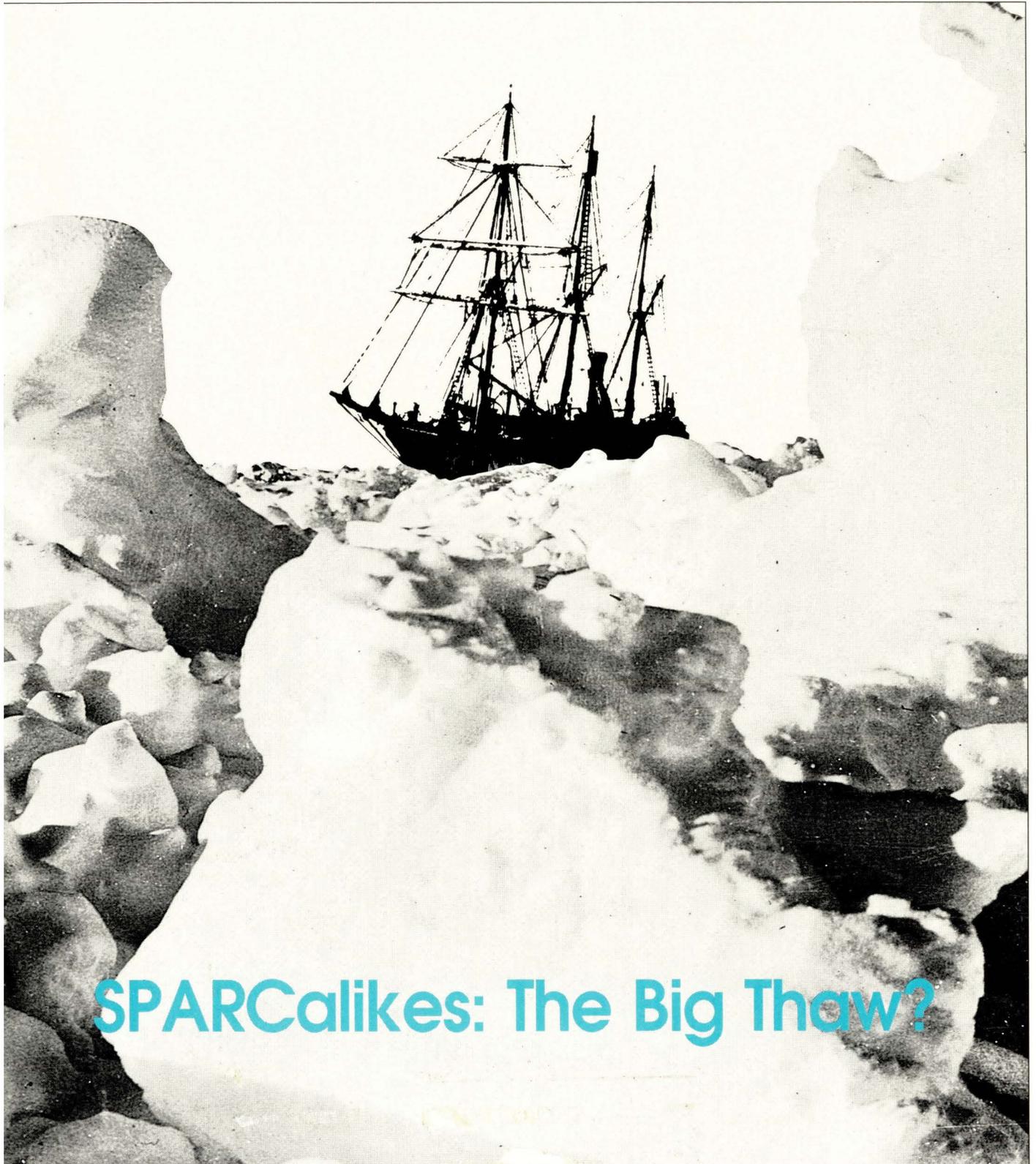


SUN EXPERT

An Independent Forum for Open Systems

MARCH 1992 Vol. 3 Num. 3 \$4.50

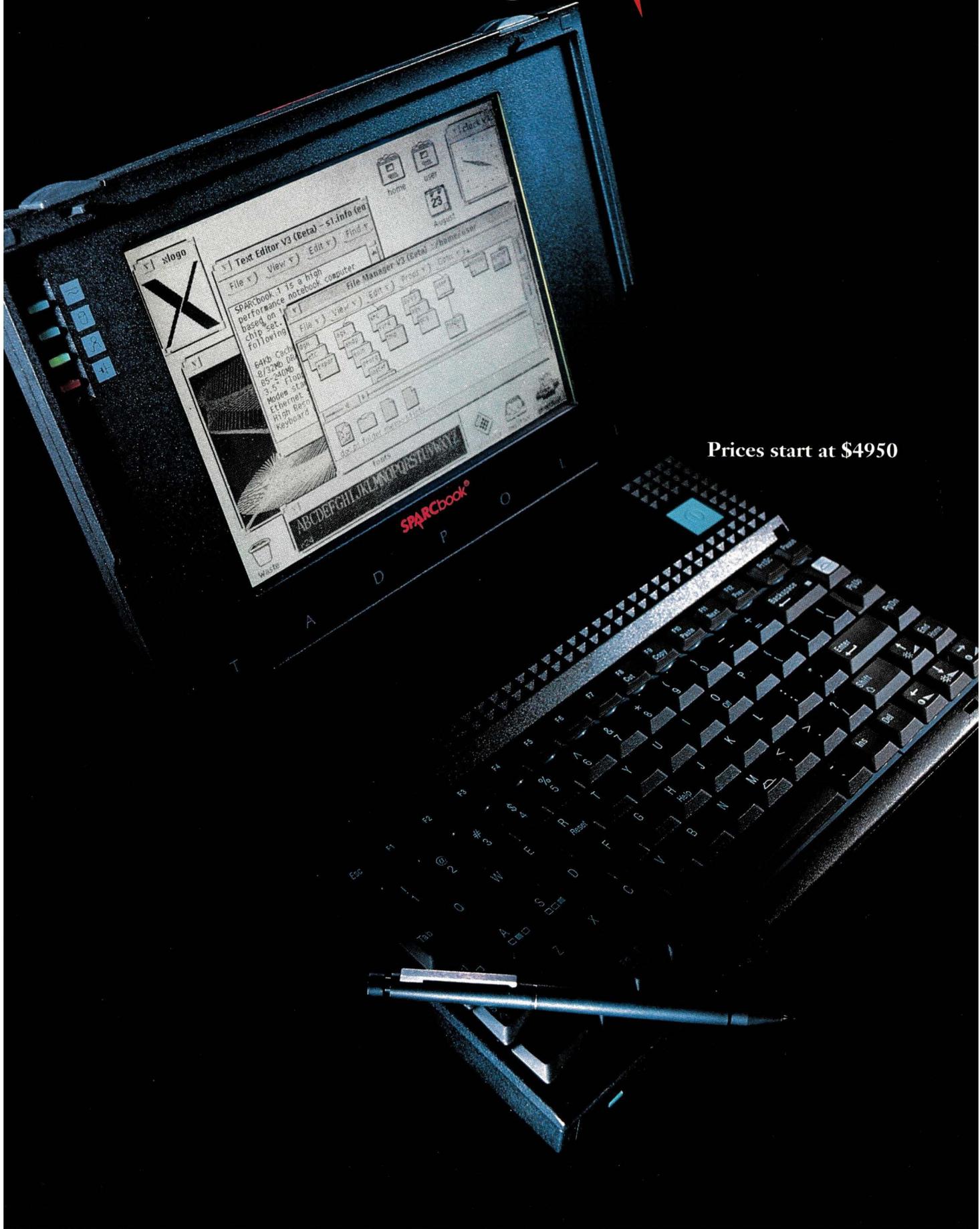


SPARClikes: The Big Thaw?

Computer Publishing Lab: SoftPC

Get Ready for Solaris 2.0

Introducing **SPARCbook**[®]



Prices start at \$4950

Meet the Notebook that Breaks the Mold

At just 6.8 pounds, SPARCbook 1 is light enough to carry comfortably and small enough to fit in your briefcase. Yet it incorporates the same power of the world's most popular desktop workstations from Sun Microsystems, including: a SPARC RISC processor sustaining 18 MIPS, 8 or 32 MB of fast DRAM and up to 240 MB of disk space.



Now you can run SPARC and DOS-compatible applications unmodified—anywhere. SPARCbook comes complete with SunSoft's Solaris 1.0.1 SPARCbook Version operating system enhanced for portable operation and Insignia Solutions' SoftPC DOS emulation software.

In the office, SPARCbook is a powerful desktop workstation. It connects to your corporate Ethernet network and supports VGA or Super VGA displays for big-screen color graphics and VGA projection units for presentations.

On the road, it travels with you to business meetings and into the field for sales, service and maintenance calls. SPARCbook's innovative MouseKey integrates the convenience of an external mouse into the keyboard. An internal 2400 baud modem with SendFax capability puts you in touch with information and people at the office—or around the world.

PROCESSOR	25 MHz SPARC IU and FPU
DRAM	8 MB or 32 MB
INTERNAL STORAGE	85 MB to 240 MB hard drive options 1.44 MB 3.5" floppy drive (85 MB and 120 MB units)
DISPLAY	Gray scale or color 640 x 480 resolution LCD External VGA or Super VGA support
COMMUNICATION	Ethernet and modem with SendFax capability
BATTERY	Removeable, rechargeable NiCad battery
KEYBOARD	82 full-size keys including integrated MouseKey and 12 function keys
DIMENSIONS	11.8" x 8.5" x 1.9"
WEIGHT	6.8 pounds (with battery)
BUNDLED SOFTWARE	Solaris 1.0.1 SPARCbook Version (SunOS 4.1.2) operating system with X11/NeWS window server and OpenWindows Version 3 with DeskSet tools, modem with SendFax, Ethernet, power management software and MS-DOS emulation with hardware VGA graphics

A sophisticated power management system maximizes the life of your battery, ensures data integrity and saves time. For less demanding applications, you can conserve battery power by switching the processor's speed from 25 MHz to 12.5 MHz. The automatic SAVE and RESUME function safeguards your system from unexpected power down and eliminates the need to boot the system when you switch it on.

Tadpole's limited warranty protects your productivity with toll-free technical support and prompt hardware repair free for one year.

SPARCbook 1 is the only workstation that offers the performance and versatility you need—whether you're in the office or on the move.

Find out more about SPARCbook today. Fax us at 512-338-4360 or call:

800-232-6656

T A D P O L E

SPARCbook is a trademark of SPARC International, Inc., licensed exclusively to Tadpole Technology Inc. General Notice: Some of the product names used herein are used for identification purposes only and are trademarks of their respective companies. Copyright © 1992 by Tadpole Technology Inc.

Circle No. 45 on Inquiry Card

RESOLUTION REVOLUTION. RASTERFLEX™. SIMULTANEOUS 8 AND 24 BIT WINDOWS.

VITec's new RasterFLEX™ series of raster accelerators advances the revolution in true-color processing.

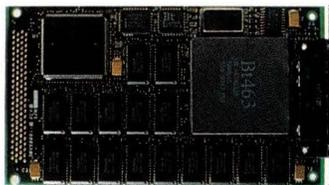
RasterFLEX-32™ brings unprecedented capability to desktop Sun SPARCstations™ and SPARC®-compatible workstations.

RasterFLEX-32 offers flexibility to drive simultaneous manipulation and display of true-color (24 bits-per-pixel) and grayscale/pseudocolor (8-bits-per-pixel) windows.

Graphics and photographs can be merged, allowing non-destructive graphic overlays on top of true-color images.

RasterFLEX-32 provides accelerated performance packed on a single Sbus card that is loaded with Open Windows™ and X Window System™ (V11R4) software environments for plug-and-play performance.

Call us and join the true-color revolution. Also ask about the RasterFLEX-8™ and RasterFLEX-HR™ high resolution products.

