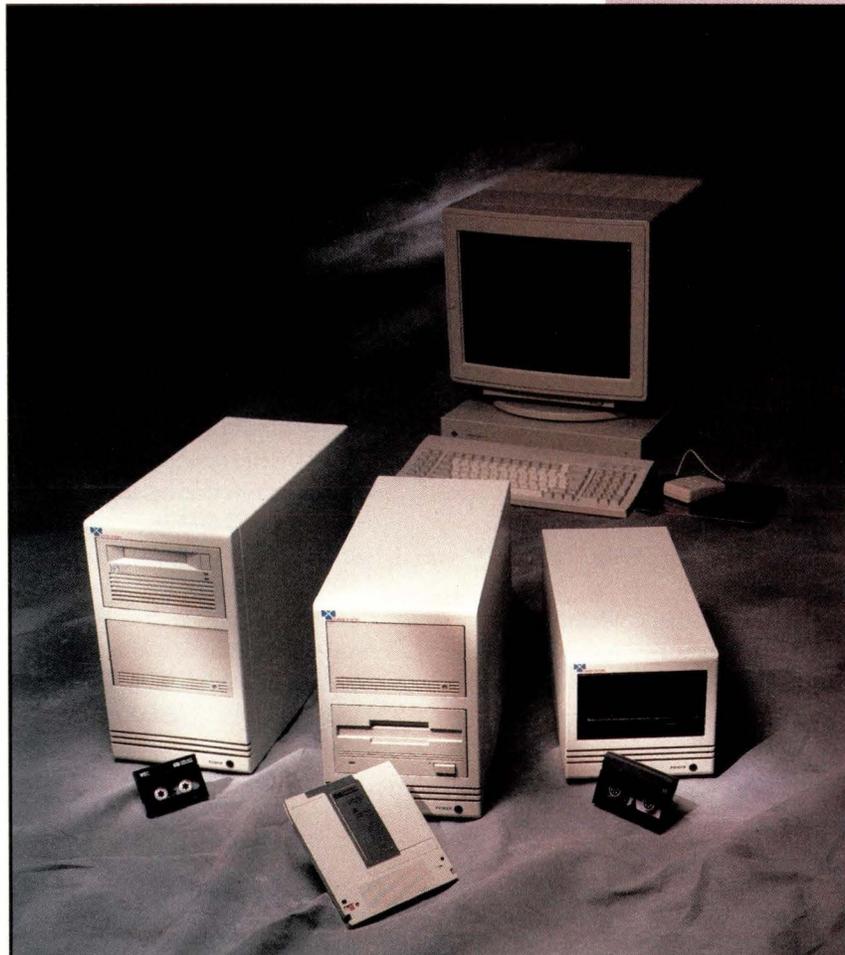
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# NEWS

## In So Little Time, So Many Upgrades

Sun Microsystems Computer Corp. has revamped its entire upgrade program—for CPU boards, chassis and full systems. All changes are currently in effect. Highlights include:

- All upgrades to the SPARCstation 2 now come with 32 MB of memory standard (rather than 16 MB) for no price increase;
- Prices for Sun-3 and 386i color upgrades to the SPARCstation IPX are reduced;
- Prices for all upgrades to the SPARCstation IPC are reduced;
- Full system upgrades (including monitors) are now available to

SPARCstation 2 color, IPX color and SPARCstation ELC systems for customers that want an “entirely new” SPARCstation.

A table summarizing these changes can be found below.—*mjf*

### NetWare and UNIX Get Chummy

Novell Inc.’s success to date may be thanks to MS-DOS, but the networking giant is no stranger to UNIX. It announced plans to create Portable NetWare versions for UNIX in August 1991. But during the past few months, Novell and UNIX—specifically, SVR4—have moved even closer.

In some ways, Novell’s increasing UNIX emphasis aligns the company more closely with Sun Microsystems Inc. and its SunConnect business unit. “We’re endorsing Sun’s overall approach, with support for Solaris, UNIX on the desktop and standards,” claims Rick Bohdanowicz, product line manager for Native NetWare UNIX connectivity products at Novell’s San Jose, CA, office. Indeed, two recently announced products, NetWare SunLink (which SunConnect developed, based on Novell’s NetWare for UNIX product) and the new version of

NetWare NFS (which made its debut last month at UniForum) are evidence of Novell and Sun’s cooperation.

At the same time, however, Novell is emerging as a competitor to SunConnect and even SunSoft, Sun’s system software subsidiary. Novell’s LAN Workplace Family of products, designed to connect PCs and Macintoshes to other systems and networks via TCP/IP, competes head-to-head with SunConnect’s PC-NFS product.

And, with Novell’s announcement in late December that it intended to get into the UNIX system-software business through its partnership with UNIX Systems Laboratories Inc., Novell is more likely than ever to butt heads with Sun. USL and Novell have formed a new company, Univel, chartered with integrating NetWare with SVR4 to form an operating system for Intel Corp.-based desktop platforms. The resulting OS, which will be released some time in 1992, according to Novell, will compete directly with SunSoft’s SunOS 5.0 (part of Solaris 2.0) for Intel. Solaris 2.0 is expected to begin shipping during the second quarter.

“We’re not trying to compete with

### CPU Board and Chassis Upgrades

From	To:SS IPC	SS ELC	SS IPX	SS2	Upgrade Type
Sun-3/50	\$4,495*	N/A	N/A	\$8,995*	Chassis
Sun-3/60 (mono)	\$4,495*	N/A	N/A	\$8,995*	Chassis
Sun-3/60 (color)	\$4,995*	N/A	\$8,995**	\$9,995*	Chassis
Sun-3/75	\$4,495*	N/A	N/A	\$8,995*	Chassis
Sun-3/80 (mono)	\$4,495*	N/A	N/A	\$8,995*	Chassis
Sun-3/80 (color)	\$4,995*	N/A	\$8,995**	\$9,995*	Chassis
Sun 386i (mono)	\$4,495*	N/A	N/A	\$8,995*	Chassis
Sun 386i (color)	\$4,995*	N/A	\$8,995**	\$9,995*	Chassis
SS SLC	N/A	\$2,095	N/A	N/A	Board
SS IPC	N/A	N/A	\$5,495	N/A	Board
SS 1/1+	N/A	N/A	N/A	\$6,995*	Chassis

\* Diskless Chassis Swap

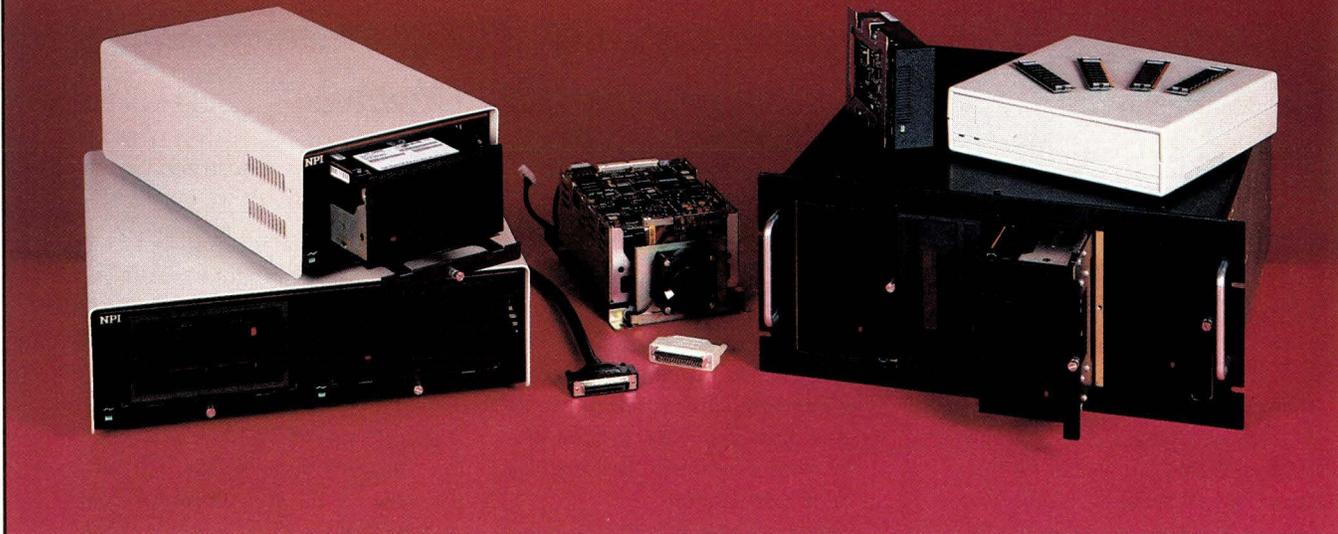
\*\* Diskfull Chassis Swap

### Full System Upgrades

From	To:SS ELC	SS IPX	SS2
Any Sun-3 or 386i System	\$3,995	\$10,495 (16-inch color)	\$15,495 (16-inch color)
Any Sun-3 or 386i System	\$3,995	\$12,495 (19-inch color)	\$17,495 (19-inch color)

Source: Sun Microsystems Computer Corp.

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## Sun Turns 10

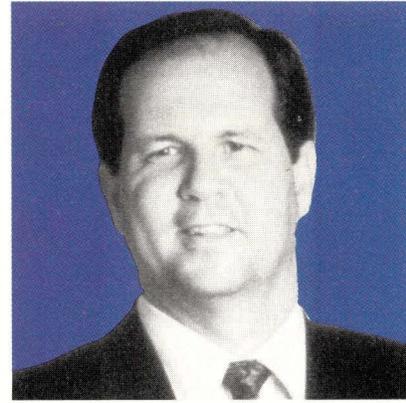
On February 24, Sun Microsystems Inc. will celebrate its 10th birthday. *SunExpert* asked some well-wishers for messages they would like to relay to Sun president and CEO Scott McNealy on this occasion. These birthday greetings follow.—mjf

Sun with Univel,” maintains Bohdanowicz. “We’re just trying to stabilize UNIX at the desktop. Novell’s belief is in sync with Scott McNealy’s: Volume is in standards.”

Novell’s idea of standards in the area of UNIX networking revolve around NetWare NFS—“our anchor product,” according to Bohdanowicz. NetWare NFS is a NetWare Loadable Module (NLM) that provides users with file, print and ftp daemon services. With the product, UNIX users can retrieve files from a NetWare server using the NFS protocol. Version 1.2, Novell’s second release of NetWare NFS in a year, offers users three key enhancements: X Window System management support, ftp enhancements and full support for bidirectional print services. The product runs on any 386-based Novell-certified platform.

Meanwhile, NetWare SunLink, a version of the renamed Portable NetWare, is designed to let NetWare users communicate with a Sun host—exactly the opposite goal of NetWare NFS. SunConnect is expected to make the product available in mid-1992. Novell has worked with Hewlett-Packard Co. on a similar product (NetWare for PA-RISC), and is expected to announce similar agreements with Digital Equipment Corp. and IBM Corp. in the near term.—mjf

*“Congratulations Sun (and Scott) on the best slap shot of the decade! What you accomplished in the computer industry during the decade of the ’80s can only be compared to the U.S. Olympic Hockey team’s victory during the 1980 Olympics.”*



David Sykes  
President  
Andataco Squared

### Andataco Squared = Sun<sup>3</sup>

Two of the largest Sun Microsystems Inc. resellers—Andataco Computer Peripherals Inc. and R Squared—are merging to form Andataco Squared. The new company expects to generate sales of more than \$100 million in 1992, with a combined customer base of more than 10,000.

Andataco Squared “will continue to focus on selling ‘add-on’ and ‘add-in’ products for users and resellers” of Digital Equipment Corp., Hewlett-Packard Co., Silicon Graphics Inc. and Sun workstations, according to company officials. The venture also will continue to integrate complete networking systems.

R Squared president Joe Campana will become chief executive officer, overseeing operations and administration, while Sykes, who will become president, will head up sales, marketing and engineering. The company will maintain 13 sales offices; co-headquarters will be in San Diego, CA, and Englewood, CO.—mjf

### At Last: BSD on Sun

Attention all you university types, government researchers, kernel hackers and wannabes: BSD 4.4 for Sun Microsystems Inc. SPARC platforms has arrived. The latest version of the OS, developed almost single-handedly by Chris Torek at Lawrence Berkeley

Laboratories (LBL), is in alpha test.

“We haven’t yet got a SPARCstation 2 port working,” says Torek. “We’re waiting for Cypress [Semiconductor Inc.] or somebody to give us chip documentation.” The OS was ported to a SPARCstation 1.

Included in the BSD 4.4 SPARC release are the gcc compiler, kernel debugging tools, a “usable” console (avoiding use of the FORTH PROM), stable and accurate clocks and, according to Torek, “some pretty fast TCP/IP code.” The OS is binary compatible with SunOS 4.X to the extent that it can run most SunOS 4.X binaries, including those using shared libraries, Torek says. The new port can use SunOS 4.X disk labels, and read and write SunOS 4.X disks. And BSD 4.4 will be SunOS 5.X-compatible, “if SunOS is POSIX-compatible,” Torek adds.

LBL undertook the task of doing a Sun port originally because the University of California at Berkeley won a Defense Advanced Research Projects Agency (DARPA) request for proposal for a common development platform that was part of the presidential High Performance Computing Communications Initiative (HPCCI). LBL was a SPARCstation shop, and the environment proposed by the university for DARPA was BSD 4.X. “We wanted to use our SPARCstations for

this effort—but not just as X-terminals,” Torek says.

In January 1991, LBL received six months of DARPA funding to do the port. By October, Torek had a rudimentary system up and running. While he received help from members of the SPRITE development project at Berkeley, Torek says that LBL got no help from Sun whatsoever. He attributes this lack to a lack of understanding on Sun's part. “Sun thought we wanted to compete with SunOS,” Torek says. He sees the two systems as fulfilling different needs.

What's new in 4.4? “Almost everything,” Torek says. The system is ANSI-C-compatible and POSIX 1003.1- and 1003.2-compliant. It includes a new file system layout, full NFS support, a complete OSI protocol stack, a new networking architecture (which unifies sockets and Ritchie's “bstreams” I/O system), a new virtual memory system (derived from Mach 2.5) and a redo of the OS' process data structures.

There's no date yet on when beta and production releases of 4.4 for SPARC will be available. But Torek says he has more than enough alpha volunteers already.—mjf

### Move Over, Oracle

A hybrid relational/object-oriented database called UniSQL/X is now

available for SPARC system users who are part of an early-customer program from UniSQL Inc., Austin, TX. The system becomes generally available next month.

The database supports arbitrary data types, methods, multiple inheritance, encapsulation and multimedia data integration. The company also has developed an application-development environment called UniSQL/4GE to help UniSQL/X users build applications that take advantage of object-oriented technology and multimedia data.

“This is more than an extended relational database model,” says Albert D'Andrea, director of marketing. Rather, it brings true relational management functions, such as query optimization, multiple database views, access-method management, access authorization, automatic concurrency control and automatic restart and recovery, to an object-oriented model.

UniSQL also has in the works a multidatabase management system, called UniSQL/M. The product is designed to provide high-speed SQL-based access to existing relational systems without conversion or loss of local data-system autonomy. UniSQL/M also will serve as the “integration bridge” between the next-generation UniSQL/X and conventional database systems. The first version will

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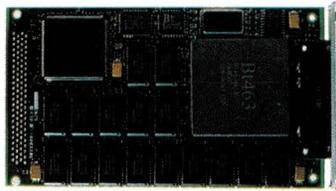
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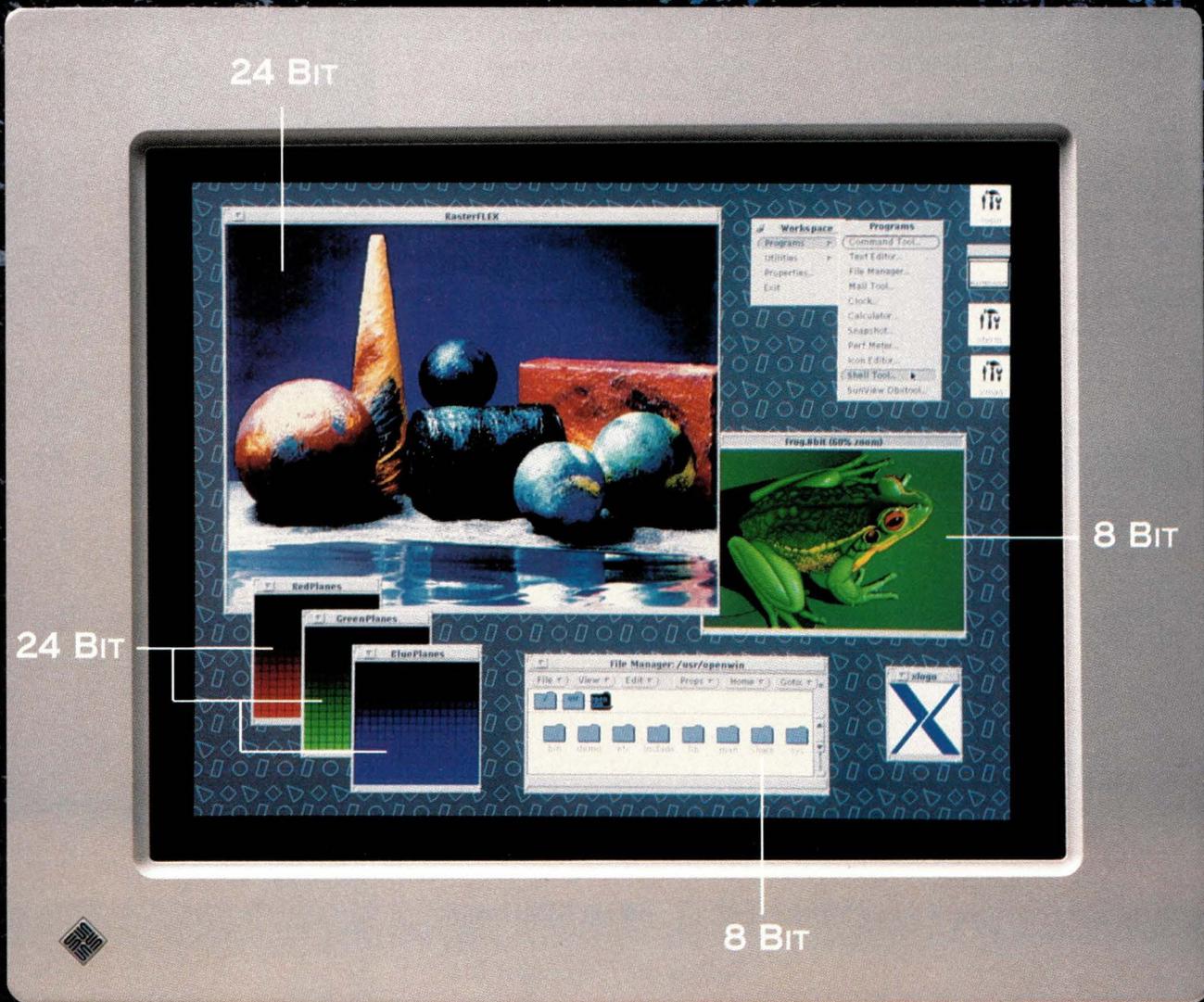
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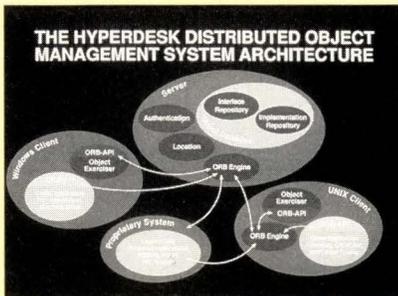


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The DOMS architecture simplifies access to APIs, RPCs, network protocols and operating systems.

## HyperDesk Delivers at Hyper-Speed

Along with Sun Microsystems Inc., a handful of companies were selected by the Object Management Group (OMG) to provide technology to meet its Object Request Broker (ORB) specification. HyperDesk Corp. of Westboro, MA, was among them. What's different about HyperDesk—besides its small size compared with the other ORB winners—is that it already has developed product that is compliant with ORB.

Announced at UniForum, the HyperDesk Distributed Object Management System (DOMS) allows users to create OMG-compliant applications in two ways, according to the company. Offering users a choice of Motif or MS-Windows, DOMS simplifies object access to underlying distributed computing layers of application programming interfaces (APIs), remote procedure calls (RPCs), network protocols and operating systems, HyperDesk claims. And DOMS includes a set of application-development tools for defining, building, storing and modifying objects.

The DOMS Development Kit is priced starting at \$1,995 per user (depending on system configuration) and is available this month. A run-time version of the product, at \$495 per user, is slated for a June release.—mjf

support UniSQL/X and Ingres from Ingres Corp.

Meanwhile, Gupta Technologies Inc., the Menlo Park, CA-based developer of the PC database SQLBase, has ported version 5.0 of its product to the SPARCstation 1. As a result, the company claims "plug-and-play scalability" across DOS, OS/2, Novell Inc. NetWare and UNIX platforms.

Version 5.0 offers higher transaction-processing performance, enhanced support for graphical applications (especially MS-Windows clients), referential integrity, EBCDIC and national-language support and password encryption. The SPARC version, available this month, sells for \$995 for a five-user configuration and \$9,995 for an unlimited number of users.

The SPARCstation—which Gupta currently supports as a server only—is the company's first UNIX platform. Director of product marketing Bruce Linn says Gupta will add to its roster the Macintosh and SPARCstation supported as clients within the next 10 to 16 months.

Gupta's porting plans call for either an IBM Corp. RS/6000 or a Santa Cruz Operation UNIX version some time in the coming year.—mjf

## Gain Perspective On Multimedia

A new company has come into being expressly to bring the technologies of multimedia to corporate life. The company in question is Gain Technology Inc., the former Cayenne Systems, of Palo Alto, CA. Gain says that it has developed software that will be able to reside on any of a number of different platforms (including Sun Microsystems Inc. SPARC systems) and provide the foundation for multimedia applications, particularly in business settings. Gain itself is an acronym for Graphical Authoring INitiative.

The company is not announcing product. Rather, says a Gain spokesperson, the company's slick press packet (complete with slides and backgrounders), is a "statement of product direction." That's a phrase tailor-made to sound alarm bells and

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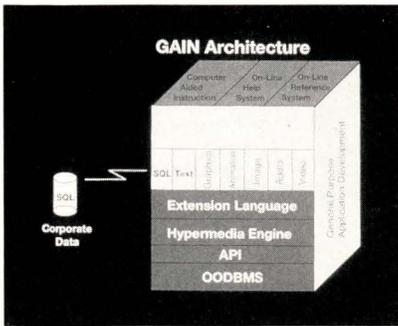


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The forthcoming Gain architecture will integrate an OODBMS, APIs, a hypermedia engine, tools and a GUI.

send journalists scurrying for cover. Yet, even in a weary age and an industry half sick-to-death of road maps and statements of direction, there could be reason to take a longer look at Gain. The company claims among its beta stations Sun itself, or at least Sun's Educational Services department. Moreover, the Gain software is a joint development of the former Cayenne and Matsushita Electric Industrial Co. Ltd., of Japan, the titanic industrial concern that is also one of the driving forces behind Solbourne Computer Systems Inc.—*mjt*

### SGI Extends Indigo Line

Silicon Graphics Inc. has extended its line of Indigo personal workstations upward with three new machines. The Iris Indigo XS, Iris Indigo XS24 and Iris Indigo Elan fit directly above the company's existing Indigo product. They provide many of the capabilities missing in the original Indigo, such as

*"Scott, we've shared the rewards of the NFS and SPARC vision over the last seven years. Thank you. Best of luck with that Intel thing."*

24-bit color, while at the same time bringing much of the functionality of the company's higher priced Iris Power machines to the low end of the product line.

The introductions could signal much about the company's future. Already, SGI has begun to describe its Indigo products as the RISC PC line. It is also discussing very ambitious plans to make its machines *the* "RISC of the desktop." Some industry observers are saying privately that the MIPS processor-based Indigos may be the most viable rival to SPARC-based machines for the low-end workstation niche. SGI customers, meanwhile, may wonder if the Indigo machines won't become the company's dominant platform, as the Macintosh became the dominant platform at Apple Computer Inc. in the early 1980s.

The three machines closely resemble the original Iris Indigo, but with much additional technology brought down from the Iris Power machines. The Indigo XS provides eight-bit color (24-bit virtual), with 1280-by-1024 screen resolution, 72-Hz refresh rate and an optional z-buffer. It differs from the original Indigo in that it has several additional graphics facilities, such as the two-sided lighting of images and RGB anti-aliased lines. Pricing begins at \$13,500.

The Iris Indigo XS24, meanwhile, has all the above plus 24-bit color. SGI says it provides roughly the same graphics performance of the SGI's



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Interactive Systems Corp.

SUNEXPERT Magazine/February 1992

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Robert Duncan  
Chairman and CEO  
SPARC International

existing Power Series line of higher priced machines. The XS24 is \$13,500. Owners of the XS model can upgrade to the XS24 for \$2,000. Both the XS and the XS24 are supposed to be available in April.

The Indigo Elan, finally, is at the top of the introductions. SGI says that the device provides 1 million 3D vectors per second, 225,000 3D triangles per second, and 100,000 3D quads per second. Pricing begins at \$27,000 for a system with a 19-inch monitor and 16 MB of memory. SGI says the product will be available in March.

Finally, SGI debuted a dual-headed Iris Indigo. The two-processor model supports a pair of monitors for users who need additional pixels and screen space for certain applications. Pricing on the dual-headed device is \$16,000.—*mjt*

### **OOP Outlook for 1992**

The convergence of relational databases and CASE tools, coupled with the ongoing emergence of local-area network software, will provide for plenty of action in the object-oriented technology marketplace, according to leading object-oriented programming (OOP) executives in recent remarks before the Venture Association of New Jersey.

This year, a number of new OOP products will be introduced because the infrastructure has matured to the point that it can support their installation, said Reed Phillips, CEO of Knowledge Systems Corp., Cary, NC, who predicted some of the changes would take place with relational data models.

Companies involved in manufacturing, pen-centric applications and client-server computing "can't stand to have a three-year development process," Phillips said. The communications industry, especially, showed a pickup in OOP interest in the second half of 1991, added Phillips, whose company developed SmallTalk. Companies are looking to combine PC and mainframe data, he explained, adding that multinational companies appear to be the early adopters of OOP.

Phillips furthermore characterized OOP as evolving into a "components industry" that by 1997 will allow the users to pick and choose what they need to get the job done. He expressed doubts that the IBM Corp.-Apple Computer Inc. effort to push OOP down into a computer's operating system in their joint project, code-named Pink, will bring these components into widespread adoption.

