SUNEXPERT

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An Independent Forum for Open Systems

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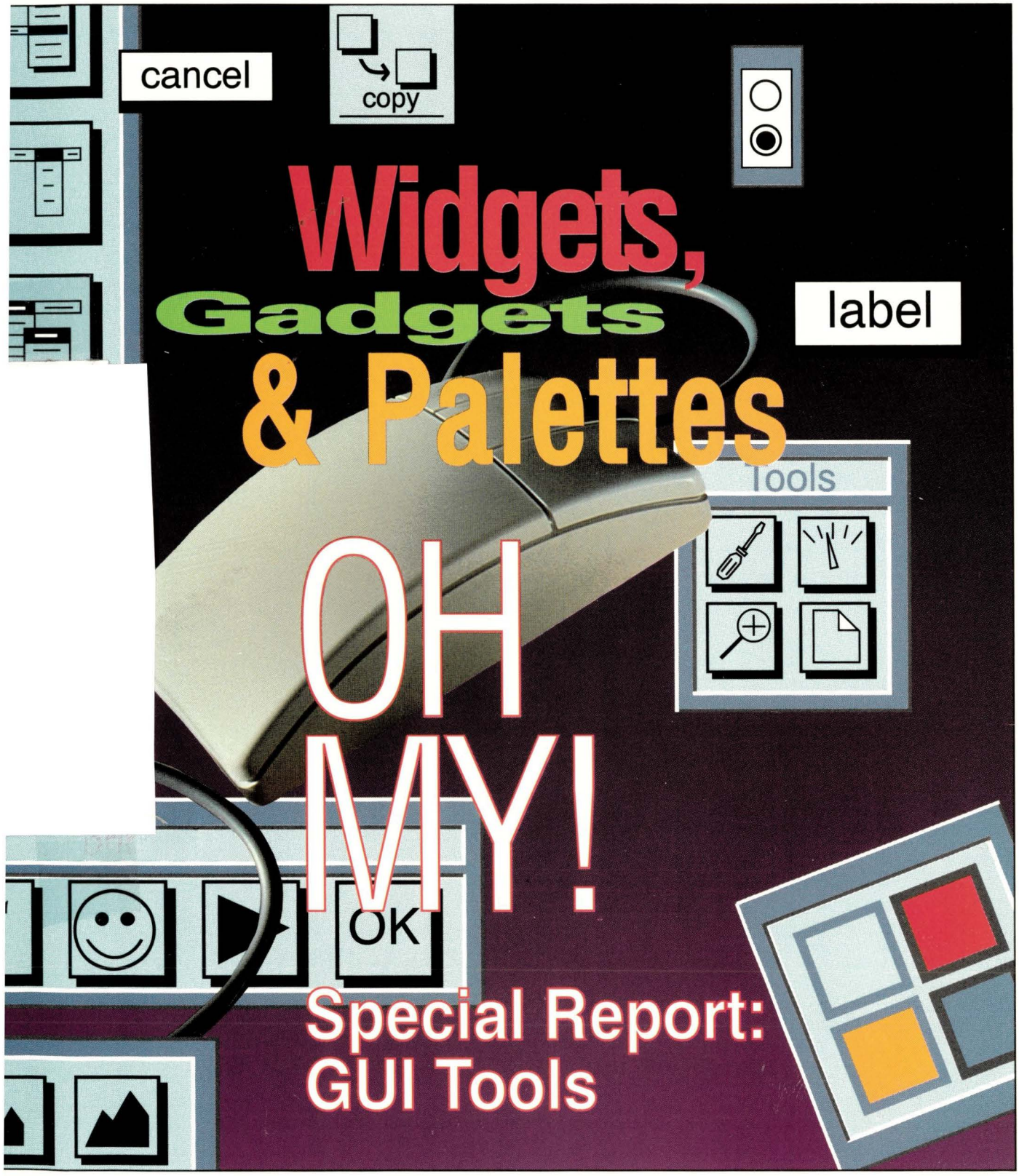

Widgets, Gadgets & Palettes

OH MY!

Special Report: GUI Tools

Reviews: Mathematica

A Guide to GUIDEs

News: Alpha Windows

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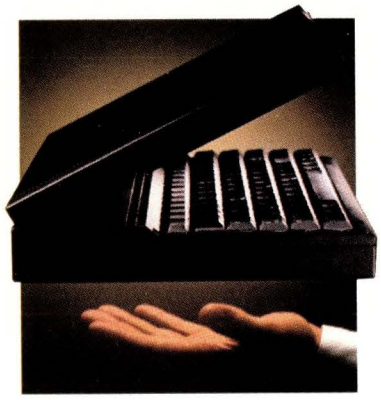

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Weight	6.8 pounds (with battery)
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Optional Software	Insiginia Solutions' SoftPC MS-DOS emulation

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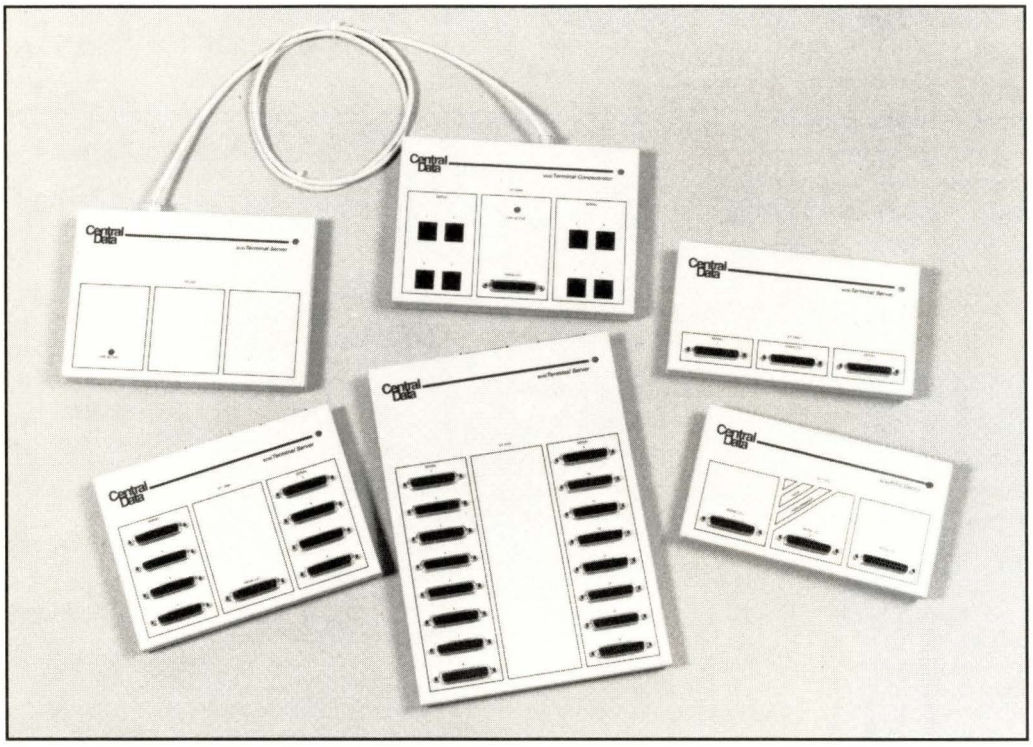

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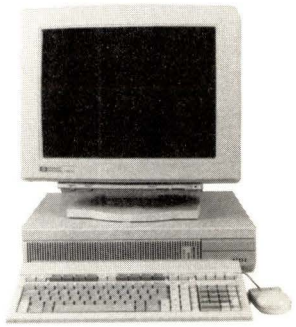

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CONTENTS

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Cover art by S. H. Lee
Mouse photograph
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FEATURES

54 **SPECIAL REPORT – GUI Tools: Widgets, Gadgets and Palettes, Oh My! –** A triple mouse-click–and you're off and writing GUI-based applications. Mary Jo Foley

63 Tools For All Trades – Graphical data generators–along with dialogue builders–offer commercial UNIX programmers new possibilities. Elfred Davies

68 The Guide to GUIDEs – A sampling of graphical user interface development environments. Maureen McKeon/Mary Jo Foley

74 **Product Review –** Mathematica, Telebit QBlazer, HDS View Station FX. Barry Shein

NEWS

8 Includes: **Alpha Terminals: Last Gasp or First Hurrah?, Tera Closes Its Doors, MIPS: SGI's Trump Card?**

COLUMNS

19 **Ask Mr. Protocol – Playing in the MUD –** Mr. Protocol recommends fitting your character with a hardhat and optional full thermal armor. Michael O'Brien

30 **UNIX Basics – Input/Output –** UNIX got big by being flexible, not necessarily logical. Peter Collinson

40 **I/Opener – Tying It All Together –** UNIX has a good shot at vertical applications, departmental computing and a range of distributed tasks. Richard Morin

46 **Your Standard Column – Decline and Fall?** – What has happened to the "creative minority?" Peter H. Salus

48 **Systems Administration – Natural Resources: Find, Join, Awk –** Your network is always the best authority on itself. S. Lee Henry

DEPARTMENTS

4 **Editorial**
36 **Reader Feedback**
80 **New Products**
93 **The SunExpert Market**
97 **Reader Inquiry Card**
99 **Subscription Card**

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

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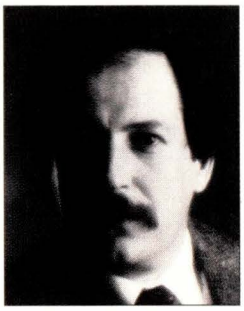
Editorial

Transition Trepidation

Only a few people remember the *Maine,* but most Sun managers and a few users remember SunOS 4.0. It got them involved in a world that seemed far, far away, alien and filled with risky turns. Many of our readers have expressed a fear that something similar will happen as they move systems over to Solaris 2.0. Of course, as



Sun users, we also have our trepidations. For example, how do we port our existing home-grown software, what do we have to do to our local scripts, and what does a dynamically configurable kernel hold in store?

If you share our concerns–and our hope for an easy migration–we would like to hear from you. *SunExpert* wants to know:

1. When do you plan to transition?
2. How long do you expect it to take?
3. What are you doing to prepare for the move (upgrade to 4.1.2 and/or OpenWindows 3.0)?
4. What are your expectations in terms of clean code?
5. Will Intel-based PCs figure into your Solaris planning?
6. Do you need multiprocessing support?
7. Will Solaris deliver true multiprocessing?
8. Have you received early access?
9. What does "Pipeline Tool" mean to you?

Your answers will help steer our coverage of the great OS shift. Email should be addressed to `solar@expert.com`. Feel free to pose your own genuine questions, which will be kept confidential. In the coming months, we will be trying to keep you abreast of any aid and comfort we can uncover.

Doug Pryor

Doug Pryor

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DOUGLAS PRYOR

executive editor
MICHAEL JAY TUCKER

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MARY JO FOLEY

technical editors
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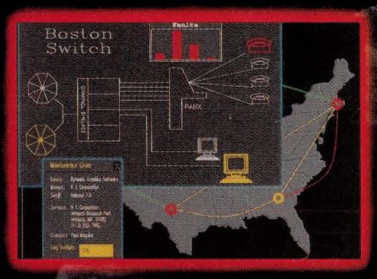
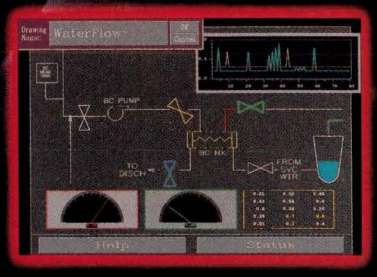
BPA

IS IT A GUI, OR IS IT GODZILLA?

Why spend thousands of hours developing your own GUI only to find you've created a monster. Instead, spend your time, money and effort wisely and build your reputation with the market leader. V.I. Corporation, the pioneer in dynamic graphics interface development environments, developed DataViews to cut your graphical interface development time by up to 80% while producing a dynamic interface that is easy to use, extend or modify. DataViews is the only interface development solution for monitoring real-time processes that offers:





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Real Time Data Output - DataViews displays dynamic data output by using graphs and meters; by changing the scale or color of objects, or by the movement or swapping of objects, to name a few. DV-Draw contains more than 60 pre-defined graph types suitable for displaying x-y output, analog output, and time series output from your application.

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Features	Artecon[1]	Brand A[2]	Brand B[3]
Number of available slots	6 (model SB-6000X)	4	4
Total available slots with multiple expansion boxes[4]	18	12	12
Master/Slave support	Yes	No	Yes
Internal drive slots	Included[5] (model SB-3000XD)	$200 option	Included
Burst mode support on ALL Desktop SPARC CPUs	Yes	No	Yes
GUI application for easy and flexible configuration[6]	Yes	No	No
Certified compatible with all of Sun's SBus cards[7]	Yes	No	Information not available
Warranty	1 Year	90 Day	1 Year
List Price	$1,995.00	$2,195.00	$2,595.00

[1] Based on latest vendor specifications dated 7/91 (specifications subject to change without notice).
[2] Based on latest vendor specifications dated 1991 (specifications subject to change without notice).
[3] Based on latest vendor specifications dated 3/15/91 (specifications subject to change without notice).
[4] Total slots available using a SPARCstation 2. For each SBus expansion box used, one CPU host expansion slot will be occupied with a Host Adaptor Card.
[5] The Artecon SB-3000XD supports any 3.5" SCSI fixed and removable media devices.
[6] SBus Tool™ is bundled free with purchase of Artecon SBus Expansion Boxes.
[7] Contact Artecon for a complete list of third party SBus cards that have been verified.

When you compare Artecon's SBus expansion boxes against other manufacturers, it's clear who really offers the best payoff. And at the best price.

With both the SB-3000XD and SB-6000X, all slots are accessible for easy external connection. Up to three boxes can be connected to a SPARCstation 2, providing you as many as 18 total SBus slots. More than any other box.

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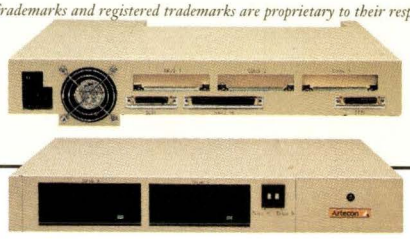

Part Number: SB-3000XD
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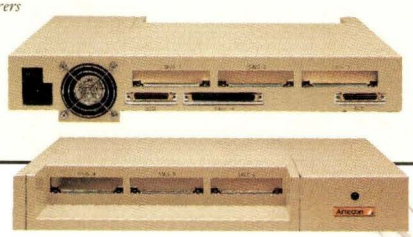

Part Number: SB-6000X
Up to six SBus cards - $1,995.00

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Features	Artecon[1]	Brand A[2]	Brand B[3]
Modem control on All SBus serial boards	Yes	No	No
Based on the latest RISC-based processor	Yes (Cirrus CD-1400)	No (Motorola MC68HC000)	No (Cirrus CD-180)
CPU burden[4]	20-25%	Not Tested	45%
SBus serial cards available	3 Serial/1 Parallel 4 Serial/1 Parallel 8 Serial/1 Parallel 12 Serial/1 Parallel 16 Serial	4 Serial 4 Serial/1 Parallel 8 Serial	2 Serial/1 Parallel 4 Serial 8 Serial 16 Serial
Software GUI for easy terminal/modem configuration[5]	Yes	No	No
Software GUI for easy printer configuration[5]	Yes	No	No
Warranty	1 Year	90 Day	1 Year
List Price	$495.00 to $1,295.00	$999.00 to $1,495.00	$595.00 to $1,995.00

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

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

Add up to 16 serial ports per slot with Artecon's SBus multiplexor cards. All of our serial cards have built in modem control and are based on the latest Cirrus chipset. That means the lowest CPU burden of any serial card on the market.

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Best of all, these expansion cards come from Artecon: the leading manufacturer of quality peripherals for your workstation.

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Four Full Modem Serial Lines/One Parallel Port - $695.00

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Twelve Serial Lines (Four Full Modem) One Parallel Port - $1,095.00

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AD06

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NEWS

Alpha Terminals: Last Gasp or First Hurrah?

A new creature is about to hit the dumb terminal market. Alpha terminals, windowing ASCII terminals with many of the features of bit-mapped displays but at far lower costs, are set to ship by the middle of this year. They have their own standards (Alpha Windows), and their vendors have recently organized into a formidable trade group, the Display Industry Association (DIA) based in Palo Alto, CA.

Their partisans say that Alpha Window terminals will be among the hottest markets of the next 10 years. The market-research firm Dataquest has already predicted that 35,000 will ship this year alone, and that 269,000 will ship in 1993.

But Alpha terminals have their critics too. According to them, Alpha represents only the last, feeble gasp of a dying character terminal industry.

Alpha terminals are at heart just text terminals. They differ from traditional ASCII terminals in that they can show multiple sessions at the same time, have additional memory, provide a mouse, and are supported by window management software that is resident at the host. "It is exactly like a bit-map display, so long as you are not putting pictures on the windows," says Vincent Luciano, director of of marketing displays for Applied Digital Data Systems (ADDS, a division of NCR) Naperville, IL, which will be making and selling them. "In fact, the look and feel will be Motif Level 1 compliant."

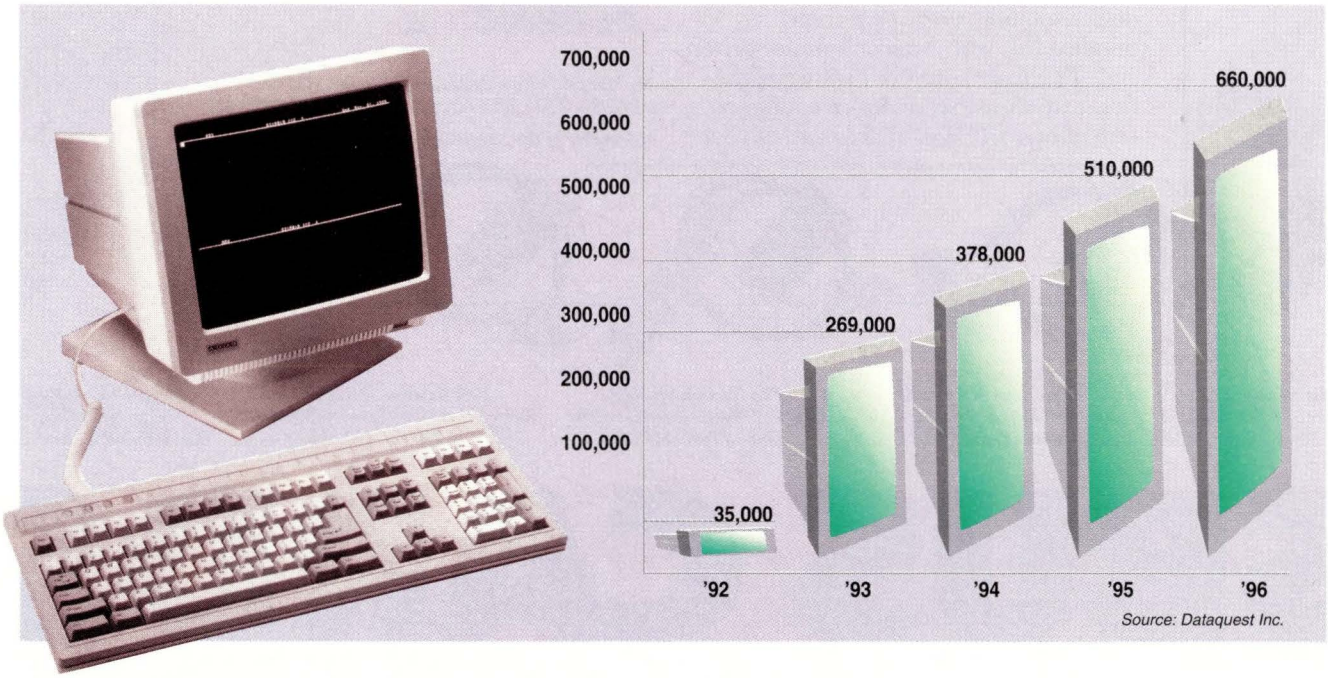
Adds Ronald Cooke, senior industry analyst at Dataquest, "We did a technology evaluation in 1990, and, at that time, we found that there was no good reason why you couldn't have pull-down menus, icons and so on on a text terminal...about the only thing you can't do is draw a circle. But, if you don't do something like draw airplane wings all day, but rather, do order entry, then you don't need that."

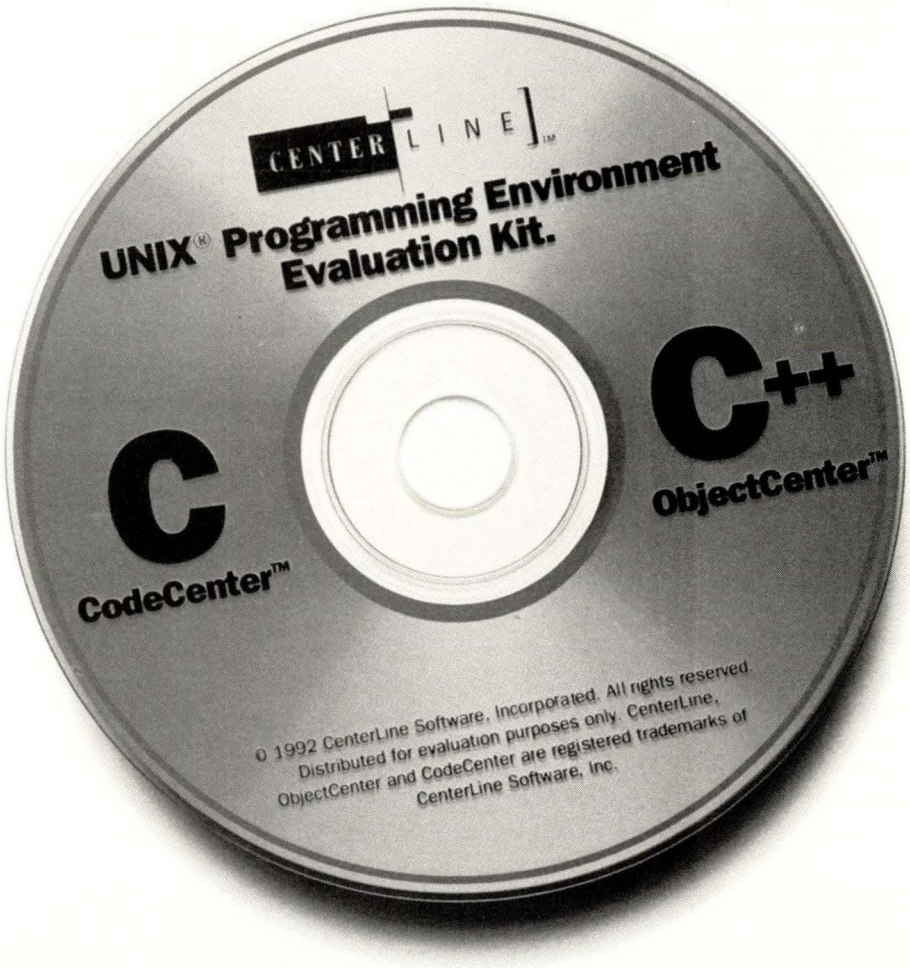
The other place Alphas will be different from bit-map displays, and particularly X terminals, is cost. Their partisans are confident that Alphas will cost at most $700 to $800, and probably less. "You don't have to put RISC into it [an Alpha] at $100 a pop," says Luciano. "You just put in an [Intel] 8051 at 59 cents apiece." In addition, like character terminals, they connect directly to the host and thus don't have to support Ethernet, with its attendant costs of cable and software.

Even though Alpha terminals are a fledgling industry, they already have powerful friends. A trade association, the DIA, includes most of the major names in the terminal business and some of the most important names in the software. On the hardware side, DIA's roster includes not only ADDS, but also Cumulus Technology, Palo Alto, CA; Digital Equipment Corp., Maynard, MA; Wyse Technology, San Jose, CA; Televideo Systems, San Jose, CA; Systech, San Diego, CA; and several others. The software side includes The Santa Cruz Operation, JSB Computer Systems, Scotts Valley, CA; Summitpoint Technologies, Fremont, CA; and Structured Solutions Inc., Plano, TX.

Alpha partisans say that the terminals will fill a considerable hole in the market–that is, meet the needs of the users who don't require graphics, but

Alpha terminals like this model from Applied Digital Data Systems will be "among the most successful products of the next decade," says Dataquest Inc.





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do need multiple sessions. Such people, say the Alpha supporters, form the vast majority of UNIX system users–the takers of airline reservations, the data entry workers, the users of office-automation systems, operators of help desks, inventory control clerks, telemarketers and so on.

compares favorably with Dataquest's predictions for X terminals.

But then, Cooke has reason to be bullish on the Alpha terminal industry–he helped create it. In 1990, Dataquest gathered its terminal vendor clients and suggested a united front. "Their feeling was that if the

Alpha partisans argue that the real cost savings isn't in the terminal but rather in the way it links to its host.

"We're very bullish on the market for these products," says Dataquest's Cooke. In fact, he says that Alpha terminals will be among the most successful computer products of the next decade. He says that approximately 35,000 will ship this year; 269,000 in 1993; 378,000 in 1994; 510,000 in 1995; and 660,000 in 1996. This

industry got together and agreed on a standard for windowing, it would re-invigorate the terminal business," says Larry Strober, executive director of the Display Industry Association.

Thus the Alpha Windows standard, the DIA and Alpha terminals themselves all trace their origin to a single conference promoted by a single research firm. Alpha terminals' detractors point that fact out with some glee. They're not convinced that Alphas fill a market need. "I don't see any future at all for Alpha terminals," says Ray Anderson, chairman of IXI Corp., which sells both user interfaces for UNIX machines and also products that help turn character-based applications into GUI-based applications.

He has no use for the argument that Alphas will be cheaper than X displays: "I can't see any reason why anyone would put a character terminal on a desk. Certainly not cost. An X terminal costs about as much as a good chair these days."

Alpha partisans argue that the real cost savings for Alpha isn't in the terminal but rather in the way it links to its host. "The difference isn't the cost of the terminal. That's not the key," says the DIA's Strober. "The difference is the overall cost. You don't need to supply Ethernet to people who don't need the full capability of X."

Detractors, though, still aren't convinced. They ask where Alphas are

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going to get software. "The industry forgets that the reason X terminals are popular is because of X, not because of X terminals," says Andrew Nilseen, vice president of market for Visual Technology Inc., an X terminal vendor. "People write for X because X is on a number of different UNIX platforms. X terminals just sort of fall out of that. I don't know who is going to write software for an Alpha terminal."

Critics are also uncertain about the economics of even modifying existing software to run on Alphas. "If you're going to rewrite your application, why not rewrite for X Windows?" asks Bruce Decker, director of marketing at Open Inc., which has software to give a Motif-like windowing system to existing dumb terminals. He argues that the really important market won't be for Alpha terminals, but rather for providing windowing to the millions of text terminals already in the world. "There's still a huge installed base of them out there."

Dataquest's Cooke responds that software won't be an issue because "the software should be drag-along. Most existing character-based applications can be run unmodified." In addition, says the DIA's Strober, new software should be coming: "There is every indication that the software community will be writing to Alpha."

He points out that one of the founding members of the DIA is none other than SCO. "They have character-based applications," he says. "That's where they've been successful." Indeed, almost all of the Alpha community looks forward to extensive software by VARs whose products are currently running on character terminals. The perfect Alpha terminal developer is perceived to be the individual who today is selling a 80386-based, multiuser system, running Xenix, to a smallish business office.

In fact, the link between Alpha and Intel-based systems is so tight that even Alpha's partisans tend not to connect the standard with Sun. Still, Summitpoint Technologies Inc., Fremont, CA, has introduced an Alpha Window manager for a Sun host and has another for the IBM RS/6000. "I am not aware of anyone else working in the same area," says Prakash Sharma, vice president of products at Summitpoint. "Most of the rest [of the members of the DIA] are focusing on PC UNIX."

So, at least some Sun VARs, or PC VARs looking to switch to SPARC, could be using Alpha terminals in the near future. As of press time, Alpha terminals were scheduled to ship by this month, or next, depending on the vendor. Just how much of a market they'll have when they do ship remains a matter of debate even among their fondest friends. "Our belief is that there is going to be a niche market between dumb terminals and X terminals," says Paul G. Vance, vice president of Structured Software Solutions Inc., which makes Facet Term, windowing software for character terminals, and which will have a version of the product for Alpha Windows as well. "The question is, how big is that niche?"–*mjt*

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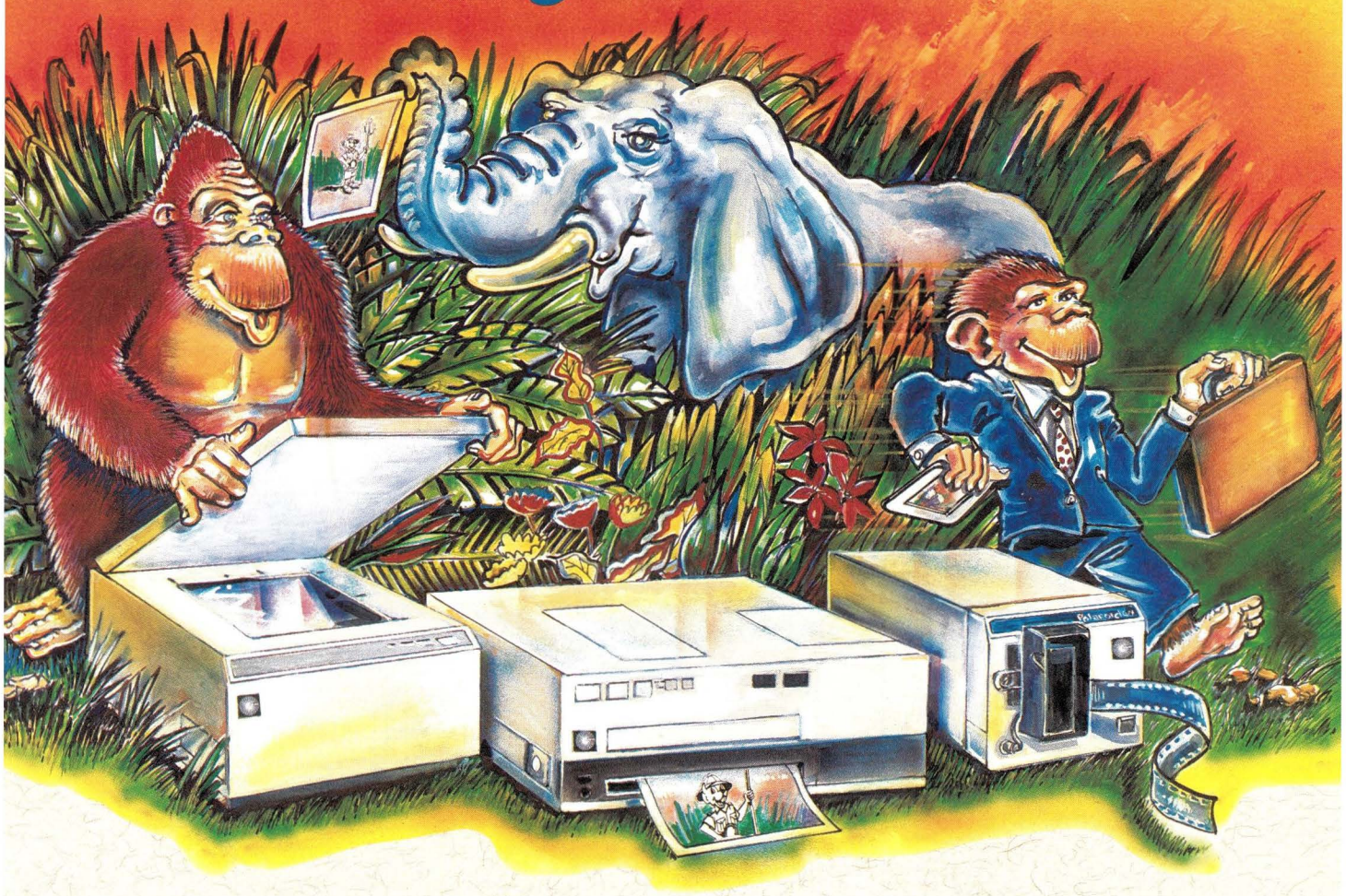

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Tera Closes Its Doors

Tera Microsystems Inc., the Santa Clara, CA, company that was building enabling SPARC chipsets, is no more. In late March, the company announced that due to a lack of second-round venture capital funding, it was ceasing operations.

Tera made public plans for its microCORE chipset in July 1991. It began licensing to clone vendors Sun Microsystems Computer Corp.'s 40-MHz SPARC chipset (which Tera labeled the TS-2) and SPARCstation 2 board in October 1991. Although several SPARCalike companies were using Tera as their suppliers for Sun's 40-MHz chips, Tera had yet to deliver the microCORE to the five vendors that had signed on for the chip. These companies were Datatech Enterprises Co. Ltd., Elitegroup Computer Systems, Hyundai Workstation Division, Sparktrum Microsystems Inc. and Trigem Corp.

"For right now, we're OK in terms of our supply of [Sun's] 40-MHz chips," says Mark Johnston, executive vice president of the Hyundai Workstation Division. "We're having discussions with AT&T about supplying these chips directly to us, without a middleman," like Sun, he says. But now Hyundai will have to look elsewhere for a supplier of "differentiated" chips for its as-yet-unannounced SPARCalike, which is due out sometime in the second quarter.