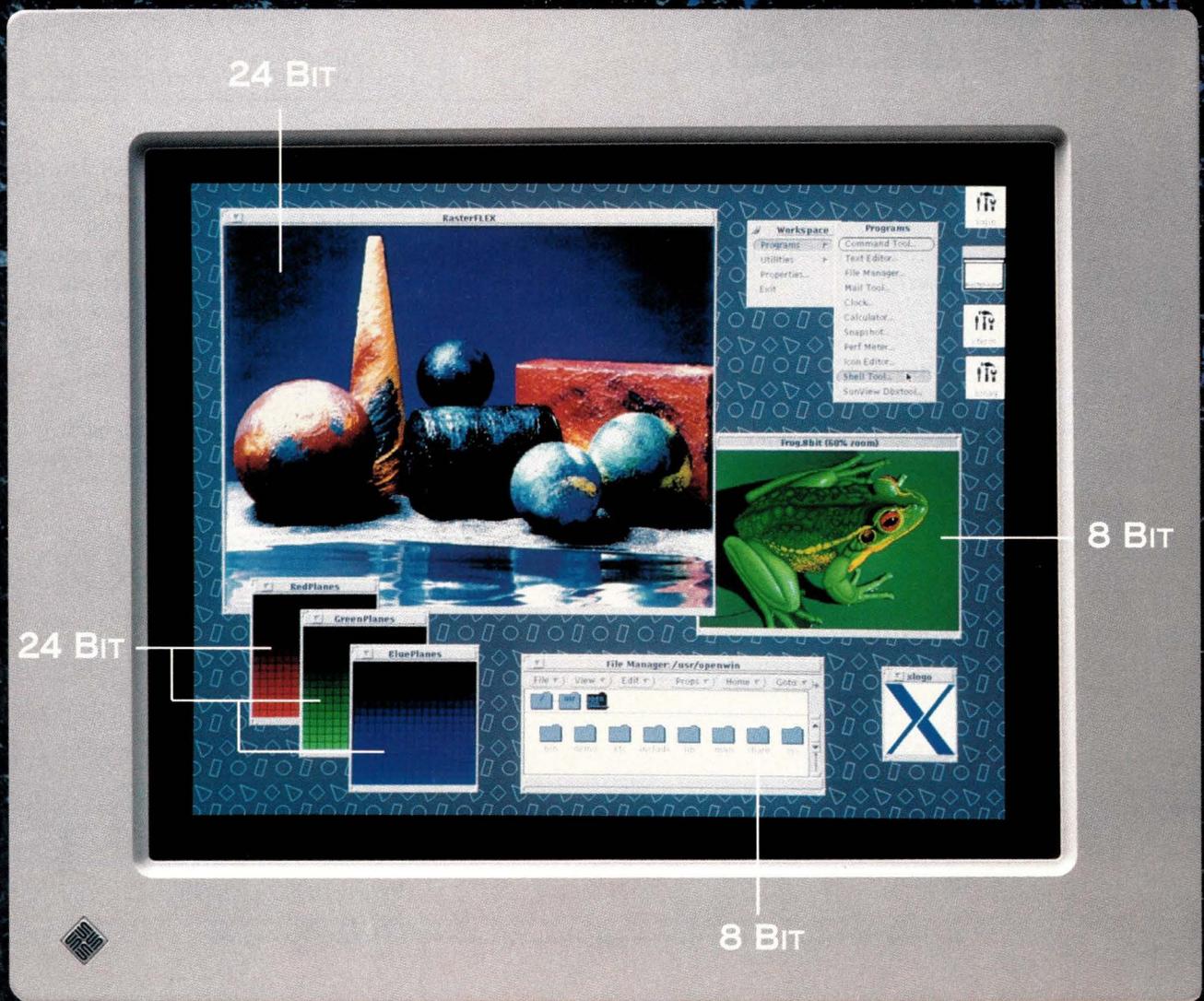


THE RASTERFLEX-32 CARD.

VITec

Visual Information Technologies Inc.
3460 Lotus Drive, Plano, Texas 75075
800-325-6467 (214)596-5600

RasterFLEX, RasterFLEX-32, RasterFLEX-8, and RasterFLEX-HR are trademarks of Visual Information Technologies Inc. OpenWindows is a trademark of Sun Microsystems Inc. X Window System is a trademark of MIT. SPARC and SPARCstations are trademarks of SPARC International Inc.



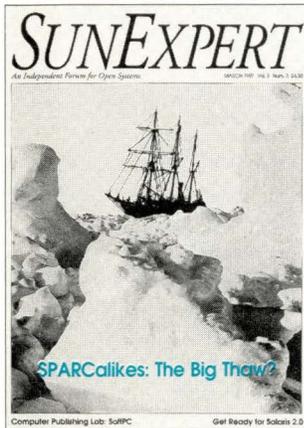
FEATURES

- 48 **The Big Thaw?** – Sun's chill on the SPARC-compatible/clone market may be over as vendors warm to the challenge of marketing and distributing their SPARClikes. Mary Jo Foley

Including on Page 56:

- A Sampling of SPARClikes** – Choose from more than 45 systems from 25 companies. Maureen McKeon

- 60 **Computer Publishing Lab: SoffPC** – If for some curious reason—like running thousands of low-cost DOS applications—you want to turn a SPARC system into a synthetic PC/AT, here's a painless option. Ian Darwin



Cover photograph of Sir Ernest Shackleton's ship *Endurance*, 1916, courtesy of The Bettmann Archive.

NEWS

- 8 Includes: **Solaris 2.0: Get Ready—Here It Comes, Sun in Graphics: To Be or Not To Be?, A Little Mac on Your Sun?**

COLUMNS

- 21 **Ask Mr. Protocol—The Desktop Dilemma** – If X is an unknown, what's an X terminal? Michael O'Brien
- 26 **UNIX Basics – Make: Part II** – The make utility can help manage several programs in a suite. Peter Collinson
- 36 **I/Opener – Free Software Distributions** – Most UNIX systems can take advantage of freeware. Richard Morin
- 44 **Systems Administration – Exploiting Cron** – You can put many administration tasks on autopilot. S. Lee Henry

DEPARTMENTS

- 4 Editorial
34 Reader Feedback
71 New Products
78 The SunExpert Market
81 Reader Inquiry Card
83 Subscription Card

SUNEXPERT

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

SUNEXPERT Magazine (ISSN 1053-9239) is published monthly by Computer Publishing Group, 1330 Beacon St., Brookline, MA 02146-3202. Telephone (617) 739-7001. Second-class Postage Rates paid at Boston, MA, and at additional mailing offices. This publication is free to qualified subscribers as determined by the publisher. Subscription rates are \$49.50 per year in the United States, and \$70.00 abroad. Subscription requests can be sent to: Circulation Department, SUNEXPERT Magazine, 1330 Beacon St., Brookline, MA 02146-3202 or electronically mailed to: circ@expert.com.
POSTMASTER, please send all address changes to SUNEXPERT Magazine, Circulation Department, 1330 Beacon St., Brookline, MA 02146-3202. Please allow 6-8 weeks for change of address. Include your old address as well as new—enclosing, if possible, an address label from a recent issue. All rights reserved. © Copyright 1992, Computer Publishing Group. No part of this publication may be transmitted or reproduced in any form by any means without permission in writing from the publisher.
Material for publication should be sent to the attention of: Doug Pryor at the above address or electronically mailed to: dpryor@expert.com. Letters sent to the publication become the property of the publication and are assumed to be intended for publication and may be used so. SUNEXPERT Magazine is not sponsored or endorsed in any way by Sun Microsystems Inc. All information herein is believed to be accurate to the best of our ability.

Editorial

Not in Kansas, Anymore

It's been a turbulent year for the SPARC-compatible market. Like Dorothy caught up in a whirlwind, many SPARCalike vendors have found themselves somewhere over the rainbow. To find out how they are faring, see "The Big Thaw," by Senior Editor Mary Jo Foley. It outlines the major



strategies of the key SPARCalike players. Don't forget to take a look at the buyers guide accompanying the article. It answers a frequently asked question: "Where do I get one?"

New for this month is our lab logo. For more than two years, Computer Publishing Group, publisher of *SunExpert*, has evaluated and tested Sun and Sun-compatible hardware, software and peripherals. With the launch of our sister publication, *RS/Magazine*, in October 1991, we added RISC System/6000s to the equipment list and finally gave our test facility a name—Computer Publishing Laboratory.

Computer Publishing Lab is equipped with SPARC servers, SPARCstations, numerous SPARC compatibles, X terminals, Macintoshes, PCs, PostScript printers, a CD-ROM and a scanner. CPL performs the testing and evaluation of products in a workaday environment that closely mirrors the workplace of our readers. The LAN is a fully functioning TCP/IP network with Internet connectivity, and the staff at CPL has extensive experience in the UNIX, TCP/IP and NFS environment ranging from system design to software development, from system administration to end-user instruction. On the test bench this month is Insignia Solution's SoftPC.

Doug Pryor

Doug Pryor

SUNEXPERT Magazine
An Independent Forum for Open Systems
MARCH 1992 VOL. 3 NUM. 3

publisher
S. HENRY SACKS

editor-in-chief
DOUGLAS PRYOR

executive editor
MICHAEL JAY TUCKER

senior editor
MARY JO FOLEY

technical editors
BARRY SHEIN
RICHARD MORIN

contributing editor
MARK SEIDEN

contributing writers
DANIEL P. DERN
MARSHA W. JOHNSTON
HELEN-CHANTAL PIKE

research editor
MAUREEN MCKEON

production editor
MARY ANNE WEEKS MAYO

marketing manager
SUSAN R. SACKS

art director
JOHN W. KELLEY JR.

design director
STEVEN LEE

associate designer
HANNA DYER

production director
RICHARD M. ABAID

assistant production manager
DEBORAH BEDLOW

circulation manager
DEBORAH MOORE

circulation assistant
DIANNA DAPKINS

assistant to the publisher
LESLIE GAFFNEY

EDITORIAL ADVISORY BOARD

STEVEN KIRSCH
Frame Technology Corp.

STEVEN CHRISTENSEN
MathSolutions Inc.

ANIL GADRE
Sun Microsystems Inc.

ROBERT BROWN
RIACS/NASA

MICHAEL BALLARD
Telebit Corp.

DOUGLAS KINGSTON III
Morgan Stanley & Co.
Sun User Group Board

EDITORIAL OFFICES

1330 BEACON STREET
BROOKLINE, MA 02146-3202
(617) 739-7002
Email: dpryor@expert.com



MultiNet™ “A Must For Sites... Running VMS® And UNIX.®”*



MultiNet—“...more than enough UNIX networking capabilities...”
*Digital Review, 12/10/90



There's only one VMS-UNIX connectivity solution that's guaranteed to be easy to install, is recognized for its quality, and includes superior support. That's why Digital Review found MultiNet TCP/IP, NFS Client and Server to be “...more than enough...to enable communications between VMS nodes and any UNIX network.”

up to 100% of the value of your current board or host-based TCP/IP implementation toward your MultiNet purchase.**

MultiNet—“Feels as if it were designed for VMS (connectivity) from the ground up.”

Dec Professional, 3/91

Clearly, MultiNet's flawless design features earned us this accolade. Designed-in quality means lower maintenance fees — as much as 50% less than what you're paying today. And with your MultiNet software maintenance agreement, you also get up to six months of free support.**

MultiNet—“The manual was excellent... the software remarkably easy to install and set up.”

Digital Review, 12/10/90

An excellent manual and easy installation makes your MultiNet decision even easier. Now add a 30-day FREE evaluation and apply

“Go with TGV—Not only is the product great... the support is even better.”

Rich DeJordy, DECUS U.S. Chapter Newsletter, 1/91

Guaranteed support and quality. No wonder MultiNet received Digital Review's Editor's Choice award. That's what you would expect from the team of experts who implemented the first TCP/IP for VMS, the first VMS NFS Server, and the world's first NFS Client for VMS. And with this same team supporting MultiNet, no support request goes unanswered. We guarantee it! MultiNet is a “must” for your VMS-UNIX site. So call TGV toll-free today.

1-800-TGV-3440



Destined To Be The New Standard.

**If your TGV annual support agreement is signed within 60 days after the purchase of MultiNet, an additional 90 days will be added to the standard 90 days which are included with every new license — a total of six months of free support.

***Not to exceed 50% of your MultiNet license fee. TGV and MultiNet are trademarks of TGV, Inc. VMS is a registered trademark of Digital Equipment Corporation. UNIX is a registered trademark of AT&T.

TGV, Inc., 603 Mission St., Santa Cruz, CA 95060. Tel (408) 427-4366. FAX (408) 427-4365. ©1992 TGV, Inc.

Circle No. 46 on Inquiry Card

Optical Options. Optimal Yield.

Features	Subsystem Type	Artecon ¹	Brand A ²	Brand B ³
594 MB & 650 MB ISO Support	EOD & EOJ	Yes	No	No
Mount & unmount by any user on any mount point	EOD & EOJ	Yes	No	Yes ⁴
1 GByte EOD Support	EOD	Yes	No	No
Transfer rate (average)	EOD	10 Mbits/sec ⁵	7.4 Mbits/sec	7.2 Mbits/sec
Open Windows™ & command line software interface	EOD & EOJ	Yes	No	No
Software driver included free with hardware	EOD & EOJ	Yes	No	Yes
Cost for 650 MB Single EOD (Including software driver & cables)	EOD	\$4,995	\$4,990 ⁶	\$6,995 ⁷
Cost for 36 GB Jukebox (Including software driver & cables)	EOJ	\$39,995	\$51,945	\$74,900 ⁷

¹ Based on the latest vendor specifications dated September 1, 1991 (specifications subject to change without notice).
² Based on the latest vendor specifications dated October 1991 (specifications subject to change without notice).
³ Based on the latest vendor specifications dated 4/90 (specifications subject to change without notice).
⁴ Only allows users to mount into their home directories.
⁵ With Maxoptix, Tahiti 2™.
⁶ Includes adaptor kits consisting of the software driver, cable and documentation. Adaptor list price is \$995.00.
⁷ Includes host adaptor card.

If cost were no object, you would probably backup and store to hard disk. If time were not a factor, you might backup to tape. But time and money are important. And the perfect solution is nearline storage with Artecon's erasable optical disks and jukeboxes.

Let's face it. Nobody ever had enough hard disk space. For long. But Artecon's optical options free up valuable hard disk space and still give you random access speed for storage and archiving.

And talk about yield, with the new Tahiti 2's 1GByte/35 milliseconds access your performance is even greater than ever.

