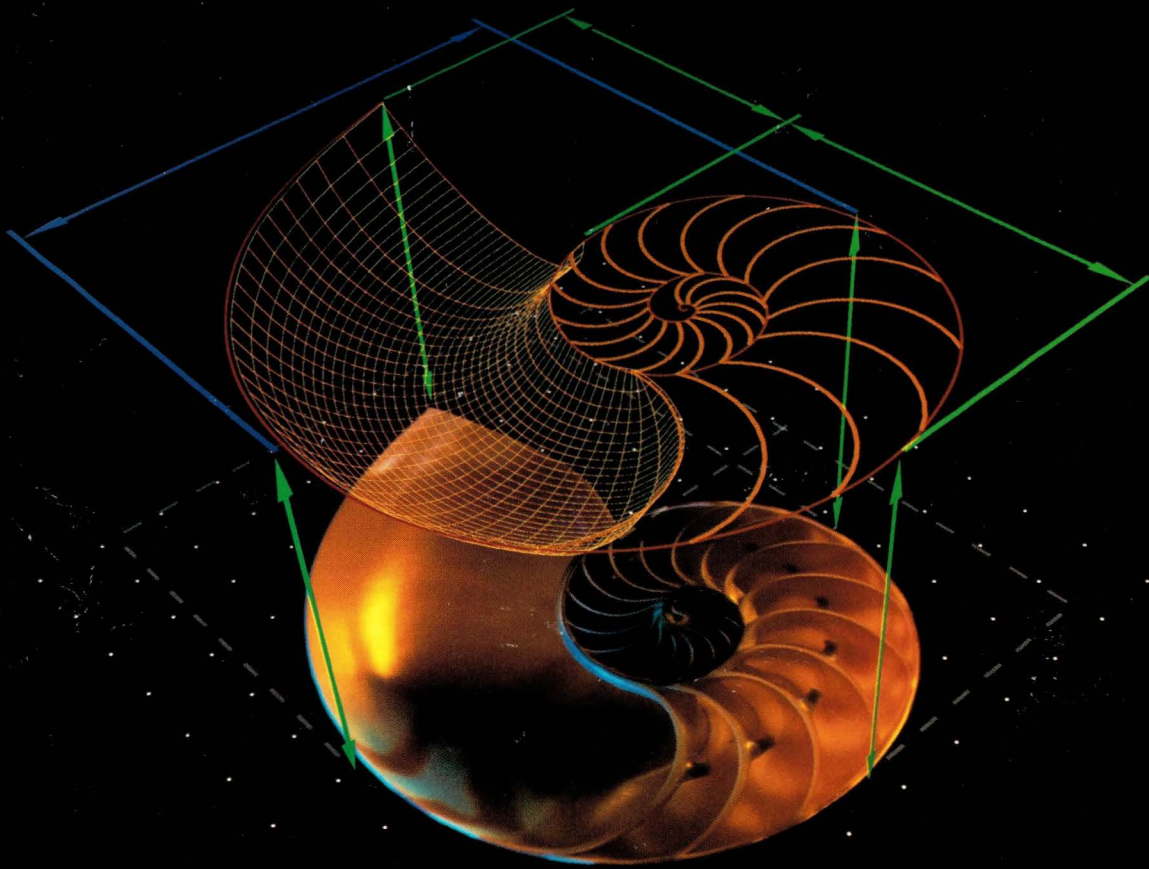


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An Independent Forum for Open Systems

JULY 1992 Vol. 3 No. 7 \$4.50

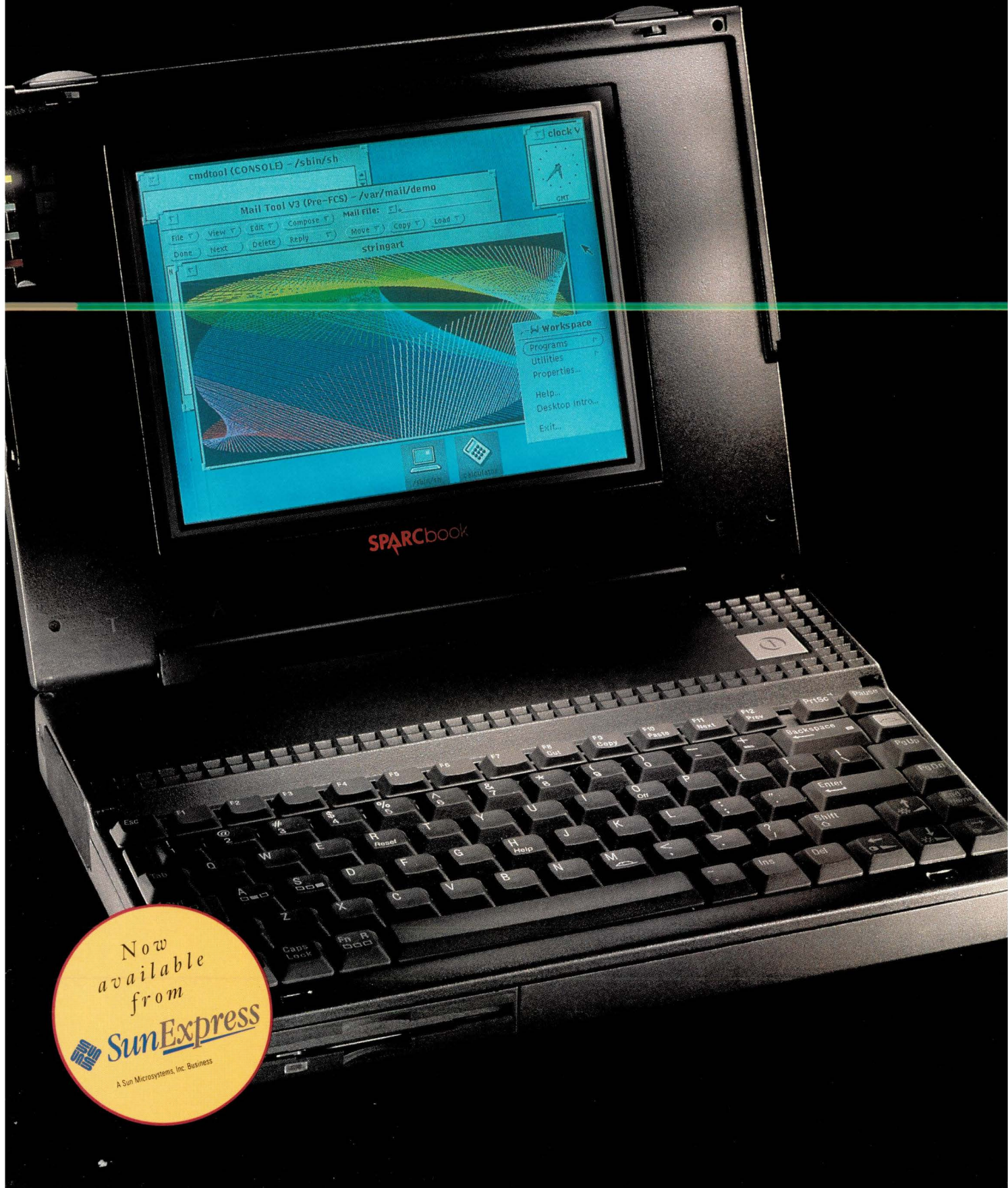
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News: Display PostScript for Suns

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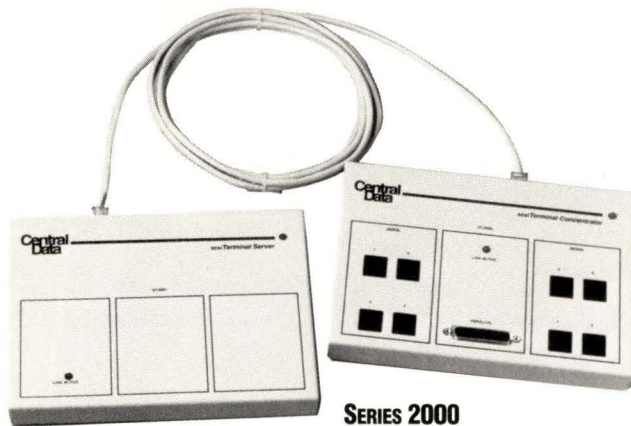
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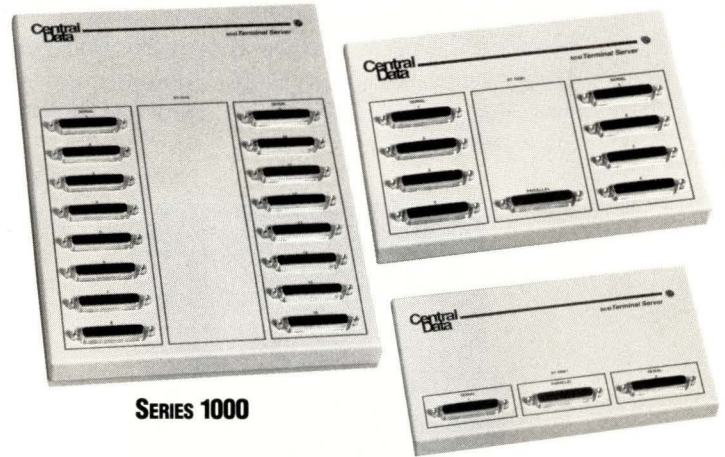
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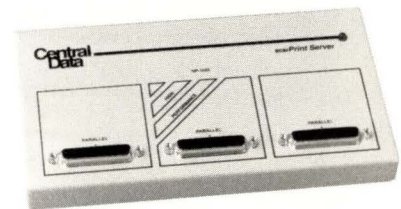
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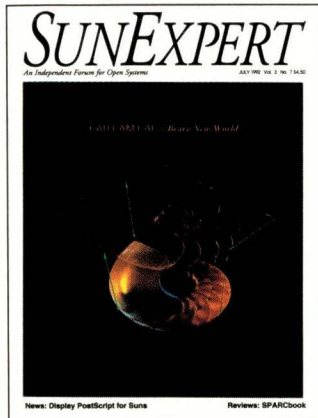
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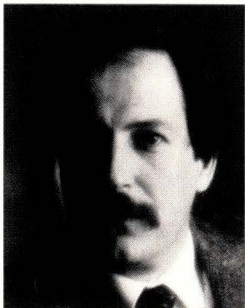
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Editorial

More Migration Tales

Responses to "Transition Trepidation" (*SunExpert*, May, Page 4) seem to confirm our suspicions that Solaris 2.0 isn't totally ready for users and Sun customers aren't fully ready for or sufficiently informed about the migration



to the new OS. In fact, the questions have spawned questions, and we feel that we're swimming upstream. For example, one reader asks, "Is it finally safe to use standard C?" Well, we aren't really sure. Another user with early access says, "Before we got hold of Solaris 2.0 machines, we started using `cc` with `-L/usr/5lib`. Unfortunately, it's not all as peachy as Sun would have you believe—`5lib`

POSIX functions don't all work correctly, and the header files are still pretty much what you'd expect on a Sun."

Pipeline Tool, the System 5 migration software that is part of Sun's free-to-users Migration Kit (if you don't have one, call your rep), was virtually unknown to respondents. Sun touts this tool as a first of its kind. The company says it scans SunOS code for Solaris 2.0 compliance and recommends solutions to incompatibilities. But one knowledgeable user says, "Some of the more difficult transition items—like POSIX process groups versus BSD—are semantic changes, not just function call changes... For a number of simpler changes the tool is useful... It was faster to just compile everything and see what broke."

Other interesting questions raised by readers include: "If Solaris 2.0 is so close to shipping and it's so good, why is 4.1.x going to be running on the new SPARCstation 10s?" and "What will motivate the average user to expend the effort to upgrade?"

I would like to thank everyone who took the time to help us with these questions (it's never too late to get a back issue and give us your feedback). Our impression is that Sun needs to do a better job of getting its message to its loyal customers before they migrate to some other hardware—say a system running BSD.

Doug Pryor

Doug Pryor

SUNEXPERT Magazine

An Independent Forum for Open Systems

JULY 1992 VOL. 3 NO. 7

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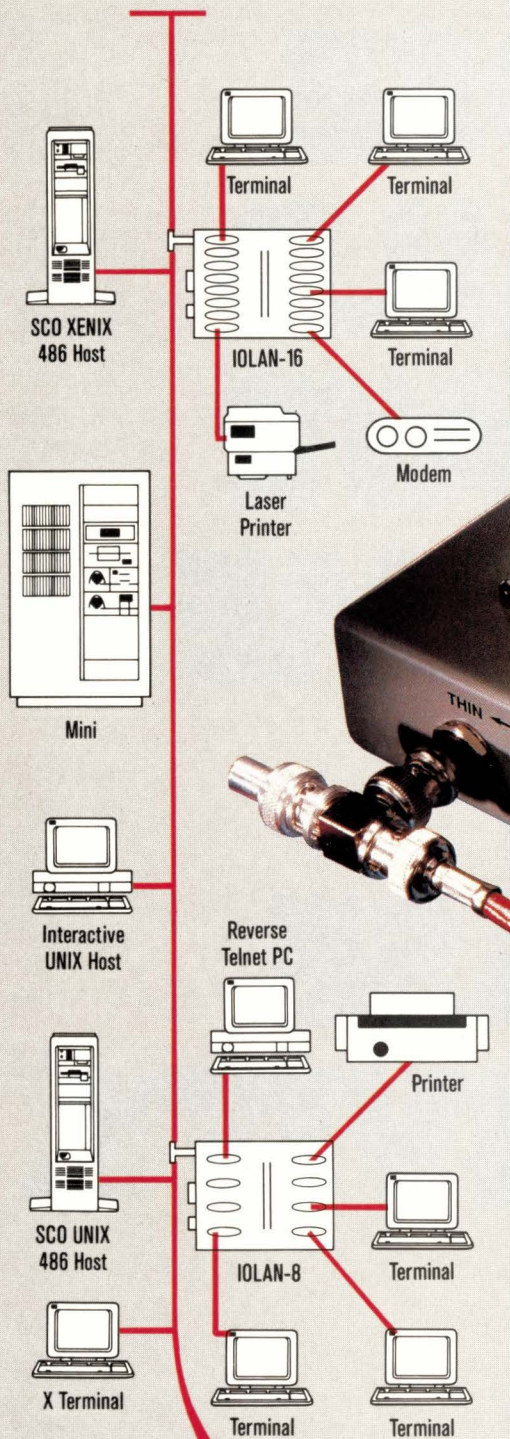
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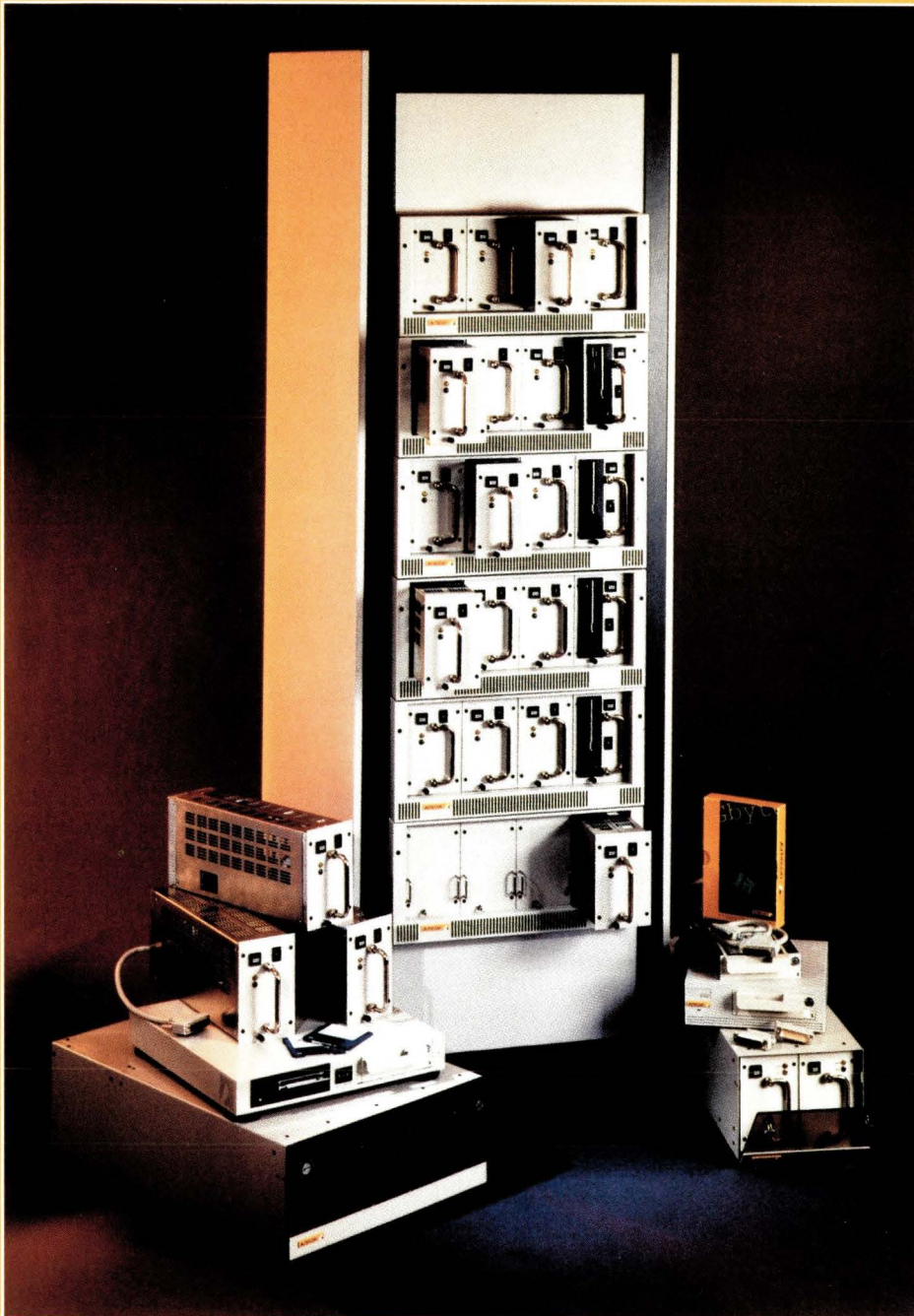
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LETTERS

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

Denominating Differences

Dear Editor:

We appreciate that you included XVT Software Inc. in your article on GUI tools (*SunExpert*, May, Page 54). We'd like to clarify your description of XVT's product line.

On page 58 you write, "In contrast to Neuron Data's 'superset' approach is XVT's stripped-down, least-common-denominator one. XVR-Design is a GUI builder that supports [portable development]..."

This description is wrong on two counts. In the first place, Neuron Data and XVT do indeed use distinct approaches to GUI portability, but the difference is that Neuron emulates the native toolkit functionality while XVT abstracts it. The idea that XVT is "least" anything is popular competitive propaganda, but not accurate. In the second place, XVT-Design does not deliver GUI portability on its own. The XVT Portability Toolkit does, and XVT-Design is a complementary GUI builder.

To be more specific, there are three possible approaches to software portability: intersection (sometimes mistakenly called "least common denominator"—greatest common denominator would be more descriptive), emulation and abstraction. XVT uses abstraction, which is the only really powerful approach. The combination of abstraction and extensibility, which allows the developer to access the native environment to create a completely GUI-compliant "look and feel," makes XVT's approach the better choice in most portable development projects.

Roger Oberg
Director of Marketing
XVT Software Inc.
Boulder, CO 80308

No Naysaying NeWSprint

Dear Editor:

The April issue of *SunExpert* (Page 62) featured "NeWSprint: Yes" by Paul Hammond of SRS Imaging, and "No" by Dan Eakins of MiLAN Technology. While we greatly appreciate the debate over the pros and cons of NeWSprint, we would like to point out the following inaccuracies in Mr. Eakins' article:

1. Mr. Eakins states that you need to dedicate a SPARCstation 2 class machine with at least 25 MIPS to make the SPARCprinter perform at 12 ppm. In fact, SunPics tests have indicated that printing to a 400-dpi black and white laser printer takes about 4 MIPS and about 4 MB of memory. This can be noticeable on the 3-year-old SPARCstation 1, but not on a SPARCstation 2. Typically, the time it takes to image a page is well under the five seconds required to move a page through the SPARCprinter, so even at the full SPARCprinter engine speed of 12 ppm, the CPU is not busy during all of the printing cycle. Because NeWSprint does a DMA dump directly to the printer, no buffer memory is required in the printer. Because Sun is a multitasking environment, other work can be done while printing is done in the background.

2. Mr. Eakins states that TranScript is "a PostScript-style compiler." In fact, TranScript is just a translator that converts other data formats to PostScript and ships it to the printer. It does not help the PostScript rendering task, which is left to dedicated hardware and software added to expensive intelligent printers. NeWSprint includes full TranScript functionality and a PostScript RIP (RTU = \$495)—the same price as TranScript alone.

3. There are three basic "printware" requirements—processing power, I/O bandwidth and PostScript. NeWSprint addresses all three by providing PostScript and leveraging the processing and I/O power of SPARCstations. The MiLAN solution addresses only the I/O portion of these requirements. The MiLAN solution provides a parallel port at "speeds approaching 1 Mb/s" although the data being sent over this port is PostScript code, which still has to be rasterized. In contrast, SunPics' SBus

PrinterCard (which comes with the SPARCprinter and is available separately including NeWSprint) has a spare parallel port rated at over 2 MB/s with Centronics handshake, 4 MB/s without. This second port can be used simultaneously while the SPARCprinter is printing. Both ports provide full DMA directly from CPU memory, so that fully rasterized images can be moved to printers, plotters, film recorders, etc. with no further data processing required. This allows most jobs to be printed as fast as the printer can move paper, i.e., the rated engine speed.

4. Mr. Eakins encourages readers to buy a combination of his MiLAN fast port, PostScript from Adobe and an HP IIIsi printer rated at 17 ppm for around \$7,000, which he says is "superfast."

SunPics has run tests with the SPARCprinter vs. an HP IIIsi running a typical Framemaker job of text and graphics for vu-graphs. In a 10-page printing test, the SPARCprinter finished 20 seconds *ahead* of the HP IIIsi. At \$2,695, the SPARCprinter has a price/performance that has yet to be matched nearly two years after it was introduced.

5. Mr. Eakins questioned whether NeWSprint is really an open system.

There are no other available printing solutions that have the range of flexibility and openness that NeWSprint provides today.

While it is true that today NeWSprint runs solely on SPARC-based processors, it will run on any SCD-compliant machine from any manufacturer. Any computer that is on the network can print to NeWSprint printers. Any F3, Type I or Type III font may be printed. NeWSprint is extensively tested with leading Mac and PC applications to ensure PostScript compatibility. Any printer can be used. NeWSprint includes sophisticated tools for adding new data formats as well as a developer's kit to easily add support for new printers. TranScript does not provide any ability to add new translators.

Finally, Mr. Eakins' article does not address the key benefits users get from Open Network Printing:

- All raster devices—printers, plotters, film recorders, dot matrix, ink jet, dye diffusion, phase change, etc.—can become PostScript devices using



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NeWSprint.

- New features can be added to any NeWSprint-driven printer through software upgrades. You don't have to buy a PostScript Level II printer to get Level II features. Many of the Level II features, such as composite font handling, are added to NeWSprint 2.0, the latest available upgrade. NeWSprint 2.0 is completely PostScript Level 1 compliant.
- Fonts can be placed in a centralized location so that a single copy of font data can be made available to all printers anywhere on the network. The alternative of storing redundant copies of fonts can become an enormous expense.
- Users no longer have to spend additional funds to add dedicated hardware for processing, font handling, etc. for each printer. Generic hardware is less expensive and more flexible, and the workstation CPU and memory are not used for printing 100% of the time. On a SPARCstation 2, printing is an unnoticeable background task.

To Mr. Eakins' credit, MiLAN's direct network spooling has the ability to provide more spooling features than are available today using the standard UNIX `lp`, `lpr` and `lpd` commands. SunPics also sees intelligent spooling as an area where the UNIX printing subsystem needs improvement.

We appreciate the opportunity to present the correct facts on SunPics' Open Network Printing and NeWSprint. With over 150,000 users voting in favor of NeWSprint, we believe that NeWSprint's future is extremely bright.

Charles Andres
SunPics Product Marketing
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allysone

Virtual Traveler

Dear Mr. O'Brien:

I am certain that I'm not the only one who will bother you with this question, but where is TinyLondon located? (See *SunExpert*, May, Page 19.) If it is a limited MUD, or unavailable, you need not bother replying. Thank you for your time, and tell Mr. Protocol that he talks about the neatest things.

Christopher Dutchyn
dutchyn@cuug.ab.ca

Mike O'B for Mr. P:

I decided that TinyLondon would, possibly, be inundated if I gave access info directly in the article; interested people would send email, as in fact you have.

TinyLondon is open and is in fact on the weekly MUD listing on rec.games.mud. It is DragonMUD, on ghost.cse.nau.edu, port 4201. Mr. Protocol refuses to divulge the 32-bit Internet address because he thinks this habit is pernicious, perpetrators should be shot on sight, and why spend all this effort on the DNS if it's not used?

Look up Caern on the MUD and say hi.

Just an X Terminal

Dear Mr. Protocol:

I have a question regarding the Sun and IBM RISC System/6000. I have been trying to display my Xview applications such as mailtool from the Sun to IBM RS/6000 monitor (I believe the monitor is an IBM X terminal). Unfortunately, I have not been able to do so. Would you tell me how to go about solving this problem? Thank you very much.

Thomas Wong
tom@Kronecker.baruch.cuny.edu

Mr. P responds:

Mr. Protocol thinks that if the RS/6000's console really is just an X terminal, this should work, but it would be necessary somehow to inform the X server therein that permission was granted to allow the Sun to open a window. The MIT X distribution does this with the utility `xhost`; on the IBM system, your mileage may vary.

Decline and Fall?

Dear Editor:

The fundamental problem with standards groups is that they tend to standardize things without building and experimenting with several independent prototype implementations first to see if their spec is really useful.

The Internet protocols (TCP, IP and

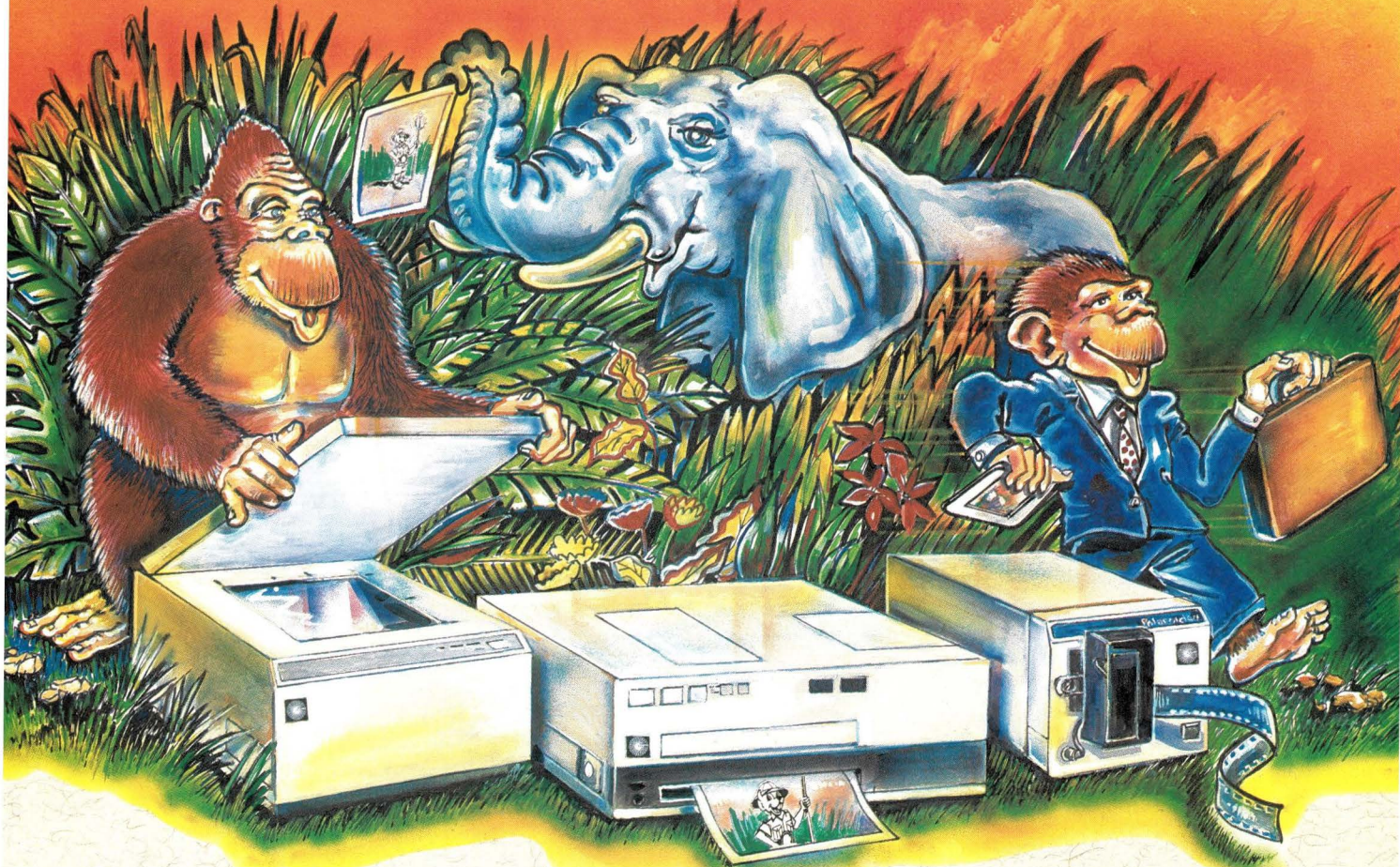
friends) have been successful largely because the IAB and IESG insist that several interoperable implementations exist before the spec is released onto the "standards track" and because there has to be reasonable experience and experimentation before a spec becomes a full Internet standard.

The problem with many other officially blessed "standard" protocols that no one uses is that they were designed by committee and published without sufficient experience with multiple independent implementations. Similarly, some standards bodies (lately this includes POSIX) have been standardizing invented technology rather than confining themselves to standardizing existing practice in areas where it is known to work reasonably well.

The POSIX.7 draft proposing standardizing printing using the not widely used "Palladium" technology rather than having a much smaller standard based on widely used existing practice (`lp/lpr/lpq/lprm/lpc/lpadmin`) is a prime example of what is wrong with POSIX. A fellow I work with is from MIT (where Palladium allegedly originated) and passes through there from time to time still. When I first heard that Palladium was about to be foisted upon us, I asked him to inquire about it the next time he was up at MIT. There were two responses to his inquiries. First and most common was "Never heard of it; we use `lpr`. What is it?" and the second was "Oh, that cruft. Why would you WANT to use it? We ripped it out in favor of the BSD stuff that actually works." This standards stuff scares me when it gets out of control like this. The truth behind Palladium is that it is technology that is proprietary to OSF (the *closed* software foundation) and is being standardized to try to shaft the honestly open vendors who are using `lp/lpr` and friends.

The notions behind POSIX.1 and POSIX.2 and POSIX.2a all are reasonable, and the results are mostly useful and reasonable. POSIX.12 also appears to be headed in a productive direction by mainly standardizing the existing practice for networking interfaces (both BSD sockets and X/Open's Transport Interfaces, XTI). Most of the rest of the POSIX efforts are harming us by standardizing prematurely and preventing

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good solutions from arising from creative hacking.

Much of this is conventional wisdom. None of the really useful thoughts are original to me.