Other SPARCalike vendors could not be reached by press time. But all are likely to be on the lookout for new SPARC chip sources.–*mjf*

MIPS: SGI's Trump Card?

If all goes as planned, next month, Silicon Graphics Inc. and MIPS Computer Systems Inc. will become one. Although MIPS stockholders will receive 0.61 shares of SGI common stock for each share of MIPS stock they own, most pundits expect the deal to look more like a takeover than a merger.

The renamed MIPS Technologies Inc. will become a wholly owned subsidiary of SGI. "It will be 100% focused on ACE [the Advanced Computing Environment consortium] and MIPS as an open architecture," says Michael Ramsay, senior vice president and general manager of SGI's entry systems division.

Because MIPS was suffering a $1 million a month operating loss prior to the merger, most industry watchers seem to regard the move favorably. "The acquisition was imperative both for the survival of MIPS as a company and the architecture on which SGI has built its systems," according to a statement from Dataquest Inc., San Jose, CA.

The effect that the merger will have on MIPS as a system supplier, as well as on the other members of ACE, remains uncertain. SGI's Ramsay says, "We think this will strengthen the ACE consortium. There's a feeling among the members that this adds lots of security to the MIPS architecture. And a greater injection of technology and investment means [the consortium members] will be able to bring more products to market more quickly."

Dataquest is predicting that the merger "may lead to a complete restructuring of the ACE consortium," and "will probably speed [Digital Equipment Corp.'s] exit from the MIPS market to Alpha." The market researcher also points out that "this merger is likely to affect whether ACE backs a MIPS [R4000] platform or Intel [Corp.] 586 for [Microsoft Corp.] Windows NT."–*mjf*

Other Open Systems News

Digital Equipment Corp.

DEC announced extensions to its Application Control Architecture (ACA) Services software, including support for Sun SPARCstation and Microsoft Corp. Windows 3.0 platforms, as well as for TCP/IP and DECnet/OSI. ACA Services is an object-oriented software package that

enables systems integrators and software developers to build and link independently developed applications across a heterogeneous environment. ACA Services implements the Object Management Group's Common Object Request Broker Architecture (CORBA) API and distributed class repositories. DEC says this makes it the first company to implement the CORBA dynamic API.

A multiprotocol terminal server, the DECserver 90TL, is now available from DEC. The server connects terminals, printers, PCs and modems to any network service supporting TCP/IP in UNIX, VMS and/or DOS environments. The eight-port Telnet/LAT server offers connections at speeds of up to 57.6 Kb/s.

Hewlett-Packard Co.

HP has introduced software that allows HP workstations to link with IBM Systems Network Architecture networks. Products include HP SNAplusLink, for data-link connections between HP systems and mainframe or peer hosts; HP SNAplus-3270, for emulation of IBM 3278 terminals and 3287 printers; and HPSNAplus API, which provides support for IBM's LU 6.2 peer-to-peer programming protocol. HP is also promising products for token ring and SNA over X.25 communications, file-transfer software and related interactive graphics applications by year-end.

HP's GlancePlus performance-management software now runs on SPARCstations. The product was already available on HP 9000 and HP 3000 systems. The product allows systems administrators to monitor system performance in networked, distributed and multiuser environments.

IBM Corp.

A utility package enabling users of RS/6000 systems to duplicate up to eight copies of magnetic-tape information simultaneously is available from Cambex Corp., Waltham, MA. CertiCopy allows users to make tape duplicates of AIX software faster and more reliably than previously. The utility is compatible with any IBM 7207 or Cambex quarter-inch tape drives connected to an RS/6000.

Hunter Systems' XDOS porting technology will soon be available for IBM's RS/6000 workstations and servers. XDOS produces native UNIX versions of DOS applications through a two-step decompile-recompile process. This way, commercially available and in-house DOS applications can be converted by XDOS to AIX. Hunter Systems has established and is managing an RS/6000 Application Porting Center at its Palo Alto, CA, headquarters to assist customers with the port.

This Just In...

• **SunSoft** has introduced what it's calling the "industry's first general-purpose Transport-Independent Remote Procedure Call (TI-RPC) Toolkit for client/server application development." TI-RPC, combined with code-generation technology from NetWise Inc., is part of the Open Network Computing (ONC) services provided with Solaris. The ONC RPC Application Toolkit allows developers to create a single version of a client/server application that runs unmodified across a range of operating systems, hardware platforms and networks. Among the vendors that already have endorsed ONC RPC Application Toolkit are Novell Inc., Borland International, Lotus Development Corp. and AST Research.

• A new quarterly newsletter for Sun software developers, aptly titled the *SunProgrammer* newsletter, is now available from SunPro. The publication contains information and tips on the SunPro compilers and other developer productivity tools. For a limited time, a free copy of the debut issue is available by sending your name, company and mailing address to `jennifer.umstattd@sun.com`.

• Version 1.0 of SunPEX is now shipping from **Sun Microsystems Computer Corp.** SunPEX is a network-transparent, 3-D extension to Sun's X11/NeWS server that allows graphics applications to be distributed across a network while taking full advantage of graphics acceleration. The product runs on SPARCstation 1, 1+, 2, IPC and IPX machines with

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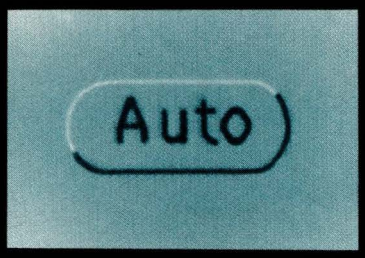

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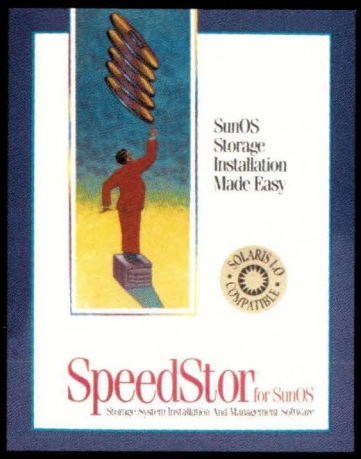

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• **Pinnacle Data Systems Inc.**, the Columbus, OH, Sun service/repair facility, has taken the SPARCalike plunge. The company has begun manufacturing its own SPARCstation 2 compatible, using its own motherboards and GX cards. Pinnacle says it plans to price its machines at $3,000 less than the equivalent Sun SPARCstation IPX/SPARCstation 2 systems, and is throwing in a two-year warranty.

• Disproving Sun Microsystems Inc.'s contention that the only safe memory upgrade is a Sun memory upgrade, **Kingston Technology Corp.** has announced that its memory upgrades have been branded SPARC Verified. The Fountain Valley, CA, company claims that it is the first memory upgrade supplier to have been awarded this SPARC International certification.

• **Fujitsu Computer Products of America** has been collecting new Sun and UNIX VARs like crazy. Following a series of VAR council meetings sponsored by Fujitsu in three states, the VAR count reached 250 to 300, says Dave Krevanko, vice president of product marketing. At the meetings, "we found that Sun resellers wanted very-easy-to-integrate products," Krevanko says. So, Fujitsu is giving them what they want, with its M2483 series of 3480-compatible tape drives, three 3 1/2-inch and one 5 1/4-inch SCSI drives, and most recently, its M3096G, a 22-ppm SCSI NeWSprint printer.

• The honeymoon is over: **R Squared**, Englewood, CO, and **Andataco Computer Peripherals**, San Diego, CA, have decided not to merge after all. According to a statement issued by R Squared, "after several months of negotiations, the two companies agreed the union was not in the best interest of their employees or customers." And R Squared executives "felt the merger involved a change in business strategy that required too much focus on strict product sales and distribution." Andataco agrees. "The two companies look like they fit well together, but philosophically, they are very different," says Steve McAllister, Andataco's director of marketing. In the words of R Squared President Joseph Campana, "It was like a marriage, where we were going down the aisle and decided at the altar that it wasn't meant to be." R Squared says it now plans to expand into the Silicon Graphics Inc., Hewlett-Packard Co. and IBM RS/6000 markets.

• **ICL** and **UNIX System Laboratories** are jointly developing Open Systems Interconnect/Transaction Processing (OSI TP) products. ICL is providing USL with the core OSI TP protocol engine, and USL will incorporate it into its OSI Open Networking Platform product family. USL also is enhancing its TP manager, Tuxedo System/T, to work over the OSI TP-enabled ONP stack. ICL will build the resulting OSI TP product into its Open Systems Transaction Management product suite. ICL Inc. is located in Irvine, CA; USL is headquartered in Summit, NJ.

• There's more than one way to connect a Sun Microsystems Inc. workstation and an IBM Corp. mainframe. **Brixton Systems Inc.**, Cambridge, MA, has unveiled BrxQLLC (Qualified Logical Link control), which allows Sun users to access IBM mainframes via public and private X.25 networks. BrxQLLC operates with Brixton's client products, such as the Brx 3270, 3770, LU0 and NetView emulators, and is bundled with Brixton's BrxX.25 and BrxPU1 Server products. **Systems Strategies Inc.**, meanwhile, has extended its Express client/server technology, called Networking Services, to support Sun clients. Express enables Sun and other UNIX systems running on TCP/IP to access IBM hosts via a server, which can be a RS/6000, DEC RISC Ultrix or UNIX 80x86 system running Express SNA Communications Server and Networking Services software. Systems Strategies is based in New York, NY.

• **Samsung Software America**, Andover, MA, is developing a full suite of shrink-wrapped UNIX office-automation software, slated to ship during the second quarter. Modules will include fax, voice and electronic-mail integration. SSA says "these technologies will be combined with databases across a variety of platforms,

including Windows, UNIX and minicomputer-based systems to form office solutions offering advanced multimedia capabilities." Stay tuned.

• Santa Clara, CA-based **SynOptics Communications Inc.** has introduced LattisSecure data-privacy software. The software resides on a 10Base-T Ethernet host module, Model 3368; is meant to be installed in LattisNet System 3000 intelligent hubs; and is designed to be a complement to encryption and other security schemes. A host module with 12 connections is available for $1,695.

• Also on the network-management front: **Independence Technologies Inc.**, Fremont, CA, has unveiled its iView SNMP Agent Kit, a tool that allows users to integrate an unlimited number of private management information bases (MIBs) into the iView SNMP Agent. These MIBs can be managed by any number of SNMP managers, including Hewlett-Packard Co.'s OpenView Network Node Manager, Sun Microsystems Inc.'s SunNet Manager, or Independence Technologies' iView System Manager. And **AT&T Network Systems** announced that its Display Construction Set (DCS) package, used to create graphical displays for network-management systems, is now commercially available. DCS is X Window System-based and runs on Sun and HP workstations; it will be ported to other platforms later this year, the Morristown, NJ, company says.

• The Esprix board from **Megatek Corp.** offers SPARC users graphics performance comparable to what is available on high-end workstations from Hewlett-Packard Co. and others–for less than $2,500, according to the San Diego, CA, company. Esprix accelerates Megatek's X11R5, Motif, OpenWindows and SunView applications and window managers. The one-slot SBus board operates in SPARCstations, the 600MP servers and various SPARC compatibles. The board features a graphics rendering processor, hardware cursor, keyboard/mouse port and 8-bit color frame buffer.

• **RDI Computer Corp.**'s BriteLite laptops are now available through Sun Microsystems Federal third-party offerings program. U.S. government end users, contractors and resellers can purchase the BriteLite line of commercial and Tempest laptops directly from Sun Federal. The Tempest version, called the T-BriteLite, is being developed jointly by RDI and SAI Technology, a division of Science Applications International Corp. The T-BriteLite is available in configurations incorporating either Sun IPX or IPC motherboards.

• A consortium of CASE vendors and end users called CASE Communiqué plans to make the first of its CASE tool messaging operation specifications available in the public domain next month. The group is developing specs for analysis and design, database management systems/4GLs, configuration management, metrics and test, project management, external interfaces, construction/reverse and re-engineering, common operations, documentation/editors and user-interface management systems. The group plans to post all specifications to the CASECOM machine–a central information repository for CASE Communiqué members that is also accessible by nonmembers via anonymous ftp–in July.

• Menlo Park, CA-headquartered **Lucid Inc.** is making announcements right and left. It has signed a technology agreement with HaL Computer Systems Inc. to provide Lucid's SPARC-based C, C++ and FORTRAN compiler technology to help build performance and speed into HaL's compilers for its anticipated SPARC systems. Lucid also has announced Version 4.1 of Lucid Common Lisp, which is closer to the anticipated ANSI Common Lisp standard than are previous versions. Lucid also is now shipping Version 1.0 of the Common Lisp Interface Manager. CLIM provides a generic set of user-interface capabilities that integrate with the host window system, whether it be X, X/Motif, X/Open Look, Genera or the Macintosh interface.

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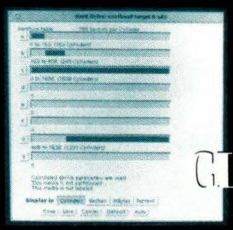

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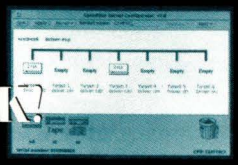

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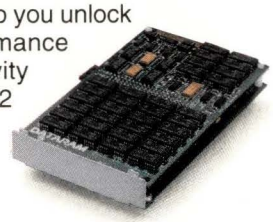

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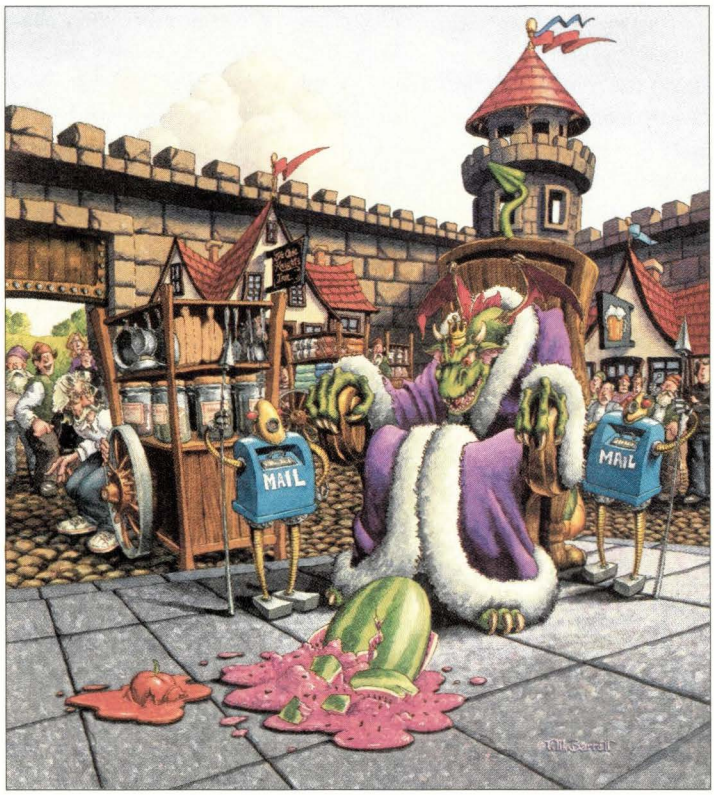

ILLUSTRATION BY TOM BARRETT

Playing in the MUD

by MICHAEL O'BRIEN

"Interesting question for the undead."
–Mortis, when asked the meaning of life

"I'll be going then, Caernarvon."
–Newton H. Homunculus, Maas-Neotek robot

Q: Would you mind telling me why we seem to be standing in the middle of London, with a major produce fight going on around us?

A: Please do not allow yourself to be distracted by trivialities. We are attending a town meeting. The fact that the town exists only in a database somewhere is merely another one of those trivialities. This place is real enough for a lot of people. Dodge that melon and come over here and listen. I think you'll be more than a little interested! Let's join Mr. Protocol, who seems to be hiding behind that cart over there…

Welcome to TinyLondon. Today we'll be exploring this city, taking a walking tour and explaining as we go why this city exists at all, and where it may be found. Come north with me to Narthat Street, and we'll have a pint at the Treadmill while we get some background. Don't pull up the paving stones, though, or you might fall into the machinery underneath!

All settled? Good. Our story goes back a long way, to the days of the game Dungeons and Dragons, which absorbed many male adolescents and college students, mostly to their detriment. The ever-popular game of `rogue` stole more cycles than many compilers. These games are intellectually complex but socially simplistic. The few attempts to translate an adventure game like these into a real novel have been almost uniform failures–stilted, repetitive and unimaginative in the extreme, regardless of the talents of the writer. But then things took a different turn. Networks came into play.

Initially, interpersonal network interaction took place via the originally defined services of Telnet and mail. Real-time services such as `finger` came later. When Berkeley first imple-

mented TCP for the VAX, services such as `talk` became common. This made it possible for two people to have a real-time conversation without having accounts on the same machine. Later, another text-based facility known as Internet Relay Chat (IRC) was developed, which is still in use. IRC uses a coterie of cooperating servers to allow multiple users to share a common communications channel. The IRC server keeps incoming messages and destinations straight and imposes on the communication space the notion of a "channel." Users may request a list of all active channels, the number of people in each and the topic being discussed in each. Channels may be created simply by joining a channel with the desired name.

IRC requires the use of a special client program, which serves several purposes. It speaks a special protocol to the client, to allow the user to enter and leave channels, to control access to a channel and to perform other actions such as setting a topic. However, it also serves the very valuable purpose of keeping output straight. Users type text in a "power-typing" mode, where `newline` is typed only at the end of a message. The client supplies line breaks after words in typical word-processing fashion, and displays output from other users, suitably labeled, in the same fashion. Further, to keep input and output straight, when output arrives while the user is in the middle of typing, the user's own input is momentarily erased, the output displayed and the pending input recreated, thereby preventing the input and output from being unreadably intermingled.

When IRC first appeared, it had an immediate vogue. It has a continuing popularity but seems on a day-to-day basis to be used more for chatting, as its name implies, than for serious work, though some very useful conferences have taken place there spottily. `Comp.lang.smalltalk`, for instance, has used the facility recently to hold an on-line conference about the future of the Smalltalk language, and more are planned.

IRC, however, is basically boring, boring, boring unless you're in there for a reason. In general use, it resembles a bank of 900-number party chat lines. On occasion, fascinating discussions abound, but not often. Mr. Protocol has found, however, that there is a way to spice up the action considerably. People do not interact in a vacuum, and unless there is surrounding context external to IRC, IRC does present a communications vacuum.

At the same time, adventure-style game-writing was continuing elsewhere. Single-user games were giving way to multiplayer games, large and clumsy. Eventually, one was written that was both technically usable and socially habitable, and TinyMUD was born.

MUD stands for Multi-User Dungeon. The original MUD was written in Britain, where it has given rise to a commercial enterprise. On this side of the pond, however, it is starting to make computer history. There are all sorts of MUD servers now, some programmable, some not, and all sorts of MUD client programs too, which serve the same purposes as the IRC client, plus more. Come on down the street a ways, and let's see what we can find. Let's see...we're in the Treadmill now, right? See Figure 1 (below) for a view.

Figure 1

```
    Main floor of The Treadmill.
    The room is long; at the far end it bends to the left,
making an L-shape, and
    in the back you see armchairs clustered around low
tables, a wreath of pipe
    smoke drifting aromatically up. Just in front of you is
a scattering of worn
    wooden tables and pub chairs. Doris presides over the
bar, which runs along
    the length of the left wall. She grins cheerfully up at
you as she polishes a
    glass.
    [ Commands: sit,  Look at menu,  Order ]
    [ Exits: Through the swinging doors to a hallway leading
south,  East to
    the
    front walk ]
    Contents:
    a flask of freshly squeezed tangerine juice
    Big, warm hug
```

Well, that was entertaining enough! And if we head out, and south down the street, we come to:

Figure 2

```
 The Town Square, London
    Chaos surrounds you. What was once a peaceful, if a bit
noisy, marketplace,
    has turned into a messy battleground. Merchants hiding
behind their wares are
    lobbing produce at each other. A melon narrowly misses
your head.
    [ Commands: Map ]
    [ Exits: Wall,  Southeast to the Bazaar,  NorthWest into
the Knight's
    Inn,
    SouthWest into the stables,  Northeast into the cyber-
port,  South,  cab,
    West,  North,  East,  Wishing Well ]
    Contents:
    The Stocks
```

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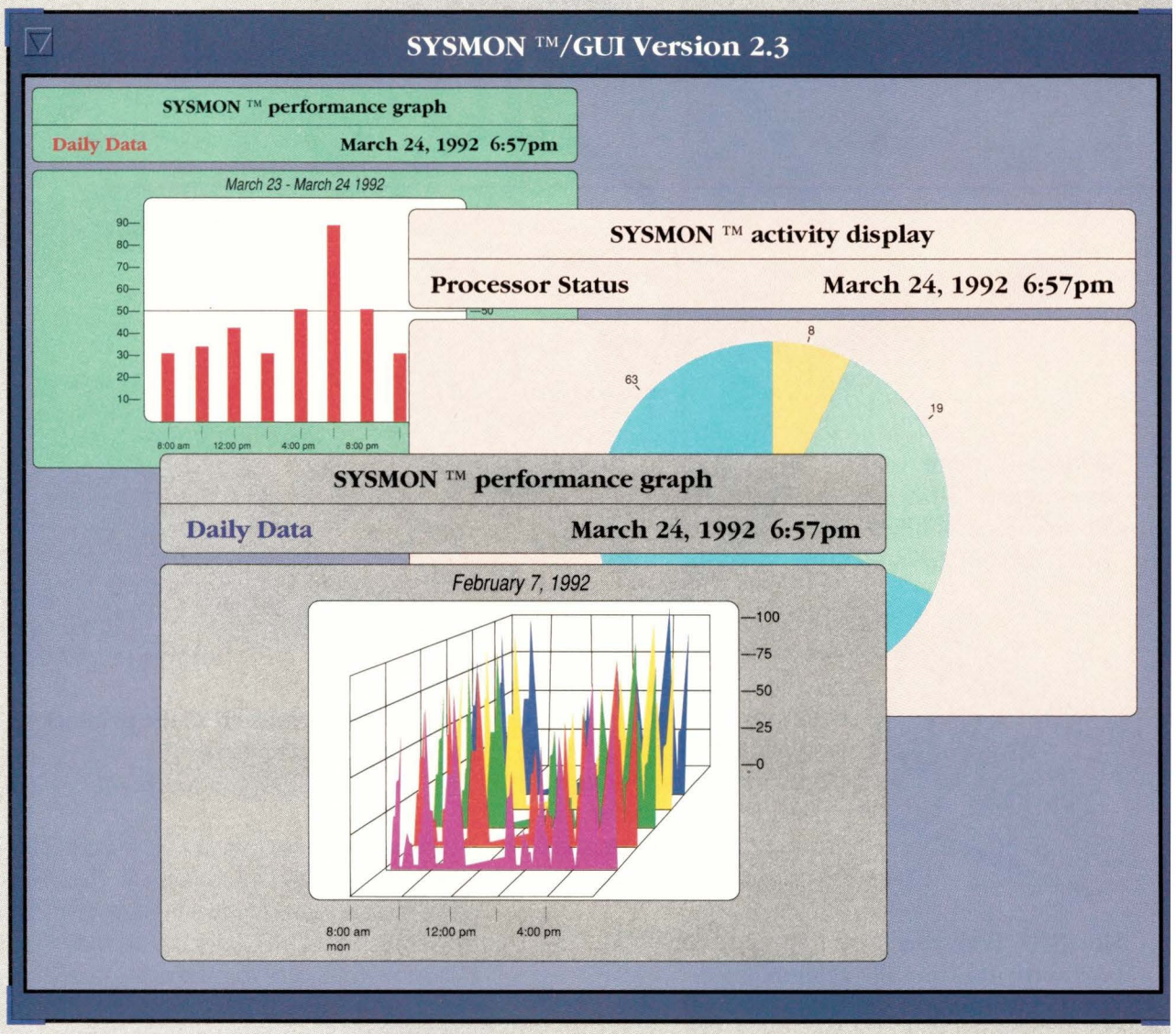

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Hmm. That all looks confusing enough. Where did that get us?

Mr. Protocol is glad you asked and hits you with a melon. He hopes that gives you the idea. The fact is that this is a text-based virtual reality. No goggles, no gloves, no fancy graphics, just descriptions of places, things and people, and possible actions one can take. It's the people that make it interesting, you see...

Some columnists, who shall remain nameless, promote the conceit that their column is authored (or at least informed) by a fictitious personality, who serves as a foil and comic relief to highlight a point and to keep the reader interested. The fact is that these multiuser games quickly became much more than mere games. They have become complete worlds, inhabited by characters as complex as the people who control them.

Wandering from room to room, picking up and putting down small, loose objects, can quickly become boring. Therefore, MUDs are set up such that it is necessary to find particular objects or solve certain puzzles before other objects are visible or other actions may be taken. It may, for instance, in a simple case, be necessary to find a key in one section of Tiny-London before a glass case can be opened at the other end. A scroll found on a path north of the city may give a clue to the location of a hidden room in a treehouse, and so forth.

However, let's face it: You can only have Dinner in Deviant's Palace or go Questing for the Elven Princess so many times before this, too, becomes boring boring boring. It just takes longer because of the richness of the environment. This is normal. However, the other end of things is that there is always something going on. Day or night, there will be at least a few other people wandering around town, and often there are a couple of dozen. At such times it is rare not to find at least a good proportion of them gathered in the Town Square, or in the Treadmill, or the White Hart, or Shar's Tavern, or some other goodly gathering place, socializing like crazy. Just not in person–in character.

Characters, in MUDs, usually bear single-word names, such as "Witchy," "Bedouin" or "Shar." Most are unique and fantastic in nature, though some are drawn from literature ("Modesty") and some from individual nicknames by which the player is already known ("Jopsy"). Also, one of the commands understood by the central MUD server is "look," so everything and everyone in the MUD has a textual description that may be examined.

Most characters on a MUD do not behave in accordance with their (usually fearsome) appearance.

Most of these are fantastic, and some are startling indeed. In fact, one particular MUD, called FurryMUD, consists entirely of animal characters, most drawn from a menagerie found only in a fever dream. Each individual MUD usually has at least a few changes made to it to differentiate it from others, and FurryMUD is no exception. It is unique in having "smell" as a descriptor and a command. Mr. Protocol has not been over there yet and may never gather the courage to go. He thinks it could be–well, overpowering.

In a MUD, characters may speak to one another, and they may also emit descriptions of their own actions, which may be real in the sense that they manipulate external objects in the MUD database, or purely imaginary in the sense that they do not actually affect other objects in the database. These speeches and actions can become quite elaborate, and various very lively parties have been

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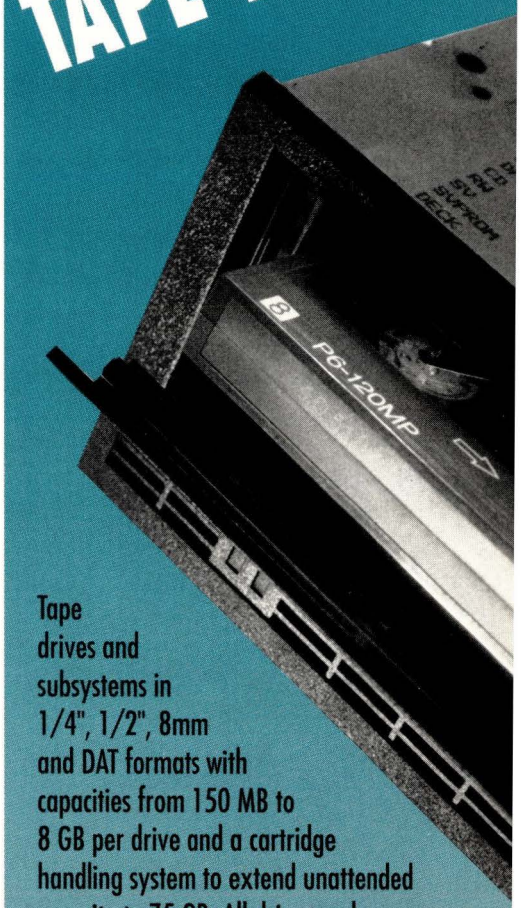

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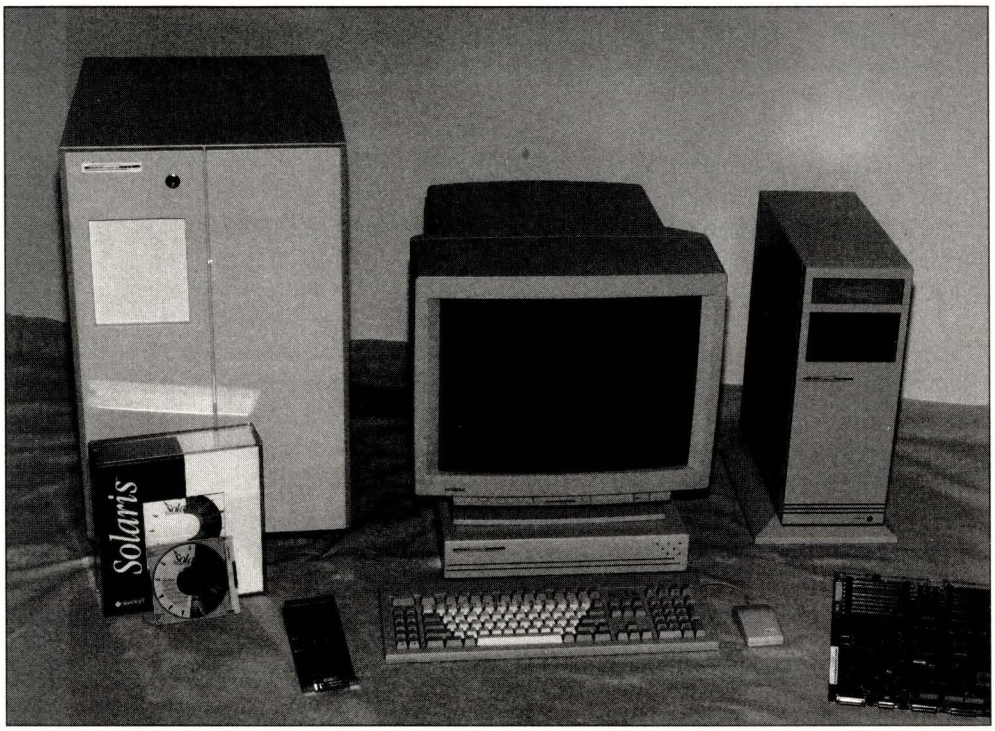

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ACCESS

To find out more about MUDs and mudding, check out the newsgroup rec.games.mud. A weekly list of available MUDs is posted to that group. Also, see the paper "Mudding: Social Phenomena in Text-Based Virtual Realities," Pavel Curtis, submitted to the 1992 Conference on Directions and Implications of Advanced Computing.

thrown in MUDs over the years. Mr. Protocol recommends fitting your character with a hardhat and optional full thermal armor before attending any birthday parties in the MUD.

Interestingly, most characters on a MUD do not behave in accordance with their (usually fearsome) appearance. The strain of interacting in character is so great that it generally cannot be sustained for long. It is never entirely abandoned, though. Since descriptions may be changed at will, characters will often change their description to suit their virtual surroundings, or even their current state in real life. The one characteristic that remains most fixed about a character is gender. Though characters of one gender may be created and used by players of the opposite gender, the player will invariably keep the character's behavior as appropriate to the character's gender as can be managed.

This is only one of the interesting social phenomena to be found on MUDs. In every culture in the world, humans take great pains to make gender immediately obvious at first meeting. On a MUD this does not occur. Because even the person who maintains the MUD server can determine, at best, only what machine a given connection is coming from, absolute identification on the MUD is impossible. Hence, one can never be certain that the human behind the character you are talking to is of the same sex as the character. Some people are completely unable to handle this.

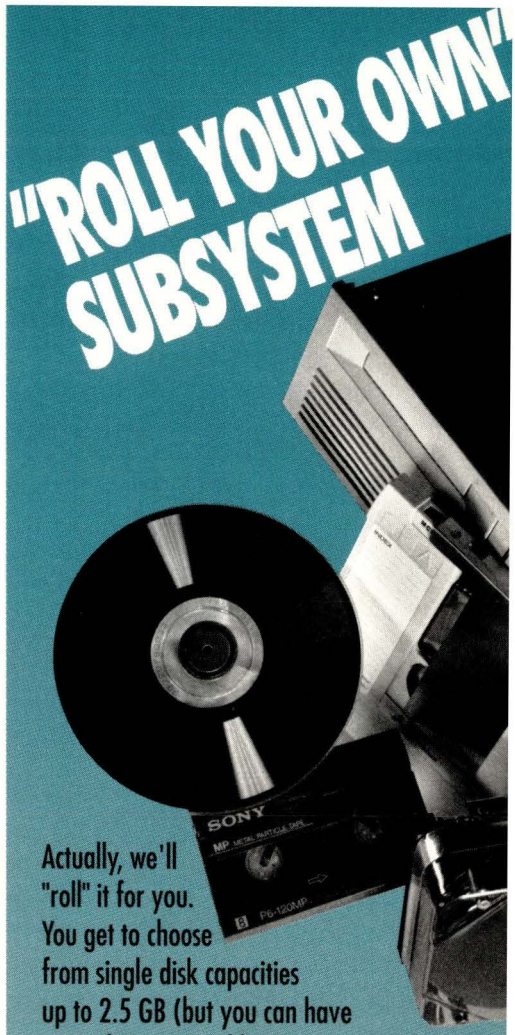
It should be noted that not all MUDs are social in nature. One class at MIT is busily constructing a Mars colony in as rigid a level of detail as possible. Guests are welcome to visit the colony. Other schools are similarly using this shared-world technology to build common projects and to work through complex ideas. Researchers at other institutions are building data-sharing tools using MUD technology and investigating their uses in such areas as group work and software integration.