Industry segments leading the way in converting to OOP and object-oriented applications are telephone and manufacturing companies, according to Marie Lenzi, a managing director for Syrinx Corp., New York, and editor of *Object Magazine*, *The Journal of Object Oriented Programming* and *The Hotline on Object Oriented Technology*. Syrinx, which started out as a CASE company in 1987 and switched to OOP, has a strong focus on "purchased libraries," or what Lenzi called "software without walls."—hcp

## Other Open Systems News

### Digital Equipment Corp.

DEC announced 19 RISC-related new products. Among the most significant is the Personal DECstation 5000 Model 20, a \$3,995 system that benchmarks at 16.3 SPECmarks. Other products announced include three RISC servers, a CPU upgrade to existing DECstation 5000/100 series systems and DEC's highest performing workstation, the DECstation 5000/240, which sells for \$11,995. At the same time, DEC and Microsoft Corp. revealed that Microsoft's Windows NT operating system will be available on the entire DECstation 5000 family.

Wind River Systems Inc., Alameda, CA, and DEC have signed a joint software development and licensing agreement. WRS is licensing its VxWorks real-time operating system and development environment to DEC as the core technology for its new, POSIX-compliant, real-time software product, the DECelx Toolkit. (For more on VxWorks, see "The Real-Time Server Comes of Age," *SunExpert*, January, Page 58.)

### Hewlett-Packard Co.

HP debuted its new, low-end PA-RISC machines and added new functionality to its Series 700 integrated graphics family. Model 705, a 19-inch,



HP's Model 710 family is based on 50-MHz PA-RISC processors.

grayscale, diskless machine, operates at 35 MIPS, 34 SPECmarks and eight MFLOPS; it will sell for \$4,990 when it ships in April. The Model 710—for a base price of \$9,490—provides users with 49.7 SPECmarks, 57.9 MIPS and 12.2 MFLOPS. The system is based on a 50-MHz PA-RISC processor. It comes complete with all of the standard I/O, internal removable media and external storage options that one has come to expect from HP. The 710 is available in a 19-inch monochrome, a 16-inch color and 19-inch color configuration.

A family of HP fiber-optic link (HP-FL) disk-array products are now available for the HP PA-RISC systems. The HP-FL line features two to five removable 1.36-GB SCSI-2 disk drives per array. HP's arrays use multiple small disk drives per controller in a compact cabinet to save space. Up to 27.2 GB of data-protected storage can be stored in one 19-inch, 1.6-meter high cabinet. The HP-FL interface can be connected to up to eight disk arrays, and the cable can be configured for distances of up to 500 meters between the array and host system.

Uniface Corp., Alameda, CA, and HP are jointly porting the Uniface 4GL to the HP MPE/ix operating system. Users will be able to use new database drivers to integrate Uniface with HP's databases (HP Allbase/SQL for MPE/ix and HP/UX and HP TurboImage on MPE/ix) and third-party relational database systems. The Uniface data dictionary will be directly integrated with the HP Allbase/SQL database.

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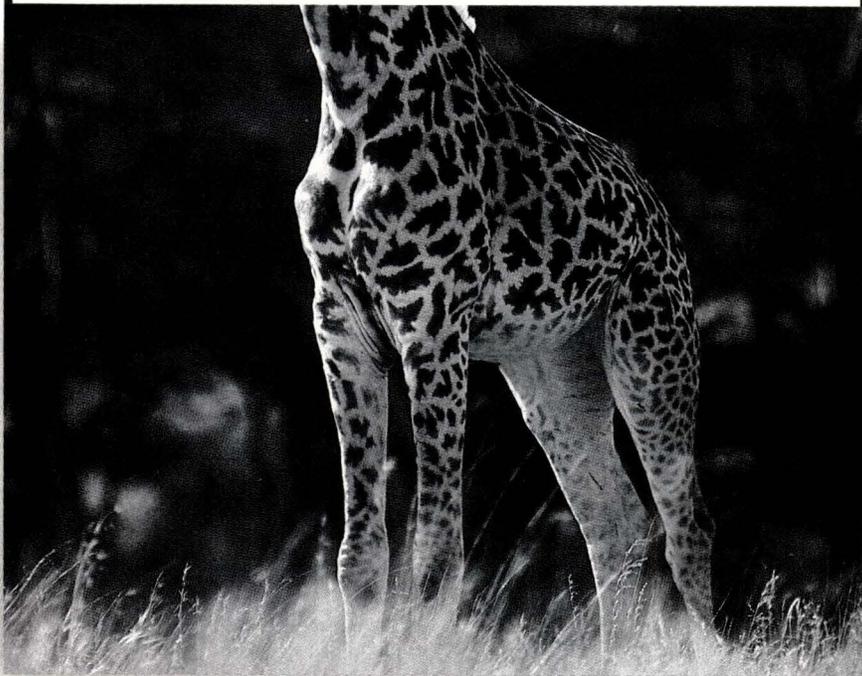
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## **IBM Corp.**

Last month, IBM was expected to announce its low-end RS/6000—about six months behind schedule. Although no specifics were available at press time, the system was expected by industry watchers to come in at under \$10,000. The low end reportedly will perform at 20 MIPS and 4.5 MFLOPS.

IBM's RISC-based workstation business was expected to grow 60% in terms of revenues between 1990 and 1991, according to Jack Kuehler, IBM president. Kuehler predicted IBM's RISC workstation business would grow another 50% next year. Meanwhile, IBM's PC business declined 10% between 1990 and 1991, which resulted in the company's losing a couple of percentage points in total PC market share, he says.

## **Silicon Graphics Inc.**

Besides rolling out three new members of its Indigo family (see "SGI Extends Indigo Line" above), SGI sealed a relationship with Siemens Nixdorf Informationsysteme AG for workstations and server products. Siemens-Nixdorf will OEM SGI's Iris 4D systems. The companies expect the deal to generate \$100 million in sales for SGI over three years. In addition, Siemens-Nixdorf will have "unrestricted, nonexclusive worldwide marketing rights" for all SGI products, including the Indigo.

Six PC graphics companies have endorsed the SGI Iris Graphics Library (GL) as a standard programming interface for interactive, 3D PC

*SGI has extended its Indigo line upwards with more powerful desktop stations.*



*"A happy 10th in Mountain View, Was not enjoyed by old 'Big Blue.' But as for me, re: staff and Scott, I only wish a joyous gavotte."*



Source: Usermix FaceSaver Project

Peter Salus  
Executive Director  
Sun User Group

Technology Inc., San Jose, CA, has announced an even more ambitious program for upgrading 20- and 25-MHz SPARCstation 1, 1+ and equivalent workstations. Users can upgrade to Tatung's 40-MHz COMPstation 40 by swapping motherboards. The cost of the upgrade is \$3,690. Users can also upgrade the Tatung CG3 frame-buffer card in its COMPstation 20 and 25 systems with a single-slot graphics accelerator card. Upgrades to Solaris 1.0 are thrown in by Tatung for free.

- An SBus accelerator card from Ceram Inc., Colorado Springs, CO, allows SPARCstation, SPARCserver and compatible-system users to gain access to memory without having to actually expand main memory in their systems. The TurboSwap card incorporates ASIC DRAM, coupled with software that provides advanced data compression, error correction and a device driver. The card is optimized to accelerate virtual-memory swapping and paging applications, and is available in either 40- or 80-MB versions. Up to four boards may be "ganged"

graphics. The companies are: Artist Graphics, ATI Technologies Inc., Hercules Computer Technology Inc., Matrox Electronic Systems Ltd., Methus Corp. and SPEA Inc. IBM licensed Iris GL in 1988. Compaq Computer Corp., Digital Equipment Corp., Intel Corp., Microsoft Corp. and UNIX Systems Laboratories Inc. already have endorsed Iris GL.

UNIX applications are FaultMan, TrendMan, PolicyMan and MeterMan. FaultMan is based on Remedy Corp.'s trouble-ticket system. SynOptics is adding Sybase SQL to its LattisWare lineup soon.

- While Sun Microsystems Computer Corp. continues to evolve its migration path, **Tatung Science and**

### **This Just In...**

- UNIX System Laboratories Inc. and Chorus Systems Inc. have cemented a relationship insuring that the companies products will evolve in step, thus providing users with an SVR4-based microkernel OS. USL invested \$1 million in Chorus Systemes S.A., the Paris-based parent Chorus Systems, Beaverton, OR. Chorus becomes a USL SVR4 VAR, and the two companies are conducting joint marketing, sales and R&D as part of the agreement.

- A family of network-management applications software that allows administrators to transform network operations data into useful information has been introduced by SynOptics Communications Inc., Santa Clara, CA. Called LattisWare Solutions, the products run on top of SynOptics' LattisNet Manager and SunConnect's SunNet Manager or Hewlett-Packard Co.'s Open View (in the DOS environment). The first four



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simultaneously. The company claims the product provides users with memory that is 10,000 times faster than disk storage for only a fraction of the cost of main memory.

- **SunConnect**, the Sun Microsystems Inc. networking business unit, has unveiled a slew of new products and services. Among these are the SunLink Token Ring Interface/SBus (TRI/S) card; SunLink SNA 3270 7.0, a communications gateway that brings token-ring support to SunConnect's IBM mainframe link and provides users with the HLLAPI programming interface; SunLink SNA Peer-to-Peer 7.0, which supports token-ring networks and provides an interface to IBM's network-management product, NetView; SunLink CG3270 7.1, which provides unlimited IBM 3179 display-terminal emulation windows on Sun workstations and support for Telnet; and SunLink Channel Gateway 7.1, the newest version of the product that connects SPARC servers (including the 600MP) to an IBM mainframe block multiplexer channel. In the DEC environment, SunConnect debuted SunLink TE320, a DEC VT terminal emulator. At the same time, SunConnect rolled out a third-party partner program.

- **Integrix Inc.** is delivering a new, low-cost graphics-accelerator card, the Model SGX 100. The card uses the same chip as Sun Microsystems Inc.'s GX card and, according to Integrix,

provides identical performance, for \$2,450. Integrix licenses the design for the card from Sun. The Newbury Park, CA, company has also announced a keyboard, the S4+, that combines features of Sun's Type 4 keyboard and its new keyboard that supports the IBM-standard PC 101 keyboard layout.

- On the graphics front, **Sun Microsystems Computer Corp.** made several announcements recently. The company enhanced SunPHIGS 1.4 with full GT accelerator support, improved functionality and various fixes, and renamed it 4.1.1. It released a version of SunPHIGS to run in the OpenWindows 3.0 environment and named it 2.0. Version 2.0 supports the GX, GXplus and GT accelerators. Sun also began shipping release 4.1 of SunGKS, which runs in OpenWindows 3.0 and supports GXplus, GS and GT. And Sun unveiled XGL 2.0, a high-performance, immediate-mode graphics environment for OpenWindows 3.0, which supports GS, GT and GXplus. ➔

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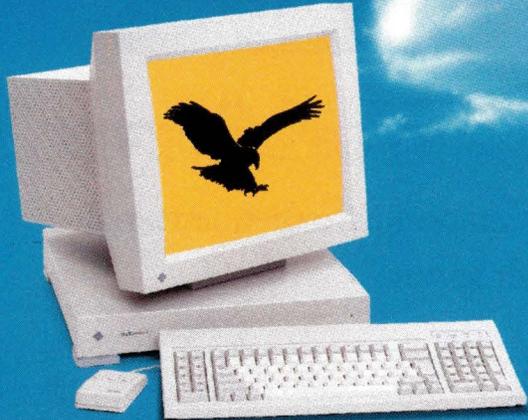
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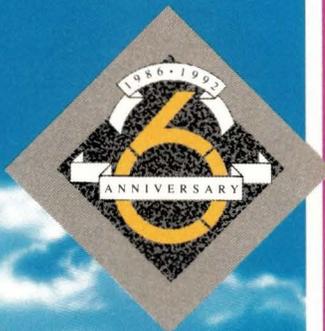
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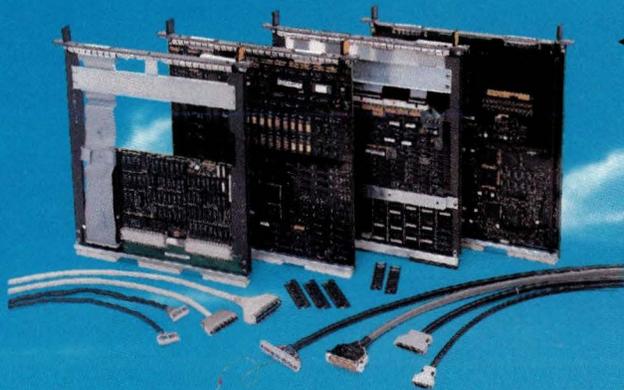
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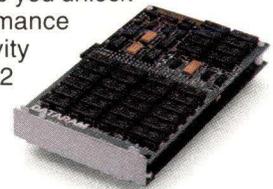
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by MICHAEL O'BRIEN

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New standards are being adopted at a blinding pace, too. New ones are coming in at such a rate that Mr. Protocol is thinking of using them as landfill. Entrancing as this prospect may be, Mr. Protocol will probably have to give it up. First, the neighbors would complain. Electronic promotion of standards is in an advanced state of development, but a miserable state of deployment. The blizzard of paper would probably kill all the lawns in the neighborhood. Second, an as-yet unknown number of these standards are actually going to get used, as the Internet develops and begins to interwork with the other nets around the world. This frantic tap dance is already in progress. More is required, though—some sort of master plan for the future of the Internet would be nice.

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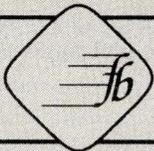
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This master plan is now being formed. Let's take a look.

The first thing Mr. Protocol wishes to point out is that the questions that must be addressed to make the future Internet work are difficult enough to make one's brain hurt. The basic problem is one of homogeneity versus heterogeneity. Mr. Protocol realizes you're probably sick of it by now, but he must point out again that when the "Internet" started, it was a single network, the ARPANet. The ARPANet was, strictly speaking, a completely homogeneous network, because every computer on the net was of exactly the same type. These weren't the computers people used—they were the switching computers that carried the message traffic. The "real" computers were connected to these Interface Message Processors, or IMPs. (They were later called Packet Switch Nodes, or PSNs, but will always be fondly remembered as IMPs.) The IMPs were the only things that were actually connected together over any distance. The computers that people actually used had to understand how to talk to an IMP, but that was all. From that point on, the computer could assume that a packet sent off into the ARPANet would reach its destination with no further worries or interference.

With the advent of the Internet Protocol this blithe assumption was history. From Ethernet to long-haul net, computers now communicated via a protocol that was assumed to be unreliable (IP) and used this protocol to construct a reliable service (TCP). Problems of routing were suddenly shifted onto the originating computer, at least to the point where it had to be able to direct packets at a router that understood how the destination computer could be reached.

In the Internet as it stands today, problems of routing have mushroomed. In the days of the ARPANet, routing was a bounded problem, since all of the connections in the network were at least known. Today, no one has any concrete idea of the true size or number of hosts on the Internet, and routing problems abound. When everyone follows the rules, everything

works, but when software or bureaucracy breaks, so does the Internet.

Add to this the sheer rate of growth of the Internet, and we add a problem of resource exhaustion. In this case, the resource being exhausted is the 32-bit address space of IP. (The original ARPANet protocol had space for what was regarded as an "infinite" number of hosts: 256.) The IP address space is carved up into blocks that represent networks of different sizes. Each block lies on a byte boundary, so there are three types of networks, called Classes A, B and C. A Class A network has one byte of network number and three bytes of host number, and therefore represents the largest possible type of network. A Class B address has two bytes of network number and two bytes of host number, and a Class C address has three bytes of network number and one byte of host number. Note that the original ARPANet would have fit into a Class C address scheme. Today, Class C numbers are practically handed out like Halloween candy!

This scheme has served well for some years. Unfortunately, it is breaking down under the load. The possible divisions of network sizes don't match the sizes of networks being built particularly well. Class C networks are too small and Class B networks are too big: the number of Class B networks is rapidly being exhausted. Hence the second real growth problem of the Internet: address space exhaustion. The number of possible network numbers will be exhausted long before the number of actual hosts comes anywhere close to filling the theoretical 32-bit address space.

The third problem is a combined problem representing both political and technical pressures. The biggest, because most immediate, pressure is political: What to do about OSI? For many years the answer most often used in practice was "ignore it," but this will no longer work. There are just too many other networks out there that cannot be ignored. Somehow, a way must be found to interwork with OSI in a rational and workable manner. Further, as new net-

work services are invented, new demands are sure to be placed on the underlying technology. Speech and video do not survive well under the Internet's current "best efforts" philosophy of packet delivery.

What can be done about this? And who is to do it? Mr. Protocol is glad you asked.

The Internet is currently run by the Internet Activities Board (IAB). Originally this group was chosen as an oversight committee by DARPA when that government body was footing the bills. These days, when the Internet is

**In the Internet,  
as it stands  
today, routing  
problems have  
mushroomed.**

funded piecemeal, the IAB acts as a semi-independent governing body. It has changed in function and composition over the years as the needs and nature of the Internet have changed. Currently, there is an effort under way to create a new body, the Internet Society, which will serve as the sponsoring organization for the IAB and, by extension, the Internet. Mr. Protocol feels that this is a Good Thing, because, once DARPA stepped out of the picture, it became very difficult to point to anybody to whom the IAB was responsible. Mr. Protocol hastens to point out that there never was any danger of the IAB transforming itself into a Court of Star Chamber and running away with the Internet, but there was a certain lack of...something. Such as accountability. With the advent of the Internet Society, the users of the Internet will

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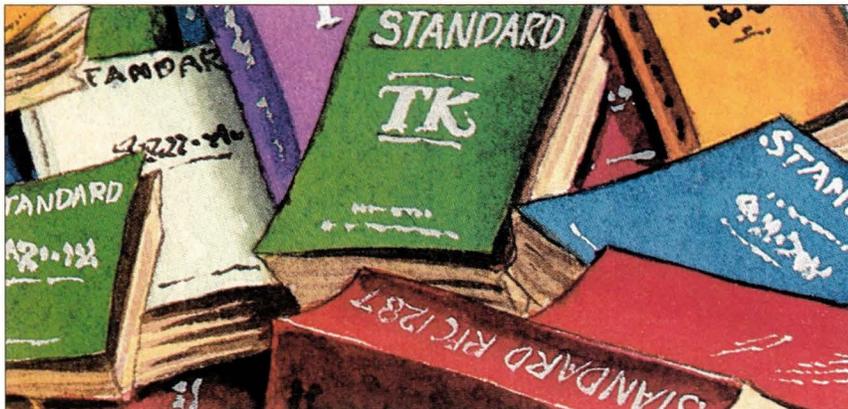
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have ultimate control over the governing of that resource.

Mr. Protocol therefore exhorts everyone to join the Internet Society and preserve humanity's inaudible and indelible right to anonymous FTP and infinite amounts of Usenet flameage, and wishes that I'd get back on the track. Which I've assured him I'll do, just as soon as I remember...Ah yes!

The IAB realized early in 1991 that the times they were a'changin' and decided to hold a sort of plenary conference on the future of the Internet. The results of that meeting have just been published as RFC 1287, "Towards the Future Internet Architecture." It makes fascinating reading. Everyone in a position to do so should do so, since to get a copy of it means you're using the Internet, and if you're in a position to use the Internet, you should read this. Believe Mr. P. when he says this.

It has always been the case that many of the primary movers and shakers in any major enterprise are what are now referred to as "Type A personalities." Judging from the description of this planning meeting, it must have been very interesting, and the supply of blood pressure and ulcer medicine in the immediate vicinity must have been greatly depleted thereby. What is surprising, and a tribute to the real abilities of those involved, is that a large measure of consensus was formed. Considering that even the scope of any possible planning effort was a controversial issue, the document that resulted is of astounding clarity. If nothing else, it proves that the Internet was not built by dummies.

The results of the meeting also serve

to point up why Mr. Protocol continually documents the doings in and around the Internet when so many of his readers are presumably residents of internal networks whose managers will open them up to the outside world at such time as it can be reliably determined that hell has frozen over. It points up that the temperature in the nether regions is plummeting in many areas.

The original one-day meeting reached consensus on the following five points:

- Routing and addressing—The Internet is running out of addresses and will eventually run out of address space. Any solution to this problem must take into account all the existing routers full of routing software that are likely to be confused by incompatible changes, making the situation worse instead of better. More recently, the group of people most concerned with this twin problem have taken to calling themselves the Road Worriers: ROAD standing for ROuting and ADdressing.
- Multiprotocol architecture—OSI isn't going to go away. Neither, given its current presence in the marketplace, is TCP/IP. This means that some sort of plan for accommodating both in the same Internet must be devised. This plan represents a future architecture. In the original discussion, the slide raising this issue was entitled, "Making the problem harder for the good of mankind."
- Security architecture—It's interesting to note that security was a prime consideration when the TCP/IP suite was first devised, and there are secu-

rity options in there to this day that are not used. Modern security issues are much broader and embrace commercial security concerns as well. Mr. Protocol can add to this that it's been demonstrated on far too many occasions that security can't be engineered in afterwards.

- Traffic control and state—This is Internet-ese for one problem raised earlier: New applications are coming that will require new services from the Internet and guarantees of those services. Things like video will require a great deal more from gateways than they are currently able to provide.
- Advanced applications—This sounds like a catchall. In fact it's the future. As new user application services are inaugurated, new underlying protocols will be needed. These protocols will support such things as real-time exchange of data, image exchange, remote database access, etc. New underpinnings will be needed for these services of the future.

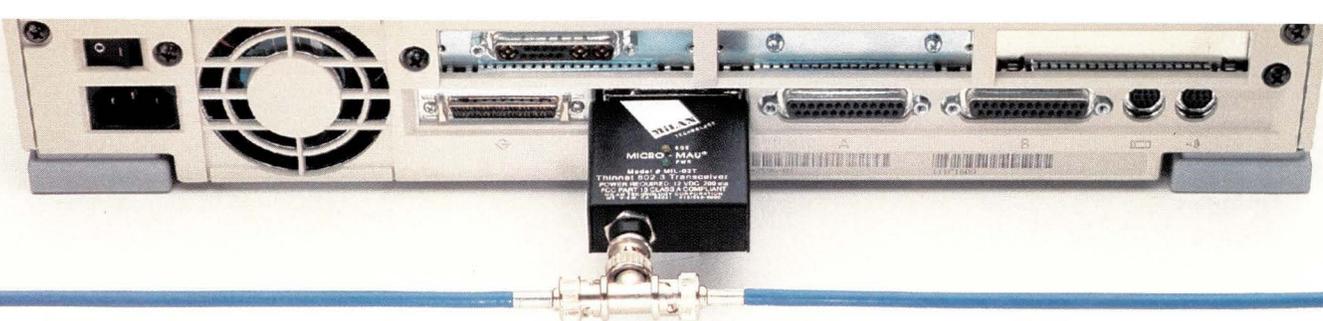
A further, three-day meeting, was held in June of 1991 to begin carving out directions for these and other issues. Mr. Protocol assures you that he will be covering these in a future column. As a relative of his once remarked on Cannery Row, "I'd be a pretty poor seer if I didn't do that much." —o—

---

**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](mailto:amp@expert.com).



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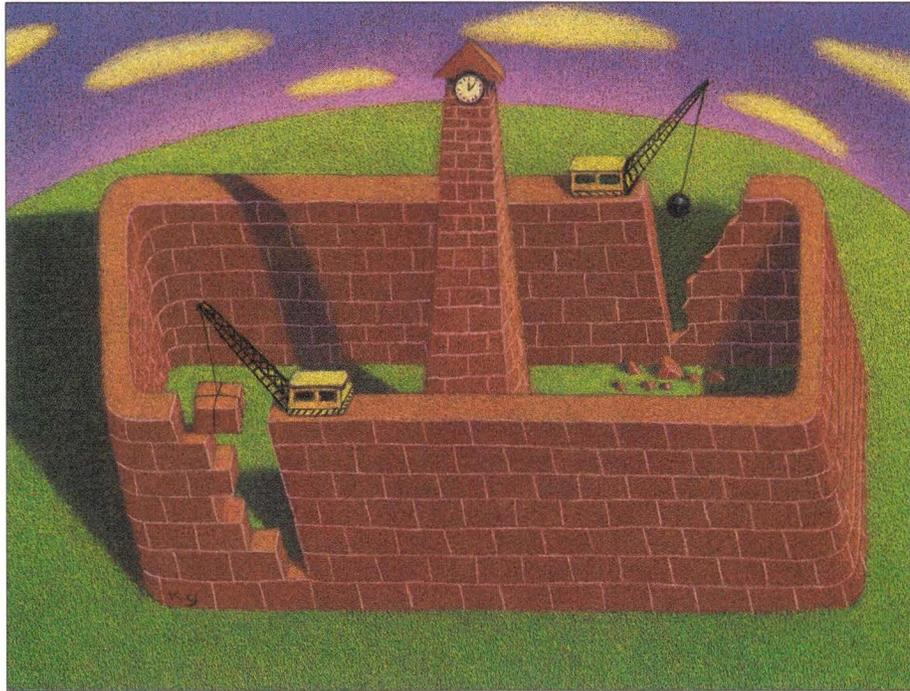


ILLUSTRATION BY KEITH GRAVES

## Make: Part I by PETER COLLINSON, Hillside Systems

The best ideas are always simple. Moments of genius often create something so obvious that you wonder why no one thought of the idea before. But no one did, and that's genius. The `make` command is a bit like that. The program uses a simple observation. When a file is created by taking a source file and passing it through some program or other, the modification times on the source and output files will be different. In fact, wonder of wonders, the time stored with the output file will postdate that of the source file.

The eureka leap of thought is the realization that if the time on the source file is *later* than that on the output file, then the source file must have been altered. As a consequence, the output file needs to be regenerated. The relationship between the files is called a *dependency* in `make`. Your job, if you want to use `make`, is to create a control file that expresses the dependencies and the commands needed to make one file from another.