Name Withheld

Shell Games

Dear Editor:

I recently left Sun Microsystems after over three years, during which I spent time in both the engineering and technical marketing organizations. Sun is a company that has long championed the open systems approach. From my experiences within Sun, I feel the company's commitment to open systems is sincere. However, I also believe that Sun doesn't fully understand the subtle consequences and requirements of an open system. Just opening the architecture isn't enough if it changes so frequently that it comes and goes too fast for the industry to get a good look at it! A system isn't open if it is a moving target; it must remain stable long enough to allow third parties to get into the market and prosper.

A stable specification is confining, though. This reality is difficult for companies like Sun to accept. Sun's internal philosophy centers on innovation, and stability is often equated with stagnation. So Sun innovates, sometimes whether or not it needs to. Processors, buses and software releases change so frequently that third parties find their resources drained by support, leaving little behind for development. The pace is exhausting, and the constant twists and turns make planning or forecasting difficult. The "playing field" isn't "level" at all.

Perhaps this is a good business model for an aggressive company in a competitive market, but it is not "open." It is proprietary. Not in the classical sense, when copyrights and patents protect intellectual property. Instead a "shell game" has replaced the lawyers. The "ball" (a specification or architecture) is revealed then shuffled around so rapidly that it's impossible to track.

For example, the SBus is an expansion interface Sun uses in its platforms. An SBus timing change that Sun now wants may obsolete the DMA(+) interface ASICS used on many current SBus prod-

ucts. Sun designed this chip. Sun also helped promote its use by third parties. Now, though, Sun wants to change the specification in a way that might lead to the extinction of this chip and the products based on it. All this in a market so young that many vendors are still trying to recoup their original investments.

To add insult to injury, Sun promotes open architectures but works to close the marketplace to any product that doesn't carry the Sun logo. For example, last year it forbade its distribution channels from carrying any "compatible" workstation products. Sun also promised third-party SBus vendors that it would not produce competing SBus cards, except certain system-essential interfaces (SCSI, Ethernet, frame buffers and so on). Now, Sun competes aggressively in many areas, even in esoteric applications such as DOS coprocessors and video frame grabbers. One vendor who has grown tired of losing money in the shell game recently told me that "Sun is eating its own children." Is this "open?"

Sun-experienced developers also know that the company isn't good at following the very standards it promotes. This was true with Sun's VME implementations—always just a little incompatible with the rest of the industry. The same is now true of the SBus. Some Sun engineers seem to believe that "we developed SBus, and we can do whatever we need to with it." This attitude persists although the SBus specification has been in the public domain for almost two years and is now becoming an IEEE standard. Is this "open?" If Sun vigorously promotes standards, shouldn't it work as vigorously to guarantee that its products comply with those standards?

For Sun to truly become an open systems company, it must allow the standards it promotes to take root and blossom. This means that it must become less fickle and more faithful. It also means that Sun must cease its cutthroat competition with third parties that are on its side in the marketplace. They are liabilities if they wound the third-party developers that have done so much to help Sun bolster its application portfolio.

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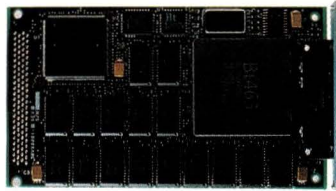
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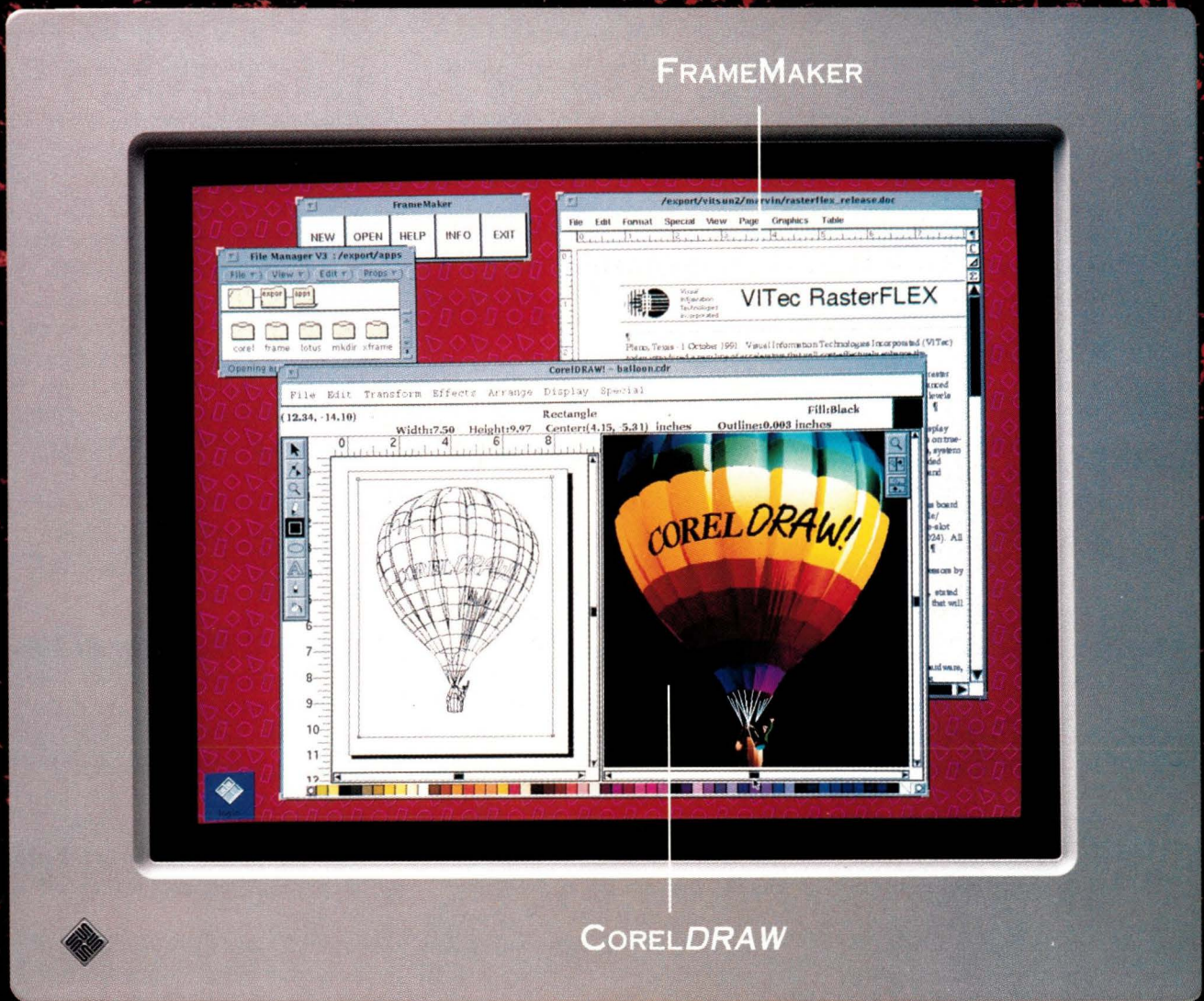


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NEWS

Display PostScript Ships for Suns

Citing overwhelming user demand as its rationale, Adobe Systems Inc. last month introduced Display PostScript for Sun Microsystems Inc. SPARC-based workstations. Display PostScript is based on the PostScript language, which is used to describe the appearance of a page to a raster-printing device. Display PostScript brings what-you-see-is-what-you-get (WYSIWYG) PostScript capabilities to displays. Display PostScript also, not so coincidentally, competes head-to-head with the display-manager portion of Sun's NeWSprint printing technology.

"We're making Display PostScript available on SPARC without Sun's help," laments Dano Ybarra, Adobe's UNIX product marketing manager. "We've been working with Sun for five years now and could be working with them for another five" before the two companies would be able to come to an agreement about how to bring Display PostScript to Suns.

Adobe claims that using systems that employ both the Display PostScript display system and a PostScript printer results in the "truest possible WYSIWYG correspondence between display and printer." The product also enables operating system and windowing system independence, Adobe says, and provides users with access to the entire Adobe Type Library.

Currently, according to Adobe data, more than 250 PostScript devices are available from more than 40 OEMs. Among the announced Display PostScript OEMs are NeXT Computer Inc., with NeXTstep; Digital Equipment Corp., with both



Adobe Systems Inc.'s Display PostScript: WYSIWYG PostScript capabilities are now available for Sun displays, too.

Ultrix and VMS systems; IBM Corp., with AIXwindows; Silicon Graphics Inc., with IRIX; and Network Computing Devices Inc., with its RISC-based line of X terminals. While Sun's own SPARCprinter is a PostScript device, it requires NeWSprint software for operation. NeWSprint is not Display PostScript-compliant. (For more on NeWSprint, see "NeWSprint: Yes and No," *SunExpert*, April, Page 62.)

Adobe is making Display PostScript available in the form of Software Development Kits to independent software vendors (ISVs). Included in the kits are a set of tools and reference materials, Displaytalk debugging software, code samples and white papers detailing strategies for optimizing performance and importing and exporting PostScript-compliant data.

Adobe is packaging Display PostScript for its OEMs as complete Display PostScript Server Integration Kits. The kit comes ready to integrate into any MIT X11R5 server running on SPARC—a process that Adobe claims takes only hours. Included in the OEM kit are DPS Library in object form; several MIT X source files modified by Adobe; server integration documentation; two font sets (a choice

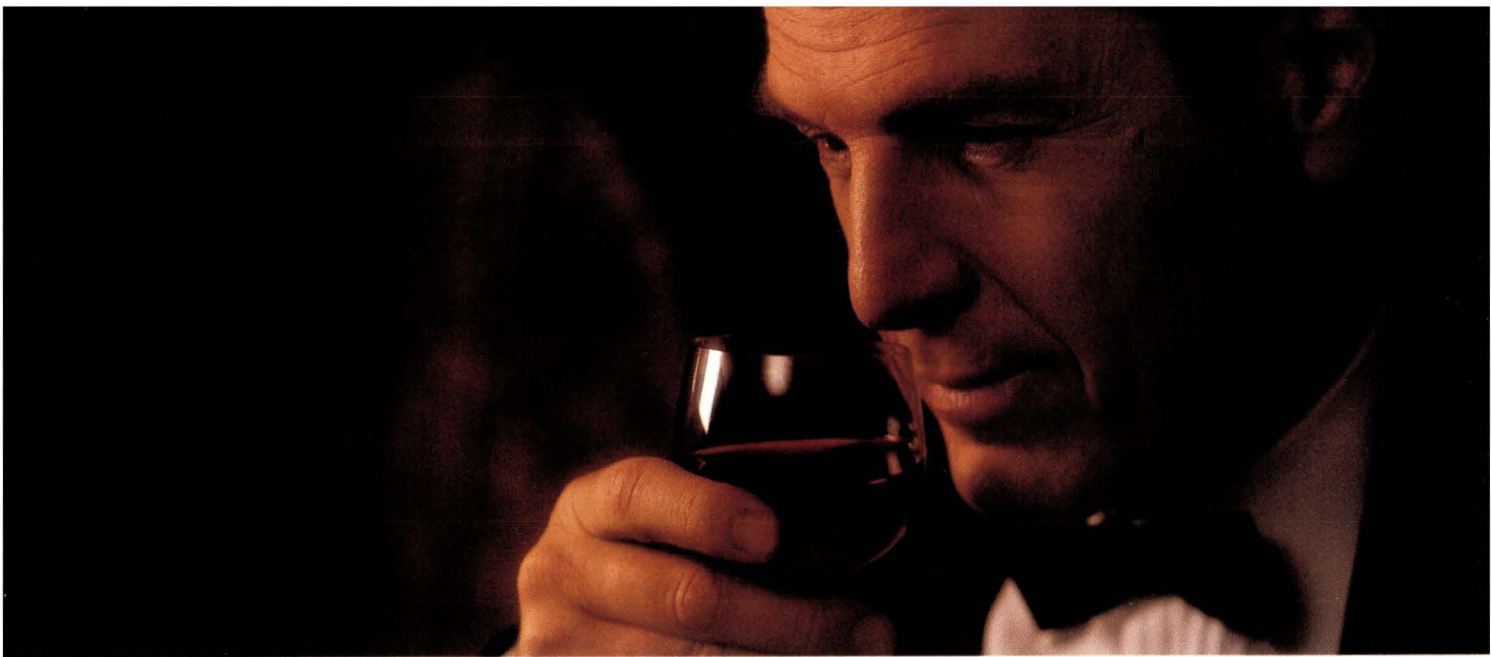
of 13 or a set of 57); Adobe Previewer, a PostScript-language file viewer; the Display PostScript Software Development Kit; two days of training; and miscellaneous other tools.

Ybarra says he expects some SPARClike vendors to bundle Display PostScript with their workstations. Users that do a lot of office communications, financial analysis, electronic prepress, graphic arts and document and desktop publishing are all expected to be major customers, he says. "Anything will run [with Display PostScript]," Ybarra adds, "except for SPARC applications that are NeWSprint-dependent." He claims there are about 10 such packages, including Frame Technology Corp.'s FrameMaker.—mjf

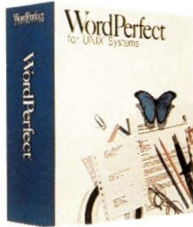
Sorting Through the Rubble

Last month, we gave you our best at-press-time shot regarding the details of Sun Microsystems Computer Corp.'s SPARCstation/SPARCserver 10 announcement (see *SunExpert*, June, Page 8). This month, we're filling in the crucial missing pieces—little details like price, performance ratings and ship dates.

A brief recap: On May 19, SMCC announced its next-generation desktop



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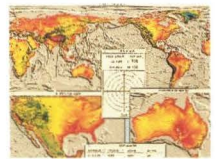
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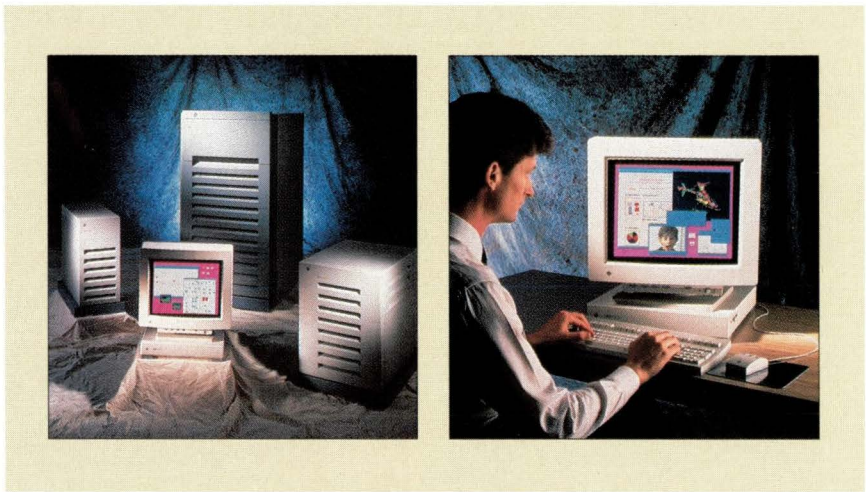
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and new low-end server, the SPARCstation 10 and SPARCserver 10, respectively. Ratings for all SPARCstation 10 models can be found in the table below. Just to make things interesting (?), Sun uses benchmarks that are based on the SPECint92 and SPECfp92 ratings, which are on a completely different scale than SPEC 89 numbers—which most of the other workstation vendors are finally supplying—and thus are not comparable. But the MIPS numbers are pretty impressive—86.1 for the Model 30, through 400+ for the quad-processor Model 54.

Now for the bad news—ship dates. Model 30 and 41, the uniprocessors, won't ship until the third quarter. Model 52, a dual processor, isn't due to ship until Q4, and Model 54 won't appear until sometime during the first quarter of 1993. These are the kind of lag times between announcement and shipping that we're accustomed to seeing from folks like Digital Equipment Corp. and IBM Corp.; they're unusual (and possibly damaging) for Sun.



Sun Microsystems Computer Corp.'s SPARCstation 10 and SPARCserver 10 are Sun's next-generation desktop and new low-end server.

Pricing for these systems falls within the range we expected. Model 30, with 32 MB of memory, a 19-inch GX gray-scale monitor, 424 MB of disk and built-in ISDN port, goes for \$18,495. The Model 41, in the same configuration except for its 40-MHz SuperSPARC CPU, lists for \$24,995. The dual-processor Model 52, with

64 MB of memory, a 19-inch GX color monitor, 1 GB of disk and built-in ISDN, sells for \$39,995. And the quad Model 54, in the same configuration as the 52, goes for \$57,995.

SPARCserver 10 pricing and availability parallels that for the SPARCstation 10s.—mjf

The SPARCstation/SPARCserver 10 Lineup

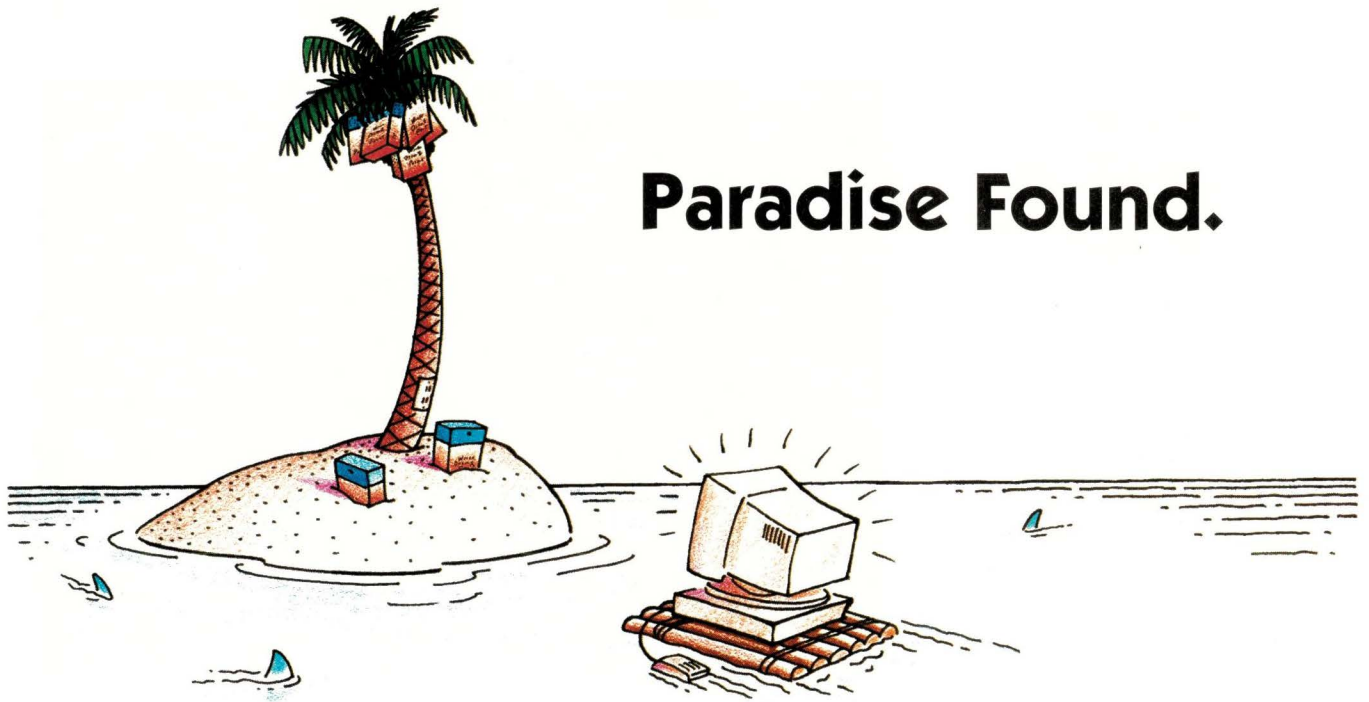
SPARCstation 10	Measurement	Model 30	Model 41	Model 52	Model 54
	No. of Processors	1	1	2	4
	MHz	36	40	45	45
	SPECint92	44.2	52.6	N/A	N/A
	SPECfp92	52.9	64.7	N/A	N/A
	SPECthruput89 (est)	*	*	109	218
	MIPS	86.1	96.2	200+	400+

SPARCserver 10	Measurement	Model 30	Model 41	Model 52	Model 54
	No. of Processors	1	1	2	4
	MHz	36	40	45	45
	tps (est)	100	120	180	220
	NFS ops./sec.	700+	800+	N/A	N/A
	SPECint92	44.2	52.6	N/A	N/A
	SPECfp92	52.9	64.7	N/A	N/A
SPECthruput89 (est)	*	*	109	218	
MIPS	86.1	96.2	200+	400+	

N/A - Not available
* Not applicable

Source: SMCC

HANNA DYER



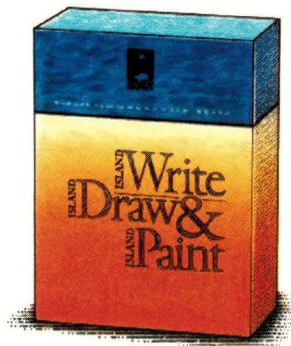
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Viking Rows Ashore; Tsunami Close Behind

Texas Instruments Inc. and Sun Microsystems Inc. have publicly shown a superscalar SPARC processor, the SuperSPARC, originally code-named Viking. In addition, the two companies also showed silicon for a new, very low-cost SPARC called Tsunami.

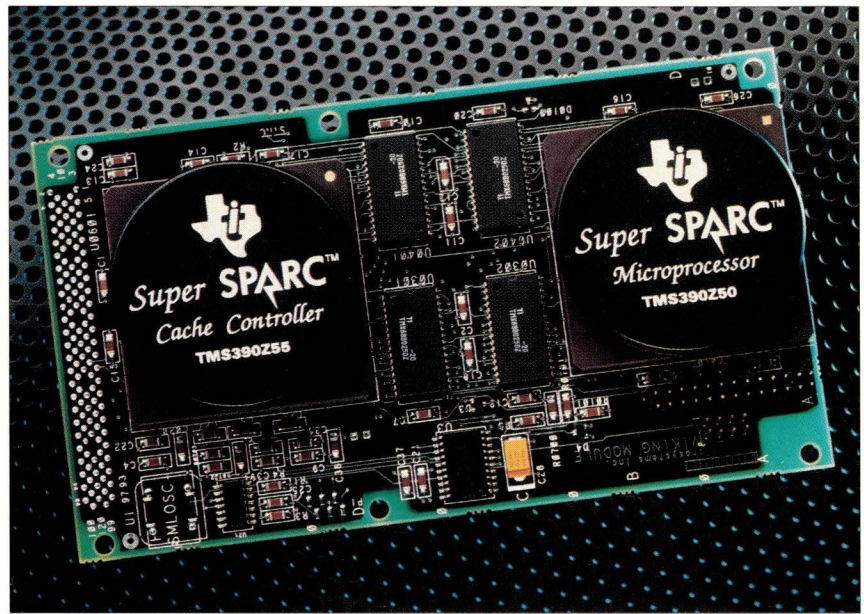
The Viking/SuperSPARC has been the focus of the concerns and hopes of the SPARC community for some months. What were perceived to be delays in the chip's introduction had fueled speculation that the SPARC design had reached the end of its useful life. SuperSPARC is now being offered as vindication for SPARC as a design. However, critics of the chip continue to wonder when SuperSPARC will be available in volume shipments and to whom.

As it was shown in May, SuperSPARC is a single-chip processor—making it one of the few single-chip SPARCs on the market. It is superscalar and can execute three instructions per clock. It is a Harvard architecture device with two very large caches on the chip itself. Operating at 33 MHz, TI and Sun say that the SuperSPARC has a peak performance of 99 MIPS, with estimated 1989 SPECmarks of 40 to 50. At 40 MHz, it will have 120 MIPS and 50 to 60 '89 SPECmarks.

In addition, TI has introduced a cache expansion module, a separate chip that also fits on the MBUS with the SuperSPARC and provides additional performance. With it, a SuperSPARC running at 45 MHz would have 135 MIPS and 60 to 70 '89 SPECmarks. A 50-MHz SuperSPARC, with the additional cache, would offer 150 MIPS at 80+ '89 SPECmarks.

Moreover, TI showed a prototype of a module that would combine two SuperSPARCs. Planned for a 1993 availability, this dual, 75-MHz module would offer 450 MIPS at peak.

In a related announcement, Xerox Corp., Sun and TI announced XBus, a high-speed packet-switched multiprocessor bus implemented in the cache



A SuperSPARC module with an attached cache controller offers up to 150 MIPS. Formerly called Viking, SuperSPARC has been called the "most aggressive of the superscalar designs," but critics wonder if the chip can be produced in volume.

controller of the SuperSPARC multi-cache controller. XBus links individual components as though they were nodes on a single, high-capacity packet-switched network. With XBus, Sun and TI envision future systems of up to 64 SuperSPARCs providing (someday) up to 9 billion instructions per second (BIPS).

While 9-BIPS systems are probably some years away, several companies have plans to use the SuperSPARC. Sun, Solbourne Computer Inc. and ICL Inc. have announced products or plans for products based on the processors. TI and Sun say that more endorsements will follow. Indeed, TI says that SuperSPARC has been available to "key executive members" of the SPARC International trade group for some months—though it will not be available to anyone else until the end of this year.

Pricing on the SuperSPARC had not been revealed as of press time. However, TI spokespeople have said that it will be "under \$400."

All in all, Sun seems to be focusing on SuperSPARC. Michael Slater, editor and publisher of the *Microprocessor Report*, notes, "I think it's clearly going to be the heart of Sun's product line." However, he also notes, "I think the

clock rates they've been able to get are a disappointment to everyone, but they're trying not to admit it."

He thinks the SuperSPARC's clock rate may be a direct product of its complexity. "It is probably the most aggressive of the superscalar design," he says. "But it also illustrates the downside of the approach...in that the complexity it introduces makes it difficult to achieve the higher clock rates."

Meanwhile, MIPS' vice president of systems technology, John Mashey, expresses concern about TI's ability to manufacture SuperSPARC in anything resembling large volumes: "The real issue here is that all the normal semiconductor wisdom says that [the SuperSPARCs] are not going to be easy to make, are not going to be easy to second source, and are going to be in limited volume."

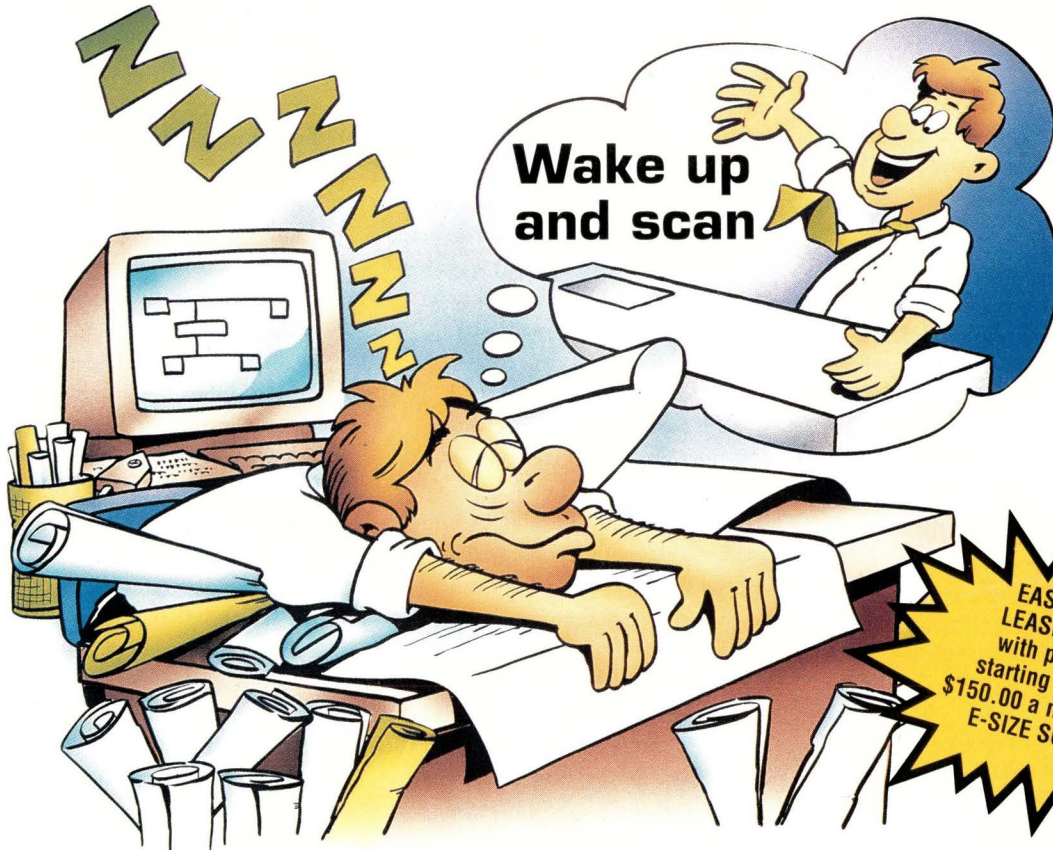
He thinks that SuperSPARC is radically out of keeping with Sun's traditional strategy of low-cost, medium-performance machines. "Sun has always been successful getting reasonable stuff out of the door at a reasonable cost," he says. "This is uncharacteristic for them. They've pushed all the edges."

Far more in keeping with Sun's history, meanwhile, is Tsunami, which

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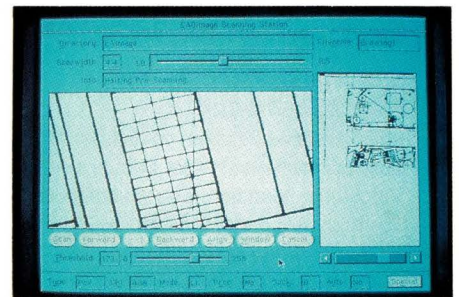
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International Spotlight

IBEX Proposes ToolTalk Center

IBEX Computing SA, a specialist in CASE, real-time and multimedia technologies based in Archamps, France, has proposed to Sun France to become an official training and software services center for ToolTalk. Even if Sun chooses not to give IBEX its imprimatur, Cheryl Gerelle, IBEX's CEO, says the company will begin offering ToolTalk courses and services in July.

IBEX has defined two courses—a half-day introduction for "people who have the product or who want to buy it but don't know how they would use it," and a two-day course for programmers using ToolTalk that teaches how to integrate it into existing and new applications. The third offer from IBEX, says Gerelle, will be ToolTalk services for either Sun ISVs or end users.

"If someone wants to build a new product but doesn't want to do the ToolTalk interface, we can do it for them," she says. IBEX has also talked with Sun about setting up a CASE integration center, where IBEX would integrate third-party products like Teamwork from Cadre Technologies Inc., Softbench from Hewlett-Packard Co. and Software Backplane from Atherton Technology onto Sun platforms, Gerelle says.—*mwj*

Sun Snares 2nd Largest French Distributor

Sun France has taken on its first national distributor in Ista, France's second largest, to market Sun workstations. Sun France is predicting Ista could generate \$30 million in revenues for Sun, which equals 10% of Sun France's total revenues. "Ista is well established in the market and well positioned with large accounts, with their competence in networking high-end micros," says Emmanuel Bompoy, channel marketing manager for Sun France. The largest distributor in terms of volume of UNIX workstations, 15-year-old Ista has 43 stores throughout France, through which it moved 15 million CPUs in the first quarter of this year, says Bompoy. Bompoy says Ista chose Sun systems over Hewlett-Packard Co. and IBM Corp. workstations "probably because Sun has 40% of the workstation market in France." —*mwj*

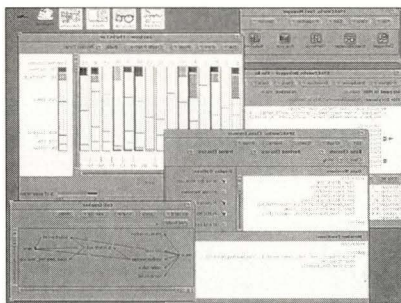
was shown along with SuperSPARC. This is a single chip combining a SPARC processor along with assorted peripheral logic to form what the company calls a "workstation on a chip." TI says that it will be a commodity chip for commodity workstations, laptops and embedded systems.