Yet the best thing about Artecon's optical solutions is our proprietary software. The graphical user interface makes mounting, unmounting, formatting, and labeling as easy and fast as clicking an icon.

ArteEOD™ and ArteEOJ™ software allow offline formatting so you don't tie up the CPU while formatting a disk. They let users mount and unmount disks without root permission. And when you try to write to copy-protected media, the software lets you abort and continue, without rebooting.

So compare your options in the chart above, then call Artecon at the number below. We'll provide optical options that give you optimal yield.

1-800-USA-ARTE



Peripheral Visionaries

2460 Impala Drive • Carlsbad, CA 92008-7236
 (619) 931-5500 • FAX (619) 931-5527 • (800) 872-2783
 A Member of the Nordic Group of Companies

Trademarks and registered trademarks are proprietary to their respective manufacturers



DSU1-300P0 - 128MByte 3.5"
Erasable Optical Subsystem - \$3,395



DSU1-300P1 - 650MByte 5.25"
Erasable Optical Subsystem - \$4,995



DSU1-300P2 - 1GByte 5.25"
Erasable Optical Subsystem - \$6,995



DSU1-300J1 - 6.5 GByte
10 Platter Jukebox - \$11,995



DSU2-300J5 - 36GByte
56 Platter Jukebox - \$39,995

NEARLINE STORAGE

CANADA
416-487-7701

UNITED KINGDOM
44-3732-42557

FRANCE
33-1-6907-2822

JAPAN
81-3-3280-5030

GERMANY
89-3232320

BENELUX
31-79-615511

Circle No. 7 on Inquiry Card

NOW AVAILABLE: NATIONWIDE ON SITE SERVICE

Today's Line Is Online

Features	Artecon ¹	Brand A ²	Brand B ³
Active Backplane™ Online Removability	Yes	No	No
Automatic kernel configuration software	Yes	No	No
Simultaneous SCSI & IPI device support	Yes ⁴	No	Yes ⁴
Individual power supply for each slot	Yes	Yes	Yes
Shock mounted drives ⁵	Yes	No	No
External ID select	Yes	No	Yes
Pizza Box & IPC/X zero-footprint enclosures	\$2,595	\$3,425	\$5,600
Supports CD ROM, EOD, 4mm, 8mm, 1/4" devices	\$13,585	\$14,485	\$19,300
Single 430 MB, 3.5" Removable SCSI Disk-desktop	\$26,275	N/A	\$35,900
Two 1.3 GB, 5.25" Removable SCSI Disks-desktop			
Four 1.3 GB, 5.25" Removable SCSI Disks-desktop			

¹ Based on the latest vendor specifications dated September 1, 1991 (specifications subject to change without notice).
² Based on the latest vendor specifications dated May 15, 1991 (specifications subject to change without notice).
³ Based on the latest vendor specifications dated 10/91 (specifications subject to change without notice).
⁴ 5.25" removables only.
⁵ Applies to DataVault series only.

What is a system administrator's worst nightmare? Downtime. Nothing is costlier than having users come to a standstill because a system is down.

And nothing can bring a system down faster than a crashed disk. It can leave an entire network of clients idle and non-productive.

Now there's a simple solution to prevent downtime: *True* online removability from Artecon. If a disk crashes, simply remove it and insert another on the fly, while the system is still up and running.

True online removability is possible through Artecon's proprietary Active Backplane™. From desktop pizza boxes to 50 GByte server configurations. Rack up as much storage as you need.

And, every Artecon removable subsystem comes with DynaCon™, our real time kernel configuration utility. DynaCon dynamically

reconfigures a running kernel. So you can add and remove SCSI disks and tapes without rebooting. No more lost time due to kernel configs.

No similar product offers you *true* online removability. Compare the facts above, and you'll see that the best removables are priced below the others.

Why settle for an ordinary drive when the smart money is riding on Artecon's online removables?

Call Artecon today.

1-800-USA-ARTE

Artecon 

Peripheral Visionaries

2460 Impala Drive • Carlsbad, CA 92008-7236
 (619) 931-5500 • FAX (619) 931-5527 • (800) 872-2783
 A Member of the Nordic Group of Companies

Trademarks and registered trademarks are proprietary to their respective manufacturers



430MByte, 3.5" Removable Disk Subsystem



2 X 430 MBytes, Fast-PAK 860MByte, 3.5" Removable Disk Subsystem



2 X 1.3GB Two Slot Data Vault with 2.6GByte, Removable Disk



4 X 1.3GB Four Slot Data Vault with 5.2GByte, Removable Disk

ONLINE REMOVABLES

CANADA
416-487-7701

UNITED KINGDOM
44-3732-42557

FRANCE
33-1-6907-2822

JAPAN
81-3-3280-5030

GERMANY
89-3232320

BENELUX
31-79-615511

Circle No. 8 on Inquiry Card

NEWS

Solaris 2.0: Get Ready – Here It Comes

Solaris 2.0, the next-generation operating environment from SunSoft, is on schedule. SunSoft says it will ship it in volume, as originally promised, sometime during the second quarter for SPARC platforms, and sometime in the third quarter for Intel Corp.-based machines.

The SVR4-compliant Solaris 2.0 consists of SunOS 5.0, which includes Sun's Open Network Computing, or ONC, software; OpenWindows 3.0, which includes ToolTalk; and DeskSet 3.0. Sun Microsystems Computer Corp. (SMCC) has said that by early 1993, all new Sun hardware will run Solaris 2.0 exclusively. (Sun systems

running SunOS 4.1.X or 4.0.X and earlier versions of OpenWindows and DeskSet—and even SunView—will still be able to operate as clients, however.)

You don't have to wait until the middle of 1992 to do a lot of the prep work for Solaris 2.0, however. According to SunSoft, developers can achieve 95% to almost 100% Solaris 2.0 compliancy today by following five key steps:

- Transition all SPARC machines to SunOS 4.1.1;
- Upgrade to Version 3.0 of OpenWindows and DeskSet;
- Adhere to ANSI C;
- Dynamically link your existing applications; and
- Implement SVR4 libraries.

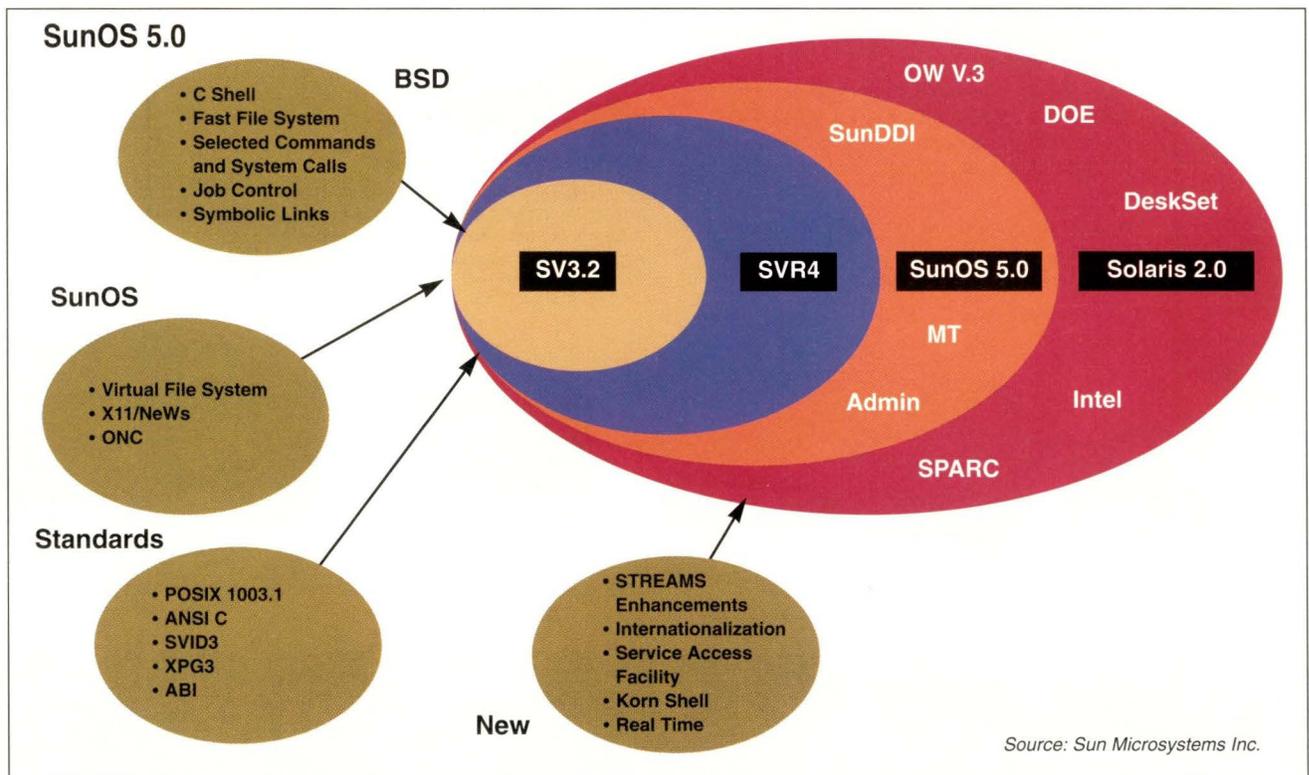
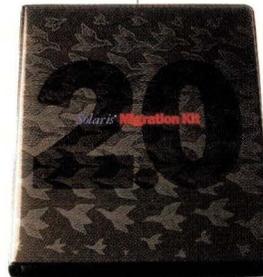
(Watch future issues of *SunExpert* for a series of articles designed to help you make the big move to 2.0.)

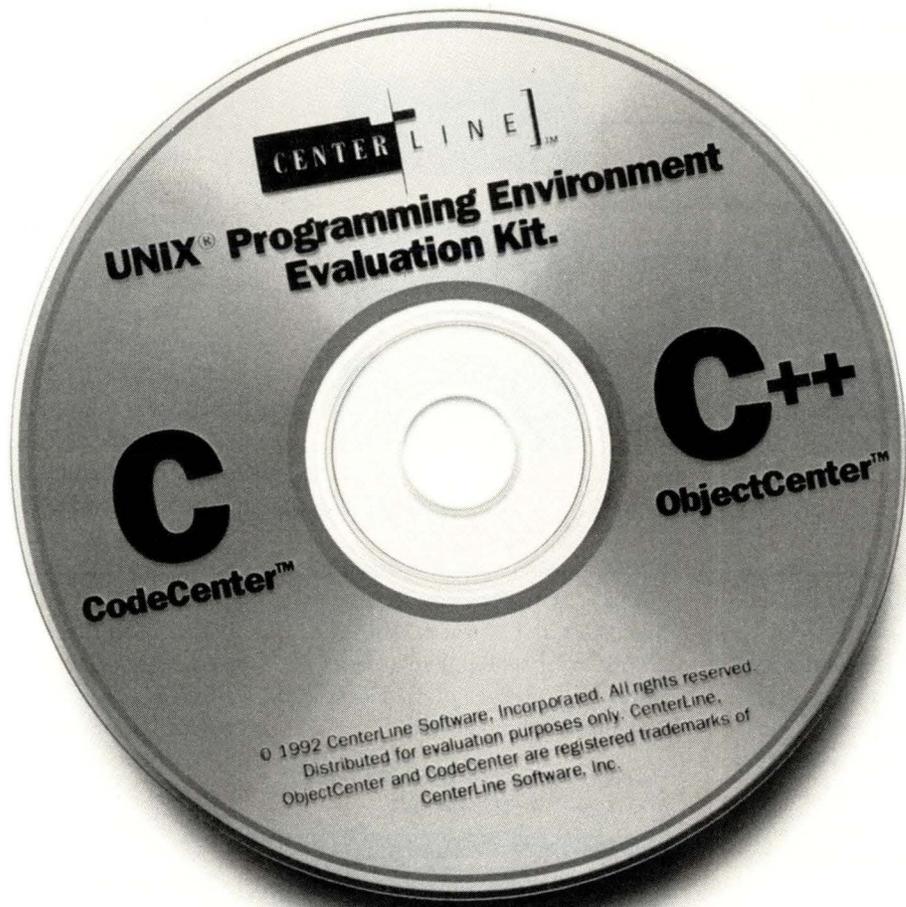
Sun has assured customers that software written for the Solaris 2.0 SPARC platform will be source-compatible with the Intel 80X86 platform, so that developers can create a single version of an application that will run

on both architectures. At the same time, SunSoft has begun shipping an SVR3.2-based version of Intel UNIX, providing customers with a binary-compatible migration-path option. Called SunSoft Interactive UNIX, the OS was developed by the Interactive Systems Corp. Intel UNIX business unit, which Sun recently acquired.

SunSoft is allowing customers that purchase the Interactive UNIX product between January and June 30 to upgrade to Solaris 2.0 on Intel for \$195 (for a single-user machine) once Solaris-on-Intel becomes available.

In January, SunSoft and SMCC both made announcements designed to make the move to Solaris 2.0 even easier. At UniForum, SunSoft demonstrated several key packages running on the Early Access version of Solaris 2.0, including Aldus Corp.'s Persuasion, AutoDesk Inc.'s AutoDesk, Frame Technology Corp.'s Frame, Lotus Development Corp.'s cc:Mail and Oracle Corp.'s Oracle. By the time Solaris 2.0 ships in volume, SunSoft expects 200 applications to be avail-





Take it for a spin.