### Makefiles

These rules are edited into a file called `makefile` or `Makefile` on the current directory. Either will do; if both exist, `make` complains bitterly then uses `makefile`. If we are

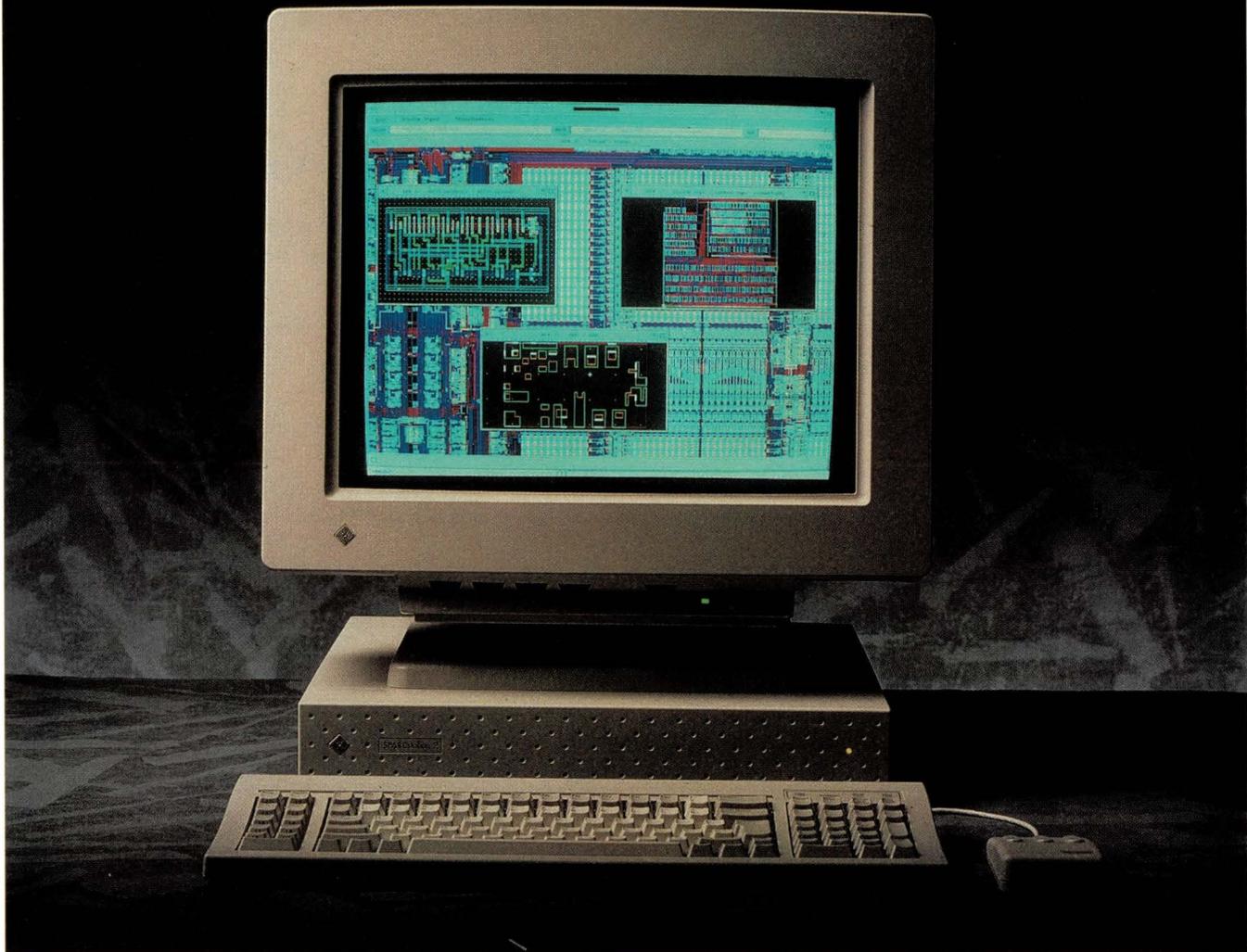
writing a `makefile` for a compilation of a simple C program like the famous "Hello world" program, you might write:

```
hello: hello.c
    cc -O -o hello hello.c
```

This says that the program `hello` is dependent on the source file `hello.c`. The object to be made is often called the *target*. The command in the next line will be run if the target `hello` exists but its modification time is earlier than `hello.c`. The command here simply runs the C compiler to generate the needed object. I have also specified that the compiler should be run using optimization by giving it the `-O` flag. You can put any number of commands in the action section of the `makefile`. One thing to remember is that each line is run in a separate shell. This can have implications when changing directories.

One syntactic problem is that `make` demands the command lines start with a tab character. Spaces simply will not do. Since a tab character and a number of spaces can look the same on the screen, the requirement can trap the unwary.

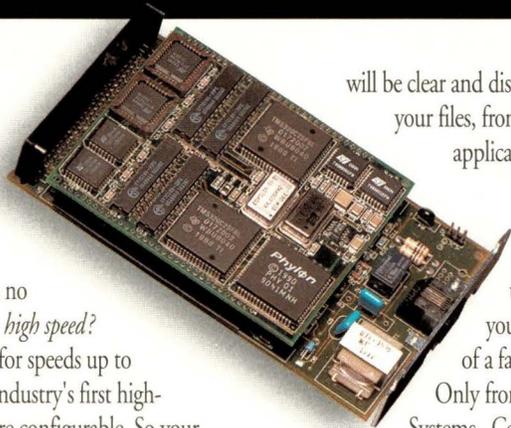
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What have we gained? Well, at this stage, not a lot. We have doubled the size of our source by using two files rather than one. However, we can compile our program by typing:

```
% make
```

which outputs

```
cc -O -o hello hello.c
```

and watch it run the compiler to generate the object. A dubious gain, I suppose.

There is one benefit. There is nothing to do if the target `hello` exists and was modified later than the source file.

---

**This is a big feature of `make`,  
it will do only the work that  
it thinks should be done.**

---

When `make` is run, it notices this and will not run the command. In fact, it will give a reassuring message.

```
% make
'hello' is up to date.
```

This is a big feature of `make`; it will do only the work that it thinks should be done. For big software projects, this is a win because it means that only the parts of the system that need recompilation will be passed through the compiler. This saves time and CPU cycles.

Another benefit is the ability to put additional targets into the `makefile` that relate to the work we are doing. If we want to print the source easily, we can expand our `makefile`:

```
hello: hello.c
    cc -O -o hello hello.c

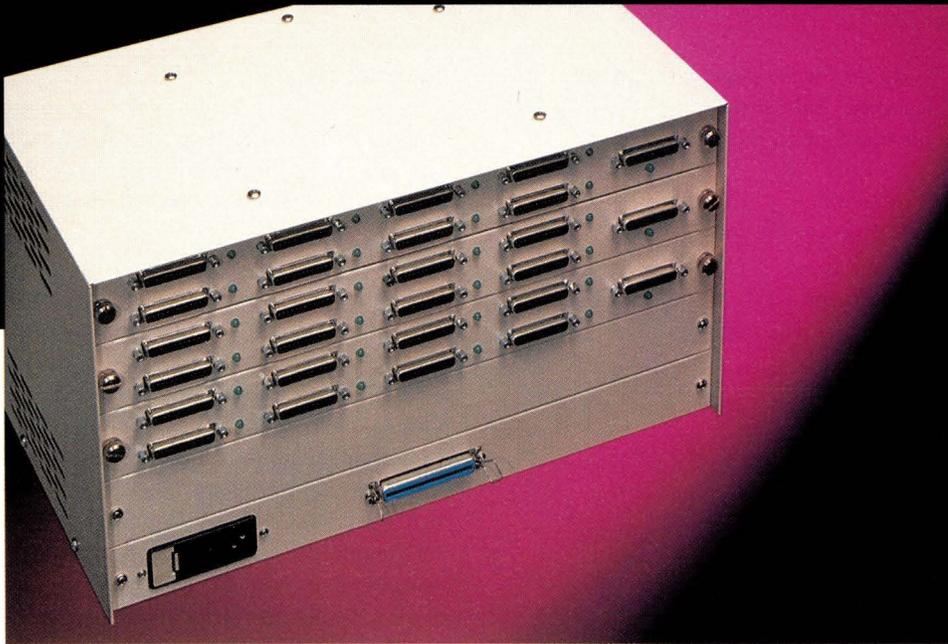
print:
    lpr hello.c
```

We can now send the source to the printer by saying:

```
% make print
```

The `print` target is not a file and does not depend on anything, and so the `lpr` command is always executed.

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If we want to install the finished program somewhere, we might add the lines:

```
install: hello
    install hello /usr/local/bin
```

This uses a standard shell script for installation; you might want to use `cp` or any other program.

This new target depends on `hello`. This is a strong feature of `make`; targets can depend on other entries in the makefile. Saying:

```
% make install
```

will mean that `make` checks for the target `hello` by invoking the previous dependency rule. If the file `hello` does not exist or the source file postdates it, the commands:

```
cc -O -o hello hello.c
install hello /usr/local/bin/hello
```

will be run. The first command is taken from the `hello` rule, the second from the `install` rule.

## Housekeeping

Another useful target is `clean`:

```
clean:
    -rm -f hello
    -rm -f core errs
```

The intention is that

```
% make clean
```

always tidies the directory, leaving just the source. The two `rm` commands are not strictly needed, but I include them to show that you can use more than one command and also to demonstrate some magic. You may have noticed that the command lines start with a minus character. The characters are not passed into the shell but are used to tell `make` that you don't care about the returned status of the command.

Normally, `make` will stop executing if a command returns with a failure. This makes sense. For example, if you have typed

```
% make install
```

you don't want to install a broken program if the compilation fails. You want the compiler to report the failure and `make` to stop running so that you can fix the problem. This is what normally happens.

However, there are occasions when either you don't want to stop if a command fails, or you simply don't care. In the example, the first `rm` will fail if `hello` doesn't exist. We don't mind that, after all, we are trying to delete it. In this case, we do want the second command to be executed even if the first fails.

To make this work "properly," we start the first command with a minus. This causes `make` to ignore its returned status. If it "fails" because `hello` doesn't exist, the second `rm` command will still be executed. By the way, I started the second command with a minus for no particularly good reason. It just looks better that way.

Additional targets are very common features of makefiles. It's a good idea to get into the habit of adding at least an `install` and `clean` target into every makefile that you write. It is good engineering. Long after development has ceased, anyone can descend on your source tree, and type:

```
% make clean
% make install
```

and know that the program that was installed was the one that you wrote. You don't need to know that the idiot has accidentally deleted the installed version.

## More Complications

Programs are rarely just a single source file. It's common to split a program into several modules where each file contains some set of related routines. Once a program consists of several modules, the compilation process becomes more complicated. First, each module is compiled to create an object file and finally, all the object modules are "linked" together to make a single program. The `cc` command will do both these operations.

It's in our interest to see this two-stage process. If we change one file, we only want to recompile *that* file and not all the modules that make up the program. The new object module can be linked with the older existing ones to make the program.

A first attempt at a makefile for a program consisting of several source files is something like:

```
prog: init.o prg.o op.o
    cc -o prog init.o prg.o op.o
```

Of course, we will add in all the other useful targets too. Surprisingly, this is not a great deal more complicated than the makefile for a program from a single source file. To make `prog` we need `init.o`, `prg.o` and `op.o`. These are not source files. They are generated by taking a source file and running the C compiler. For `prg.c`, the command that is needed will be:

```
cc -c -O prg.c
```

The `-c` flag tells `cc` that the source file is not a complete program. The file should be compiled and the result left on a `.o` file (pronounced *dot-oh*), here `prg.o`.

If we start with an empty directory, the commands needed to create the program `prog` are:

```
cc -c init.c
cc -c prg.c
```

```
cc -c op.c
cc -o prog init.o prg.o op.o
```

The last `cc` will link all the compiled modules together with the standard library to create a runnable program. None of this complexity is apparent in the `makefile`. It only contains the last `cc` line. How does `make` know to run the first three commands? There are no explicit rules for that.

The knowledge is built into `make`; it knows how to compile a `.o` file from a `.c` file. In fact it knows quite a bit about filenames and what commands are needed to make one file from another. This information used to be hard-coded inside `make` when it was built. These days, on SunOS at least, the data is picked up from a default file:

```
/usr/include/make/default.mk.
```

The rules are based on consistent use of suffixes and file-name stems. A C source file stored on `prg.c` will be compiled into an assembler source file called `prg.s`. In turn, this will be passed into the assembler to make a file called `prg.o`. Once we have a number of `.o` files, they are linked together to create the program binary.

The default rules for `make` contain the "order" of the suffixes, that `.c` becomes `.s` and then `.o`. The rules also contain entries saying how to make one file from another, say a `.o` file from a `.c` file.

The default rules mean that it is easy to cope with most common cases and writing the `makefile` becomes simpler. One thing that you should get right is the specification of dependencies. If our three source files contain a shared header file, say `prog.h`, we really want to ensure that they

are all recompiled when the header file changes. When run, `make` will not look into files and deduce that one file is included in another. Instead, you must include the dependency explicitly in your `makefile`. We can write:

```
init.o prg.o op.o: prog.h
```

saying that the object files are dependent on the header. You don't need to specify a rule to be executed.

You can also derive dependencies by using the `-M` option to `cc`. This is a little more certain than hand-editing, since it runs the C preprocessor on the named files to print dependencies. Saying

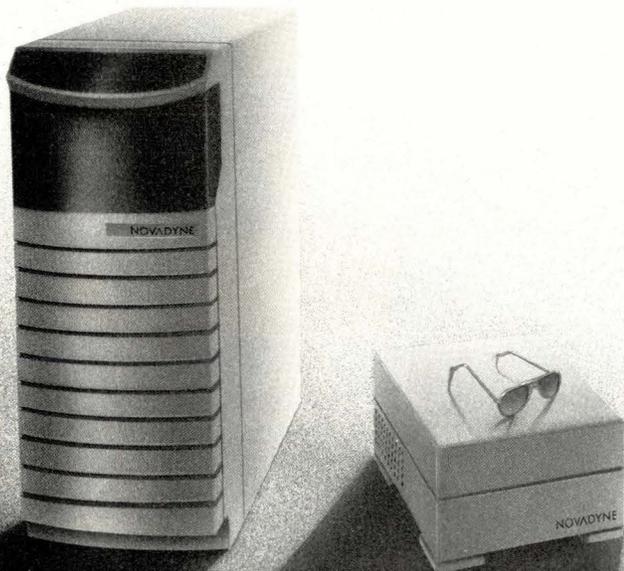
```
cc -M init.c prg.c op.c
```

will result in a complete dependency tree:

```
init.o: init.c
init.o: ./prog.h
prg.o: prg.c
prg.o: ./prog.h
op.o: op.c
op.o: ./prog.h
```

You should be careful about believing this. The C preprocessor makes it possible to exclude portions of source depending on the value of a compile-time variable. If these excluded portions contain the `#include` directive to pull in `prog.h`, the dependency listing from `cc` will not contain the file.

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This can be bad news. Later when you change the compile-time variable, the dependency list will not include a file that is now needed to compile the program. This whole area is fraught with problems.

However, it is better to recompile something that perhaps didn't require recompilation than not to compile something that did. A partial solution that follows this maxim is to ensure that you never control the inclusion of files by using preprocessor directives. The directives can be used to exclude the whole content of an included file, but the file should always be pulled into the source.

The `-M` switch to `cc` is a recent addition to the UNIX programmer's toolkit. Previously, dependency lists were created by clever use of `sed` and `awk`. You may find these techniques in use in public-domain sources since not all systems support the `-M` option.

### Macros

The contents of the `makefile` can be viewed as a mini-language in its own right. It certainly has comments; a line starting with a hash symbol `#` is ignored. It has variables too. They behave like variables in the shell. For example:

```
OBJS=init.o prg.o op.o
prog: $(OBJS)
    cc -o prog $(OBJS)
```

The first line sets the variable `OBJS` to a list of object files. The variable is invoked by writing `$(OBJS)`. This works by textual replacement, like the shell. When the `makefile` is

read, the variables are replaced by their contents as an early part of the scanning process. This type of text handling is most often called a "macro replacement."

Notice that we will only need to alter one line of the `makefile` if we add a new module to the program. We can continue to create a general-purpose `makefile`:

```
TARGET=prog
HDRS=prog.h
OBJS=init.o prg.o op.o
DEST=/usr/local/bin
CFLAGS=-O
$(TARGET): $(OBJS)
    cc -o $(TARGET) $(CFLAGS) $(OBJS)
clean:
    -rm -f $(TARGET) $(OBJS)

install: $(TARGET)
    install -s $(TARGET) $(DEST)

# dependencies
$(OBJS): $(HDRS)
```

The default rules specify a set of "well-known" variables that are used to control the action of the built-in commands. For example, since time immemorial, the variable `CFLAGS` has been used to give additional flags to the `cc` command. When it is set, every invocation of the `cc` command will have these options specified.

When `make` decides to run `cc` by using one of its built-in

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rules, the rule will reference `CFLAGS` so you can affect the way the entire program is compiled by simply changing one line in the `makefile`. I have included an explicit reference to the `CFLAGS` variable in the call to `cc` in the example above. It is not strictly necessary in the example because the current contents of the variable do not affect linking and loading. However, it allows for later changes.

Once nice aspect of these variables is the ability to alter them dynamically from the command line. So

```
% make clean
% make CFLAGS=-g
```

will clean the directory and rebuild the program using a new value of `CFLAGS`. The `CFLAGS` on the command line will override any definitions that are present in the `makefile`. This time the program is compiled with support for debuggers like `dbx` or `ups`.

You will find that the default rules have also parameterized command names. For example, you can change your C compiler by saying

```
CC=gcc
```

You use `$(CC)` rather than `cc` when creating your own `makefile`. Start doing this now, in preparation for the day when SunOS in the shape of Solaris does not provide you with a C compiler as standard. You can use `gcc` in protest. Unbundling compilers is a misguided decision and a backwards step in my opinion.

### Finding Out More

As usual, it is possible only to scratch the surface in one of these articles. However, this is the first of a pair of articles on `make`. Next month, I will expand a little on the theme covering the use of `make` on projects where several programs are being made.

There is quite a bit of written material about `make`. Sun's effort is located in the *Programming Utilities and Libraries* document; you will find this in the Sun Administrator's set (for some reason). It's Chapter 5 and is called the *make User's Guide*. It's OK, perhaps a little compressed in places, but OK. Also you can consult the manual page for your system. Bear in mind that this is a reference document and is not intended to teach you how to use `make`.

If you have access to the Berkeley manual set, you can find a copy of Stu Feldman's original paper extolling the virtues and usage of `make`. You will find that many of the standard textbooks include sections on `make`. I like the various sections in *The UNIX Programmers Environment* by Kernighan and Pike because they show how the `makefile` grows with a project. ➡

Peter Collinson runs his own UNIX consultancy, dedicated to earning enough money to allow him to pursue his own interests; doing whatever, whenever, where ever. ... He writes, teaches, consults and programs using SunOS running on a SPARCstation 1+. He is the Usenix Standards Liaison. Email: [pc@expert.com](mailto:pc@expert.com).

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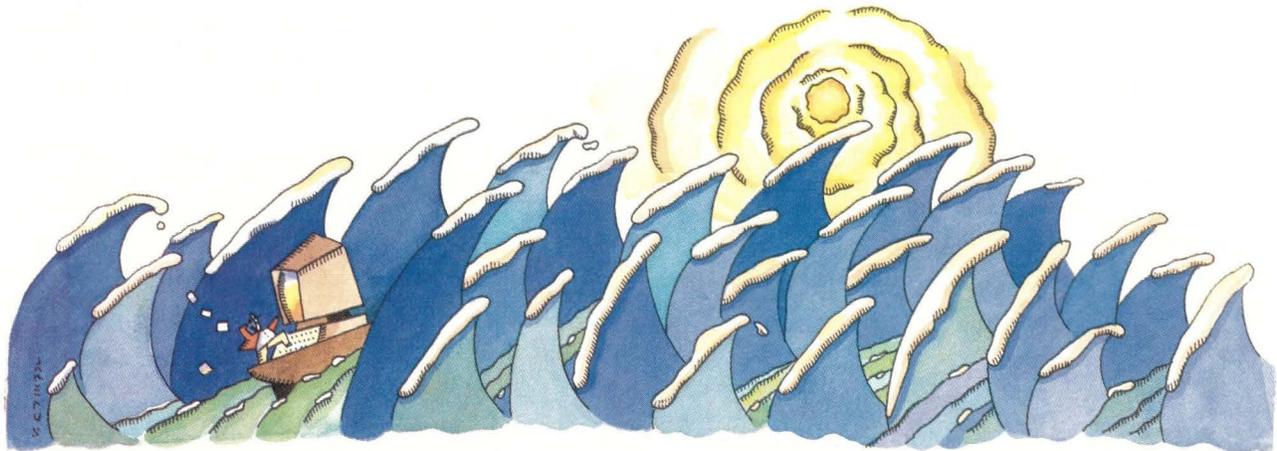


ILLUSTRATION BY ROBIN JAREAUX

## What a Long, Strange Trip It's Been

by RICHARD MORIN, Technical Editor

**H**eliotropism (Sun-following) has its rewards, but there are some definite drawbacks. As a long-term Sun user (I bought Serial No. 285), I can tell you that Sun has done more than a few annoying things to its users. Most of these, predictably, resulted from emphasizing standards and price/performance ratios.

Shifting standards are a way of life at Sun. For example, for bus technology Sun has used Multibus, VMEbus, SBus and Mbus. Sun's disks started with SMD interfaces, but now use SCSI and IPI. Graphics programmers learned how to use Core, then GKS and now (perhaps) PEX. At the same time, Sun went through a range of processors, starting with 680X0s, dallying with Intel 80X86s, settling (loudly) on SPARC and now including 80X86s, once again.

While these shifts may be disconcerting, they are not necessarily bad. I sold off #285 quite a while back and have no interest whatsoever in going

back to it. Nonetheless, Sun users do need a bit of, shall we say, flexibility.

Not to mention solvency. Buying entirely new computer systems every two years is a lot of fun if you can afford it, but I'm not sure that everybody can. "Open Systems for Open Wallets," indeed.

On the other hand, I'm still using Sun stuff (as, presumably, are you), so the company must be doing something right. Perhaps we're masochists, or maybe we are willing to tolerate a steady series of small dislocations, in return for a reasonable upgrade path and access to cost-effective technology. Sun isn't changing its tack, in any case, so we can either jump ship or get used to the motion.

### The Long and Winding Road

SunOS has been pretty stable for the last few releases. No major bugs; we finally understand how to administer it; our systems and networks

work pretty well, requiring only a modicum of administration. I knew it was too good to last.

SunOS 5.0 (also known as Solaris 2.0) mixes SunOS 4.X with USL's System V Release 4 (SVR4). The results should be interesting—possibly all too interesting. SVR4 ("Everything You Wanted in an OS, and a Whole Lot More") was the result of mixing System V, Xenix and BSD 4.X. After all of our favorite SunOS goodies have been added in, the resulting OS should take up most of a 200-MB disk.

Disk is cheap, however, so we can ignore that problem. What about operational differences? The good news is that naive users won't notice much difference. They may finally have to learn OpenWindows, but that shouldn't be too painful. A 32-MB SPARCstation 2 can run OpenWindows nearly as fast as my 3/60 runs SunView.

Programmers shouldn't have much of a problem, either. They love rewriting

old code to work with new libraries—piece of cake. Actually, it shouldn't be too bad. The library interfaces have been converging for some time; most code should compile and run with little effort. Applications written under 4.X should port to 5.0 almost invisibly.

To take full advantage of the new OS, however, programmers will have to learn some new techniques. The most interesting of these have to do with DOE (Distributed Objects Everywhere) and real-time capabilities.

### Here, There and Everywhere

DOE is simple in theory, but I suspect it may take a bit of work to use. DOE applications are composed of objects (collections of code and data) that interact with each other through an ORB (Object Request Broker). The ORB passes messages between objects, awakening or even starting up objects as needed. The communication may take place on a single machine, a local network or a global Internet.

As David Rosenthal noted in a recent talk ("A Vision of Sun in the Mid-90s," SUN Conference, 12/91), the emergence of such widespread systems will reveal some cherished illusions to be false. Many applications assume that networks are instantaneous, infinite in bandwidth, absolutely reliable and completely secure. None of these assumptions are true for any network, but worldwide public-access network networks will show just how silly they are.

The fire walls provided by an Object-Oriented Inter-Process Communication (OOIPC?) system provide a necessary starting point for building these large, distributed applications. Adding some programmer sophistication, we may even get some large-scale systems that work. What about (for instance) full intercompany ordering, financial transfer and inventory control systems. These might allow us to find products without calling (or driving) all over the local area.

### Time in a Bottle

Real-time programming capabilities have been on the UNIX horizon for quite a while. Some tantalizing morsels ( asynchronous I/O, memory

locking, lightweight processes, shared memory) have shown up to keep us interested. Actual real-time capabilities have eluded UNIX, however, due to occasional 100-ms timing hits caused by the scheduler.

SVR4 provides true real-time performance, depending on your definition of "real time." Michael Peck, of Berkeley Camera Engineering (BCE), divides the field into six levels, five of which can be called "real time" ("Redefining Real Time," SUN

## Applications written under 4.X should port to 5.0 almost invisibly.

Proceedings, 6/91). At level five, there is no guaranteed response time. This is typical of most previous versions of UNIX.

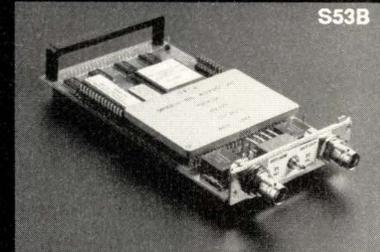
Level four and three systems promise to respond within 100 or 10 ms, respectively. SunOS 5.0 should have absolutely no trouble with this. Sun is actually trying for a 2-ms worst-case response (dispatch latency) time. To accomplish this, they have reworked the scheduler, adding a real-time class to the priority model.

In addition, the kernel is fully preemptive, allowing real-time tasks to break into the kernel's activities at almost any time. Preemption is only curtailed for a limited number of critical sections. Previously, only selected "windows" of kernel code could be preempted, leaving long stretches of nonpreemptible time.

Level two (under 100 microseconds) requires a dedicated processor, possibly running a specialized real-time kernel. VxWorks (Wind River Systems) and LynxOS (Lynx Real-Time Systems) have demonstrated this level of performance.

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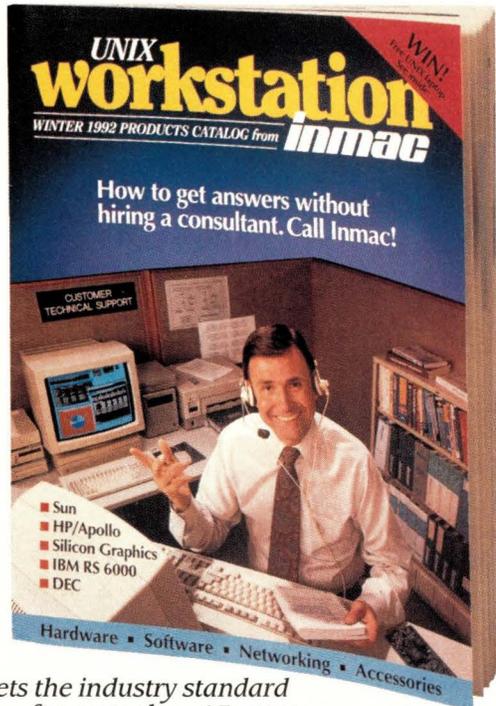
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Sun's Norman Eaglestone points out that, by dedicating one processor in a multiprocessor system, one could achieve [level two] performance. Sun does not claim to support this yet, however, and it may be a while before we see it working. Until we see some application papers (SUG Proceedings, 12/93), we should reserve judgement on this one.