Tsunami was shown but has not been officially announced as an actual product. However, company spokespeople say that it will probably be introduced later this year.—*mjt*

Oh, Say, Can You C?

If it hasn't already come to your attention, it should as soon as you take shipment of Solaris 2.0: Sun Microsystems Inc. is no longer bundling a C compiler with its operating system.

"Ten out of 15 people we talk to don't even know that Sun is unbundling its compiler [with 2.0]," says Robert Cramer, marketing manager of programming environment vendor CenterLine Software Inc. "Out of the five that do, four don't fully understand the issues. The one remaining person knows what has happened and is upset."



If you need a Solaris 2.0 C compiler, SunPro's is but one of your available choices.

Cambridge, MA-based CenterLine is just one of several compiler/programming-environment vendors just dying to fill the gap. Others include Edinburgh Portable Compilers Inc. (Edinburgh, Scotland), Liant Software Corp. (Framingham, MA), Lucid Inc. (Menlo Park, CA), Oasys (Lexington, MA) and UNIX System Laboratories (Greensboro, NC), to name the most prominent.

There's also—surprise, surprise—Sun itself, which, through its SunPro sub-

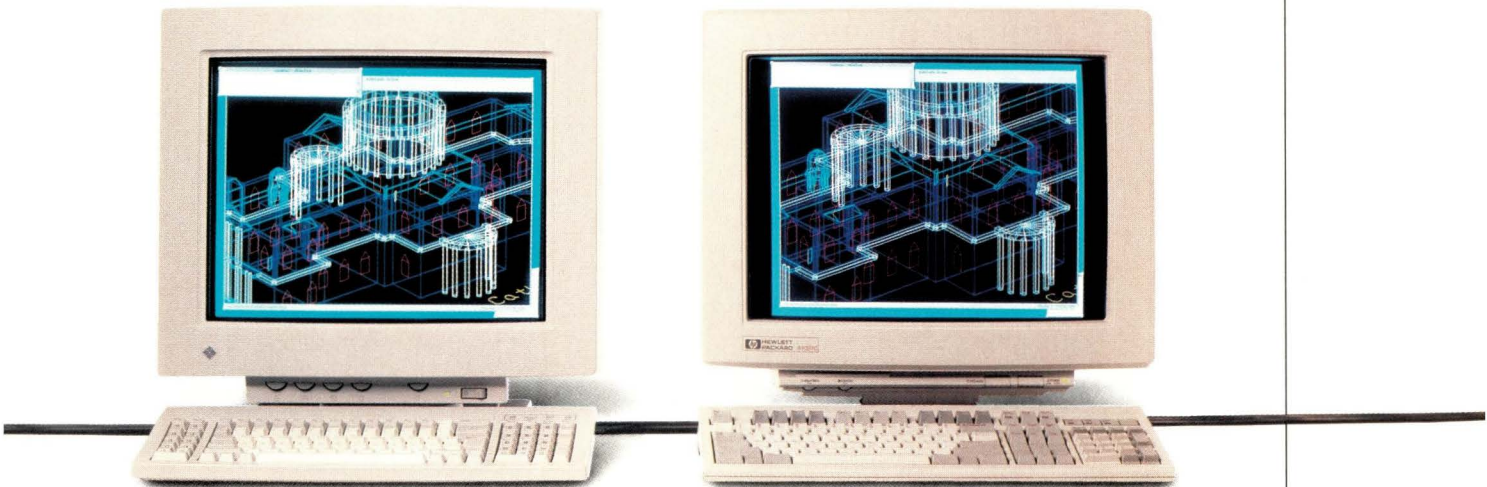
sidary, is offering both individual compilers (C, C++, Ada) and a complete programming environment called SPARCworks. "But," cautions Cramer, "you need to think about the ramifications of going with a platform-specific [i.e., SPARC-only] tool like SPARCworks, versus one that can run on all platforms, like our Code-Center product."

Sun has been taking heat for more than just platform specificity, however. A couple of months ago, Sun posted to the net an article defending its decision to unbundle. Its reasoning went as follows:

- With Solaris 2.0, a compiler is no longer required to build or customize the SVR4 kernel. The use of dynamically linked libraries makes a compiler unnecessary.
- If the compiler is bundled, then everybody is paying for it. And not all users need a C compiler. Sun claims 18% of its customers are serious C programmers—developers who code for a living. Another 30% are casual users, who compile and run, but make only minimal changes to source code. This means 52% of Sun customers don't need a compiler, according to Sun. (The obvious should be noted here: This means at least 48% of Sun customers *do* need a compiler—maybe more, since even diskless client users are often times dependent on someone with a compiler.)
- By unbundling, Sun is opening up Solaris/SPARC to all the compiler vendors in the market.

Sun points users who "don't need a highly optimized compiler" in the direction of Cygnus Support, Palo Alto, CA, which is making available the Free Software Foundation's GNU C compiler. (The FSF, Cygnus and GNU C users beg to differ with Sun's characterization of their product.) Cygnus' Solaris 2.0 port was completed in May. At press time, Cygnus was seeking 150 sites to chip in \$2,000 each for the development work, distribution and support (plus a donation to the Free Software Foundation) to cover its costs. It planned to provide a free copy of GNU C for Solaris 2.0 on the Sun Catalyst CDware disk;

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*Suggested U.S. list prices for 19" color models. Contact your local HP sales office for details. OPEN LOOK is a trademark of AT&T. MOTIF is a trademark of the Open Software Foundation. VUE stands for Visual User Environment. †IBM RS/6000 support available September, 1992. HP Vectra PCs running Santa Cruz Operation Open Desktop. ©1992 Hewlett-Packard Company CSPA001

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Cygnus provides a year of support for \$2,000 to \$3,000.

When the other Solaris 2.0 development tools actually ship remains to be seen. CenterLine was scheduled to ship the newest version of CodeCenter in June; at press time, Cramer said he expected first customer ship to take place sometime this fall. There was talk that even SPARCworks itself might not ship before September or October, a full year after SunPro first announced it. —mjf

What a Difference Five Years Makes

In five years, Sun Microsystems Inc. has revamped its distribution strategy at least as many times. Yet, in spite of distribution-related complaints from resellers and end users alike, Sun has managed to hone its strategy pretty much the way it has desired. Between 1988 and 1992, the percentage of Sun sales attributable to indirect channels has increased from 36 to 60, which is roughly the original indirect-channel-share goal Sun set for itself.

A few months ago, Sun Microsystems Computer Corp. restructured its U.S. reseller program yet again. Now, Sun is focusing on providing systems

and support to four categories of resellers: hardware OEMs, commercial/federal systems integrators, value-added resellers (VARs) and master resellers. Sun is continuing to encourage its resellers to turn to its three master resellers, Arrow Electronics, Access Graphics and Intelligent Electronics, for products and other assistance.

SMCC further refined its strategy by dividing VARs into four types: application resellers, which have vertical market and application-specific expertise; industry resellers, which specialize in vertical solutions; high-end networking integrators; and account resellers (of which there are about 10), which have a "significant long-term relationship" with a specific, large, end-user account. SMCC says it is tailoring its financial and support programs to better meet the needs of resellers in each of these categories.

—mjf

More Robust SunNet Manager Debuts

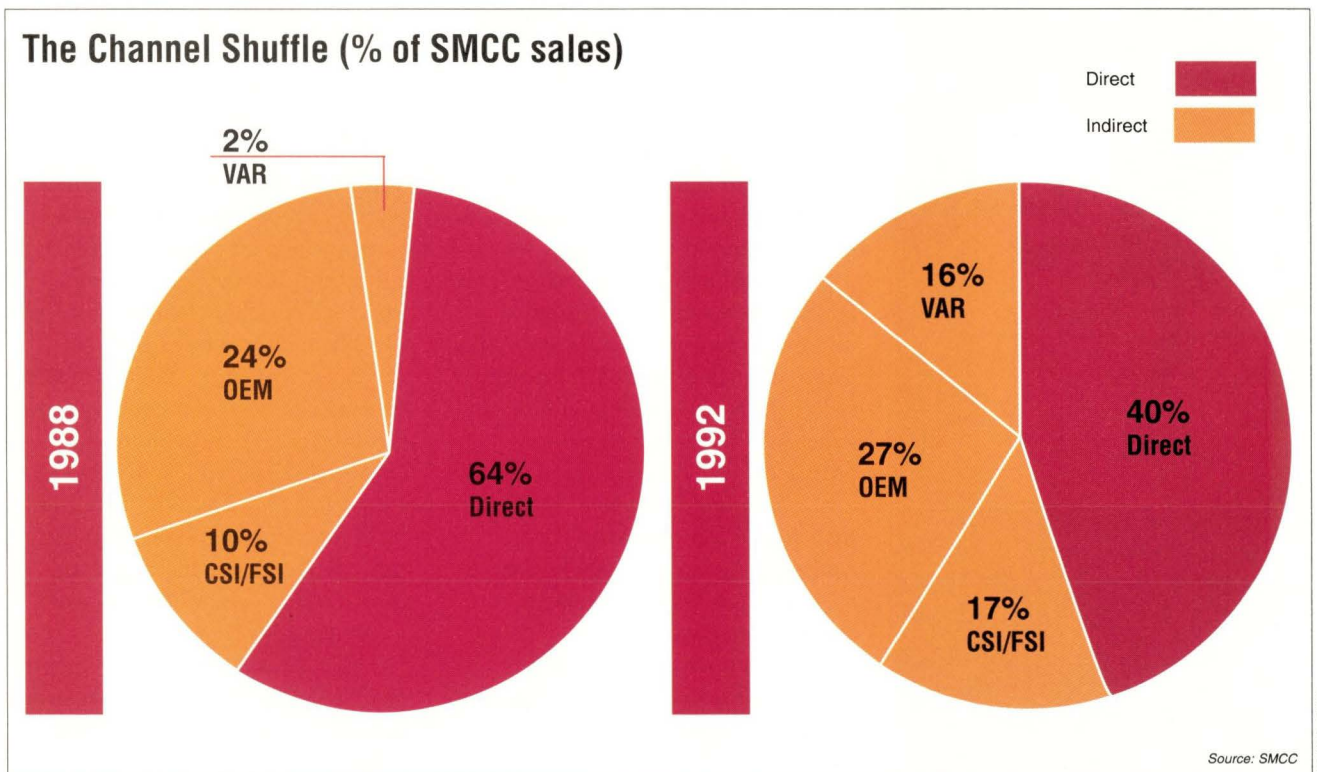
SunConnect beefed up its SunNet Manager network-management platform and rolled out a new release, Version 2.0, as expected, at Interop in

mid-May. SunConnect also announced officially that it will be making SunNet Manager available on other UNIX platforms, including Intel Corp. 80X86-based PCs, IBM Corp. RISC System/6000s and Hewlett-Packard Co. 9000s. It said timetables would be forthcoming at an as-yet-unspecified date.

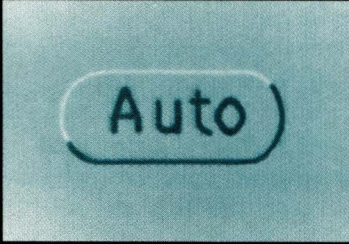
Among the new features SunConnect added to SunNet Manager are:

- An auto-management capability, "whereby network nodes are not only discovered, but immediately managed," through an automatic ping feature.
- A customization facility, enabling administrators to specify default behavior for user tools, system-wide operations and alarms.
- A single control window for management queries.
- General, across-the-board management simplification, via more point-and-click-activated commands.
- A new user's guide, which supplements the product's on-line help facilities.

In addition to promising support for SunNet Manager on other platforms, SunConnect also assured users the



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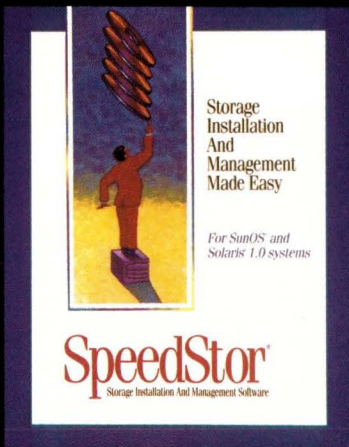


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product would support CMIP and the Open Software Foundation's Distributed Management Environment (DME) at some point. More details were unavailable at press time. SunConnect also added 35 new third-party network-management software partners to its SunNet Manager stable, bringing the total number of ISVs with applications that operate on top of SunNet Manager to 68.—*mjf*

PCs Need UNIX, Too

The soon-to-be-launched version of Solaris 2.0 for Intel Corp.-based platforms isn't SunSoft's only low-end UNIX solution. SunSoft is equally committed to positioning and maintaining Interactive UNIX as a [Santa Cruz Operation] "Xenix killer," in the words of Mary Anderson, director of channel marketing for SunSoft.

"We've relaunched Interactive UNIX 3.0 at the same time as we've relaunched the channel," Anderson says. Specifically, SunSoft has created an indirect-channel marketing program, called Spectrum, for distributors and resellers of the Interactive UNIX product line that SunSoft acquired from Interactive Systems Corp. in January. Spectrum includes training and education, sales and lead-generation and marketing and merchandising support components geared to aid SunSoft's network of more than 50 Interactive UNIX distributors and 3,000 resellers. SunSoft says the Spectrum program will also benefit distributors and resellers of Solaris 2.0, once the product is shipping.

The announcement of Spectrum and SunSoft's intentions to continue to improve and support Interactive UNIX laid to rest talk that SunSoft intended to kill off the product line and consolidate its PC UNIX efforts around Solaris for Intel. SunSoft claims there is a lot of ongoing Interactive UNIX momentum; between March and April, says Anderson, SunSoft received more than 6,000 phone inquiries about the product.

"Not everyone will need Solaris 2.0," Anderson adds. "For small and mid-sized accounts, and for those accounts that don't need multithread-

ing, System V.4 UNIX support and the like, Interactive UNIX is the better PC UNIX solution," she says. Besides, as Anderson points out, there are more than 1,200 Interactive UNIX applications on the market today.

Meanwhile, SunSoft is rolling along with its Solaris on Intel plans. The division announced its Early Access program at PC Expo in June. It will follow up with migration programs similar to those announced for Solaris 2.0 for SPARC over the next couple of months, Anderson says.—*mjf*

Other Open Systems News

Digital Equipment Corp.

Systems Strategies Inc., New York, has developed a line of Ultrix-to-IBM communications software, which DEC has incorporated into its DECnet/SNA gateway line. Systems Strategies developed four access routines, LU6.2, RJE, 3270 and HLLAPI, which work with DEC's DECnet/SNA gateway or DEC's Ultrix/SNA server.

TGV Inc., Santa Cruz, CA, has unveiled the latest version of its TCP/IP connectivity solution for VMS users, MultiNet 3.1. The new release includes support for new features, including a remote magnetic tape client, IP over X.25 support, improved trivial file transfer protocol (TFTP) and file transfer protocol (FTP) support, an X Window System gateway and new license-management capabilities. TGV also brought out enhanced versions of MultiNet NFS Client and MultiNet NFS Server for VMS, as well as additional support software for connecting MultiNet users to other users with other platforms using NFS.

DEC's latest application to support its OSF/1 Program for Manufacturing is Xerox Computer Services' Chess. Chess is a manufacturing resource

planning (MRP II) application. It is available now on DEC's Ultrix DECSystem platform. The DEC OSF/1 version will follow at an as-yet-unspecified date.

Hewlett-Packard Co.

Introducing what it called a "main-frame computing alternative," HP introduced a line of air-cooled, PA-RISC-based business computers, software and customer-support programs. The so-called HP Corporate Business Systems are designed to perform at more than 400 transactions per second and will provide up to four-way symmetric multiprocessing. HP showed four HP Ultrix-based 9000 Corporate Business Servers, ranging in price from \$335,000 to \$650,000, and five MPE/iX-based HP 3000 Corporate Business Systems, priced between \$365,000 and \$925,000. In standard configuration, according to HP, the machines can accommodate thousands of users, handle up to 2 GB of main memory and provide up to 690 GB of disk capacity and up to 256 MB/s of I/O.

Merely days before SunConnect unveiled its next-generation network-management platform, HP announced Version 3.0 of HP OpenView. The new release includes an enhanced graphical-user interface and offers administrators greater control over their networks. HP OpenView 3.0 products are the first available net management systems based on the Open Software Foundation's Distributed Management Environment (DME) technology. HP is offering to resellers and ISVs the OpenView SNMP platform and HP OpenView Distributed Management Platform, which will provide access to both SNMP and CMOT services. HP says it will extend HP OpenView Distributed Management platform capabilities by including CMIP support later this year. HP also unveiled HP OpenView Network Node Manager 3.0, a tool for controlling distributed TCP/IP networks. The products are available on HP 9000 and 3000 systems, Sun workstations, IBM Corp. RS/6000 workstations and

MS-DOS PCs.

HP and Sun signed an agreement for HP to sell and support HP's RTAP/ Plus Industrial Automation Enabler on SPARCstations running Solaris 2.0, marking the first time the industrial-automation package will be ported to a non-HP platform. The package is a high-level tool for process-control, supervisory-control and data-acquisition tasks.

IBM Corp.

IBM dropped the entry-level price point for its Power Visualization System (PVS) server by 25% to 40%, while increasing available related software options. The PVS server is an 8- to 32-way parallel processor. IBM announced that it will market versions of the IBM Visualization Data Explorer software for Hewlett-Packard Co., Sun Microsystems Inc. and Silicon Graphics Inc. workstations. IBM also is making available a PVS software development kit, including C and FORTRAN compilers and related tools. The kit is available from The Portland Group, Wilsonville, OR.

Systems Strategies Inc.'s Express and ezBridge products now support IBM's Advanced Peer-to-Peer Networking (APPN) protocol and Common Programming Interface for Communications (CPI-C), the standard LU6.2 application-programming interface. These announcements make the New York-based communications expert one of the first, if not the first, software vendor to make APPN available under UNIX.

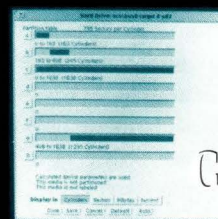
SynOptics Communications Inc. introduced a software product that allows customers to manage their SynOptics intelligent hub-based Ethernet and token-ring networks directly from network-management platforms from IBM (as well as Digital Equipment Corp. and HP). The product, Lattis Views, provides selected hub-management applications previously available only on SynOptics' SunNet Manager-based LattisNet Manager for UNIX product. Lattis Views can be run on IBM's AIX NetView/6000, DEC's DECmcc Management Station for

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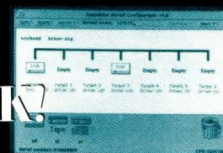
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Ultrix and HP's OpenView Network Node Manager.

Silicon Graphics Inc.

SGI rolled out the Iris Indigo server, a file and compute server designed for small- to medium-sized workgroups. The system employs a MIPS R3000A CPU, benchmarking at 30 MIPS, 4.2 MFLOPS and 26 SPECmarks. It can hold three SCSI-2 internal drives, and using external devices, provide up to 8.4 GB of disk storage. The server comes with two serial ports, one high-speed parallel port and five 16-bit audio ports. Price: \$6,400.

Iris Inventor, an object-oriented, 3D toolkit for application development, is now available from SGI. The kit combines the graphics programming capabilities of Iris Graphics Library (Iris GL) with the modularity of a 3D toolkit. Iris Inventor is integrated with the X11 windowing system and Iris GL rendering. It provides complete support for C and C++. The product defines a new, 3D file interchange format that provides 3D cut-and-paste operations, called the Inventor File Format. Iris Inventor runs on SGI's line of Iris 4D workstations.

This Just In...

- From our "It sounded too good to be true" department: **Quorum Software Systems Inc.** and **Apple Computer Inc.** are entangled in a legal battle over Quorum's right to help ISVs migrate their Macintosh-compatible applications to other platforms, including Suns. Apple claims that Quorum Latitude, a cross-platform compatibility tool, violates Apple patents on "pull-down menus," "color Quick-Draw" and Apple's copyrights. Menlo Park, CA-based Quorum claims that Latitude relies solely on Motif or Open Look for menus and uses Adobe Display PostScript or SunSoft's NeWS for screen rendering, and thus fails to infringe on any Apple copyrights or patents.
- Version 1.1 of Sun's Ada Development Environment is now available through **SunPro**. The product is compatible with the VADScross family of cross-development products from **Verdix Corp.** and contains an interface

to SCCS, the UNIX utility for source file version control. The environment, which consists of the SunPro Ada compiler and SPARCworks/Ada toolset, also comes with network licensing.

- **NeXT Computer Inc.**, Redwood City, CA, is porting its NetInfo systems administration software to Sun and other UNIX platforms. This is the first time NeXT is venturing into source-code licensing to third-party developers. **Codex Corp.** of Albert Park, Victoria, Australia, has already announced a complete NetInfo-based product for Suns called NetInfo for Sun, which allows users to manage mixed networks of Suns and NeXT workstations from a single platform.
- Software publisher **Qualix Group Inc.**, San Mateo, CA, has developed what it's calling its "Cheap Seats" program—a scheme to bring the price of networked licensed UNIX software below that for many PC and Macintosh programs. Qualix is making available between 25 and 50 seats of select packages for a radically reduced fee. The first packages included in Cheap Seats are Lotus Development Corp.'s Lotus 1-2-3, Elan Computer Group Inc.'s Avalon Publisher, MindWork Inc.'s Personal Postmaster, Crosswinds' Synchronize and Computer Support Corp.'s Arts & Letters Graphics Composer. The price for 25 floating licenses of 1-2-3, for instance, is \$10,000 under Cheap Seats. Qualix plans to add more products during the next six months, especially in the productivity tool area.
- Cambridge, MA-based **Integrated Computer Solutions Inc.** has come up with a novel idea for hawking widgets. The company has published the Widget Databook, a collection of more than 40 Xt-based widgets and other objects that help developers create Motif-based graphical user interfaces. For \$10, customers receive the Widget Databook and accompanying CD-ROM containing the binary widget code and access to six public-domain widgets (in source code form); users can purchase access codes for widgets described in the book directly from ICS and its resellers for prices ranging from \$200 to \$3,000.

- **Atria Software Inc.**, Natick MA, has rolled out a CASE management system called ClearCase. And already the company has inked agreements with Sun Microsystems Inc., Hewlett-Packard Co. and Silicon Graphics Inc. to make ClearCase available on their workstations. (HP is actually OEMing the product.) The system provides version control, configuration management and process (i.e., policy and procedure) control.

- **SPARC International** updates: The SPARC Compliance Definition 2.0 spec is at last ready and available. New to the spec, among other features, is a Motif Widget Set option, allowing vendors to support Motif yet remain SCD-compliant. SI also announced availability of its Developer's ToolChest, a set of interface specifications and tools distributed on CD-ROM to aid customers in migrating to 2.0. (If this sounds a lot like Sun's Open Migration Toolkit, that's because it is; Sun's aids developers in moving to Solaris 2.0; SI's helps them move to SCD 2.0.) And SI is now making available royalty-free, for a one-time license fee of \$99, the SPARC architecture license. All you have to do to qualify is purchase the SPARC Architecture Manual Version 8 for \$37. SPARC International is based in Santa Clara, CA.

- If you don't recognize the name **Gain Technology Inc.**, you just might by this fall. Sun Microsystems Computer Corp. is using the Palo Alto, CA-based company's GainMomentum object-based hypermedia application-development technology to develop interactive multimedia training software. SMCC is expected to bundle this multimedia software with all new SPARCstations starting this fall. Sun's already using the GainMomentum-based package in-house at Sun University for training its own employees. GainMomentum, which bears a strong resemblance to NeXT Computer Inc.'s NeXTstep, allows developers to build applications incorporating multiple types of data, including SQL database data, text, images, graphics, audio (and even animation, in the next release). ➡



PETER KALABOKIS

Mail Bonding by S. LEE HENRY

No. This isn't a column about guys getting close, and I haven't forgotten how to spell. We're going to look at a compatibility issue between the mailtools in OpenWindows Versions 2 and 3. For sites running both windowing systems and for users with old mail still in inboxes when OpenWindows Version 3 is installed, I've included a tool that will turn enclosures (the enclosure mechanism for mailtool in OpenWindows Version 2) into attachments (the enclosure mechanism for mailtool in OpenWindows Version 3). We'll also examine the differences between the two mail models and how the binding of icons to files is used in mailtool.

The mailtool in OpenWindows Version 3 brings some clever new features to its users. Among these, the more intuitive approach to attaching and mailing files of various types gives the mail recipient a clearer view of attached files. Now displayed as icons, rather than appearing as uuencoded compressed text, these files are neatly lined up and numbered in the attachments window.

Coming and Going

What users do to mail files has changed in OpenWindows Version 3. In OpenWindows Version 2 mailtool, the sender drags a file from File Manager and drops it into the compose window. In response to a notice box that then pops up, the sender selects the option to encode the file. Voilà! The blocky, incomprehensible text appears in the window couched between the begin and end lines that `uuencode` and `uudecode` use to delimit files.

In OpenWindows Version 3 mailtool, the sender drags a file from File Manager into the Attachments window and the appropriate icon for the file appears and is assigned the next sequential attachment number.

Recipients in OpenWindows Version 2 can look at the blocky encoded text if they wish but might notice the "(E)" in the message header telling them that the message contains an enclosure. They then drag the message from the header line into File Manager and retrieve the original file.

What users do to retrieve mailed files has also changed. In

represented in the chart below. The bottom four OSI layers form the lower-level infrastructure of the OSI model. They provide the data-transfer end-to-end services. The upper three layers are the upper-level infrastructure and provide the services for information transfer.

The official basis for each of the layers is to allow the independent development of protocols at each level. The total communications task is thus parceled into smaller areas that are intended to be functionally separate. Protocol standardization can thus be established. For each layer, "one or more standards have been defined." And these standards are intended to specify fully the protocols and services

OSI's Layers

Application	}	Application Services
Presentation		
Session		
Transport	}	End-to-End Services
Network		
Data Link		
Physical		

required for that layer's functionality. At the winter 1988 meeting of the UKUUG, Professor P.F. Linington of the University of Kent gave a tutorial on "current facilities and transition plans." The very next year, Peter Houlder, of the same university, told the audience in Cardiff: "The higher level OSI protocols cannot be supported on our existing ukc machine."

Problems

As far as I'm concerned, there are three major problems with OSI:

1. It is large, ungainly and slow;
2. There are few manufacturers supplying either software or hardware support for OSI;
3. There was nothing wrong with TCP/IP (except, perhaps, that it originated in the United States).

New ANSI Committee

ANSI's Accredited Standards Committee X3, Information Processing Systems, has announced

For more information about X3H7, contact:

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the formation of a new Technical Committee, X3H7-Object Information Management. The object paradigm is increasingly used as a basis for interoperability in the areas of object data management, object programming languages, object networking, object analysis and design, and object user interfaces. X3H7 will work actively with other organizations to reach consensus. X3H7 will develop a reference model technical report. The scope includes:

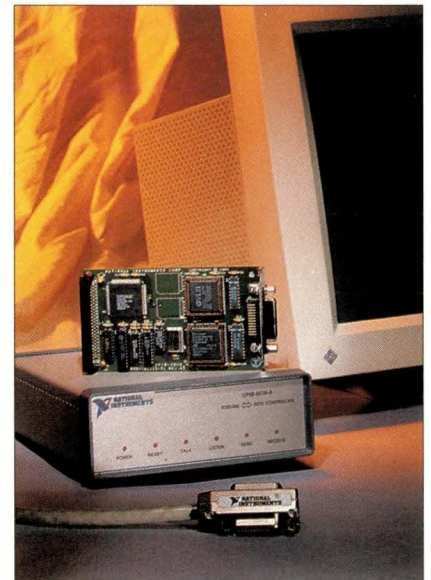
- An interoperable object model
- Object data management services
- External representations of object model schema and data
- Object class libraries
- Object languages
- Object communication and distribution
- Object design and methodologies.

Any individuals or organizations who are interested in the work of X3H7 are invited to participate. There was a meeting of X3H7 scheduled for June 30 to July 2 in Palo Alto, CA. I will discuss what's going on in a future column. ↔

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

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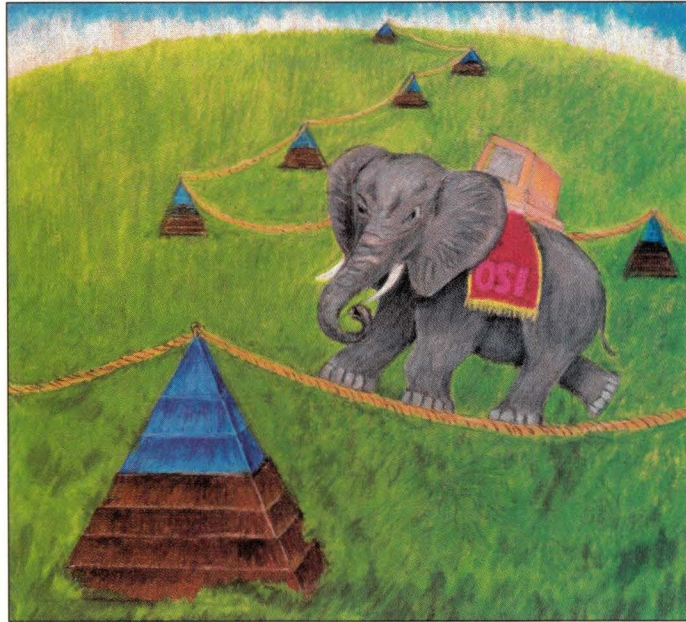


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JOHN W. KELLEY JR.

OSI or TCP/IP? by PETER H. SALUS

Well, let me begin by stating that I don't like OSI—the Open Systems Interconnection. I feel that this is something that was forced upon the world of computing by the large governmental PTTs (the national post-telephone-telegraph entities of Asia and Europe). Much to the dismay of those who felt that TCP/IP could do the job better, the U.S. National Institute of Standards and Technology (NIST, formerly NBS) has gone along, and so we have GOSIP (Government Open Systems Interconnection Profile), issued as FIPS 146-1.

GOSIP

GOSIP is based on the recommendations of a group of vendors and users who participated in a NIST workshop. It incorporates all of OSI and “additional protocols [that] provide new services useful to Federal Agencies.”

This means that the already slow and overheavy OSI has been burdened with still more fetters.

Yet the U.S. federal government is pushing GOSIP ever harder. So I guess we'd better get used to it. As of a few months ago, the Department of Defense, NASA and the Department of Agriculture were stiffening their requirements for OSI technology. This is quite different from this past year, when RFPs mentioned GOSIP in a footnote, if they ever did mention it. And while the Office of Management and Budget has nominal oversight where GOSIP compliance is concerned, they apparently don't check procurements for compliance.

Nonetheless, OSI will soon be upon us.

And, as far as I can tell, all the T-shirts are true: the elephant balancing on the phone lines, “Same-day service in a nanosecond universe,” the seven layers topped by one labeled “politics.”