Over 10,000 UNIX programmers do, daily.

Now you can get an evaluation copy of two of the hottest programming environments around – CodeCenter and ObjectCenter, formerly called Saber-C and Saber-C++.

And it's free.

Just call 1-800-922-3229 to get the software that top software and hardware developers use to create, test, debug and enhance their applications, every day.

More hours in your day.

In a recent IDC report, greater than 50% of those who have purchased UNIX C++ programming environments, chose ObjectCenter.

One reason is that both ObjectCenter and CodeCenter users report an immediate

increase in productivity of about 30%. Some as high as 400%.

Plus, only ObjectCenter and CodeCenter let programmers work the way they think.

Intuitively. Interactively. Naturally.

Better code, guaranteed.

Here's another only: we have the only programming environments that promise to *significantly improve the quality of your code*. Guaranteed. Thanks, in part, to our exclusive run-time error detection feature.

In all, ObjectCenter and CodeCenter are the most complete programming environments you can use.

Both feature an interactive workspace, superior debugging capabilities, dynamic

graphical browsers, a lightning-fast incremental linker, and much more.

Call 1-800-922-3229 to get an evaluation kit. Free.

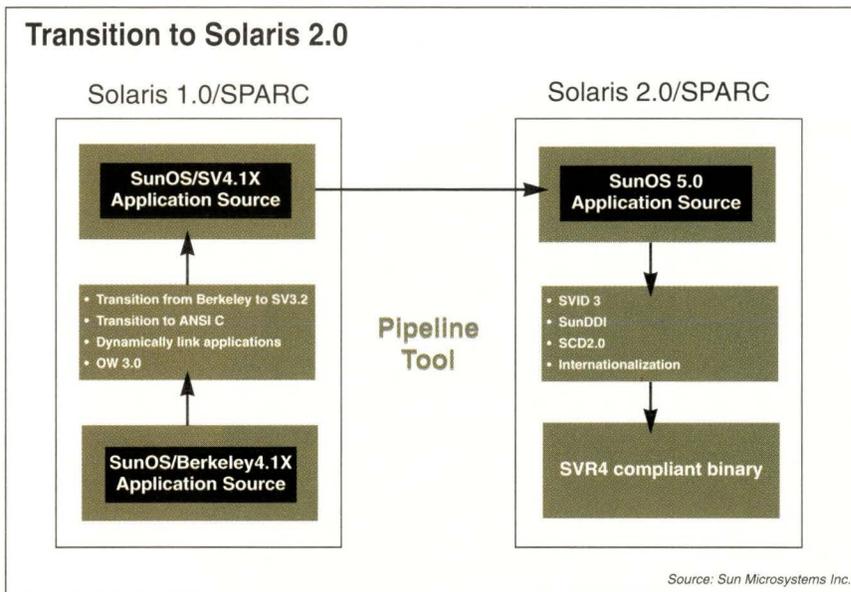
It's that simple. We'll send a free evaluation copy of ObjectCenter and CodeCenter either on CD-ROM or tape.

So call now. It's not just a test-spin you'll be taking part in. It's more like a revolution.



Formerly Saber Software.

10 Fawcett Street, Cambridge, MA 02138 • (617) 498-3000



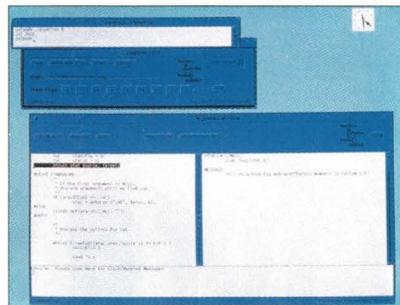
able for it, says Mike Zadig, director of systems software product marketing. At press time, more than 50 developers were working with Solaris 2.0 source code, according to Zadig.

Also, under the Early Access program, SunPro announced availability of new versions of its SPARCworks compilers and tools for Solaris 2.0. SPARCCompiler C was shipping at press time.

SunSoft is right on target with its Solaris 2.0 delivery program, says Zadig. The next and last phase will be the announcement this month of SunSoft's Catalyst Solaris 2.0 Migration Program, under which all Catalyst independent software vendors (ISVs) will receive Solaris 2.0 source. SPARC hardware vendors, or OEMs, as SunSoft calls them, were to begin receiving Solaris 2.0 source code and binaries (for clone vendors) in early February, Zadig claimed. The first

OEM to deliver product running Solaris 2.0 was Tadpole Technology Inc., Austin, TX, which shipped its SPARCbook laptop with a choice of either SunOS 4.1.2 or the Early Access version of 2.0 in January.

Pipeline Tool scans Solaris 1.0 code and recommends changes.



SMCC, for its part, is offering all new and existing customers with a software-support contract the Solaris 2.0 Migration Kit, a free set of tools and documentation to help them

move from Solaris 1.0 (SunOS 4.1.X) to Solaris 2.0. The kit consists of a System V migration tool (Pipeline Tool), the *SunOS 4.1.x-to-Solaris 2.0 Migration and Compatibility Guide*, a site-migration planning worksheet, multimedia tutorial about Solaris 2.0 and various guides, white papers and documentation—all on a single CD. The kit uses Sun's AnswerBook, a hypertext search and retrieval tool.

"We believe a large percentage of our installed base is already on [SunOS] 4.1.1," says Ed Julson, transitions manager for SMCC. "These folks don't need the [Solaris 2.0] Early Release version." Instead, he says, they can use the Migration Kit while implementing the aforementioned steps that SunSoft advocates.

At the heart of the kit is Pipeline Tool. ISVs that are part of the Early Access program are already using this SunSoft-provided tool. Zadig claims that, "Developers using this [tool] are moving their applications [from Solaris 1.0 to 2.0] in a day to a week." The Pipeline Tool is a mouse-driven, Open Look-based software product that scans Solaris 1.0 application code for Solaris 2.0 standards compliance and recommends solutions to incompatibility problems. The application code is checked for System V Interface Definition Issue 3 (SVID-3) and SPARC Compliance Definition 1.1 (soon to be 2.0) compatibility. "You can use the tool in a real-time, line-by-line fashion, or in batch mode, which is better if you need to transition multiple files," explains Julson.

More migration help is on the way from SPARC International, as well.

PPP

Turn your UNIX system into a dial-up IP router
Access your office environment from remote locations
Transparent to users on the LAN
Easy, flexible, high performance, low cost internet connectivity

"We had a need for a quick and easy on-demand system to connect customer clients with their databases — sometimes over far-flung long-distance lines. Morning Star made IP linking as easy to implement as UUCP, and saved us from having to re-invent a large wheel."
 — Nick Sayer, Resumix, Inc.

"I'm a software engineer and I work from home. Prior to using Morning Star's PPP, I was wasting countless hours installing and debugging public domain SLIP software. Not only is PPP an improvement, but the superb documentation and technical support from Morning Star has allowed me to forget about the problems I once dealt with."
 — Beth Miaoulis, Cayman Systems, Inc.

Morning Star Technologies

1760 Zollinger Road • Columbus, Ohio 43221
 614 451 1883 • 800 558 7827
 Marketing@MorningStar.Com



Networking Solutions

X.25 Serial gateway
 PDN & DDN certified
 SunNet compatible socket interface

Sometime over the next few months, the group is slated to unveil its ISV Toolchest. Like the SMCC Migration Kit, the Toolchest will be a collection of utilities, documents, migration guides and a "System Migration Tool" that sounds a lot like Pipeline Tool. SPARC International is also expected to include portable C, FORTRAN and Pascal compilers (with C++ and Lisp versions to follow) and system administration scripts as part of its Toolchest, according to Phil Huelson, vice president of technology. "We'll give you everything you need on a single CD for building [SVR4]-compatible applications," Huelson says. The Toolchest CD will be available for free, and customers will pay for any pieces they want to license, he adds.

In short, there are three basic differences between SunOS 4.1.X and SunOS 5.0, says SunSoft's Zadig. With 5.0, scripting will no longer be based on BSD, some new system and library calls will be used and—gradually—multiprocessing and multithreading capabilities will be added. This summer, SunSoft expects to make available developer kits to allow customers to work with user-accessible, or application-accessible, threads, which will give applications more of a "real-time" feel as a result of tighter granularity, Zadig explains. But, the "SunOS kernel already is fully preemptible and fully multithreaded," he says.

If there's one message that Sun and others in the SPARC camp are hoping to convey, it's that there's no need to be afraid of Solaris 2.0. —mjf

Sun in Graphics: To Be Or Not To Be?

Just when it seems like Sun Microsystems Inc. has finally decided to throw in the graphics towel, it jumps back into the graphics arena.

In January, Sun handed off responsibilities for its VX and MVX visualization accelerators to Vicom Systems Inc. (see *SunExpert*, January, Page 10), making it clear that it didn't consider high-performance graphics to be a volume business. But then, in late January, Sun Microsystems Computer Corp. (SMCC) signed a joint agree-

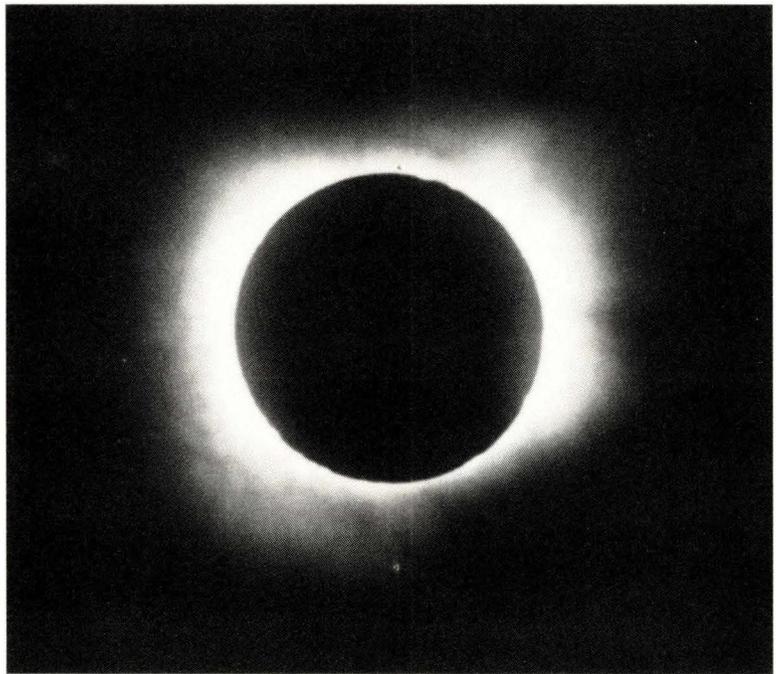
ment with high-performance graphics pioneer Evans & Sutherland Computer Corp. (E&S). E&S will be developing new graphics accelerators for SMCC's systems. The accelerators will be designed to be software-compatible with workstations currently available from both SMCC and E&S. E&S is based in Salt Lake City, UT.

During the same month, Sun joined nine other hardware and software companies in announcing their com-

mitment to PEXlib, a 3D graphics application programming interface (API).

The other supporters were Convex Computer Corp., Digital Equipment Corp., E&S, Hewlett-Packard Co., Hitachi, Ithaca Software, Kubota Corp., SHOgraphics Inc. and Tektronix Inc. These same 10 companies earlier this year endorsed PEX, the distributed 3D graphics protocol based on the X Window System. Use

What good is service that promises the moon when it means going for days without Sun.



When you consider how much you rely on your Sun system, it's good to know you can always replace it. Fast.

Apex Computer's 24-hour emergency program guarantees next-day replacement.

It's part of Apex's full menu of support services, including remote maintenance, depot repair and technical phone support. And it's all backed by warranty.

We'll do everything we can to keep you from going without Sun. Even if it takes a little moonlighting.



APEX
COMPUTER

We also buy & sell used Sun equipment.

Seattle • Santa Clara • Boston • London

1-800-654-8222

Circle No. 5 on Inquiry Card

IEEE 488. Data acq. For Sun. Now.



Only IOtech has all you need to turn your Sun workstation into a powerful laboratory system.

Control up to 14 IEEE 488 devices with IOtech's SCSI interface for the SPARCstation, Sun-3, and Sun-4 or our SBus interface for the SPARCstation. Each controller comes with an IEEE device driver that supports SunOS 4.1 and any high-level language.

Add an IOtech analog, digital, or serial I/O converter and graphical user interface software for complete data acquisition, control, and analysis.

Call, fax, or write today for your free IEEE 488 technical guide.

IBM PC, AT, 386, and PS/2 IEEE Products

Macintosh IEEE Products

Sun and DEC Workstation IEEE Products

Serial/IEEE Converters and Controllers

Analog and Digital I/O Converters to IEEE

IEEE Analyzers, Converters, and Extenders

IOtech, Inc. • 25971 Cannon Road
Cleveland, Ohio 44146
PHONE 216-439-4091 • FAX 216-439-4093

The products mentioned above are trademarks or registered trademarks of Sun Microsystems, Inc.

Circle No. 30 on Inquiry Card

12

What About 4.1.2?

With all the fanfare surrounding SunOS 5.0 and Solaris 2.0, it's easy to overlook interim operating-system releases. But in late January, SunOS 4.1.2 became Sun Microsystems Computer Corp.'s (SMCC's) default operating system for all SPARC platforms, including Sun's new SPARCserver 600MP servers.