What other factors crop up in this strange new world? Well, not only are some of the characters nonhuman, so

The success of the environment depends upon what can best be termed good city planning.

are a few of the players. Most MUDs have a robot or two wandering around. TinyLondon has Newt, short for Newton H. Homunculus, which is, for all intents and purposes, a player like any other, using the same interface to the MUD server. However, at the other end of the socket is a rather clever program, which runs the character through the MUD, mapping all the way. To find one's way around the MUD, it is often sufficient to figure out which of the current players is the robot and ask it. A character who has been on for eight days is very likely to be robotic. Robots can also be told to remember messages for other players, thereby acting as walking mailboxes. These bots, as they're called, act very similarly to the user agents that were being built as research vehicles 10 years ago or so.

Let's take another case in point. We introduce, not a character, not a bot,



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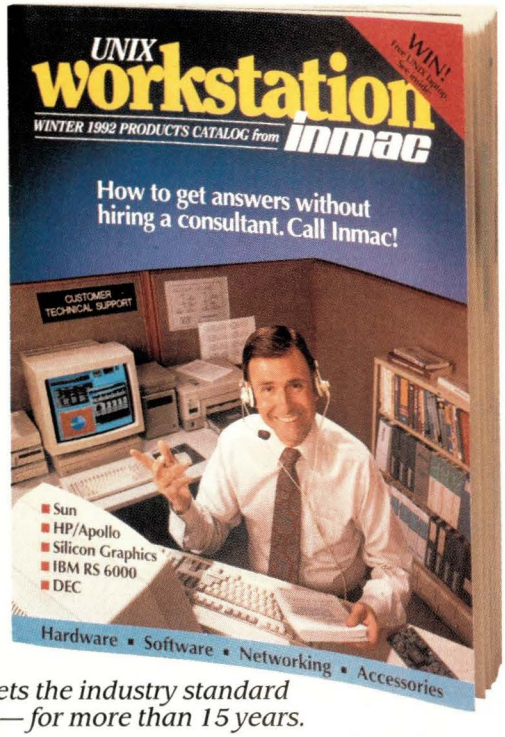

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but a real human being: Mr. John Phillip Crane, modified initials JO. P. C., known as Jopsy. Mr. Crane has been interested in these matters for some little time, at first running a BBS system, later working on a FORTRAN version of an interterminal game. When TinyMUD was created, Mr. Crane had the code up and running within one day of its general release. Thus did Jopsy create TinyLondon, in November 1989.

The process of MUD creation is interesting, since the success of the environment depends upon what can best be termed good city planning. A MUD is basically a database engine, and when first created, there is one room (room #0 called, simply, "Void"), and one user, called Zeus. This user is like the superuser on a UNIX system, able to do anything. The first thing Zeus did was to change his own name to Dragon. The Dragon would own TinyLondon and enforce its "laws." The next thing the Dragon did was to plan a scenario. Since new arrivals were new in town, they'd obviously arrived by carriage. Therefore, the Void became the interior of a carriage, the next room created became the town stables, and outside the town stables was the Town Square. From the Square, four streets radiated in the four compass directions, and the building of TinyLondon was under way.

In the intervening years, much has been done to TinyLondon. A rather anachronistic Cyberport was added, to permit access to a second area constructed by a class. Battlements were built around the city, and city gates added. An entire countryside was constructed around the city, full of odd features and adventure.

So where do the people who inhabit this world spend most of their time? In town, in one place or another, talking, acting out fantasies, speaking of real things, making friends, forging lasting bonds. Interacting with one another, by the hour, by the day. For the interesting thing about this environment is that it satisfies that deep need in people to put on a mask, to say, "It isn't me!" and then, later, to pull the mask off and laugh.

Of more than a thousand registered characters, the several hundred regulars come and go with the flow of the day and the week. TinyLondon is actually like an interdimensional bar, always open. Many of the regulars know each other's true identities, but they do not use them on the MUD. In France or Germany, permission to use a person's first name cements a friendship; on the MUD, mere knowledge of a person's true name serves the same purpose.

Human nature being what it is, there can be a dark side to the MUD. The MUD as a whole is owned by one person–Jopsy–but he cannot hope to manage it alone. The sheer workload of catering to several hundred users is immense. Therefore, there are volunteer helpers in the MUD, known collectively as wizards. These are players with the power to affect entities they do not own, and therefore with the power to fix problems in the machinery underlying the world. This therefore gives them the power to cheat and to make life difficult for other users. Both of these have occurred in the past. Also, there is the problem of the abusive player. These desocialized people can make life very difficult indeed for other players, even though they can do no lasting harm.

The most important factor of all about MUDs is that the simulation of reality is far, far better than the purely textual interface would lead one to believe. If text alone could not move us deeply, there would be no purpose in books. Virtual life in a MUD becomes as real as the investment a player makes in it, and since other players are real people, and may become close friends, the darker side of human nature can lead to vicious personal attacks and the forging of lasting hatreds and injuries.

This is where the talents of someone like Jopsy must lie for a MUD to be successful. He must manage an environment full of people who can never be identified with certainty, and who, if ejected, can immediately reappear as a newly created character, in a masquerade as impenetrable as their textual "acting" talents may allow. To have held such an environment together for years is a tremendous feat of creative social engineering. It is a talent that few recognize now, but which will become an entirely new profession in a few years, as consensual realities become more and more the norm. Such talents must be identified now, as they will be of immense value later. The term "moderator" is too poor to encompass all that they do, including as it does the description of city planner, police force, judge, counselor and man-about-town.

Most MUDs thrive for a while, then collapse under their own weight, or fall apart in a feud, and fade away. Not Jopsy's. It just rolls along, making people happy.

All in all, Mr. Protocol thinks people like Jopsy are a rare breed, which is too bad. The way things are going, we'll be needing a lot of them.

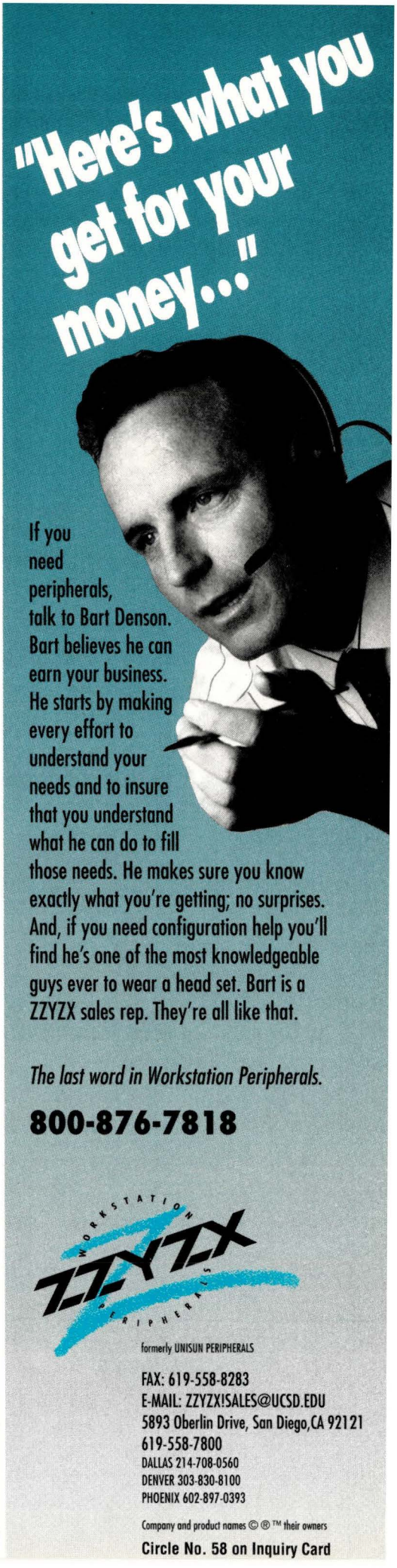
Chocolate Chip Cookie Hall of Fame Dept.

Thanks to Laura Breeden for an early pointer to the Mars Project. Many thanks to John P. Crane for putting up with a bunch of boisterous strangers running around his town. And Mr. Protocol's deepest thanks and biggest cookie to Valerie Polichar for inviting Mr. P. to the Treadmill for a drink. ⊸

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

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

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



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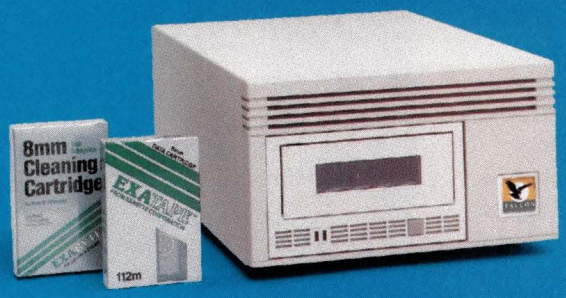

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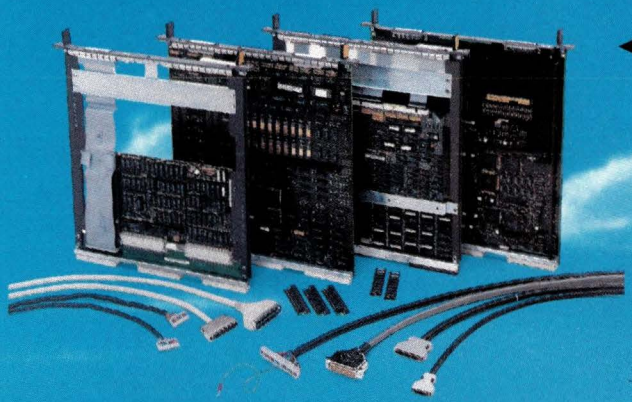

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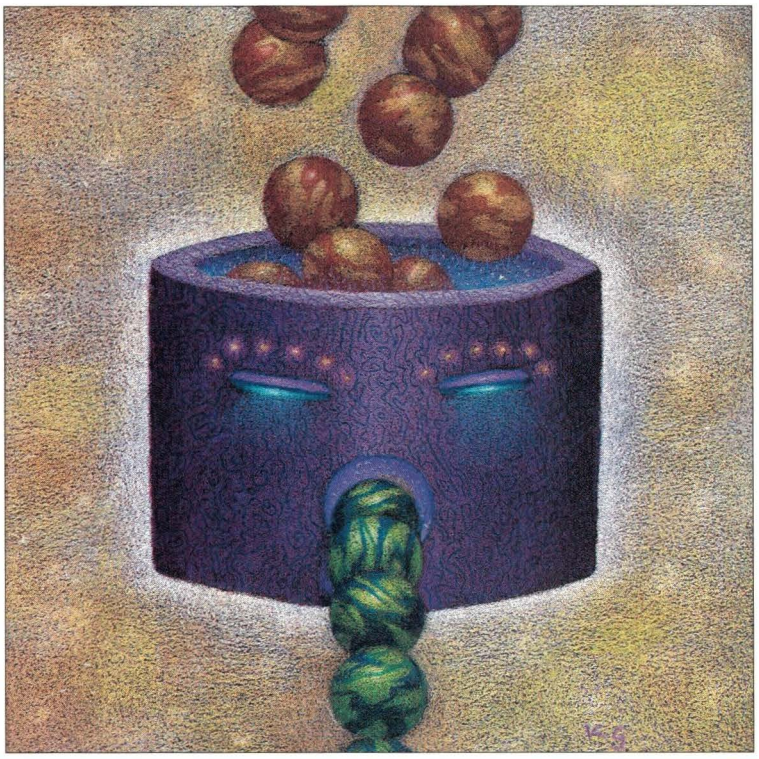

ILLUSTRATION BY KEITH GRAVES

Input/Output

by PETER COLLINSON,
Hillside Systems

Programmers all take the UNIX model of input and output for granted. Familiarity breeds contempt, as they say. This article scans these familiar territories and highlights aspects of the underlying models. I hope that by doing so, the article will serve as an introduction for those who need one and will provoke a few thoughts in those who already consider themselves knowledgeable in the area.

There are a few basic system calls that programs use to access UNIX files. I won't go into great detail but will just give a broad-brush view to act as a basis for the discussion. If you are interested in the correct and full usage, look at the relevant manual pages.

Opening a File

UNIX is all about files. Everything (or nearly everything) is a file. To access a file we need to open it, and so `open` is our starting point. The generic form is:

```
fd = open(filename, flags);
```

This looks for a file called `filename` in the file system. If the file exists, the kernel will set up some internal tables and return a small positive integer, `fd`, to the calling program. The small integer is known as a *file descriptor* and is used whenever the program wants to refer to the newly opened file. The `flags` argument tells the kernel how the file is to be accessed by the program. The file can be opened only for reading, only for writing or for both reading and writing.

The `open` call will fail if the `flags` mode specifies a type of open that is not allowed by the permissions already set on the file. The call can fail for several reasons, and again please look at the manual page to pursue these.

The basic `open` call assumes that the file already exists. The second system call, `creat`, makes a new file in the file system.

```
fd = creat(filename, mode);
```

The `mode` here is often expressed in octal and is loaded into the file permissions when the file is created.

These days, `creat` can also be done by an extension to the `open` call. You can set a bit in the `flags` parameter to the `open` to say: "create the file if it doesn't exist." The parameters to the `open` call are expanded to contain the `mode` as an additional (optional) argument. The generic form is:

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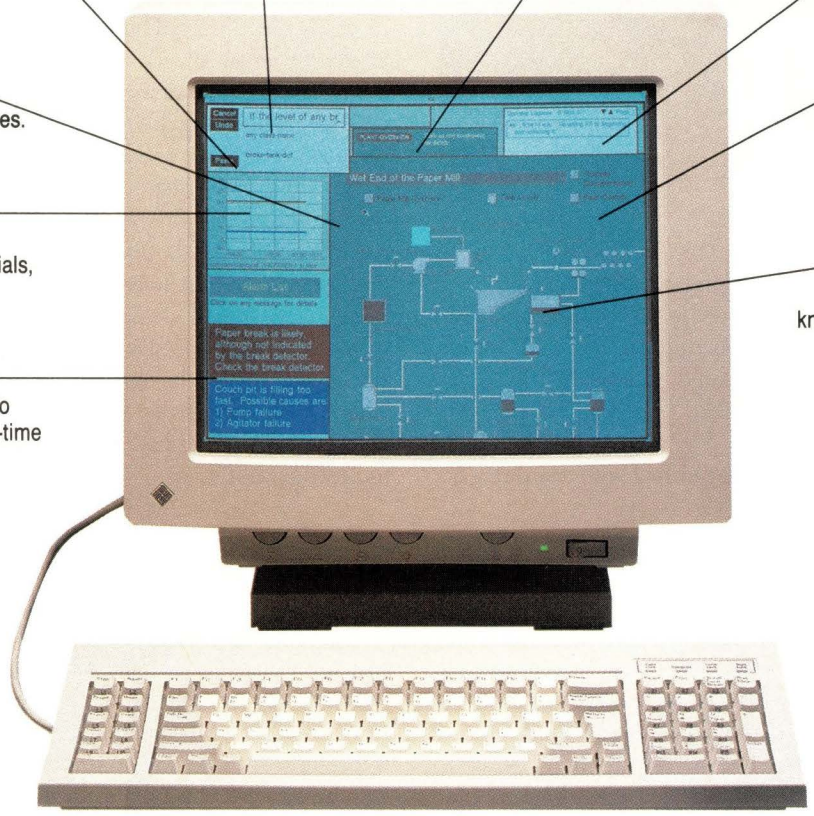

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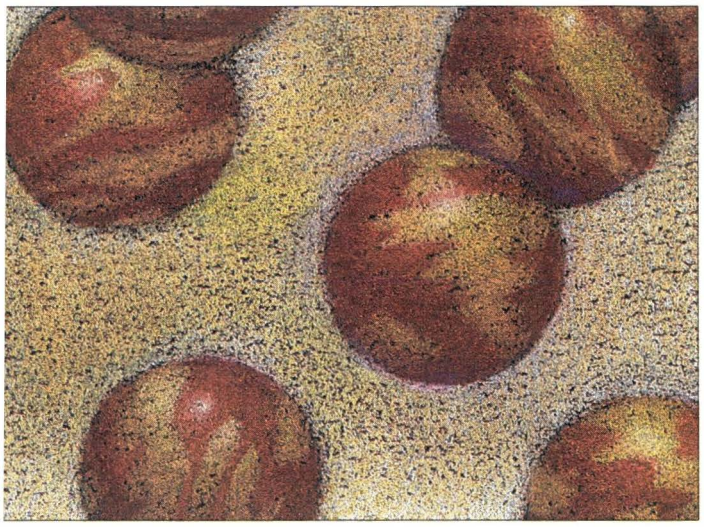

```
fd = open(file, flags, mode);
```

In many systems, `creat` is no longer a system call but simply a small routine calling `open`. It removes the rationale behind an old (and probably apocryphal) UNIX tale. When Ken Thompson was asked if he could improve UNIX, he thought for a moment and said "Yes, I'd add an 'e' to the creat system call."

We tell the system that we have finished with any opened files by using the `close` call:

```
ret = close(fd);
```

This invalidates the file descriptor and signifies that this process has stopped using the file. The `close` system call returns a status to show whether the call has succeeded or not. The "or not" is rare, and programs seldom check the status. By definition, all open files are closed when a process dies.

File Descriptors

The file descriptor is passed into any other I/O routine when the program wants to talk about the particular file. It's sometimes called a "handle" to the file. File descriptors have several interesting properties.

A file descriptor can be passed between processes. This sounds grander than it is. A file descriptor can be passed from parent to child. More properly, a child inherits any open files that exist in the parent at the time of the `fork` call that created the child. In addition, the `exec` call retains any open files.

These two bits of mechanism mean that a new process running a new program can inherit files that were open in the original parent. The implication here is that programs can be written to do some task using file descriptors that are opened by a parent. Explicit references to named files are not needed.

This is the basis of filters. These are programs that perform some task on a data stream being read from one file descriptor, while they write their output to another file descriptor. It's desirable that such programs are interchangeable. We must have some convention that dictates which specific file descriptors are used to read and write data.

All UNIX programs run in an environment where file descriptor 0 is the "standard input," file descriptor 1 is the "standard output" and file descriptor 2 is the "standard error output." To establish a default setting, these three file descriptors are set to point to the terminal by the `login` program.

The `login` program will eventually `exec` your shell, and that will be the parent of any programs that you run. In the normal case, then, all your programs will inherit the first three file descriptors. These descriptors will all be pointing at your terminal.

You can easily make the shell start programs with the three descriptors pointing to different files; this is the function of the shell redirection operators: >, < and >>. These work by setting up the requisite descriptors before calling the command. The process that you have created does not see this redirection. It takes no special action. It just accesses the file descriptors using the normal I/O system calls and functions.

If we have special file descriptor numbers used for specific purposes, then we need a way of fiddling with things so that a particular file can be opened on file descriptor 0, 1 or 2. This is helped somewhat by the sequential allocation of file descriptors. A call to `open` will always return the lowest unused descriptor. So

```
close(2);
open(file, O_WRONLY);
```

will first close the file on file descriptor 2. Since file descriptor 2 is now free, the call to `open` is guaranteed to return 2. The guarantee holds good only if file descriptors 0 and 1 are already open and it assumes that the call succeeds. It may not. It's always good practice to check.

You may want to move an already open file onto a specific file descriptor. The duplicate system call, `dup`, can be used to do this. It has the general form:

```
fdnew = dup(fd);
```

It takes an existing file descriptor and creates a new one that refers to the same file as the old. You now have two file descriptors that point at the same object. This is mostly used in circumstances like:

```
close(2);
dup(1);
```

This will close the standard error, leaving file descriptor 2 free. The `dup` call will duplicate file descriptor 1, returning 2. We now have file descriptor 2 pointing to the same place as file descriptor 1. The output and any errors from the program will end up in the same place. The pair of calls like this are so common that there is a standard routine that condenses them:

```
dup2(1, 2);
```

This says to duplicate file descriptor 1 as file descriptor 2. If file descriptor 2 is open, the `dup2()` call closes it first.

If you have a suite of programs and want to pass a file among them, then there is no reason you should not adopt some internal convention that a certain file is open for use on a particular file descriptor. This can even be done in Bourne shell scripts because you can assign files to particular file descriptors.

You really don't want programs to inherit files in a random fashion.

If you are writing a program that opens files and `fork`/`exec`s to another program, then it's good practice to ensure that you close any files that you may have opened before calling `exec`. You really don't want programs to inherit files in a random fashion.

Some time ago, there was the dim and distant time before the Internet worm overloaded its way across the net. It was before security became a fashionable topic. Someone wrote a program that looked for inherited open file descriptors. It was applied to various interactive commands like `vi` or some `mail` programs. The commands of interest have embedded "!" options to start subshells. It turned out that these subshells were sometimes passed handles to very interesting files like `/etc/passwd` or `/etc/wtmp`. Not nice.

You really want to close any unwanted opened files before `exec` is called. You can do this explicitly by sitting in a loop and closing all but the first three files. Alternatively, you can supply a `flags` value to `open` call on a file that says: "close this file on `exec`."

Reading and Writing

Opening and closing the file isn't all the story. The general form of the read call is:

```
bytes = read(fd, buf, size);
```

This tells the system to read at most `size` bytes into a memory area pointed to by `buf` using the file descriptor `fd`. The call will return the actual number of bytes moved or an error indication. At the end of the file, the system call will return zero.

For write, the general form

```
ret = write(fd, buf, size);
```

writes at most `size` bytes from the memory area pointed to by the memory address `buf` using the file descriptor `fd`. The routine will return the number of bytes actually moved

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or an error indication. After a successful completion, most people assume that `ret` will be equal to `size`. For most normal purposes this is true. There are some classes of programs where you should worry about this assumption.

In both the `read` and `write` calls, the position pointer associated with the file descriptor is automatically updated. If a `write` call extends the file, this will increase the file size value stored in the per-file information read from the disk when the file is opened. The disk copy is updated. For read, the position pointer is compared with the size found in the per-file information. If the position pointer has moved past the file size, then the end of file indication, zero, is returned.

If a `write` call extends the file, this will increase the file size value stored in the per-file information read from the disk when the file is opened.

You can set the file descriptor pointer by using the `lseek` system call. The general form is:

```
ret = lseek(fd, offset, whence);
```

This moves the position pointer referenced by the file descriptor. It moves the pointer by `offset` bytes, and `whence` defines where the offset is measured from: the start the file, the end of the file or relative to the current position.

The returned value from `lseek` will be an error indication if the call fails. Otherwise it gives the new position, in bytes, from the start of the file. This is one way of obtaining the size of a file:

```
size = lseek(fd, 0L, SEEK_END);
```

This seeks to the end of a file, in fact–zero bytes from the end of the file, and returns the position of the pointer.

This also reminds me to mention that it's called `lseek` because it's a *long* seek, the second parameter is a `long` or 32-bit offset. UNIX Version 6 had a 16-bit offset and called it the `seek` call. This was changed in UNIX Version 7. People are now talking about the need to deal with files addressed by a 64-bit offset. Plan 9 already has this. I suspect that we will see this being called `llseek`. I think that I favor reverting to `seek` since with 64 bits you can address 18,446,744,073,709,551,616 bytes, and this should last for a bit.

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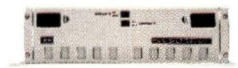

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Blocking

For regular disk files, both read and write have a strong notion that the data is moving in a stream. The kernel provides buffering that isolates the system from the varying requests for data that are made by the user processes. It also isolates the processes from the actual blocking factor of the data on the disk.

Character devices also exist as names in the file system, and their device drivers will provide the illusion of stream data to any user process that accesses them.

The buffering means that the system calls will *block*. If a `read` has not reached the end of the file, it will wait for some data to materialize–perhaps from the user who needs to type some characters on the keyboard–or from the disk system that has finally managed to produce the relevant block that the user needs.

A `write` system call is often done by moving the data from the user process into the kernel for later output. If a `write` cannot get the resources for this, it will block until the needed buffer becomes available.

The user process does not see this blocking. It is not aware of being put to sleep to await the data for the `read` or availability of resources for `write`. It just calls a routine or system call, and at some later point the call returns with an indication of success or failure. On general time-sharing systems, this blocking is useful. The CPU can be given to some other process until the mechanical devices have moved.

Of course, the blocking of the user process finishes very quickly when it is accessing files from a local disk. The time "lost" to the process is negligible. For character devices that are awaiting user input, the blocking can go on for huge periods of time. Usually, this is no problem. Most programs in the world read some data, do some processing and generate some output. We don't care how long they have to wait to read the data.

We do need to deal with the small number of other programs that need to get control back if the I/O call would block. For one reason or another, they don't want to get stuck in the I/O system call. Perhaps they want to examine several different sources of data, or they don't want to get stuck in the `write` call while they are listening for some data on another file descriptor.

There have been many attempts at doing this. SunOS 4.1.1, running on my machine as I write, supports three different ways. BSD allows an `ioctl` call or an `fcntl` call that says: "this file is nonblocking." If a `read` or `write` call would block, it returns with an error indication saying "I would get stuck–try again later." POSIX defines a different but equivalent mechanism. The System V method is just defective.

Devices as Files

As we have seen, UNIX builds its devices into the disk file system so that the `open` call just refers to a file name to get a descriptor for a device. The kernel will manage the device interface so that `read/write` calls look like stream I/O. Apart from this, how well do devices map onto the stream model?

I think that it's all on the edge. For example, let's look at magnetic tape. Since the earliest UNIX system, programs have accessed tape devices using the character device interface. This permits direct data movement between the user's

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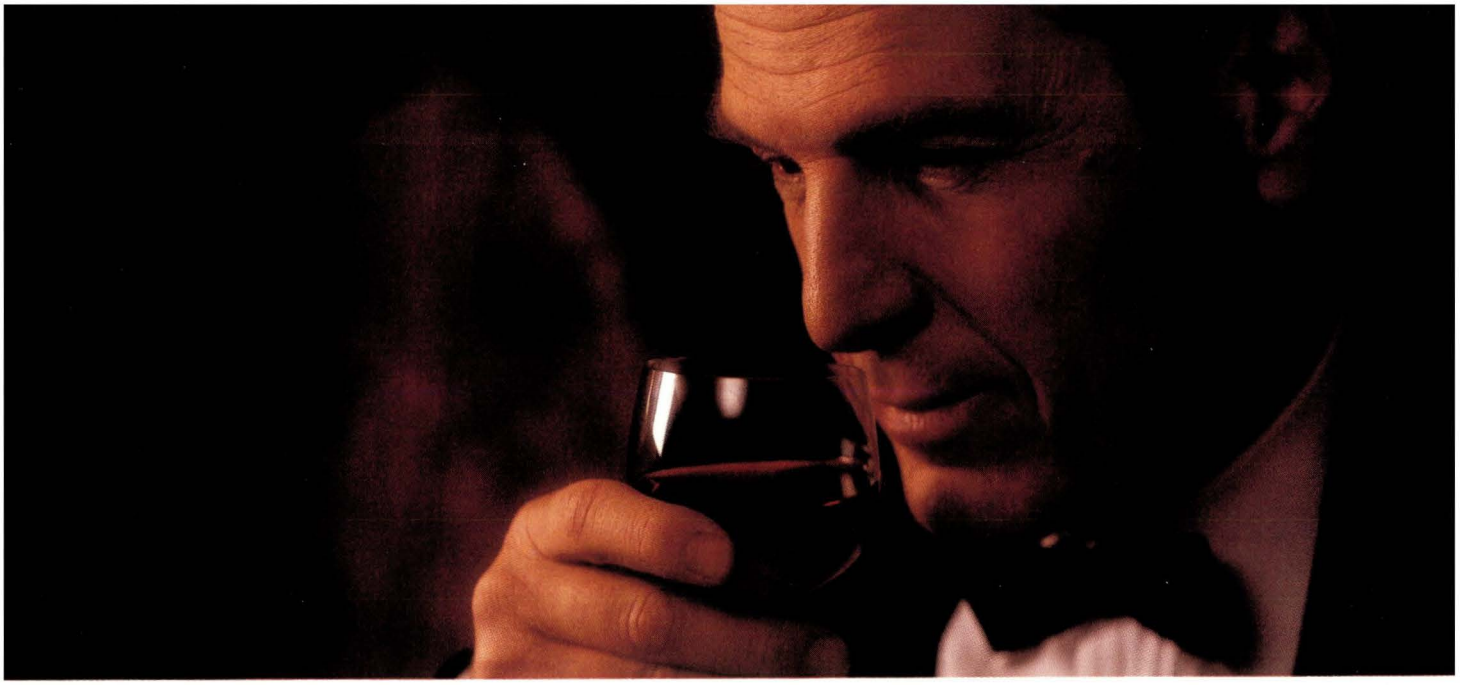

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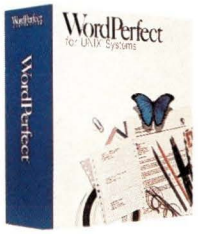

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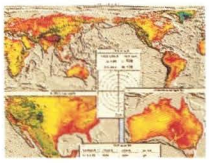

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address space and the tape controller.

There is also a kludge. You need to set a record size when you are writing tape. This is done by taking the number of bytes that the user has specified and using that as the block size. This is "outside the normal model." Suddenly, for tape devices, and tape devices only, the size of the write buffer takes on a huge significance. It works and we all accept it. But it isn't clean.

For reading tapes, things generally will work out. The program asks for a huge amount of data to be read, but is only handed the amount that is found in one record from the tape. Again though, this isn't clean. It preserves the blocking structure that everything else takes such pains to hide.

In addition to writing and reading data, there are special actions that you might want to take. You might want to write more than one file on a single physical tape. To do this you will need to make sure that the tape is not rewound and stays where it is when the system has finished writing the first file. We have a physical requirement that sometimes we need to open the tape and have it rewind when we are finished, and sometimes we want the tape to stay where it is.

This is generally arranged by having several names in the file system for a single physical tape drive. If you open the tape using one name, it will rewind on close. When another name is used, the tape will be left where it is after I/O has finished and the tape is closed.

This works by the "major and minor" device numbers that the kernel uses to translate from a name in the file system to a particular device. Try

```
% ls -l /dev
```

to see the numbers. The major number accesses a particular device class. The minor device number is passed into the device driver and can be used in any way by the code.

The minor number usually indicates a particular peripheral in a class of devices, terminal 6 or disk 2, for instance. For tapes, one bit in the minor number is conventionally used to show that the tape should not be rewound on the last close of the device. All this is another kludge. We accept it, but it isn't clean.

Fine Control

The idea of using the minor device numbers to mean something special is not very extensible. It only permits us to set a mode of working when we start using the device. For tapes, we might want to use the hardware to skip over a tape record, or a whole file. Perhaps we have aborted some tape action by using Control-C or whatever your interrupt character is set to. Now we need to backspace to find the end of the last file that we successfully wrote.

There is a need for three types of interaction with devices and their drivers. First, as we have seen, there are a class of short-term actions that we might want to make for a particular peripheral hardware. Second, we might want to establish some personal preferences in the behavior of the inter-

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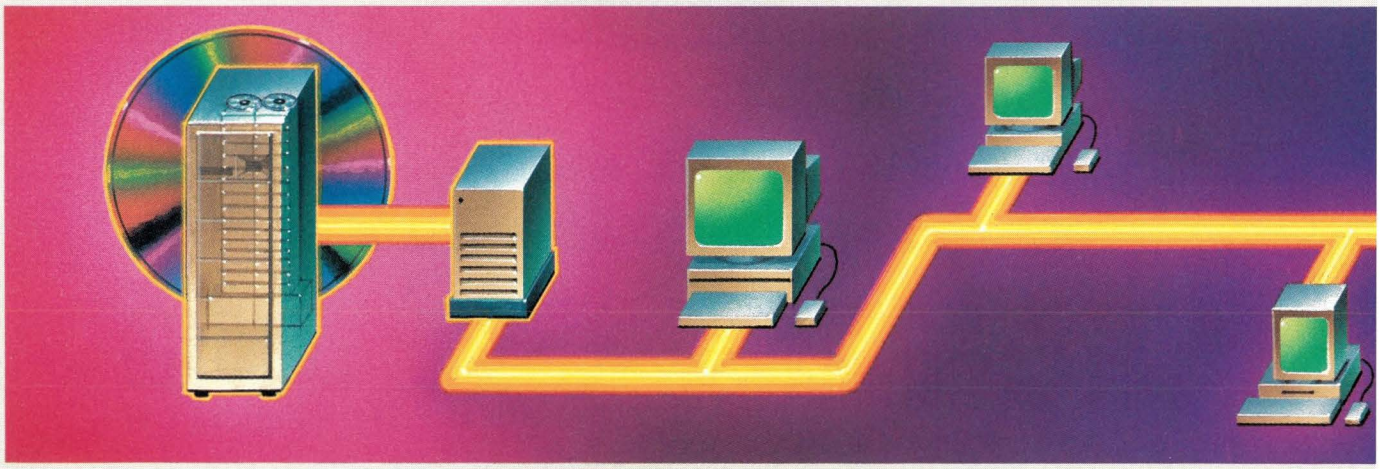

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face. For example, we allow users to set the terminal interrupt character. Finally, we might want to change the behavior of the kernel device interface for short periods. For example, we might want to turn echo on the terminal off because we are reading a password.