Finally, levels one (under 10 microseconds) and zero (under 0.1 microseconds) are out of the question unless



dedicated hardware is brought into the picture. BCE's SBus DSP cards, for instance, contain both a digital signal processor (Motorola 56001) and an in-circuit-loadable gate array (Xilinx 3042). The DSP provides sub-microsecond (level one) performance, and the gate array provides signal handling support, for true level zero performance.

Combining this kind of hardware support with SunOS 5.0's real-time capabilities, systems will be able to handle applications at all levels of performance. This will allow a variety of applications, from data analysis and process control to nifty multimedia hacks.

Under 4.1.1, for instance, the BCE card must provide 0.2 seconds of buffering to handle possible OS "holidays," limiting its performance to two channels of CD-quality stereo sound. With 5.0, the card will be able to record and/or play back 10 channels at a time, opening up a host of audio-processing applications.

### Too Much Monkey Business

The biggest problem I see coming with SunOS 5.0 is the retraining of system and network administrators.

## Companies Mentioned in this Article

**Berkeley Camera Engineering**  
(SBus DSP)  
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**Lynx Real-Time Systems**  
(LynxOS)  
16780 Lark Ave.  
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**Sun User Group**  
1330 Beacon St., Ste. 315  
Brookline, MA 02146  
Circle 127

**Wind River Systems**  
(VxWorks)  
1010 Atlantic Ave.  
Alameda, CA 94501  
Circle 128

These folks have learned which control files do what, how to edit them safely and when to leave them alone. Every new release brings a few more files, but the growth has been slow and incremental. A competent SunOS administrator is thus conversant with dozens of control files.

Under SunOS 5.0, much of this territory will change. Files have been renamed and whole subsystems have been merged, moved or even removed. Things are different. Further confusing the issue, SVR4 has yet another menu-based attempt at "easy system administration." I haven't played with it much, so I can't say how robust it is. If it's another SNAP, we'll soon see the flames in `alt.sys.sun`, and be warned.

The real problem, however, is that the whole system of control files was written (not designed) by and for a bunch of (lazy) programmers. There is little consistency in file syntax. Comment format, continuation rules, even white space interpretation vary from file to file.

More fundamentally, the files concern themselves with the information needed by the programs, rather than the needs of an administrator. Let's say you have a user whom you don't trust but cannot remove. Which files do you modify, and how? And what holes must you live with because of the system's bugs and limitations?

DOE should resolve some of this, eventually. By putting object-based firewalls around subsystems, we can make them secure. High-level mes-

sages ("don't trust fred") should then be possible to implement with a fair degree of ease and reliability. I give this a minimum of five years, however, so we'll have to live with the current mess through a few more OS releases.

### SUGar, SUGar...

As may be apparent from the references in this column, the Sun User

Group is invaluable to anyone who wants to keep up with technical happenings in and around Sun. SUG Conferences and Proceedings provide a level of focused attention that magazines (even this one :-)) and Usenet groups cannot match. Other amenities, such as the trade show, SUGCD, newsletter and T-shirts only add to the value.

This year's conference (San Jose, CA, December) is certain to have a host of speakers and panels on SunOS 5.0 and related topics. The associated trade show will have hundreds of software and hardware vendors, all eager to show how their products can enhance (or replace) your Sun equipment. Start bugging your manager now, and you might actually be able to go. →

Richard Morin may be reached at Canta Forda Computer Laboratory, P.O. Box 1488, Pacifica, CA 94044. His electronic address is `cfcl1rdm@apple.com`, or he can be reached at `rdm@expert.com`.

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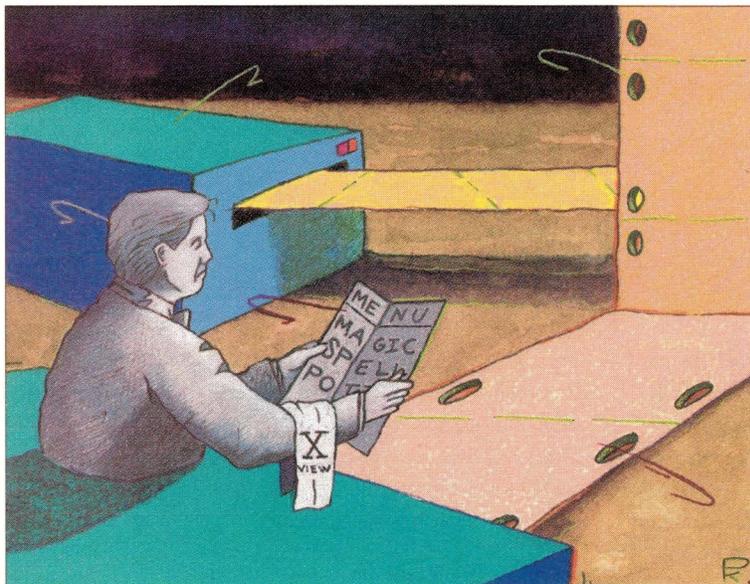


ILLUSTRATION BY PETER KALABOKIS

## Rerouting Print Files

### Part 2: XView

by S. LEE HENRY

Last month I detailed a C shell script for moving print jobs from one print queue to another. This month, we'll examine XView code to accomplish the same thing. With XView, I'll add a point-and-click front end and an icon so that the tool can sit in your workspace with dignity.

I'll highlight sections of the code as we go along so that you might more easily reuse chunks of it to create your own sysadmin tools in XView. If you do and would like to share your tools with other readers, send me email and we'll work out a distribution channel.

#### Using XView

XView is an easy-to-use, object-oriented toolkit for creating Open Look X applications. Building XView tools requires both a familiarity with the C language and with the XView processing model and calls. *XView Programming Manual*, Third Edition, by Dan Heller (O'Reilly & Associates Inc., Sebastopol, CA), is new for Version 3 and has a companion reference volume. These books are a must. Take a look at Sun's XView class if you want to get off the ground quickly.

#### The Code

Our reroute tool begins with `include` statements, which set up definitions for string processing and the specific XView components we will be using for this tool. For example, `panel.h` includes the definitions for creating and using XView panels. We also define a couple of variables for sizing arrays.

```
#include <string.h>
#include <xview/xview.h>
#include <xview/panel.h>
#include <xview/icon.h>
#define SIZE 100
#define QSIZE 36
#define LISTROWS 20
#define NROWS 40
```

The next thing to do is to read two icons into arrays. These icons, created earlier with the icon editor, depict two printers with an arrow pointing from one to the other. As you can see from the Figure (see next page), the second icon appears as a shadow of the first and is used to make the

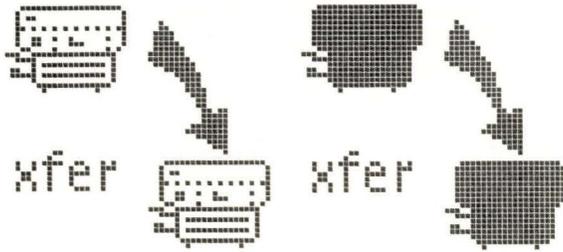


Figure. Rerouting icon

desktop icon transparent—that is, it allows a solid workspace color to fill in around the shapes of the icon elements rather than displaying the icon in a little box (called a “bordered” icon).

```
static short icon_array[] = {
#include <images/reroute.icon>
};
static short mask_array[] = {
#include <images/reroute.mask.icon>
};
```

Once the icon files are read into these arrays, we still need to create the server images (graphic images that X can use), create the icon, and assign the icon to our base frame. We will get to this in our main procedure.

In the meantime, we have a number of objects to set up for our tool—the “frames” (windows), and the panels into which we will put buttons and choice stacks. In addition to the frame and panel for our basic tool, we define a frame and panel for the window that will pop open when our user asks to see what’s in a selected printer’s queue. We also set up two buttons: one that brings up a listing of what’s in the queue, and another that allows the user, once an item is selected, to transfer it to another print queue. The `src_item` and `dest_item` objects allow us to list the available printers, saving the user the trouble of typing the names. The `populist` is where we will store the print queue entries for display and selection.

```
Frame frame, popupframe;
Panel panel, popuppanel;
Panel_item showQbutton, xferbutton;
Panel_item src_item, dest_item;
Panel_item populist;
Server_image icon_image, mask_image;
char *src_server;
char *dest_server;
char *src_printer;
char *dest_printer;
char str[SIZE];
char Qitem[SIZE];
char Qno[3];
char Qname[SIZE];
char status[50];
```

Our main procedure begins with procedure declarations

and a `setuid` call to enable the user to access the files associated with the selected print job. Keep in mind that providing this system privilege is a security risk.

```
main( argc, argv )
    int      argc;
    char    **argv;
{
void  xferproc(), showQproc(), serverproc();
int  getQitem();
Icon  icon;
src_server = dest_server = "wizard";
src_printer = dest_printer = "Magic";
setuid( 0 );
(void)xv_init(XV_INIT_ARGC_PTR_ARGV,
    &argc, argv, 0)
```

The `xv_init` function, which we always want to call as early as possible in an XView program, will open the connection to the X server, initialize the Notifier and do many other things. The Notifier is the controlling entity in XView and handles mouse clicks and menu selections, etc.

Now we create a base frame, our two server images and finally, our icon, which we associate with the base frame.

```
icon_image = (Server_image)xv_create
(XV_NULL, SERVER_IMAGE,
XV_WIDTH,          64,
XV_HEIGHT,         64,
SERVER_IMAGE_BITS, icon_array,
NULL);
mask_image = (Server_image)xv_create
(XV_NULL, SERVER_IMAGE,
XV_WIDTH,          64,
XV_HEIGHT,         64,
SERVER_IMAGE_DEPTH, 1,
SERVER_IMAGE_BITS, mask_array,
NULL);
frame = xv_create( XV_NULL, FRAME_BASE,
XV_LABEL, "Transfer Print File",
XV_HEIGHT, 100,
XV_WIDTH, 650,
FRAME_LEFT_FOOTER,
    "print file to transfer:",
FRAME_RIGHT_FOOTER,  "- - - -",
FRAME_SHOW_FOOTER,  TRUE, NULL);
icon = (Icon)xv_create(frame, ICON,
ICON_IMAGE,          icon_image,
ICON_MASK_IMAGE,    mask_image,
ICON_TRANSPARENT,   TRUE, NULL);
xv_set(frame, FRAME_ICON, icon,
XV_X,                0,
XV_Y,                0, NULL);
```

We still need to create a panel to enclose our user controls. We build two choice stacks for our user to select a printer from. Although this is the easiest way to create the selection list, it is inflexible. Unless all of your users share the same set

of printers, you should read the printer names from the printcap file (the way printtool does). Send email if you'd like the C code for doing this.

```
panel = xv_create( frame, PANEL, NULL );
src_item = xv_create( panel,
PANEL_CHOICE_STACK,
    PANEL_LAYOUT, PANEL_HORIZONTAL,
    PANEL_LABEL_STRING, "Print Queue for",
    PANEL_CHOICE_STRINGS,
        "Magic", "Spell", "Potion", NULL,
    PANEL_NOTIFY_PROC, serverproc,
    PANEL_LABEL_X, xv_cols( panel, 10 ),
    PANEL_LABEL_Y, xv_rows( panel, 1 ),
    NULL);
dest_item = xv_create( panel,
    PANEL_CHOICE_STACK,
    PANEL_LAYOUT, PANEL_HORIZONTAL,
    PANEL_LABEL_STRING, "Move to Queue on ->",
    PANEL_CHOICE_STRINGS,
        "Magic", "Spell", "Potion", NULL,
    PANEL_NOTIFY_PROC, serverproc,
    PANEL_VALUE, 1,
    PANEL_LABEL_X, xv_cols( panel, 40 )
    PANEL_LABEL_Y, xv_rows( panel, 1 ),
    NULL);
```

The popupframe gives us a place to list our print queue. We set up the XView attributes to make it large enough to

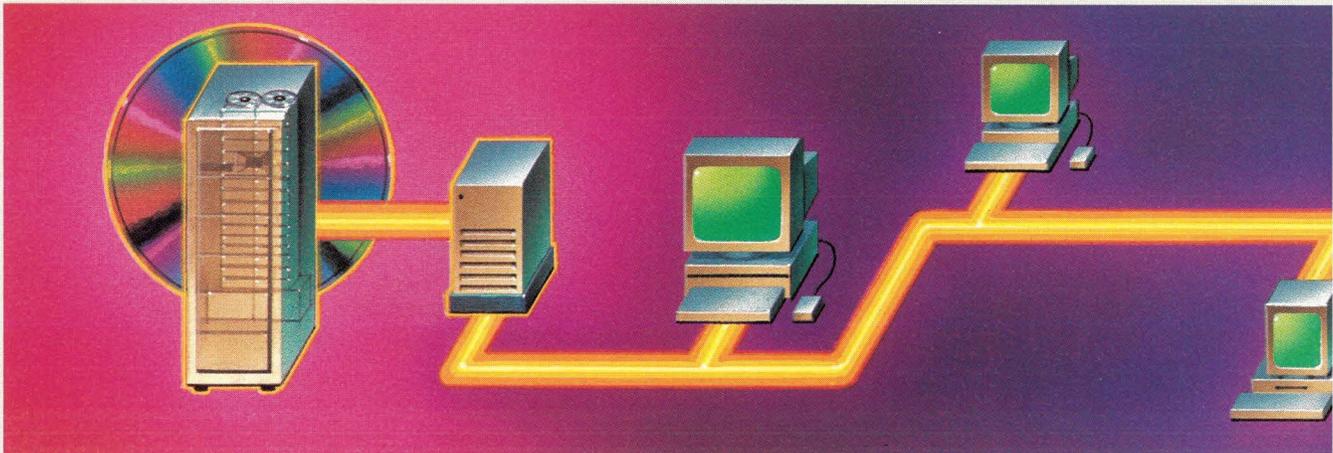
display our print queue, give it a label, but do not display it immediately (XV\_SHOW is set to FALSE). This panel will appear only on user demand.

```
popupframe = xv_create( frame, FRAME_CMD,
    FRAME_INHERIT_COLORS, TRUE,
    XV_LABEL, "Select a Print File",
    XV_SHOW, FALSE,
    XV_X, 110,
    XV_Y, 110,
    XV_HEIGHT, 400,
    XV_WIDTH, 600,
    FRAME_RIGHT_FOOTER, "",
    FRAME_SHOW_FOOTER, TRUE, NULL);
popuppanel = xv_get( popupframe,
    FRAME_CMD_PANEL, NULL);
popuplist = xv_create( popuppanel, PANEL_LIST,
    PANEL_CHOOSE_ONE, TRUE,
    PANEL_READ_ONLY, TRUE,
    PANEL_LABEL_STRING, "PRINT JOBS",
    PANEL_LIST_DISPLAY_ROWS, LISTROWS,
    PANEL_LIST_NROWS, NROWS,
    PANEL_LIST_STRINGS, "NONE", NULL,
    PANEL_NOTIFY_PROC, getQitem, NULL);
```

The next thing we want to do is set up our user controls. Here we add two buttons—one for displaying the queue and one for applying the transfer request.

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```

showQbutton = xv_create(panel, PANEL_BUTTON,
    PANEL_LABEL_STRING, "Show Queue",
    PANEL_ITEM_X,      xv_cols(panel, 15),
    PANEL_ITEM_Y,      xv_rows(panel, 2),
    PANEL_NOTIFY_PROC, showQproc, NULL);
xferbutton = xv_create(panel, PANEL_BUTTON,
    PANEL_LABEL_STRING, "Transfer",
    PANEL_LABEL_X,     xv_cols(panel, 50),
    PANEL_LABEL_Y,     xv_rows(panel, 2),
    PANEL_NOTIFY_PROC, xferproc, NULL);

```

Then, to turn control over to XView so that it will monitor our user events and keep our tool refreshed, we call the `xv_main_loop`, which starts the Notifier. Now our tool can receive and process events.

```

xv_main_loop( frame );
}

```

We have now done just about everything we need to do in XView. It's time to build procedures for selecting printer names and determining which systems are the print servers, creating and displaying the print queue, and moving the print files themselves. From here on, the code is almost pure C with the exception of some commands for displaying messages in the footers of frames and populating a popuclist from information from the print queue.

Our `serverproc` procedure associates print server names with each of the printers in our selection list. Again, here we

are hard-coding our printer list. For more flexibility, we should pull this information out of the `printcap` files.

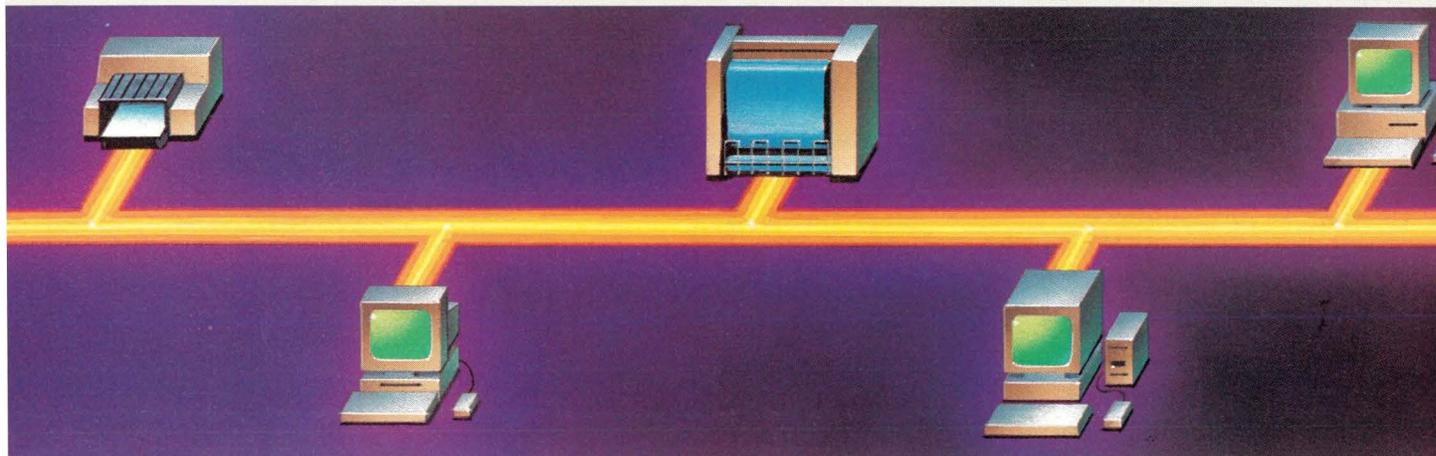
You will note that the case statement below uses the value of the selected printer. The first item in the list has the value 0 and is associated with our default printer.

```

void serverproc(item,value,event)
Panel_item item;
int value;
Event *event;
{
char      *server;
char      *printer;
switch( value ) {
    case 0:
        server = "wizard"; printer = "Magic";
        break;
    case 1:
        server = "sorcerer"; printer = "Spell";
        break;
    case 2:
        server = "witch"; printer = "Potion";
        break;
}
if ( item == src_item ) {
    src_server = server;
    src_printer = printer; }
else {
    dest_server = server;

```

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```
dest_printer = printer; }
}
```

This procedure is used for selecting both the source and destination printers. Each time it is called, it sets up the appropriate two strings—depending on whether the user is selecting the source or destination printer.

The `xferproc` is even simpler. It composes the shell commands to perform the file transfer and issues them with the system command. Here you will see a marked resemblance to last month's script. We issue a remote copy, echo a message to the destination printer (since the line-printer daemon may not be active at this time), and remove the files from the original spool directory.

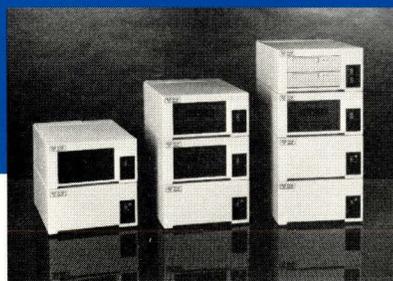
```
void xferproc(item,event)
Panel_item item;
Event *event;
{
sprintf(str,"rcp %s:/var/spool/%s/*
%s* %s:/var/spool/%s",
src_server,src_printer,Qno,dest_server,
dest_printer);
system(str);
sprintf(str,"echo REROUTING | lpr -P%s",
dest_printer);
system(str);
sprintf(str,"rsh %s rm
/var/spool/%s/*%s*",src_server,
```

```
src_printer,Qno);
system(str);
}
```

The `showQproc` sets up a pop-up list from the selected print queue. Like `xferproc`, it uses a system call to create a file containing the information about files in the print queue and then reads and displays this information in a pop-up list.

The first line of the file is the printer status (e.g., "Magic is ready and printing"). This information is displayed in the footer of the pop-up frame where the user is likely to notice it. Notice how we, at the end of this procedure, change the value of `XV_SHOW` to `TRUE`. This brings our completed panel list into view.

```
void showQproc(item,event)
Panel_item item;
Event *event;
{
int d,n,i,ch;
FILE *fp;
xv_set(popuplist,PANEL_LIST_NROWS,QSIZE,NULL);
for (d = 0 ; d < QSIZE; d++) /* init */
xv_set(popuplist,PANEL_LIST_STRING,d,"",NULL);
/* create and load the Queue now */
sprintf(str,
"lpq -P%s > /tmp/queue",src_printer);
system(str);
```



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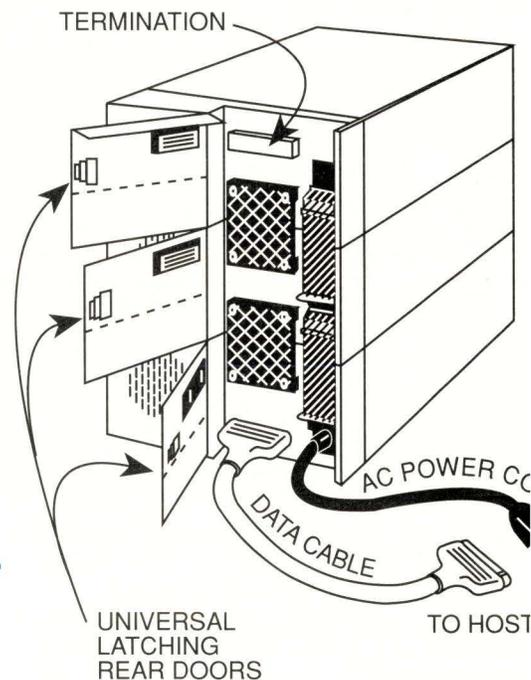
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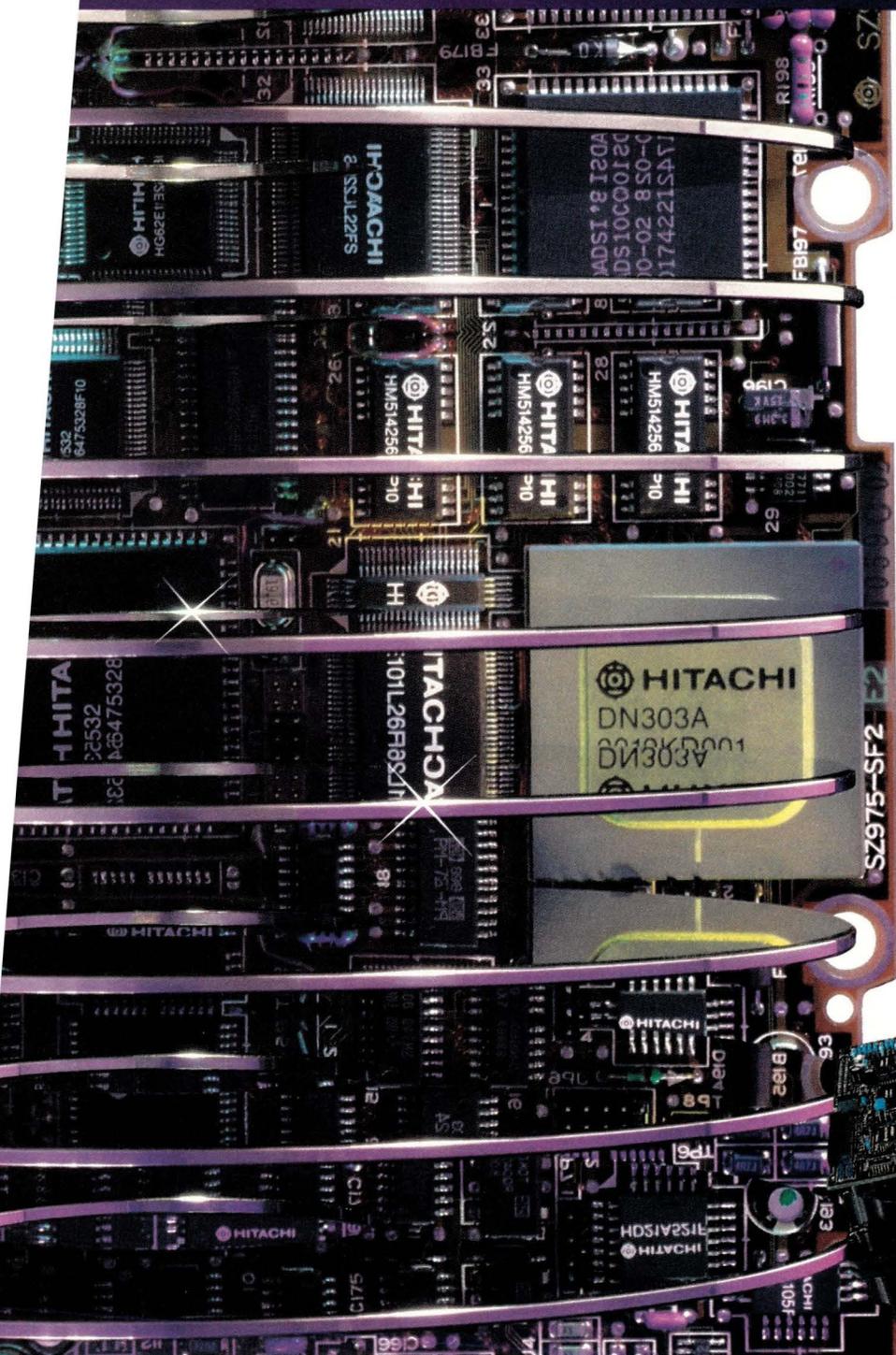
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```

for (i=0; i < SIZE; i++) { /* blanks */
    str[i] = '\040';
}
if ( (fp = fopen("/tmp/queue", "r" ) ) == NULL )
    { perror("/tmp/queue");
    exit (1);
}
n = 0; d = 0; i = 0;
while ((ch = getc (fp)) != EOF) {
    if (ch == '\012') { /* end of line */
        /* show info in footer */
        if (n == 0) {
            xv_set (popupframe,
                FRAME_RIGHT_FOOTER, str, NULL);
            ++n;
        }
        if (isdigit(str[0]) ||
            str[0] == '\141') { /* eg, active */
            xv_set (populist, PANEL_LIST_STRING,
                d, str, NULL);
            ++d;
        }
        i = 0;
    }
    else {
        str[i] = ch;
        ++i;
    }
}
if (d == QSIZE) ch = EOF;

```

```

}
window_fit (popupframe);
xv_set (popupframe, XV_SHOW, TRUE, NULL);
}

```

The getQitem procedure uses the information about the selected print job to compose the strings that will be needed to identify the files in the spool directory. We also display the information about the selected print job in the footer of our base frame to reassure the user that he has indeed selected the correct item. Notice that we take pains to extract the print job number from the print queue entry and to pad our queue item number with zeroes since this is the way it will appear in the file name. Recall from last month's column that our file names will look like cfA004wizard. The zero-padded Qno variable will allow us to compose these file names and avoid copying other files (e.g., cfA040wizard).