SunOS 4.1.2 is Sun's first multiprocessing operating system. The OS is fully binary-compatible with SunOS 4.1.1. It incorporates SunOS 4.1.1 Rev B, GFX patches and VX/MVX feature tape. SunOS 4.1.2 also provides a limited upgrade facility from SunOS 4.1.1, integrated Sun QuickCheck (fast file-system checking) functionality and support for the Rock Ridge file system, as well as more than 250 bug fixes. OpenWindows Version 2 is the default windowing system, but Sun provides Version 3.0 with all copies of 4.1.2 for no additional cost. Pricing for 4.1.2 is the same as for 4.1.1.

of PEX and PEXlib combined insures that developers can access a standard, common set for graphics functions across all supported platforms.

A PEXlib spec, along with a sample implementation, is expected to be available to software vendors via the MIT X Consortium some time in the first quarter of this year. Implementations of PEXlib are due from DEC, HP, Kubota and Sun in the second half of 1992.—mjf

A Little Mac on Your Sun?

All users who were dismayed when RDI Computer Corp. was unable to deliver on its promise of Macintosh emulation on a SPARC, take heart: A Menlo Park, CA, software start-up has found a way to let you run your favorite Mac applications on not only your SPARCstation, but on other RISC workstations as well.

Quorum Software Systems Inc. spent two years developing what it calls the Quorum Compatibility Engine, a portable implementation of the Mac Toolbox, including Mac 7.0 system software, user interface, programming utilities and application programming interfaces (APIs). This engine "allows MacOS source code to recompile on RISC," explains company president Sheldon Breiner.

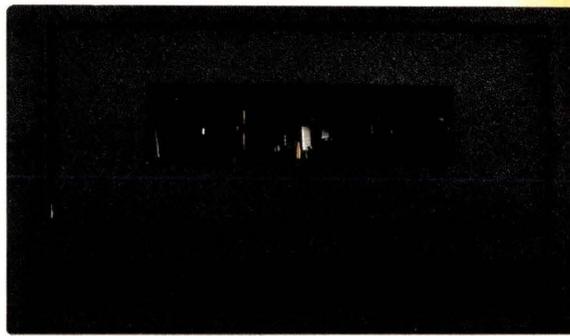
Quorum is making this technology available in two ways. The Quorum

Latitude product is an aid for Mac developers who want to bring their own source code over to RISC. Developers can then market the resulting application themselves. Quorum Equal is an end-user product that combines the Quorum Compatibility Engine with a Motorola Inc. 68000-based hybrid interpreter-emulator. It will allow users to run any existing Mac apps on their workstations.

Latitude will be available this quarter for Sun Microsystems Inc., Silicon Graphics Inc. and IBM Corp. platforms; systems from Digital Equipment Corp. and Hewlett-Packard Co. are next on Quorum's list of supported machines. Equal will become generally available in the second quarter. At press time, Quorum was expecting several vendors to ship "Mac RISC" versions of their applications. Among the most likely candidates: Adobe Systems Inc., Aldus Corp. and Cambridge Scientific Computing Inc. Quark Inc. and Claris Corp. are expected to enter the pipeline soon.

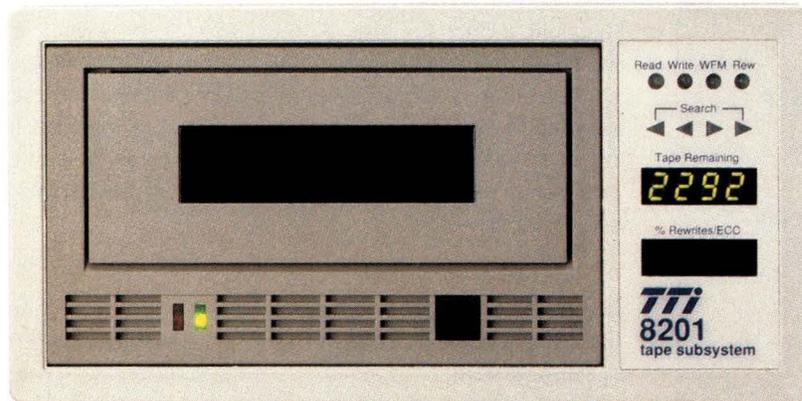
"Apple [Computer Inc.] is very excited about what we're doing," claims Jay Friedland, vice president of marketing and sales. "We have a continuing agreement with Apple to license other pieces of MacOS, like QuickTime, as they become available." Both Breiner and Friedland hint that Apple itself

Bare.



Your basic 8mm drive

Essentials.



The fully instrumented TTI 8201

Which would you rather have, prices being equal?

A generic, bare-bones 8mm drive?

Or the fully instrumented TTI?

If you choose the generic, you'll get a great drive and an on-off light.

Pick TTI, and you'll get the same great drive and on-off light, **plus** a brilliant on-board display with real-time information on tape capacity, ECC error correction usage, read/write rate, and tape status.

Undecided? Here's more.

TTi's CTS-8201 and CTS-8501

8mm helical scan tape subsystems are high performance workhorses with the capacity workstations demand: up to 5GB fits on just one low cost tape. And it has the speed you need, with data transfer rates of up to 30 MB per minute, nothing is faster.

So when it's time to add 8mm tape backup to your Sun 3, Sun 4 or SPARC workstation, don't settle for a bare bones drive. For about the same price you can own a TTI CTS-8201 or CTS-8501 with a display users consider absolutely essential.

For more information, call or

write: Transitional Technology, Inc., 5401 East La Palma Ave., Anaheim, CA 92807. Phone: 714-693-7707. FAX: 714-693-0225.

In Europe, call Transitional Technology, Ltd.: (44) (295)269000.



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

TTi
TRANSITIONAL
TECHNOLOGY, INC.

Why Go To FirstBase?

It's a Complete
Multi-User Relational
Database System

Featuring:

- Ready to Use Applications Including Bug Tracking, Expense, Inventory, Medical, Problem Reporting, Rolodex and Sales Monitoring
- UNIX Toolkit Design
- End User Tools
- No Programming Required
- Database Editors
- Report Generators
- Multiple Query Languages: dbSQL, dbAWK, dbMACRO
- Query By Example
- Open Look and SunView Accelerators
- Custom Screens
- Trigger and Macro Fields
- Menu and Update Tools
- Security Features
- Excellent Support
- Free Upgrades
- Optional C Libraries
- Much, much more!

FirstBase is a steal at

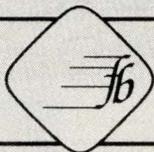
\$995

Floating, Fixed, and Site
Licenses available.

Call for a Demo Tape!

1-800-562-4232

firstbase software
2509 N. Campbell
Tucson, Arizona 85719
(602) 327-2299



Formerly the Cdb Toolkit
from Jaybe Software

International Spotlight

Sun's Sales Stall in Europe

Dataquest Europe figures show Sun Microsystems Inc.'s total shipments in Europe stalled in the last two calendar quarters of 1991 compared with 1990, with SPARCstation 2 shipments particularly down in the first half. Sun's total unit shipments for 1991 in Europe were 50,000, instead of a Dataquest/Sun estimate of 53,000 that was made in November. In 1991, Dataquest says that first-quarter units shipped totaled just over 13,000; second quarter, 15,000; third quarter, 10,500; and fourth quarter, 11,500.

Although exact shipments by product line were not available, Dataquest says that the SPARCstation IPC and IPX continued to sell well in the fourth quarter, along with the first 600MP units, but the SPARCstation 2 suffered from increased price-performance pressure with Digital Equipment Corp.'s VAXstation and DECstation lines, Hewlett-Packard Co.'s Series 700 and IBM Corp.'s RS/6000.

Sun experienced 40% growth in European unit shipments during 1990, says Karen Benson, Dataquest analyst, and still holds the top market share by unit sales, of 32%. The fourth calendar quarter did not live up to expectations for most computer vendors, she adds, with the exception of HP, which launched a new product line.

A U.K.-based spokesperson for Sun refuted the notion that the SPARCstation 2 has been adversely affected by increased competition, at least in the United Kingdom. In fact, he says, SPARCstation 2 unit sales in the United Kingdom for the fourth calendar quarter in 1991 "outperformed our expectations." Although the spokesperson admits to losing a few sales to HP's 700 line, he says that Sun has seen more incidence of users migrating from the SPARCstation 2 to the IPX. "While there have been some dramatic moves on the part of the competition to try and gain market share, they haven't had quite the desired effect," the spokesperson concludes.—mwj

may be using Quorum's technology to speed the development of its PINK operating system.

Quorum is already setting its sights on moving other PC software to RISC. It is working on products to allow developers to bring their Microsoft Corp. Windows applications to RISC UNIX and their Windows apps to the Macintosh, Breiner says.—mjf

Ain't What It Used To Be

The third-party market for leased, repaired and used Sun Microsystems Inc. equipment may be under fire from Sun. As part of its reseller "house cleaning," Sun says it is removing "unauthorized VARs" from the list of companies it sells to. A number of the biggest used-equipment vendors seem to fall into this category, in Sun's eyes.

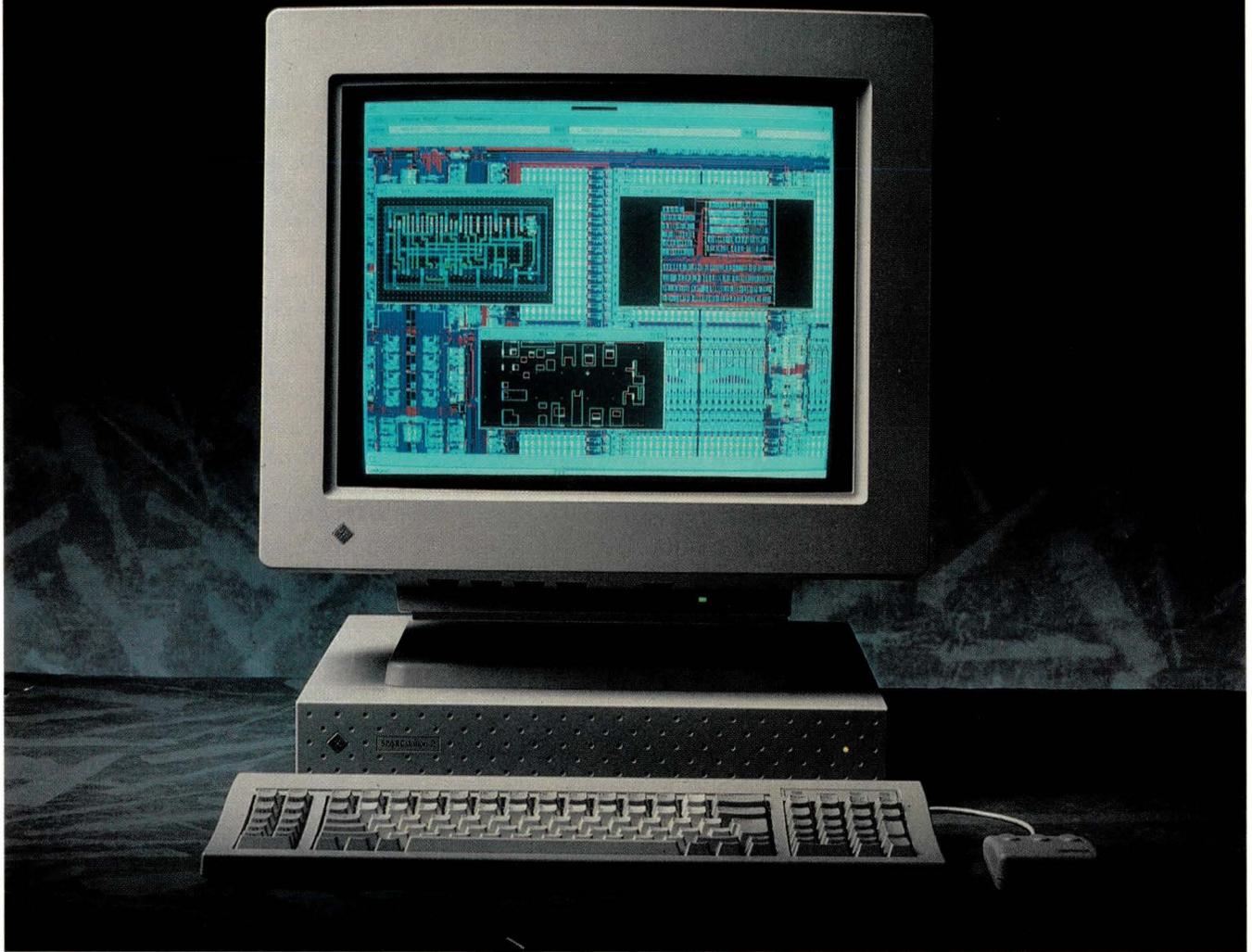
"We don't want to create a used-equipment marketplace," says Chuck Berger, Sun's vice president of U.S.

marketing. "Some of these 'resellers' were buying product from Sun manufacturing. That practice has been discontinued. These companies were never resellers in the first place."

According to correspondence obtained by *SunExpert*, this new policy at Sun is being supported from all sides. In a letter to one used-equipment vendor, Carol Bartz, vice president of worldwide field operations for Sun Microsystems Computer Corp. (SMCC) states: "Sun utilizes authorized resellers who comply with reseller program rules to market its products, thereby maximizing customer service and satisfaction as well as market penetration. You are not an 'authorized reseller.'"