These three needs are all handled by the `ioctl` system call. Pronounce this as you will: I call it *eye oh control*, some people call it *eye oh see tee ell*, some people call it *eye oh cuttle*–I hate this–it's not a fish. The call has the general form:

```
rv = ioctl(fd, cmd, datap);
```

The `fd` is our friendly file descriptor. The `cmd` is a unique value that indicates an action to be taken. The `datap` points to a data area that is used to move values in and out of the kernel. The `rv` is a success/failure indicator. As usual, it is rarely checked by calling programs.

The need to alter the interface for short periods is more keenly felt when we are looking at aspects of handling the terminal. The `ioctl` routines grew from the special-purpose `stty` and `gtty` terminal handling system calls of Version 6 UNIX. This is worth mentioning because the name `stty` lives on in the familiar command that a user can type to set the terminal interface.

Theoretically, any character device driver can be given its own `ioctl` routine to provide the user with a hook to change the way that things work. There are also some `ioctl` values that can be applied to regular files. For example, on BSD systems close on exec, and nonblocking I/O functionality can be set by an `ioctl` call.

In addition to `ioctl`, we also have `fcntl`, the "file control" system call. History has dealt this system call a confused role. It seems to have inherited many unrelated functions on open file descriptors that couldn't find good homes elsewhere. Current SunOS systems are a merge of System V and BSD features, and there is considerable overlap between the functions provided by `ioctl` and `fcntl`.

Finally

I seem to have ended up by trying to illustrate the complexities of stretching simple models to fit real-world needs. History and different development paths in the different UNIX camps have left a whole bunch of debris that is rationalized to some extent by POSIX.

There are aspects of the "devices as files" model that I have never been too happy with. But still, UNIX got big by being flexible, not logical. ⊷

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

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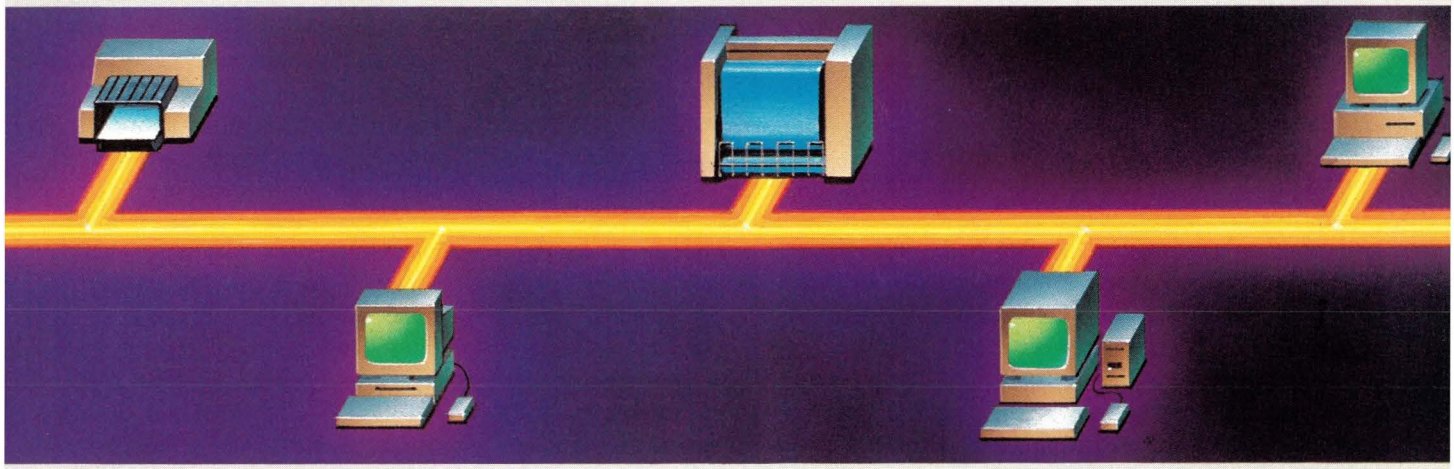

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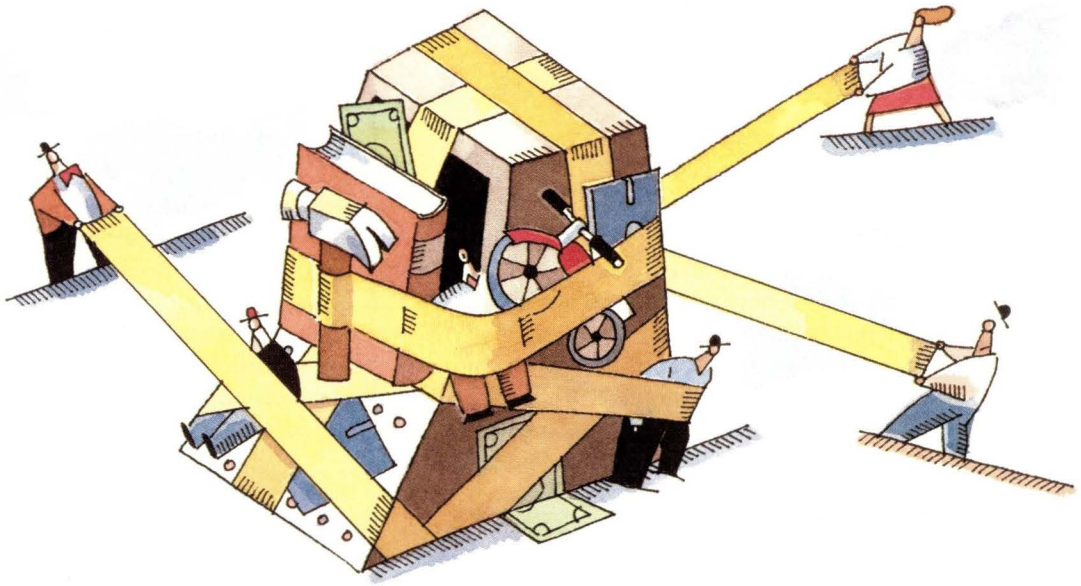

ILLUSTRATION BY ROBIN JAREAUX

Tying It All Together

by RICHARD MORIN, Technical Editor

MS-DOS is not about to go away, at least not real soon. Peter Weinberger said that it would be around forever, or until 18 months after an undetectable, ineradicable virus was unleashed. Maybe so, but I don't believe it. Instead, I suspect the business world would lock its doors, insist on shrink-wrapped software and pray. Given the recent Michelangelo unpleasantness, I'm sure some have done so already.

In any case, I predict that neither IBM, Microsoft nor any combination of companies will be able to stuff MS-DOS back into the box. MS-DOS is the VolksOS, and the Volk seem to be reasonably happy with it. It is cheap, functional (enough) and internationally available. Software that works with it (e.g., Windows) will succeed. Attempts to supplant it (e.g., OS/2) will fail.

Specifically, I would not bet the future of UNIX on an attempt to replace MS-DOS on the world's desktops. UNIX is too big, too hard to administer, too expensive–in short, it's overkill.

UNIX has a good shot at vertical applications, departmental computing and a range of distributed tasks. It will also retain its position in science, engineering and software development. The typical desktop will belong to MS-DOS, however, for quite a while to come.

All of which is fine with me. As long as I can buy wonderful, cheap boxes that run UNIX, I really don't care what OS my local retail stores use. I would, however, like them to get a bit more functionality out of their systems.

Vrooom

Let's say I need a ZBQ-23 for my 1982 Kawasaki. I call up my dealer, who looks it up on his terminal: "The warehouse in Irvine has one; I can have it for you in two days." No pain, no strain and rapid (if not instant) gratification. Note, however, that this is a hierarchical, vertical application, sponsored by a single motorcycle vendor. It won't find BMW parts, and it certainly won't find a replacement gasket for my dishwasher.

In my idealized world, the entire network of retailers, wholesalers and factories would be interconnected. Information, orders and funds would flow among them in a transparent and reliable manner. Inventories would be minimized, delays would be held down and checks would not get "lost in the mail."

Most of the time, the system would be invisible. It doesn't matter how many spares a store has, as long as you can buy what you need. The store benefits from reduced inventories, however, and consumers *should* see some reduction in prices.

In some cases, the effects would be quite visible. Spare parts are a good example. Dealers don't like to carry zillions of parts, but they need the ability to fill orders quickly. An electronic stocking system could make this possible.

Bookstores are another area that could use some help. If bookstores could order books in a week, rather than two months, even small stores could provide very acceptable levels

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of service. Similar arguments apply, of course, to audio, video and computer software.

Ideally, the world's product distribution channels would emulate the "just in time" nature of the Japanese manufacturing sector. No more excess inventory, long waits for back-ordered items or lame ("we can't get that product") excuses. Look on it as a return to the General Store, with quite a bit more generality.

How To

Sun will happily tell you how to build such a system. Use their ORB (Object Request Broker) technology, along with UUCP, `cron` and a proprietary DBMS or two. Stitch it together with several thousand lines of C, and you're on the air.

Back in the real world, however, we still have MS-DOS to contend with. Brain-damaged multitasking, limited networking and hundreds of incompatible business packages. These machines can't call each other automagically and wouldn't speak the same language if they did. Besides, think of the number of phone calls. ...

So don't do it that way. Start with an email system, based loosely on the current structure of the Usenet. Each PC calls its local hub, exchanges mail, then hangs up. The hubs route the mail among themselves on a continuous basis. A few local phone calls each night will ensure that all mail arrives by morning.

The retail PC application performs a fairly mundane set of tasks. It figures out what is needed to maintain inventory levels, adds any special orders and divides the result into messages to suppliers. It then handles the email interaction, perhaps using UUCP protocols. Finally, it processes any incoming messages, generating any needed reports or control files.

The wholesale side is a bit trickier. The wholesaler may not be ready to handle prioritized "pick lists," and some restructuring may be needed. A few wholesalers should be willing to make the effort, particularly if their retailers demand it.

Enough hand-waving; here is a roadmap. Create a central data exchange, capable of providing secure and reliable data transmission and storage. Build filters for the most common application formats. Find some market segments that need (and don't yet have) such a system. Demonstrate a system that is workable and useful, even if it isn't a total solution.

Once the basic system is in place, expand it. Add data formats, market segments and new services. If the system provides a competitive advantage at a reasonable price, it should be able to overcome the usual conservative tendencies.

The Information Market

Tangible products aren't the only things that could use better distribution channels. Services and information (raw, rare and cooked) are also good candidates. Shouldn't we be able to buy and sell knowledge, finding out about it in an organized, computer-mediated manner?

I think we should, and so do the folks at The American Information Exchange (AMIX). AMIX is a computer-assisted marketplace for information and services. Unlike the Usenet, AMIX is commercial; you must expect to pay both AMIX and the information provider. On the other hand, Usenet information can often be worth less than you pay for it: "Gosh, I dunno, but I think. ..."

Unlike Dialog, anybody can play. If I maintain a database of left-handed sewer-flautists, Peter Schickele is free to buy the information. Someone else may have a better or cheaper index, and Peter is free to buy from them, instead.

There are some gotchas, to be sure. The system is relatively new and small at present, so its range of providers is limited. The only user interface offered at present works under MS-DOS, so Macintosh and UNIX users (among others) are out in the cold.

On the other hand, the prospects for growth are tremendous. Do you know a lot about a particular subject? Maybe you should consider offering your services as an information provider. If you have the time, you might wish to be an AMIX Market Manager.

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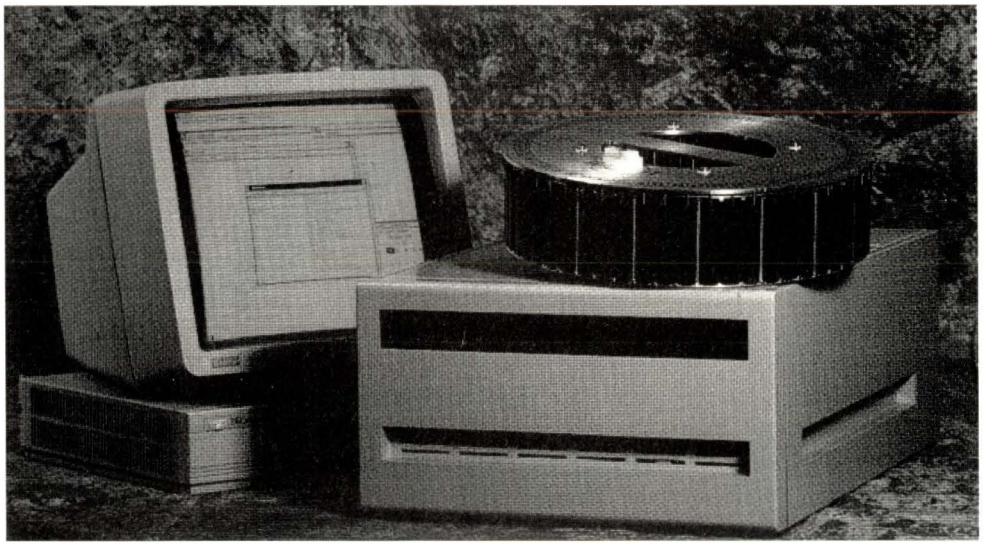

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If you publish a newsletter or magazine, you might wish to let folks receive issues (or just selected articles) over AMIX. Book publishers might also wish to get into the game. The publisher makes money when the information is accessed over AMIX and stands a good chance of gaining a print customer.

Legalities

I like the open approach AMIX has taken. Nobody is forced to participate; nobody is left out. A few legal problems may arise, however. Pamela Samuelson's excellent article "Copyright Law and Electronic Compilations of Data" (*Communications of the ACM*, February 1992) explains that data, per se, is no longer copyrightable. In *Feist Publications vs. Rural Telephone Service*, the U.S. Supreme Court wiped away decades of precedent based on "Sweat-of-the-Brow' logic, requiring instead that substantial originality and creative spark be present. How, then, are information providers to protect their work?

AMIX may also find itself drawn into ownership disputes. Is AMIX responsible for ensuring that providers have the right to sell particular sets of information? What kinds of legal agreements and/or "due diligence," if any, can protect AMIX from legal harm? The six-page "AMIX Customer Agreement" covers a lot of bases, but even I can see some holes. Information sellers promise to indemnify AMIX from assorted legal harm. What if the provider hasn't got the resources to shield AMIX, has gone out of business or has disappeared altogether?

Magazines, book publishers and other information conduits face similar issues all the time, but there are two important differences. The scale of a full-blown AMIX system could be huge, leaving a great deal of room for problems. Electronic data is very mobile, and large amounts of data can be transferred in a short period of time. AMIX cannot (and probably should not) monitor all of the information it conveys. Let's hope it manages to protect itself (and all other parties) without enriching too many lawyers.

The economics of soft-copy publication are interesting. Image and other data files can easily outrun economical on-line storage. The current set of Magellan data (Venus radar images) occupies 40 CD-ROMs and is still growing–a bit large for on-line storage, and minuscule compared with some of the other NASA collections. Fortunately, AMIX isn't trying to handle raw data of this sort.

Textual information tends to be quite a bit smaller; a few tens of megabytes can hold the entire output of a major author. The price of on-line storage, moreover, is far cheaper than hard copy. Disk space currently costs about $2 per megabyte. A single-spaced page of text contains just under 5,000 characters. This means that text can be stored on-line for about a penny a page. At that rate, it isn't hard to justify permanent on-line storage of just about any typed document.

Storage costs aside, AMIX has some dicey economic questions to handle. How can a rate structure support wide ranges in size and cost, encouraging buyers and sellers to participate? Meanwhile, how can AMIX support itself, without draining the vitality (read funds) from the market?

I suspect the company will solve these questions gracefully; they already have a good start. AMIX hopes to provide new ways for us to exchange information and services. There is no guarantee that its effort will be successful, but I like what I see so far, and I wish AMIX luck in their attempt.

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

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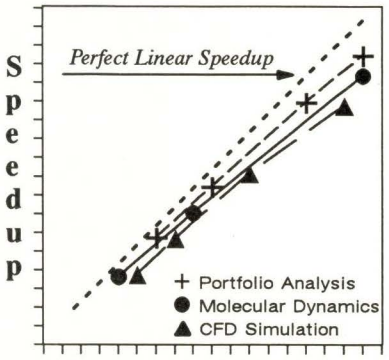

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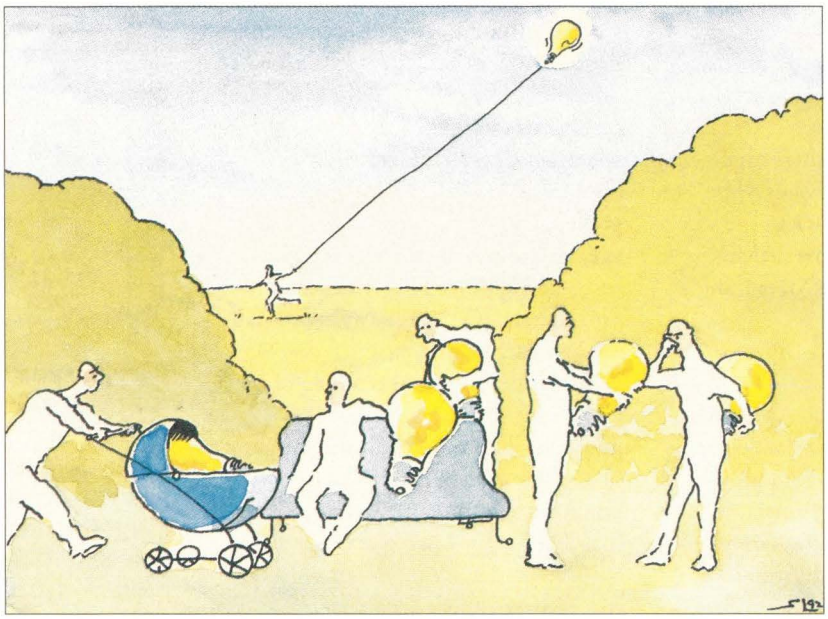

ILLUSTRATION BY S. H. LEE

Decline and Fall?

by PETER H. SALUS

Over the past few months I have been corresponding with Jeff Haemer of Interactive Systems and Paul Rabin of OSF about Arnold J. Toynbee, the philosopher of history. In his monumental *A Study of History,* Toynbee remarks:

> We have now arrived at the close of our inquiry into the process of the disintegrations of civilizations, but before we leave the subject there is one more question to be considered. We must ask whether, as we look back over the ground we have traversed, we can discern any master-tendency at work, and we do in fact unmistakably descry a tendency towards standardization and uniformity; a tendency which is the correlative and opposite of the tendency towards differentiation and diversity which we have found to be the mark of the growth stage of civilizations.

–Beginning of Chapter XXII, "Standardization through Disintegration" (abridged edition, Oxford University Press, 1946, Page 555).

Earlier on, Toynbee had pointed out that the process of disintegration of societies (Egypt, Greece, Rome, etc.) works out to a "result which is logically incompatible with its nature"..."the qualitative effect of disintegration is standardization" [Page 367].

What I'd like to ask this month is whether this is true of UNIX, as it was certainly a new culture two decades ago.

At the UKUUG in London in July 1990, Dennis Ritchie asked what you do when your teen-ager grows up; that is, as one of the fathers of UNIX, what is his role after 20 years? His answer to his rhetorical question was, "You let go."

If I consider the family tree of UNIX, I see a fairly uniform linear development up to about 1980. Thereafter, we got the diversification that led to System V.4 and BSD4.3 (Reno and Tahoe), and their modifications and derivatives: BSD2.10, Xenix, Ultrix, A/UX, AIX. We also have the tangled mat that results from V.4 picking up, for example, sockets from BSD and SunOS (a BSD derivative) merging with V.4 into Solaris 2.

Returning to Toynbee, in his discussion of the waning of the Roman and Hellenistic empires and the increased

power of the Christian church, he talks of the "creative minority" which had "once evoked a voluntary allegiance from the uncreative mass, in virtue of the gift of charm which is the privilege of creativity, [and then] given place to a 'dominant minority' destitute of charm because it was uncreative."

Is this the situation in which we now find ourselves?

A decade ago, UNIX was, indeed, the product of the "creative minority." The various UNIXes have now emerged from the research sites into the world of marketing and standards. Certainly, as I wandered UniForum in January, I was repeatedly struck by just how uninteresting much of what was on display was, and how ubiquitous the consortial endorsements were: OSF, SPARC International, X/Open, 88open, UI, etc.

We are all open; we are all endorsers of standards. But where has it gotten us? Are we the (figurative) vinyl disks waiting for the CD?

I invite your comments.

Congratulations

Back in December, I set a "Christmas Competition." The winner is Geoff Collyer, whose contribution follows. Geoff is a bit weak on metrics, but he wields a mean stiletto. I have awarded him two (2) prizes: an "IBM 1620 GOTRAN" reference manual and the ANSI/NISO Z39.19 draft standard–"Proposed ANSI Guidelines for the Construction, Format, and Management of Monolingual Thesauri." Happy hacking, Geoff!

Finally, I'd like to welcome Jeff Haemer and Jeff Copeland to *SunExpert*'s sister publication, *RS/Magazine*. They begin a series on Internationalization, called "I18N" in the May issue. It is just splendid. ⊸

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.

The 12 Days of ISO Christmas

On the first day of Christmas,
ISO sent to me,
A standard from POSIX-dot-three.

On the second day of Christmas,
ISO sent to me,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the third day of Christmas,
ISO sent to me,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the fourth day of Christmas,
ISO sent to me,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the fifth day of Christmas,
ISO sent to me,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the sixth day of Christmas,
ISO sent to me,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the seventh day of Christmas,
ISO sent to me,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the eighth day of Christmas,
ISO sent to me,
eight argumentative national C representatives,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the ninth day of Christmas,
ISO sent to me,
nine new European country codes,
eight argumentative national C representatives,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the tenth day of Christmas,
ISO sent to me,
ten newbie zealots,
nine new European country codes,
eight argumentative national C representatives,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the eleventh day of Christmas,
ISO sent to me,
eleven premature standards,
ten newbie zealots,
nine new European country codes,
eight argumentative national C representatives,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
three bad transport protocols,
two enormous doses of hubris, and
A standard from POSIX-dot-three.

On the twelfth day of Christmas,
ISO sent to me,
twelve bottles of vodka,
eleven premature standards,
ten newbie zealots,
nine new European country codes,
eight argumentative national C representatives,
a seven-layer chocolate cake,
six kilos of mail standards,
five representations of mail addresses,
four megabytes of Berkeley kernel,
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A standard from POSIX-dot-three.

– by Geoff Collyer

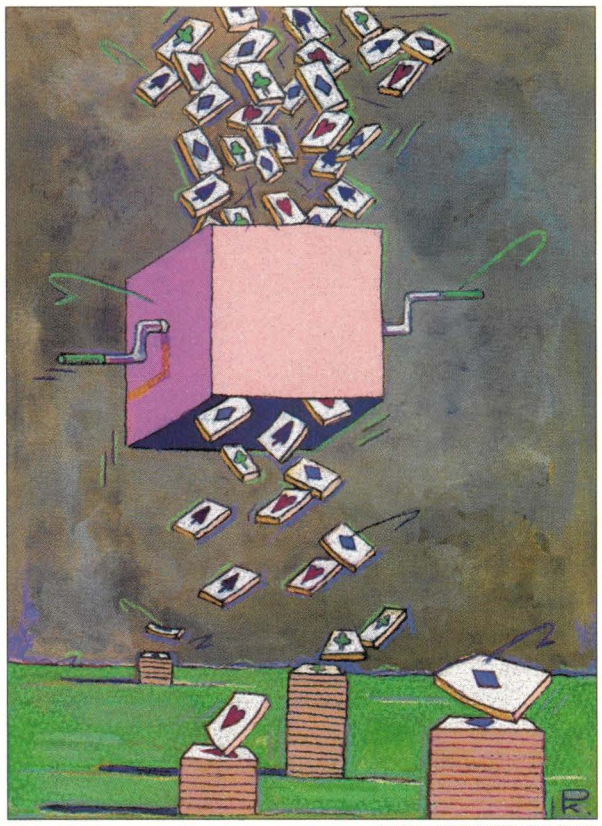

ILLUSTRATION BY PETER KALABOKIS

Natural Resources: Find, Join, Awk

by S. LEE HENRY

Magic is wonderful, but even the most wizardly systems administrator will sometimes be asked some very mundane questions about what users are doing on their networks–what applications they are running, how disk space is being chewed up so quickly, and how they think we can justify buying another printer. So what do you do? User surveys are valuable, but they annoy people and can be time consuming. Besides, most of us would rather divine wisdom from our systems than talk to our users. UNIX accounting routines can be used to gather lots of information–like how much of the system's resources are used up by some particular command–but nothing that directly helps us answer these questions. To exploit the wealth of appropriate information available on our networks, why not use basic UNIX utilities to gather and massage the information we need into a form that will help convince managers that we know what we're talking about? File status information and printer log files, funneled through `awk` filters for tallying and formatting and accumulated over time with the `join` command, can provide a lot of insight into how our networks are being used.

Your network is always the best authority on itself. Using the system to describe its status is such a natural that we may not often think about how much it can tell us about how it is being used and changing. File-status information is easily available through the `find` command. Printer log files track all your printing activity. This raw information is too much to look at but, piped through an `awk` routine, can be reduced to meaningful subtotals. Accumulated over time with a `join` operation, this information also allows you to see growth or trends.

What Applications Are Being Used?

Let's assume that a good measure of application usage is a combination of how many print jobs it generates and how many files it updates. If we can then differentiate files and print jobs by application, we can accumulate totals based on these criteria and produce data tables or graphics that provide a picture of application usage on our networks. The methods I propose here are easy to use, unobtrusive and reliable, where alternatives like maintaining log files of every time a user invokes an application require *a priori* setup and can be misleading; many users will use an application for weeks at a time without ever exiting, while others will keep it iconicized without ever touching it.

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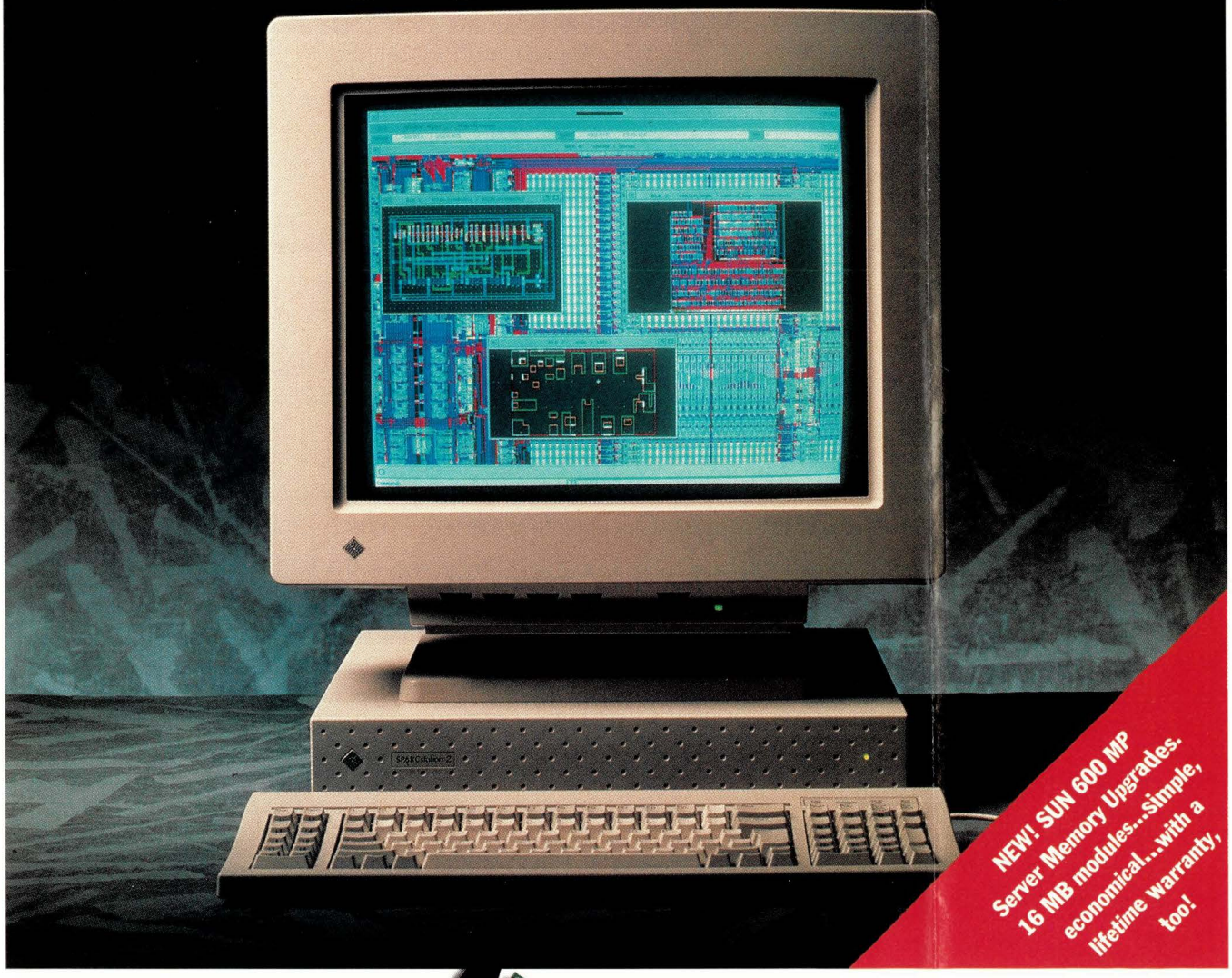

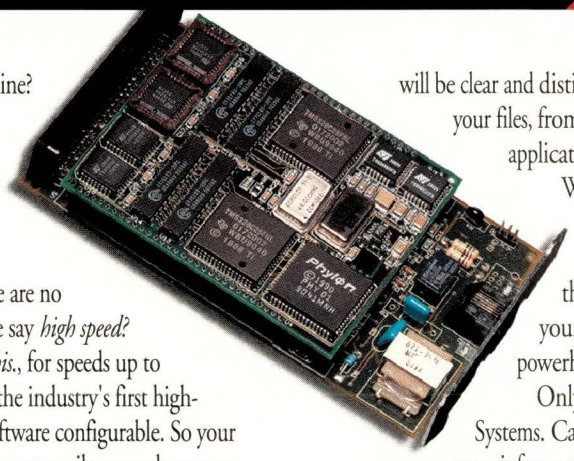

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Printer Log (Accounting) Files

Printer log files are the source of information on printing activity. If you're using TranScript, the file to look at is the one designated by the `lf` line in your printcap file. If you are using NeWSprint, look at the file designated by the `af` line (`acct`, by default).

```
psbanner: wizard:root  Job: WingzAAAa07837
Date: Mon Mar 16 06:25:01 1992
psif: wizard:root magic start -
  Mon Mar 16 06:25:02 1992
psif: end - Mon Mar 16 06:25:17 1992
psbanner: wizard:slee  Job: IslandWrite
  Date: Mon Mar 16 10:05:54 1992
psif: wizard:slee magic start -
  Mon Mar 16 10:05:55 1992
psif: end - Mon Mar 16 10:07:16 1992

Printer magic
Host wizard
User slee
Job IslandDraw
Date Wed Feb 19 09:54:43 1992

Printer magic
Host wizard
User slee
Job IslandDraw
Date Mon Feb 24 21:45:49 1992

Printer magic
Host wizard
User slee
Job IslandWrite
Date Wed Feb 26 21:08:18 1992

Printer magic
Host wizard
User slee
Job WingzAAAa00371
Date Sun Mar 15 08:13:02 1992
```

Find

The UNIX `find` command is the starting point for looking at files. `find` allows you to search for files based on a number of criteria (e.g., name, type) and then allows you to do something with the files you've found (e.g., print their names, remove them). By setting up the `find` command to look for files that have been modified within so many days, we can flush out the files in the system that may be of interest. By providing a starting point in the file system, we can constrain the search to areas of interest and cut down the length of the search. For example, if we want to look in user home directories for files created or modified within the last seven days, we can type:

```
find /home/wizard -mtime -7 -type f -print
```

The UNIX `find` command is the starting point for looking at files.