```

static int getQitem(item,event)
Panel_item item;
Event *event;
{
    int recno,numrecs,d,n,q;
    char *p;
    recno = -1;
    numrecs = (int)xv_get (populist, PANEL_LIST_NROWS);
    for (d = 0; d < numrecs; d++)
        if(xv_get (populist,
            PANEL_LIST_SELECTED,d, NULL))

```

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```

    recno = d;
if (recno < 0) return(0);
strcpy(Qitem, (char *)xv_get(popuplist,
    PANEL_LIST_STRING, recno, NULL));
for (q=0; q < 3; q++) { /* pad */
    Qno[q] = '\060';
}
for (q=0; q < 100; q++) {
    Qname[q] = '\040';
}
n = 21;
while (Qitem[n] == '\040') {
    --n;
}
n = n - 2;
for (q = 0; q < 3; q++) {
    if (Qitem[n] != '\040')
        Qno[q] = Qitem[n];
    ++n;
}
n = 24; q = 0;
while (Qitem[n] != '\040') {
    if (Qitem[n] == '\057') {
        q = 0; ++n;
    }
    else {
        Qname[q] = Qitem[n];
        ++n; ++q;
    }
}

```

```

}
xv_set(frame, FRAME_RIGHT_FOOTER, Qitem, 0);
xv_set(popupframe, XV_SHOW, FALSE, NULL);
}

```

## Conclusion

Although writing XView tools is considerably more difficult than the corresponding C shell scripts, you can build tools that are more fun to use and considerably more powerful. There's a lot more to XView than I can describe in this column—so, go ahead, try this at home! ➡

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. She is also president of her own firm, The Next Page Inc., a tiny firm specializing in software documentation. Her email address is [slee@expert.com](mailto:slee@expert.com).

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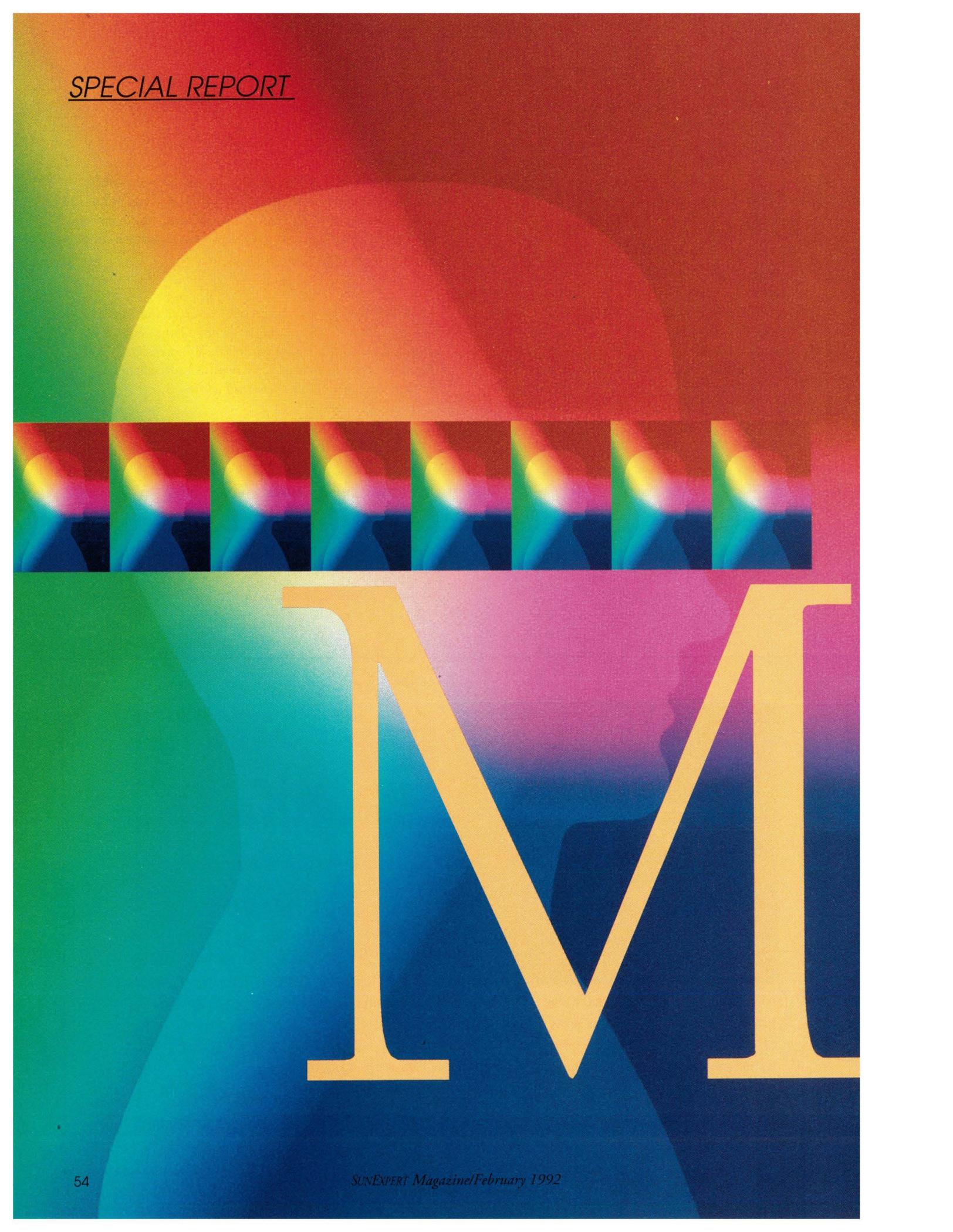
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SPECIAL REPORT



# MM

*Suns may be the best  
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platform around.*

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In this month's Special Report, *SunExpert* will look at Sun Microsystems Inc. and multimedia. That may be a surprising choice of topic since personal computers—not workstations—tend to be thought of as the only true multimedia platforms.

Yet Suns and SPARClikes already have a much bigger role in multimedia than they are given credit for—and that role could grow quite dramatically. In the following articles, this month's issue will look at how Sun systems are already a leading development

platform for multimedia productions, and how economics (not technology) has given PCs their apparently dominant role as a multimedia platform.

We'll also look at how Sun workstations are, in fact, already the dominant "multimedia" machine in several different fields—notably, in the lab, where an emerging class of "scientific media" applications challenges the very definition of words such as "scientific visualization" and "multimedia." Finally, we will see how multimedia may blend at the corporate desktop, and what it is that a workstation needs to be called a multimedia machine.

## More Than A Ghost of a Chance

by MICHAEL JAY TUCKER,  
Executive Editor

# ultimedia:



## SCREEN 1: A Healthy Dose of Puns

# E

verybody knows about Sun and multimedia, right? Suns are excellent multimedia machines, but Sun is targeting corporate multimedia. It is serious multimedia. Pin-stripe multimedia. No-fun-at-all multimedia. Right?

Well, maybe not. While PCs, Apple Computer Inc. Macintoshes and an emerging class of consumer-interactive video devices have garnered headlines as multimedia platforms, Suns have quietly emerged as a leading multimedia development platform.

Consider, for example, Tiger Media Inc. "The company was founded in 1986," says Ann Lediave, a Tiger marketing associate, "for the sole purpose of doing CD-ROM titles." Specifically, that meant games and interactive educational materials for a variety of different formats—including both PC and non-PC systems. For example, the company supports Compact-Disk/Interactive (CD/I), which is a consumer-interactive video-disk system backed by a consortium of companies headed by Philips N.V. of the Netherlands.

Tiger also has products in the PC

arena. For instance, the company announced plans to support the recently debuted MPC specification—a hardware and software standard for PCs that want to support common multimedia functionality—being promoted by a newly formed subsidiary of the Software Publishing Association, the Multimedia PC Marketing Council. ("The council has been established to promote multimedia on the Windows platform," explains Glenn Ochsenreiter, the managing director of the council. "Other than Microsoft [Corp.], the members are all [PC] hardware vendors.")

Among Tiger's products are games. Its first was *The Case of The Cautious Condor*, a comic, interactive mystery novel that is partly in homage to, and partly a parody of, the detective fiction of the 1930s. Players navigate among screens—drawn in imitation of vintage comics—to discover the identity of a murderer.

The company's second game, introduced late last year, was *Murder Makes Strange Deadfellows*. Tiger producer Paul Norman describes the comedy/thriller as "a straight classic ghost story...except that we turn it on its ear a bit, à la *Airplane*."

Tiger does its development almost entirely on Suns and then downloads to target systems. "It is extremely difficult [to produce multimedia titles]," says Norman. "There is a certain space for workstations...especially Suns...because of their capacity."

Norman (who says of himself "like many in the mythical arena of multimedia, I came out of computer games...I made a buck or two out of

eight bits.") says that *Deadfellows* was among the most ambitious projects he's ever attempted. In fact, he says that the process was almost like directing a play or a movie rather than developing software. "It does have similarities [to film]," he notes. "First of all, you are working with live actors for the audio. Certainly, it is like doing a radio play...with, of course, a healthy dose of wordplay, puns and double entendre."

Tiger has turned some of its devel-

*Murder Makes Strange Deadfellows is another Tiger Media Inc. game. Multimedia producer Paul Norman describes it as being like "a radio play...with, of course, a healthy dose of word play, puns and double entendre."*



opment tools into products. It is currently marketing Cats Meow, which Craig Moody, Tiger's vice president of sales and marketing, says, "allows you to take a variety of images, music, etc., and integrate them into multimedia applications...without any scripting. It is all done with the mouse."

Yet another multimedia producer that works on Suns is Capital Disc Interactive, a vendor of titles for the CD/I format. "We use the Suns because of their power," says John R. Gray, president of Capital. "I think we've got like 15 workstations on the net."

Capital specializes in CD/I. In fact, Gray says that his company is "one of the top three CD/I developers in the world." He notes that his company is partly funded by Philips, which is promoting CD/I.

Capital came into the business to help those firms with title ideas but no expertise to produce them. "We are complete soup to nuts," says Gray. "You bring me an idea, and I'll give you a tape you can take to get mastered."

More recently, though, the company has moved into the production of its own works as well. "We have several titles," says Gray, "some of which we now own a percentage of. So, we are in the position of being publishers." In fact, says Gray, Capital has produced about half of the 50 or so CD/I titles in existence.

Capital does most of its development on Suns and then downloads to the CD/I format. It uses Suns in many of the same ways, and for many of the same reasons, that other software developers do: They are cheap, powerful and familiar. "I think we chose Suns, if I recall, mostly because we had more expertise in the technical group with Suns than we had anything else," says Gray.

Now, Capital is entering the Sun market as well. It has recently decided to market some of its technology—including an SBus board that goes into SPARCstations and allows developers to download applications to a CD/I player, as well as a suite of development tools.

Suns *should* be multimedia machines par excellence. Their multiple window displays, multitasking operating systems, powerful CPUs and high bandwidth networking should all lend themselves nicely to the technology. "PCs get a good deal more of the attention," says Gwen Peterson, vice president of marketing for Clarity Software Inc., which markets an integrated software suite with multimedia functions for workstations. "But the workstations are actually better positioned. They're already shipping, standard, things like audio and CD-ROM...features that you have to add on to most personal systems."

Why, then, does PC multimedia get all the headlines? Well, says Clarity's Peterson, "I think the primary reason is the sheer market weight of PCs... there are just so many more of them."

But the real kicker is market position. "Multimedia applications," says Joan-Carol Brigham, director of the Macintosh and graphics program at market-research firm International Data Corp., Framingham, MA, "are low-cost, low-end applications." They tend to be defined as single-user applications that run on general-purpose machines in missions that are rarely critical. They're things like computer-aided training software, point-of-purchase displays, even games. They're in schools, retail operations, museums (as information displays) and, perhaps more than anywhere else, at home.

That isn't the way workstations are used. It is a rare individual who will have a workstation, even an IPX, as a home computer. It is a rarer vendor who is going to bring out a workstation product with a PC price.

"It is almost not worth a salesperson having to be on the phone," says Dennis Daudelin, president of Aurora Technologies Inc. Aurora offers products that fall both within and without traditional multimedia, such as scanners and network SBus boards. In recent months, the company looked hard at doing additional audio and video products for Sun workstations

but discovered that there were severe limits on the kind of margins available in the "low-end" world of multimedia. Support and sales became overwhelmingly costly, says Daudelin.

When multimedia does show up on workstations, with workstation prices, it ceases to be multimedia. "There is a such a thing as high-end multimedia, but we call it film and video production," explains Robi Roncarelli, a computer-graphics consultant and editor of the newsletter *Pixel*. "And that's where you find the workstations."

There is also another, very subtle reason that Suns and multimedia aren't usually linked. Moreover, workstation customers tend to regard "multimedia" functionality as a given in their systems, and something only marginally connected to why they buy software. Thus, even Clarity, whose Rapport office productivity software is famed for its multimedia functionality—particularly for its voice email—tends not to be bought as multimedia. "To tell you the truth, we haven't had much success with that [Clarity's mul-

## SCREEN 2: PC and Proud

timedia]," says John Hipp, a Clarity user and senior research director at the Harvard Medical School at Beth Israel Hospital in Boston.

Where Clarity is used, says Hipp, is as a networked, group word processor. "This is a research lab," he says. "We have a lot of students...we were looking for a way to get students and faculty to smoothly collaborate on producing documents." Rapport let them do so. "And most people here use it for email," Hipp adds.

But workstations may yet claim a commanding role in multimedia—particularly given their already strong position as development machines. "As far as I know, people are going to the workstations," says Steven Qualline, chief software engineer at Artecon, a systems development and integration group. "Very little work is being done on the PCs...because their CPUs are just too limited."

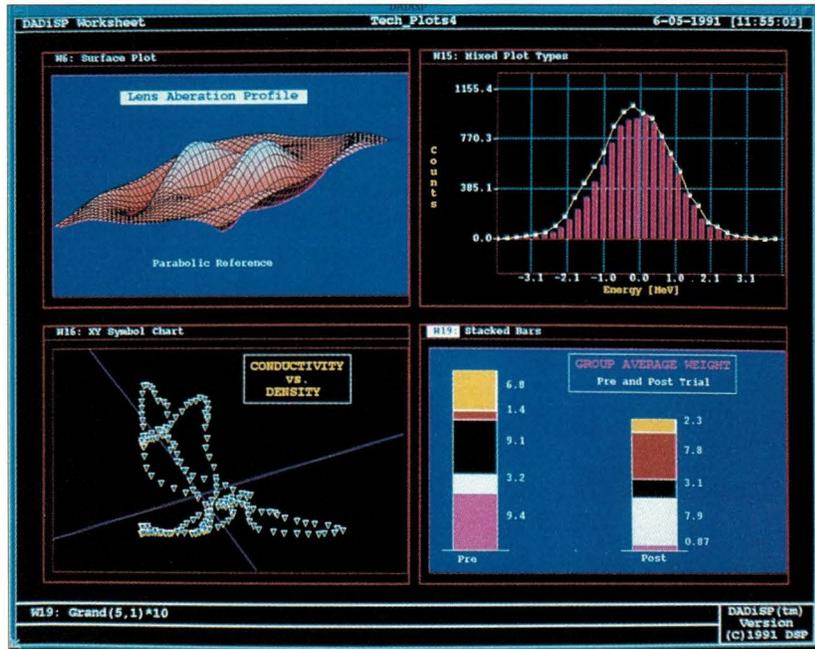
“**M**ultimedia on Suns? Well, I guess that depends on what you mean by multimedia,” says Joan-Carol Brigham, director of Macintosh and Graphics programs at the market-research firm of IDC. “I don’t see the kind of applications you see on a Mac or PC...but, Sun has a lot more scientific-visualiza-

## SCREEN 3: *Sci-Media*

tion applications...and that’s a *kind of* multimedia.”

Scientific visualization—sci-viz—is difficult to characterize. It isn’t quite graphics, and sci-viz partisans bristle at the idea of linking the technology to something as PC-ish as multimedia. Then, too, not all sci-viz packages do the same thing—some perform analysis, some are passive displays. More confusing still, there is another kind of “multimedia” at work here—not multimedia in the sense of display but in the sense of being able to take input from multiple, different media.

And that sort of multimedia is hard, far harder than display. Yet products to do it exist. One such product is DADiSP from DSP Development



“*Sci-media*” applications, which combine traits from many different fields, including scientific visualization and multimedia, are coming on-line for workstations. One such application is DADiSP from DSP Development Corp.

Corp. In its current release, DADiSP provides tools for data acquisition, scientific visualization, data analysis, mathematical analysis and display in forms ranging from tables to charts to 3D images. It requires no programming on the part of the user, yet its users have done everything from modeling the performance of spacecraft to analyzing the low-frequency songs of insects.

What makes the product “multime-

dia” is its ability to deal with input from many different media, ranging from keyboard strokes to test data from lab instruments. It is a multimedia application but in the reverse of the usual sense of the word. So, to describe DADiSP and products like it, should we coin a new term, “scientific media?” *Sci-Media*? If so, then workstations are already dominant in one kind of multimedia even though they aren’t recognized as such.

“**W**e are focused on corporate multimedia,” says Sun’s multimedia evangelist, Darleen Yaplee.

But what *is* corporate multimedia? Well, at its very simplest, says Aurora Technologies’ Dennis Daudelin, it is something—almost anything—that increases one’s productivity. “Voice,” he says. “It means that I can talk to the fool machine. Not in any AI sense, but just in the sense that I don’t type. It could save 20 minutes in my day...just in not typing.”

## SCREEN 4: *The Corporate TV*

He adds that multimedia mail should be considered base-level functionality for any workstation. He argues that for networked, corporate multimedia to be real, users should be able to pump multimedia documents—including video and audio—throughout their organizations.

What is to be in those multimedia documents? Exactly what’s in most business-text documents today: proposals, reports, advertisements and all the other manuscripts that business professionals use to sell products, suggest ventures, win customers and otherwise influence the world at large. “Where multimedia is useful,” explains John Ricketson, vice president for Parallax Graphics Inc., which markets video and audio boards for SPARCstations, “is where a professional can sit down, put together a multimedia document and convince someone to do something.”

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## SCREEN 5: Collaborative Multimedia: Which Way to the Promised Land?

**D**istributed, open multimedia systems will take us beyond text and graphics to live videoconferences with interactive computer presentations and personalized, real-time multimedia news. Because this implies real-time communication among many people over a network (in contrast to stand-alone applications), we call this "collaborative multimedia." What are the enabling features and technologies that will make this happen?

- *APIs.* The industry needs open, standard application-programming interfaces and data formats so that different vendors' applications can interoperate and share data, no matter which vendor's platform they run on.
- *Time-critical support.* Traditional architectures guarantee that data is correct. Multimedia requires that data is processed and delivered "on time." For example, in an interactive videoconference, the system must be able to keep audio and video synchronized as they are processed and transmitted over networks.
- *Networking.* Most multimedia applications need networks that provide high bandwidth, low latency and consistent delivery. Network protocols need to be developed to identify time-critical data and deliver it on schedule. In some multimedia applications, it is more important to deliver data on time than error-free. The maximum acceptable latency for an email message is tens or hundreds of seconds; for a video packet, that time is measured in milliseconds.
- *Compression.* Video compression can be thought of as a way to adapt the media (video) to the network. For ISDN, stan-

by Dave Stewart

*Corporate multimedia is still a ways removed from what's doable, or at least easy, today. Sun's manager of the Integrated Multimedia Group, Dave Stewart, offers a few observations about what's necessary to make corporate multimedia a reality.*

ardized video compression techniques compress video from tens of megabytes to a constant, reliable 128-Kb/s data channel. Ethernet offers higher peak bandwidth, but bandwidth is shared and is therefore unreliable. Compression algorithms that deal with the variability of Ethernet networks will be required for nomadic applications that use radio.

- *Multitasking.* The notion of "fair" multitasking must be changed to a model in which UNIX can meet the needs of time-critical processes first, leaving non-time-critical tasks to run during free cycles. Extensions to UNIX that handle time-critical requests must also be capable of determining what to do in "overload" conditions.

- *Device controllers.* Workstation-based multimedia systems must be able to control consumer and industrial-grade media devices, such as videotape recorders, DAT recorders and CD players.

Currently, a plethora of proprietary standards makes this difficult. Groups like the Interactive Multimedia Association (IMA) are working toward an open, standard interface for external device control.

In fact, one of the key challenges of multimedia lies in creating a set of standards that will allow all technologies to be implemented across many platforms. Only then will the multimedia market take off, and only then will we see the light at the end of the tunnel.

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Dave Stewart is manager of the Integrated Multimedia Group at Sun Microsystems Computer Corp.

## Bringing Multimedia Technology to the SPARCstation

by JOHN A. MALLEO-ROACH,  
Paradise Software Inc.

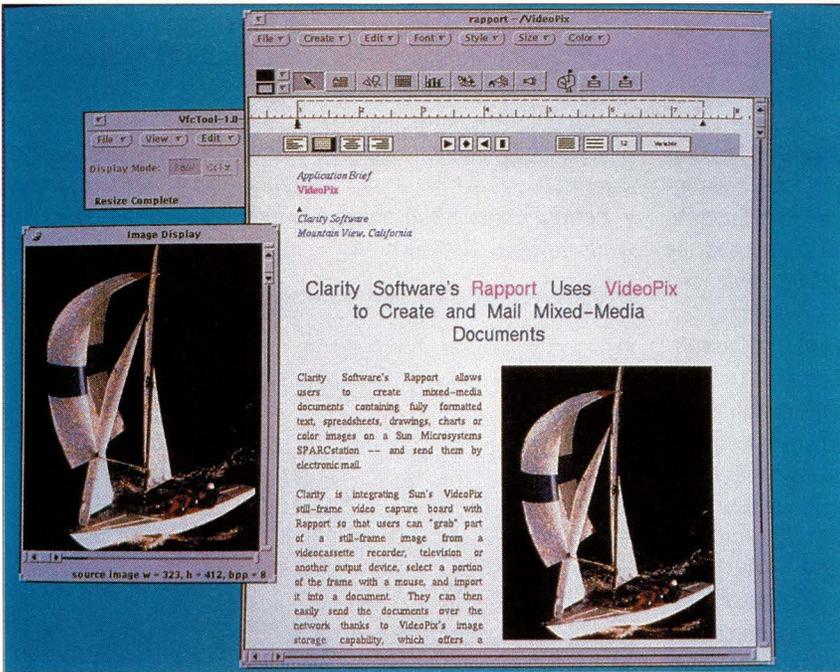
Perhaps the most overworked word in the English language (certainly in normal computer jargon) today is "multimedia." In its broadest sense, it refers to the simultaneous assimilation of information through multiple communication channels. But multimedia has been used in combination with so many other things, and so loosely that users have

difficulty separating fact from fiction, hype from reality.

Underlying the confusion, however, is "real" technology, advances in software and hardware capabilities that promise to revolutionize the way people use computers. If one accepts text, graphics, audio and video as the basic elements of multimedia computing, it is relatively easy to

identify the enabling technologies necessary for a computing environment to provide for their seamless integration. These are (in no particular order):

- bit-mapped display,
- device-independent graphics rendering,
- audio/video



The VideoPix SBus card from Sun Microsystems Inc. provides limited video power to SBus-based SPARCstations. It is an inexpensive way for Sun users to take a low-risk first step into multimedia applications.

- hardware/software support,
- data compression,
- low-cost wide-area distribution (CD-ROM),
- control and synchronization of media,
- authoring tools,
- low-cost local-area distribution (networking),
- high CPU/disk performance/bandwidth.

They range from the easy and commonplace (bit-mapped display) to the more difficult and rare (control and synchronization of media). It is common to find several of these technologies on a single hardware platform. How well a particular hardware/software environment implements and supports these technologies will determine its viability in delivering multimedia computing to a large base of users.

### The Multimedia Vision

The first attempt to bring multimedia to the computing masses (in this author's opinion) occurred when Apple Computer Inc. introduced the Macintosh in 1984. Since that introduction, Apple has

maintained a comfortable lead over its rivals in the introduction of multimedia technology, ranging from HyperCard to the recent System 7.0 software extension, QuickTime, which addresses the problems of data compression and medical control/synchronization.

However, while Apple has been recognized as the pioneer of multimedia computing and continues to innovate in this area every day, there are chinks in its software/hardware armor that provide an opportunity for a workstation company like Sun Microsystems Inc. to leapfrog Apple when the next generation of multimedia computing arrives (the assimilation of video into the computer). Why would a workstation company find itself in a position to assume a leadership role in the evolution of multimedia computing? Because the enabling technologies that make multimedia computing feasible have been coming together in the form of UNIX-based RISC workstations. Apple has found itself in the position of having to import new software/hardware technology in the form of new System 7.0 features such as virtual memory, multitasking and

interprocess communication (long standard UNIX features), and RISC System/6000 technology via the Apple/IBM Corp. agreement in order to facilitate further multimedia evolution.