Used-equipment vendor Marathon International Group Inc., Los Gatos, CA, has been a victim of this crackdown, according to general manager Greg Hall. Hall says that Marathon and other used-equipment resellers

Only One High-Speed Fax/Modem Fits Right In.



Tired of waiting for the fax machine? Well, now you don't have to. Because now there's an internal high-speed fax/modem that fits right into your SUN SBus workstation. HeliosCOM+.

Did we say *internal*? That's right. There are no cords or complicated connections. Did we say *high speed*? Right again. HeliosCOM+ features V.32 bis., for speeds up to 14,400 bps, tops. Making HeliosCOM+ the industry's first high-speed, internal SBus modem. Plus, it's software configurable. So your hardware never becomes obsolete. And you can easily upgrade as new features come along.

You also get a Group III, Class I fax. Which lets you send and receive faxes directly from your workstation. Plus compose and send Raster, Postscript and ASCII files. Our high resolution (203x196 dpi) capability makes everything easier on the receiving end, too. Your CAD drawings

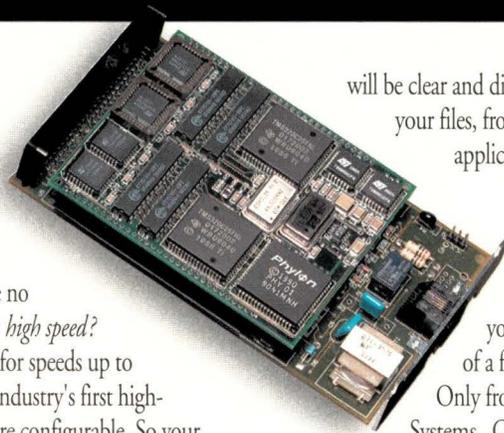
will be clear and distinct. Your chip masks, easily legible. In fact, all your files, from desktop publishing, CAM, CASE, or other applications, will be easier on everyone's eyes.

What else? Try this. HeliosCOM+ easily operates on SUN Open Window software. Just "point and click." That's it. An operating procedure that improves your productivity—not complicates your life. So turn your workstation into a powerhouse of a fax/modem. Look into HeliosCOM+.

Only from Helios Systems. Call today for more information.

Or to order. (800) 366-0283,
(408) 432-0292.

Because without HeliosCOM+, your workstation simply isn't working hard enough.



HeliosCOM+ is a registered trademarks of Helios Systems. All other product names are trademarks of their respective companies. To operate HeliosCOM+, SUN OS 4.0 or better is required.



1996 Lundy Avenue
San Jose, CA 95131

Circle No. 23 on Inquiry Card

Translate AWK to C

Now you can have the execution speed and security you always wanted with your **awk** scripts. Code faster in **awk** for simplicity. Then use the **AWKCC** translator to compile and execute for speed and security. **AWKCC** is transparent too: **awk** scripts that execute in an interpretative mode will produce the same results in compiled mode - only *much* faster!

the Korn Shell

The best shell for UNIX Systems; we're shipping **KSH-the Korn Shell** with **ASPEN's kforms** extension. **ASPEN'S KORN SHELL** delivers more power per keystroke - you can save time and save money, boost productivity, and remain compatible with old Bourne shell scripts. Display forms and accept data input with *kforms*, the **KSH** forms capability extension.

BOTH AVAILABLE FOR:

386 UNIX & Xenix, Sun3, Sun4; ATT 3B2; IBM RT; Sequent

BOOKS:

The KORNSHELL Book
by Bolsky & Korn - \$36.00

The AWK Programming Language

by Aho, Kernighan, Weinberger - \$32.00

sed & awk

by O'Reilly & Associates - \$22.00

ASPEN Technologies, Inc.
PO Box 5727
Parsippany, NJ 07054

Telephone: **201-316-0866**
FAX: 201-316-5781

Check or Money Order, **VISA** and **MC** accepted. Please include \$6.00 for Shipping & Handling to the U.S.; \$10.00 for Canada, and \$30.00 for Overseas; (N.J. residents please add 7% Sales Tax).

Money Back Guarantee.

kforms is a trademark of ASPEN Technologies, Inc.
XENIX is a registered trademark of Microsoft Corp.
UNIX is a registered trademark of AT&T.

NEWS

have obtained refurbished product from various divisions of Sun for some time now. During the past two years, in fact, Marathon has bought roughly \$1 million worth of equipment directly from Sun, according to Hall.

"We feel Sun has created an arbitrary definition of authorized and unauthorized," he says. "Although we don't have the same restrictions as VARs, we still add value in different ways, such as immediate availability and price competitiveness." Hall has brought his complaint before Sun CEO and president Scott McNealy. But so far, it looks like it's going to be a battle among lawyers.—*mjf*

A Leaner, Meaner Interactive

The first time many users and developers probably heard of Interactive Systems Corp. was when Sun Microsystems Inc. announced that it had purchased Interactive's Products Division to help port Solaris to the Intel Corp. architecture. But if Interactive has its way, it is likely to become a household name among OEMs and end users alike.

Currently, 60% of Interactive's UNIX system development work is done for OEMs and 40% for end users, according to the Naperville, IL-based company. Within three years, says new company president and CEO Ben Salama, sales to OEMs should account for about 30% of income, with the remaining 70% coming from end-user sales. Interactive expects consulting and development services to bring in the end-user and OEM bucks.

Even the type of OEM that Interactive works with is likely to change. Chip vendors such as Fujitsu Microelectronics Inc., LSI Logic Corp., Tera Microsystems Inc. and Weitek are likely to continue to be important Interactive customers, since Interactive is charged with insuring that Solaris runs on these different SPARC implementations.

But before Sun spun off its SunSoft system-software division, more than half of the SPARCalike vendors were going to Interactive for their SunOS or SPARC/OS ports. Now almost all of the SPARCalike vendors are work-

ing directly with SunSoft for their operating systems. And Interactive is tapping into a new pool of OEMs—many of them European—that are looking to replace proprietary communication protocols and other system software with TCP/IP and OSI.

This is where Interactive's TCP/IP expertise comes into play. The company supplies the TCP/IP sold by AT&T in SVR4 and by The Santa Cruz Operation in Open Desktop. It augmented its existing STREAMware product line in January with STREAMware X.25, a STREAMS-based implementation of X.25 packaged as a source-code product. Interactive also offers STREAMware TCP, STREAMware SNMP, STREAMware NetBIOS, the Portable STREAMS Environment, as well as SendX/400 Mail Gateway and the Retix OSI protocol line.—*mjf*

A New Gaming Partner For Sun?

Sun Microsystems Inc. may be getting ready to sign up a new software partner in Europe—namely, the Anglo-French Sema Group. In January, the two companies postponed a press conference, which they said would be rescheduled with ample notice.

A Sema spokesperson said the impending announcement would demonstrate clearly "Sun's serious intent to move more heavily into commercial applications and, at the same time, [leverage] Sema's UNIX expertise." Then, at a recent Sun press conference, Sun Microsystems Computer Corp. vice president of planning and development William Raduchel alluded to "impending agreements with some large ISVs" for commercial databases and applications.

Sema Group's commercial software packages range from SEB 10 for electronic-funds-transfer management to I-Line for integrated management of industrial applications, to Principia, a software engineering workbench. Sema also develops custom applications: of late and most notably, the integrated operations software for the Summer Olympic Games in Barcelona, Spain.—*mwj*

Other Open Systems News

Digital Equipment Corp.

DEC became the first ACE vendor to roll out a production version of the OSF/1 operating system as a deliverable product. More than 90 software companies have said their applications will run on DEC OSF/1. At the same time, DEC unveiled a conversion program for Ultrix users allowing them to convert Ultrix licenses and service contracts to OSF/1 ones for "a nominal fee." As part of the announcement, DEC introduced key "foundation products" for DEC OSF/1: DEC FORTRAN, Pascal, OPS5 (an expert-system development environment) and the PrintServer Source Kit for OSF/1. It also introduced a starter kit for the Open Software Foundation Distributed Computing Environment (DCE) to aid users in designing and building multi-vendor applications. There are three versions of the kit: Runtime Services, Application Developer's Kit and Cell Directory Service Server. All will be available in May. DEC says it is providing the technologies employed in DEC OSF/1 to The Santa Cruz Operation for incorporation in its ACE UNIX product.

DEC expanded its networking product line with several new servers. It announced the DECserver 700 family of Ethernet communications servers, MUXserver 320/380 remote terminal servers and DS90L+ workgroup terminal servers. DEC also made public its future plans to provide a multiprotocol terminal server (the DS90TL) for the workgroup environment. DEC also managed to integrate the DECnet and OSI protocols into a single operating environment for VMS and added the capability of running OSI applications over TCP/IP under Ultrix. DEC rounded out its slew of offerings with FDDI and SNMP management products; the EtherWORKS Router/DECnet remote PC LAN router; an adapter for token-ring connectivity; and

FDDI and dual-Ethernet interface cards for token-ring connectivity.

Cementing a deal with Cray Research Inc., Eagan, MN, DEC announced it will begin marketing, selling and distributing the Cray Y-MP EL supercomputing systems in conjunction with its own VAX vector systems and DECmpp line of massively parallel systems. The agreement is effective immediately. DEC plans to price the systems at under \$350,000.

Hewlett-Packard Co.

HP introduced a new family of high-performance disk arrays for its Apollo 9000 Series 700 workstation Model 700s and HP 3000 and 9000 multiuser computers. The disk arrays, called the Series 6000 Models 1350SA and 420SA, support systems running HP-UX 8.07. Model 1350SA has a base configuration of five 5 1/4-inch, 1.36-GB SCSI-2 disk drives per array. The 420SA has five 3 1/2-inch, 422-

• X SERVERS • X TERMINALS • CLIENT SERVER PROTOCOLS • BRIDGES • SYSTEMS

A full Sun upgrade at a fraction of the price

Give your older Sun workstation the power and speed of a new SPARCstation 2 at a fraction of replacement cost with a **RISC MANAGEMENT** upgrade. Optimize your current hardware investment and experience immediate improved performance and reliability.

- Increase performance to 28.5 MIPS @ 40 Mhz
- 3 S-BUS slots and 8 Mb RAM included
- Installation and service options available



SPARCstation 1	\$2995
Sun-3/80	\$3995
Sun-3/50	\$4395

For more information call

(617) 455-6636

163 Highland Ave., Needham, MA 02194

RISC MANAGEMENT. Performance products for Sun networks.

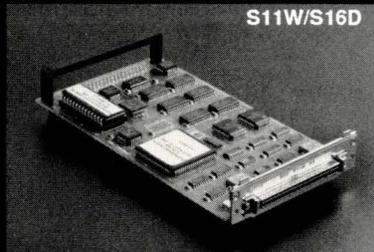
PRINTERS • E-MAIL • SUN CLONES • PRINT SERVERS • IO DEVICES • TCP/IP COMPRESSION • LOAD BALANCING

OFFICE AUTOMATION • GATEWAYS • TERMINAL SERVERS • PC/MAC UNIX INTEGRATION • S-BUS PERIPHERALS

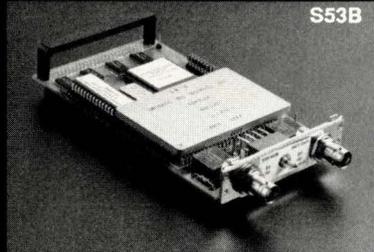
• NETWORK MANAGEMENT • MULTIMEDIA • VIDEO CONFERENCING • MONITORS

EDT Interface Cards

... the Intelligent Choice



S11W/S16D



S53B

S11W

- Interfaces with DR11W peripherals
- 16 bit parallel interface
- 8 Mbyte per second transfers

S16D

- 16 bit parallel interface
- Supports buffered block mode with internal FIFO
- 10Mb per second transfers
- Continuous Input or Output

S53B

- Complete MIL-STD 1553B
- 1 MBit per second serial interface
- Supports all mode codes for dual redundant operation
- Configurable as Bus Monitor, Bus Controller, or Remote Terminal

EDT Provides several levels of customer support, from phone consultation to system integration, as well as custom hardware and software design.



1100 NW Compton, Suite 306
Beaverton, OR 97006
Ph. (503) 690-1234
FAX (503) 690-1243

Circle No. 20 on Inquiry Card

NEWS

MB SCSI-2 drives per array. A utility package allows the arrays to operate in multiple redundant arrays of inexpensive disks (RAIDs).

Lexcel, a Micro Technology Inc. company based in Fullerton, CA, will be including HP LanProbe segment monitors as part of its Lance+ network-management solution. HP LanProbe is a specialized instrument that measures and diagnoses performance and reliability problems on Ethernet LANs. Both HP LanProbe and Lance+ support the remote-network-monitoring management-information base (RMON MIB).

IBM Corp.

IBM took the wraps off its low-end RS/6000, as expected, at UniForum. Several configurations of the single-chip implementation, 33-MHz, 25.9-SPECmark POWERstation/POWERserver 220 are available for less than \$10,000. The system is shipping in the United States. A 19-inch monochrome system can be had for \$6,345; a gray-scale with 160 MB of disk goes for \$7,185; and a 16-inch color system with 160 MB of disk for \$8,475. The 220 can also be set up as a diskless or dataless system, thanks to AIX 3.2.