If we're also interested in changes in ownership or permissions, we can use:

```
find /home/wizard -ctime -7 -type f -print
```

These `find` commands start at `/home/wizard` and search through all files and subdirectories below it, looking for files that have been modified (or created) in the last seven days and are plain files (i.e., not directories, links or sockets, etc.) and print their names. On a busy file server with a lot of users, this command would give us a lot of information!

```
/home/wizard/slee/.Xauthority
/home/wizard/slee/Wingz/geom.wkz
/home/wizard/slee/IslandDraw/Tracking/figure1
/home/wizard/slee/IslandWrite/LATLONG
/home/wizard/slee/IslandWrite/Tracking.Appl.text
/home/wizard/slee/IslandWrite/code/track_du
/home/wizard/slee/SunExpert/code/diskuse
/home/wizard/slee/SunExpert/code/file_stats
/home/wizard/slee/SunExpert/code/lpr_stats
/home/wizard/slee/SunExpert/code/Tracking.Appls
/home/wizard/slee/programs/convert
/home/wizard/slee/programs/convert.c
/home/wizard/slee/programs/convert.icon
/home/wizard/slee/.xnews.wizard:0
```

So, how do we cut down the output to something useful? If we're interested in looking at files by application, we can define regular expressions (patterns) that describe the location, naming convention or file type, and build an `awk` routine to tally files by these criteria and print totals.

Awk

To illustrate how regular expressions are defined in `awk`, take the example of global coordinates. Latitude/longitude values are generally expressed by a strings of numbers and letters–e.g., 385318N0770124W is in Washington, D.C.,

Bare.

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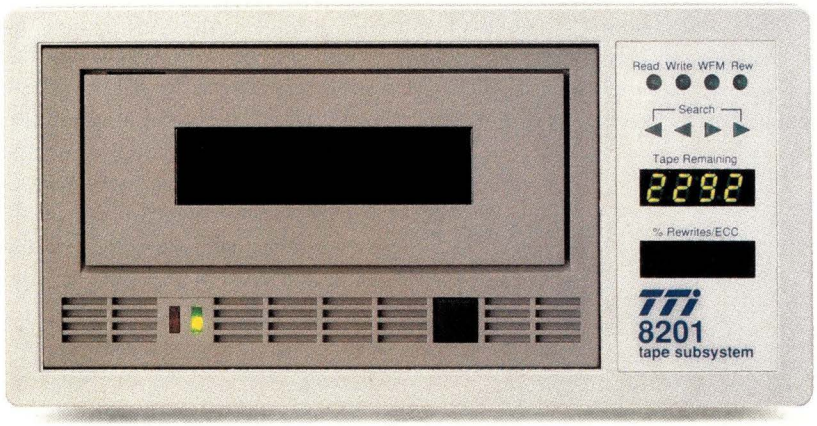
Essentials.



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and 422142N0710302W is in Boston. The pattern of digits and letters might be expressed:

```
$2 ~ /^[0-9]+[NS][0-9]+[EW]$/
```

The pattern doesn't check whether the minute, second and degree fields fall within more limited ranges or have the correct lengths.

This pattern says that the line we are matching against must start with some digits, followed by the letter N or S, followed by some more digits, and ending with an E or a W. Additionally, the ^ and $ characters say that this pattern comprises the entire second ($2) field. This pattern doesn't check whether the minute, second and degree fields fall within more limited ranges or have the correct lengths. To do this, we'd need a series of acceptable patterns as shown in the listing below:

```
# 00-90 00-59 00-59 NS 000-180 00-59 00-59 EW
$2 ~ /[0-8][0-9][0-5][0-9][0-5][0-9][NS]
     [0][0-9][0-9][0-5][0-9][0-5][0-9][EW]/
$2 ~ /[9][0][0-5][0-9][0-5][0-9][NS]
     [0-1][0-7][0-9][0-5][0-9][0-5][0-9][EW]/
$2 ~ /[0-8][0-9][0-5][0-9][0-5][0-9][NS]
     [0-1][0-7][0-9][0-5][0-9][0-5][0-9][EW]/
$2 ~ /[9][0][0-5][0-9][0-5][0-9][NS]
     [0][0-9][0-9][0-5][0-9][0-5][0-9][EW]/
$2 ~ /[0-8][0-9][0-5][0-9][0-5][0-9][NS]
     [1][8][0][0-5][0-9][0-5][0-9][EW]/
$2 ~ /[9][0][0-5][0-9][0-5][0-9][NS]
     [1][8][0][0-5][0-9][0-5][0-9][EW]/
```

To understand the above example, use the explanations below:

`$2`	second field in record (delimited by white space)
`^`	beginning of field
`[0-9]`	any digit
`[0-9]+`	any string of digits
`[NS]`	any of the included letters (N or S), `[A-Z]` would be any uppercase letter
`[EW]`	any of the included letters (E or W), `[a-z]` would be any lowercase letter, `[A-Za-z]+` would be any string of letters
`$`	end of field

This awk script will tally print jobs by the "Job" line if you use it as shown below. Here, the patterns we're matching on are the literals "IslandWrite," "IslandPaint" and "IslandDraw," and strings that begin with "Map" or "Wingz."

```
cat /var/spool/magic/acct | grep Job | awk -f
lpr_stats

# lpr_stats
# init w zeroes so won't print null if none found
BEGIN {DRAW=0;MAP=0;WRITE=0;PAINT=0;DRAW=0}
$0 ~ /^IslandDraw$/     { ++DRAW }
$0 ~ /^Map/             { ++MAP }
$0 ~ /^IslandPaint$/    { ++PAINT }
$0 ~ /^Wingz/           { ++WINGZ }
$0 ~ /^IslandWrite$/    { ++WRITE }
END {
print "Draw:    " DRAW
print "Map:     " MAP
print "Paint:   " PAINT
print "Wingz:   " WINGZ
print "Write:   " WRITE
}
```

Here's an awk script that accumulates file totals based on pathname patterns. In this example, we are assuming that users' files will be stored in subdirectories with names that correspond to the applications themselves. Whenever a pattern is matched, the corresponding accumulator is incremented. At the end of the routine, the totals are printed. To use this script, run your find command and pipe its output to this awk routine like this:

```
find /home/wizard -ctime -7 -type f | awk -f
file_stats


# file_stats
# init w zeroes so won't print null if none found
BEGIN {DRAW=0;MAP=0;WRITE=0;PAINT=0;DRAW=0}
$0 ~ /^[/]home[/][a-z]+[/][a-z]+[/]Draw[/]/
     { ++DRAW }
$0 ~ /^[/]home[/][a-z]+[/][a-z]+[/]Map[/]/
     { ++MAP }
$0 ~ /^[/]home[/][a-z]+[/][a-z]+[/]Paint[/]/
     { ++PAINT }
$0 ~ /^[/]home[/][a-z]+[/][a-z]+[/]Wingz[/]/
     { ++WINGZ }
$0 ~ /^[/]home[/][a-z]+[/][a-z]+[/]Write[/]/
     { ++WRITE }
END {
        print "Draw:    " DRAW
        print "Map:     " MAP
        print "Paint:   " PAINT
        print "Wingz:   " WINGZ
        print "Write:   " WRITE
}
```

The key below will help you decipher what's going on in the example above.

`[/]`	matches slash in pathname
`home`	literally matches file system name
`[a-z]+`	matches host names (no caps)
`IslandWrite, etc`	matches on subdirectory names
`++DRAW, etc`	increments application counter

The results of running our print log file or our `find` command through the provided `awk` filter will look like this:

```
Draw:   46
Map:    80
Paint:  55
Wingz:  100
Write:  144
```

Join

To combine results from several systems or the same system over time, the UNIX `join` command can be used to match on the label and produce a file with multiple columns. The `join` command requires the files be sorted on the joining field–the application name, in our example.

```
join oldfile new file

Draw: 34 44 46
Map: 80 48 80
Paint: 88 65 55
Wingz: 101 127 100
Write: 105 180 144
```

The following command will turn blanks into tabs creating a file that can be read into Wingz after you insert row and column headers. A similar procedure could be used for creating Lotus-readable files in which numeric values should be separated by commas and strings set in double quotes.

```
tr -s "\040" "\011"
```

You can then create some slick charts even your manager might understand! ➸

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 is also president of her own firm, The NextPage Inc., specializing in software documentation. Her email address is `slee@expert.com`.

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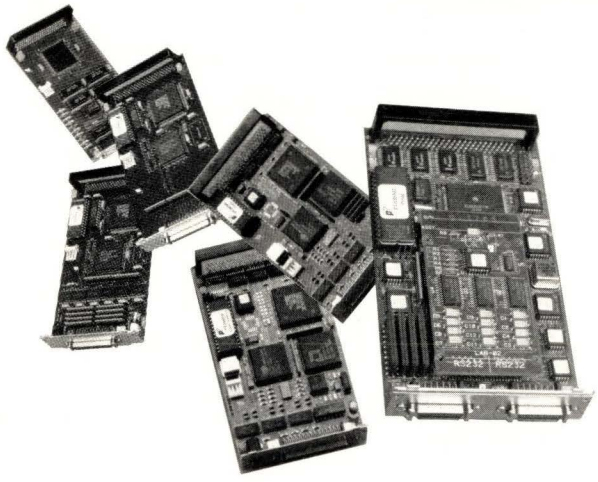

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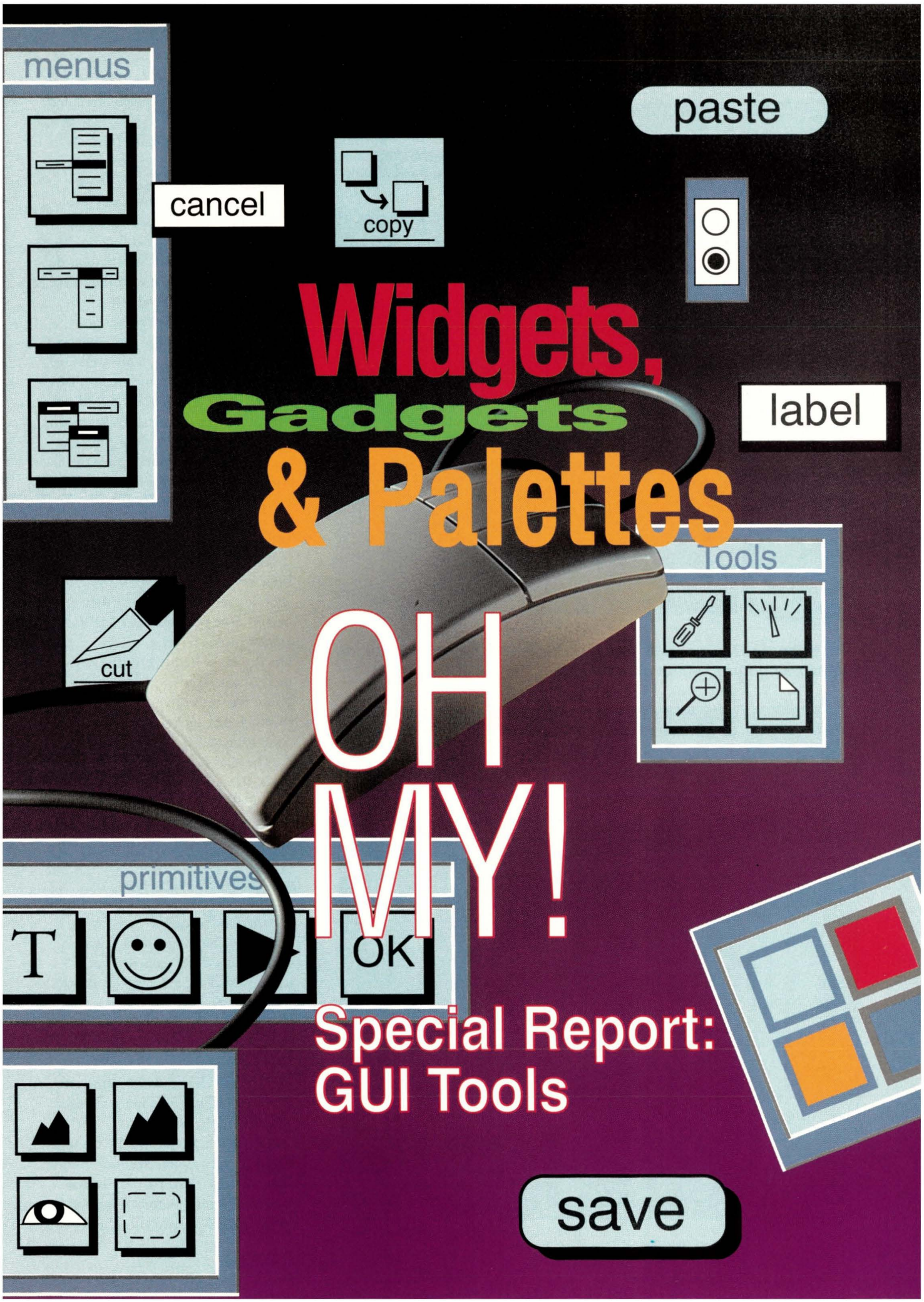
Widgets, Gadgets and Palettes– Oh, My!

SPECIAL REPORT:

A triple mouse-click–and you're off and writing GUI-based applications.

by MARY JO FOLEY, Senior Editor

Almost two years ago, when the programmers at Applix Inc. were in the throes of developing Aster*x, they wrote from scratch the code that enables users to select either Sun Microsystems Inc.'s Open Look or the Open Software Foundation's Motif interface when using the Aster*x business/office productivity package. They didn't go through this painstaking process because they were martyrs, nor because they suffered from the not-invented-here syndrome. Rather, "interface development tools didn't really exist back then," says Jonathan Dale, director of development at the Westboro, MA-based company. "So we implemented our own widget sets [i.e., scrollbars, buttons and other elements making up the user interface] using neither the Open Look nor Motif toolkits."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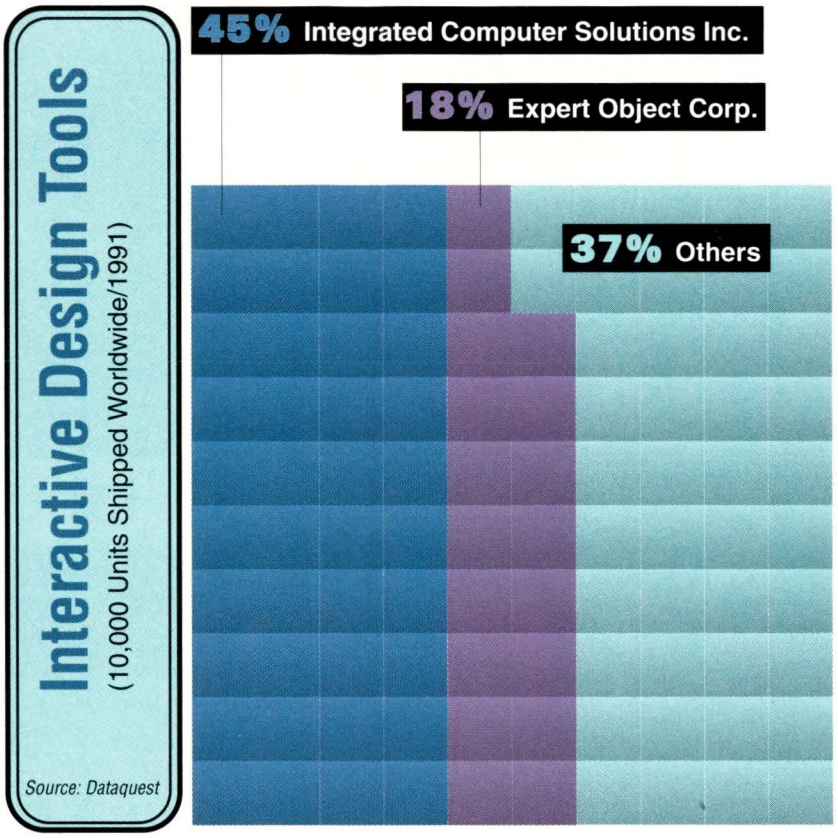
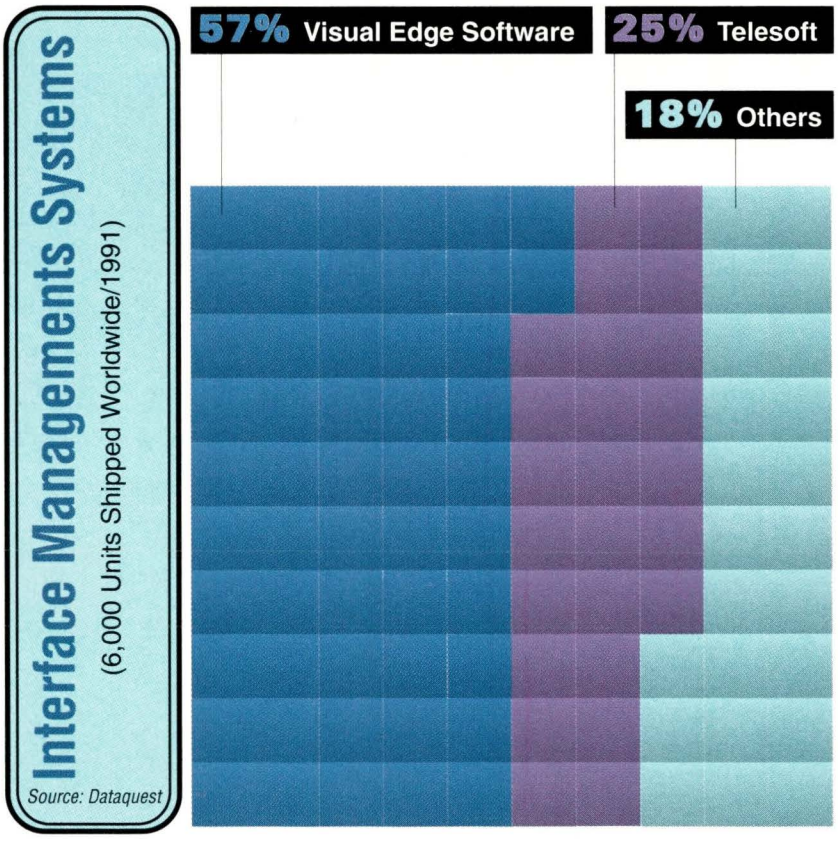


In neither the IDT nor IMS segments have more than a couple of vendors captured much of the market.



The resulting, switchable user interface and associated interface-editing tools, which ship as part of Aster*x, aren't "quite as sophisticated as what you can buy [commercially] now," concedes Dale. And there are "some very minor ways," he says, that the widgets and gadgets [a collection of widgets] created with Aster*x tools differ from those created with the native OpenWindows or Motif toolkits.

Consequently, Applix is seriously considering redoing the user-interface portion of its product. This would be no simple matter. "It means we'd have to do separate Open Look and Motif versions of our product," Dale explains. "We'd need to use the Motif toolkit, rip out our widgets and replace them with theirs. Then we'd have to do the same thing for Open Look."

Troublesome–yes; trivial–no. Whereas standards-compliant graphical user interfaces (GUIs) have always been key to PC and Macintosh packages, it's only recently that they've begun to be considered crucial to UNIX applications. Developers–whether creating commercial packages or programs for in-house use–must give a lot of thought to which user interfaces they plan to write to, as well as how they plan to do it. "User interface development comprises 50% to 80% of building a software application," claims Mike Foody, president of Visual Edge Software Ltd. "Of this, 20% to 30% is creating the [GUI] layout; the rest consists of [widget] behavior modification."

Until two years ago or so, developers like the folks at Applix had few options for building GUIs. There were the low-level tools that came standard with X, namely Xlib and Xt Intrinsics. Then there were the toolkits that came standard as part of OpenWindows (XView, OLIT and TNT) and Motif (the OSF/Motif Toolkit and UIL). More recently, a number of third-party vendors began introducing their own toolkits for building applications that are compliant with Open Look, Motif or both. Some of these third-party-provided products even supported Windows, the Mac Toolbox and character-based

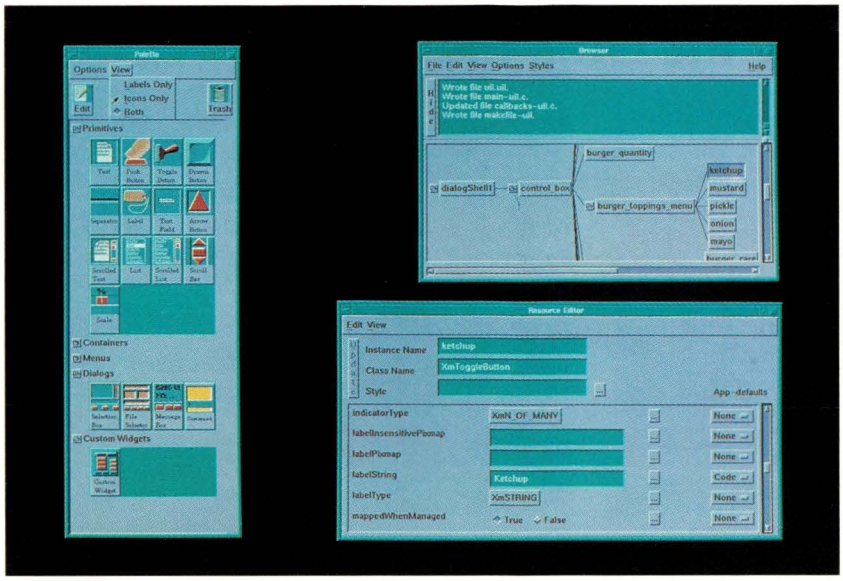
terminals. (For a listing of many of these tools, see our "Guide to GUIDEs" table.)

'Newer Than Embryonic'

"This market is newer than embryonic. It's in the Fallopian-tube stage. There are new companies entering the market every week," says Dataquest Inc. software tools analyst John DeArmon. Dataquest estimates that the worldwide market for UNIX-based Motif toolkits reached the $35 million mark in 1991 and that the Open Look one came in at $20 million. More and more of the Motif toolkits are being sold into Sun environments, where developers, usually at the request of corporate management and end users, are standardizing on Motif rather than Open Look. Dataquest divides the market into interactive design tool (IDT) and interface management system (IMS) segments. IDTs provide developers with drag and drop capabilities, and often a palette of widgets from which to select. IMS tools provide the same functionality as IDTs, along with rules and conventions for guiding widget behavior and usually some type of scripting language and/or interpreter. Last year, third parties shipped 10,000 IDTs and 6,000 IMS tools, Dataquest says.

There are other ways to slice up the GUI tool market. Some divide the pie between dialogue builders and graphical data generators (see "Tools For All Trades," in the "Features" section). Others, like Visual Edge's Foody, talk about layout editors, user-interface management systems and cross-platform development tools. But there are also cross-over products to consider, such as GUI/fourth-generation language (4GL) hybrids, including Contexture Systems' Contessa and JYACC Inc.'s JAM, and desktop managers, like IXI Ltd.'s X.Desktop and Visix Software Inc.'s Looking Glass–both of which come with user-interface modification tools.

However you partition the GUI development world, one thing's certain: Only a handful of vendors can claim to have captured much of the market. Integrated Computer Solutions Inc. (ICS) and Expert Object Corp. (EXOC) lead in IDT shipments, according to Dataquest. And Visual Edge and Telesoft Inc. head up the IMS pack, Dataquest claims.



ICS' Builder XCessory is a GUI builder that allows developers to add custom widgets to the standard Motif set.

So what really differentiates the 40-plus (and growing) GUI development tools out there? Again, the answer depends upon whom you ask. At least one tool vendor out there claims that there's a 90% to 95% overlap in what the currently available GUI tools can do. Dataquest's DeArmon begs to differ. "All of these products do different things in different ways, which is good, because not all developers do the same things in the same ways," he says.

While they harp on their following of standards–which some adhere to more closely than others–most GUI tool vendors predictably stress the features that differentiate their products.

"We have a basic philosophy of sticking to the standard," which is Motif in ICS' case, says company President Peter Winston. "We come with no strings attached–no run-time fees or [proprietary] libraries. Other vendors add value and make products that are 'standard...but.'"

ICS' flagship product, Builder XCessory, is exactly what its name implies: a GUI builder. The product allows developers to add custom or locally designed widgets to the standard Motif set. It also is integrated directly with CodeCenter (formerly Saber-C) from CenterLine Software Inc., allowing users to debug code and invoke callbacks without compiling.

The No. 2 IDT vendor, EXOC, likewise emphasizes its adherence to standards. "We consciously position ourselves not as a user-interface management system [UIMS]," explains director of marketing Barry Bowen. In EXOC's view, X and the native Motif and/or Open Look toolkits should be the UIMS, Bowen says. "Our development strategy is to provide pure, native C code generation. This way, our tool doesn't preclude you from any options." In fact, Bowen claims, the biggest danger to GUI tool consumers is "the proliferation of proprietary toolkits with proprietary libraries."

EXOC offers the greatest number of GUI development tools of any single vendor. It unveiled its first offering, AutoCODE, a "visual-interface programming environment," (a k a, GUI builder) for SunView way back in 1988. It also currently offers a Motif builder, Open Look builder, various interface conversion tools and a worksheet for application developers called HyperMatrix.

How the GUIs Stack Up

Source: ICS

Look and Feel	Implementation	Base Technology	Operating System
CUA	OSF/Motif	X Window System and X Toolkit	UNIX and others
	Windows	X Window System and X Toolkit	DOS
	Presentation Manager	X Window System and X Toolkit	OS/2
Open Look	XView	X Window System and SunView	UNIX and others
	OLIT	X Window System and X Toolkit	UNIX and others
	TNT	NeWS and PostScript	SunOS
Macintosh	Macintosh	Macintosh and QuickDraw	System 7.0
NeXTStep	NeXTStep	NeXTStep and PostScript	Mach

HyperMatrix is EXOC's newest offering. EXOC describes the product as "a programmable worksheet for building database screens, desktop productivity applications and display or input windows for all nongraphic applications." It features a visual prototyper for Motif or Open Look, a worksheet engine and a library toolkit with more than 50 "convenience functions."

Dan Adler, a programmer at a New York City trading firm, is a HyperMatrix customer. He is part of a team developing applications for viewing and analyzing historical, pricing, real-time and other types of financial data by the firm's traders and researchers. "We're not big believers in [GUI] builders or ready-made applications," Adler explains. "We think good libraries are the only things that really help in writing custom applications." The firm was exposed to an early version of HyperMatrix which came bundled with EXOC's ExoCode/Plus. (HyperMatrix is sold as a standalone product; a less powerful version is still bundled with ExoCode.) The trading-firm developers ended up using ExoCode/Plus on their SPARCstation 2 development platforms for its worksheet capability alone. For them, "the new [standalone] HyperMatrix version is really good," Adler says.

Cross-Platform Pioneers

Strong widget libraries also were the deciding factor for CenterLine Software Inc., the Cambridge, MA, programming-environment vendor, when it was searching for GUI development tools a year ago. CenterLine is in the midst of redoing the user interfaces for its CodeCenter and ObjectCenter products. It went with Solbourne Computer Inc.'s Software Business Unit's Object Interface (OI) Library and User Interface Builder (UIB). UIB lets developers create GUIs that are dynamically switchable between Motif and Open Look. It is integrated with OI, a C++ class library.

"Their [Solbourne's] builder's nice, but their class library is really great," says Scott Chapman, a software engineer for CenterLine's C++ technologies group. "We looked at lots of other products. Some were good Motif builders; others were good on DEC platforms only. But we needed something that worked on multiple platforms," as well as across both the Motif and Open Look interfaces. CenterLine has a team of six or seven developers working on SPARCstations who are doing the user-interface modification. "We're really happy with the class libraries," Chapman says. "We've been able to change the complete look and feel of our class browser 15 times faster than we could have" without the Solbourne tools.

CenterLine has become more than just a Solbourne customer. It has licensed the UIB and OI technologies. It will private-label and distribute both products under the ViewCenter name, and help Solbourne port the products to "all other major UNIX workstations" by the end of this year.

GUI builders and UIMS tools that are available across multiple platforms seem to be gaining in popularity all the way around. Tool vendors such as Neuron Data Inc. and XVT Software Inc. are among the original cross-platform pioneers.

Open Interface from Neuron Data operates as a GUI builder for Open Look, Motif, Presentation Manager, Windows 3.0 and Macintosh applications. (The company plans to add support for character-based DEC VT-100 and DOS terminals by the end of the year.) Unlike most GUI development tools, Open Interface doesn't rely on the Motif or Open Look toolkits; it uses its own, which allows it to provide a common set of widgets across all supported platforms, rather than making use of the different widgets that are native to each GUI.

"We can show any look and feel anywhere," boasts Drew Harman, technical product manager for Open Interface. "You only need one development tool for any one platform and run-time licenses for each platform where you want the product to run."

In contrast to Neuron Data's "superset" approach is XVT's stripped-down, least-common-denominator one. XVT-Design is a GUI builder that supports developers of applications for Motif, Open Look, Presentation Manager, Windows and Mac platforms, as well as character-based terminals running DOS, OS/2, UNIX, VMS or CTOS. XVT has solved the multiple-

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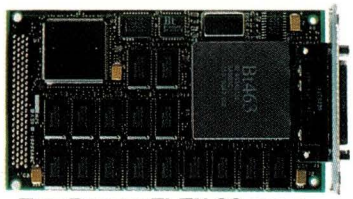

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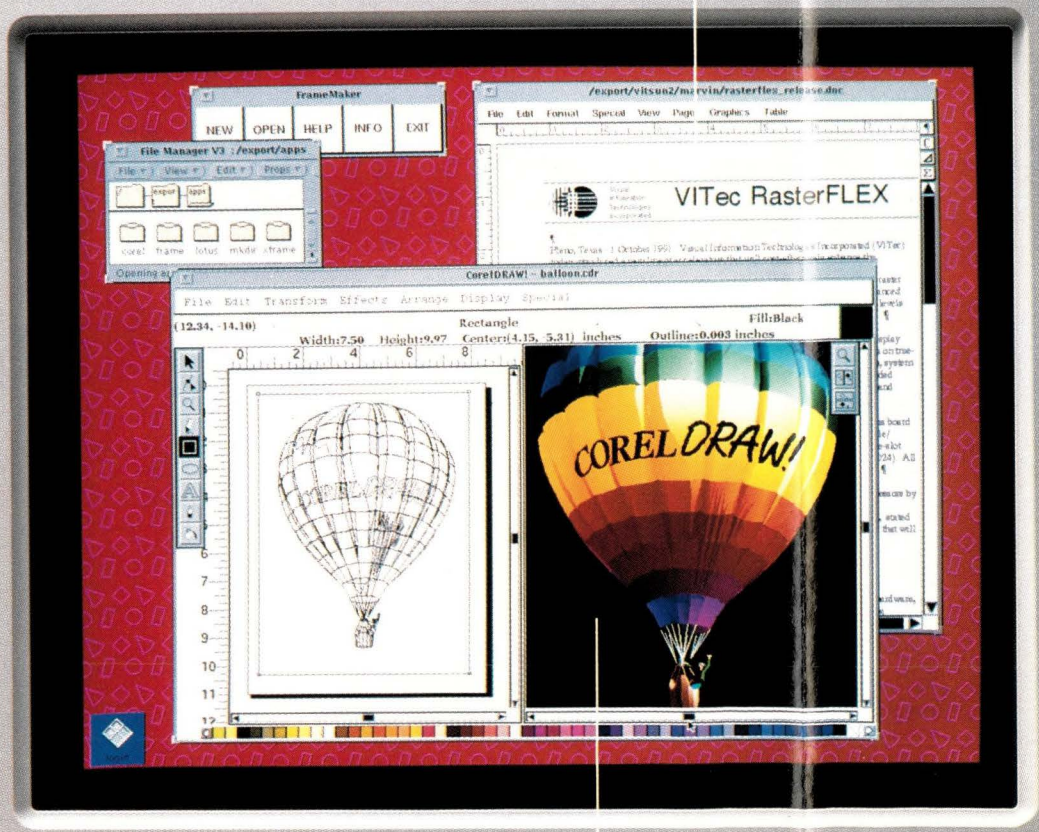

COREL*DRAW*

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platform-support dilemma by writing a layer of software that sits on top of the various native toolkits available on different platforms. XVT-Design offers developers a palette of widgets that are common to all of these interfaces from which to choose.

Southwestern Bell's information systems group selected XVT-Design to build a PC application that allows phone customers to receive their phone bills on a personal-computer diskette. The resulting bill analysis and tracking package, called Bill Plus, was developed by a two-person team on Suns and PCs. "We had tried developing with various graphic packages, but we wanted to be able to run [the resulting package] on MS-Windows, DOS-based character systems, Macs and Sun workstations," says Don O'Brien, systems analyst for the St. Louis, MO-based customer service and support group. With the graphics packages, "it was going to take a lot of work to make all of these versions compatible," he adds.

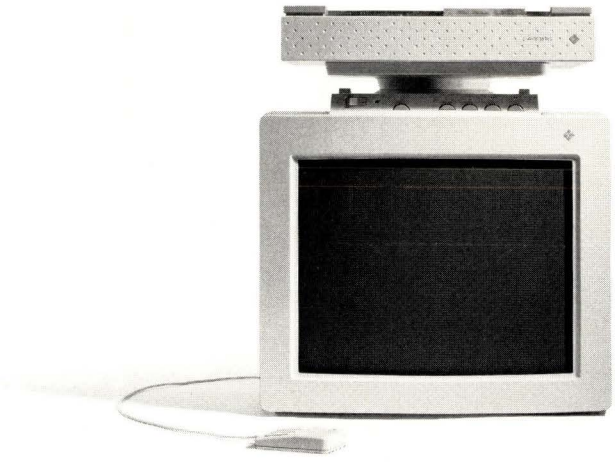
Another consideration for Southwestern Bell was whether or not it would be forced to pay royalties to a GUI tool vendor every time it sold a copy of Bill Plus developed with the vendor's tools. XVT doesn't exact royalties via run-time license sales–a big plus for Southwestern Bell. The product documentation is excellent, to boot, O'Brien says. XVT-Design enabled the developers to finish Bill Plus and begin testing in four months, he says.