In addition to GOSIP, there are OSI/CT (ISO/IEC 9646: Open Systems Interconnection—Conformance Testing Methodology and Framework) in five parts; OSI/RM (ISO/IEC 7498: 1984: OSI—Basic Reference Model) the infamous seven layers, see below; and OSI/SM (Draft Standard ISO/IEC 10164: OSI—Systems Management).

In fact, ISO 7498 has three more parts: 7498-2: 1988, which describes security services and defines their positions with regard to the reference model; 7498-3: 1989, which defines name use and address use; and 7498-4: 1989, which defines concepts and a structure for OSI management. There is also an Addendum 1: 1987, which adds provisions for connectionless-mode transmission.

Seven Layers

The “OSI Reference Model” is organized around a seven-tier structure

Not every OODBMS is capable of handling the kinds of arbitrary networks that would emerge from this system, but there are some that could. Unfortunately, storage is not the tricky part. Data representation, navigation and interpretation are the real bugaboos.

Dr. Wasserman notes: "The biggest problem that we have encountered is the ability to handle objects of a different grain size. It's relatively easy to take care of a small number of big objects and to do the processing outside the OMS. It's much harder to deal with a large number of small objects... one might treat an entire diagram as an object in the OODBMS, but that will often be too coarse a grain. Along the same lines, it's often necessary to treat an object in several different ways, i.e., an entire source program vs. a single module vs. a line of code vs. a token vs. a character. Different tools need different views of the object and its composition/decomposition. This is an ugly and difficult problem."

Most of today's network-analysis and modeling tools are very special-purpose creatures. This makes sense; an electrical-circuit simulation program cannot be expected to do stress analysis for bridges. Nonetheless, *some* commonality of formats is going to be needed, if only to keep programs from chewing on inappropriate data.

More expansively, certain analytic and modeling techniques are clearly applicable to more than one discipline. Fast Fourier Transforms and Linear Programming are two obvious examples. Presentation techniques, including audio and video annotations, can also help users deal with large amounts of data. If the system encourages exploratory analysis, interesting cross-fertilization may occur. (SGI's "Iris Explorer" is a nifty example of just such an exploratory analysis system.)

Don't look for this kind of system to drop out of the sky in the near future. Pieces of it are available today, however, and sundry efforts (DOE, OOSD, ToolTalk) are trying to solve some of the grainier problems it would present. Give it a few years, perhaps a decade, and this fantasy might well seem all too conservative.

Acknowledgements

Dr. Tony Wasserman should not be blamed for the mistakes in this column. His comments helped me to clarify some of my ideas, however, and to better understand the current state of the art. More fundamentally, Tony and IDE have inspired my (and perhaps others') thoughts on the possible future of CASE tools. →

Richard Morin produces Prime Time Freeware, a semi-annual CD-ROM collection of redistributable, UNIX-based source code. Between releases, he consults, writes and teaches on UNIX topics. He may be reached at CFCL, P.O. Box 1488, Pacifica, CA 94044 or by email at cfc1!rdm@cfc1.com.



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Circle No. 23 on Inquiry Card

Today

Computers have gotten pretty good at handling text; most systems come with at least one text editor, and formatting systems are commonplace. Drawing packages are substantially less common. The Macintosh provides a couple; SunOS (discounting *iconedit*) provides none, although packages such as CorelDraw and IslandDraw can be purchased separately.

Unless you have some add-on software, your Sun system can't do any of the tricks described above. Even with the best software available today, some of them are still beyond reach. Let's look at the current state of the art.

Simple drawing packages (e.g., MacDraw, TopDown) are no problem. There are a number of programs that will allow you to enter lines, circles and other objects. They won't help you much in keeping things connected, however. If you move an icon across the screen, be prepared to redraw a number of arrows.

Flow chart-specific drawing packages (e.g., MacFlow) try to deal with explicit connections. Move an icon, and the connections will remain attached. Unfortunately, it isn't hard to confuse the ones I've seen, but they do make an effort. They fall down, however, on implicit connections.

Venn and Warnier-Orr diagrams, for instance, have no physical lines attaching their components. Worse, each has different rules for grouping its graphical elements. Even if a flow-charting program had the necessary icons, the dynamics of editing such a drawing would be out of reach.

To assist in creating and editing a diagram, a drawing package must "understand" how the diagram's elements fit together. If I select a block in a Warnier-Orr diagram, all of the constituent items should come along for the ride. If I add items, existing items should make room for them, as they would in an outlining program.

Software through Pictures

Interactive Development Environments (IDE), San Francisco, has been promoting CAD software for design and analysis for several years. Their environment, called Software through

Pictures, supports a variety of design methods. These include Structured Systems Analysis (DeMarco/Yourdon and Gane/Sarson), Real Time Requirements Specifications (Hatley/Pirbhai), Hierarchical Data Structures (Jackson), Entity-Relationship Modeling (Chen), Structured Design (Constantine/Yourdon) and Object-Oriented Structured Design (OOSD; Wasserman/Pircher).

The system integrates diagram editors and checkers with code and documentation generators. The tools and support libraries communicate through a relational DBMS, allowing a substantial degree of cross-checking and coordination. To support varying customer preferences, IDE provides more than 300 alterable tool properties.

The IDE system's name implies that one can develop entire suites of software by drawing pictures. This is not yet the case (no pun intended), but they are closing in on it. Prototyping tools, augmented by snippets of functional code, can go a long way toward simulating or even producing a running system.

This is a substantial piece of work. It could be very useful to any large C/UNIX development effort. The DOD standardization support (DOD-STD-2167/2167A) alone could save many hours of tedious and possibly error-prone effort. And yet, and yet, I find it all a little confining.

What I Want

My idealized editing package would be quite a monster; it might be better to think of it as a system of programs. Or, to be *au courant*, a set of cooperating objects. Nonetheless, all that is a mere (-) implementation detail.

Fully comfortable in a multimedia world, the package would deal with text, images, audio and video clips, the works. It would allow manual input from a variety of devices: mice, pens, space balls, data gloves, etc. Arbitrarily extensible, it would accept new subsystems gracefully. Finally, it would be supplied with, or would at least be economically available for, any reasonable computer system.

CAD capability would be integral to the package. Rule sets for all major types of CAD would be available, and

new sets would be trivial to add. A central Object Management System (OMS) could store everything: data, relationships, values for their properties, mechanisms for access control and event triggering. I would prefer to see this done by an OODBMS, but that's not critical.

A common form of notation would allow assorted checkers, simulators and translators to use the common data pool. IDE's Object-Oriented Structured Design (OOSD) notation (Computer, March 1990, among others) is a step in that direction. How, after all, can you properly design a building when you can only simulate its subsystems in isolation?

Networked access would be built in, allowing multiple users to view and edit drawings as part of an on-line conference. I am appalled, by the way, at the dearth of interactive communications programs in use on UNIX systems. UNIX still lacks a multiuser talk facility; VMS had one back in 1980.

Does all this seem pretty far-fetched to you? It does to me, as well, but most of the essential technologies are already available. Some are a bit researchy, others are being sold as products.

Getting There

The "iconic editor" is a pretty trivial extension on any of the current high-level window libraries. It should be able to accept new icon definitions, use old ones in drawings, etc. It should know the conventional meanings of symbols but allow alternate usage without serious complaint.

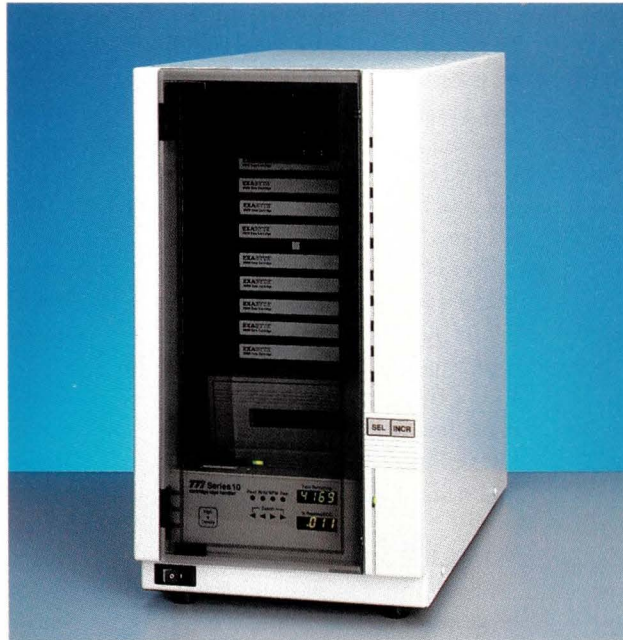
Ideally, users would be able to add, or at least edit, rule sets for connectivity, related icons, etc. I suspect that the initial definitions would require substantial expertise, but simple adaptations should then be possible with relatively little effort. A hexagon and a diamond may have very different meanings, but their graphic rules are likely to be pretty similar.

Multiuser interaction isn't too difficult, as long as only one user is trying to change things at a given instant. A simple approach would allow multiple cursors to roam the window at the same time but only allow one of them to be "in control."

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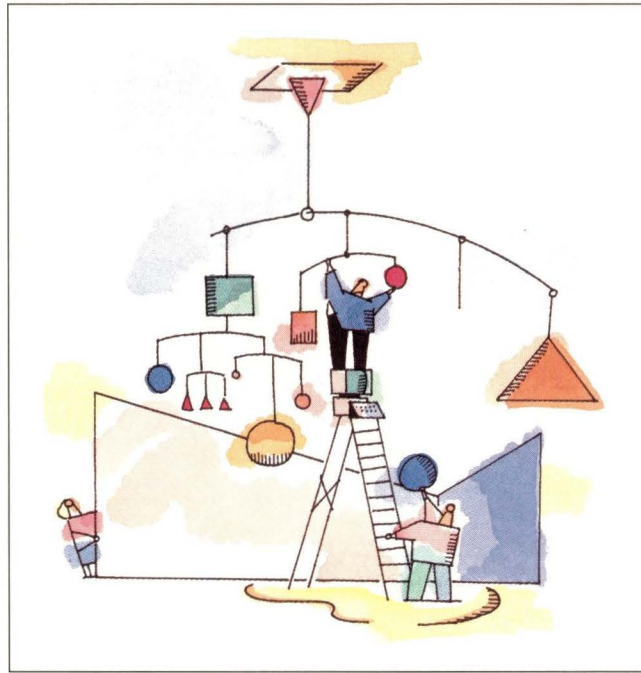
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ROBIN JAREAUX

Computer-Aided Diagramming: Needs, Tools and Prospects

by RICHARD MORIN, Technical Editor

Several years back, I engaged in a small exercise. I wrote down a list of the diagramming languages that I knew, at least on a reading basis. I came up with a couple of dozen without significant effort. More to the point, I found several that I use on a regular basis.

Most programmers and engineers will have equivalent lists, adjusting for their particular specializations and tastes. *Diagramming Techniques for Analysts and Programmers* (Martin & McClure, Prentice Hall, 1985, ISBN 0-13-208794-4) has chapters on:

- Decomposition Diagrams
- Dependency Diagrams
- Data Flow Diagrams
- Three Species of Functional Decomposition
- Structure Charts
- HIPO Diagrams

- Warnier-Orr Diagrams
- Michael Jackson Diagrams
- Flow Charts
- Structured English and Pseudocode
- Nassi-Schneiderman Charts
- Action Diagrams
- Decision Trees and Decision Tables
- State-Transition Diagrams
- Data Structure Diagrams
- Entity-Relationship Diagrams
- Data Navigation Diagrams
- Compound Data Accesses

More current reference works would likely have even more. I don't know how many diagramming languages are in use worldwide, or even in the United States; there must be hundreds. Now for the interesting part: How many of these languages does your computer understand? Whirrr. Beep. Ill-defined question.

OK, I'll try again. Can your computer assist you in editing any of these languages? That is, does it know enough about their "syntax" to keep logically connected icons grouped appropriately? Can it check for syntactic (let alone semantic) errors? Can it read descriptive data files and turn them into reasonable, editable diagrams?

Heading into multilingual territory, can it integrate multiple diagramming methods in a single database? How about checking for inconsistencies and/or converting among differing diagramming methods? Does it let you add new diagramming methods? Easily?

Can you share a sketchpad over the network? Make your drawings with a pen? Scan in and interpret existing drawings? Well, don't feel left out; I can't do most of these, either.

```
ioctl call:
setnb(int fd)
{
    int i;

    i = 1;
    ioctl(fd, FIONBIO, &i);
}
```

setting `i` to zero will clear the internal flag that marks the file descriptor for nonblocking I/O. You can get exactly the same result by using a call to `fcntl`.

```
setnb(int fd)
{
    fcntl(fd, F_SETFL, O_NDELAY);
    /* _FNDELAY is a synonym */
    /* for O_NDELAY */
}
```

You can see that there is loads of confusion here. POSIX has defined yet another way of providing nonblocking I/O. You use `fcntl` to set on the `O_NONBLOCK` status flag on the file descriptor. The POSIX specification says that the `read` and `write` system calls should return an error `EAGAIN` rather than the original 4.2BSD `EWOULDBLOCK` error value when the calls would block.

Incidentally, you can set the `O_NONBLOCK` or `O_NDELAY` flags on for the file descriptor when the file is opened. You

pass one of these flags in as part of the `flags` parameter to the `open` system call. It's better to use this option if possible and use `fcntl` only when you are affecting the flags set onto an already open file descriptor.

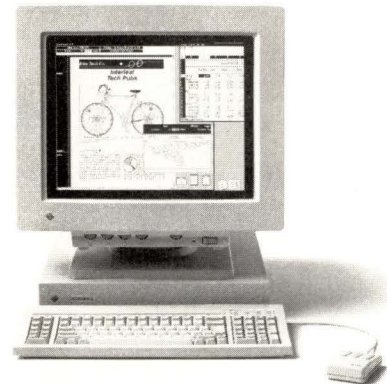
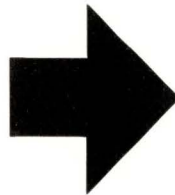
All this is a demonstration of the bag and baggage that UNIX has picked up over the years in the name of backward compatibility and the coexistence of the different flavors of system. I hope that POSIX will reduce all this.

Finally

The development of the `select` system call and the non-blocking settings on file descriptors have enabled the creation of a broad class of applications that support I/O multiplexing. System V does not have `select`; instead it uses a system call called `poll`.

This has similar features to `select`. The POSIX working group charged with working on the System Interface API is about to start making decisions about a version of `select` or `poll` for POSIX. The group will be meeting this month in Chicago. ➡

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



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ing, then the call will return a value of zero to the calling process. This allows the code to tell whether the timeout has elapsed.

If you supply a structure containing zero timeouts, then the effect is to poll the file descriptors for any activity. If there has been no activity, the call will return immediately returning zero.

It's really easy to misuse this call and take the machine away from any other user. It permits you to write programs that use short or zero-length timeouts and loop endlessly, polling away. I know that you are public-spirited citizens and want to minimize unnecessary, nonproductive processor cycles, especially on a workstation. That other user is really you.

Inhibiting Blocking

It's easy to see how we can use a system call that will wait for input events. The delays are most often due to some human who is busy doing a myriad of other things that occupy normal life. What an interesting-looking cloud, person, insect, bird, table, fingernail, etc., etc. The delays involved in output are less obvious and it's not so clear why you might wish to test whether output will block.

Can you guarantee that output will always happen in some reasonably short time? It depends on the application and the risks that you, the author, are prepared to take. For example, output to the terminal will always happen in some finite time, or will it? What happens if the user has pressed Control-S and stopped the data flowing? A number of

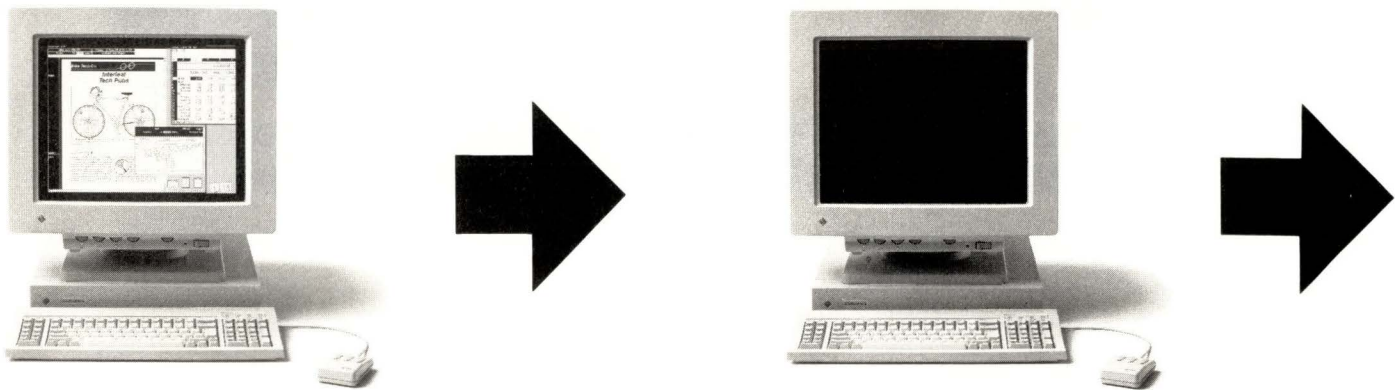
writes will fill up the buffering that the kernel is prepared to do, and the output will block. What about output to disk? That always happens, right? Well, what if the disk is really a remotely mounted NFS filesystem and the network has just

Does it matter if it blocks in these 'odd' circumstances? It depends entirely on the application. Just don't take apparent certainties for granted.

died? Can your application survive that? Does it matter if it blocks in these "odd" circumstances? It depends entirely on the application. Just don't take apparent certainties for granted.

One way around this problem is to mark the file descriptor with a flag that stops the I/O system calls from blocking. The `read` or `write` system calls will return an error if the call that has just been made would block. The system call will return `-1`, and the external variable `errno` is set to `EWOULDBLOCK`. You can detect this error, go off and do some useful work and try the system call again later.

You can set this up on any file descriptor by using an





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have failed and will return -1. It fails mostly because it is incorrectly set up. It can return because a signal has been received before data for reading has appeared at a file descriptor. Dealing with this eventuality is somewhat application dependent.

Normally, the `select` call will replace the `fdset` bit map with a new bit map with bits set to show the calling program the file descriptors that have had some activity. It will return a nonzero value giving the number of file descriptors that need to be looked at. This method is a little like the `width` parameter that you send into the call in the first place. If I continue with my example:

```
if (rv > 0) {
    if (FD_ISSET(0, &fdset)) {
        /*
         * can read from fd 0
         */
    }
    if (FD_ISSET(infd, &fdset)) {
        /*
         * can read from infd
         */
    }
}
```

I don't fret about the returned value from the `select` call because my application is simple.

In more complex situations, you may see people write things like:

```
for (i = 0; i < rv; i++) {
    if (FD_ISSET(i, &fdset)) {
        /*
         * do work
         */
    }
}
```

Notice that the mechanism means that the original `fdset` cannot be used in a loop because it is destroyed by the call to `select`. Input to the `select` call needs to be reset every time it is used.

Even with the addition of the event detection part of the `select` call, your application may still find that it is unacceptable to block for uncontrollable periods inside the call. The designers of `select` thought of that. If you supply a pointer to a `timeval` structure:

```
struct timeval {
    long tv_sec;
    long tv_usec;
};
```

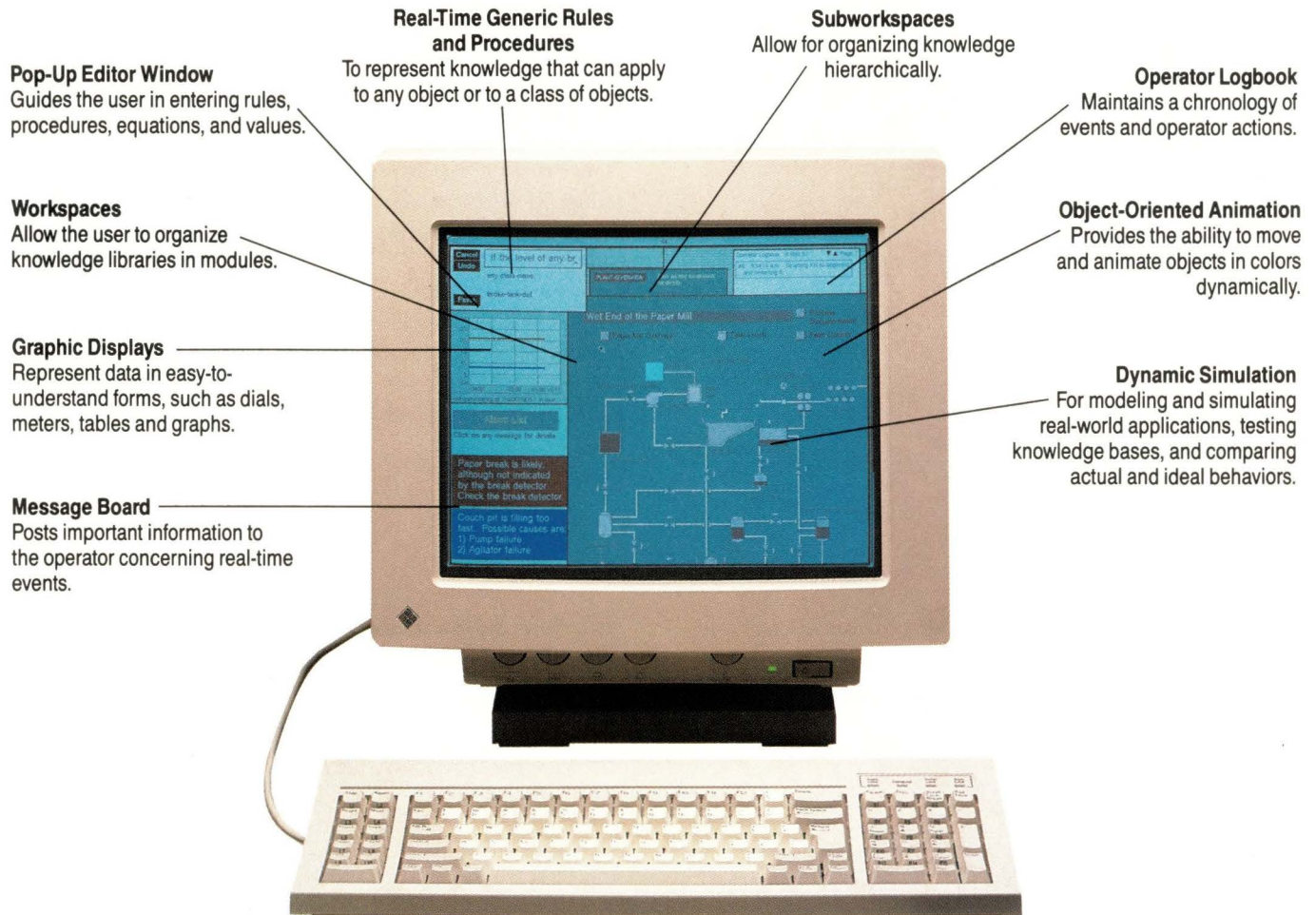
This allows the specification of seconds and microseconds of a timeout period. If the period elapses with nothing happen-

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Call ...

variable-length bitfields. The general form of the system call is:

```
rv = select(width, readfds,
            writefds, exceptfds,
            timeout);
```

The width parameter gives the number of file descriptors to be considered in this call to `select`. It can set to the maximum number of file descriptors that are supported by the implementation; you can get this directly from the `ulimit` system call. Alternatively, it can be set to one more than the value of the highest used file descriptor in the call.

The `fds` parameters are bit maps that specify the type of activity that is to be looked for: read, write and exceptional conditions. The `exceptfds` bit map is really only applicable for network connections where it can be used to detect "out-of-band data." It can also see master/slave communications on pseudo-ttys. The final parameter to the system call gives a timeout value. I'll talk about that in a bit.

The parameters whose names end in `fds` are pointers to bit maps that are manipulated by a set of macros. The macros make the program portable into environments with different numbers of bits in the maps. Setting up a call to `select` is then reasonably easy. Let's imagine that we want to listen for data from standard input (file descriptor 0) and some other source whose file descriptor is in `infd`. The code goes a little like this:

```
int w;
int rv;
fd_set fdset;
...
...
/* clear the bit mask */
FD_ZERO(&fdset);

/* set bit 0 and infd */
FD_SET(0, &fdset);
FD_SET(infd, &fdset);

/* set width */
/* slight kludge */
w = infd + 1;

/* call select */
rv = select(w, &fdset, NULL, NULL, NULL);
```

As usual, I am limited in text width by the printing process. I have included some definitions at the start of the code so you can see what is happening. The first code line ensures that the bit map is set to zero, a necessary step. The next two lines set the appropriate bits to make the system call look at file descriptors zero and `infd`. I then derive the width from the value in `infd` since I know that it will be the maximum value for this call. Finally, I call `select`. The arguments I am not using are set to the null pointer.

At some point in the future, `select` will return. It may

More Complex Applications

However, many more complex applications do not want to be blocked. Consider something apparently simple like a terminal emulator. It takes data from the keyboard and relays it over some communications channel to a remote machine, down perhaps an RS-232 line or an Ethernet connection. At the same time, it is reading data from the remote host from the communications line and writing it onto the screen.

If you restrict yourself to the standard system call set, it's hard to write a terminal emulator like this as a single process. There are two code paths, both doing "read" and then "write." You will be blocked waiting for data from the keyboard when data comes in from the communications line, and vice versa.

Perhaps the most popular terminal emulator, `rlogin`, gets around this problem by using two processes. One takes data from the keyboard and sends it up the line; the other listens for data from the communications line and writes it to the screen.

It works well, but only because `rlogin` is very "raw." It does no local line reconstruction or character processing; it tries to be an extension of the RS-232 line. It doesn't need to have much communication between the two halves of the program. A terminal emulator like `telnet` will do local processing of characters. It will assemble a line of data from the user, permitting line editing and displaying the result on the local screen. A new line of clean data will be sent to the remote host when the user hits return.

To do this, the two code paths that make up the program will have to be closely coupled to enable character processing to take place. A character coming from the keyboard will be stored locally and then echoed. The display process taking characters from the communications line and displaying them on the screen now also needs to take characters from the input process that is handling the keyboard.

The conclusion is that we'd like to be able to put these two code paths into one program. To enable us to do that, we need some way of dealing properly with the data coming from several sources, two in this case. The key system call that permits all this was invented for 4.2BSD; it's called `select`.

The Select System Call

The basic idea is that you pass a set of file descriptors into `select`. It will block until something interesting happens on the I/O channels those descriptors represent. If it is looking at descriptors used for reading, then it will return when data is present for those file descriptors. When looking at descriptors used for writing, it will return when there is space to write some data.

A complication arises in specifying the file descriptors. In 4.2BSD, you could only have 32 file descriptors in any process and there were 32 bits in each integer. It was natural to use the bits of the integer as a bit map of file descriptors that would be inspected by the `select` system call.

Unfortunately, systems now provide many more file descriptors than 32. The arguments to `select` are now

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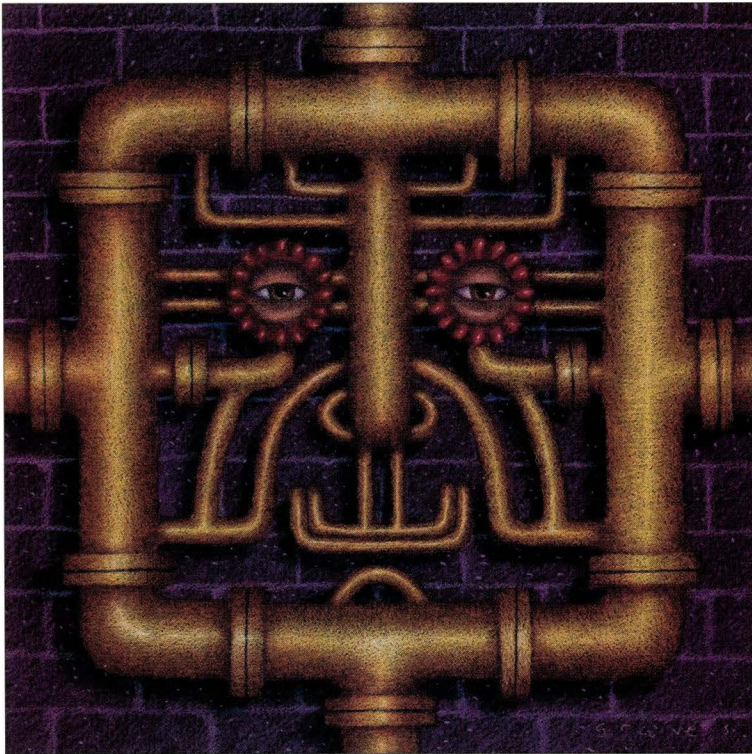
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KEITH GRAVES

by **PETER COLLINSON**,
Hillside Systems

Nonblocking Input/Output

My article expressively entitled “Input/Output” (*SunExpert*, May, Page 30) covered the underlying notions of the UNIX I/O system. If you are a beginner in this game, I suggest that you pluck the copy from your bookshelf and scan the article. It gives you the basics you’ll need to understand what follows.

A feature of the `read` and `write` system calls that always deserves special mention is the idea of *blocking*. When a process executes an I/O system call, it will be put to sleep if the I/O call cannot be completed. The process is oblivious to this. When the I/O system call completes, the process sees a normal return from the routine that was entered to perform the I/O.

UNIX does this to maintain the notion that all processes deal with streams of data. If the process is reading from the terminal and input pauses, then the process should not need to take any special action. It will simply wait in the `read` system call until new data is ready. If the process is writing some data to a magnetic tape then the device will accept data much more slowly than the CPU can produce it. The process-output speed will be regulated by making it block when the device is not ready to take data from the kernel.