IBM announced lots of other goodies at UniForum, including upgraded models of its POWERstation/POWERserver 340, 350 and 520. IBM also unveiled a new model, the 560, which clocks at 50 MHz and 89.3 SPECmarks. Workstation configurations of the 560 start at \$64,110, and servers at \$62,240. IBM also delivered Version 3.2 of its AIX operating system, complete with X11/R4 and Motif 1.1 compliance. It rounded out its pack of announcements with a host of AIX tools, NetWare for AIX, a multiprotocol router, FDDI network adapter, AIX NetView/6000 network management software, and various CASE products under its SDE Workbench/6000 label. The latter is based on SoftBench technology licensed from Hewlett-Packard Co.

Waltham, MA-based Cambex Corp. made a slew of RS/6000 introductions, too. It unveiled the CertaintyR

6200-T Series of mass-storage subsystems, providing packaging for multiple RS/6000 SCSI devices in single-tower configurations. It introduced the Certi-STOR software utility, which enables users to write simultaneously to pairs of IBM or IBM-compatible disk drives in an RS/6000 environment. And it announced its Certainty Series Authorized Distributor Program, offering IBM industry remarketers and resellers access to the company's Certainty Series of disk, tape, memory and software products.

In more storage-related news, Introl Corp., Minneapolis, MN, added support for the RS/6000 (and Apple Computer Inc. Macintosh) platforms with its erasable magneto-optical subsystems. The company now supports the 1-GB and 650-MB subsystems for the RS/6000.

This Just In...

- Sun Microsystems Inc. and Cray Research Inc. have formalized an agreement to cooperate on the development of future SPARC systems. The companies plan to develop a "seamless" software environment that will allow Sun systems and Cray supercomputers to work better together. Eagan, MN-based Cray says it will use Sun technology to build high-end SPARC RISC machines that will complement the product lines of both companies. Last year, Cray acquired SPARC minisupercomputer vendor Floating Point Systems of Beaverton, OR, and subsequently formed Cray Research Superservers Inc. to develop high-end SPARC systems. Cray plans delivery of its first, approximately \$1.3 million, high-end SPARC servers in late 1993.

- Sun isn't the only company revamping its operating system. Solbourne Computer Systems Inc. has announced an upgrade to its OS/MP symmetric multiprocessing system that significantly improves database performance, according to the company. Version 4.1A.2, which is available at no cost to Solbourne customers, relies almost entirely on OS/MP kernel enhancements for better DB perfor-

mance, the Longmont, CO, company says. Solbourne continues to promise Solaris 2.0 compatibility in future OS/MP releases.

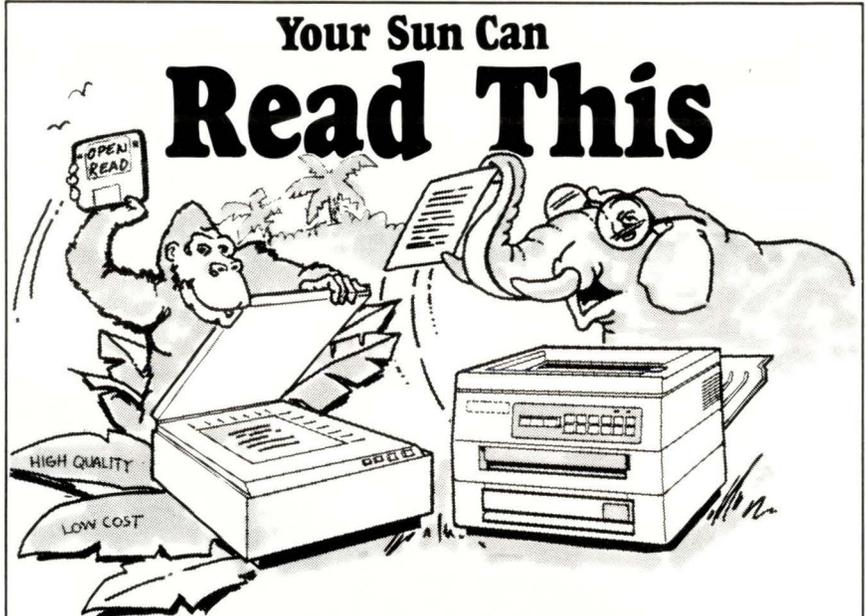
And while we're on the topic of Solbourne, the company recently put out a release full of euphemisms like "strategic refocusing" and "management consolidation." You know what that means: Layoffs of more than 100 staff and administrative positions. The company claims it is focusing more aggressively on the UNIX server market and that "staffing consolidations" won't affect its development engineering or national technical-support organizations.

• Now available from SPARC

International: The Version 8 SPARC architecture manual, the MBus interface specifications (Version 1.2) document, SCD 1.1 spec. For more, contact Susan Sloyer, SPARC International, Menlo Park, CA, at (415) 321-8692, ext. 257.

• **Lotus Development Corp.** increased its commitment to UNIX recently with the formation of its Worldwide UNIX Group, part of its International Business Group. The new group is chartered to deliver Lotus' desktop suite of products on UNIX and enhance current UNIX applications. Lotus also recently began a joint promotion campaign with X-terminal vendor **Human Designed Systems**, King of Prussia, PA. Lotus is offering a complementary node license for Lotus 1-2-3 for Sun SPARC Systems (Version 1.1) with certain models of HDS' ViewStation FX series of X terminals.

• Be the first on your block to receive an upgrade to **Sun Microsystems Inc.**'s forthcoming PC emulation product in the fourth quarter of this year. Until March 31, existing Sun customers can buy **Insignia Solutions Inc.**'s SoftPC 2.1 from SunExpress ((800) USA-4SUN) and be first in line for Sun's next-generation PC emulation product, which will be based in part on Insignia's SoftPC 3.0 technology. Sun says it also is developing hardware-accelerator products that will give SPARC users access to high-performance DOS capabilities. ➡



Your Sun Can Read This

The Best OCR, Scanners and Printers For Your Sun Workstation

Scanners

- 8 Bit Gray Scale Scanner with your choice of 400 DPI or 600 DPI native resolutions
- High Quality 24 Bit True Color Scanner. Dichoric Prism for accurate color separation in a single pass scan.
- Attaches directly to the SCSI port on any Sun Server or Desktop including SPARCstations, IPCs, or SLCs.
- SunView, OpenLook, and command line user interface. Scanner can be accessed remotely from any Sun Workstation on the network. Programming library for control of scanners from user developed code.

OpenRead Plus OCR Software

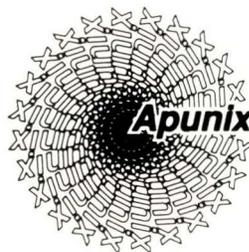
- Omnifont and trainable in one package.
- Interactive learning mode means the fastest and easiest document correction possible.
- Train foreign fonts or special characters.

Digital Photo Image Editing Software

- Easy-to-use tool for image creation.
- Versatile image retouching with masking capability.
- Image enhancement, special effects, and color image processing (optional 4-color separation).

Printers

- Low cost Personal PostScript Laser Printers. Six PPM PostScript printer.
- 300 DPI 24 Bit Color Thermal Transfer Printer. RISC processor with 6 MB memory and 35 PostScript fonts. RS-232, Parallel, and AppleTalk interfaces.



(800) 8AP-UNIX

Apunix Computer Services

**5575 Ruffin Road, Suite 110
San Diego, CA 92123**

Voice: (619) 495-9229 FAX: (619) 495-9230
UUCP: ...!ucbvax!ucsd!apunix!sales
Internet: apunix!sales@ucsd.edu



Value
Added
Reseller

Our family of products includes: Image Scanners • PostScript Printers • Color Printers • Serial I/O
Teletype Modems • Memory • Disks • Exabyte • DAT • Tape Stackers • Terminal Servers • Ethernet
QIC Tape • Half-inch Tape • Magneto Optical

Circle No. 6 on Inquiry Card

One call can improve SPARC 2 performance and save you money by this time tomorrow.



We guarantee it.

Introducing Dataram's DR475, the only expansion memory for SPARC 2 workstations and servers *available from any source within 24 hours.*

Our latest Sun upgrade powers your SPARC 2 computers all the way to their 128MB max.

It's designed for big workstation jobs. Priced for small workgroup budgets.

Available in 32MB and 64MB increments that are easy to install, maintain and upgrade.

All it takes is one easy phone call.

We can put DR475 boards into your hands as quickly as you need them. Within 24 hours of your call, anywhere in the country. At prices averaging 30% below Sun's.

Guaranteed.

Another first from Dataram, the leader that brought you SPARC 470/490 upgrades half a year before any other supplier of add-in memory.

Now we offer an extensive line of fully Sun-compatible memory. From 32MB to 768MB, available today and backed by Dataram's exclusive customer satisfaction package:

- Lifetime guarantee
- Free trial period
- Express spares
- Service-call expense reimbursement
- Dial-in assistance
- Trade in/up
- Technical support

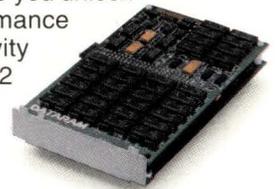
Dataram's been making memory for 25 years—longer than the combined total of nearly all

other expansion memory providers.

Today we produce more than 50 different upgrades for minis, workstations and servers made by Sun, DEC, HP/Apollo, IBM, SGI and DG.

And our newest is the DR475.

Just dial **1-800-DATARAM** now and let us help you unlock all the performance and productivity your SPARC 2 has to offer.



DATARAM

P.O. Box 7528, Princeton, NJ 08543-7528
Satisfying our customers sets us apart.

All names referenced are trademarks of their respective manufacturer.

Winner of 1991 *Sun Observer* Excellence Award for Memory

Circle No. 17 on Inquiry Card

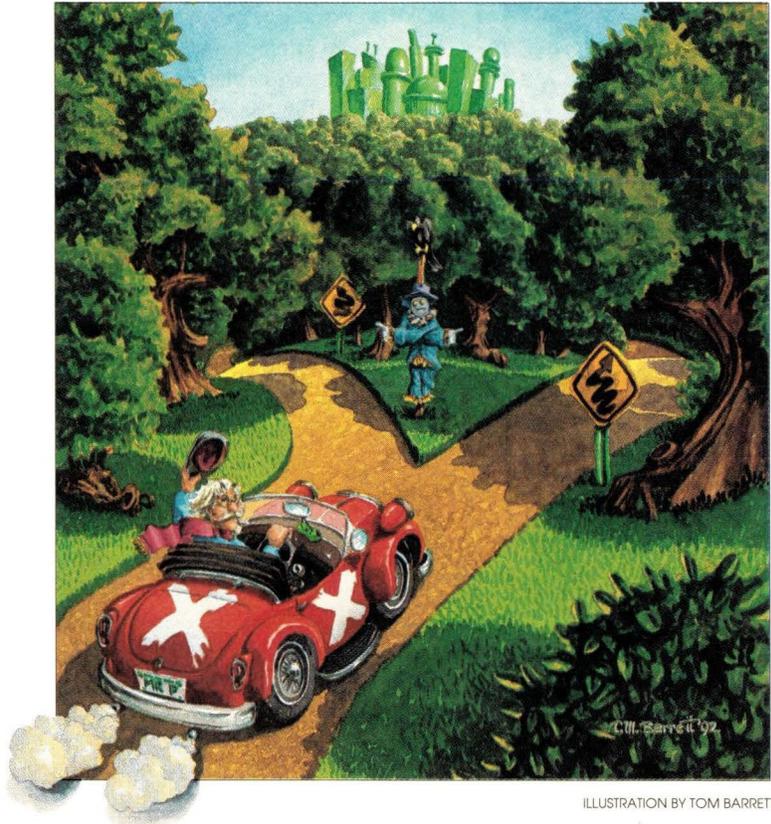


ILLUSTRATION BY TOM BARRETT

by MICHAEL O'BRIEN

"...she set to work very carefully, nibbling first at one and then at the other, and growing sometimes taller, and sometimes shorter, until she had succeeded in bringing herself down to her usual height."

—Lewis Carroll,
Alice's Adventures in Wonderland

"A Question of Balance"

—A hokey '60s band

"Sometimes I feel as if I've been here all the time."

—Dr. Manhattan

The Desktop Dilemma

Q: Do you have any idea how much time and money you waste being flip? How am I supposed to figure out what to

put on my desktop given the nonsense you come up with? Should I still be putting workstations on desktops, or are X terminals a better buy?

A: All right, Mr. Protocol will take those in order: 1) Yes. 2) Pay better attention. 3) It depends.

It has not escaped Mr. Protocol's attention that the X Window System shows no immediate signs of dying out. In fact, far from languishing, it is spawning not only a whole new software industry, but a new hardware industry to go with it. It seems that there are no software packages for UNIX-based workstations that are not

now sporting X Window System interfaces, and the rate of production of new toolkits seems to be settling down nicely. Meanwhile, an instant hardware niche appeared shortly after X took off, which has expanded linearly along with the X Window System: the X terminal.

As X grew, an interesting phenomenon grew with it. Some people who had workstations on their desks were not doing any real computing on the workstations but merely using them to open X Window System sessions to applications running elsewhere. These people were obviously not using computational resources cost-effectively, but the only alternative was to give them clunky old character-based CRT terminals, also known as "boat anchors." This created something well-known in the industry: a market.