Along with utility vendors and communications companies, defense and aerospace firms are among the largest consumers of GUI development tools. For many of these developers, support for Ada is a requirement. There are at least two tools out there that generate Ada, along with standard C and/or C++ code: ezX from Sunrise Software International and TeleUSE from Telesoft.

ezX was the choice of Westinghouse Aerospace's Baltimore, MD-based software engineering group, which is charged with developing a reusable-code-library application. To undertake development of the "Reusability Search Expert," says principal engineer Eric Beser, "we needed a user interface that generated Ada and worked between multiple platforms." Westinghouse looked at an in-house-developed user-interface builder from TRW Inc., as well as a public-domain system called DRT, according to Beser. The latter "didn't work well under Motif and didn't generate Ada," he says, "and we would have wound up spending more time on the GUI than the application." Wright Laboratories in Dayton, OH–for which Westinghouse originally was under contract to build the library-management system–suggested ezX. Westinghouse's 400-plus software engineers, developing primarily on Suns and VAXes, have been quite satisfied with it, Beser says.

At Grumman Aerospace's corporate research center in Bethpage, NY, Ada happened not to be a requirement (even though Motif, as it almost always is in government bids, was). The research center is developing a computer-aided-engineering tool called Protoblock, which is a graphical interface for building control-design systems on a wide range of platforms, including VAXes, Sun

If it ever goes down, another computer?



SPARCstations, and Hewlett-Packard Co. and Silicon Graphics Inc. workstations.

"I outgrew PHIGS and Figaro because I needed more control and speed," recalls research scientist Eitan Eadan. "I moved to the X environment and chose Motif. We started developing with UIL [Motif's user interface language] at first, but this was very tedious." Eadan looked at a variety of Motif tools, including Builder XCessory from ICS and TeleUSE. In the end, he went with VUIT, DEC's GUI development tool, which DEC ported to the Sun platform last year.

VUIT allows Grumman to read and write UIL files and doesn't require any sort of scripting language, Eadan says. "I needed the builder to be very generic, but very portable. I have some extremely complicated dialogue boxes—some with more than 100 widgets. VUIT makes modification of them easy," he adds. He says VUIT would suit Grumman's needs even better if it generated UIL or OpenWindows code, since the research center uses both Suns and various Motif-based platforms for development. He also would welcome VUIT support for Windows and Macintoshes, he says.

The Goo Thickens

GUI tool users are likely to find themselves with more, rather than fewer, product choices, at least in the near term. Most of the existing tools are for developers who don't need much handholding and who find widget libraries to be more than adequate programming aids. But the new tools—designed to help developers who aren't necessarily whiz-bang UNIX programmers–include hybrid GUI builder/4GL systems and graphical data generators.

Contexture Systems, for one, is angling to stay above the C and C++ levels, according to company President and CEO Bill McHale. Contexture's Contessa, a GUI builder/4GL combo, allows developers to take advantage of the strengths of both kinds of tools, he says. Contessa provides developers with strong language/scripting capabilities and data integration, as does a 4GL, as well as visual-editing tools, as does a builder, McHale explains. "We don't provide every Motif widget and callback under the sun," and don't intend to, he says. Instead, Contessa allows you to incorporate widgets created with other vendors' packages into the Contessa environment.

At the same time, new and existing GUI tool vendors are thinking about, if not implementing, hooks to allow their development tools to integrate more easily with debuggers and other programming tools. ICS' Builder XCessory and Telesoft's TeleUSE both include direct interfaces to CenterLine's programming environments. A few existing tools like Visual Edge's UIM/X ship with their own built-in C (or C++) interpreters and debuggers.

Ultimately, GUIs will come standard with full-fledged development environments, opines Dataquest's DeArmon. GUIs and their related tools will come to operate like programming-environment frameworks, such as HP's SoftBench or Sun's ToolTalk, he claims. In the meantime, the more toolkits, the merrier.

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SPECIAL REPORT:

Tools For All Trades

Graphical data generators –along with dialogue builders– offer commercial UNIX programmers new possibilities.

by **ELFED DAVIES,** ICL plc

There is a world of difference between the functionality required by graphics tools for commercial applications development and those for building technical applications. Technical applications primarily require data visualization through 2D and 3D graphics. Commercial applications, on the other hand, primarily involve data manipulation for relatively simple and repetitive transactions requiring quick and consistent response time. Today the majority of these commercial applications have a text interface and are accessed through dumb terminals.

While the commercial world is aware of the value of graphics, its focus until now has been on the presentation of numerical data, such as spreadsheets. Few applications enable users to interact graphically with commercial information.

Why are there so few commercial applications with graphics interfaces? The basic reason is that Windows, on UNIX as well as DOS, are just that–windows into the application. The application running inside the window is more than likely a text application.

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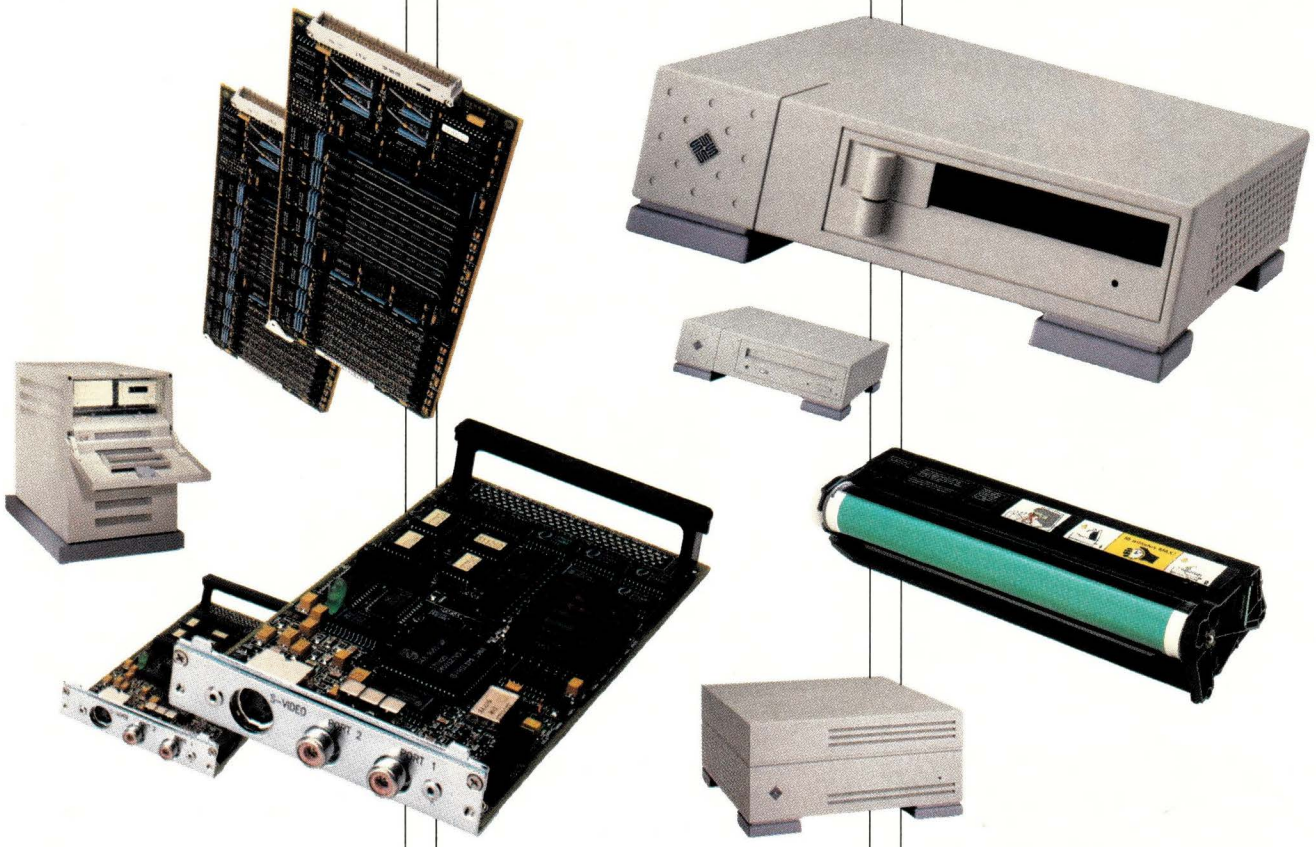

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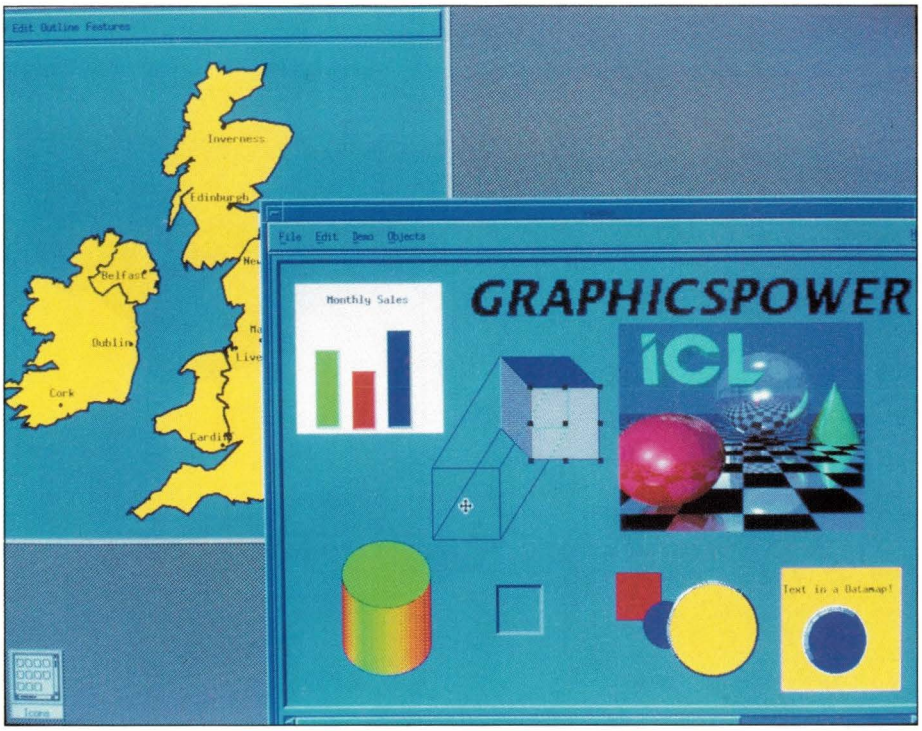

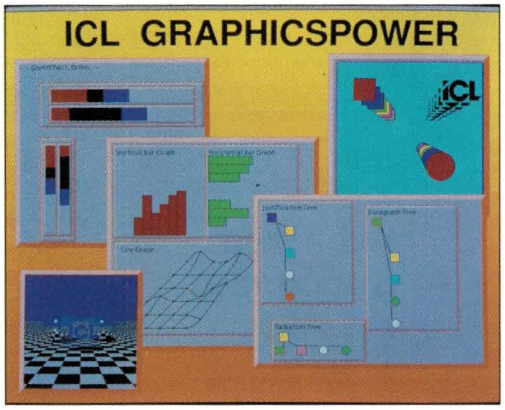

ICL's graphical data generator, Graphicspower, provides dialogue objects, graphical objects and specialized business-oriented objects.

One can argue that the availability of standard graphical environments would encourage more commercial developers to produce graphical applications. However, reality does everything but encourage graphical application development. In X and Motif there are about 400 calls–functions, macros, etc. This is not just a characteristic of the UNIX graphical environment–the DOS Windows 3.0 development environment is equally complex, as shown by the length of time it has taken major PC package suppliers to release Windows versions of their products.

It can take a UNIX and C programmer six months to become proficient in X. The learning curve is even longer for the commercial applications developer whose expertise and focus is more likely to be on the application's data processing logic than on its look and feel.

Tools for commercial UNIX programmers are now beginning to appear–and the best part is that the developer does not need to be an X and graphics expert to take advantage of them.

Dialogue Graphics Versus Graphical Data

These new tools fall into two broad categories: dialogue builders and graphical data generators.

Dialogue builders allow graphical user interfaces to be built into applications. Typically, the GUIs generated provide facilities for the user to choose options using a mouse, and to input and receive data from the application. With a dialogue builder you can add a GUI to an existing text-based application, or generate a GUI for a new application.

Graphical data generators offer a different set of possibilities to developers. Unlike the more common dialogue tools, the new graphical data generators allow the application's data to be represented directly as graphical objects which can be manipulated by the user. For example:

- The user clicks on graphical objects that represent cartons of different sizes, resulting in the application generating on screen the optimum stacking configuration for cartons on pallets;
- The user can select and resize bars in a bar graph. The new value is then fed back into the application, such as a spreadsheet.

The significance of graphical data generator tools is that they enable solutions to be built that would be impossible or extremely difficult to code in X.

Let's examine these categories in more depth:

Dialogue builders for existing text applications. More lines of COBOL are still being written each year than any other programming language. These are being added to the estimated 88 billion lines already in existence. It would be an impossible task to convert such a huge number of applications to a graphical user interface.

Two examples of the emerging class of products for adding GUIs to these applications are Deskterm from IXI Ltd. and ALEX from Systems Strategies Ltd.

Deskterm, for example, allows a Motif-conformant graphical user interface to be added to an existing text application. It can be used in two modes—either the application can be left totally unchanged, or some slight modification can be made; the latter gives better performance. In the first mode, the product accepts as input the unchanged terminal I/O stream from the appli-

cation and converts it to X protocol. The conversion is governed by a set of instructions provided by the developer. In the second mode, the application's character I/O code is amended to produce Deskterm protocol. A typical way of using Deskterm is to prototype using the first mode and to amend the application only when the GUI meets requirements.

Additionally, Deskterm is not restricted to UNIX applications. Mainframe applications such as MVS CICS can be given the same treatment as long as the emulator used to access them runs on a UNIX machine.

Dialogue builders for new applications. More of these tools appear every day. All work in essentially the same way, in that they enable the developer to "paint" the GUI as the end user would see it by selecting graphical objects (widgets) displayed in a toolbox on the screen. (The majority of tools, listed in our table, "The Guide to GUIDEs," fall into this category.)

Imperial Software Technology's X Designer offers an example of how these tools tend to function. X Designer enables the developer to design a Motif-conformant user interface interactively; X Designer then automatically generates the C code to produce the interface. It displays a toolbox on the screen of about 30 widgets (buttons, labels, text input fields, scroll bars, forms, etc.). The developer selects these objects to build up a widget hierarchy representing the user interface. The user interface resulting from this hierarchy is immediately displayed on the screen. The interface between the user interface and the application code is achieved by the use of callback routines. For every event associated with a widget–such as pushing a button–a callback routine can be specified so that application's code can be called to act on the event.

One further category of dialogue builders deserves mention: These are products from the relational database vendors that allow a GUI front end to be developed for database applications.

Undoubtedly, one of the best-known example is Windows4GL from ASK Computer Systems Inc.'s Ingres divison, which provides a wholly object-oriented environment. It provides a toolbox on the screen with radio buttons, scroll bars, etc., which the developer uses to design a Motif-conformant user interface to database applications. But more and more of these hybrid GUI builder/ 4GL products are bursting onto the scene.

Graphical data generators. This growing group of products enables the developer to provide a graphical representation of the application's data without the need for a detailed knowledge of X. Examples include Graphicspower from ICL plc, GoBE from Digital Equipment Corp., Guide Power from Fujitsu Ltd., InterViews from Stanford University and DataViews from V.I. Corp.

ICL's Graphicspower was developed jointly with Fujitsu's Artificial Intelligence Unit (the Fujitsu version is called Guide Power). It is an object-oriented toolkit that allows the developer to represent the application's data graphically. Graphicspower provides dialogue objects (buttons, menus, etc.), graphical objects (lines, circles, bitmaps, etc.) plus specialized business-oriented graphics objects (tables, bar graphs, line graphs, etc.). Developers can also define their own graphical objects. The end user can select, drag, resize and rescale these objects.

Graphicspower runs under the industry standard X11 windowing system. With Graphicspower, applications may currently be written in C; product enhancements planned for later 1992 release will support development in C++, Prolog and Lisp.

Elfed Davies is marketing manager for Integrated Desktops (UNIX and DOS) in ICL plc's Mid Range Systems Division, based in Bracknell, United Kingdom. He is responsible for worldwide product management of ICL's desktop, PC LAN and secure network-access activities.

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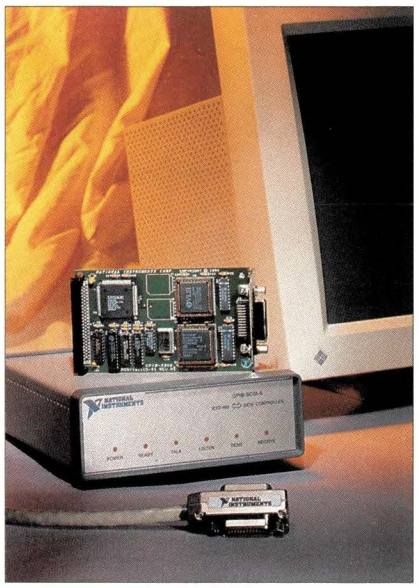

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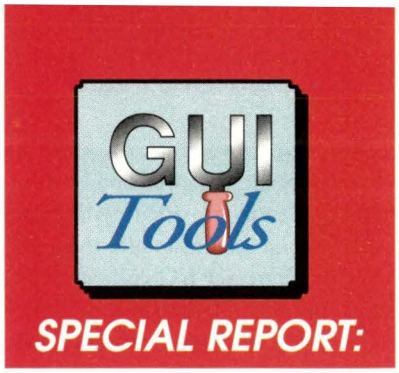

The Guide to GUIDEs

(Graphical User Interface Development Environments)

Compiled by Maureen McKeon and Mary Jo Foley

ASET Inc.
2957 Clairmont Road
Suite 200
Atlanta, GA 30329
Circle 200

Tool: Agora UIMS
Type: UIMS
Interfaces supported/Product specifics: Motif and Open Look /user switchable
Platforms supported: Sun SPARC, SCO UNIX (386/486), HP 9000, IBM RS/6000, DEC Ultrix

Briler Inc.
31 Glenwood Drive
Short Hills, NJ 07078
Circle 201

Tool: XDK Widget Set
Type: Third-party widget library
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: X Window systems

Cambridge Connectivity Ltd.
197 High St.
Cottenham, Cambridge
CB4 4RX, England
Circle 202

Tool: Soft Option
Type: GUI builder
Interfaces supported/Product specifics: Motif and Windows 3.0/user switchable
Platforms supported: All UNIX platforms

Contexture Systems
One Exeter Plaza
Boston, MA 02116
Circle 203

Tool: Contessa
Type: Builder and 4GL combo
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: Sun SPARC, IBM RS/6000, HP, DEC Ultrix and VMS, Apollo, Okidata, DG

COSMIC (Computer Software Management and Information Center) for NASA
University of Georgia
382 East Broad St.
Athens, GA 30602
Circle 204

Tool: Transportable Application Environment (TAE) Plus
Type: GUI builder
Interfaces supported/Product specifics: Motif/developed and maintained by NASA Goddard Space Flight Center/generates C or Ada/ships with source code
Platforms supported: Sun SPARC, DEC Ultrix and VMS, HP (Mac A/UX in version 4.1, but not current version)

Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
Circle 205

Tool: DEC VUIT
Type: Builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun SPARC; DEC VAX VMS, VAX Ultrix, RISC Ultrix

Tool: LinkWorks Developer's Tools
Type: Navigational tool
Interfaces supported/Product specifics: Motif
Platforms supported: Sun SPARC; DEC VAX VMS, VAX Ultrix, RISC Ultrix

Tool: DECwindows Graphical Interface Tools
Interfaces supported/Product specifics: Motif/comprised of two widgets: GoBe (graphical object editor) and NetEd (network editor)
Platforms supported: Sun SPARC; DEC VAX VMS, VAX Ultrix, RISC Ultrix

Expert Object Corp.
500 Hyacinth Place
Highland Park, IL 60035
Circle 206

Tool: ExoCODE/XM
Type: Motif visual interface programming system (VIP)
Interfaces supported/Product specifics: X Window System (or hardware vendors' equivalent, i.e., Open Look, DECwindows, etc.)
Platforms supported: Sun 3, Sun SPARC; DECstation; IBM RS/6000; HP 9000 series 300, 400

Tool: ExoCode/Plus
Type: Open Look VIP system
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun 3, Sun SPARC

Tool: AutoCODE
Type: SunView VIP system

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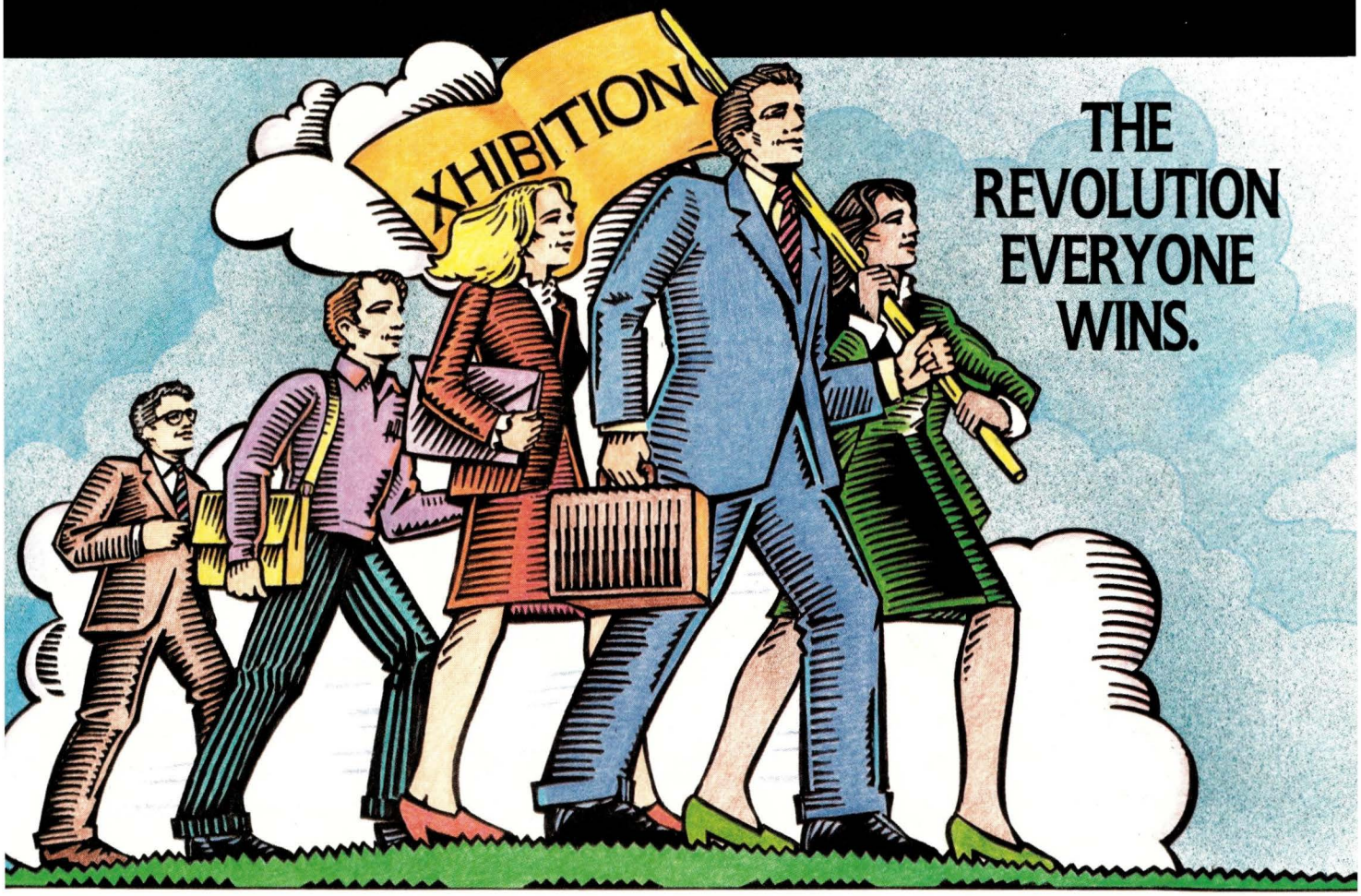

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Expert Object Corp. (continued)

Interfaces supported/Product specifics: SunView
Platforms supported: Sun 3, Sun SPARC

Tool: HyperMatrix
Type: Programmable worksheet
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: Sun 3, Sun SPARC; DECstation; HP 9000 series 300 and 400

Tool: XVconvert
Type: Open Look to Motif source-code converter
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun 3, Sun SPARC or compatible; DECstation 3100 or 5000

Tool: XMconvert
Type: Visual SunView to Motif source code converter
Interfaces supported/Product specifics: SunView
Platforms supported: Sun 3, Sun SPARC or compatible; DECstation 3100 or 5000

Tool: PLSconvert
Type: Visual SunView to Open Look source-code converter
Interfaces supported/Product specifics: SunView
Platforms supported: Sun SPARC

Graphical Software Technology Inc.
1559 E. Pacific Coast Highway
Suite 300
Hermosa Beach, CA 90254
Circle 207

Tool: Xtra XWidgets
Type: UIMS
Interfaces supported/Product specifics: Motif and Open Look/spreadsheet application module, hypertext facility, toolkit for building help capabilities, form layout tool and other tools
Platforms supported: Sun SPARC , IBM, HP,
Interactive 386

Guideware Corp.
2483 Old Middlefied Way
Suite 224
Mountain View, CA 94043
Circle 208

Tool: Wintran
Type: Builder
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: Beta versions for Sun SPARC, DEC, HP, Mac A/UX, IBM RS/6000, SCO, MIPS, Sony, Interactive

ICL plc
1 High St.
Putney, London
SW15 1SW, England
Circle 209

ICL Inc.
Mid-Range Systems Division
9801 Muirlands Blvd.
P.O. Box 19593
Irvine, CA 92713-9593
Circle 210

Tool: Graphicspower
Type: Object-oriented graphical data generator
Interfaces supported/Product specifics: Motif and Open Look/developed in conjunction with Fujitsu Ltd.
Platforms supported: ICL SPARC-based DRS 6000 and 80486-based DRS 3000/other SVR4-based systems, including Sun SPARC platforms (pending)

Imperial Software Technology
95 London St.
Reading, Berkshire
RG1 4QA, England
Circle 211

Tool: X-Designer
Type: Builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun 3, Sun SPARC; IBM RS/6000; DECstation; Sony NeWS; DG Aviion; HP 300, 400; Apollo Domain

Integrated Computer Solutions Inc.
201 Broadway
Cambridge, MA 02139
Circle 212

Tool: Builder Xcessory (BX)
Type: GUI Builder/ Interactive Design Tool (IDT)
Interfaces supported/Product specifics: Motif
Platforms supported: Sun, DEC, IBM RS/6000, SGI, HP, Interactive UNIX, SCO UNIX, Mac A/UX, MIPS, DG, Sony

Interactive Technology Inc.
Park Plaza West, #416
10700 S.W. Beaverton
Hillsdale Highway
Beaverton, OR 97005
Circle 213

Tool: Skylight (operates with proprietary, fast toolkit), Skylight/Motif (operates with native Motif toolkit)
Type: UIMS with builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun SPARC; HP 3000; DECstation, VAX; Intel 80386

Interface Engineering
109 Collenswood Road
Stevenage, Hertshire
SG2 9HA, England
Circle 214

Tool: Xv++
Type: C++ interface for Sun's XView Open Look toolkit/a library of classes providing a C++ API
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun SPARC platforms and other machines running unmodified XView toolkit

IXI Ltd.
62-74 Burleigh St.
Cambridge
CB1 1OJ, England
Circle 215

IXI Corp.
One Annabel Lane
San Ramon, CA 94583
Circle 216

Tool: X.desktop
Type: Desktop manager with some builder tools
Interfaces supported/Product specifics: Motif
Platforms supported: Sun 3, Sun SPARC; HP 9000/700/300; MIPS; Interactive UNIX; DECstation running Ultrix; IBM RS/6000; SCO; SGI

Tool: Motif Development Kit
Type: Builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun, SPARC

Jonathan (formerly UniCAD)
150 Boush St.
Norfolk, VA 23510
Circle 217

Tool: XPression
Type: UIMS
Interfaces supported/Product specifics: Motif
Platforms supported: Sun, SGI, DEC Ultrix/ IBM RS/6000 (pending)

JYACC
116 John St.
New York, NY 10032
Circle 218

Tool: JAM (JYACC Application Manager), plus various presentation interfaces
Type: GUI 4GL
Interfaces supported/Product specifics: Motif, Windows, character-based/Open Look and Mac (pending)
Platforms supported: All UNIX workstations, DOS-based PCs, VAX VMS, etc.–a total of 10 operating systems and more than 100 different hardware platforms

Kinesix
10333 Richmond Ave.
Suite 1100
Houston, TX 77042
Circle 219

Tool: Sammi
Type: Distributed graphical user environment
Interfaces supported/Product specifics: Motif and Open Look (but incorporates only Motif widgets)
Platforms supported: Sun SPARC, DEC Ultrix and VMS, IBM RS/6000, SGI, DG, HP/Apollo, Motorola 88000-based platforms, SCO/ MIPS, Wind River Systems' VxWorks, Interactive, Lynx OS (pending)

KL Group Inc.
134 Adelaide St. East
Suite 204
Toronto, Ontario
M5C 1K9, Canada
Circle 220

Tool: XRT/graph for Motif
Type: Builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun SPARC, IBM RS/6000, HP 9000

Tool: XRT/graph for XView
Type: Builder
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun SPARC

Tool: XRT/graph for OLIT
Type: Builder
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun SPARC

Kovi Design Automation
2350 Mission College Blvd.
Suite 390
Santa Clara, CA 95054
Circle 221

Tool: X Sculptor
Type: Builder
Interfaces supported/Product specifics: Motif and Open Look/ user switchable
Platforms supported: Sun, SGI, DEC Ultrix, HP 9000 (300, 400, 700, 800), IBM RS/6000

Neuron Data Inc.
156 University Ave.
Palo Alto, CA 94301
Circle 222

Tool: Open Interface

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Neuron Data Inc. (continued)

Type: Cross-platform GUI builder
Interfaces supported/Product specifics: Motif, Open Look, Presentation Manager, Windows 3.0, Mac/VT-100 and DOS character-based terminals (pending)
Platforms supported: Sun 3, SPARC; DEC Ultrix and VMS; HP 300/400 and 700/800; IBM RS/6000; Interactive; SCO; DG Aviion; SGI; Sony (RISC and CISC); PCs running Windows, OS/2 or Mac OS

Non Standard Logics SA
57-59 Rue Lhomond
75005 Paris, France
Circle 223

Non Standard Logics Inc.
99 Bedford St.
Boston, MA 02111
Circle 224

Tool: XFaceMaker 2
Type: Builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun; DEC; HP; Apollo; IBM RS/6000, 386/486; SCO UNIX; Interactive UNIX; MIPS; SGI; Evans & Sutherland; Sony; MIPS; Bull; DG

Open Inc.
655 Southpointe Court, Suite 100
Colorado Springs, CO 80906
Circle 225

Tool: Aspect
Type: Cross-platform GUI development system
Interfaces supported/Product specifics: Motif, Open Look, Presentation Manager, Windows 3.0, Mac, character terminals
Platforms supported: UNIX, OS/2, PC, Macintosh, character terminals

Parc Place Systems
1550 Plymouth St.
Mountain View, CA 94043
Circle 226

Tool: Facets\4GL
Type: Application development tool for Objectworks\Smalltalk with an interface builder
Platforms supported: Sun SPARC, IBM RS/6000, DEC, HP/Apollo, PC, Macintosh

Quest Windows Corp.
5200 Great America Parkway
Santa Clara, CA 95054
Circle 227

Tool: UIM/X
Type: GUI builder with built-in C interpreter
Interfaces supported/Product specifics: Motif
Platforms supported: Sun 3, Sun SPARC; MIPS; SVR3 386, SVR4 386

Tool: ObjectViews C++
Type: Commercialization of the Stanford InterViews graphical-data-generator environment
Interfaces supported/Product specifics: Motif, Open Look and a "Mac-style" interface (user switchable)/incorporates the Quest Object-Oriented GUI Builder (OOGB)
Platforms supported: SunSPARC

Research Systems Inc.
777 29th St.
Boulder, CO 80303
Circle 228

Tool: IDL/widgets
Type: Extension to the IDL 4GL
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: Sun, HP, DEC Ultrix and VMS, IBM RS/6000/Windows 3.0 PC (pending)