Workstation vendors such as Sun, IBM Corp., NeXT Inc., Silicon Graphics Inc. and perhaps Digital Equipment Corp. find themselves positioned to make tremendous strides in perceived multimedia capabilities. All have recently made announcements regarding new products or strategies that are directly related to furthering multimedia computing on their platforms. However, Sun seems better positioned in taking the early lead in delivering multimedia computing to its users because of its market leadership in terms of units shipped, its broad line of compatible hardware (particularly at the low end, which is very important for delivering affordable multimedia), and support of PostScript within the X11 server. If we re-examine the list of multimedia enabling technologies in light of Sun's current offerings, we can construct a reasonably good fit:

- *Bit-mapped display*—All SPARCstations support a 1152-by-900 bit-mapped display, with all models except the SLC and ELC providing 8-bit pseudo-color, the minimum color support necessary for reasonable multimedia capabilities.
- *Device-independent graphics rendering*—All SPARCstations support OpenWindows 2.0/3.0 with its built-in X11/NeWS imaging models. X11 compatibility is a must in the workstation marketplace, but built-in PostScript rendering puts Sun a step ahead of other workstation vendors (except, of course, for NeXT) in the multimedia arena.
- *Audio/video hardware support*—Every SPARCstation comes with minimal built-in audio capabilities (8 kHz, single channel). Other Catalyst vendors, such as Ariel Corp., provide SBus cards that extend these capabilities up to two channels, 96 kHz. Moreover, Sun has introduced VideoPix, a low-cost SBus video frame



What are the top 10 multimedia products for Suns? Here are some *SunExpert* favorites. This should, however, not be considered in any way definitive. If we've left out any of your top 10, please write, email or fax us your alternative list.

- **Cats Meow** multimedia authoring tool from Tiger Media Inc. This is the company that produced such CD/I games as *Murder Makes Strange Deadfellows*.

- **Astr\*x** business office-productivity software with surprisingly strong multimedia functionality from Applix Inc. The product was originally named "Astrix" but was changed because of a trademark conflict with a European comic strip character, "Astrix the Gaul."

- **Rapport** networked productivity software from Clarity Software Inc. The product has gone far to prove that the future of business systems is linked to multimedia email.

- **Uniflix**, a video software package from Paradise Software Inc. The company also pioneered the

idea of software-based video on Suns as an interim step to more expensive hardware-based approaches.

- **OpenWindows and DeskSet V.3**, a GUI and user environment for Suns from SunSoft. When SunSoft introduced the newest of OpenWindows and DeskSet last year, relatively few observers noticed that the software came complete with rather expensive multimedia facilities. Yet it does—including support for multimedia email and a base-level audio tool.

- **BBN/Slate** workgroup productivity software from BBN Software Inc. Slate, and BBN, proved before most others the value of networked, corporate multimedia.

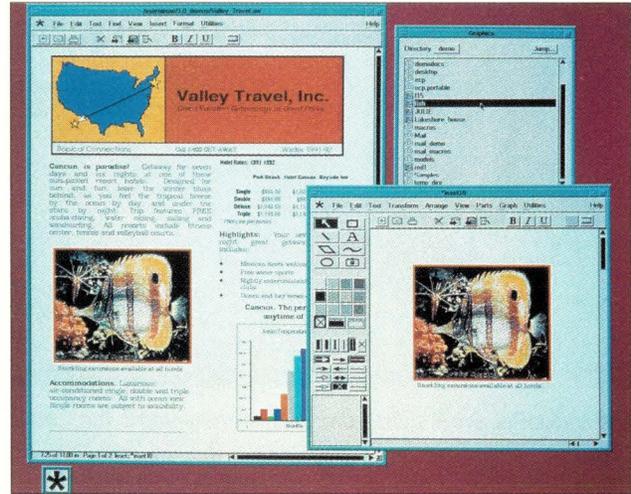
- **DADiSP Version 3.0** data-analysis software from DSP Development Corp. DADiSP is a product that is difficult to describe. It combines in one package scientific-visualization functions, data-analysis tools, mathematical tools and input from multiple media. In the sense that it combines very different forms of input and display, it is truly multimedia—a kind of scientific/technical multimedia.

- **CorrectColor Calibrator**, a device for measuring the color of screens or hard copy from RasterOps. Color calibration is one of the more exasperating problems faced by desktop

publishers, video makers, and multimedia producers. This product is one of the few that allows color measurement of both hard copy and workstation screens.

- **XVideo** video SBus board from Parallax Graphics Inc.

documentation from standard texts. *Lotus 1-2-3* from Lotus Development Corp., which has several multimedia-style functions in its newest release. *Wingz*, from Informix Corp., which may be the first ever mixed-media spreadsheet



*Astr\*x* from Applix Inc. is a networked business office-productivity package. It is not supposed to be a multimedia product, but multimedia functions it possesses all the same.

XVideo provides both full-motion video and stills to SPARCstations and SPARClikes.

- **VideoPix** frame grabber and limited video board from Sun Microsystems Inc. VideoPix provides graphic evidence of what can be done even with very low-cost equipment.

And some runner-ups: *DynaBook*, a hypermedia authoring system from Electronic Book Technologies. *DynaBook* allows users to produce online

available for Suns. *Mathematica*, from Wolfram Research Inc., which manages to combine mathematical processing with 3D graphics and audio. *Digital Palette CI-5000* with SCSI driver from Apunix Computer Services, which allows users to create images on the Sun, and then download them to 35mm slides, transparencies, prints or chromes. *Island Write, Draw and Paint* from Island Graphics Corp., which brings media to the masses.

grabber, while Parallax Graphics Inc. (XVideo) and RasterOps (SPARC-TC-PIP) both provide full-motion SBus video boards.

- **Data compression**—Sun provides support for software-based JPEG compression of still images as part of the VideoPix offering; Paradise Software Inc. offers Uniflix, a software-based video compression/ decompression toolkit for full-motion video; and Parallax Graphics provides optional hardware-based JPEG compression of stills

and video as part of the XVideo product offering.

- **Low-cost, wide-area distribution of material**—Sun has committed wholeheartedly to CD-ROM for software distribution, and CD-ROM is already the media of choice for multimedia because of the storage requirements usually involved. In fact, CD is becoming easier with each passing year. Young Minds Inc., for instance, can provide software that formats CD-ROMs for UNIX

compatibility.

- **Control and synchronization of media**—SunOS supports several low-level mechanisms for sequencing and controlling processes, including shared memory, interprocess communication, semaphores, timers and threads. At the toolkit level, while there are several third-party packages for pieces of the puzzle, there currently isn't any comprehensive solution for SPARC.
- **Authoring tools**—A variety of author-

ing packages are available for the Sun platform, including the Turing Institute's HyperNeWS, a PostScript-based user-interface design system; Tiger Media Inc.'s Cats Meow, a multimedia presentation tool; Paradise Software's Mediawrite, a hypermedia authoring tool; Market Focus Technologies Inc.'s StoryTool, an expert-system development environment; and KMS, a distributed hypertext system from Knowledge Systems Inc.

- *Low-cost local-area distribution (networking)*—Sun has always emphasized support for the client-server model of computing. It views multimedia as a natural extension of the client-server model when applied to workgroup communication. The emphasis in this area has made Sun the recognized leader in distributed computing with support for a variety of protocols (RPC, NFS, RFS and TCP) bundled with the basic SunOS.
- *High CPU/disk performance/ bandwidth*—The SPARCstation is one of several RISC workstations that con-

tinue to push the price/performance curves for personal computing to new levels.

### Multimedia-Ready SPARCstations

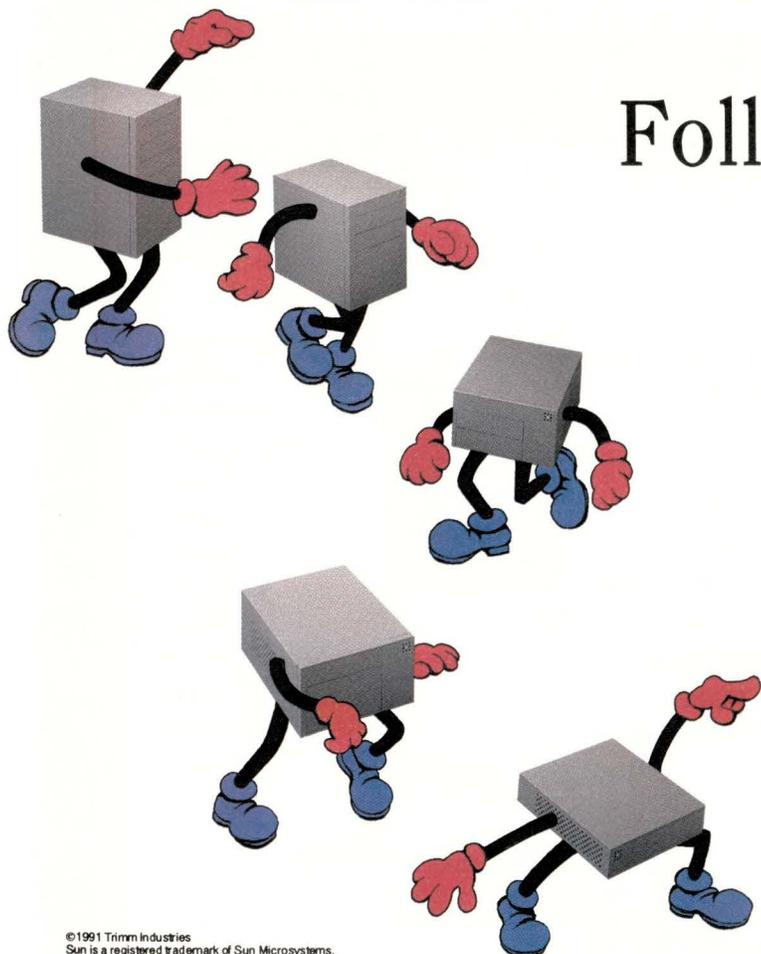
Given the relative abundance of enabling technologies for multimedia computing on the SPARC platform, it makes sense to define "degrees of multimedia readiness" for different configurations of SPARCstations. These configurations of "multimedia-ready" SPARCstations can be categorized as *minimal*, *enhanced* and *operational*. As is usually the case in these situations, the levels that can be defined can be neatly segmented by their respective cost of implementation. Ultimately, as the cost of technology comes down, the cost of each configuration will reach a point where it obtains its maximum technological impact on the marketplace. Almost any technology is feasible at a large enough price. Before any multimedia technology can become widespread, the cost of entry

for a workstation customer should drop to under \$10,000.

But we can define the various levels of multimedia readiness fairly easily. A *minimal* system should consist of, as hardware, a SPARCstation 1, 1+ or IPC with an 8-bit color frame buffer. It should have a CD-ROM player and 8-kHz audio I/O. For software, it should have SunOS 4.1 or greater, OpenWindows 2.0, animation player or software-based video decompression and a multimedia development API (toolkit supported).

An *enhanced* system, then, should be a SPARCstation 2 or IPX with video input (still or full-motion, 44.1-kHz audio-out CD quality), with links to a medium-speed local-area network (10 Mb), and similar links to a low-speed wide-area network (say, 56 Kb). For software, it should have software-based video/still compression, similar software-based audio, OpenWindows 3.0, and a multimedia authoring system (application supported).

Finally, an *operational* system should have all of the above hardware, plus



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hardware-based video/still compression/decompression, video output (still or full-motion), links to a high-speed LAN (at least 100 Mb), and additional connections to a medium-speed WAN (1.5 Mb). Moreover, it should have real-time OS extensions and a multimedia authoring environment supported by the OS.

It is likely that the definition of an enhanced system will become the minimal system in 12 to 18 months, and the operational system will become the enhanced system in 18 to 24 months. A minimal system can be obtained for about \$10,000 today; an enhanced system should be possible for about \$35,000. Thus, only the minimal-configuration multimedia-ready SPARCstation has been achieved today, with the enhanced version of the SPARCstation reaching \$10,000, possibly in 1993 or 1994.

When would we be likely to see a multimedia-operational SPARCstation? It is difficult to guess, but it seems reasonable that a \$10,000 operational SPARCstation could appear by 1995.

### Next-Generation SPARCstations

Based on Sun's previous track record, it seems likely that the next-generation SPARCstation product, SPARCstation 3, will be announced in the coming months. In contrast to the similarity in hardware between the 1 and 2 (only CPU performance and capacity really changed), it is possible that there could be some significant multimedia-oriented hardware additions to the next product. Sun has already stated that the GX option will become a standard part of the SPARC motherboard.

Perhaps 8-bit color (or more) will assume the standard configuration role that monochrome currently plays, with 24-bit color a low-cost option. Telephone-quality audio was first introduced on the SPARCstation 1; look for Sun to upgrade this to near CD quality on the SPARCstation 3. Lastly, it's not out of the question that video input could become part of the basic package. One possibility would

be an upgraded version of the VideoPix card routing video data through a DSP chip for compression and storage on the hard disk.

So, in summary, the technology that makes multimedia computing possible is finding it difficult to continue to grow and flourish in the typical PC computing environment. The opportunity for UNIX-based RISC workstations to assert a leadership role in bringing multimedia capabilities to the desktop is here. Sun has stated its

desire to support multimedia as part of a client-server computing environment. These factors combine to place the SPARCstation squarely in the middle of the multimedia revolution. →

**John A. Malleo-Roach** escaped from the confines of Bell Labs as a founder of Paradise Software in 1989. His current interest is in finding the "killer.ap" of multimedia. He can be reached at [jamr@paradise.com](mailto:jamr@paradise.com).

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*In some ways, the European SPARC-systems*

*market is just like its North American*

*counterpart. In others—like its almost total*

*reliance on resellers—it's far, far away.*

# Miles and Miles and Miles...

by MARSHA W. JOHNSTON

**N**ot too long ago, the Belgian Army decided to add functionality to the three-million-line COBOL-based hospital information system used by its three military hospitals. To do that it was clear they would have to upgrade their Siemens mainframe, so they wrote out a request for proposal (RFP).

Two vendors responded: Siemens-Nixdorf Informationsysteme AG and BIM S.A./N.V., a local systems integrator/distributor for Sun Microsystems Europe Inc., the European operating unit of Sun Microsystems Inc.

“BIM offered to take out the mainframe, to bring in a completely new, decentralized hardware platform in all three hospitals, to redevelop the COBOL application using Sybase Inc.’s Sybase database-management system and to provide system training—all for the same price as the Siemens upgrade,” recounts Lieven Jaspert, general manager, Sun Microsystems Belgium. “The Siemens upgrade would have provided merely more [computing] power.”

Even though the politically charged deal was alien to the techie BIM sales staff, says Jaspert, “it was such a radical technological difference that the political influence Siemens had didn’t work.”

Now the Army hospitals' Admission, Transfer and Discharge (ATD) system runs on a Sun SPARCserver 490 at each site; and about 40 SPARCstation 2s that function as X Window System application servers and 250 Network Computing Devices Inc. X-terminal front-end stations are distributed over the three sites. The computers communicate via an IP wide-area network that spans a radius of approximately 250 kilometers. With its 10 GB of disk space, says Jaspaert, the networked system solves an archiving problem for the hospitals, since the Belgian government requires patient files be kept on-line for 10 years.

Without BIM, Sun probably would not have won that contract, or another at the Belgian Senate, which recently replaced its desktop 386 PCs with SPARCstations and a custom hypertext database publishing application developed by BIM. Says Jaspaert, "BIM is a very good partner in Belgium. They have built up momentum with an incredibly prestigious installed base, and they've gotten Sun on the approved list of vendors of the EC Commission...things like that."

### Partners Give Sun A Push

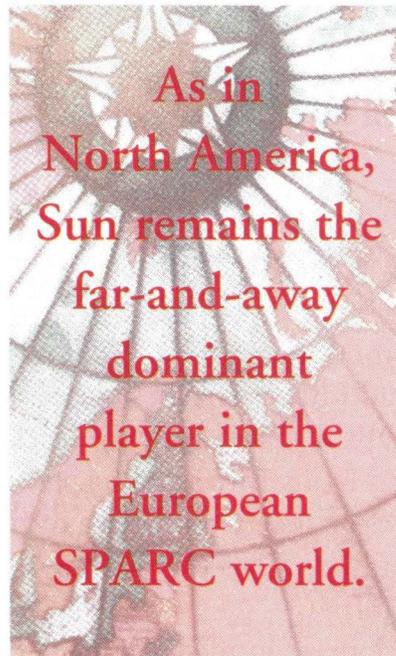
The European SPARC marketplace is in some ways just like its North American counterpart. But, in others—most notably, the prominence of and vendor reliance upon indirect resellers—it is miles apart.

As in North America, Sun remains the far-and-away dominant player in the European SPARC world. In 1990, Sun had leveraged the expertise of its partners into the largest share of the workstation market in western Europe (30%), according to Paris-based Dataquest Europe S.A. Those partners must also be at least partially credited with the fact that, as of 1990, the majority of Sun revenues began coming from non-U.S. sales. Sun claims that it was second only to Boeing in the percentage of products exported last year.

This year will be no different, says Dataquest analyst Karen Benson. "Sun has had a very good first half in

Europe, compared to 1990. In the first half of 1991, the European market has been faster growing than the United States; in terms of unit shipments, maybe a 50% to 60% growth rate," she says.

The importance of indirect channels to Sun's success in Europe, be they OEMs, value-added resellers or low-



end distributors, cannot be underestimated. In the same way, makers of SPARC-based systems in Europe have contributed to an expansion of the SPARC installed base. In fact, says Benson, of the RISC workstations shipped in Europe in 1990, SPARC accounted for 59%; MIPS, 15%; IBM Corp., 14%; and Intergraph Corp.'s Clipper, 10%. Hewlett-Packard Co.'s Precision Architecture PRISM, the Motorola Inc. 88000 and "others" make up the final 2%.

Benson attributes a healthy percentage of Sun's market growth to partners: "Sun has signed up quite a few systems integrators; it has improved on its indirect channels." For the same reason, she predicts, Sun will soon experience more competitive pressure from number-two competitor Digital Equipment Corp. (HP is number one.)

DEC will not find Sun sitting still, however. "Sun is mutating its internal structure, trying to build a very

leveraged organization so that our revenue command run-rate (revenue per employee) should increase," says Sun Belgium's Jaspaert. In fact, Sun Belgium, Sun's newest subsidiary, is the only one that is 100% indirect, says Jaspaert.

Although Sun Microsystems Ltd. still has substantial direct sales activity, indirect channels are the fastest growing part of Sun's U.K. business, says Alistair Houston, business and marketing support for indirect channels. "Historically, Sun's business was 70% to 75% direct, but that is changing very quickly. In the United Kingdom, it's now 45% indirect, and over the next 12 months it could reach 50%."

One of the biggest reasons for Sun's push to develop indirect channels is they are more cost-effective than direct sales for the low-cost desktop computers Sun is bringing to market, says Houston. Jaspaert agrees. "If you look at where the UNIX market is heading, we're talking about \$5,000 products on the desktop, productivity software running on UNIX instead of DOS or OS/2. It's a totally different market from five years ago, which was technical, R&D oriented. So we need a whole new approach to tackle that market, rather than the old approach of using only a high-end distributor."

Consequently, Jaspaert has been acquiring new low-end distributors, such as AB Computers in Brussels and two other as-yet-unnamed agents, all of which already are in place. He is also setting up a "special channel to handle the educational market." Among the 250 resellers in United Kingdom, says Houston, the PC-type dealers are working closely with Sun direct sales to get extra support in fulfilling corporate accounts. "They are taking an increasing share of Sun's business," he notes.

A willingness to work closely with partners is something that sets Sun apart from its competitors, says Klavs Skjerbek, marketing and sales manager for the CASE systems division of Computer Resources International A/S, a Copenhagen-based software house. In getting ready to commercialize the

integrated set of CASE tools it developed for the European Space Agency, CRI has been talking to Sun about Sun helping CRI market the product in the United States, since CRI has no presence there. The fact that CRI is 50% owned by IBM further demonstrates that Sun is open-minded, Skjerveb says. "I mean, they could say, 'Why should we work with you?'"

### Suffering SPARCalikes

For vendors of SPARC-based systems in Europe, the question of when and how to work with Sun is critical. Some SPARClike vendors that have tried to compete based largely on price have failed entirely. Others, which either aim their clones at non-Sun markets or provide services and systems not available from Sun, seem to be faring much better.

A recent price-wars victim was AFE Computers Ltd., which was the first

European vendor to begin making SPARC-based systems. It decided in September to end most of its Sun-compatible business. "The systems we've been selling are almost competitive to [the IPX] systems, and with recent pricing policy from Sun, we can't get into the market with the margins we need to stay in business," says an AFE executive who wished to remain anonymous.

AFE is refocusing its core business on making an industrialized version of its Sun-compatible for its own graphics software. It will also continue to sell graphics accelerators and graphics boards and motherboards for the Sun SPARCstation for OEMs. "We had hoped to focus on graphics, but now Sun has put the GX graphics accelerator directly onto the IPX, which makes it even more difficult for us to differentiate. Still, with industrial products, there's more

margin to play with; you can do more things," says the AFE manager.

"Of course we're upset and disappointed; we thought it was a business opportunity, but it hasn't worked out," he adds. "In fact, it seems Sun is killing off the clone market, because they themselves are so aggressive with product." Sun, of course, denies any such intent.

Christopher Dawes, managing director for U.K.-based MicroMuse Ltd., is more adamant. "You cannot sell SPARC clones into the Sun market on a price basis. You have to go into new markets where SPARCs aren't already enjoying a high penetration." MicroMuse makes and sells the Muse/ix 2000, a SPARClike clone that is based on the SPARC system manufacturing kit from Opus Systems.

In the educational market in the United Kingdom, for instance, Sun's own pricing is so good, "we've got

**S**olbourne Computer Systems Inc. may be the leading SPARC-system maker after Sun Microsystems Inc. in the United States, but in Europe it lags far behind Fujitsu Ltd.-owned ICL Ltd. in terms of market share

**SOLBOURNE EUROPE:** and recognition.

**A LONG ROAD AHEAD** The bulk of Solbourne Computer Europe users are British, with 48% of Solbourne Europe 1990 unit sales coming from the United Kingdom, according to Dataquest Europe S.A., Paris. Germany accounts for 25%, followed distantly by France, with 6%. It has virtually no sales in Italy or Spain; the rest of its sales are spread mostly throughout

Scandinavia and other northern European countries, says Dataquest.

Although no exact numbers are available, Dataquest says Solbourne sold only half as many units as ICL in 1990 and was bested by even U.K. SPARC-alike maker MicroMuse.

One of Solbourne's most prominent users, the British Broadcasting Corp.'s research division, chose its two Series 5/604 multiprocessor servers about two years ago, in part, because Sun did not yet have multiprocessing sorted out, says Steven Dancer, BBC research engineer. The BBC was already a Sun user and, he says, "I'm not sure we wouldn't have gone to Sun if they had had it [multiprocessing] together."

But Solbourne, which had not then been long established in the United Kingdom, was looking for a well-known U.K. user and gave the BBC a deal. "It was price-performance, really," says Dancer. "The two [servers] together were about 100 times more powerful than one of our [Digital Equipment Corp.] MicroVAX IIs." The servers are used primarily for the BBC's image-processing research into new high-definition television (HDTV) systems.

Greater power than its traditional 386-based systems was also why the London-based Royal Commission for Historic Monuments chose a Solbourne 800 as the central server for its Oracle database. The database will catalog and curate

the commission's 6 million to 7 million historic photographs, says operations manager Chris Watkins, and eventually the commission hopes the SPARC architecture will allow them to add the photographs themselves alongside the textual data.

"It's our first inkling of SPARC machines here," Watkins says, "but when we put the tender [RFP] out, the Solbourne machine outperformed the rest." It was the only SPARC machine in the competition, however.

And despite the BBC management's trepidation at choosing the unknown Solbourne, it now seems to think it was the right decision, says Dancer. In fact, the BBC has ordered a second Solbourne S4000 workstation.



For instance, says Dawes, SPARC-alikes can be sold on price more successfully into the UNIX PC market than into the Sun workstation market. This is partly because Sun is not concentrating on that market, but more importantly because the real price advantage to SPARC-alikes is vis-a-vis UNIX PCs, not Sun workstations.

He explains that commercially available UNIX PC operating system software, such as the Santa Cruz Operation Inc.'s Open Desktop or Interactive Systems Corp.'s Workstation Developer, cost up to £2000 (approximately \$3,500 U.S.). MicroMuse's Muse/ix systems include the X Window System, Motif and Open Look and the operating system for between £5,000 and £6,000 (\$8,800 to \$10,600 U.S.). In choosing instead a UNIX PC platform, Dawes notes, "Once you take £2,000 off for the operating system, that leaves £3,000 to £4,000 (\$5,300 to \$7,000 U.S.) for a PC, and you don't get a high-level UNIX PC for £3,000 to £4,000."

As a result, he says, between 50% and 60% of the SPARC-alike systems

MicroMuse has sold have been for customers wanting UNIX PCs, in what is quite an easy sale. "This month we're shipping in excess of 30 boxes and that gives us a good percentage of the U.K. SPARC market, maybe more than 1%," he says. MicroMuse expects to realize revenues of about \$2 million in 1991 and probably between \$5 million to \$6 million in 1992, says Dawes.

ICL, too, has been operating in system performance and vertical market areas different from those of Sun, says Peter Stuart, vice president of business development for the mid-range systems division. "Where Sun is most successful is where the customer needs a high-performance desktop workstation connected into UNIX file servers. That's the profile of Sun's mainstream business. Our business is much more using SPARC-based servers as an integrator in the enterprise between a variety of DOS PCs and traditional corporate mainframe systems, be they ICL, Unisys [Corp.] or Siemens," he says.

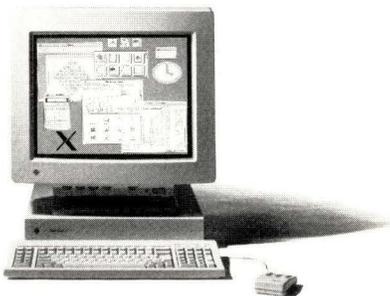
Until September, when Sun introduced its new 600MP multiprocessing

SPARC servers, ICL's SPARC-based DRS 6000 server line had occupied a part of the performance spectrum not covered by Sun. In fact, in anticipation of delays in getting the 600MP to market, Sun had signed a co-marketing agreement with ICL for the DRS 6000 Model 65, which was targeted mainly at the commercial market. With the arrival of the 600MP, the relationship has changed somewhat, resulting in a deemphasizing of the agreement.

"Certainly the emphasis a year ago was that we had a product, the DRS Model 65, that filled a hole Sun had in its product range. [With the marketing agreement], the amount of business we could do was small. We were compensating for a hole in their product range, and we understood [the agreement] as such," says Stuart.

Now, the differentiation from Sun involves ICL's use of UNIX System V.4 and its vertical-market expertise. "The 600MPs are implementations of SunOS," says Stuart. "When they get to SV.4 early next year, only then will they be where we were a few months ago.