These ideas are well illustrated by pipes. Pipes contain a

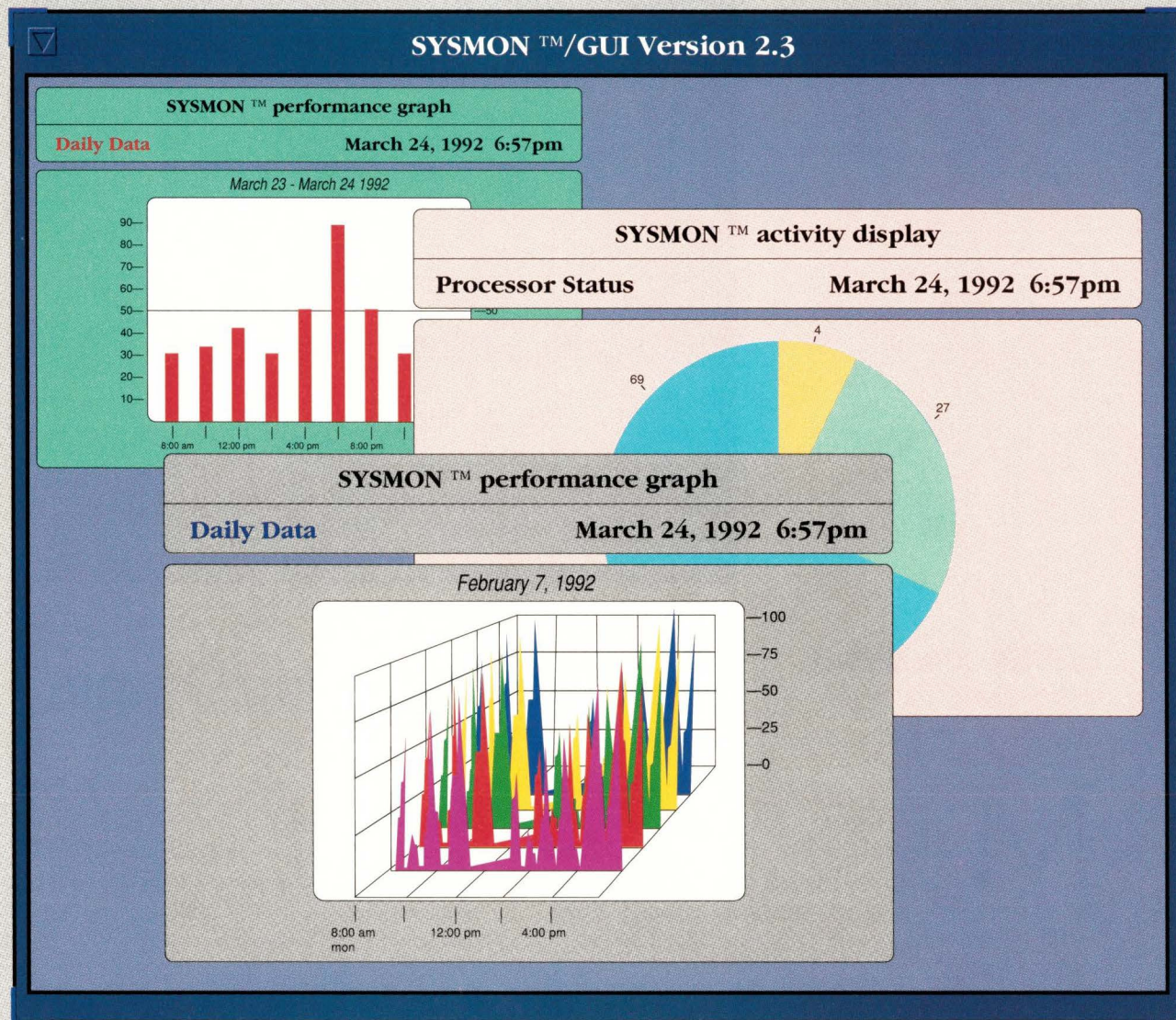
small amount of buffering and would not work on a single processor unless they did. A producer process writing into a pipe can do so until the pipe buffering is full. At this point, the producer is put to sleep. While the pipe is empty, a consumer process will be asleep waiting for data to come. When data appears, the consumer is roused and reads the data. This makes space for the producer to write more; it is restarted and the cycle continues.

The idea of blocking is more than just a convenience for the programmer. On a multiprocessing system, it’s important that the CPU is given to some other process when the lack of a resource means that the currently running process can no longer proceed. We must try to avoid using the CPU to detect events by constant inspection (known as “polling”). Instead we try to arrange that a process is told when some resource becomes available. We try to make events drive actions.

Blocking is an important feature of multiprocessing systems, and user processes don’t often care that it is happening. Most processes have single execution paths: They read some data, process it, output some new data and finally die. Execution is sequential. Authors of such programs don’t care about them being blocked because the programs cannot proceed without waiting for the I/O to complete.

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vided, but not `listen()` and `accept()`. No provisions were made for setting socket options, and socket addresses could be provided only in the form of strings representing host names. This led serious network programmers to the desperate expedient of constructing special servers, exter-

one. It recognized that network protocols are just that—protocols—and that implementations differ. It is not yet the case that complex network code can be arbitrarily shifted between platforms, though that day is coming. Certainly, it cannot yet be shifted between operating systems, and it is

at least, and implementable on any system whose network primitives are powerful enough to be translated into the Berkeley socket abstraction.

This level of indirection—from platform to virtual machine to application image—points the way to a new type of network programming, an environment wherein the application programs need not depend explicitly upon the semantics of the underlying network. This provides the separation of layers that the OSI network model promotes, and which current applications lack. Mr. Protocol thinks this is pretty good going for an old fuddy-fashioned language that's over 20 years old. ➡

It is not yet the case that complex network code can be arbitrarily shifted between platforms, though that day is coming.

nal to Smalltalk, which would accept a network connection from the Smalltalk virtual machine, and then proceed (in C!) to do whatever actual network magic was necessary to make the application fly.

Mr. Protocol avers heatedly that this was neither pretty nor fun, but it did work. However, it did point up one of the strengths of object-oriented programming. The upper layers of the application, in Smalltalk, merely had to say to the network module, "gimme a socket." The fact that the network module was extremely limited did not matter, as the external server provided the power necessary. When a later release of the system provided better network capabilities, only the network module changed. The entire remainder of the application was untouched. The next release of the system provided not one but two ways around the problem. In the first place, it allowed the end user to add (in C) new primitive methods to the virtual machine, in effect extending Smalltalk arbitrarily. This is obviously useful for binding Smalltalk into other applications, as well as solving a variety of environmental problems. It represents the beginning of a new era for what was originally a complete operating system—the ability to interact with an external software environment that simply did not exist when Smalltalk was first invented.

The second provision represented what Mr. Protocol refers to as a "shift of vision." This shift is an important

only by dint of browbeating that it is possible to move UNIX networking code between a System V-based STREAMS environment and a BSD-based socket interface...most such systems now provide application libraries that translate the semantics of one environment, as closely as possible, into the native semantics of the platform. This is marketing at work, not computer science. What was finally recognized, after deep thought, discussion and some screaming, was that the socket interface had not been adopted merely because of a deep-seated desire to propagate arbitrary complexity (the feelings of observers of the Berkeley computing scene notwithstanding), but because members of the DARPA steering committee, which oversaw that work very closely, were already longstanding veterans of the network wars. The complexities of the socket interface mirrored the complexities of (at least) this generation of network programming. The result was a beautiful thing to behold: a complete representation, in Smalltalk, of the various entities connected with network programming.

This, at last, permits the development in Smalltalk, with full object-oriented benefits, of complex network applications—applications that can be moved to any platform whose virtual machine implements the necessary network primitives. This set of primitives is complex, of course, but can be constructed using the facilities commonly available on UNIX platforms,

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.

ACCESS

There are three versions of Smalltalk currently available. The first is GNU Smalltalk and is available for free from wherever you choose to obtain the GNU distribution. It, however, lacks a graphical user interface. The second version, by Digital, has not substantially penetrated the Sun market but is commonly found on PCs. The version described in this column, which is by far the most complete (and most expensive!), is available from:

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info@parcplace.com

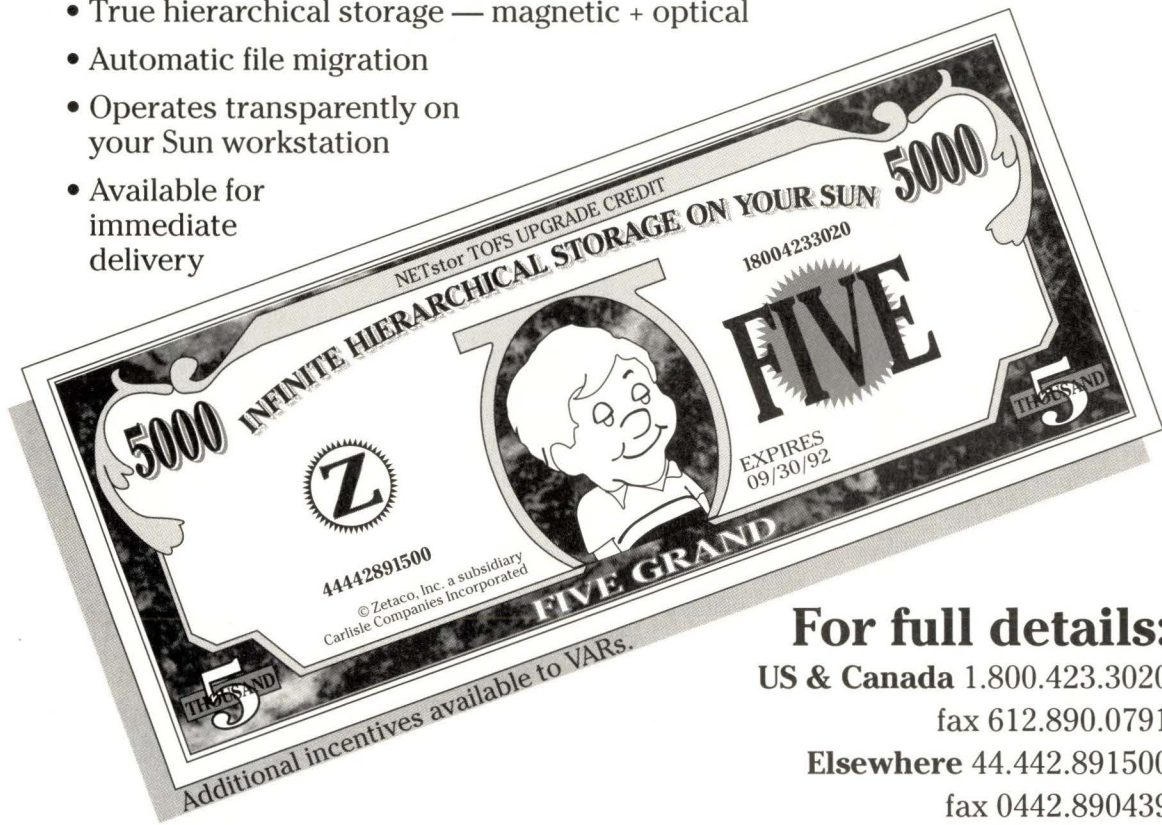
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things right the second time around. And that's where Mr. Protocol shows great interest. Smalltalk permits the programmer to think about applications in a way that does not at all resemble the way that a typical C programmer does. Instead of figuring out the data structures and the functions that share them, he simply designs a protocol, a data exchange language, between objects. The objects may mirror real-world objects, or they may be representations of abstract concepts such as queues or clocks. Mr. Protocol is not about to turn this screed into a tutorial on object-oriented programming, except to note in passing that while C++ can be used to construct programs that are largely object-oriented in flavor, it is in no way an object-oriented language in and of itself, and in fact is missing some capabilities, such as general polymorphism, which characterize object-oriented programming.

What are the differences between programming networked applications now versus when Smalltalk was in its

infancy? How does network programming in Smalltalk differ from network programming in C? Let's see.

First of all, network protocols are much more mature now than in 1970. There are far more services, and the available toolkit is much larger. Because Smalltalk need no longer provide the underlying operating system (or microcode!), it can make use of at least the low-level network tools already available. The structure of Smalltalk is that of an undifferentiated collection of classes, in a single tree. There are no competing class libraries, as in C++. The source code for all classes is available for modification and subclassing, at exactly the same level as new application code. Smalltalk programming is done by refining and subclassing the existing class hierarchy—surprising to some, but perfectly obvious in the light of its original intent, that of providing a powerful, customizable, personal system. Actual computation takes place by means of a virtual machine, which is implemented for each platform

upon which Smalltalk is to run. This virtual machine provides a set of "primitive methods," which implement the abstract machine upon which Smalltalk runs. This allows the great body of Smalltalk code, called the "image," to remain identical across various platforms. This provides Smalltalk with a degree of code portability only dreamt of by most application programming systems.

However, network programming differs substantially among platforms, and this led to an initial misfiring in providing networking primitives. ParcPlace knows that the portability provided by the system is one of their main strengths and will go to some lengths to avoid introducing platform-specific code. The initial attempt at providing networking primitives, however, fell afoul of this policy. The first networking primitive provided a class called Socket. A socket is exactly what it was, but only just. It provided the ability to connect to a server socket, but it could not provide a passive socket interface: `connect ()` was pro-



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that attempts to use Smalltalk to run FTP over the 3 Mb/s Ethernet had a tendency to leave the last fragment of a block untransferred—certainly an undesirable characteristic in most people's books. Much is made of the problems Xerox had and has in bringing its research innovations to market. The Star system was a disaster of such magnitude that people are still writing papers explaining the causes. Steve Jobs' visit to PARC and his subsequent decision to build the Macintosh are computer history now.

Xerox held onto its Smalltalk technology and attempted to market it, but, as it ran only on Xerox processors and Xerox processors were not exactly worldbeaters in the marketplace, Smalltalk's dissemination was slow at best. In fact there came a point when Xerox dropped its processors as a product line but continued support for Smalltalk, which left the Smalltalk group as a department without a mission. The group promptly obtained a hefty contract with a large and nameless government agency that had as a

primary requirement the sifting and characterization of large amounts of information. The result was turned into a product. Mr. Protocol notes in passing that people who think integrated spreadsheet packages are nifty have not lived until they've seen *The Analyst*.

Eventually, Xerox saw the light and spun off an independent company, called ParcPlace Systems, to market Smalltalk technology for existing hardware. ParcPlace has done this, providing Smalltalk environments for most of the major workstations, including Suns, PCs and Macs. This company has been very successful in selling to large corporate customers, while encouraging research at universities.

There is even a niche available for those who, like Mr. Protocol, wish to use Smalltalk in the role for which it was originally developed—as a personal productivity and prototyping tool at the individual level. This is no longer the primary focus of the company, however, and Mr. Protocol feels that



though this may be a business necessity, it is nevertheless sad.

However, today's workstations represent the lineal descendants of the Altos and Dorados of Smalltalk's youth, and thus it can do what few software packages have ever had the opportunity to do: return to the ground of its youth and try to get

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acter entirely unexamined, so we will now provide, by way of examination of one product, a rather different view of networking.

The product under examination at the moment is ParcPlace Systems Release 4.0 of Objectworks\Smalltalk, which is the current *nom de marché* of what used to be called Smalltalk-80, or simply Smalltalk. This is an interesting package to discuss because a)

the computer at the level of the individual researcher. It was among the first systems ever constructed with personal use and productivity as its primary orientation.

Smalltalk, then, would seem to be a system meriting consideration due to its part in the history of computer science. What is interesting is that it is slowly gaining more widespread acceptance today, having as its chief

ware designers to design machines so powerful that the software engineers couldn't keep up and find uses for the power. Hence, it was always too slow. It was designed to be: Hardware would catch up. After 20 years, it finally has, but the fast processors are a far cry from the early Xerox computers on which Smalltalk was first implemented.

These machines were also among the first to use bit-mapped screens and mice. As Mr. Protocol has noted in the past, the mouse was first developed for the NLS system at SRI, where it was used in conjunction with a chord keyboard. It was at PARC that the mouse and the chord keyboard parted company forever. The mouse was kept and the chord keyboard dropped. In a very real sense, that's why you don't have one (unless you're Jon Postel). Smalltalk, then, was one of the first systems to use a bit-mapped screen, windows and a mouse. Pop-up menus were first used here, and the use of a three-button mouse on Suns is a return to the Good Old Days in many ways: Smalltalk uses all three buttons, since it's always had them available, which makes life interesting when running Smalltalk on a PC or a Mac, Mr. Protocol would like it to be known.

What, you may pointedly ask, is the reason for this excursion down memory lane? Mr. Protocol is glad you asked.

From their earliest days, the Xerox processors were linked on a network: the first Ethernet, which ran at 3 Mb/s. The use that Smalltalk has made of that network has been peculiar. In the early days of its development, Smalltalk was resident in a pure research environment. The researchers certainly used and lived in the environment they had built, and there was planned development, but network applications did not arise in the sort of distributed research environment that characterizes the Internet today. The result is that the sorts of network services that were made available to and through Smalltalk were fairly haphazard, and in some cases, downright buggy. Mr. Protocol still remembers

Smalltalk was among the first systems ever constructed with personal use and productivity as its primary orientation.

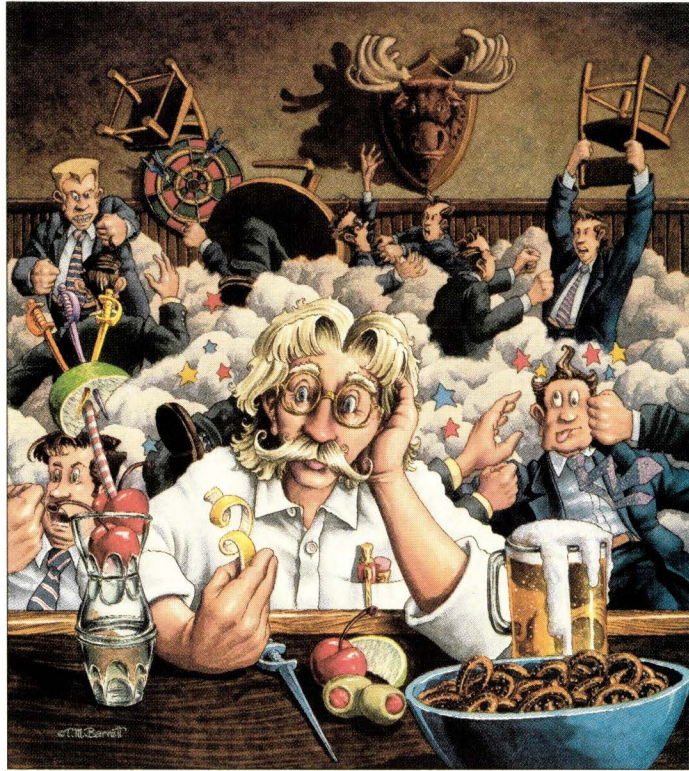
relatively few people have actually used it, and b) relatively many people have an opinion about it. This leaves it as a ripe candidate for arguments in a bar, and there are few things in computer science privileged enough to merit that sort of treatment.

Remembering that the *Guinness Book of World Records* was originally compiled to settle arguments in bars, a brief examination shows that it has its merits in this regard. Smalltalk was not the first object-oriented language (SIMULA is usually accorded that honor), but it is certainly the farthest over in that direction. It was the first system of any sort to support a windowing system with a mouse. Our entire use of windows descends from the early experiences with Smalltalk, by a tortured lineage. And it's the first, and certainly one of the only, software systems that had as an explicit design criterion the fact that it was too slow and cumbersome to be run on the machines available when it was created. This criterion was met beautifully.

Smalltalk was first developed in the late 1960s at Xerox Corp.'s Palo Alto Research Center, known then and now as Xerox PARC. It was originally conceived of as one component of a solution to what PARC researchers thought of as their chief research problem: how to harness the power of

drawback its own historical reputation. As first conceived, Smalltalk was a simple language that ran on dedicated hardware. "Simple," here, is a relative term, of course. It was always large as software systems go, but not outrageously so (at least to start with!). It ran on a variety of proprietary Xerox processors, such as the Alto, the Dolphin and the Dorado. These machines were peculiar in architecture, to say the least. The machines were designed to multitask at the hardware level, with 16 possible "tasks." Since each task, at least potentially, had different microcode, doing system programming on these machines was not a task to be taken lightly. In fact, the major applications that ran on these machines, such as Smalltalk and Interlisp, would load application-specific microcode as part of the startup sequence. Hence, when running Smalltalk, an Alto was a Smalltalk machine from the ground up.

Smalltalk has always had the reputation of being so slow that it was useless above the level of building "toy" applications. This is perfectly true, though the same charge was once leveled at UNIX in its early days (and it was true there too—but the toys were interesting enough to be useful!). Smalltalk was, in part, designed in reaction against the proclivity of hard-



TOM BARRETT

by MICHAEL O'BRIEN

That Obscure Object of Desire

"The Medium is the Massage."

—Someone not particularly object-oriented

"I object!"

—Someone else who hasn't quite got it

"But do not turn it, do not turn it, for the world turns with it."

—Terry Bisson, *Talking Man*

Q: Something very strange is going on here. What is Mr. Protocol playing with? I can't tell if they're

blocks or dominoes.

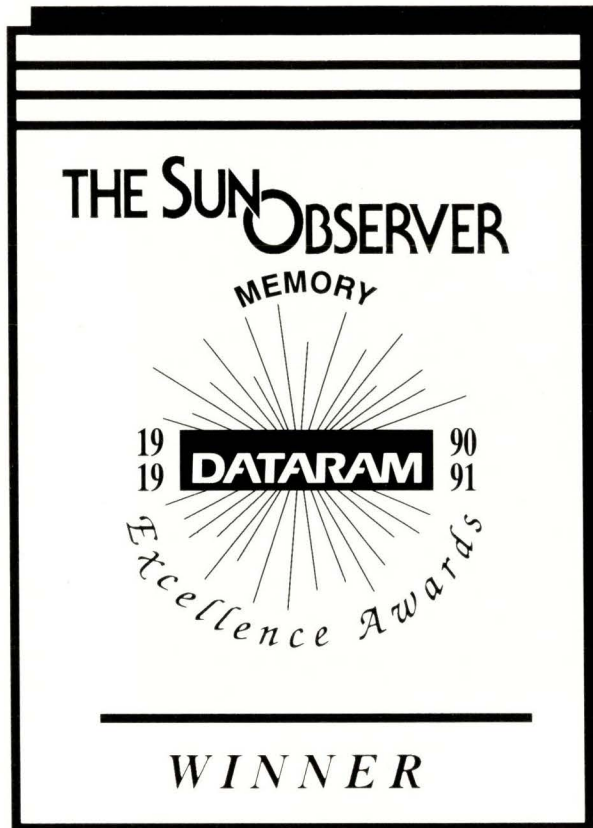
A: Well, no wonder. They're neither. Mr. Protocol is playing with objects. If they seem a little fuzzy, well, that sometimes happens when you play with objects. It's peculiar, but while many people attempt to get rich by peddling structured object design methods, some of which may actually work, one of the chief benefits of playing with objects is that it is not necessary to have a clear vision of the final goal when you start out. This can be very important in a prototyping environment. It can also lead to systems that can only be looked at in a mirror

if the viewer is to survive. Spaghetti code can give way to a Gorgonian haircut.

One lasting image of Mr. Protocol is that of a kindly old gent sitting up sleepless at three in the morning, tracing Internet routes. Leaving aside for the moment the fact that gateway congestion sometimes leaves three Ack Emma as the only time when the entire Internet even comes close to working, and wildly ducking the question of *where* it is supposed to be 3 a.m., we must still point out that this image is, well, not always true to life. Mr. Protocol is sometimes to be found jumping up and down in full daylight, saying things about various vendors that cannot be reproduced here for various reasons.

It would not be fair to his readers, though, to leave this side of his char-

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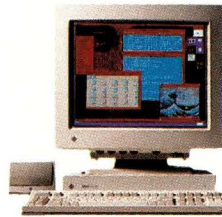
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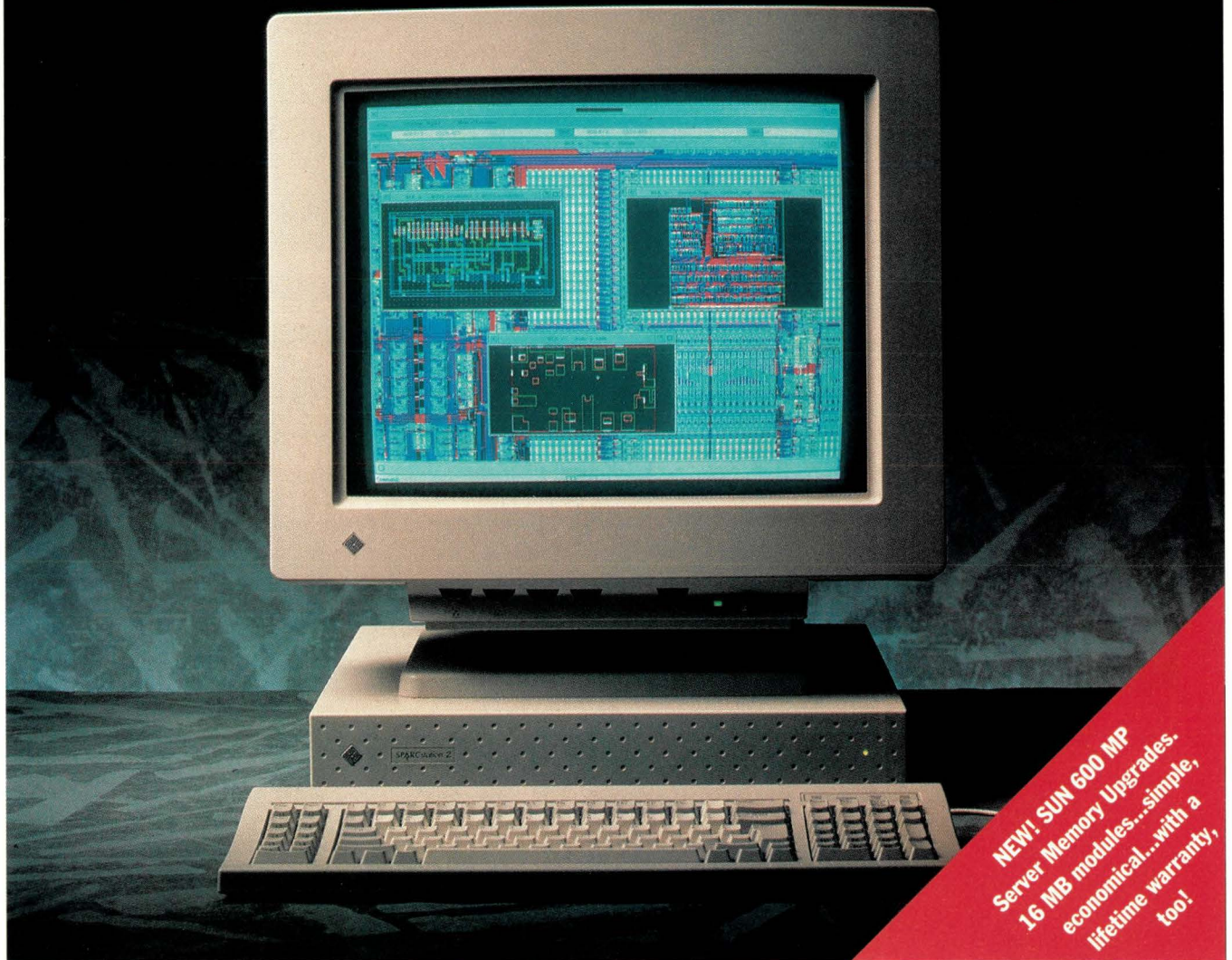
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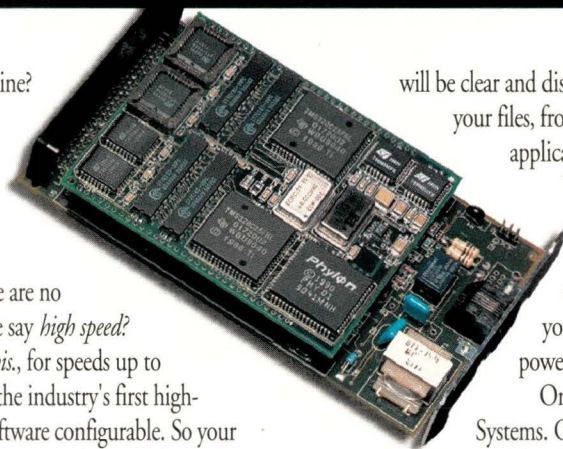
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OpenWindows Version 3, recipients retrieve files by dragging icons from the Attachments window. With a more intuitive view of the files they've received, they can more easily decide where they want to drop them. They might, for example, want to put spreadsheets and images into different subdirectories.

Behind the 'Seens'

Underneath what the sender and recipient see, the content of mail messages has not changed all that much. The most striking difference in the format of mail files is the inclusion of descriptor lines that identify the mail objects (e.g., text message, attached files). These lines describe the object to follow, including such information as the number of lines, type of object (e.g., text or raster file). On the other hand, what the user sees is dramatically improved, and the change in terminology from "enclosure" to "attachment" will help to clarify this difference.

- *Enclosure*—A file dragged and dropped into the Compose Window in OpenWindows Version 2. The file is uuencoded and compressed in the process.
- *Attachment*—A file dragged and dropped into the Attachments Window in OpenWindows Version 3. The file is uuencoded but appears in mailtool as an icon.

The "X-Sun-Data-Type" descriptor line below notes that this particular file is an IslandWrite document.

```
X-Sun-Data-Type: IslandWrite-document
X-Sun-Data-Name:
X-Sun-Encoding-Info: default-compress, uuencode
X-Sun-Content-Lines: 85
X-Sun-Content-Length: 5101
```

Mailtool uses this line to select the icon to display in the Attachments window. The type value is derived from the bindings in effect at the time the file was attached.

Figure 1. Retrieving mailed files

		To	
		OpenWindows2	OpenWindows3
From	OpenWindows3	Dragging message out of the Header Window returns original file	Dragging message out of the Header Window results in a <i>mailfile</i>
	OpenWindows2	Dragging message out of the Header Window returns original file	Dragging message out of the Attachments Window returns original file

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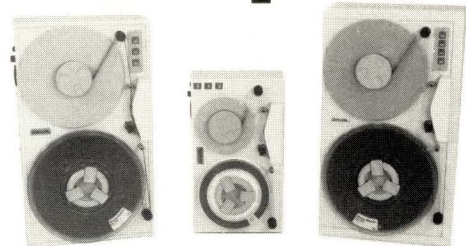
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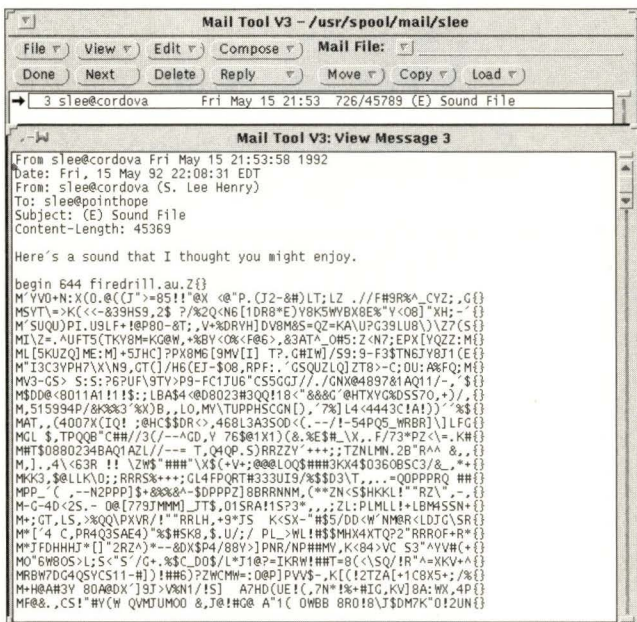


Figure 2. An Enclosure

OOPS

When mail with enclosures appears in the mailtool in OpenWindows Version 3, the recipient is faced with a challenge. If he opens the mail message, he finds himself staring at the same blocky encoded text file that he would see in OpenWindows 2. But alas! When he drags the message from the Header window, he doesn't get the file he expects, but a

mailfile. In other words, the enclosed file is still in its uuencoded form and contains all the addressing and message information. In fact, any message dragged out of the Header window in OpenWindows Version 3 mailtool creates a mailfile. Don't be too concerned about this. The incompatibility will be short-lived and is only an issue when both versions of mailtool are in use. It could also be modified to work with uuencoded files mailed from other systems.

So what do we do? The user could edit each mailfile, remove the mail header information and accompanying text, uuencode, decompress and rename the file. Or the ambitious system administrator could do this for his users.

Or ...

You could use a tool like that presented here to turn the enclosures into attachments that will drag out of the mailtool the way OpenWindows Version 3 mailtool intended. Your users will probably never suspect that you saved them some work and confusion.

What Convmail Does

The convmail tool presented here is very simple-minded. It reads the inbox (/var/spool/mail/<user>) that you send it through standard I/O, checks the subject line for the "(E)" notation that indicates there are enclosed files. When it finds this notation, it inserts descriptor lines in front of any preceding text messages, then scans for "begin NNN filename" lines that indicate the beginning of each enclosure and inserts the appropriate descriptor lines ahead of them. It

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also attempts to evaluate the type of each enclosed file. If the file matches any of the types included in the program, it assigns that file type to "X-Sun-Data-Type" so that the attachment will use the appropriate icon; otherwise, it assigns the default document icon.