Science Applications International Corp. (SAIC)
Open Systems Division
10260 Campus Point Drive
San Diego, CA 92121
Circle 229

Tool: SAIC VUE Developer's Toolkit
Type: Port of HP's Visual User Environment (HP VUE)
Interfaces supported/Product specifics: Motif and Open Look
Platforms supported: Sun SPARC, IBM RS/6000

Siemens Nixdorf Information Systems
200 Wheeler Road
Burlington, MA 01803
Circle 230

Tool: Dialog Builder
Type: UIMS with GUI builder
Interfaces supported/Product specifics: Motif
Platforms supported: Sun, DEC, HP/Apollo, Siemens Nixdorf Targon and MX300 and MX500 families running UNIX

SL Corp.
240 Tamal Vista Blvd.
Suite 100, Hunt Plaza
Corte Madera, CA 94925
Circle 231

Tool: SL-GMS (Graphical Modeling System)
Type: UIMS specializing in dynamic graphics
Interfaces supported/Product specifics: Motif, Open Look, DECwindows, IRIS GL (SGI)/ Presentation Manager (pending)/ specifically for creating control-system graphics
Platforms supported: Sun, DEC Ultrix and VMS, HP, RS/6000, MIPS, 88000-based platforms

Solbourne Computer Inc.
Software Business Unit
1900 Pike Road
Longmont, CO 80501
Circle 232

Tool: User Interface Builder (UIB) and Object Interface Library (OI)
Type: Builder and tools
Interfaces supported/Product specifics: Motif/Open Look-switchable
Platforms supported: Sun and SPARC-compatibles/other UNIX workstations (pending)

SunRise Software International
170 Enterprise Center
Middletown, RI 02840
Circle 233

Tool: ezX
Type: GUI builder/generates C, Ada and UIL
Interfaces supported/Product specifics: Motif
Platforms supported: Sun, DEC Ultrix and VAX VMS, IBM RS/6000, SCO UNIX, SGI

SunSoft
2550 Garcia Ave.
Mountain View, CA 94043-1100
Circle 234

Tool: OpenWindows Developer's Guide (DevGuide)
Type: GUI builder
Interfaces supported/Product specifics: Open Look
Platforms supported: SPARC systems with 4.1.1 SunOS

Telesoft
5959 Cornerstone Court, West
San Diego, CA 92121-9891
Circle 235

Tool: TeleUSE
Type: UIMS
Interfaces supported/Product specifics: Motif/direct interfaces to CenterLine's CodeCenter, SQL databases, C++, Ada and other programming languages and environments
Platforms supported: Sun 3, SunSPARC; SGI; NCR System 3000; DG Aviion; DECstation; HP 9000/400 and 700; HP Apollo; IBM RS/6000

Tigre Object Systems Inc.
3004 Mission St., Suite D
Santa Cruz, CA 95060
Circle 236

Tool: Tigre Interface Designer
Type: Builder for Smalltalk environments
Interfaces supported/Product specifics: Motif and Open Look

Platforms supported: Sun SPARC, DEC, HP/Apollo, DOS PCs

UniPress Software
2025 Lincoln Highway
Edison, NJ 08817
Circle 237

Tool: XView Toolkit
Type: Converter of SunView or XView applications to IBM, DEC, HP, SGI and Sony
Interfaces supported/Product specifics: Open Look
Platforms supported: Sun SPARC, DECstation, IBM RS/6000, HP 9000 300/400/700, SGI, Sony RISC

V.I. Corp.
47 Pleasant St.
Northampton, MA 01060
Circle 238

Tool: X-Designer
Type: GUI builder/code generator
Interfaces supported/Product specifics: Motif
Platforms supported: Sun 3; Sun SPARC; 386 or 486 with SCO or Interactive; SGI; IBM RS/6000; DECstation (Ultrix); HP 300, 400 and 700; Apollo Domain; DG Aviion

Tool: DataViews
Type: Dynamic user interface builder
Interfaces supported/Product specifics: Motif and Open Look/limited number of Open Look widgets available/mostly for monitoring and control markets
Platforms supported: All UNIX platforms, plus Concurrent 7000 and 8000, DEC VAX VMS

Tool: GECK (Graphical Editor Construction Kit)
Type: User interface builder for editors
Interfaces supported/Product specifics: Motif/Motif-like graphics library
Platforms supported: All UNIX platforms

Visix Software Inc.
11440 Commerce Park Drive
Reston, VA 22091
Circle 239

Tool: Looking Glass Professional and Looking Glass Advantage
Type: Desktop manager and related GUI customization tools
Interfaces supported/Product specifics: Motif, Open Look, Presentation Manager/Windows and Windows/NT (pending)
Platforms supported: Sun SPARC, Intergraph and other X Window System platforms

Tool: Galaxy
Type: Application development environment with GUI builder and other visual-editing tools
Interfaces supported/Product specifics: Replaces Motif, Open Look, Windows and Mac Toolbox
Platforms supported: Sun and other X Window System platforms, PCs, Macs

Visual Edge Software Ltd.
3870 Cote Vertu
St. Laurent, Quebec
H4R 1V4 Canada
Circle 240

Tool: UIM/X
Type: GUI management and development system
Interfaces supported/Product specifics: Motif and Open Look/AT&T OEMs the OL version
Platforms supported: All major UNIX platforms

XVT Software Inc.
4900 Pearl East Circle
Boulder, CO 80308
Circle 241

Tool: XVT-Design
Type: GUI builder
Interfaces supported/Product specifics: Motif, Open Look, Mac, Microsoft Windows, Presentation Manager, XVT's character-based system running DOS, OS/2, UNIX, VMS, CTOS
Platforms supported: Sun 3, Sun SPARC; 386/ix; SCO UNIX; IBM RS/6000; DEC VAX VMS, DECstation; HP 9000/300 and 400; MIPS and MIPS compatibles; character-based terminals

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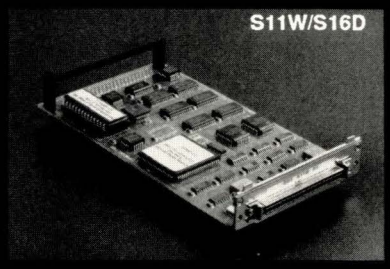

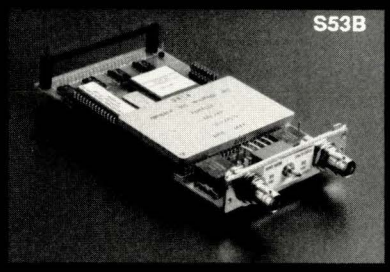

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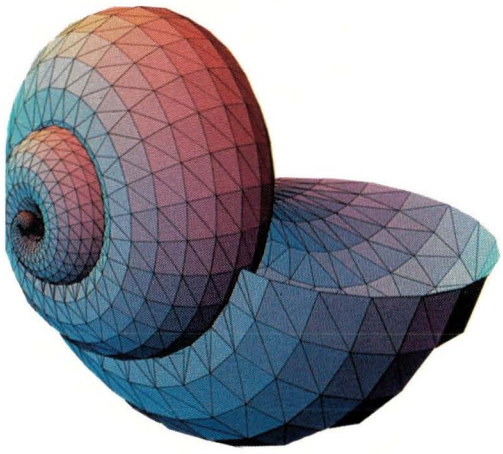
Mathematica, QBlazer modem, HDS X terminal

by **BARRY SHEIN**, Technical Editor

Since the first copy of *SunExpert* appeared almost three years ago, Sun Microsystems Inc.'s acceptance in the marketplace, as well as that of UNIX in general, has soared. In those early days, we had to hunt for products we thought would interest you. Today they come in so fast, and so many are so good, that we have trouble keeping up with the flow. It seems the CD player and tape drives are always busy. This new feature is designed to provide a mixture of in-depth and quick-glance reviews of products we found interesting. In all cases, unless otherwise noted, we have used the products and are reporting our experiences with them.



One Mathematica strength is versatile graphics

Mathematica Version 2.0

Symbolic mathematics has been an active area of research for at least 20 years. Symbolic mathematics programs accept and manipulate expressions similarly to how you might have learned in algebra and calculus courses. Mathematica is a very modern and powerful symbolic mathematics program already popular on Macintosh, UNIX, VMS and other platforms. For this article, we're using Mathematica Version 2.0 on a SPARCstation IPC running SunOS 4.1.1.

Mathematica is the brainchild of Stephen Wolfram. Stephen is a certifiable math genius and was one of the youngest (perhaps the youngest) people ever invited to a position at the prestigious Institute for Advanced Studies at Princeton. Other notables invited for positions at the IAS have been Albert Einstein, Kurt Goedel and Freeman Dyson. For years Stephen Wolfram was interested in areas such as cellular automata and did significant research in the field. Later he became engrossed in the problem of producing symbolic mathematics computer programs. After a few previous attempts, Mathematica is his winner.

Let's get started with some examples. Here's a simple one: Suppose we are given an equation like x^2+2x+1 to factor:

You would type (`In[1]:=` is Mathematica's prompt):

```
In[1]:= Factor[x^2+2x+1]
```

the response would be:

```
                2
Out[1]= (1 + x)
```

This manipulation can also be reversed:

```
In[2]:= Expand[%]
                    2
Out[2]= 1 + 2 x + x
```

Notice the use of the "%" to pick up the last bit of output rather than have to type it back in. Mathematica is chock full of features like this.

Calculus is another Mathematica forte:

```
In[3]:= Integrate[%,x]

                    3
              2    x
Out[3]= x + x   + -
                   3
```

In this case, I have asked Mathematica to integrate the equation we just expanded with respect to x.

One premier feature of Mathematica is its very easy to use graphics. If I wanted to plot the last result I would just type:

```
In[4]:= Plot[%,{x,0,10}]
```

and a new window would pop open on my screen (I am using X11) with a 2D plot of the equation from Out[3], from zero to 10.

In addition to X11, Mathematica supports NeWS, OpenWindows, SunView, PostScript and TeX (for generating printable output) and other windowing environments. One of the early strengths of Mathematica as a product was good separation between the internal math engine, the kernel and the external user interface, the front end. This allowsWolfram Research to support many platforms easily. If none of these suit your needs, you can use the supplied MathLink protocol to create your own front end, calling Mathematica as if it were a very powerful subroutine package.

Continuing with the example above, we can calculate the equation for a specific value:

```
In[5]:= x = 3
Out[5]= 3
In[6]:= %3
Out[6]= 21
```

Notice the use of "%3" to pick up Out[3] rather than typing it in again.

We could have just as easily assigned a symbolic formula to x, as in:

```
In[7]:= x = (1-Log[a])
Out[7]= 1 - Log[a]
In[8]:= %3
                                          3
                          2   (1 - Log[a])
Out[8]= 1 + (1 - Log[a])   + ------------ - Log[a]
                                   3
```

Mathematica is handy for solving another common problem, an equation for a particular variable:

```
In[19]:= Solve[x^2-2x+1==0,x]
Out[19]= {{x -> 1}, {x -> 1}}
```

Vectors and matrices are also first-class objects in Mathematica; many common matrix functions such as Inverse[] and Eigenvalues[] are provided.

```
In[1]:= m = {{2,0,3},{0,3,0},{1,0,0}}
Out[1]= {{2, 0, 3}, {0, 3, 0}, {1, 0, 0}}
In[2]:= Inverse[m]
                          1        1        2
Out[2]= {{0, 0, 1}, {0, -, 0}, {-, 0, -(-)}}
                          3        3        3
```

The list of mathematical forms and functions that Mathematica supports is too long to begin to introduce in an article like this. In short, they include list operations, programming features, translation to C and FORTRAN, summation, limits, statistics and linear algebra. Many available add-on packages further extend Mathematica into specific areas. Some packages are provided free with Mathematica; others can be purchased; still others can be had from the net.

If you need a more complete overview or wish to investigate whether Mathematica handles some specific area you need, the best way would be to go out and buy Stephen Wolfram's book, *Mathematica*, published by Addison-Wesley, ISBN 0-201-51502-4, Hardbound; 0-201-51507-5, Paperback. This text should be available at any decent technical or college bookstore.

Beyond mathematical manipulation, Mathematica presents an entire environment for working with your mathematical problems. You can save and restore files with Mathematica commands, load packages and interact with the operating system and file system in various ways.

Some versions of Mathematica have what Wolfram calls a Notebook interface. The UNIX version we used did not have such an interface; it provides a fairly simple text interface. You can pass expressions to your predefined editor (e.g., `emacs` or `vi`) with variations of the Edit[] function Wolfram provides.

One thing I found irritating was that if I made a gross syntactic error that caused Mathematica to reject an expression entirely, there didn't seem to be any way to force it into the editor for correction, other than using the native window system's cut and paste. If there is a way to do this, it was certainly not adequately explained in the two pages devoted to the Edit[] function in the text. One typing error I made over and over was using parentheses for functions where square brackets were needed. All I

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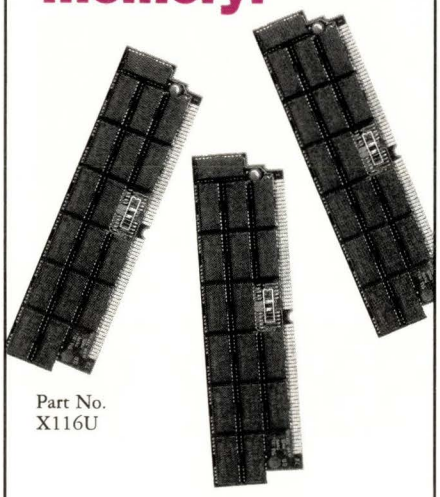

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could do was either type it all back in or carefully cut and paste pieces back together.

Besides the mathematics, which are stupendous, one feature I found exciting was the graphics, both 2D and 3D. After a few minutes of playing around with the basic system, I found myself engrossed in trying to create interesting functions to plot. I was mesmerized.

TESTED BY COMPUTER PUBLISHING LAB SUNEXPERT Magazine SOFTWARE REVIEW

Mathematica

Company
Wolfram Research Inc.
100 Trade Center Drive
Champaign, IL 61820-7237

Phone
(217) 398-0700

Price
Single user: $1,495
Floating license: $2,495

Overview
Symbolics mathematics package with powerful graphics and other features.

Best Feature
Interactive 2D and 3D color graphics and integration into window system.

Worst Feature
Editing and fixing input in the text-based environment.

Mathematica Training

Company
Variable Symbols Inc.
2161 Shattuck Ave., Ste. 202
Berkeley, CA 94704-1313

Phone
(510) 843-8701

Fax
(510) 843-8702

Email
Nancy Blachman
nb@cs.stanford.edu

Overview
Provides on-site Mathematica tutorials.

The only other graphics feature I might have liked would have been some way to change the point of view and other basic factors interactively, with the mouse. You can do all these things (including controlling color and lighting and other graphical effects), but only through reworking the initial expression and adding various options, such as using the ViewPoint and Lighting parameters. It would have been useful to be able to just rotate (etc.) the 3D plot directly in the window with the mouse. Even if it took time to recalculate, it would be easier than retyping.

An entire subculture has developed around Mathematica. There is a Mathematica journal, an electronic mailing list (`mathgroup@yoda.physics.unc.edu`, moderated by Steve Christiansen), and it is often discussed in the newsgroup `sci.math.symbolic`. Tutorials are available from Variable Symbols Inc. (see sidebox). If you have Internet access, you can pick up all sorts of useful packages and programs, including updates, via anonymous ftp to the host `wri.com`.

Overall, Mathematica is a fantastic program. It should be made available, by fiat, to all college students who are learning mathematics. The ability to manipulate and plot mathematical objects makes it all come alive. All who use mathematics seriously in their work are at a serious disadvantage without a package like Mathematica on their desktop computer.

Telebit QBlazer

Telebit modems have long been the workhorse modem of the UNIX community. Their early 9,600-baud protocols revolutionized the UUCP and Usenet worlds, making high-volume batch transfers over the public telephone network available to almost everyone. Telebit has always been a–pardon the expression–trailblazer in modem design.

The new QBlazer modem is once again a unique entry into the high-speed modem market. The QBlazer is a 2.4-inch black cube; I can just about

Telebit's QBlazer will fit into the palm of your hand

put my hand around the whole thing.

Inside this unique packaging lies a state-of-the-art, industry-standard, V.32, 9,600-bps modem. The top of the cube has a speaker grate, the front sports eight LEDs (Send Data, Receive Data, Carrier Detect, DTR, On-Hook, Error Correction Enabled, Modem Ready and Low Battery). The back side has three jacks for RS232 (DIN, similar to what Macintoshes use, to DB9/DB25), AC power and an RJ11 telephone line.

The QBlazer is designed for portability: You can stick this one in your coat pocket or briefcase easily. It also comes with its own padded nylon carrying case to help protect it and stow the cables neatly. It also has a spot inside for a 9-volt battery, off of which the QBlazer can run up to four hours if you're someplace without AC power.

Besides 9,600/V.32, the QBlazer supports 4,800-, 2,400-, 1,200- and 300-baud operation. For error correction, you can use either V.42 (LAP-M) or MNP4 (or neither). Data compression is accomplished via V.42bis or MNP5. The NVRAM can store two phone numbers, up to 38 characters per phone number. There are 40 S registers to get fine-tuned control over the modem's behavior, such as how many rings to wait before auto-answering, but most features are available as Hayes-style AT commands. There is also a full complement of self-diagnostic tests.

The QBlazer comes with a two-year return-to-factory warranty.

One problem we did experience with the QBlazer, which Telebit is apparently aware of, is that when it auto-answers a dialed-in modem, it seems to be hit or miss whether a 2,400/MNP (MNP is a standard error correction protocol) connection can be made. There's never trouble if the originating modem is another Telebit, but we had definite problems with other modems. At 2,400 without error correction, there were no problems, nor were there any at other speeds.

TESTED BY COMPUTER PUBLISHING LAB SUNEXPERT Magazine
HARDWARE REVIEW

QBlazer modem

Company
Telebit Corp.
1315 Chesapeake Terrace
Sunnyvale, CA 94089-9868

Phone
1-800-TELEBIT

Email
modems@telebit.com

Overview
2.4-inch cube, battery or AC, 9,600/V.32, V.42, V.42bis, MNP1-5, also 300-4,800 baud.

Price
$599 (list)

Best Feature
Full-featured V.32 modem in a tiny, portable package at a good price.

Worst Feature
Problems auto-answering 2,400/MNP calls.

Available from:
UUNET Technologies
3110 Fairview Park Drive
Ste. 570
Falls Church, VA 22042

Phone
1-800-4UUNET3

Email
modems@uunet.uu.net

Here's another reminder to send for your reduced price 16-MB SIMM or a free SunExpress catalog.

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☐ Please send me a free SunExpress catalog.

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Phone (_____) _____

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Mail this to:
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SunExpress
P.O. Box 4491
Bridgeton, MO 63044-9822

3EM

Other than that one problem, which I would expect to see fixed in a future ROM revision, this is a nifty little product.

HDS ViewStation FX

Human Designed Systems (HDS) has been around for a long time and has been producing terminals with unique features, such as their early (1985-ish) 66-line full-page ASCII terminals with simple windowing and multisystem support.

HDS's newest product, the ViewStation X terminal, should be another bright star in the company's history. This is a full-featured, high-resolution, color X terminal. The display we reviewed uses a 1,280-by-1,024, 100-dpi, 256-color, 19-inch, 64-KHz Sony Trinitron (about 20% more resolution than a typical Sun workstation) and is remarkably crisp. The terminal is also available in a gray-scale (1,256 shades) model, and other sizes (14-, 16-, 17-inch).

The HDS ViewStation FX uses an Intel Corp. 80960CA RISC CPU with 2 MB to 72 MB of memory. To HDS's credit, the terminal comes ready to plug into either thick-wire (DB15), thin-wire (BNC) or twisted-pair (RJ45) Ethernet. I don't believe I've seen an X terminal that supports all three types of media before. In addition, the ViewStation supports both SLIP and CSLIP (Compressed SLIP) via its two serial ports (one DB25, the other RJ-11). There's also a Centronics bidirectional parallel port (DB25).

The keyboard we reviewed is an IBM 101+ style AT. I found it usable. The Delete key is small (the size of a single key) and the Enter key is huge. There was no problem remapping the Caps-Lock to be a Control key using the standard X11 utility xmodmap. You can also order the ViewStation with a DEC LK401 (VT420)-style keyboard, or a 102-key multinational. I would suggest looking at those if you're not accustomed to IBM-style keyboards.

Now things get surprising, at least for me: The HDS setup menus are full X Window System. When you select the setup box in the lower right-hand corner, the window-manager will do its usual thing and you'll have a setup window in your environment. The menus are easy to use and more or less self-explanatory, assuming you know the sort of things it is likely to present (network masks and font server addresses and so forth).

Investigation of the setup options reveals choices for Open Look or Motif window managers. I killed my window manager (twm) and clicked on the Open Look choice: An Open Look window manager started up inside the X terminal. This is great. I always thought that running the window manager on the remote system seemed wrong (particularly when window manager responsiveness is important). A similar experiment reveals that the terminal can also run a built-in Motif window manager. What a country!

The setup options also have many other choices to control the terminal's behavior, such as XDMCP setup, whether to use backing store, screen-saver control, various telnet settings and so on. There's an option that pops up an X Window to track memory usage in the terminal (a little bar and textual display that is constantly updated).

The server can be run either from the terminal's Flash-PROM or can be downloaded over the net using standard BOOTP and TFTP protocols. You can either set the terminal's address or tell it to use RARP during start-up to discover its own address by querying a server on your network.

Although it came with a tape with something on it, we discovered that the HDS ran fine right out of the box (once we plugged it into power and the network, of course). The tape, it turned out, had some additional fonts. HDS has its own font format beyond standard X11 fonts and provides a few software utilities for doing conversions (also on the tape). There is also a crypt program for encrypting passwords for the terminal onto a remote server.

The HDS ViewStation is one of the most impressive X terminal products I've seen yet. If America could build cars like HDS builds terminals then Mr. Bush could eat at home more often. I highly recommend this product. ⊸

HDS X terminals support up to 72 MB of memory

TESTED BY COMPUTER PUBLISHING LAB
SUNEXPERT Magazine
HARDWARE REVIEW

HDS ViewStation FX

Company
Human Designed Systems Inc.
421 Feheley Drive
King of Prussia, PA 19406

Phone
(215) 277-8300

Overview
X terminal, gray-scale or color, impressive array of features including support for thin, thick and twisted-pair Ethernet, SLIP and CSLIP.

Price
$2,899

Best Feature
Many, very crisp color display, high-resolution (1,280 by 1,024), built-in Open Look and Motif window managers, supports several common network hookups.

Worst Feature
The keyboard we tested was just OK; other keyboards are available.

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HEWLETT PACKARD

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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.

Turn 3/50 into SPARCstation

A product that turns older, Motorola processor-based Sun workstations into SPARCalikes has been introduced by Pinnacle Data Systems. Nameless at the moment, though sometimes called the Pinnacle Three-to-Four, the product is a metal adapter with some associated electronics that support a SPARCstation motherboard. The whole assembly then slides into a Sun 3 to replace the older CPU.

Buyers can use either the company's SPARC-based CPU or one from another vendor. The adapter is currently priced at $295. Pinnacle's SPARC board is $4,295.

Pinnacle Data Systems Inc.
1350 W. Fifth Ave.
Columbus, Ohio 43121
Circle 113

SBus DMA Controller Chip

Nimbus Technology has introduced a DMA controller chip for SBus I/O devices. Called the NIM618, the product can be used to interface almost any kind of peripheral to the SBus. Moreover, the company says it is pin-for-pin compatible with LSI Logic's L68453 DMA chip, except that it can also access any part of the 32-bit SBus address space (the LSI part is restricted to 24-bit addressing).

Nimbus says the chip can be used for complicated peripherals that require bus master capability, like network and disk controllers. However, pricing begins at $35 in quantities of 100, and the company hopes the relatively low price will make the chip attractive to vendors of less expensive, less complex peripherals as well.

Image Analysis on Suns

Software that turns SPARCstations and compatibles into image analysis workstations has been introduced by Scitor. Called OverView, the product is designed to take digitized images–such as satellite or aerial photography–and display them for analysis or modification. Images can be enhanced, given color, measured and annotated. A measure mode provides point-and-click measurement of linear features, areas and point locations.

OverView is capable of dealing with almost any form of digital images. It can import image tape formats from such satellites as SPOT and Landsat. OverView also supports a variety of image data input media, including 1/4-inch tape cartridge, 8mm tape cassette, 1/2-inch 9-track tape, and any SunOS file system device, such as hard disk and CD-ROM.

OverView requires a Sun SPARCstation or SPARCalike with Sun OS 4.1 or later, OpenWindows 2.0 or later, an 8-bit color display buffer, at least 12 MB of main memory and 20 MB of swap space. Pricing begins at $2,995.

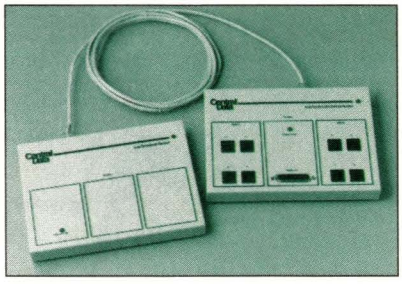
Scitor Corp.
256 Gibralter Drive
Sunnyvale, CA 94089
Circle 112

Nimbus Technology
2900 Lakeside Drive
Suite 205
Santa Clara, CA 95054
Circle 114

scsiTerminal Servers

A family of scsiTerminal Servers has been introduced by Central Data. The products connect to a SPARCstation or compatible via the SCSI port and provide up to 392 serial ports and up to 49 parallel ports. They can support additional devices up to 1,500 feet away from the host.

The Series 2000 product line consists of of the scsiTerminal Server (ST-2001) and the scsiTerminal Concentrator (ST-2008+). Up to seven ST-2001s can share a single SCSI bus. Each ST-2001 can then attach up to



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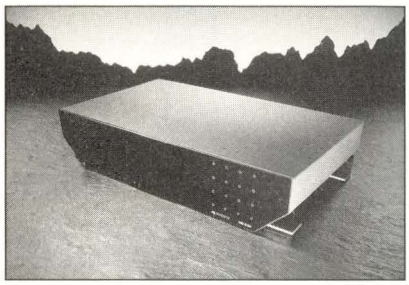
Circle No. 48 on Inquiry Card

seven ST-2008+s via an RS-485 link. Each 2008, in turn, has eight RJ-45 serial ports and one parallel port. Pricing on the 2001 begins at $695, while the 2008+ is $795.

Central Data Corp.
1602 Newton Drive
Champaign, IL 61821-1098
Circle 115

Ethernet-to-Transputer Gateway

SGS-Thomson Microelectronics has introduced an Ethernet-to-transputer gateway. The INMOS IMS B300 is a desktop unit that provides connections between transputer-based devices and Ethernet-oriented systems. The product thus gives Sun workstations a relatively convenient interface to, for example, networks of transputers configured for particular applications.



The B300 contains an implementation of the TCP/IP protocol suite in firmware. It also supports additional layered networking software. Applications programming support is available through the use of socket library interfaces with standard INMOS ANSI C and occam development tools. Pricing begins at $5,032.

SGS-Thomson
Microelectronics Group
1000 East Bell Road
Phoenix, AZ 85022-2699
Circle 116

16-MB SIMMs for Galaxy

A 16-MB SIMM product for the Sun SPARCserver 630MP, 670MP and 690 (popularly called the Galaxy machines) has been introduced by Clearpoint. Called the CPSM-09A/S16-80, the product is populated with 16-MB SOJ DRAMs and incorporates double-sided surface mount technology for higher density and reliability on a single board.

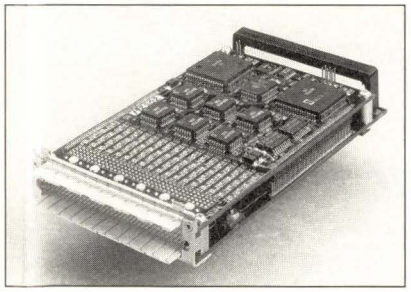
Clearpoint notes that Galaxy users can bring their systems to a total of 1,024 MB with the product. Pricing on the CPSMA/S16-80 begins at $6,000.

Clearpoint Research Corp.
35 Parkwood Drive
Hopkinton, MA 01748
Circle 117

SBus At Sea

An interface adapter that links SBus to the U.S. Navy's NTDS interface has been introduced by GET Engineering. The product consists of an SBus board that provides a full-duplex NTDS parallel data path, which is software-configurable to operate as a peripheral, computer, intercomputer or interperipheral channel. Called the GET 10048301 NTDS/SBus Interface Adapter, the device can be configured to operate in the NTDS standards, SLOW, FAST, ANEW or Type H environments.

The adapter resides in a single SBus slot. It allows the user to write application software that uses the onboard processor to interface with or emulate NTDS devices. The NTDS input and output ports can be independently



programmed to provide level 5 SBus bus interrupts. The NTDS ports are fully software configured. Pricing begins at $4,425, with quantity discounts available.

GET Engineering Corp.
9350 Bond Ave.
El Cajon, CA 92021
Circle 118

Apple AgentMan

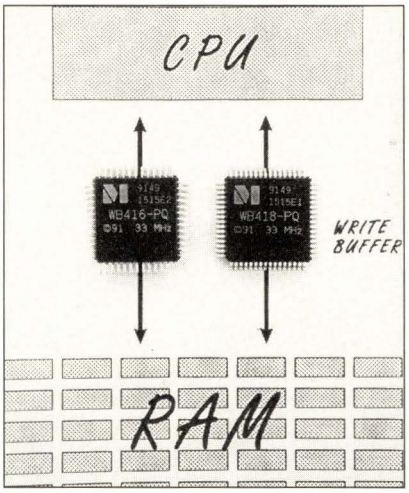
A product that allows SunNet users to monitor AppleTalk devices has been introduced by IPT. Apple AgentMan is an extension of SunNet Manager that allows a workstation user to probe the status of devices on an AppleTalk network. It has a "discovery function," which automatically locates all AppleTalk devices on a network, including those that can be reached through routers and gateways.

Second, AgentMan provides proxy agents, like those in SunNet Manager, that report on the status of AppleTalk devices and sound alarms when network conditions change. These agents can report such things printer status, AppleTalk packet statistics and routing table data. Pricing begins at $595.

Information Presentation
Technologies Inc.
555 Chorro St.
San Luis Obispo, CA 93405
Circle 119

Write Buffer From Matra

Matra Design Semiconductor has announced a suite of chips that provide write buffering between CPU and either memory or peripherals. The Write Buffer Slide products consists of the 16-bit WB-416 and the 18-bit WB-418.



Each is a 4-deep buffer that can be used in combination to build write buffers for 16-, 32- or wider bus CPUs.

The Writer Buffer slice can be used to enhance subsystem performance. In systems with a write-through cache, the Buffer can handle memory writes. In systems using a write-back cache, it be used as a copy-back buffer to minimize the miss penalty of a copy-back cache. The Buffer can also be used as a universal interface for the CPU. Pricing varies according to quantity.

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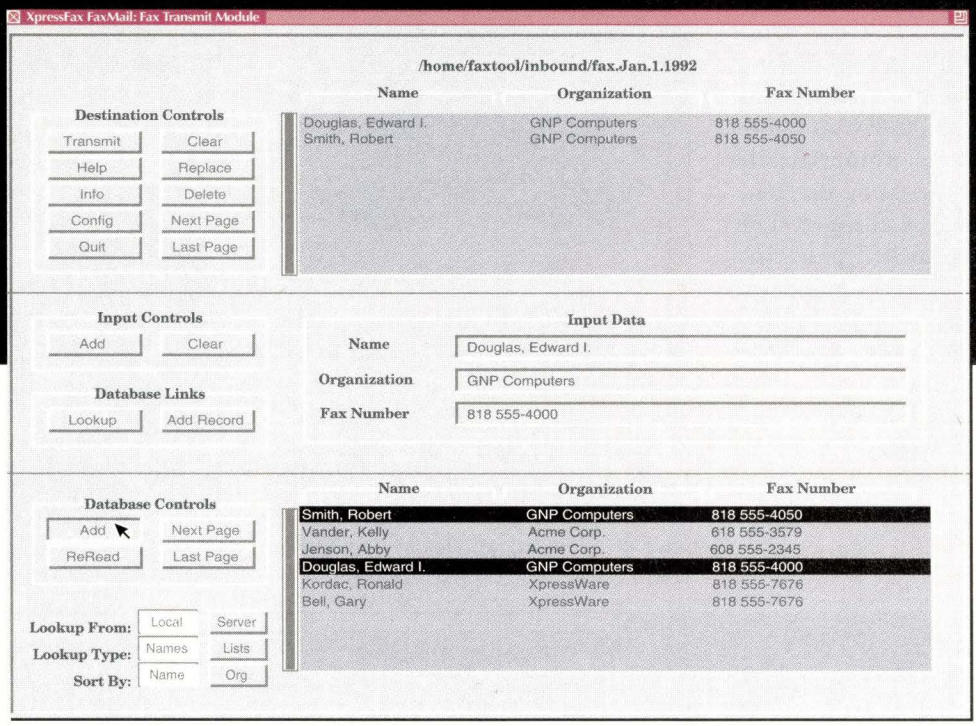

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Circle No. 21 on Inquiry Card

Matra Design Semiconductor
2895 Northwestern Pkwy.
Santa Clara, CA 95051
Circle 120

Multiuser Spreadsheet

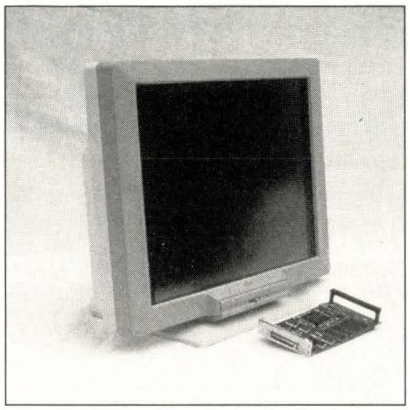
Quality Software Products has introduced a groupware version of its eXclaim! spreadsheet. By using COeX software from Twin Sun, the new version of eXclaim! allows multiple users to simultaneously edit the same spreadsheet on different workstations.