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Circle No. 45 on Inquiry Card

## Companies

## Mentioned

## In This

## Article

**AFE Computers Ltd.**  
AFE House  
Anchorage Road  
Sutton, Coldfield, B74 2PG  
United Kingdom  
**Circle 129**

**Cray Research  
FPS Computing Division**  
P.O. Box 23489  
Portland, OR 97223  
U.S.A.  
**Circle 130**

**ICL Ltd.**  
1 High St.  
Putney, London, SW15 1SW  
United Kingdom  
**Circle 131**

**MicroMuse Ltd.**  
Unit 1L, Chelsea Reach  
79-89 Lots Road  
London, SW10 0RN  
United Kingdom  
**Circle 132**

**Opus Systems**  
329 North Bernardo  
Mountain View, CA 94043  
U.S.A.  
(Contact U.S. headquarters  
for European distributors)  
**Circle 133**

**RDI Computer Corp.**  
Stollenweg 2  
7080 Aalen 1  
Germany  
**Circle 134**

**Solbourne Computer Europe**  
Kembrey Park  
Swindon, SN2 6BL  
United Kingdom  
**Circle 135**

**Sun Microsystems  
Europe Inc.**  
Bagshot Manor  
Green Lane  
Bagshot, Surrey, GU19 5NL  
United Kingdom  
**Circle 136**

**Star Technologies Inc.**  
European Operations  
44 Walnut Tree Road  
Shepperton  
Middlesex, TW17 0SA  
United Kingdom  
**Circle 137**

**Tadpole Technology plc**  
Cambridge Science Park  
Milton Road  
Cambridge, CB4 4WQ  
United Kingdom  
**Circle 138**

**Toshiba Corp.**  
1-1-1 Shibaura  
Minato-Ku  
Tokyo 105, Japan  
**Circle 139**

**TriGem Computers (UK) Ltd.**  
69 Buckingham Ave.  
Slough Trading Estate  
Slough, Berkshire SL1 4PN  
United Kingdom  
**Circle 140**

ICL's established presence in certain vertical industries, such as local and central government (largely in the United Kingdom), utilities and retail, will continue to lend a complementary sheen to an otherwise more competitive relationship. Says Sun's Lovell, "We have a good relationship with ICL...they are present in some marketplaces we're not strong in, although a number of their products have capabilities that replicate Sun equipment, so the complementary nature of the relationship is in markets."

### Room At The Top

The high-end SPARC-based systems from FPS Computing and Star Technologies are sold into traditional Sun enclaves, such as universities and R&D organizations. However, their performance levels are such that they do not compete directly.

Both FPS and Star still have active joint-marketing agreements with Sun. "If you look at the spectrum, we're at the high end beyond, where the SPARC compute-server line ends, based on raw scalar performance," says

Thomas Hillman, the newly appointed managing director of international operations for Sterling, VA-based Star. "We compete with Convex Computer Corp., IBM, DEC and FPS."

Star is trying to leverage that joint marketing agreement by establishing a network of distributors in Europe that can support scientific computing and its Star 910 VP network server. "We're focusing on the United Kingdom, Germany and France because we believe those are the strongest three countries for scientific and engineering computational markets," says Hillman. At press time, Star expected to announce a distributor in Germany in November. In France, its products are available through its own offices in Paris.

Emerging areas where Star expects to establish distributorships include Scandinavia and Italy and/or Spain. Market growth in Scandinavia, says Hillman, is being driven by the petroleum industry, for which Star's 910VP is well suited. He says the 910 is specifically optimized for applications like computational fluid dynamics, seismic processing, computational chemistry

and signal and image processing.

Since Sun has yet to provide SPARC-based notebook or laptop computers, Toshiba, Tadpole Technology plc and others are left to pursue that market niche. Indeed, Sun has a good relationship with such companies, says Houston, of Sun U.K., because it sees their products as complementary to its own.

In Europe, says Benson, laptops from RDI Computer Corp. and TriGem Computers (UK) Ltd. have not been selling well. "There have been a lot of complaints about the hard disk, that you can only run a stripped down version of the operating system and that the screen quality is not so good," she says. It should be noted that RDI has amended these problems with recent additions to its product lines.

Toshiba's new SPARC laptop is said to be a better quality unit, but it won't be available in Europe until some time this quarter. When it does ship, MicroMuse intends to market and support it, says Dawes.

Providing SPARC-based systems that fall outside the Sun performance spectrum is the easiest way to succeed in the Sun market. Short of that, companies can protect their profit margins with custom services such as those provided by BIM and MicroMuse. "When we define the customer's problem in terms of items of hardware and software, they have a much greater incentive to buy the product from us because it's not a product readily available in commodity-level format," says Dawes.

But whether it be Sun or otherwise, everyone seems heartened by the fortunes of SPARC in Europe. As ICL's Stuart puts it, "Sun, in fact, has a common interest with ICL"—not to mention all of the SPARC-based system vendors—"in ensuring that the customer chooses SPARC-based systems. Once we've won that battle, we can decide which company gets the business." ➔

**Marsha W. Johnston** is a Paris-based freelance writer specializing in information technology.

# NEW PRODUCTS

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

## New and Improved QIC Drives

Wangtek has unveiled the 9200 Series. The 9200 streaming-cartridge tape drive stores up to 2.15 GB of data without data compression. The 9200C tape drive provides hardware data compression for capacities of 4.3 GB or more.

The drives are 5 1/4-inch form factor and offer features such as Auto Throttle, which permits the host to automatically adjust transfer rates from 440 to 600 KB/s for the 9200, and 800 to 1,200 KB/s for the 9200C for optimum performance. Another feature, SoftLoad, is an automatic cartridge-loading system. The Quick File Access feature provides a rapid means of accessing any file on a tape in two minutes or less.

In both models, the drive-interface switch is selectable to either SCSI 1 or 2, with a differential driver option. The products offer a burst-transfer rate of 4.8 MB/s and a MTBF rating of greater than 80,000 power-on hours at 10% tape motion.

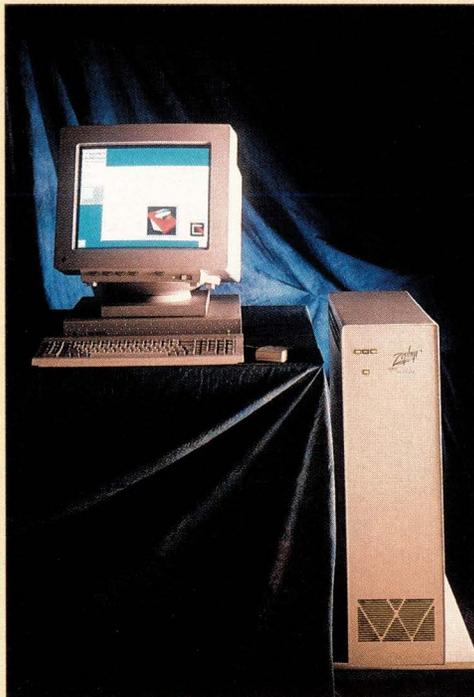
The 9200 lists for \$700 in OEM quantities; the 9200C for \$900 in OEM quantities.

**Wangtek**  
41 Moreland Road  
Simi Valley, CA 93065  
Circle 141

## Nikon Film Scanner

Nikon has announced availability of its next-generation 35mm film scanner, the LS-3510AF, for desktop computers and workstations. This updated film scanner reads color or monochrome 35mm film positives and negatives, and also includes such user-requested features as Autofocus, SCSI or GPIB interface, optional 12-bit processing

## Zephyr Takes Multiprocessor Wing



A desktide massively parallel computing attached processor has been introduced for Suns and SPARClikes.

Called the Zephyr, the product is a low-end version of the company's Data Transport Computer. The two models of the product each measure 8 inches wide, 23 inches deep and 29 inches tall. The Zephyr 4 contains 4,096 processing elements; the Zephyr 8 contains 8,192. The machines are used for volumetric rendering and other tasks that require the modeling of large samples in 3D.

Performing such tasks, the Model 8 is capable of computing speeds in excess of 700 million operations per

second. The company says the device has applications in medical imaging, signal processing, molecular biology and anything else requiring 3D sample modeling. Pricing on the Model 4 is \$85,000; the Model 8 is \$150,000.

**Wavetracer Inc.**  
289 Great Road  
Acton, MA 01720  
Circle 147

and a free-rotation slide mount.

The 3500 scanner converts analog data to digital while reading 256 gradations each of red, green and blue in 24-bit code to reproduce more than 16.7 million colors. Nikon will continue to bundle the customer's choice of PhotoShop or ColorStudio software for the Mac and PhotoStyler for IBM PC and compatibles.

List price is \$8,995.

**Nikon Inc.**  
Walt Whitman Road  
Melville, NY 11747-3064  
Circle 142

## Colormaster Printer

CalComp has introduced the ColorMaster Plus family of color-thermal-transfer printers aimed at the business-presentation graphics, publishing, graphic arts and CAD markets. The printers

come in two models: Model 6603, which prints 8 1/2-by-11-inch letter size, and Model 6613, which prints both letter size and 11-by-17-inch tabloid size.

The PostScript version outputs from Mac, IBM and compatible PCs, and UNIX workstations, and prints in Pantone-approved color simulations. This version comes standard with RS232C serial, Centronics parallel, AppleTalk and SCSI interfaces.

Suggested retail prices: 6603PS is \$6,995 and the 6613PS is \$9,995; both include a one-year on-site warranty.

**CalComp**  
P.O. Box 3250  
Anaheim, CA 92803  
Circle 143

## HyperSpace Shuttle Blasts Off

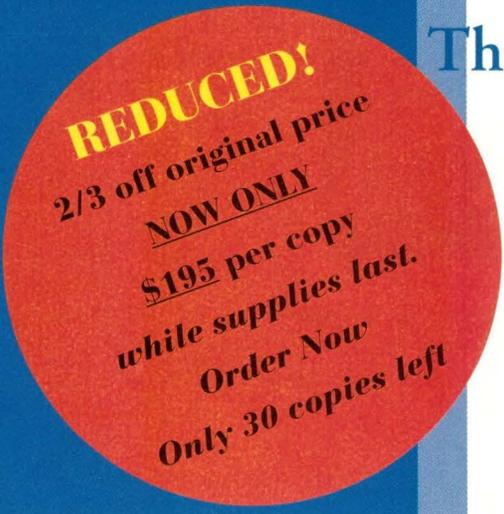
Ricoh's File Products division has

# SPARCalikes: *Opportunity is Not Enough*

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The report covers both the marketing and technological issues driving the market for desktop SPARC-based systems. This is not a product catalog. We provide strategic evaluations of each company's market strategy.



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**SUNEXPERT**

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announced the HyperSpace Shuttle, a 3.25-GB, plug-and-play compact desktop library. The library uses five 5 1/4-inch, 650-MB, ISO-standard rewritable optical cartridges. It has been designed to function as near-line storage for networked workgroup environments, operating in conjunction with primary storage devices. Where fast retrieval is required, it can also serve as a backup device while unattended, or provide systemwide backup with available third-party backup software solutions.

The library will be available for NetWare 386, Sun, DOS 5.0 and Windows 3.0 workgroup environments. The unit will be sold as a turnkey solution. Pricing for these versions is as follows: NetWare 386, \$8,990; SunOS, \$8,990; DOS 5.0 and Windows, \$7,990.

**Ricoh Corp.**

File Products Division  
5150 El Camino Real, Ste. C-20  
Los Altos, CA 94022  
Circle 144

**It's UNIX Magic**

Magic Software Enterprises has introduced a UNIX version of its

Magic family of application development tools. The UNIX System V version supports simultaneous application development for multiuser installations—especially useful to programmers in workgroup situations. This version, Magic II for UNIX, is fully compatible with Magic for DOS.

Magic's family of "codeless" front-end application tools create a visual, menu- and table-driven development environment aimed at developers who want to speed up development time in creating turnkey systems. Because applications are described rather than coded, Magic's design cycle enables users to move quickly from prototyping to execution, with no interim coding, debugging and compiling. Once created, Magic applications can be ported transparently across a variety of software and hardware platforms, including DOS and OS/2. Users may also access database files residing anywhere on a LAN, WAN or standalone system.

Platforms supported include SCO 386 UNIX System V Release 3.2, as well as versions for the Sun SPARCstation, IBM RS/6000, HP 9000

300/400 and 700/800 Series, and others. Users can choose from GUIs such as X11, Motif and Open Look. In addition to running under UNIX, Magic operates under the Novell NetWare, Microsoft LAN Manager and Banyan Vines network operating systems. The product also supports the TCP/IP and NFS protocols.

Run-time pricing for SPARCstations starts at \$1,500.

**Magic Software Enterprises Inc.**  
1200 Main St.  
Irvine, CA 92714  
Circle 145

**Three New Thermals**

Three thermal printers capable of producing high-quality color images from a variety of digital or video sources have been introduced by Eastman Kodak.

The Kodak XLT7720 digital continuous-tone printer, the S6600 thermal printer, and the P6600 thermal printer produce photographic-quality images on paper, transparencies and other media. The high-quality output stems from the printer's ability to produce

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**Expand the Sun**

Aurora offers new expansion options for SPARC workstations.

FD350 (3.5") and FD525 (5.25") SCSI Floppy subsystems offer local storage and allow easy PC data sharing.

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more than 16.7 million colors and 256 shades of gray.

This Kodak 6600 series of printers accepts NTSC and RGB video and digital signals, making them compatible with a variety of image sources including video cameras, VCRs, optical disk systems, scanners, image-analysis systems and more.

List price is \$4,300 each.

**Eastman Kodak Co.**  
343 State St.  
Rochester, NY 14650  
Circle 146

### Fast Disk Subsystem

A high-speed, high-capacity 3 1/2-inch SCSI disk drive subsystem for Suns and SPARClikes has been introduced by Acropolis Systems.

Called the ASI-3S-1004, the subsystem incorporates an IBM disk drive that features a formatted capacity of 1.004 GB. It has an average access time of 9.8 ms. Track-to-track seek time is 0.6 ms.

The company says that the ASI-3S-1004's drive spins at 4,316 rpm, which reduces latency to 6.95 ms and trans-

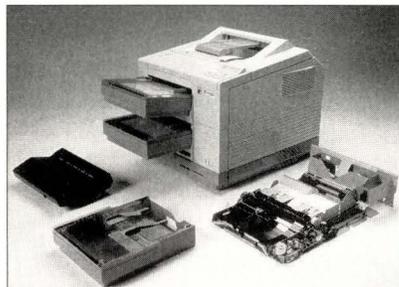
fers 5 MB/s. It uses two head elements per disk: one for write operations and the second for read.

**Acropolis Systems Inc.**  
1638 Centre Pointe Drive  
Milpitas, CA 95035  
Circle 148

### Multinetwork Printer

QMS has introduced a 17-ppm, 600-dpi printer that the company says is optimized for UNIX-oriented networks.

The QMS-PS 1700 connects directly to Ethernet or token-ring networks with optional interface cords. The Ethernet connection supports either DECnet, TCP/IP, NetWare or EtherTalk. Up to four simultaneously active interfaces include



standard RS232C, Centronics parallel and LocalTalk.

Based on an Intel i960 processor, the printer comes with 8 MB of RAM (expandable up to 16 MB). It uses the 17-ppm Canon NX printer engine, with a 100-sheet input capacity and 50,000-page-per-month duty cycle. The printer also supports letter- and legal-sized paper, as well as envelopes, transparencies and label stock.

**QMS Inc.**  
One Magnum Pass  
P.O. Box 81250  
Mobile, AL 36689-1250  
Circle 149

### Modula-2 Library

Odegard Labs has introduced a module library for users of Sun's Modula-2 compiler.

Called the Modula Collection, the library contains modules supporting of streams; multiprogramming (including lightweight processes); networking and abstract data types such as bags, sets, stacks, queues, sequences; and dictionaries.

The collection runs under SunOS

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#### APRIL

##### **The State of SPARC**

Multiprocessors: From Chips to Servers  
Chip Vendor Profiles  
Whither SCD 2.0 and SPARC International

#### MAY

##### **GUI Standards**

Interface Toolkits  
Motif vs. Open Look  
X Protocol Update

#### JUNE

##### **Optical Disks**

Rewritable Drives  
CD-ROM and Software Distribution  
Survey of Optical Disk Vendors

#### JULY

##### **Suns in CAD/CAM**

What's New Under the Sun:  
Best of the New SPARC CAD Offerings  
3D Extensions

4.1.1 and requires Sun's Modula-2 v2.3 and 3 MB of available disk space. Pricing for a one-to-three-user license is \$2,000; additional users can be added for \$500 each.

**Odegard Labs Inc.**

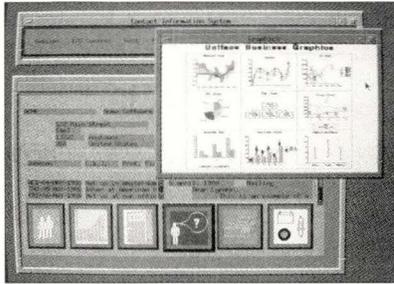
100 Bush St., Ste. 625  
San Francisco, CA 94104  
Circle 150

**Graphical Package for 4GL**

A business-graphics package for the Uniface 4GL has been announced by Uniface.

The Graftsman option gives users of the company's popular fourth-generation language (which runs on top of such RDBMSes as Sybase, Oracle, Ingres, Informix, Rdb and RBASE) additional display facilities. Developed by the Wichita, KS-based Softtek International Inc., the product can be used to display data from multiple DBMS in a graphical format onscreen or in printed form.

The company says that Graftsman allows the user to design a chart template with control over the size, color,



style and placement of every element in the graph. Any number of templates can be combined, mixing pie, bar and line charts with a single display. It supports a range of output devices, including bit-mapped displays, dot-matrix and laser printers, plotters and film recorders. Pricing ranges from \$325 to \$32,000 based on configuration.

**Uniface Corp.**

1420 Harbor Bay Parkway, Ste.140  
Alameda, CA 94501  
Circle 151

**SCSI Installation Software**

SpeedStor, a program that automates the process of installing generic SCSI hard drives on SPARCstations, has been

introduced by Storage Dimensions.

The product runs on a SPARCstation and prepares a drive in as little as 10 minutes. The product also provides on-going management of SCSI drives via screen icons and object-oriented diagnostics.

SpeedStor monitors SCSI devices and a dynamic status panel pops open to warn of any potential problems. The product's partition manager lets users custom partition any hard drive, while its filesystem management and protection features allow users to create, check, locate, mount and unmount filesystems. A built-in warning feature alerts users if a newly created filesystem will affect existing files. Pricing is \$149.95 per node and \$499.95 per domain.

**Storage Dimensions**

2145 Hamilton Ave.  
San Jose, CA 95125  
Circle 152

**Digital Audio Interface for Suns**

Ariel has introduced a self-contained digital audio interface unit that brings recording-studio-quality sound to Sun systems.

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**One Year Warranty**

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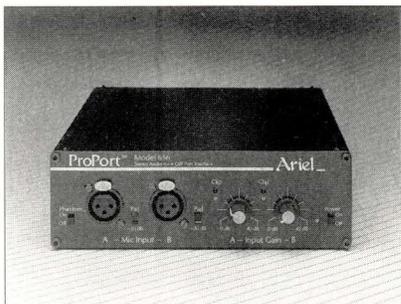
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**Aurora Technologies**  
176 Second Avenue  
Waltham, MA 02154  
617-290-4800  
617-290-4844 Fax

**Lifetime Support**



Called the ProPort Model 656, the product links to a Sun or SPARClike to provide analog audio. Its sample

rate is selectable from 5 kHz to 96 kHz, and it comes standard with tracking input filters to prevent aliasing. In addition, the company says that ProPort has continuous gain controls to ensure optimum dynamic range for signals of any amplitude. It can also function as a general-purpose data-acquisition instrument.

ProPort provides two channels of 20-bit, eight-times-over-sample digital-to-analog conversation. The output stage of each channel accepts a

16-bit word from the host system and uses a digital LSI interpolating filter to unsample by a factor of eight. Pricing begins at \$1,585.

**Ariel Corp.**

433 River Road  
Highland Park, NJ 08904  
Circle 153

### SoftPC 2.1

Insignia Solutions has introduced version 2.1 of its SoftPC package for Suns.

SoftPC lets the user emulate a PC/AT running an Intel 80286 CPU and an 80287 math coprocessor. The 2.1 upgrade also adds an IBM-compatible VGA BIOS. This gives users access to the display modes, resolutions and attributes of the IBM Color/VGA and IBM Color Display. The VGA, CGA and EGA Hercules adapters are supported on both color and monochrome Sun monitors.

SoftPC runs as a window on a Sun screen, while the rest of the system continues to run SunOS applications. Multiple SoftPCs can run concurrently. Pricing begins at \$695.

**Insignia Solutions Inc.**

6 Campanelli Drive  
Andover, MA 01810  
Circle 154

### Tek RGB Printer

Tektronix has announced a 300-dpi thermal wax-transfer, color-screen printer.

The RGB III can manage several papers sizes, including A, legal, A4 and A4 Special. It provides users two different palettes of 4,096 colors each: one for standard output and one for optimized color adjustment.

The RGB III links to its host via a fiber-optic cable and can capture and print a screen image in 43 seconds. Base configuration is 2 MB of memo-



## Books That Help People Get More Out of Computers

### Learning GNU Emacs

By Deb Cameron & Bill Rosenblatt  
442 pages, ISBN 0-937175-84-6, \$27.95

This book is an introduction to the GNU Emacs editor, one of the most widely used and powerful editors available under UNIX. It provides a solid introduction to basic editing, a look at several important "editing modes" (special Emacs features for editing specific types of documents), and a brief introduction to customization and Emacs LISP programming. The book is aimed at new Emacs users, whether or not they are programmers.

### Power Programming with RPC

By John Bloomer  
500 pages (estimated), ISBN 0-937175-77-3, \$29.95 (estimated)

RPC, or remote procedure calling, is the ability to distribute the execution of functions on remote computers. Written from a programmer's perspective, this book shows what you can do with RPC and presents a framework for learning it.

### Essential System Administration

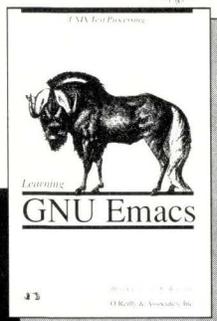
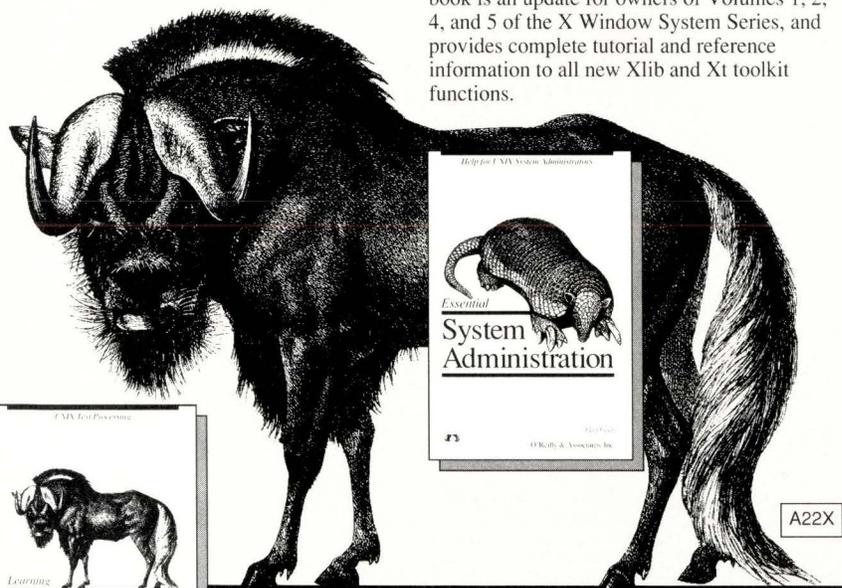
By Eileen Frisch  
466 pages, ISBN 0-937175-80-3, \$29.95

*Essential System Administration* provides a compact, manageable introduction to the tasks faced by everyone responsible for a UNIX system. This guide is for those who use a stand-alone UNIX system, those who routinely provide administrative support for a larger shared system, or those who want an understanding of basic administrative functions, on all major versions of UNIX.

### Programmer's Supplement for Release 5 of the X Window System, Version 11

By David Flanagan  
390 pages, ISBN 0-937175-86-2, \$29.95

For programmers who are familiar with Release 4 of the X Window System and want to know how to use the new features of Release 5. This book is an update for owners of Volumes 1, 2, 4, and 5 of the X Window System Series, and provides complete tutorial and reference information to all new Xlib and Xt toolkit functions.



**O'Reilly & Associates, Inc.**

103 Morris St., Suite A • Sebastopol, CA 95472  
(800) 338-6887 • (707) 829-0515 • nuts@ora.com

ry and one video adapter. Pricing begins at \$7,800.

**Tektronix Inc.**  
Graphics Printing and Imaging  
MS 63-630  
P.O. Box 1000  
Wilsonville, OR 97070  
Circle 155

### **PCs Into X-terminals**

A package that turns Intel 286/386/486 PCs into X-terminals has been introduced by Age Logic.

XoftWare for DOS turns a PC equipped with a high-resolution video adapter—such as the Hercules MDGA, EGA, VGA, SuperVGA and so on—into an X-terminal. The company says that XoftWare is fully functional under DOS 5.0.

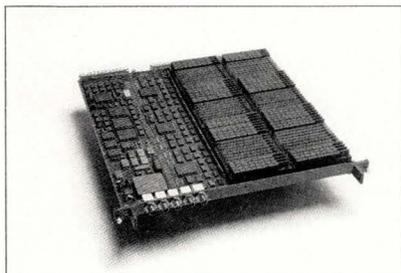
XoftWare is the former Xsight from Locus Computer. Age purchased Xsight and has reissued it with several enhancements. XoftWare has a hot-key facility that allows users to switch back and forth from the X Window System and MS Windows by clicking on icons. Xoftware is priced at \$395. Bundled with TCP/IP software, it is \$465.

**Age Logic Inc.**  
9985 Pacific Heights Blvd.  
Ste. 200  
San Diego, CA 92121  
Circle 156

### **VME Frame Buffer**

A high-capacity frame buffer that competes with rotating media has been introduced by Viewgraphics.

The Viewstore is a 9U by 400mm VME board that can hold up to 384 MB of 24-bit true-color image data. The company says that this provides enough on-board storage for one 10,000-by-10,000-pixel true-color RGB image, or 72 HDTV images or



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Circle No. 2 on Inquiry Card

372 standard TV images. This provides up to 12 seconds of video storage, which means the board is competitive with some disk-based digital TV storage techniques.

The company says that the Viewstore is meant for applications in HDTV, multimedia, virtual reality, film animation, satellite-image analysis, geophysical mapping, pre-press and medical imaging. Additionally, the board comes with a suite of software utilities to make application-development easier. Pricing ranges from \$25,000 to \$49,000.

**Viewgraphics Inc.**  
1185 Terra Bella  
Mountain View, CA 94043  
Circle 157

### **FMS For Star**

Star Technologies has introduced a version of Multipath Corp.'s Fast Matrix Solver (FMS) matrix algebra package optimized for its SPARC-based supercomputer.