The convmail program also changes the subject line very subtly. The "(E)" notation is changed to "[E]" so that running an inbox through the program more than once will not result in multiple sets of descriptor lines.

The way you use this program should depend on how you

introduce OpenWindows Version 3 in your environment. If you install OpenWindows Version 3 across your network fairly simultaneously, you can run each individual inbox through the convmail tool and be done with it. If all your inboxes are stored on a single mail server, you might enter the commands shown below.

```
cd /var/spool/mail
foreach inbox (`ls`)
? echo $inbox
```

Listing. Automating OW2 to OW3 conversions

```
/*
/* convmail.c -- convert OW2 enclosures to OW3 attachments */
/*
#include <stdio.h>
#include <string.h>
#include <sys/types.h>
#include <sys/param.h>

#define TRUE 1
#define FALSE 0

/*
 * Table of file type names and magic numbers
 */
struct filetypes {
    char *type;
    char *magic;
} filetypes[] = {
    { "IslandDraw-document", "1.2$N6,D#9LR,4" },
    { "IslandPaint-document", ",/#0(#,0#,0!@P984" },
    { "IslandWrite-document", "<,[,&2,G#1PZ=LK( " },
    { "NITF file", "3I)0,0(" },
    { "Wingz-Help-File", "5YPT7)%\"Q(" },
    { "Wingz-Script-file", "5YP<T7)%RY0A" },
    { "Wingz-Worksheet-file", "5YP<T7)%RY0I" },
    { "audio-file", "+N:X(0.@(" },
    { "font-file", ",&C,L $" },
    { "sun-raster", ",/#4R!'&AHTP.6J " },
    { "sun-icon-image", "+U2 ,/) " },
    { "default-doc", "" },
};

#define NTYPES (sizeof(filetypes)/sizeof(filetypes[0]))
#define SIZE 25 /* >= longest magic number (bytes) */

main()
{
    char text[BUFSIZ];
    char filename[MAXPATHLEN];
    char filetype[MAXPATHLEN];
    char magnum[SIZE];
    FILE *fp;
    int c;
    int i,j,k,len;
    int enclosures = FALSE; /* flag if enclosure present */
    struct filetypes *ft;

    for(i=0; (c = getchar()) != EOF;) {
        text[i++] = c;
        if(c == '\n') {
            if(strncmp(text,"From ",sizeof("From ")-1) == 0) {
                enclosures = FALSE;
                printf("%s",text);
            }
            else if(strncmp(text,"Subject: (E)",sizeof("Subject: (E)")-1) == 0) {
                enclosures = TRUE;
                /*
                 * Replace ( with [ and ) with ] (around E)
                 */
                text[9] = '[';
                text[11] = ']';
            }
        }
    }
}
```

```
? cat $inbox | /usr/local/bin/convmail >
  $inbox.tmp
? mv $inbox.tmp $inbox
? chown $inbox $inbox
? end
```

If, on the other hand, you are going to run both windowing systems for an extended time, you might prefer to insert the tool as a filter in your aliases file.

```
slee: "| /usr/local/bin/convmail | mail\slee"
```

Modifying the Code

In the C code presented here, I've selected a number of file types so that the appropriate icon will be displayed in the Attachments Window. The set that you want to display may be different than mine. In this case, you can modify the arrays of filetypes and magic values that reflect the filetypes important to your site.

The names of filetypes can be retrieved from the Binder in OpenWindows 3. Determining the magic value to look for, on the other hand, is more difficult. These values represent

```

printf("%s",text);
puts("Content-Type: X-sun-attachment");
putchar('\n');
puts("-----");
puts("X-Sun-Data-Type: text");
puts("X-Sun-Data-Description: text");
puts("X-Sun-Data-Name: text");
putchar('\n');
}
else if(enclosures == TRUE) {
for(i=0,j=0; text[i] != '\n';i++)
if(text[i] != '{' && text[i] !=}')
output[j++] = text[i]
if(strncmp(text,"begin ",sizeof("begin ")-1) == 0) {
(void)memset(filename,(int)'\0',sizeof(filename));

/* Skip past 'begin NNN ' and copy out file name */
for(j=10,k=0; text[j] != '{' && j < sizeof(text); j++,k++)
filename[k] = text[j];
filename[k] = '\0';

/* remove compressed indicator in filename */

len = k-1;
if(filename[len] == 'Z' && filename[len-1] == '.')
filename[len] = filename[len-1] = '\0';

/* look ahead for file type */

for(i=0; (c = getchar()) != '{'; i++)
output[i] = c;

for(j=5,k=0; k < SIZE; j++,k++)
magnum[k] = output[j];
magnum[k] = '\0';

for(i=0,ft=filetypes; i < NTYPES; i++,ft++)
if(strncmp(ft->magic,magnum,strlen(ft->magic)) == 0)
break;
strcpy(filetype,ft->type);


puts("-----");
printf("X-Sun-Data-Type: %s\n",filetype);
printf("X-Sun-Data-Name: %s\n",filename);
puts("X-Sun-Encoding-Info: default-compress, uuencode");
puts("X-Sun-Content-Lines: 57");
printf("\nbegin 666 ",filename);
printf("\n%s",text);
}
else
printf("%s",text);
}
else
printf("%s",text);
(void)memset(text,(int)'\0',sizeof(text));
(void)memset(output,(int)'\0',sizeof(output));
i = 0;
}
}
exit(0);
}

```

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Figure 3. An Attachment

the magic number for this filetype, uuencoded and compressed. Examining the contents of OpenWindows 2 enclosures is probably the easiest way to decipher the value you need to look for. Note that I have skipped past the first five characters of this value in the code; these are the same for all filetypes.

A simplification of the tool would be to omit the arrays altogether and simply assign a default icon for all attachments. If you replace the last block with the following hard-coded assignment, all your attachments will look the same until they are dragged out of the Attachments Window into File Manager.

```
printf("%s\n", "X-Sun-Data-Type: default-doc");
```

Getting Code

I will be happy to send you the code presented here if you don't want to type it in. If you include "SunExpert" in your subject line, I am less likely to overlook your request (sorry, I get a lot of mail). This tool can also be built in *awk*. For those of you more comfortable with an *awk* script, I will send the *awk* script instead. ➔

S. Lee Henry is on the Board of Directors of the Sun User Group and is a systems administrator for a large network of Suns in the federal government. Slee also heads her own firm, The Next Page Inc., specializing in software documentation.

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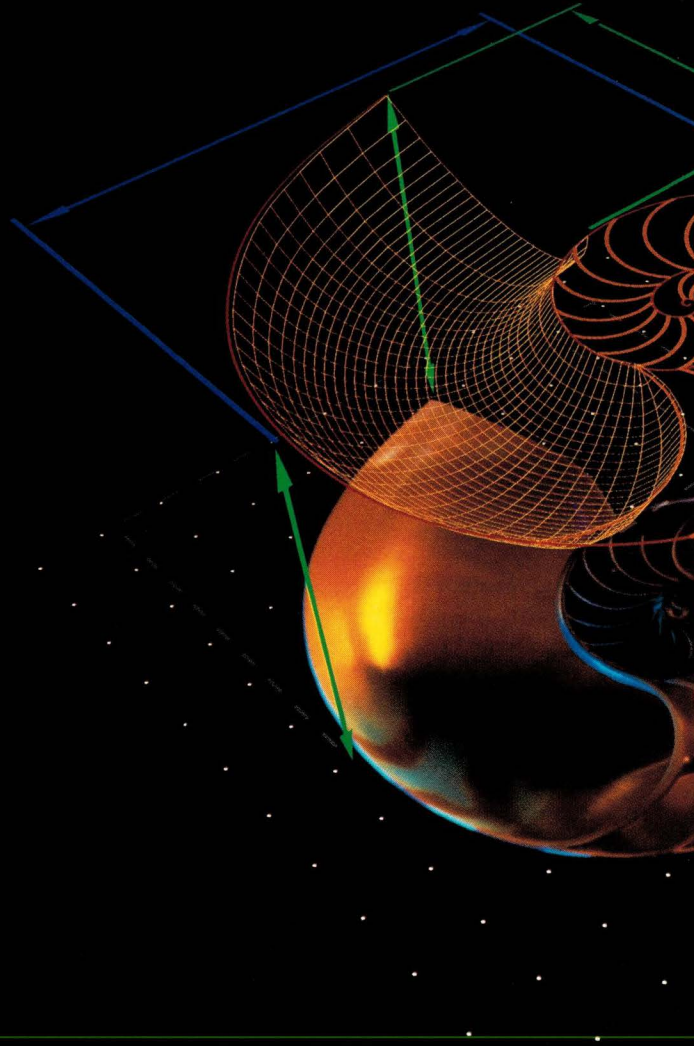


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Suns in CAD/CAM/CAE

by MARY JO FOLEY, Senior Editor



More Sun Microsystems Inc. systems can be found handling computer-aided design, manufacturing and engineering tasks than doing anything else. CAD/CAM/CAE can be considered Sun's—and, in fact, just about every workstation vendor's—core business. It's the point from which workstation companies have traditionally expanded into other technical and commercial markets. Today, a full third of Sun's revenue comes from CAD/CAM/CAE-related hardware sales.

Because these kinds of applications tend to be MIPS/SPECmark-intensive, CAD/CAM/CAE customers are likely to be on the bleeding edge in terms of their computing needs. These customers are oftentimes first to upgrade to top-of-the-line workstations and servers. In Sun's case,

What's hot in the brave new world of MCAD, AEC, EDA and GIS applications

CAD/CAM/CAE platforms of choice to date have been SPARCstation 2 GX, GXplus, GS and GT systems.

Now these users are clamoring for the newly introduced SPARCstation/SPARCserver 10s and 600MP servers. They are dying to get their hands on Solaris 2.0 so they can benefit from the multithreading and multiprocessing necessary to make their CAD/CAM/CAE packages percolate.

As a result, it's not too surprising that sales of Sun platforms for electronic design automation (EDA) applications generate nearly 20% of Sun's revenue, according to Deepak Natarajan, director of design automation applications for Sun Microsystems Computer Corp. (SMCC). Hardware sales into mechanical CAD (MCAD) generate more than 10% of revenue. Architecture, engineering and construction (AEC)-related system sales bring in just under 3% to 5% of revenue, as do geographic information system (GIS)/mapping-related platform sales, Natarajan adds.

For Sun, MCAD has blossomed during the past few years. Natarajan says the company expects MCAD platform sales to top 15% in the next year or two. And an even more rapidly increasing contributor to Sun's revenue base is GIS/mapping, which Sun predicts will grow at a compound annual rate of 50% or more during the next five years. SMCC is using GIS technology to build an internal application that is helping the Channels Marketing and Development Organization hone its reseller coverage (see "GIS: Not Just for Map Makers Anymore").

These patterns parallel what's going on in the industry at large, says San Jose, CA-based market researcher Dataquest Inc. Dataquest anticipates that the MCAD market will surge from its \$2.2 billion level in 1991 to \$2.7 billion in 1995, a 23% increase. And the GIS/mapping area should climb 1,742%, from \$76 million in 1991 to \$1.4 billion in 1995, Dataquest predicts.

Most of this growth is attributable to the steady increase in the number of third-party CAD/CAM/CAE software offerings available for all types of hardware platforms—PCs, workstations, servers and mainframes. Unlike

More Than Meets the Eye: Sun's CAD/CAM/CAE Share
(Worldwide Factory Revenue for All Applications)

Company	% in 1990	% in 1991
IBM Corp.	9.7	11.2
Intergraph Corp.	10.9	7.3
Computervision	5.4	5.9
Digital Equipment Corp.	8.8	5.9
Hewlett-Packard Co.	5.1	5.4
Sun Microsystems Inc.	6.0	4.3
Fujitsu Ltd.	*	3.1
NEC	*	2.9
Compaq Computer Corp.	*	2.7
EDS/Unigraphics	*	2.7
Other	54.1	48.3
Total	\$14.3 billion	\$15.8 billion

* Not tracked separately Source: Dataquest Inc.

Sun Microsystems Inc. didn't lose much, if any, market share between 1990 and 1991, since Intergraph Corp., Computervision and several other vendors still bundle Sun hardware with their software.

Digital Equipment Corp., Hewlett-Packard Co., IBM Corp., Intergraph Corp. and other system providers, Sun has made a conscious effort to stay out of the CAD/CAM/CAE software business. This doesn't mean Sun is uninterested in manufacturing applications; just check the seemingly endless pages of listings in the latest Catalyst catalog if you have any doubts about Sun's stake in CAD/CAM/CAE. But, says Natarajan, Sun is leaving the development and support of these kind of applications to its independent software vendors (ISVs), VARs and OEMs, and is thus avoiding any and all possible competition with them.

MCAD: Revenge of the NURBS

If Sun *were* in the CAD/CAM/CAE software business, MCAD is the area in which it would most likely butt heads with its ISVs and resellers. The leading UNIX MCAD software vendors, according to Dataquest's calculations, include IBM and Hewlett-Packard.

Neither IBM nor Dassault Systems (its division responsible for CADAM, the product IBM acquired from Lockheed Corp.) sells MCAD software for Suns. But HP does. HP has been selling its Precision Engineering/ME-10 2D design and drafting software for Suns for two years. HP bills ME-10 as a product ideally suited for the novice

CAD user. During the past year or so, HP has added a 2D parametric design module, B-spline geometrical handling capability and Motif look and feel to the product, says Hartmut Sievert, marketing manager for the mechanical design division, which is based in Boeblingen, Germany.

HP also is in the midst of porting its 3D design system, called Precision Engineering/SolidDesigner, to the Sun. When HP introduced the product in February, it announced it simultaneously for HP/Apollo and Sun systems. According to Sievert, the Sun version should ship sometime next year. The package, which is an upgrade to HP's ME-30 product, is built on the ACIS solid-design geometric kernel. SolidDesigner uses a Motif interface and is compatible with ME-10. At the same time it rolled out SolidDesigner, HP introduced Precision Engineering/WorkManager, an engineering data- and process-management system, for both HP/Apollo and Sun systems. WorkManager uses the HP InterLink integration toolkit to manage data from other applications in their native environments via packets/folders, vaults, forms and routing lists.

Speaking of HP, there's also Computervision. This train of thought isn't the non sequitur that it once might have seemed. Even though Computervision sells more than 80% of its flag-

GIS: Not Just for Mapmakers Anymore

Geographic information systems (GIS) have long been considered the orphaned stepchild of the CAD/CAM/CAE market. Increasingly, however, they are emerging as The Next Big Thing in productivity tools. "In actuality, CAD/CAM is a component of GIS, not the other way around," says Michael Cosentino, GIS market development manager for Sun Microsystems Computer Corp. (SMCC).

There are some big names in the UNIX-based GIS business, including Autodesk Inc., Computervision, ERDAS Inc., Environment Systems Research Institute Inc. (ESRI), Intergraph Corp., Landmark Graphics and Siemens-Nixdorf Information Systems, to name but a few. And while all of these vendors sell applications that can draw a stunning map of any locale, from your neighborhood to a continent, they can do a lot more—as many nontraditional GIS customers, such as Sun, are discovering.

ESRI's Arc/Info package provides hundreds of tools for map automation, data conversion, database management, map overlay and spatial analysis, interactive display and query, graphics editing, address geocoding and network analysis, surface modeling and display and data automation through coordinate geometry. Arc/Info consists of the proprietary graphical DBMS Arc, combined with Henco Software's Info RDBMS. It is available for PCs, UNIX systems, minicomputers and mainframes. One of ESRI's newest modules, called Arc/View, provides visualization, query, display and output of geographic databases in a wide variety of formats, including raster-image data. Customers can integrate Arc/View with spreadsheets, statistical programs, business graphics and/or desktop publishing packages.

ERDAS sells ERDAS for PCs, workstations and DEC VAX/VMS systems. The product is modular, like Arc/Info. (In fact, there's a live link available between ERDAS and Arc/Info that allows users to overlay Arc/Info vector data on top of ERDAS' raster imagery.) In February, the company rolled out ERDAS Imagine, a geoprocessing package with an X Window System interface that can perform spatial and statistical modeling and advanced image-processing functions on multiple data layers.

Autodesk addresses the GIS market through its Arc/CAD module within Version 11 of AutoCAD. Arc/CAD is an ESRI-developed product that initially will be available on PCs only. A UNIX version is expected sometime in the future. Autodesk also has formed

alliances with a handful of imaging and mapping ISVs to deal with the "fuzzy" area where facilities management and GIS intersect, according to Joe Nicholson, industry manager for mapping, GIS and civil within the company's AutoCAD business unit. Currently 10% to 15% of AutoCAD users are employing the product for GIS/mapping, Nicholson says. And 200 of Autodesk's third-party developers are working on GIS/mapping-related AutoCAD applications, he says.

"GIS applications are basically database managers," claims Nicholson. "They're going to be like spreadsheets were in the 1980s. Everybody's going to have one on his or her desktop."

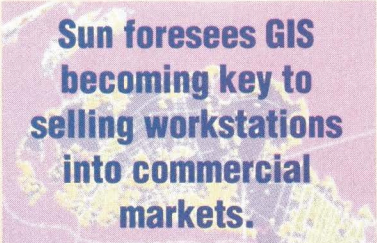
The most frequently produced output of GIS packages is maps. But as SMCC's Cosentino points out, GIS software can also generate a list based on spatial data. This moves it from a vertical tool to a horizontal, general business tool, he says. And this is why Sun foresees GIS becoming key to selling workstations into commercial markets in the not-too-distant future.

As if to prove its point, SMCC has developed a commercial GIS system that is being deployed by its U.S.

field operations channels marketing and development organization. The Reseller Information System and Coverage application evaluates and provides guidelines on SMCC's reseller coverage by geographic region. "We're trying to understand our end-user reseller sales profile for the top 150 cities in the United States," explains Bo Johnson, manager of channels business development.

SMCC's system is based on ESRI's Arc/Info and Arc/View products. Arc/View allows the channels marketing department to visualize various types of business data, including databases from International Data Corp., Wharton Economics, Computer Intelligence, G2 Research and other market-research outfits. Although these databases aren't interconnected, they can all be viewed through Arc/View. From this information, Sun is constructing a database with revenue forecasts and recommendations on how many resellers should be located in each geographic region. The output is viewed using a dynamically scalable color map.

The 100 or so users within SMCC can obtain this data via anonymous ftp over the Sun wide-area network. The databases and Arc/Info hosts are located throughout Sun and reside on various IPX, SPARCstation 1+/2 and 4/470 and 4/490 systems.—mjf



Sun foresees GIS becoming key to selling workstations into commercial markets.



Structural Dynamics Research Corp.'s I-DEAS provides design, analysis, drafting, testing and numerical-control programming.

ship CADDs product into Sun sites, the company announced last year that it was unbundling its software from Sun hardware in order to establish additional reseller relationships with DEC and HP.

This move didn't go unnoticed by Sun. "We expect the Computervision impact [on our MCAD business] to be a little rough in the short term," acknowledges Natarajan. However, right on the heels of the unbundling decision, Computervision signed a contract to purchase more than \$200 million worth of SPARCstations and servers per year over several years. (While Computervision no longer "bundles," it will "custom package" hardware and software for customers upon request.)

Nearly the entire Computervision line runs on Sun hardware. This includes CADDs, an integrated CAD/CAM product for design, analysis and manufacture of components and assemblies; Medusa, a set of CAD/CAM applications for discrete manufacturing, AEC and facilities management; PDGS, the Product Design Graphic System, a Ford Motor Co.-developed product; the Calma product family, a series of CAD/CAM/CAE software for mechanical and AEC users; and Personal Designer, Personal Machinist and VersaCAD software, a series of 2D and 3D appli-

cations that run on PCs and workstation platforms.

Release 5 of CADDs was unveiled last summer. Computervision has incorporated parametric, feature-based advanced 3D modeling on the geometrical side, says Director of Systems Marketing Allen Hopkins, as well as a standardized interface for developers to embed in their own products. Called CVDoors, this interface spec is a set of C++ nonuniform rational B-splines (NURBS) routines. Computer-

vision also has moved its Engineering Data Management (EDM) product to Sun server hosts. EDM is designed to manage CAD/CAM data from multiple vendors via its distributed database in order to manage and control engineering data throughout the product-development process.

Some other key names in the Sun MCAD game are EDS (which purchased the McDonnell Douglas Information Systems' Unigraphics division in late 1991), Parametric Technology Corp., Structural Dynamics Research Corp. (SDRC) and Autodesk Inc. As is true of HP and Computervision, all of these companies have made adding 3D capabilities to their MCAD packages a focal point. At the same time, all of these vendors admit that 2D still dominates the MCAD scene, and that many purchasers of 3D packages are doing mostly 2D work with them.

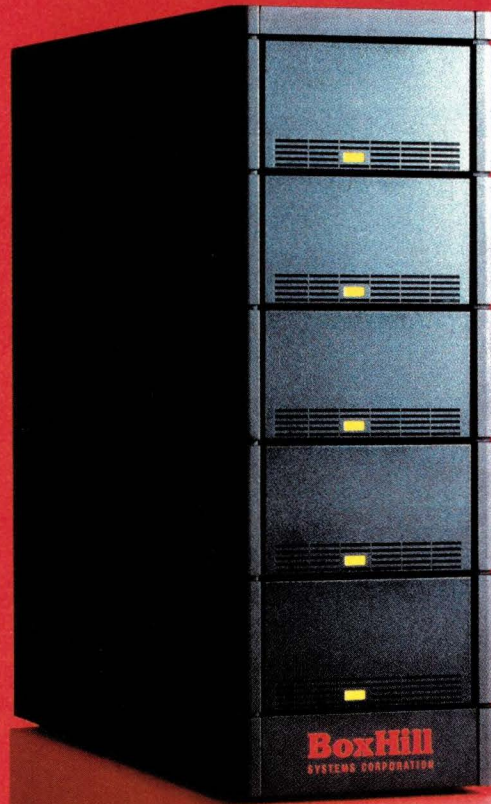
Parametric, as its name implies, is a specialist in parametric modeling. Parametric modeling packages assign symbols to model dimensions, rather than fixed values, allowing engineers to relate model dimensions and features to one another. Engineers who make changes in one area see their changes automatically updated throughout.

Unlike other 3D products, the vast

From ASICs to NURBS—A Glossary

AEC	Architecture engineering and construction
ASICs	Application-specific integrated circuits
CAD/CAM/CAE	Computer-aided design, manufacturing and engineering
EDA	Electronic design automation
EDIF	Electronic data interchange format
GIS	Geographic information system
IGES	Initial graphics exchange specification
MCAD	Mechanical CAD
MCM	Multichip modules
NURBS	Non-uniform rational B-splines
PDES	Product data exchange using STEP
STEP	Standard exchange of product model data
VHDL	VHSIC hardware description language
VHSIC	Very high speed integrated circuit

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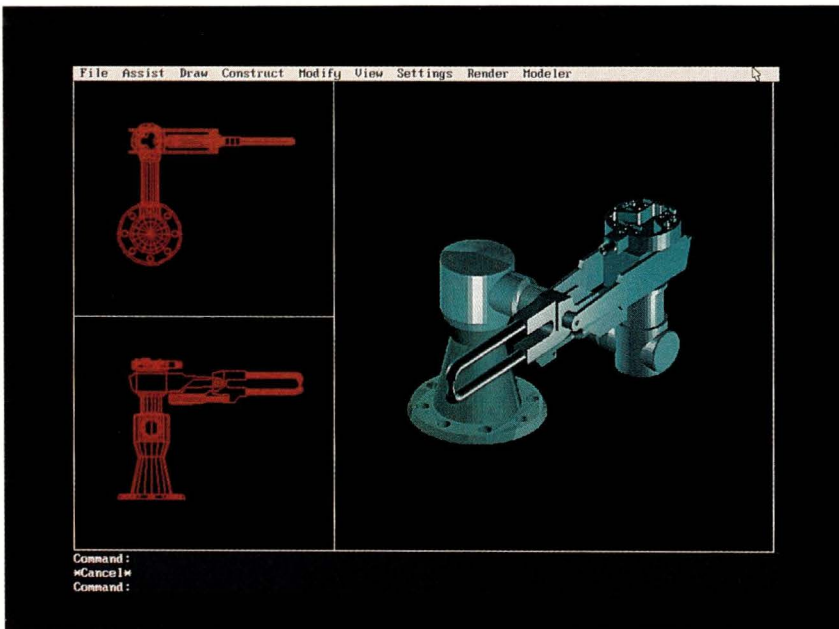
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Autodesk Inc.'s 2D/3D AutoCAD product for Suns generates 10% of Autodesk's total sales.

majority of which evolved from main-frame-based wire-frame technology, Parametric's Pro/Engineer is a workstation-based, solids-modeling-only package. Parametric Technology's Pro/Engineer product has been called by one industry watcher "the hottest product for 3D mechanical design." The product is available on all major UNIX platforms, as well as on HP's Apollo family and DEC's VAX/VMS line. The complete system comprises 21 independent modules. Parametric is working with a number of third parties, including Sherpa Corp., Texas Instruments Inc., Alias Research, Wavefront Technologies, Mentor Graphics Corp. and Racal Redac Inc. to provide seamless interfaces between Pro/Engineer and their manufacturing software products.

Like Parametric, SDRC is focused exclusively on mechanical design. Of the six major platforms the company supports, Sun is No. 3 in terms of license growth rates (HP is No. 1 and Silicon Graphics Inc. is No. 2). I-DEAS is SDRC's core product. It is a system that provides design, analysis, drafting, testing and numerical-control programming for mechanical design automation. Like other MCAD products, I-DEAS features its own programming language—in this case

called IDEAL—and a central relational database for storing and transferring geometry, analysis data and test data from I-DEAS to other applications. Within I-DEAS, the Part Design module is the heart of the system.

SDRC is releasing Version 6.1 of the product this summer. The new version will incorporate enhancements in the product's dynamic navigator feature in the drafting module, says Wayne McClelland, vice president in charge of I-DEAS. "We're breaking the mold," McClelland claims. "Usually, CAD/CAM companies need to add more commands in order to add more features. But we've cut the number of commands by a half, while adding 35% in functionality." SDRC has achieved this feat by moving toward an anticipatory user interface, meaning the cursor can scan all the elements in a drawing and "anticipate" a next move.

A heavily rearchitected Version 7 of I-DEAS is due out in 1993, McClelland says. This release will fully incorporate the anticipatory user interface. It also will make use of "highly tuned expert systems" that further automate numerical control tool paths, structural analysis and other modules, McClelland says. Finally, SDRC will continue to evolve its Data Management and

Control System (DMCS), its product for organizing, tracking and retrieving engineering and manufacturing data. DMCS now features a Motif-style user interface, client/server capabilities and templates for drawing management, engineering flow-management control and the like, McClelland says.

AEC: Designing the Glass House

AEC is the CAD/CAM/CAE market segment where Sun goes head-to-head with PC vendors. Sun's strategy is straightforward, says Natarajan: "If we can get our ease-of-use factor to increase, we can attract some of those 85% of AEC customers that currently use PCs or Macs."

AEC is also the segment where PC CAD marketer Autodesk reigns. Currently, just over 10% of Autodesk's total CAD/CAM business is attributable to sales on Sun platforms, according to Manda Mafy, strategic relations manager for the AutoCAD business unit. More than 70% of Autodesk's sales still are PC-platform-based, she says. About 45% of Autodesk's shipments of its flagship product, AutoCAD, go into the AEC market, Mafy says; another 30% are MCAD-related and 20% to 25% are GIS/mapping-related.

AutoCAD is a 2D/3D design product. Release 12, announced in June, provides users with better performance of the most-used drafting operations, a streamlined user interface, new drawing tools, built-in rendering and improved plotting. Autodesk also makes available a color-rendering product, called AutoShade (which includes photo-realistic rendering capabilities based on Pixar's RenderMan technology). In February, the company announced a new release, 2.0, of its Advanced Modeling Extension (AME) solid-modeling module. Among the enhancements offered by 2.0, according to Autodesk, are improved accuracy, an improved programming interface and stronger links between 2D and 3D design. AME is designed to be a first-generation solids modeler; it doesn't handle sculpted or free-form surfaces, says Kempton

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Desktop Development Tools for the 90s

Izuno, AME marketing manager.

AutoCAD's primary value comes from the more than 1,000 third-party applications, tools and utilities that have been developed on top of AutoCAD using the development system and its embedded AutoLISP program-

ming language.

According to Dataquest, other top UNIX AEC software vendors are Intergraph Inc., Fujitsu Ltd., IEZ (a German architectural firm) and Computervision. Intergraph first ported its AEC offering, MicroStation, to the

Sun platform in January. Besides Suns, MicroStation runs on PCs, Macs and Intergraph Clipper-based workstations. MicroStation offers a variety of display styles, from wire-frame to Gouraud shading, as well as parametric and NURBS surface-han-

Will the Real Framework Please Stand Up?

To date, virtually the only way to link disparate manufacturing data has been to rely on proprietary frameworks offered by a handful of the largest CAD/CAM/CAE vendors. Lack of an all-encompassing standard has led to a variety of closed, noninteroperable CAD/CAM/CAE products.

There have been a couple of attempts to change all this. The initial graphics exchange specifications (IGES), a standard for exchanging drawing information, has been adopted by nearly every CAD vendor but has suffered from too many interpretations of its export standard. The standard exchange of product model data (STEP) and product data exchange using STEP (PDES) are designed to standardize solid models and other

advanced CAD data. Both IGES and STEP/PDES are supported by many manufacturing software vendors today.

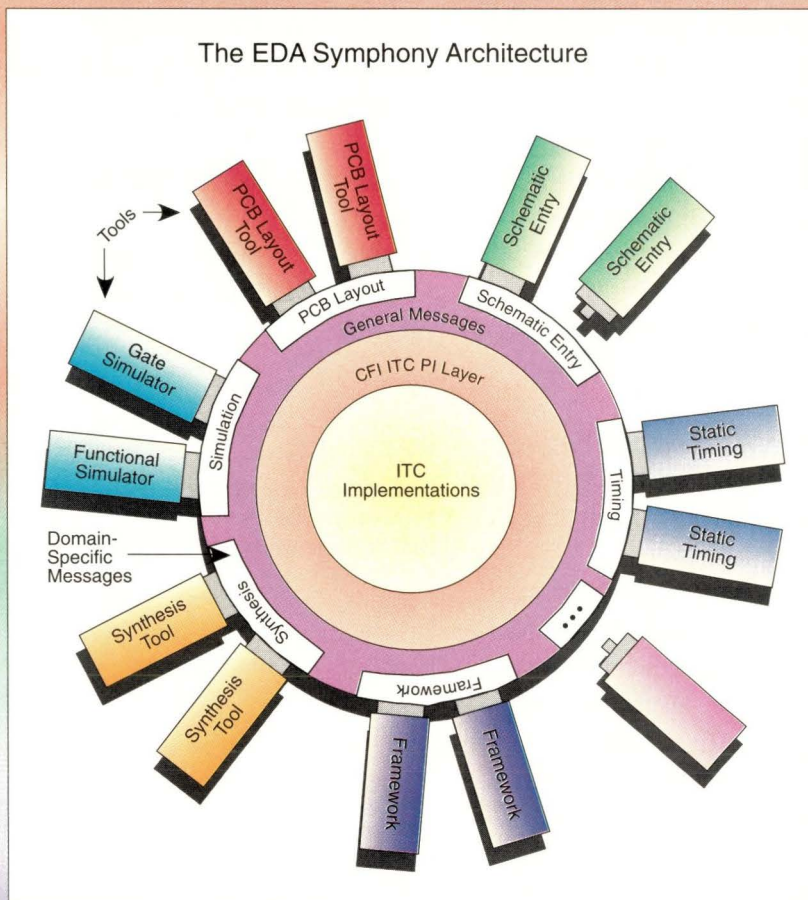
But the real great white hope of the CAD/CAM/CAE community is the series of standards emerging from the CAD Framework Initiative Inc. (CFI). The Austin-based group is attempting to devise a standard EDA framework, called CFI. Such a framework would encompass a CFI-defined procedural interface, common intertool communications and tool-encapsulation capabilities and other tool and interface standards.