The company says that when a user makes a change, the CoEX version of the spreadsheet can automatically inform everyone else using the same spreadsheet of those changes. The product also offers standard spreadsheet features, plus windowing, pull-down menus, 3D business graphics, dialog boxes and so on. Pricing begins at $695 for a single-user license.

Quality Software Products
5711 West Slason Ave.
Suite 240
Culver City, CA 90230
Circle 121

16-inch Flat-Panel Display

A 16-inch flat panel display has been introduced. Integrix says that its Flat Panel Subsystem may be the largest flat-panel display available for SPARC-



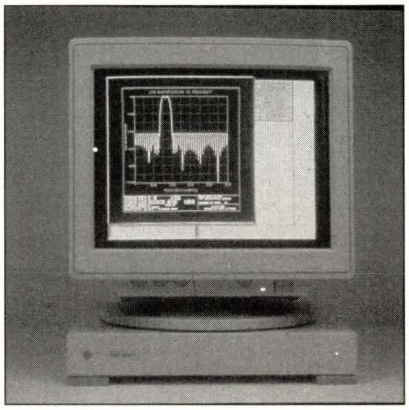
stations and SPARCalikes. The product is a 32-bit AC plasma device measuring 3 1/2 inches in depth that offers 1,280-by-1,024 resolution.

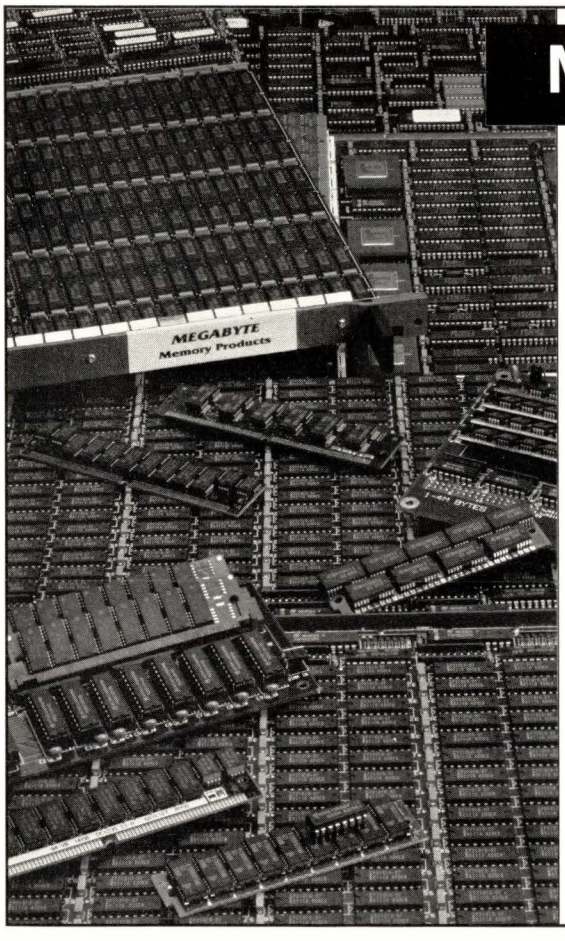
The display comes with a single-slot graphics controller called the Model SFD-100. This controller can transfer data at 32 pixels per transfer, which compares with eight pixels per transfer on Sun's own product. The complete system is $5,500. The controller card alone is $1,250. The product can be either set on a desk or mounted on a wall. There is also an optional 1,024-by-1,024 display.

Integrix Inc.
6713 Convoy Court
San Diego, CA 92111
Circle 122

DSP Filter Design and Analysis

A digital filter design and analysis package for Sun workstations and SPARCalikes has been introduced by





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11772 Sorrento Valley Rd. Su. 160 San Diego, CA 92121

Circle No. 32 on Inquiry Card

Momentum Data Systems. QEDesign 100+ is a package for DSP professionals needing design filters for specific applications. The product performs complex mathematical computations for filter designs, while also providing graphical displays and design reports. The product offers three types of filter design: Finite Impulse response (FIR), Infinite Impulse response (IIR) and Equiripple Finite Impulse response (also known as Parks McClellan).

The product is available under Open Look and SunView on the Sun 4. Pricing begins at $4,200.

Momentum Data Systems Inc.
1520 Nutmeg Place
Suite 108
Costa Mesa, CA 92626
Circle 123

More Memory for Galaxy

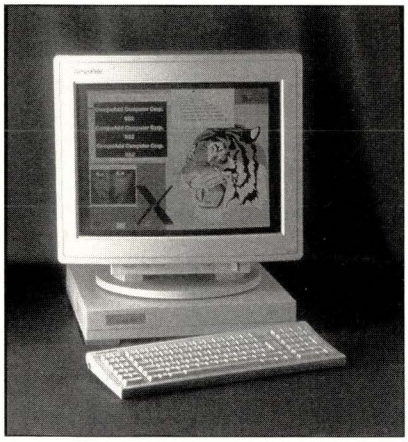
Helios Systems has introduced a 16-MB SIMM module for Galaxy machines. The Helios 16-MB SIMM module allows users to increase a Sun 600MP series multiprocessor server to 320-MB CPU board memory. They can also use the Helios product to increase expansion board memory to 1 gigabyte.

The product fits into existing SIMM slots on both the CPU and memory expansion board. Pricing begins at $3,000.

Helios Systems
1996 Lundy Ave.
San Jose, CA 95131
Circle 124

SPARCalike 2 Unleashed

CompuAdd has unveiled its third-generation SPARCalike, a 40-MHz workstation that clocks at 28.5 MIPS.



The SS2 is 100% binary compatible with Sun's SPARCstation 2 and comes with Solaris 1.0 preinstalled. For $9,995, you get 8 MB of RAM, a 240-MB hard drive, a 1.44-MB floppy drive and a 16-inch Sony Trinitron monitor.

The workstation comes with a one-year warranty and toll-free technical support for the life of the product.

CompuAdd Computer Corp.
12303 Technology Blvd.
Austin, TX 78727
Circle 125

40-MHz SPARCalike Enhanced

Tatung Science & Technology, which has been shipping its 40-MHz SPARCalike, the COMPstation 40, since November 1991, has upgraded the machine with a 535-MB internal drive. As a result, Tatung customers now can choose from 207-, 340- and 535-MB hard drives for the machine.

In addition, because the COMPstation 40 is designed to accommodate dual internal drives, customers can

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GUI (goo'•ee) n. Graphical User Interface; absolutely mandatory in state-of-the-art software development; the key to successful software applications. ***See Quest***

◆ ◆ ◆

Quest ObjectViews C++ (qwest ob•jekt•vyoos see•++) n. Drastically increases productivity; dynamic switching capability between Motif and OPENLOOK; superior to intrinsics using object-oriented reusable C++ classes; Motif compatible periodic table; premier object-oriented C++ GUI builder; superset functionality of Interviews ***See Quest***

QuestMotif (qwest•mo•teef) n. Superior shared libraries optimized for memory efficiency; support for Sun OpenWindows; enhanced Motif and X server for full Sun keyboard support; benefit from Quest's OSF membership; selected by many Fortune 500 and Government/ Defense as their Motif standard ***See Quest***

Quest UIM/X (qwest yoo•i•m•x) n. Premier Motif GUI Builder; dynamically test callback behavior with a robust C interpreter; generates quality Motif code; UNIX World "Best Product"; supports 100% of the OSF/Motif toolkit; corporate style guideline creation and enforcement ***See Quest***

Quest Training (qwest trayn•ing) n. Incredibly informative training classes offered by Quest regarding X, OSF/Motif, UIM/X, UNIX, C, C++, and more... ***See Quest***

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In cooperation with Sun User Group and Sun Microsystems
SUN OPEN SYSTEMS EXPO '92

double the 535-MB capacity to achieve more than 1 GB of internal storage. A machine configured this way could be used as a server for up to 140 clients on a network, according to the company.

A COMPstation 40 with a 19-inch color monitor, 32 MB of RAM, a single-slot graphics accelerator and 535 MB of internal storage sells for $13,180. The machine comes bundled with Solaris 1.0 and Motif, X11R4 and X.desktop.

Tatung has also announced that Solaris 1.0 is available for the Mariner 4i, the SPARCalike developed with Mars Microsystems Inc. that Tatung now sells exclusively.

Tatung Science & Technology Inc.
2060 Ringwood Ave.
San Jose, CA 95131
Circle 126

More 40-MHz Upgrades

Opus has begun shipping a 40-MHz upgrade kit for its Personal Mainframe customers. The kit consists of a 40-MHz motherboard, Solaris 1.0, documentation and installation instructions. Using the kit, customers can boost performance from 15.8 MIPS to 29 MIPS. The kit lists for $4,195.

The upgrade is designed to replace 20- and 25-MHz processors in all current Opus SPARCalikes, including the Personal Mainframe Models 5120 and 5340.

Opus Systems Inc.
329 North Bernardo
Mountain View, CA 94043
Circle 127

Data Compression For Sun 4s

A data-compressing archiver for Sun 4 workstations is now available from Precise Electronics. The product, Uni-Zip, is compatible with the DOS archiver Pk-Zip and features the same syntax and compression capabilities. The company claims that Uni-Zip archives are 10% to 30% smaller than other UNIX archivers' files. Uni-Zip also provides 32-bit cyclical redundancy check, providing it with more security than many archival products.

Other features of Uni-Zip include the capabilities to save and restore directory trees, preserve UNIX filenames, test archive integrity without extraction, attach descriptive comments to files, select files by date, update archives incrementally and exclude selected files.

Uni-Zip lists for $149 per single CPU license and comes with a 30-day money-back guarantee.

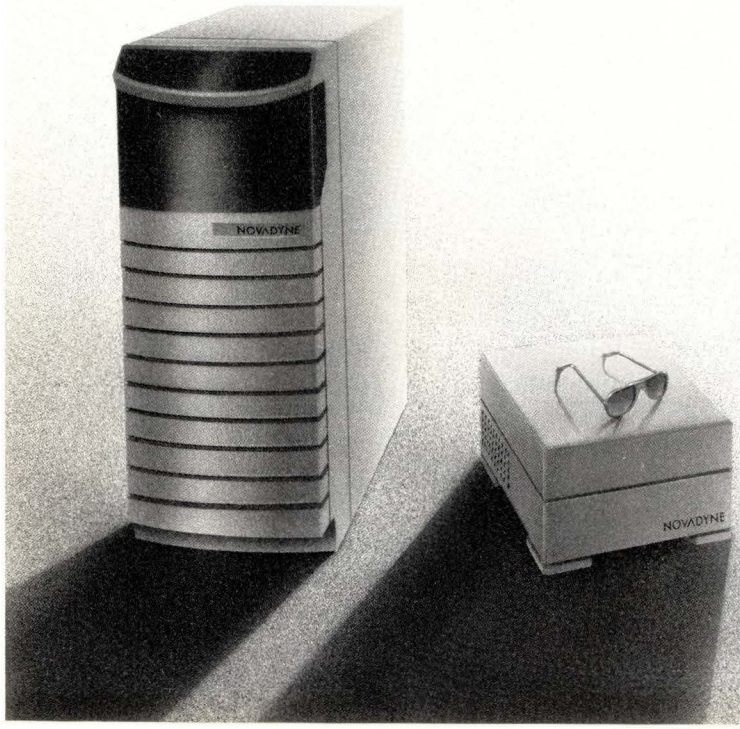
Precise Electronics
31 Englewood Ave.
Brookline, MA 02146
Circle 128

Recital Now Available for Sun

Version 7.1 of the Recital relational database now runs on Sun SPARC systems.

Features of 7.1 include support for Recital/4GL programs executing from shared global memory; a distributed cache manager; and more than 60 other enhancements to the Recital 4GL and related development tools. The total number of open files has been upped to 200. According to Recital, the developer of the product, release 7.1 "allows users to maximize throughput for transaction-oriented applica-

What's Novadyne's connection to Sun®? For starters, 32-128 ports.



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tions and minimize the overhead on available resources."

A software developers kit is also available with 7.1. As part of the kit, developers receive an open applications programming interface.

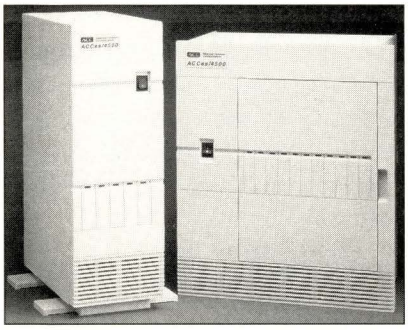
Version 7.1 is available on more than 70 UNIX platforms. Contact the company for pricing.

Recital Corp.
85 Constitution Lane
Danvers, MA 01923
Circle 129

Hubs Minimize Network Downtime

Advanced Computer Communications has unveiled a line of bridge-router hubs that provide up to 20 connectivity ports and are designed to minimize network downtime.

The ACC Enterprise System (ACCes/4500) is available in a five-slot or 11-slot enclosure and can connect multiple local and remote networks. The system provides redundant power supplies and allows for hot-card swaps, thus reducing downtime. The ACCes/4500 also features a high-capacity bus for pro-



viding high-speed network connections, including Ethernet, token-ring, X.25 and frame-relay technologies.

With Series 4000 software, networks can be connected via bridging, multi-protocol routing or simultaneous bridging/routing.

The hubs are available for $14,995, to $38,995, depending on enclosure and module configuration.

Advanced Computer Communications
720 Santa Barbara St.
Santa Barbara, CA 93101
Circle 130

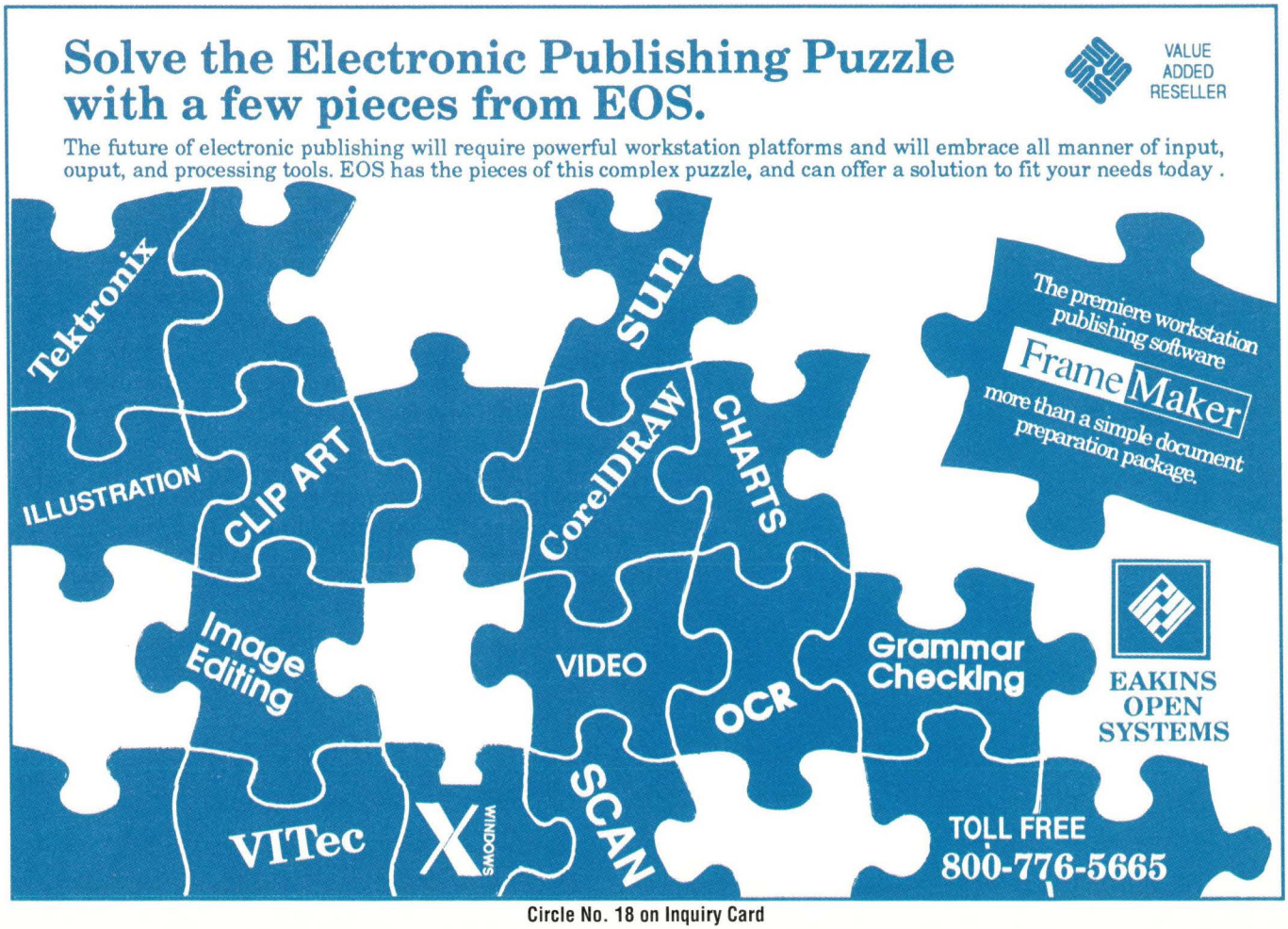
Disk Array Adds Performance, Capacity

The Rimfire 6600 disk array from Ciprico supports the fastest and largest drives available today, according to the company. The array offers transfer rates of 10 MB/s and 5.4 GB of storage.

The 6600/10 series is a family of SCSI-2 to ESDI disk arrays using a RAID-3 implementation with five drives. Failed drives can be hot swapped–i.e., replaced while the disk array remains on line. The family offers sector blocking/deblocking, which maximizes disk-array format efficiency while maintaining operating system compatibility. Ciprico claims this feature provides more than 85% usable space, as compared with less than 60% for arrays without this capability.

The Rimfire 6610 is available in either a desktop/rack-mount or tower enclosure. (The controller alone is also available to OEMs.) The 6610 subsystem (without drives) has an OEM list price of $15,395 for the desktop version. The deskside version has an OEM list price of $11,895.

Ciprico Inc.
2955 Xenium Lane
Plymouth, MN 55441
Circle 131



Circle No. 18 on Inquiry Card

Tool for FORTRAN Programmers

A product that automatically generates correct FORTRAN headers has been introduced by Software Systems Design. FTN/HDR helps assure developers and independent software vendors that their source-code comments are correct by generating FORTRAN header source-code comments that accurately reflect the interrelationship of their subroutines and functions.

FTN/HDR analyzes a FORTRAN program's modules and generates source-code files that contain comments describing "Calls," (routines involved with a particular module) and "Called_by" headings (routines that call the module in turn), and inputs and outputs. Pricing begins at $350 for workstations. It is currently available on Sun 3, Sun 4 and SPARCstations, as well as assorted other UNIX, MVS and DOS systems.

Software Systems Design
3627 Padua Ave.
Claremont, CA 91711
Circle 132

FORTRAN Compiler Suite

Magus has introduced a FORTRAN compiler validation suite, the Magus Automated Software Testing procedure, or MAST. The product contains a suite of FORTRAN programs that work with the company's Numerical Analyst library product to test FORTRAN compilers for validity. MAST executes automatically, without supervision, and then reports the results of all tests with pass/fail messages in a single summary file.

The company says MAST differs from most compliance suites in that it not only tests for compliance to published standards for FORTRAN, but it also validates floating-point calculations. The results of floating-point calculations are said to be usually approximate, with answers varying from run to run even on the same system. However, MAST includes the concept of a computed result being "close enough" to an exact result. Each problem can be given its own level of allowed error.

Magus
P.O. Box 390965
Mountain View, CA 94039
Circle 133

Corollary Terminal Concentrator

A terminal concentrator that can support terminals up to 2,500 feet away has been introduced by Corollary.

The 8/tctp+ features eight ports with RS422 for data signals and RS423 for control signals–that means that the concentrator can be removed from its terminals. The company says that it is particularly useful in point-of-sale applications, where terminals (such as cash registers) must be at a distance from the concentrator. The product can also link to RS232 machines. It connects to serial devices via a 15-pin D-shell interface. There is also an optional power supply for situations where the concentrator must be installed a long distance from the host system. Pricing begins at $695.

In addition, the company introduced a new version of its eight-by-eight driver, which supports AT&T UNIX System V Release 4.0. The new driver includes support for the AT&T Streams communications interface. It is available to Corollary customers at no charge.

Corollary Inc.
P.O. Box 18977
Irvine, CA 92713
Circle 134

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AutoCAD Librarian

A program that manages CAD drawings has been announced by SoftSource. Drawing Librarian for Sun allows users to view AutoCAD drawing files, DXF files and slide files. Users can call up, display and manipulate AutoCAD drawings without running AutoCAD, or even knowing how to use AutoCAD, which the company says is an advantage for users who may just wish to check a file rather than going through the time-consuming process of invoking the program.

Moreover, users can mark revision notes on AutoCAD drawings without also changing the original files. Users mark up AutoCAD drawings via a menu of drawing commands, but all changes are saved into a separate file. This means that even read-only files can be revised. Prices begin at $1,000.

SoftSource
301 W. Holly St.
Bellingham, WA 98225
Circle 135

Discovery Machine

A product that allows information to be automatically extracted from a database, without the user needing to know SQL, has been announced by IntelligenceWare. Called IXL: The Discovery Machine, the software is a combination of a built-in query processing module and a database interface, with a built-in statistical module for data analysis and "discovery and induction module."

The company says that the product allows a user to search databases even if the exact criteria for the search isn't fully known. Rather than the user forming questions and asking them, as occurs with a query language, IX allows the user to state the general theme of the search, and the product then forms and asks the questions itself. Currently the product is available on Sun for a variety of databases, including Sybase, Oracle and Ingres. Pricing begins at $7,500.

IntelligenceWare Inc.
5933 W. Century Blvd.
Los Angeles, CA 90045
Circle 136

PV Add-on Provides Gridding

Precision Visuals and Geophysical Techniques have introduced an add-on to Precision Visuals' PV-WAVE scientific-visualization product that provides advanced gridding. This is the process by which large, nonuniform data sets can be transformed into precise surfaces and contours that can then be displayed graphically. Called PV-WAVE:GTGRID, the product can turn 10,000 irregularly located data points into a 40-by-40 grid in 30 seconds on a SPARCstation.

The product gives users a choice of algorithms, including traditional methods such as bilinear interpolation and inverse distance for quick approximations and adaptive and convergent techniques for fast, accurate minimum curvature solutions. In addition, the company says that GTGRID gives the user direct control of gridding specifics, such as the number of rows and columns in an array, the X, Y and Z clipping planes, value substitution for missing data points and so on. Pricing begins at $895.

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Compact Price

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The **Sun User Group** is proud to announce X11R5 and GNU on a CDROM, priced at $50 to SUG members, including a caddy.

The SUG 1992.1 disk contains 543MB of essential source code on an ISO 9660 disk (which means it can be used by PC, Macintosh, and other workstations as well), and comes with one of those hard to find caddies for only $50! If you are a not a SUG member, you can become one for an additional $40 if you live within the US, or $55 outside.

For more information contact:

The Sun User Group
1330 Beacon Street, Suite 315, Brookline, MA 02146
USA
Phone: +1 617 232-0514 Email: office@sug.org

Circle No. 60 on Inquiry Card

Precision Visuals Inc.
6230 Lookout Road
Boulder, CO 80301
Circle 137

Fiber-Optic Interface Cards

Bit 3 Computer unveiled two fiber-optic interface cards for its VMEbus- to-VMEbus adapters, which provide a high-performance fiber-optic link between two VMEbus chassis.

The Model 400-5 is an economical version of the interface that requires one duplex fiber-optic cable. One fiber is used for transmitted data and one for received data. This model supports data transmission rates to 15 MB/s. The Model 400-6 requires two duplex fiber-optic cables and supports data-transfer rates to 30 MB/s. Two fibers are used for transmitted data, and two for data received.

Two fiber-optic interface cards are required for the fiber-optic link. A card is connected via a ribbon cable to a Bit 3 adapter board installed in each VMEbus chassis. The cards are interconnected by 62.5/125-micron glass duplex OFNP-grade fiber-optic cable. Pricing is $1,095 for the Model 400-5 and $1,795 for the Model 400-6.

Bit 3 Computer Corp.
8120 Penn Ave. So.
Minneapolis, MN 55431-1393
Circle 138

Add-In SBus Module

Performance Technologies has announced the availability of its Narrow/Fast SCSI-2 add-in SBus module for SPARCstations and SPARCstation clones. The Model PT-SBS430 provides add-in SBus-based SCSI-2 capability on Sun SPARCstations. The module supports SCSI-2 transfers up to 10 MB/s.

The PT-SBS430 is available with single-ended or differential SCSI connection. The single-ended version includes active SCSI bus termination to maximize data integration at the extended SCSI transfer rates. The product is supplied with "plug-and-play" driver support that is fully compliant with the Sun Common SCSI Architecture (SCSA).The software driver supplied by Performance Technologies also includes an Adaptive Synchronous Negotiation feature that "tunes" the SCSI-2 host-target operating environment for optimum transfer performance and data integrity under actual SCSI bus conditions. Pricing: $695 (Single-ended SCSI-2 Adapter).

Performance Technologies Inc.
Computer Products Division
315 Science Pkwy.
Rochester, NY 14620
Circle 139

OODBMS for RISC

Objectivity announced support of its Objectivity/DB object-oriented database management system and joint marketing activities for Silicon Graphics Inc.'s family of RISC-based systems. This software is made for technical and scientific applications. It provides consistently high performance as databases grow and the number of users increases. It supports application interoperability through automatic transparent conversion of incompatible data formats across different systems architectures and networks.This product features a fully

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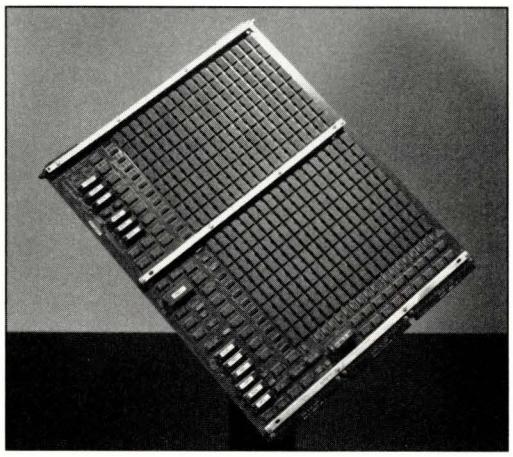

AnTeL offers 100% Solbourne Kbus-compatible memory at attractive third-party prices. Modules work in all 5 and 5E series servers. The S128M and S32M are 128-Mbyte and 32-Mbyte modules respectively. Let your applications have a stretch without sacrificing an arm and a leg.

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Circle No. 10 on Inquiry Card

distributed architecture that maximizes the use of distributed workstations and provides complete flexibility in storing data.

The product supports Silicon Graphics' Iris Indigo systems; DEC RISC/Ultrix; VAX/Ultrix; HP 9000 series 300, 400, 700, 800; IBM RS/6000; Sun's Sun 3 and SPARCstation. Prices are from $15,000 to $30,000, depending on users and requirements.

Objectivity Inc.
800 El Camino Real
Menlo Park, CA 94025
Circle 140

Bad Memory?

Andromeda Systems has introduced the SCSI CacheMaster, which adds cache memory and/or RAM Disk to any SCSI computer systems and can reduce disk-access times to less than .02 ms. It contains a high-speed, 10-MIPS processor, cache memory from 2 MB to 320 MB and Andromeda's exclusive modem-loadable firmware capability. The CacheMaster can intelligently cache all the I/O operations of the attached SCSI Winchester, tape or optical devices. The device can be used as a SCSI RAM disk to satisfy those applications requiring maximum response performance. It is software-selectable as a RAM disk and/or cache memory and may be partitioned for any combination or memory size.

The CacheMaster has a 5 1/4-inch half-height form factor and has the same style power and I/O connections as the standard SCSI devices. Cache memory sizes of 2 MB through 320 MB are available with a cost per megabyte of $250 to $500.

Andromeda Systems Inc.
9000 Eton Ave.
Canoga Park, CA 91304
Circle 141

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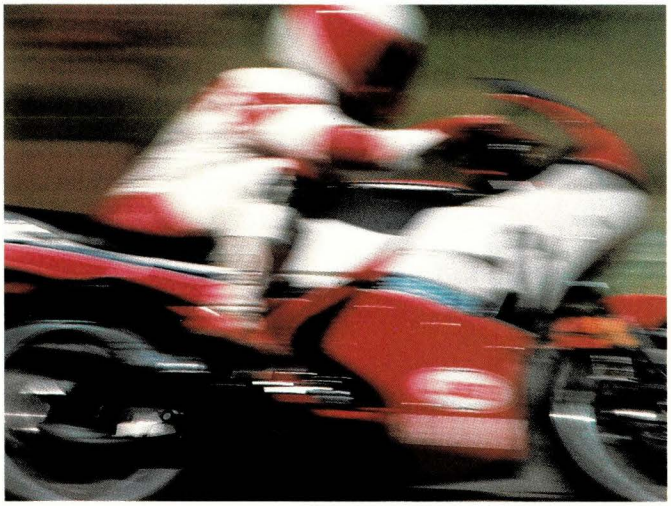
If you could have anything you wanted in a C and C++ programming system, what would you like?



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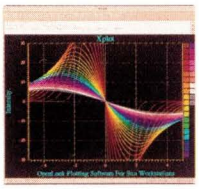

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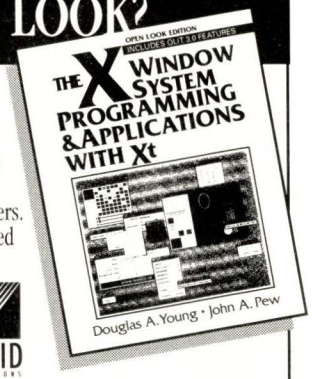

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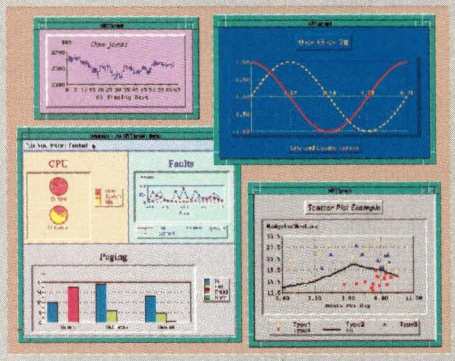

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CIRCLE NUMBER		PAGE
1	American Computer Rental	43
2	ANDATACO	35
59	ANDATACO	37
3	AnTeL	91
4	Apex Computer	10
5	Apunix Computer	13
6	Arche Technologies	92
7	Artecon	6
8	Artecon	7
9	Aurora Technologies	89
10	Aurora Technologies	91
11	BALR	22
12	CenterLine Software	9
13	Central Data	2
14	Cranel	14-15
15	CS Electronics	89
16	Datalease	90
17	Dataram	18
	Digital Equipment	41
18	Eakins Open Systems	88
19	Engineering Design Team	73
20	Falcon Systems	28-29
21	GNP Computers	83
22	Gensym	31
23	Helios Systems	49
24	Hewlett- Packard	79
25	ICS	69
26	IGM	44
27	Inmac	26
28	Insignia Solutions	12
29	Intersolv	62
30	Lucid	93
31	Marner International	24
32	Megabyte Memory Products	84
33	MiLAN Technology	inside back cover
34	Minicomputer Exchange	34
35	National Instruments	67
36	Novadyne Computer Systems	87
37	Novadyne Computer Systems	back cover
38	Performance Technologies	53
39	Quest Windows	85
40	R Squared	11
41	Rave Computer Association	33
42	Scientific Computing Associates	45
43	Storage Dimensions	16-17
44	Sun Microsystems	60-61
45	Sun Microsystems	64-65
46	Sun Microsystems	70-71
47	Sun Microsystems	76-77
48	Sun Microsystems	81
	Sun Open Systems Expo	86
60	Sun User Group	90
49	Tadpole Technology	inside front cover-1
50	TGV	21
51	Transitional Technology	51
52	VI Corp	5
53	Visual Information Technologies	59
54	Xcelerated Systems	42
55	Zetaco	38-39
56	ZZYZX	23
57	ZZYZX	25
58	ZZYZX	27

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