The optimized FMS will run on the Star 910/VP server, a multiprocessor system with top speeds of up to 80

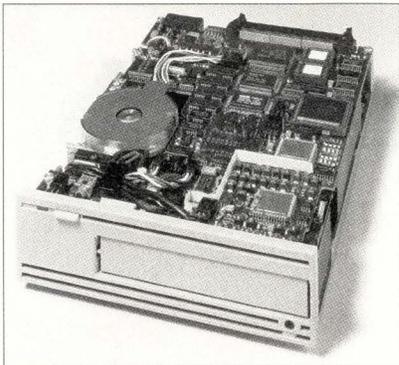
MFLOPS. FMS is the programming standard for matrix algebra operations on large matrixes. It is a library of FORTRAN- and C-callable routines that can be incorporated in new or pre-existing applications. The FMS package stores itself on disk, bringing it into system memory only when needed. This means that users can solve problems that would otherwise exceed the physical memory of their machines. Pricing for FMS on Star begins at \$20,000.

**Star Technologies Inc.**  
515 Shaw Road  
Sterling, VA 22170  
Circle 158

### **Anaconda Gobbles Gigas**

Two 2.1-GB tape drives have been introduced by Archive Technology.

Both members of the company's Anaconda line of drives, the Model 2800 and 2850 provide a formatted capacity of 2.1 GB on a single cartridge. The company says the drives provide a data-transfer rate of 600 KB/s. The Anaconda product line also includes the 1.6-GB 2750 and the 4.2-GB 2850C.



The Model 2850 has a 2-MB memory buffer and a hardware-data-compression option that can double the capacity of the drive to 4.2 GB. Both drives have a recording accuracy of less than one hard error in  $10^9$  bits of data. The drives have a rated MTBF rating of 80,000 hours, based on a 20% duty cycle. The 2800 is \$950; the 2850 is \$1,000.

**Archive Technology Inc.**  
1650 Sunflower Ave.  
Costa Mesa, CA 92626  
Circle 159

### vi Class On Tape

A cassette tape that teaches the use of the *vi* editor has been introduced by Specialized System Consultants.

The course material consists of hard-copy reference texts on UNIX and *vi* plus a cassette. The user listens to the tape while trying out commands at a terminal. A workbook provides exercises. The taped class covers *vi* concepts, editing, *ex* mode, buffers, substitutions, line addressing, regular expression, and setting options.

The course also comes with an exam that the user can take and return for a certificate of completion from SSC. The *vi* Audio Course is \$39.95.

**Specialized System  
Consultants Inc.**  
P.O. Box 55549  
Seattle, WA 98155  
Circle 160

### 128 Ports For Suns

Novadyne Computer Systems has introduced two new serial port expander products that can give Sun boxes access to up to 128 additional serial devices.

The Novaport Asynch Expander

products consist of the Novaport Desktop Expander and the Novaport Deskside Expander. The desktop unit is a chassis that links to a Sun workstation via an SBus card and cable to provide up to 32 ports. Four desktops can be linked, for a total 128 ports.

The Deskside product is a tower unit that provides up to 128 ports as well as bays for additional tape or disk drives. Two towers, each with its own SBus card, can run off a single system to provide a total of 256 ports. The company says that the latter configuration would lend itself particularly well to multiple dumb terminals, perhaps doing order entry, running off a single



multiple processor 600MP.

The Novaport supports software-programmable data rates of up to 38.4 KB/s. Data rates of 9,600 bps are supported when all or more than 32 serial ports are operating simultaneously. The Desktop unit is \$2,995. The Deskside is \$5,595.

**Novadyne Computer Systems Inc.,**  
1700 E. St. Andrew Place  
P.O. Box 35060  
Santa Ana, CA 92705-6560  
Circle 161

### Reliability Rating Service

A service measuring the failure records of UNIX workstations has been introduced by Reliability Ratings.

The reports, which come in the form of a regular newsletter, track the reliability and general-service histories of workstations from such ven-

dors as AT&T, DG, HP, IBM, Silicon Graphics and Sun. The report also tracks the performance of disk drives, tape drives, memory boards, printers and other peripherals that run off UNIX workstations.

The company gets its data from surveys of end users. The reports cover field reliability, including MTBF, predictive failure rates, availability/uptime percentages and the cause of failures. They also note customer-satisfaction data, list new prices and forecast residual values of the equipment surveyed.

Included in the service is telephone access to the company's analysts via a hotline. The monthly reports are priced at \$395 a year for end users, and \$500 a year for vendors.

**Reliability Ratings**  
163 Highland Ave.  
Needham, MA 02194  
Circle 162

### New Technology

Graphical Software Technology has announced availability of a spreadsheet application module, as part of 2.0 Xtra XWidgets. In addition to spreadsheet computing, this release adds a hypertext facility, a toolkit for building application help capabilities, an automated form layout tool, engineering graphics and other modular application components to the business graphics tools provided in earlier releases.

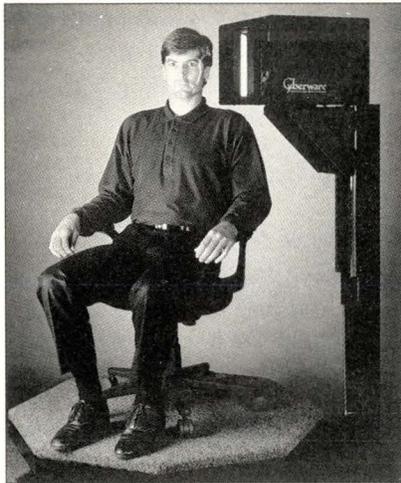
Xtra XWidgets follows the X Window System API standard and can easily be incorporated into any UNIX application. Fully interactive user interfaces are supported through a callback facility. XWidgets is implemented in C and is available in a wide variety of UNIX computing environments including Sun, IBM, HP and Interactive 386.

Pricing for single-user workstations is \$795. Discounts for multiuser network configurations are available.

**Graphical Software Technology**  
1559 E. Pacific Coast Highway  
Ste. 300  
Hermosa Beach, CA 90254  
Circle 163

### 3D Digitizing Platform

A motion platform that allows users



to scan objects such as the human head quickly and easily has been introduced by Cyberware. The platform works with Cyberware's 3030 family of rapid 3D color digitizers to produce accurate, full-color 3D computer models in less than 30 seconds.

The digitizer uses a light beam and video camera to capture all details of color and shape with a resolution as fine as 0.5mm. The resulting 3D computer model can be viewed on a graphics workstation or an IBM PC-compatible computer, using Cyberware software. This software allows users to control the scanning process, manipulate the computer model's shape, and convert the model for use in CAD programs. Users can reproduce the object, or a modified version of it, on automated milling machines and rapid prototyping systems.

Engineers, doctors, artists and film makers have made use of such scanning devices, and the motion platform will suit applications involving objects that are normally inconvenient to place on moving platforms.

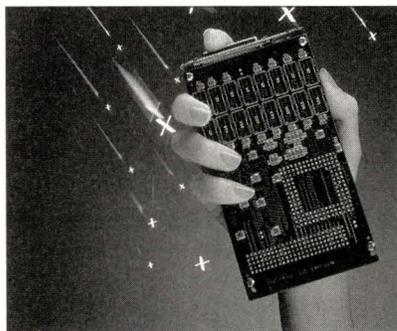
Price is \$8,000.

**Cyberware**  
8 Harris Court  
Monterey, CA 93940  
Circle 164

### **Mega Acceleration**

Megatek has announced X-Cellerator MX, a one-slot plug-and-play solution that dramatically accelerates text and graphics performance for the X Window System. This product supports a video resolution of 1280

by 1024 at 60 Hz, features off-screen memory and operates with the Sun SPARCstation, IPC, IPX and SPARC-compatible workstations. X-based software applications and the OSF/Motif and Open Look graphical user interfaces are accelerated on the



Megatek board. Also supported are SunView, OpenWindows, and applications that run on a Sun CG3 color frame buffer.

Each X-Cellerator MX includes X software, driver, CG3 compatibility, a dedicated graphics coprocessor, 4 MB of local memory, a hardware cursor, a keyboard port and an 8-bit color frame buffer.

Suggested list price is \$2,850 (4 MB of memory). Discounts offered to VARs and OEMs.

**Megatek Corp.**  
9645 Scranton Road  
San Diego, CA 92121  
Circle 165

### **DEC Does Windows**

DEC has announced a family of X Window System terminals—the VXT 2000 family. These terminals are designed to make efficient use of all aspects of the customer's existing computing and networking environment. It uses local X-terminal client applications to reduce the demand for host and network resources while implementing a distributed style of computing, providing fast access to data.

The seven members of the VXT 2000 family all have a resolution of 100 pixels and a flicker-free refresh rate of 72 Hz. Models are available in color, grayscale and monochrome, standard with 4 MB of memory expandable to 16 MB.

Prices range from \$1,999 for a 15-

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inch monochrome terminal to \$5,895 for a 19-inch color terminal.

**Digital Equipment Corp.**  
146 Main St.  
Maynard, MA 01754  
Circle 166

### **Network Print Server**

FastPort, MiLAN's new network print server, is available for under \$1,000 and allows a printer to be connected directly anywhere on a UNIX network. The server provides a TCP/IP interface for the printer, which means the server and attached printers can be placed near users who need them, rather than tied down to the location of a network file server. Higher speed is also a plus; FastPort runs up to 15 times faster than other parallel port servers.

A 16-bit microprocessor powers sustained transfer rates of 30 KB/s, which allows UNIX workstation users on a TCP/IP Ethernet network to use high-speed laser printers and plotters. FastPort has a generic parallel port that communicates with Adobe's Transcript software for PostScript printing.

Printers attached to the server can be accessed by any user on the network under standard UNIX print utilities such as lpr and lpd. List price is \$899.

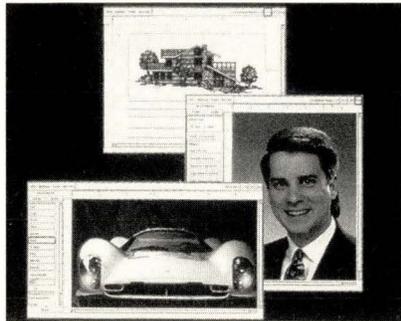
**MiLAN Technology Corp.**  
67 East Evelyn Ave., Ste. 3  
Mountain View, CA 94041  
Circle 167

### **Manipulation Software**

Mentalix has introduced Pixel!FX, a software package that allows users of UNIX workstations to incorporate and manage digital image information. It includes multiple toolkits that enable users to scan, view, manipulate and print various types of image data, including line art, grayscale and true-color images.

The toolkit includes Pixel!SCAN software that allows for scanning of images on a variety of scanners with control over resolution, intensity, contrast and mode. Also included is Pixel!MARK, an image retouch/annotate toolkit that attaches directly to the image window and provides drawing,

copying, pasting, text insertion, rotating and scaling. Pixel!IMAGE is an image filter and transform tool that provides smoothing, sharpening, shadowing and format conversion.



Pixel!PRINT, another tool included, offers optional interactive image placement and manipulation, and provides a direct interface to the Kodak XL-7700 color printer. Pixel!OCR, an optional optical-character-recognition tool, provides an omnifont recognition engine to convert line art images of text to ASCII. Price is \$995.

**Mentalix Inc.**

1700 Alma Drive, Ste. 110  
Plano, TX 75075  
Circle 168

### **New Hub Approach**

Accton Technology has released the EtherHub 1000 System, the first item in a line of component-based network-management products yet to come. The EtherHub 1000 System consists of two hardware components and network-management software based on SNMP. The EtherHub approach allows network managers to install low-cost dumb Ethernet concentrators, then add SNMP management capabilities with an external SNMP module for an equally low price.

The first component in the system is the EtherHub-12i, a 12-port, 10-Mb/s standalone wiring concentrator that can be used as a standalone unit to link up to 12 workstations into a single local area network, or it can be linked up to 14 other EtherHub-12i units. The Hub conforms to the IEEE's 802.3 10BASE-T standard and uses RJ-45 connectors.



# Availability



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The second component is the EtherHub-MGT. It supports both in-band and out-of-band SNMP management and comes bundled with Accton's NMS, AccView. The EtherHub-MGT can manage up to 14 networking devices, such as other hubs, bridges and repeaters. It is equipped with a 16-MHz 80C186 microprocessor with 640 KB of RAM to store SNMP information, 8 KB of EEPROM to save configuration parameters, and 256 KB of ROM to store initialization and diagnostic data.

The software utilized is Accton's own NMS, AccView, which runs under Microsoft Windows 3.0. The software requires 1 MB of RAM, and can monitor up to 14 EtherHub concentrators in a single configuration map.

EtherHub-12i retails at \$1,099; EtherHub-MGT at \$899 (including AccView software).

**Accton Technology Corp.**  
46750 Fremont Blvd., Ste. 104  
Fremont, CA 94538  
Circle 169

### **Parallel Ports**

Aurora Technologies introduced its high-performance SBus parallel card designed for CAD users, desktop publishers and others with demanding hardcopy output applications. The Multiport Model 20S+ is a dual high-speed, bidirectional parallel port SBus card specifically designed for SPARC workstations. Each card includes two high-speed parallel ports; each can support either the standard Centronics parallel interface, or a user-specified, general-purpose eight-bit interface. The 20S+ features the RISC-based, Cirrus Logic CD1190 Intelligent I/O controller, and FIFO buffers for enhanced performance and application versatility.

The Model 20S+ comes complete with a molded breakout cable, a simple-to-install SunOS device driver, a user's guide and a one-year limited warranty. Price is \$595.

**Aurora Technologies Inc.**  
176 Second Ave.  
Waltham, MA 02154  
Circle 170

# SUG notes

## Elections, CDs, Discounts and More

by PETER H. SALUS,  
Executive Director

There is a good deal of news to report, so I'll jump right in.

The December (San Jose) conference and exhibit had a total attendance of just over 3,700 folks, a bit lower than 1990, but more than double 1989. The tutorials appeared to be exceptionally popular, so we are already at work on our future offerings.

While the next SUG conference is in December, we are cooperating with Sun Open Systems Expo on their February and July events: February in

Chicago, July in Anaheim, CA. SUG will be mounting four tutorials in February and sponsoring eight technical talks; July may see us offering even more tutorials at the Expo. Slated for February tutorials are Rob Kolstad and Evi Nemeth, William LeFebvre, Tom Christiansen and Dan Klein.

### SUG Elections

The autumn elections saw Stan Hanks and Barry Shein re-elected, and S. Lee Henry elected to the Board. Stan was then elected president of SUG for 1992; Mark Seiden was re-elected vice president; Barry Shein remains treasurer, and S. Lee Henry was named secretary. The Board expressed its gratitude to Doug Kingston (who remains on the Board) for his six-month service as president, and to Frode Odegard, for his three years of activity as a Board member.

### CDs and Other Matters

The SUG CD has sold relatively well—over 600 to December 1—and it appears that SUG will make two CDs available in 1992. One may be available to the membership as early as the February Sun Expo in Chicago.

As SUG has expanded its scope—as I

write, the machine `sug.org` has become a Tatung, graciously donated to the User Group—into SPARC vendors and licensees, we are embarking on a membership drive. If you are reading this and are interested in the many benefits available to SUG members, send email to `office@sug.org` or mail to Sun User Group Inc., Ste. 315, 1330 Beacon St., Brookline, MA 02146.

Speaking of Tatung's donation, our access to the network is now by way of modems donated by Telebit. Our gratitude to Majid Eskandari (at Tatung) and Mike Ballard (at Telebit) is enormous: Now all we need is a good printer!

Our member benefits keep waxing: SUG has made an arrangement with the Usenix Association so that SUG members can attend Usenix conferences at member rates (this is reciprocal) and can subscribe to *Computing Systems* at a discounted rate. SUG members also receive discounts on Addison-Wesley, O'Reilly & Associates and SPARC International publications. We hope to increase this list of discounted publications over the next few months.

### LUGs and National Groups

There is an ever-increasing number of Local User Groups and of European and Pacific Rim National Sun User Groups. We are attempting to keep the list correct and up to date and it will appear in the fall issue of *README*. In the summer issue, there will be a member questionnaire. We at SUG have found that we really want to know more about our membership, what they are interested in, and what they like or don't like. In the days when there were under 3,000 copies of *README* mailed each quarter, this was less of a problem. Now that we have over 9,000 readers, just who all of you are is important.

The membership is the lifeblood of our organization. We want to do everything possible where the users of Sun's equipment, SPARC equipment, peripherals and software are concerned.

Join the Sun User Group! Let us know what you want. Visit Sun Expo in February in Chicago; talk to us.

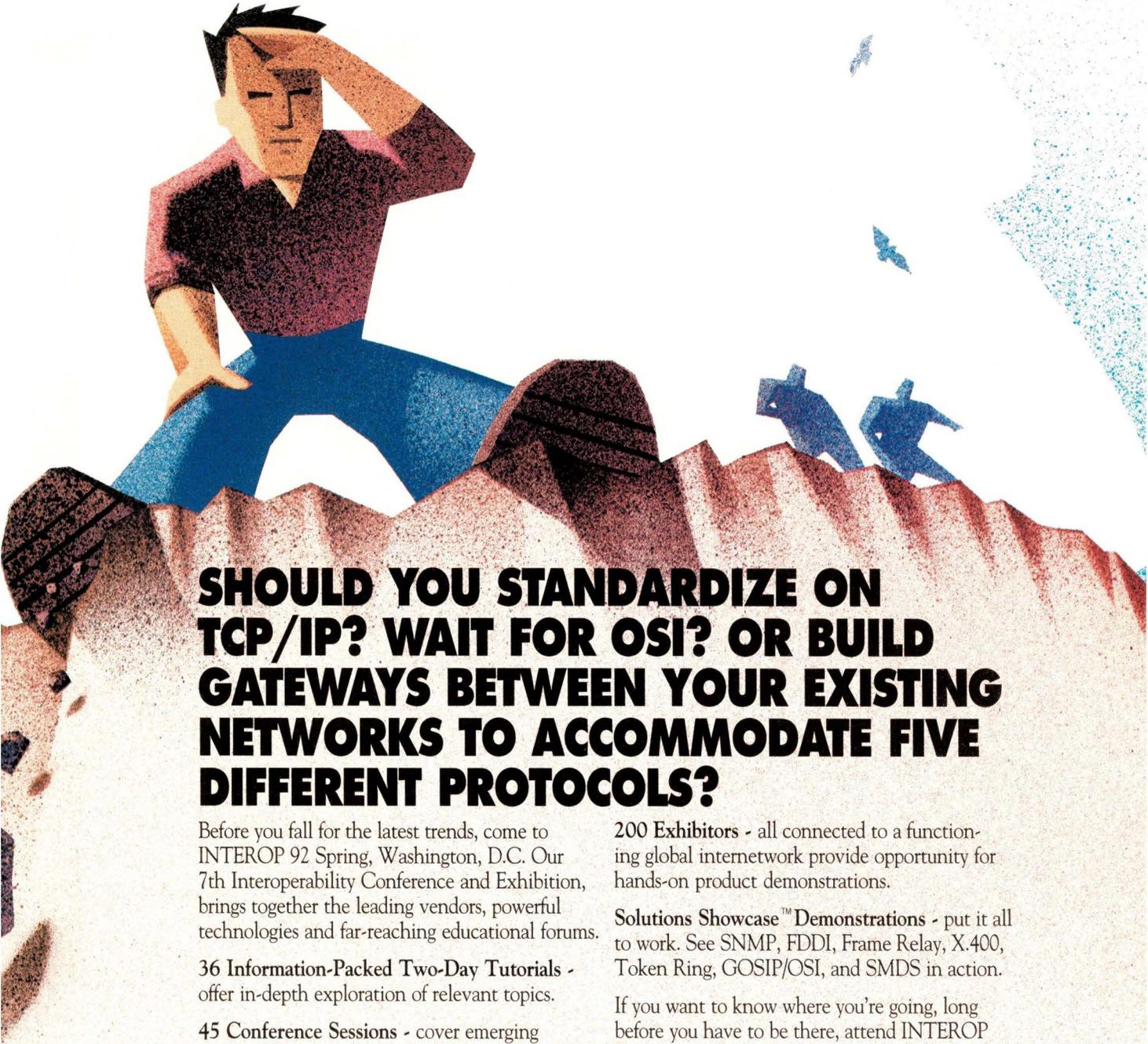
### February Fare

#### SUG Tutorials for February 19, 1992, in Chicago:

- Tom Christiansen (Convex Computer), Perl
- Dan Klein (Software Engineering Institute, Carnegie Mellon University), UNIX Device Driver Design
- Rob Kolstad (BSD Inc.) & Evi Nemeth (University of Colorado), Topics in System Administration
- William LeFebvre (Northwestern University), The Internet and Its Protocols

#### SUG Papers for Chicago

- "I'll bet I can guess your password! Exercises in password cracking and password security," Daniel V. Klein, Software Engineering Institute, Carnegie Mellon University
- "SPARC Compilers," Keith Bierman, SunPro
- "Introduction to Disk Drives: Practical Information for the Systems Administrator," Dinah McNutt, Pencom Software Inc.
- "Vendor Support via Network Services," Mary E. Riendeau, Software Tool & Die
- "SPARC Meets 386: Two Heads are Better than One," Brian Rosen, Mars Microsystems
- "Is There a Future SPARC Market?," Michael Jay Tucker, *SunExpert Magazine*
- "Solaris on the Dell," Charles Sauer, Dell Computer
- "GNU and Other Free Software," Stephan von Bechtolsheim, Integrated Computer Software Inc.



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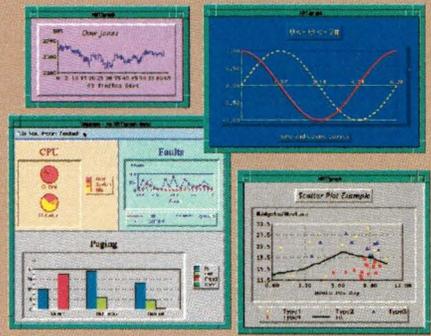
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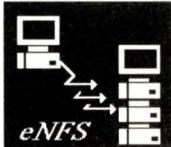
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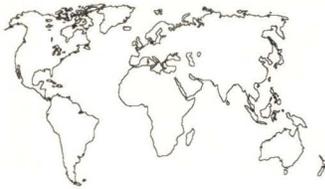
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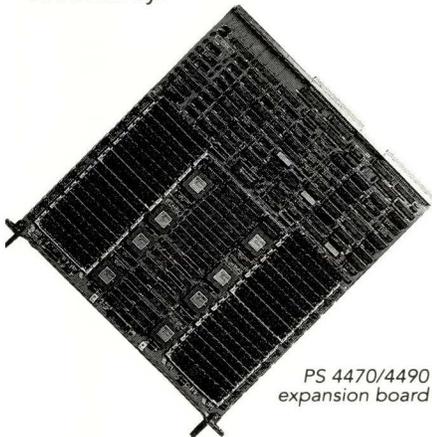
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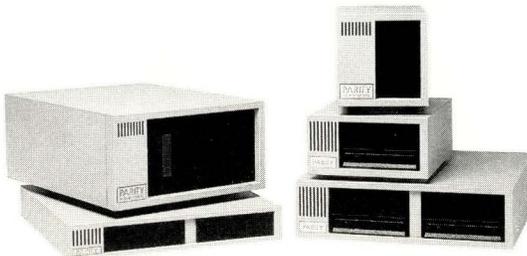
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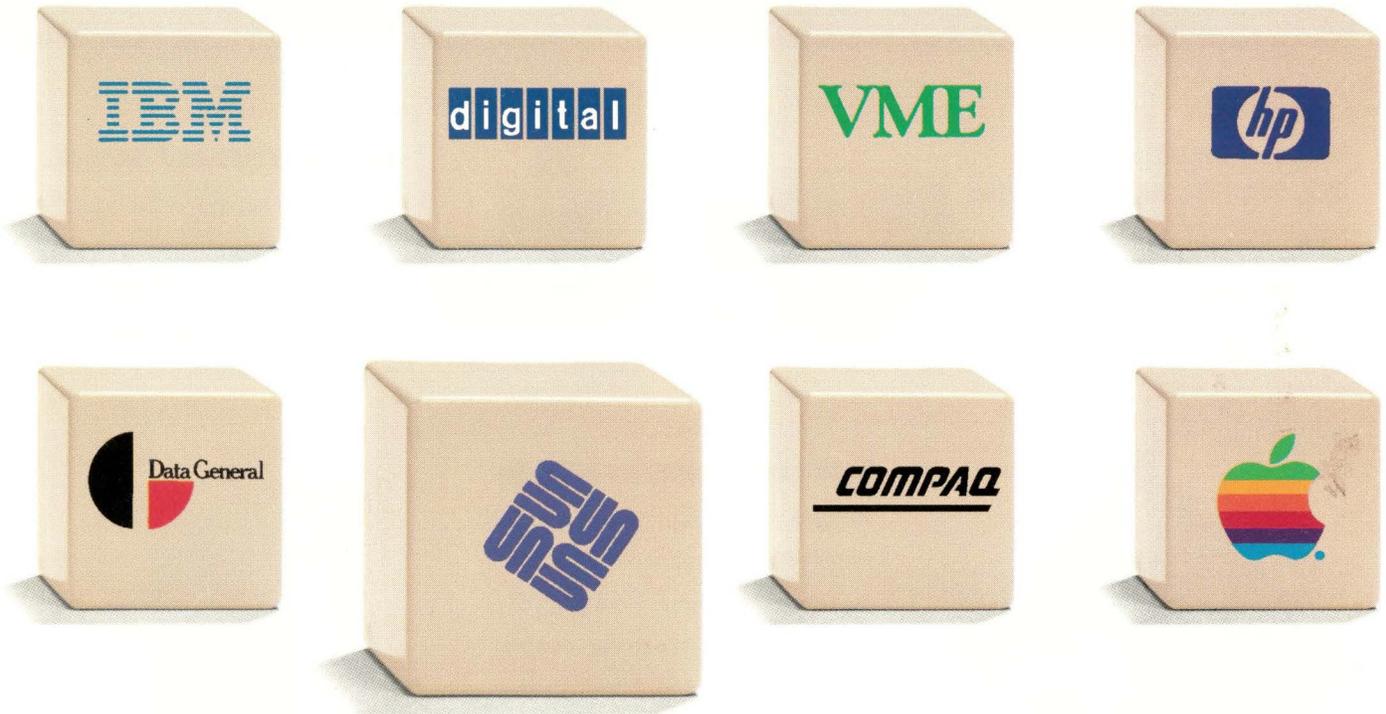
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