In early 1992, CFI did a pilot release of its 1.0 draft standards. Four companies devised field tests of these standards: Sun Microsystems Computer Corp., Hewlett-Packard Co., IBM Corp. and Siemens-Nixdorf Information Systems.

SMCC made public what it's calling the EDA Symphony pilot in April. Sun's pilot included the participation of Cadence, Harris Corp.'s EDA division, Mentor Graphics, Synopsys and Viewlogic Systems Inc.

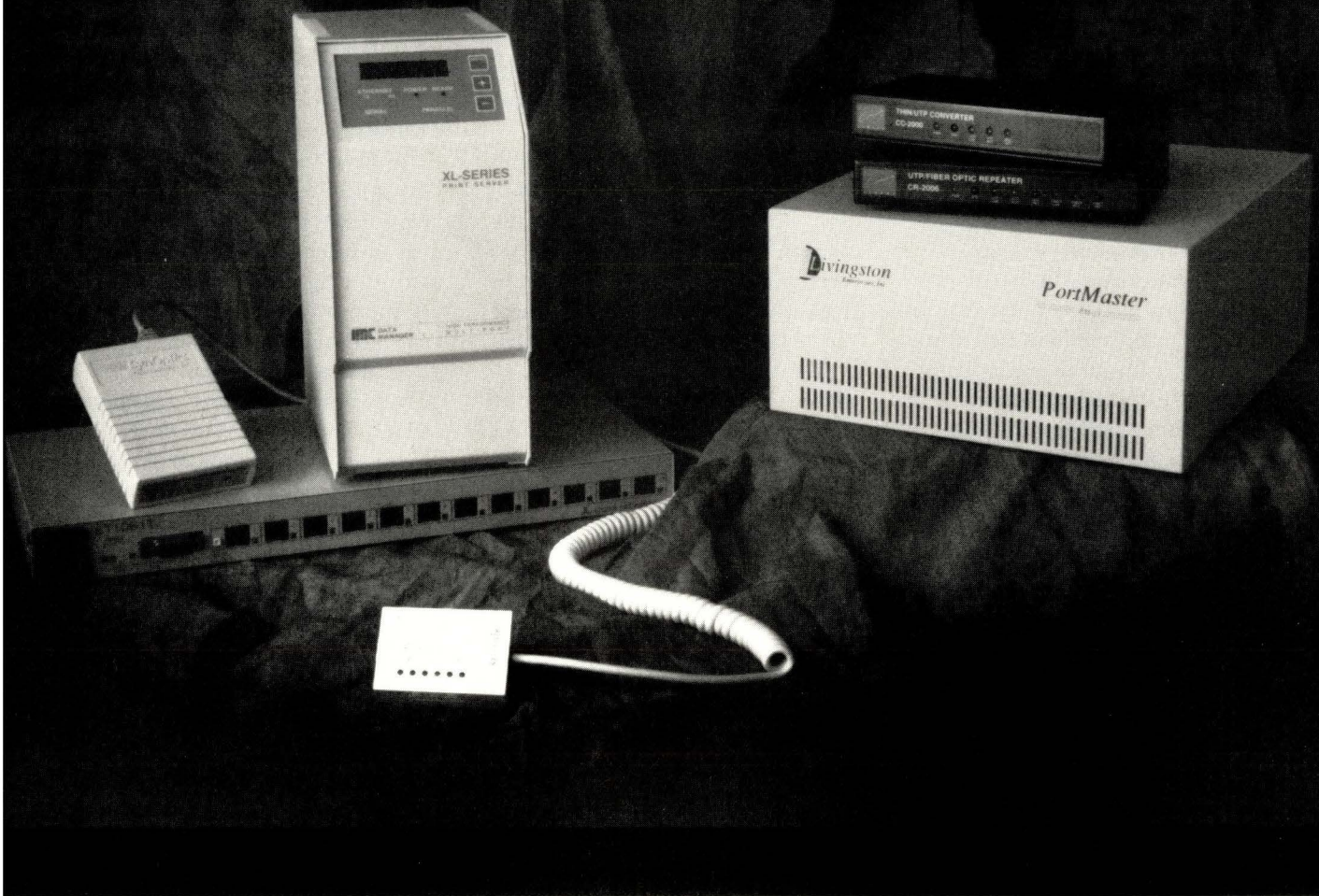
Sun is interested in proving the commercial viability of the inter-tool communication (ITC) technology specified in CFI Release 1.0, says Khanh Vu, manager of corporate CAD for SMCC. Sun has proposed to CFI that its cross-tool messaging system, ToolTalk, be accepted as the ITC standard; the EDA Symphony project is Sun's demonstration of the workability of ToolTalk as a CFI backbone.

Cadence and Mentor Graphics have developed their own intertool messaging technology, which they have incorporated into their respective EDA frameworks. But both companies say they will adopt whatever emerges as the CFI standard. —mjf



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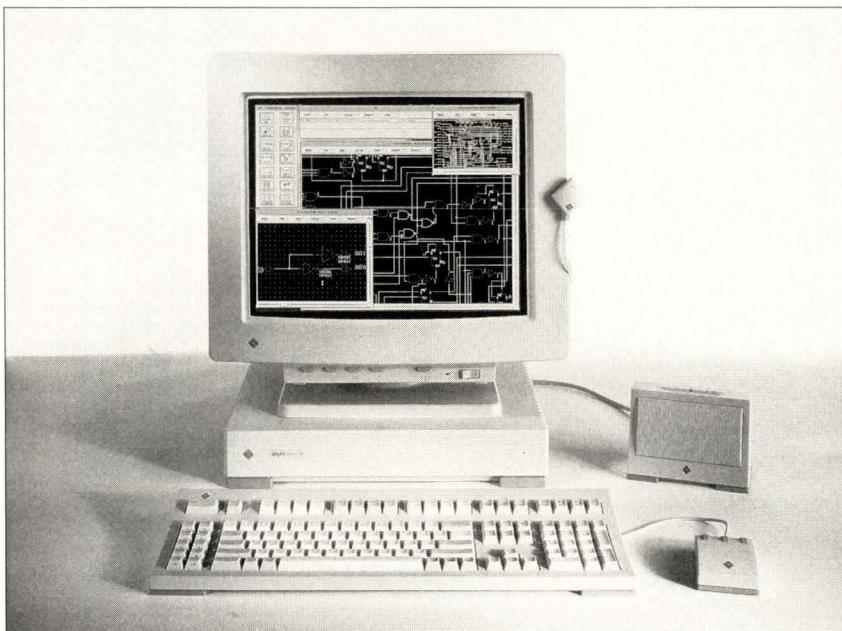
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dling capabilities and associative dimensioning. The product features a Motif GUI and the MicroStation Development Language, which includes a full implementation of C.

The next version of MicroStation, 5.0, is still nine months or so away, says Tom Anderson, application specialist in the MicroStation marketing group. It will incorporate more 3D surface capabilities, such as intersecting NURBS handling; font and text enhancements; better Motif support; and links to Borland International's dBASE and Ask Corp.'s Ingres relational databases (in addition to its existing links to Oracle Corp.'s Oracle).

MicroStation also links directly to Intergraph's Engineering Modeling System, I/EMS, a modeling and drafting system for mechanical applications. I/EMS allows for integrated wire-frame, surface and solid modeling. I/EMS features parametric design tools and represents all geometric elements, including NURBS. Intergraph offers a full complement of tightly integrated, downstream tools and applications, such as a geometric element modeling system (I/Rasna), finite element modeling (I/FEM) and mechanical systems modeler (I/MSM), to name but a few. It interfaces with Intergraph's Product Data

Mentor Graphics' Falcon Framework can really take advantage of Sun Microsystems Inc.'s new SPARCstation.



Manager (I/PDM), which manages information and data for total project management. Version 2.0 of I/EMS began shipping on the Sun platform in April.

EDA: Closing the Design Loop

EDA is big business for Sun, as well as for the software conglomerates that dominate the field. Cadence Design Systems Inc., the proud parent of Valid Logic Systems; Mentor Graphics Corp.; and Intergraph, the new owner of Dazix, are duking it out for the top UNIX EDA ranking. But several upstarts—for example, simulation tool vendor Synopsys Inc.—are emerging as key players in their own right.

"Simulation is the backbone of EDA," says Cindy Thames, founder of Focused Market Reports, a Boston-based CAE consultancy. "Schematic capture has become a commodity. But the test area is growing fast, too."

Synopsys is strong in simulation and test, and consequently, has earned a reputation as "the Boy Wonder of the industry," according to Thames. And Synopsys' No. 1 platform is Sun. Synopsys markets various high-level design tools, including synthesis and simulation tools, for the design of full custom and application-specific integrated circuits (ASICs). Its synthesis

tools optimize and translate circuit descriptions written in various formats, including VHDL (the VHSIC hardware description language) and Verilog, into logic gates. Its simulation tools measure the expected performance and function of hardware and software at the front end of the design process. And its test tools automate design for tests and provide automatically generated ASIC test patterns.

In May, Synopsys rolled out Test Compiler Plus, a product incorporating Synopsys' constraint-driven partial-scan technology and automatic test-pattern generation product. Earlier this year, Synopsys unveiled a 3D debugging environment for high-level IC and systems designs in VHDL. The environment is part of Synopsys' VHDL System Simulator. It also rolled out a new version of its synthesis tool that provided enhancements in the timing-driven synthesis area. This spring, the company announced it was working with Mentor Graphics to integrate its products with Mentor's Falcon Framework.

Falcon Framework is the heart of the Mentor EDA strategy—and a big part of the reason that Sun rival Hewlett-Packard has been successful in EDA. Mentor has been developing products for HP/Apollo workstations for nearly eight years. In June 1991, Mentor delivered its first 8.0 Concurrent Design Environment software, of which the Falcon framework is the core, for Sun systems. According to Farrokh Irani, marketing manager for the platform technology division, sales for Sun platforms have almost quadrupled in the past four months.

Falcon provides data access, tool interoperability, consistent user interfaces and heterogeneous data and process management. It is a software product that resides above the operating system. It relies on data-access standards, such as VHDL, the electronic data interchange format (EDIF) and initial graphics exchange specification (IGES) and Mentor's own Design File Interface for connectivity across platforms. Falcon Framework encompasses process management, data management and tool integration

utilities and applications, from Mentor and other vendors, and provides common basic services, including a Motif user interface, Mentor's Advanced Multi-Purpose Language and Frame Technology's FrameMaker

**Companies Mentioned
in This Article**

Autodesk Inc.
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Cadence Design Systems Inc.
555 River Oaks Parkway
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Circle 102

**Environmental Systems
Research Institute Inc.**
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Redlands, CA 92373-8100
Circle 103

ERDAS Inc.
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Circle 104

Hewlett-Packard Co.
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Fort Collins, CO 80525-9599
Circle 105

Intergraph Corp.
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Circle 106

Mentor Graphics
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Wilsonville, OR 97070-777
Circle 107

Parametric Technology Corp.
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Circle 108

**Structural Dynamics
Research Corp.**
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Milford, OH 45150-2789
Circle 109

Synopsys Inc.
700 East Middlefield Road
Mountain View, CA 94043-4033
Circle 110

for documentation purposes.

The first Mentor application to ship for Sun was Board Designer 8.0, a board design and analysis product that can accommodate very dense boards and multichip modules (MCM). Mentor also integrated IC Station, a design and verification environment, and MCM Station, a design and manufacturing product for MCMs, into the Falcon Framework. Mentor followed up these announcements with Idea Station 8.0, its front-end EDA system. Idea Station integrates Mentor's Design Architect design-capture tools, its System 1076 VHDL solver, compiler and debugger and QuickSim II, its ASIC and board-level digital simulator. And in May, Mentor unveiled its next-generation board-level design product, Board Station 500. It is currently available for HP/Apollo and Sun systems.

Mentor's archival Cadence is carving out its own framework-based strategy. Cadence beat out Mentor in terms of porting to Sun; Sun-based software sales make up Cadence's biggest chunk of revenue. (Systems from another SPARC systems vendor, Solbourne Computer Inc., are Cadence's No. 2 platform.) Following its 1991 purchase of Valid Logic, Cadence divided its EDA products into six groups: Framework, design entry and synthesis, analysis, digital IC design, analog IC design and board design. All products from all groups run on Suns.

The framework group handles the company's Design Framework II tool integration environment. Design Framework II combines Cadence's framework technology with the Valid-Frame EDA framework from Valid Logic, including the Valid Communications Manager technology for inter-tool communications. Beneath the common design-management layer is the PowerFrame design-management engine from DEC.

A key focus for Cadence in the area of ASIC, board-level-system and MCM design is the provision of "mixed-level" design tools. These are tools that incorporate a combination of hardware description languages,

schematics, synthesis and simulation tools, and allow designers to use as much or as little HDL style as they want. Cadence predicts mixed-level design tools will be adopted by two-thirds of the CAE market by the mid-1990s. Here, the company offers Composer, a mixed-level entry system, which is being merged with Valid Concept, another mixed-level entry system. The resulting environment is slated to ship during the first half of 1993.

The Black Holes: Solaris and MP

Although their carefully constructed plans may belie the fact, every company in every segment of the CAD/ CAM/CAE market is in the midst of profound change—some might even say turmoil—regarding their Sun products and plans. Sun's move to the System V Release 4-compliant Solaris 2.0 operating system, replete with its underpinnings for symmetric multiprocessing, affects all software vendors. But due to the sheer numbers and size of their offerings, no ISVs are likely to be as severely impacted as the CAD/CAM/CAE vendors.

The end result of the move to Solaris and multiprocessing is sure to be purely positive for these companies and their customers. "Our software, right off the bat, will experience speedups due to multithreading," says Tony Zingale, vice president of corporate marketing for Cadence. For customers who are doing "graphical, interactive-oriented, large-team designs, speed is king," Zingale says, "so multiprocessing will be king."

In the short term, however, the porting process looks to be arduous. Cadence has had a Sun engineer working at its site daily to help with the transition for months; at press time, a good part of Design Framework II had been ported to Solaris 2.0. Computervision is in the throes of porting CAD applications consisting of 10 million lines of code. None of the CAD/CAM/CAE vendors expect to have a shippable 2.0 version before sometime in 1993. But once they're ready, ISVs say, designers will be able to crank like never before. ♦

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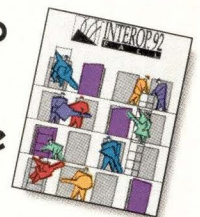
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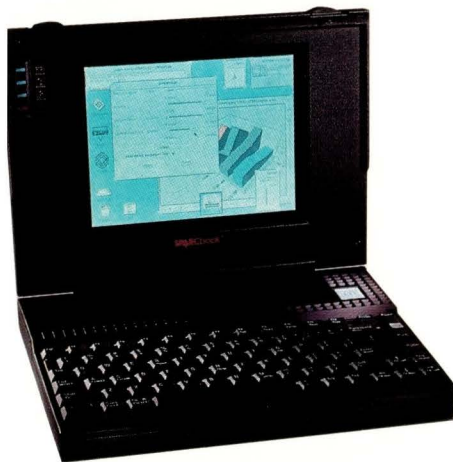
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A Notebook, a Paperback and a Clone

by BARRY SHEIN, Technical Editor

This past month I spent a lot of time on the road, so what better product to open with than the Tadpole notebook SPARC I carried with me? Also, much to our dismay, the Compstation 40 from Tatung is about to leave the lab after a very useful stay. And I finished reading a book on UNIX systems administration just out from O'Reilly, one of my favorite publishers of practical UNIX books.



The compact, light SPARCbook from Tadpole Technology Inc. now comes with a color display.

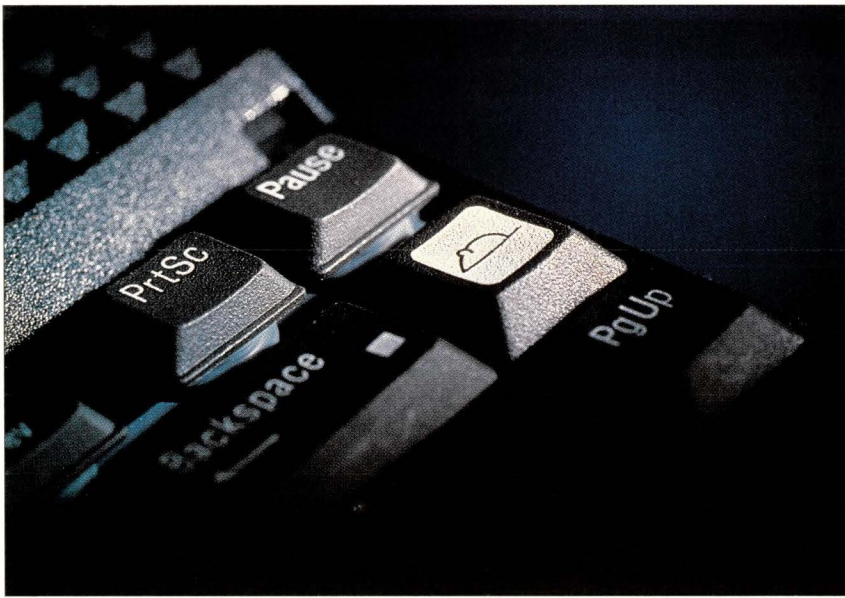
Tadpole: A Moveable Beast

According to the captain, I am at 35,000 feet somewhere over Pennsylvania and leveling off. The seat belt sign goes out so I reach for my shoulder bag and remove a Tadpole SPARCbook. The SPARCbook, in its own nylon bag, with manual, fits comfortably into my under-the-seat shoulder bag along with a large paperback novel and other assorted essentials. It's not a very large bag. I pop open the sleek black cover on this notebook-size computer (8.5- by 11.8- by 1.9 inches) and hit the power-on button located just above the keyboard. A message informing me that the system is resuming flashes on the screen. A few diagnostics later, I am right back where I left the screen last night. Late last night. Late last night I finally found a thin-to-thick converter. (No, I didn't find one. I waited until everyone was gone and I

"borrowed" one for a few hours. Why are they always in such short supply?)

I spent a few hours that evening preparing this SPARCbook for a trip to Colorado Springs and then London via Boston. There was almost 30 MB of disk free on the system's 120-MB disk last night. You really are tempted to turn the whole thing over to see where 120 MB can possibly be in this slim notebook computer and say "Go-ly" in your best Gomer Pyle voice. This system has a full SunOS distribution, OpenWindows 3.0, and my compatriot, Spike, has already thrown on GNU/Emacs, *ispell* and *lord* knows what else—things he considers essential, like *xloadimage*. Well, 30 MB free (the bundled software provided by Tadpole only takes up about 52 MB plus swap). As we all know, nature abhors a vacuum and it's not nice to fool Mother Nature, so I proceed to fill up the disk with more essentials for the trip.

First things first: I knew I would want Kermit so I could stay in touch with the office system and backup files. I ftp'd CKermit Version 5A(178) sources and rebuilt it. I fired Kermit up, plugged a phone jack into the built-in 2,400-baud modem, `set line /dev/modem, ATDT7399753` and I was logged into our system. Good stuff. I made sure file transfer



What to do about the mouse is a challenge for laptop engineers.

worked reasonably. It did, so I proceeded on to other software.

The next tool I wanted was `groff`, the wonderful GNU/Emacs `troff` clone. One reason it's wonderful is that it has a built-in X11 previewer. (Well, it actually forks off of another process, `gxditview`, but it feels like it's all integrated.) I pull over the sources and, oh bother, it's partially written in `g++` (GNU's C++). I don't want to rebuild the entire GNU compiler environment, as much as I love it. That's not what I'm doing on this trip. Well, we do have `groff` built and in use on our 4.0.3 system. (OK, we haven't upgraded, so speak badly of me every chance you get.) I copy over the binaries to the Tadpole and some other local library files, launch a test and `groff` works just fine. The joys of binary compatibility.

The SPARCbook screen and keyboard are not bad. For a notebook they're very good, in my opinion. But of course they're not quite as comfortable as the workstation on your desk. No problem, to do all this setup I just fired up `inetd` on the SPARCbook and telnetted into it from my workstation.

One challenge for laptop engineers is what to do about a mouse. You can bring one along (the SPARCbook has a mouse port), but mice are not very convenient in an airline seat with that

limited commodity: flat surface area. All the notebook vendors (PC, Mac, SPARC) have recognized this problem, and each seems to have its own solution. I suppose we can describe this situation as an area of great creative interest. The SPARCbook has its own solution to the problem: A key in the upper right-hand corner with a picture of a mouse on it and a pivoting mounting. Lean the key to the left, the mouse cursor moves left, lean it right, up or down and you get the respective motion on the screen. It is sensitive to how sharply you angle it, so a light touch moves it slowly, and a hard press in a direction moves the mouse quickly. For mouse buttons, you use a special key marked FN (down near where an ALT key might be) and the A, S and D keys become the mouse buttons left, center and right, respectively. At first, the arrangement seems clumsy, but after just a few minutes I find my fingers have learned to use this arrangement without much thought.

There's still some disk space left so I throw on a full set of manual pages and enough include and library files to do some X11 development work I need to get done. I'm pleased with how much I can fit on this disk without really straining. You can also get a 240-MB (two 120-MB disks) or an 85-MB disk. This system has 8 MB of

RAM, which works fairly well, but it can be loaded with up to 32 MB total in 4-MB increments.

I'm using the 640-by-480 gray-scale display—a color display is on the price list (passive matrix, 16 simultaneous colors, also 640 by 480). For office use, there's a plug on the back that can accept an external VGA monitor and an Ethernet (thicknet) adapter. The modem is a fairly basic 2,400-baud (no MNP or V.42) Hayes-compatible with 9,600-baud sendfax capability (Group III). The company bundles the fax software with its Solaris 1.0.1 release. Finally, there's a serial port (to 38.4 Kb/s), floppy, Centronics parallel and external mouse ports. Optionally, Tadpole provides a parallel-to-SCSI host adapter. The CPU in the Tadpole is a 25-MHZ SPARC,

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Circle 111

12.6 SPECmarks (about 18 MIPS) and uses the 64-bit MBus.

Another major issue with portable computers is power management. Unfortunately, the state of the art for a computer like this is only about two hours or so of continuous use. There is a power management window tool that lets you extend this about 25% to 2½ hours with some care by dimming the screen, letting the system spin down the disk when not in use and running in "slow" mode, which didn't seem to impact what I did noticeably. It's not a criticism of Tadpole, as I said this is the state of the art, but 2½ hours is not enough with these cross-country (and transatlantic) flights. You can carry an extra battery pack (or more), but they're heavy. I suppose it's a footrace between either better battery technology or electrical outlets near plane seats. (I hear at least one air carrier already offers these on some flights.) I also hear apocryphal stories all the time of executives locking themselves in airline bathrooms trying to recharge their laptop units from the shaver outlets. I suppose it's just a matter of time before we get lectured about this along with how to inflate your life jacket in the event of an emergency water landing in the Mojave.

On the way to Colorado, I (perhaps foolishly) ignored the little red light that warns you that power is getting dangerously low. Eventually the system just said "sorry" and shut itself down. When I got to my hotel room, I plugged it in for a recharge, and everything was just fine. If you shut the system down in an orderly fashion (using a key-combination) then on power-up it will be right back where you left off, window set up, etc. That's a very nice feature, no need to figure out what to save away when you need to pack in a hurry.

I had little problem with airport security other than that they wanted me to turn it on for them and didn't seem to understand what they were looking at. One person kept asking me to show her a "menu" (I assume they receive training on MS-DOS

systems). She was also confused that I wanted to wait until it was fully up so I could shut it down properly. Life in the fast lane, I suppose. One security person instructed me to remove the software, which precipitated a short conversation. All in all I'm glad they check, particularly after being rushed out of the underground the day after that large postelection blast in London. That sort of event brings the reality home (fortunately it was a false alarm).

Overall, I am very impressed with the Tadpole SPARCbook. It's compact and reasonably light and very powerful for its size. I lived with it for two weeks of traveling and did a lot of useful work (including writing most of this article) without a hitch. With a little capacity management, there's nothing you can do on a full SPARC workstation that you can't do on this system. I wish power lasted about twice as long, and it would be nice to have a full 1,152-by-900 (or similar) screen, but that's a minor inconvenience that isn't hard to adjust to with a little fiddling. And being able to do real work in a hotel room or at 35,000 feet is a true modern miracle. .

Book Review: Page Thrashing

Essential System Administration by Eelen Frisch, new book from O'Reilly & Associates, is intended to cover the basics of UNIX systems administration. Frisch covers most of the basics, including system startup and shutdown, file and other security issues, accounting, backup/restore, printer and network management as well as providing a short treatise on shell programming in the back of the book (an essential skill for the systems administrator). The style is clear and concise, and Frisch does a nice job of bounding the topics to which a new systems administrator should attend.

The two weakest features of the book are, first, the attempt to cover multiple UNIX versions (System V variants, BSD, SunOS, Xenix, AIX) is, in my opinion, a mistake. A book

like this one stresses practical examples. I would prefer to buy two books (or more), each heavily focused on a particular version of the OS (even if the two were otherwise very similar) rather than try to filter through which features pertain to which system. Over the years, I have often commented that O'Reilly's idea to publish separate introductory handbooks for BSD and System V users was an excellent concept no other publisher seems to have had the insight to mimic. It is disappointing that they have veered from this style for a topic like systems administration, which is highly sensitive to which UNIX variant is being used. My second complaint is that the networking section treats the topic far too lightly. Name servers and other modern topics are not touched upon at all, and these are often the most perplexing issues for a new (or even seasoned) systems administrator.

Overall this is a handy, well-organized book with a lot of practical information and suggestions. The author knows her topic and presents it in a clear and useful style. I would, however, suggest that O'Reilly consider expanding the work to multiple volumes, each focusing better on different UNIX variants.

Essential System Administration

Author

Eelen Frisch

ISBN

0-937175-80-3

Publisher

O'Reilly & Associates Inc.
632 Petaluma Ave.
Sebastopol, CA 95472-9902

Voice

(800) 338-6887, (707) 829-0515

Fax

(707) 829-0104

Price

\$29.95

Circle 113

More Cloning Around: Tatung Compstation 40

The Tatung Compstation 40 is a SPARCstation desktop clone (40 MHz), running Solaris 1.0 (Solaris 2.0 when available), with SPARCstation-2 performance (28.5 Dhrystone MIPS, 4.2 MFLOPS, 24.7 SPECmarks) at a very competitive price (starting at less than \$6,000 for a color, diskless system). This system consists of a pizza-box chassis, monitor, keyboard and mouse. We used a 19-inch color system, 16 MB of RAM and two 300-MB disks (total about 600 MB, all internal) for this review. It is priced at \$10,090 (with GX graphics accelerator).

The Compstation 40 chassis can hold up to 16 MB (1-MB SIMMS) or 64 MB (4-MB SIMMS) of memory, two 3½-inch hard drives and a floppy disk drive. There are three SBus slots (one is needed for a color frame buffer), two DB25 serial ports, thick Ethernet and an external SCSI port. The same system is available with various display options, both mono-chrome (15-, 17- and 19-inch) and color (15-, 17- and 19-inch; 1,152 by

900 or 1,280 by 1,024) as well as various graphics accelerator options I'll explain later. Tatung uses a Weitek FPU chip (IEEE 754) and claims 4.2 MFLOPS.

I ran the Dhrystone (Version 2.1) integer benchmark on this Compstation 40, which yielded about 44,000 Dhrystones using Sun's cc. For comparison, a Sun IPC benchmarks at 25,000 and a Sun SPARCstation-2 at about 44,000 Dhrystones under the same conditions. The integer performance claim seems to be confirmed by our testing results.

The Compstation 40 is, for the most part, binary compatible and indistinguishable from a comparable Sun SPARCstation. There was one difference we ran across: The Weitek-based graphics accelerator (5000WX) Tatung installed in the unit we originally received was not entirely compatible with Sun's SPARCstation graphics accelerator. Specifically, MIT's X11R5 server distributions would not run with this configuration. The version of OpenWindows shipped with the Tatung worked well, so for most people this would not be an issue, but designers of custom, low-level graphics software might want to choose another graphics option.

To get to the bottom of this I spoke with Frank Dupré at Tatung and he confirmed that this was indeed the case with this particular low-cost accelerator. Tatung has another, newer graphics accelerator (5000GX) that is completely compatible with the Sun GX product. The technology used in Tatung's 5000GX is licensed from Sun. Tatung quickly shipped us a 5000GX board and, as promised, it worked completely compatibly. You can also order the system without a graphics accelerator,

Tatung Co. of America Inc.'s Compstation 40 is one of the first compatibles to offer SPARCstation 2 performance—and for under \$6,000.



Compstation 40

USA Headquarters

Tatung Co. of America Inc.
2850 El Presidio St.
Long Beach, CA 90810

Voice

(213) 979-7055/637-2105

Fax

(213) 637-8484

Prices

\$10,090, test unit included
19-inch color, 16 MB of RAM,
two 300-MB disk and
GX accelerator; others begin
under \$6,000 for color,
diskless versions

Best Feature

One of the first SPARCstation 2
performance clones to market,
nice packaging.

Worst Feature

The WX frame buffer is not
100% Sun compatible, stick
with Tatung's GX or CG3 options.

Circle 112

either mono-chrome (5000MGC) or color (5000CG3, compatible with Sun's standard CG3 frame buffer). My suggestion would be to stick with the CG3 or GX options to avoid incompatibilities and leave the WX to systems integrators looking for a lower cost delivery system.

The Compstation 40 is manufactured by Tatung Science and Technology Inc. (TSTI), a subsidiary of the \$2 billion, Taiwan-based Tatung Co., founded in 1918. TSTI was founded in 1983 and is located in San Jose, CA.

Overall, the Tatung Compstation 40 impressed me as one of the better SPARClikes, with snappy performance and one of the first to offer SPARCstation-2 speed, with good packaging at a good price.

Also of interest: TSTI has announced a motherboard upgrade for your Sun SPARCstations (SS-1 and SS-1+). For \$3,690 you can swap the Sun board with a Tatung 40-MHz board bringing your system up to SPARCstation-2 performance →

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.

PEX Tool Kit

A graphics tool kit that gives developers the ability to use the PHIGS and PEX standards more effectively has been introduced by Liant Software. Called FIG+, the product runs on top of the PHIGS graphics standard, or PEX (PHIGS Extensions to X), to make graphical applications development faster and easier. Currently, the product supports two implementations of the PHIGS standard, Liant's own Figaro and Sun's SunPHIGS, and will support PEXlib implementations as those become common.

Fig+ is a library of preprogrammed objects that contain information on generating and manipulating a given graphic. Written in C, the library contains such things as default values for views and light sources, utilities for common viewing operations (such as panning, zooming, orbiting, etc.), assorted color resources and so on. Pricing ranges from \$1,245 to \$2,245.

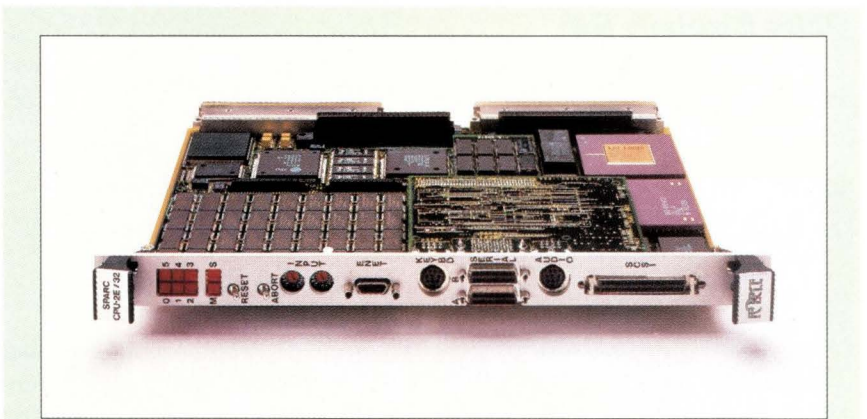
Liant Software Corp.

959 Concord St.
Framingham, MA 01701
Circle 115

X on MS Windows

The Xoftware X Window System implementation for PCs is now available on Microsoft Windows. The product, Xoftware for Windows 1.5 from AGE Logic, provides supports for MS Windows 3.1. In addition, the company says it supports backward compatibility with MS Windows 3.0. With it, X applications can be displayed in a Windows-equipped PC as though it were an X terminal.

Software for Windows requires a 286, 386 or 486-based PC or PS/2; a minimum of 2 MB of extended memory; a 5¼-inch, 1.2-MB or 3½-inch,



Force Shows Embedded SPARC

Force Computers has introduced a SPARCstation 2E board for embedded applications. The SPARC CPU-2E is a single-board computer that implements the equivalent of a Sun SPARCstation 2 on VME. The company says the product uses the LSI SPARC processor and can provide up to 28.5 MIPS.

In addition, the product features Open Boot firmware, which allows dynamic reconfiguration of the computing environment. Open Boot, which is in the process of becoming an IEEE standard, comes with a Forth-based monitor and debugger.

The SPARC CPU-2E with 16 MB of DRAM is \$7,995. With 32 MB of DRAM, it is \$9,495.

Force Computers Inc.

3165 Winchester Blvd.
Campbell, CA 95008-6557
Circle 114

1.44-MB disk drive; a hard disk with at least 2 MB of free space; an MS-Windows-compatible mouse; a video card with an MS-Windows driver and compatible monitor; and a network package. Pricing begins at \$495.

AGE Logic Inc.

9985 Pacific Heights Blvd.
Suite 200
San Diego, CA 92121
Circle 116

Mathcad Adds Up

Mathsoft has introduced Version 3.1 of its Mathcad software for UNIX. Mathcad is a scientific and technical calculator that also has mathematical desktop publishing features. Version 3.1 provides 200 built-in functions and offers such new features as vector and matrix math (handling up to 8 million elements), a license manager, color surface

plots and linear and log graph.

Mathcad runs under Motif and Open Look. Pricing begins at \$695 for single-node or standalone versions. Network versions are also available.

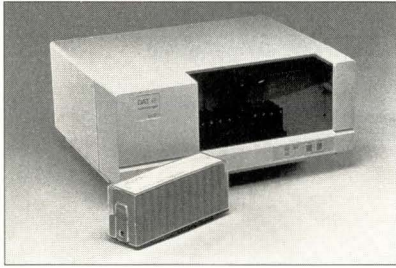
In addition, the company has announced that it is teaming with textbook publishers to offer Mathcad books. Called Electronic Handbooks, these use Mathcad as a publishing platform to deliver technical reference works in which math and graphics are "live" and can be used to perform calculations. The texts include collections of useful methods and formulas on machine design and analysis, materials science and so on. Pricing on these range from \$99 to \$149.

MathSoft Inc.

201 Broadway
Cambridge, MA 02139-1901
Circle 117

Delta Displays DAT

Delta Microsystems has shown a 4mm DAT jukebox with unattended backup and archival. Combining



Delta's own backup and archival software, BudTool, with a 4mm DAT jukebox from Advanced Digital Information Corp., the product provides up to 96 GB of storage.

The jukebox operates in a random-access mode with search time within a tape averaging 20 to 30 seconds. BudTool, meanwhile, provides a windows-based GUI that guides the user through backup and retrieval operations. A yearly backup schedule can be set up for an entire network in a one-time operation. Pricing varies.

Delta Microsystems Inc.
111 Lindbergh Ave., Suite C
Livermore, CA 94550
Circle 118

Sleek SAIB for Sun

Sonitech has introduced two DSP-based interfaces that allow SPARCstations and VME-based systems to run speech processing, telephone, audio and multimedia applications. The Stereo Audio/Telephone Interface Box (SAIB) is a 16-bit stereo A/D and D/A converter with a dynamic range of up to 80 dB. It also uses a serial port that connects to Sonitech's DSP boards, the TMS320-based SPIRIT-30.

The SAIB includes a built-in input anti-aliasing filter and output low-pass smoothing filter. It is software programmable for input and output sections for gain, sampling rate (8 to 48 kHz) and word size (16-bit linear, 8-bit u-law, 8-bit A-law). The product has three options for input—line level, microphone ¼-inch phone jack and telephone handset—and four options for output—line level, headphone with

¼-inch stereo phone jack, telephone handset and speakers. Pricing begins at \$595.

Sonitech International Inc.
14 Mica Lane
Wellesley, MA 02181
Circle 119

Financial Software for Sun

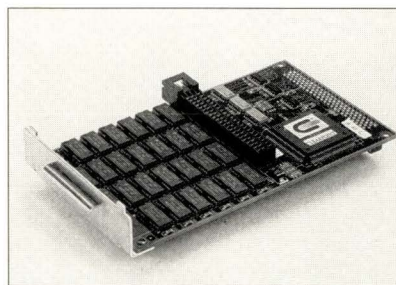
Software to automate international financial management has been introduced for Sun workstations and servers. Called SunSystems, the product is an integrated suite of software applications covering several of the major aspects of managing money across international boundaries. The vendor, Systems Union, says that the product can handle multiple currencies, several different languages, and several different platforms, including IBM RISC System/6000s and DEC VAXes as well as Sun workstations.

Modules in the product include an accounting package, a multicurrency module (which automatically handles such things as currency conversion and exchange rate recording), a fix assets package, a sales invoicing and order-entry module, an inventory package, an SQL tool and so on. Pricing ranges from \$1,700 to \$100,000.

Systems Union Inc.
10 Bank St.
White Plains, NY 10606
Circle 120

SBus Memory from Clearpoint

SBus boards offering 32 MB of additional memory have been introduced for Sun SPARCstations, SPARCserver 2 series machines and



SPARClike compatibles. The SNME-SBS motherboard and the SNME-

SBD daughtercard, from Clearpoint Research, each provide 32 MB of memory for a total of 64 MB. With them, a typical SPARCstation reaches 128-MB maximum memory.

The company says the form factor of the cards makes it possible for users to add additional Clearpoint daughtercards in SBus expansion chassis from other vendors. Pricing on either product is \$2,300.

Clearpoint Research Corp.
35 Parkwood Drive
Hopkinton, MA 01748
Circle 121

Diamond Monitor Shines

The Diamond Pro 17, a 17-inch color monitor for Suns and other UNIX-based systems, has been introduced by Mitsubishi Electronics. It



uses an aperture grille CRT with a pitch of .26mm. It also features the Diamond Match Color Calibration Systems, a microprocessor-based method of adjusting the on-screen colors to match hard-copy, Pantone or other copy samples. It has a low magnetic emission design, meeting U.S., Canadian and international standards.

The Diamond Pro is compatible with all medium- and high-resolution standards from 640-by-480 through 1,280-by-1,024 at 60 Hz noninterlaced. The autoscans range frequency is 30 to 64 kHz horizontal, to 130 Hz vertical. The digital scan mode memory stores up to 12 different operating frequencies, with display parameters

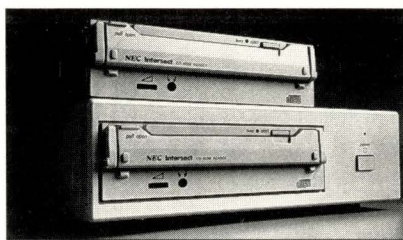
remaining constant between frequencies. User controls adjust brightness, contrast, vertical size and position, horizontal size and position, convergence, on-screen colors, memory reset, degauss, pin-cushion amplitude and phase and key balance. Pricing begins at \$1,599.

Mitsubishi Electronics America Inc.

Information Systems Division
5665 Plaza Drive, P.O. Box 6007
Cypress, CA 90630-0007
Circle 122

CD-ROMs for NECing

A line of small CD-ROM readers has been shown by NEC. Actually meant for the PC and Mac markets, the products can be attached to Sun workstations via the SCSI port. The InterSect CD-ROM reader line includes the InterSect CDR-74 external drive, the CDR-84 internal drive and the CDR-37 portable drive. The 74 and 84 support NEC's MultiSpin technology, which allows them to spin at 300 KB/s when retrieving data.



Both the 74 and the 84 also have an access time of 280 milliseconds. Pricing on the 74 begins at \$675, while pricing on the 84 begins at \$599.

The portable 37, meanwhile, has an access time of 450 milliseconds and a data transfer rate of 150 KB/s. It weighs 2.2 pounds and has an optional battery pack. Pricing on the 37 begins at \$449.

NEC Technologies Inc.

1255 Drive
Wood Dale, IL 60191
Circle 123

Replix Tips the Scales

A UNIX-based fax management software package has been introduced by Samsung Software America. Called Replix, the product allows users to

send, receive, route, view and manage fax directly from their desktop systems, including Sun workstations. The company says that Replix allows users to fax directly from PostScript and ASCII applications, or to fax via email.

Samsung says that Replix can be integrated with other applications and that it is scalable. Systems administrators can add as many users, servers or telephone lines as needed. It will be sold on a network floating-license basis. The base package, with two concurrent clients and unlimited servers, starts at \$2,395.

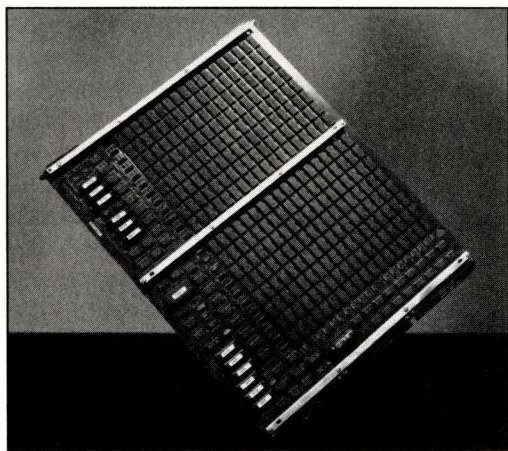
Samsung Software America

One Corporate Drive
Andover, MA 01810
Circle 124

Security Software for SPARC Servers

Software meant to protect SPARC-based systems from unauthorized modem access has debuted. The CoSECURE package from CoSystems is said to protect Sun and Solbourne systems from destructive users by

SOLBOURNE MEMORY



AnTeL offers 100% Solbourne Kbus-compatible memory at attractive third-party prices. Modules work in all 5 and 5E series servers. The S128M and S32M are 128-Mbyte and 32-Mbyte modules respectively. Let your applications have a stretch without sacrificing an arm and a leg.

Call for pricing at 1-800-RAM-ANTEL



625 Digital Drive, Suite 107
Plano, Texas 75075

Circle No. 4 on Inquiry Card

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

Circle No. 8 on Inquiry Card

adding security protection to modem ports. The package intercepts incoming phone calls, qualifies them according to predetermined security parameters and then acts accordingly.

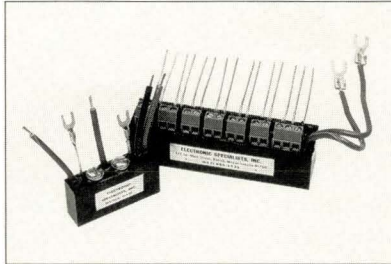
CoSecure has a variety of security options, including time and date controls and dial-back capabilities. The security parameters are accessible only to the system administrator and can be either set globally or on an individual basis. The product places no limit on the number of authorized users or telephone lines. Pricing ranges from \$595 for a single-line license to \$3,995 for a license with no restrictions on the number of telephone lines.

CoSystems Inc.
3350 Scott Blvd., Bldg. 61-01
Santa Clara, CA 95054
Circle 125

Industrial Sensor Protectors

A Massachusetts-based firm has shown a line of encapsulating protectors for harsh industrial environments.

The protectors, from Electronics Specialists, are meant for such applications as process control, storage, chemical processing and so on, where sensors must exist in a harsh environment and connect to comput-



ers by many meters of cable. The traditional hazard to computers (including workstations) in such situations is that power surges or other dangers can be transmitted down the connector from the sensor to the system.

Electronic Specialists' protectors exist on the lines between the sensor and computer to shield the system from power surges, spikes and radio frequency or electromagnetic interfer-

ence. They can be custom made or modified from existing off-the-shelf units. Pricing begins at \$60.

Electronic Specialists Inc.
171 Main St.
Natick, MA 01760
Circle 126

SPARC Support

A MBus board set that enables manufacturers to build high-performance SPARC-based systems has been introduced by Nimbus Technology. The company, which specializes not in SPARC processors but in the support chips around SPARC processors, says the product consists of Nimbus' own chip set plus a printed circuit board that can be manufactured by the buyer. The board will work with any MBus-based SPARC CPU, including the recently introduced Cypress Semiconductor and Texas Instruments Inc. superscalar variants.

The board contains Nimbus' NIM6000M chip set. This chip set includes a main memory subsystem,

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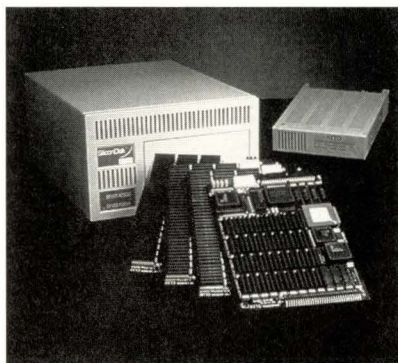
619-793-1104 • fax 619-793-1124
11772 Sorrento Valley Rd. Su. 160 San Diego, CA 92121

an asynchronous and on-board I/O subsystem, an SBus high-speed I/O subsystem and a graphics subsystem. Pricing varies.

Nimbus Technology Inc.
2900 Lakeside Drive, Suite 205
Santa Clara, CA 95054
Circle 127

Hot Rod RAM Disk

A high-speed RAM disk has been introduced by Atto Technology. The SiliconDisk Pro ia a SCSI-2 solid state drive that offers access times of .02 milliseconds and transfer rates of 10 MB/s.



The product has a capacity of 8 to 512 MB, depending on configuration. It is built around a 68020 processor and is a dedicated 40-MHz SCSI-2 processor. It automatically formats itself upon installation to support Sun, IBM, DEC, DG, SGI and HP. Pricing begins at & 4,995 for the 8-MB version.

Atto Technology Inc.
Baird Research Park
1576 Sweet Home Road
Amherst, NY 14228
Circle 128

Fee, Fi, Fo, FDDI

An SBus controller for FDDI has been introduced by Interphase. The 4611 SBus FDDI Connection, along with the company's fiberHUB 1600 concentrator, can provide Sun workstation and SPARClikes with FDDI links. The product complies with the ANSI X3T9 FDDI standard and comes with a SunOS driver that includes native TCP/IP support.

With it, up to 16 SBus systems can be connected through the fiberHUB

1600. The 4611 is a single SBus card and it supports fiber or twisted pair. Pricing for the fiber version is \$2,395; the twisted-pair version is \$1,895.

Interface Corp.
13800 Senlac
Dallas, TX 75234
Circle 129

Nimbus Shows RAID from Unbound

Unbound has introduced a family of intelligent disk subsystems that can provide Sun Microsystems Inc., Digital Equipment Corp., IBM Corp. PC and Apple Computer Inc. Macintosh systems with plug-and-play redundant arrays of inexpensive disk (RAID) storage. The RAIDSTORE subsystems use the high bandwidth and speed of a SCSI-2 connection to link a host computer with up to 35 5/4-inch SCSI drives for as much as 70 GB of storage.

Moreover, the product allows three different levels of RAID implementation. These include RAID 0, which is basic disk striping without fault toler-

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Aurora Technologies
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Waltham, MA 02154
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617-290-4844 Fax

Circle No. 9 on Inquiry Card

ance; RAID 3, which permits striping of up to 35 disks with parity written to a spare drive; and RAID 5, which spreads data parity information across all disks.

RAIDSTORE subsystems are available in a variety of cabinet and rack configurations. Storage ranges from 7.5 GB to 70 GB. Pricing ranges

from \$35,224 to \$270,368.

Unbound Inc.

17951 Lyons Circle
Huntington Beach, CA 92647
Circle 130

SI Developer's Tool Kit

SPARC International has announced the Developer's ToolChest, a compre-

hensive set of source and binary interface specifications and tools enabling software developers to move applications to SVR4 and the SPARC Compliance Definition 2.0. The ToolChest, which is being distributed on CD-ROM, includes a series of on-line books—the SPARC Architecture Version 8 Manual, the System V Application Binary Interface manual, the System V Application Binary Interface: SPARC Processor Supplement, the SPARC Compliance Definition 2.0 for SVR4, the System V Interface Definition (SVID) Release 3, and Migration guides from nine assorted computing environments to UNIX SVR4. The kit also contains the SPARC Migration Tool, a source migration tool to minimize porting effort.

Pricing on the various parts of the ToolChest varies. Users select the tools they want and then pay for access to them. Cost ranges from \$28 to \$395.

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535 Middlefield Road
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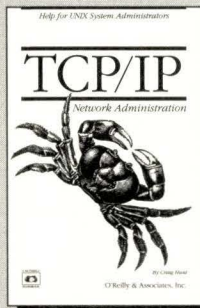
Turbo Laser Printer

A high-speed PostScript laser printer has been introduced by the U.S. sub-



sidary of the Swedish firm Facit AB. The P5160-Turbo is a 16-ppm printer based on a Weitek 8220 processor. It supports PostScript Level 2 and automatic emulation simulation—the latter meaning that the printer automatically switches to select the emulation needed to do the job at hand, whether that be PostScript or HP Laserjet. It also has concurrent hot-port switching, which enables the printer to determine

Books for System Administrators



TCP/IP Network Administration

By Craig Hunt
470 pages (estimated),
ISBN 0-937175-82-X,
\$29.95 (estimated)

A complete guide to setting up and running a TCP/IP network for practicing system administrators.

Covers how to set up your network, how to configure important network applications, including sendmail, and discusses troubleshooting and security. Covers BSD and System V TCP/IP implementations.

Managing UUCP and Usenet, 10th Edition

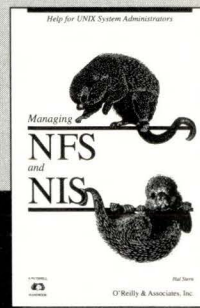
By Tim O'Reilly & Grace Todino
368 pages, ISBN 0-937175-93-5, \$27.95

For all its widespread use, UUCP is one of the most difficult UNIX utilities to master. This book is for system administrators who want to install and manage UUCP and Usenet software. "Don't even TRY to install UUCP without it!" —Usenet message 456@nitrex.UUCP

Managing NFS and NIS

By Hal Stern
436 pages, ISBN 0-937175-75-7, \$27.95

Managing NFS and NIS is for system administrators who need to set up or manage a network filesystem installation. NFS (Network Filesystem) is probably running at any site that has two or more UNIX systems. NIS (Network Information System) is a distributed database used to manage a network of computers. The only practical book devoted entirely to these subjects, this guide is a "must-have" for anyone interested in UNIX networking.

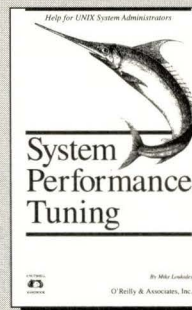


Essential System Administration

By Eelen 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.

System Performance Tuning

By Mike Loukides
336 pages, ISBN 0-937175-60-9, \$24.95



System Performance Tuning answers the fundamental question: "How can I get my computer to do more work without buying more hardware?" Some performance problems do require you to buy a bigger or faster computer, but many can be

solved simply by making better use of the resources you already have.

Practical UNIX Security

By Simson Garfinkel & Gene Spafford
512 pages, ISBN 0-937175-72-2, \$29.95

Tells system administrators how to make their UNIX systems—either System V or BSD—as secure as they possibly can be without going to trusted system technology. The book describes UNIX concepts and how they enforce security, tells how to defend against and handle security breaches, and explains network security (including UUCP, NFS, Kerberos, and firewall machines) in detail.

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which interface is receiving data when more than one interface is connected at the same time.

The P5160-Turbo comes standard with 2.5 MB of memory, expandable in 1-MB increments up to 4.5 MB. AppleTalk, RS-422 and RS-232 interfaces are available. There is a 250-sheet drawer under the printer itself. List prices begin at \$4,439.

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Manchester, NH 03101-1107

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Corrections

The address of ZCode Software (*SunExpert*, April), vendors of Zmail, is 4340 Redwood, Suite B50, San Rafael, CA 94903.

The address of Integrix Inc. (*SunExpert*, May) is 1200 Lawrence Drive, #150, Newbury Park, CA 91320. *SunExpert* regrets the errors. ➔

Upgrades, Enhancements, Additions...

- Wavetracer has introduced new software for its massively parallel computers to produce large 2D and 3D image-processing applications. **Wave-Tracer Inc.**, 289 Great Road, Acton, MA 01720. **Circle 133**

- The database Db_VISTA III has been renamed Raima Data Manager by vendor Raima, which says it is now targeting the commercial market. **Raima Corp.**, 3245-146th Place SE, Bellevue, WA 98007. **Circle 134**

- Lasertechnics has announced two new device drivers that allow Sun workstations to print high-resolution continuous-tone images on the company's DRI gray-scale printer. **Lasertechnics Inc.**, 5500 Wilshire Ave. NE, Albuquerque, NM 87113. **Circle 135**

- Ceram is shipping in the United States an accelerator card for Sun SPARCstations that boosts performance by replacing slower fixed disk swap partitions with fast access memory. **CERAM Inc.**, 2260 Executive Circle, Colorado Springs, CO 80906. **Circle 136**

- Digital Tools has ported its AutoPLAN project-management software to Motif on Sun. Before, the product had run on Open Look. **Digital Tools Inc.**, 18900 Stevens Creek Blvd., Cupertino, CA 95014. **Circle 137**

- Version 2.2 of XRT/graph has been announced by KL Group. The new version of the graph widget and development tool kit includes combination graphs, area graphs, dual Y axis, logarithmic axis, multiple text areas and

an optional 3D look for bar and pie charts. **KL Group Inc.**, 134 Adelaide St. E., Suite 204, Toronto, Ontario, Canada M5C 1K9. **Circle 138**

- Frame Technology is now shipping FrameMaker and FrameViewer 3.1 on the Open Look GUI. The products will be on CD-ROM. **Frame Technology Corp.**, 1010 Rincon Circle, San Jose, CA 95131. **Circle 139**

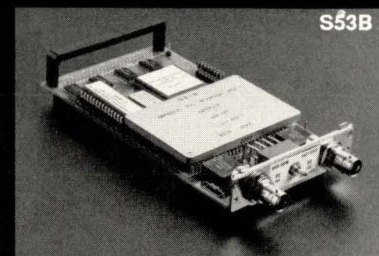
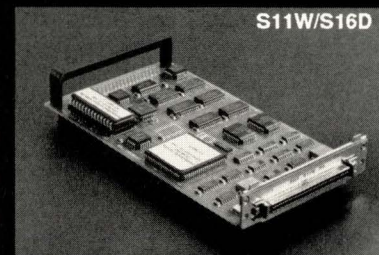
- Cayman Systems, which specializes in connecting UNIX and Apple systems, has released updated software for GaterBox, GaterBox CS and GaterBox GX. Release 2.1 of the software allows closer integration of TCP/IP, AppleTalk and DECnet. **Cayman Systems Inc.**, University Park at MIT, 26 Landsdowne St., Cambridge, MA 02139. **Circle 140**

- The Uniface 4GL and development environment now supports Ingres 6.4. The Uniface product is a development environment that supports multiple databases. **Uniface Corp.**, 1320 Harbor Bay Parkway, Suite 100, Alameda, CA 94501. **Circle 141**

- Rabbit Software and J1 Systems have announced a joint marketing agreement by which J1's Control Unit Terminal (CUT) 3270 emulation software will be available as the RabbitSTATION CUT coax adapter. The new product will operate with Rabbit's coax board and Rabbit's Cricket pocket coax adapter for laptop systems. **Rabbit Software Corp.**, Great Valley Center, Seven Great Valley Parkway East, Malvern, PA 19355. **Circle 142**

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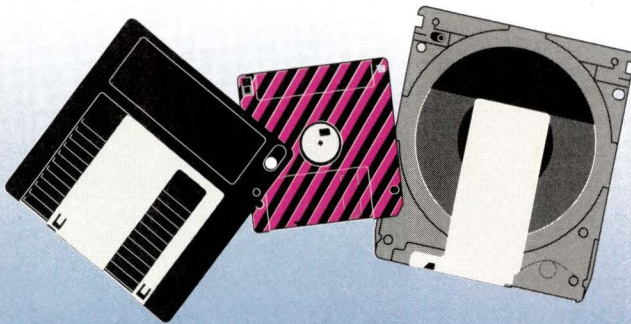
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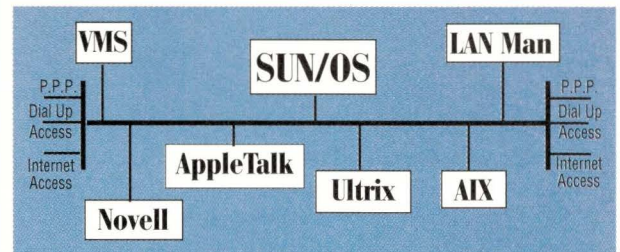
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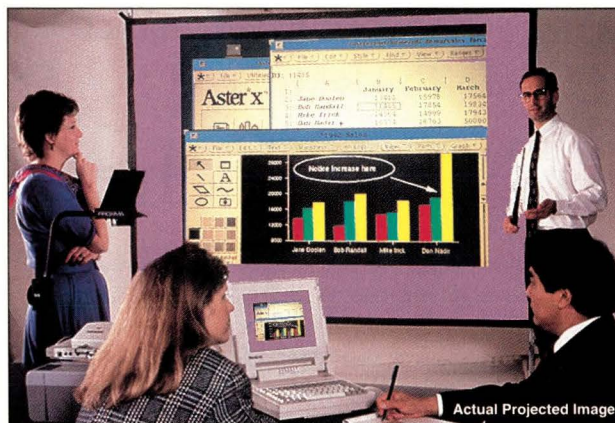
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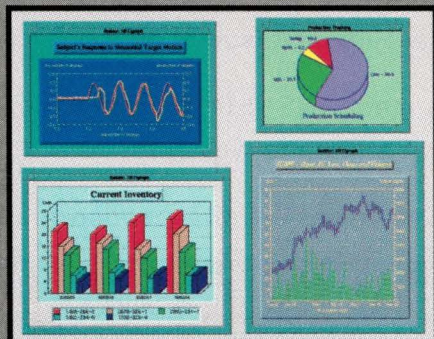
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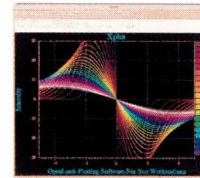
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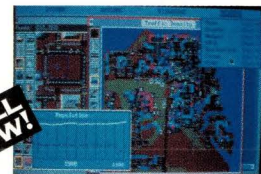
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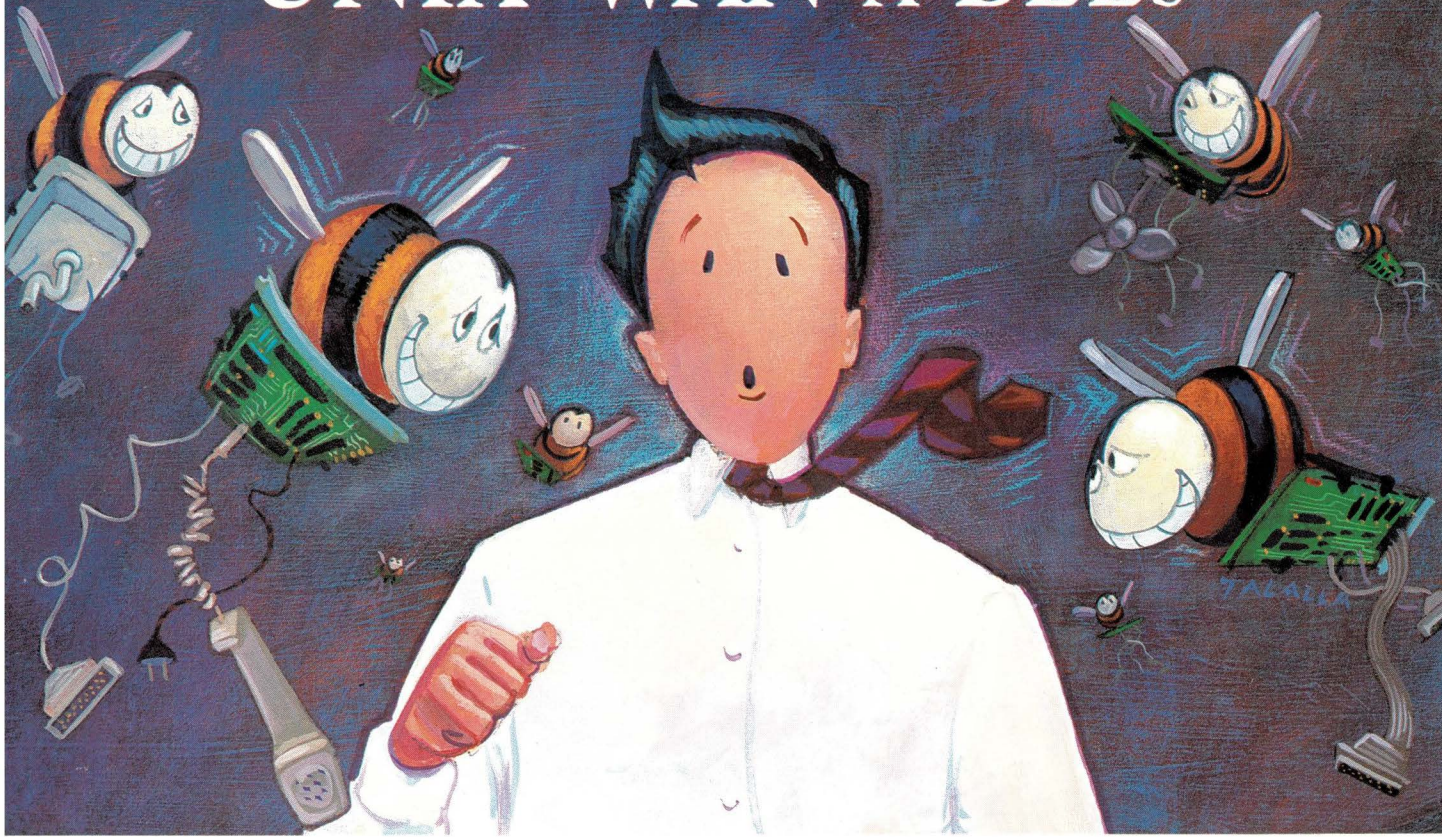
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