The market would seem to be a narrow one, at first glance. Potential cus-

What could you do with 100 GB?



HP is building a reputation as a leader in optical disk technology. Featuring Jukeboxes with capacities of 10, 20, 60 and 100 GB, in WORM and rewritable configurations, HP has a system that's right for your application.

HP Jukeboxes feature a single mount point for ease of use, and simple mechanisms for reliable operation. Operating software and on-site installation are included.

Cranel is your source for HP Jukeboxes. We have the experience and expertise to answer your questions before the sale and to support you after the sale, including on-site maintenance.

Cranel also features a full line of storage, back-up, printing and scanning products, including: 8", 5.25" and 3.5" disk drives; 3480-compatible tape; 1/2" tape; 1/4" tape; 4 mm DAT; and 8 mm cassette.

Cranel specializes in off-the-shelf and custom subsystems and offers a full range of service programs.

Call Toll-Free: 800-288-3475

CRANEL
INCORPORATED

"The Peripheral People"



Circle No. 14 on Inquiry Card

tomers were those whose needs were not met by regular alphanumeric terminals, but who did not require the power (or merit the expense) of a personal workstation. In fact there have been several attempts over the years to fill this niche with what amounted to small, special-purpose graphics workstations. The commercial version of the BLIT terminal manufactured by Western Electric for AT&T is one example, and the BBN Bitgraph terminal (which anticipated the sound capabilities of the Macintosh) is another. The Bitgraph was based on work that was done at BBN on a complete workstation, which never reached the market.

Although each of these graphics terminals had loyal adherents and boasted many appealing features, neither attained widespread success in the marketplace. The usual collection of reasons are proffered for this, but Mr. Protocol thinks it's because of a combination of high price and lack of standards. In order to exercise the special features of each terminal, special software had to be installed. In itself this was not a problem, but it also meant that all software that wanted direct access to the extended graphics features had to include special code. This was, of course, a dead write-off. Given that requirement, it was time to join the procession to the churchyard.

With the advent of X as a de facto standard, however, the picture changed dramatically. Now, there was a real chance that new software would operate under a standard graphic interface. When this was combined with the fact that it is almost invariably cheaper to build quantities of special-purpose hardware than to produce the same quantities of general-purpose hardware to run a special-purpose application, the stage was set for a new kid on the block. (Did Mr. Protocol really say that? He probably didn't mean it.)

Wait a minute, you may say. I've heard Mr. Protocol make glib pronouncements, but that one went by awfully quickly. Let's call him on that one. Is it really cheaper?

Mr. Protocol is probably not partic-

ularly glad you asked, but I am. About time he got caught out before the letters roll in (he will probably never be able to look an Oxford English Dictionary in the eye again, assuming it had one).

Is it really cheaper? The answer is yes, it is, if only because it is cheaper to provide a single piece of software—an X server—than a general-purpose software release of an operating system and all the utilities. Speaking in terms of the hardware, an X terminal is not that

**In terms of the
hardware, an X terminal
is not that
much simpler than
a workstation.**

much simpler than a workstation, except that it generally lacks the degree of expandability and connectivity that a workstation has. For instance, it is highly unlikely to have a SCSI adapter, and its maximum memory size is likely to be smaller than an "equivalent" workstation.

The real question, however, is not whether it is cheaper to produce, but whether it is the right thing to buy. *That* question, Mr. Protocol is glad you asked.

Einstein always said that he arrived at the theory of special relativity by asking a fairly simple question: "If I were moving through space at the speed of light, and I held a mirror in front of me and looked into it, would I see myself?" His answer was, "Of course!" From this, all of the results of special relativity may be derived. Rob Pike, of Bell Labs, asked a similar question: "Should this thing on my desk be a terminal or a computer?" His answer: "A terminal!" From this,

the BLIT developed.

The difference between Rob Pike and Einstein is that in Einstein's case, there was only one right answer. (Mr. Pike may disagree with this characterization.)

There are those who have come to agree with this vision, that a terminal is a terminal and computing should be done elsewhere. To be fair, the current view of the world at Bell Labs is that a terminal is indeed a terminal, but that this shouldn't prejudice matters unduly: The terminal should run the same operating system (or, at least, present the same operating-system interface) as the computer. This arrangement is known as Plan 9, and it represents a truly distributed operating system environment. The terminal and the central computer both seem to the user to run the same operating system, and the user may slide jobs back and forth, carrying the file-system name space along...no need for oddball file-system mounting arrangements to produce transparency. Actually there are some very oddball file-system mounting arrangements indeed, but they happen automatically.

The central idea behind Plan 9 is that computing should take place on machines that are really built to compute, and that things on the desktop should look pretty and leave the hard work to other people. This was the idea behind the original BLIT terminal. While that terminal could run arbitrary jobs, its internal "OS" was unique. It could produce a fine game of "Asteroids" while you were compiling, but the game had to be written specially to run on the BLIT. Under Plan 9, jobs can run without recompilation under either the terminal or the CPU environment, but in practice only display-oriented jobs run on the terminal.

This principle of letting resources do what they do best has been successful and probably represents the next major step in true distributed operating system design. However, since it requires the cooperation of the people responsible for the central computer and the desktop unit, it may be some time before this turns into a product. Bell Labs can get away with this because they write all their own code,

from the compilers up. Mr. Protocol, in typical understated fashion, observes that few installations are willing to do this.

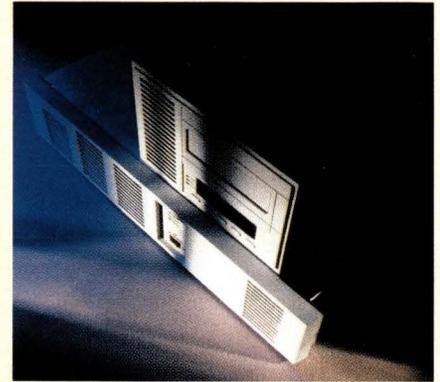
The question that is posed, then, is whether it would be better to keep the computing in the computer, or distribute the computing around to the various desktops. The advent of X makes it possible to finesse the question and provides a continuum of solutions. At one end of the continuum is the intellectual descendant of the BLIT: the X terminal. The typical X terminal is a special-purpose desktop workstation, which operates on a network as an X terminal server, and nothing else. It will have a node name like a host, but will accept connections only on the X reserved port.

Some fancy footwork is generally required, because the everyday X client and server software assumes when it starts up that login authentication has already been done. Further authentication may be done on the fly with each new request to open a window, to ensure that the user is legit, but even this is not necessarily provided. An X terminal, however, must allow someone to log in *before* it can proceed to open windows...yet it may not even have a fallback "dumb terminal" mode to allow logins.

In such cases the vendor must provide software that performs the functions of the `login` program, providing user authentication and setting up the necessary environment, while at the same time initializing and running in the X environment. After all the fancy footwork, the user is ready to go. The usual X defaults and initialization files will take care of the rest.

Obviously an X terminal is not installed on a network in the same way as a workstation. Vendor-specific software must be installed to initialize the terminal and take care of the login process. In some cases, user accounts must be specially set up so that the login script does some necessary initialization as well. Thus, just as in the case of the BLIT or the Bitgraph, special-purpose software unique to the terminal must be installed, used and maintained. What are the advantages

Designed for 3480. Built for speed.



Fujitsu's 3480 compatible tape system, the M2480, provides high speed tape transfer in a rack mount or table top configuration. It features sustained transfer rates of 3 MB per second — up to 4 MB in burst mode. With optional data compression, each cartridge can hold up to 600 MB. Add a 10 cartridge auto loader, and you've got 6 GB of backup on one drive. And, because the controller accommodates four drives, you can back up as much as 24 GB. Includes SCSI, Pertec and STC interfaces.

Cranel is a full-service supplier of Fujitsu products, offering a full range of peripheral products, including disk and tape subsystems, band and laser printers, scanners and more.

The Cranel difference begins with your first call and continues throughout the life of your equipment. You can choose from a range of service programs, including swap-and-repair, maintenance contracts, rental equipment and depot level repair.

Call Toll-Free: 800-288-3475

CRANEL
INCORPORATED

"The Peripheral People"

FUJITSU

Circle No. 14 on Inquiry Card

The Beginner's Guide To SunOS Disk Drive Installation.

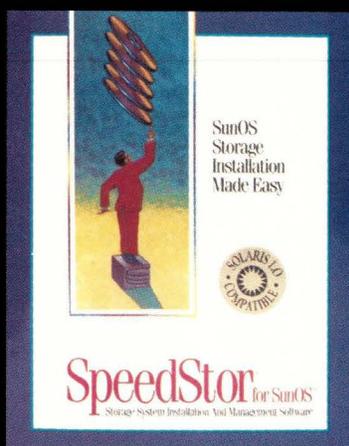


CLICK!

Installing SCSI hard drives is now as simple as "point and click". No hassles. No wasted time or energy. No FORMAT.DAT entries. No complicated geometric calculations. No names and numbers to remember. Except these.

SpeedStor Software for SunOS*. Just \$149.95 per workstation. Or \$499.95 per domain. Order today, call 1-800-245-UNIX Ext. 52. Email: info@qualix.com.

* Storage system installation and management for all SPARC-stations, SunOS 4.1 and Solaris 1.0.



 STORAGE DIMENSIONS

© 1992 Storage Dimensions. SpeedStor is a registered trademark of Storage Dimensions.

Circle No. 42 on Inquiry Card

that have made the X terminal a success, where the other special-purpose terminals failed in the marketplace?

The answer lies in the nature of the applications run on the terminal. The other special-purpose terminals required that each application using the graphics features of the terminal contain special code for the terminal. The same is true of X terminals, of course, but the difference is that the "special-purpose code" is X code, which is now very widely accepted. This is the crucial difference. Although the support and maintenance code for each X terminal is vendor-specific, X application programs will run equally well on all of them, modulo the (almost inevitable) bugs in the various X servers.

It should be noted here that while most X terminals run as stations on the local net, not all of them speak X protocol directly. Some vendors choose to run the X server on one of the user's other computers and send a proprietary protocol to the terminal. There is nothing wrong with this, since it is mostly transparent to the application (and can make for a much faster server if the computer running the server is fast), but it does mean that instead of having a unique host name for each station, the stations are regarded as separate displays on whatever machine is actually running the server or servers. A minor detail, but it can be confusing at first.

There is another point that may seem minor but can grow to be a major one. Each display or user input operation on an X terminal requires an exchange of packets on the local net between the X server and the application program. This may grow to become a substantial load on the network if very many of these terminals are in use.

In the event that the terminals are of the type that run a remote X server speaking a proprietary protocol, the user must first determine whether the network load is likely to be significant, and then determine whether the use of this particular proprietary protocol will represent more or less of a load than the standard X protocol. This assumes, of course, that the applica-

tion programs will mostly be running on the same computer as the X servers. If not, the network load for every operation would be doubled: once to exchange packets between the application and the X server, and once as the X server exchanges information with the actual terminal using the proprietary protocol. Batching of requests can cut down on this double loading, but not eliminate it.

Mr. Protocol notes that one of the more successful X terminals was never intended as such. This is the now-venerable Sun-3/50, an underpowered

Obviously an X terminal is not installed on a network in the same way as a workstation.

runt of a workstation if ever there was one. The 3/50 was designed to be a rock-bottom workstation, and there were certainly large numbers of people whose budgets were down on the bottom with the rock. Many of these found, though, that the bottom is where they stayed. Sometimes the 3/50 paged so violently that it took minutes to accomplish what an only slightly faster workstation with sufficient memory accomplished in seconds. Of course this provided a booming aftermarket in wingding memory add-ons that Sun was too chicken to provide, making the 3/50 an entrepreneur's dream product, but even so there were many workstation-like things that the 3/50 was just not going to accomplish. But people had a problem: They had already bought dozens of the fool things! Now what?

This led to a sort of 3/50 afterlife, where many of these beasts were

retired into service as X terminals. They couldn't run many simultaneous programs, but they could run one: an X server. Many, in fact, are still doing duty in this capacity today, growing gently old and out-of-date. Continuing to maintain the hardware on these things after Sun drops support for them will doubtless bring other entrepreneurs forward and make secret stashes of 3/50 spare parts a wise investment. Who cares if the latest OS won't run on them? Not the X server, that's for sure. And they'll run an X server whose price is right, too: the MIT X server, which is free.

All right then, what about workstations? Won't they run X just as well? Hoo boy, says Mr. Protocol, will they ever. X servers just love 28-MIPS workstations to run on; they just scream along. So does the bill. The fact is that you have to want to run more than just X to justify the cost of a full workstation over an X terminal—unless, as with the 3/50, you're merely providing an honorable retirement. Whether you're likely to run processes on the desktop or in a central computer depends partly on your job mix and partly on your religion. We've already had our lesson in comparative religion, so let's look at job mix.

Consider as an example a shop that does mostly CAD/CAM sorts of things. It might run a design program that is computationally very expensive but that relatively few people are running at once. The rest of the time, they do mainly text processing and a variety of other, computationally easy tasks. In this case, it would make sense to have a powerful central machine serving an array of terminals, since the fundamental assumption of time-sharing would be met here. Most people would not be making heavy demands at any given time, allowing the power of the expensive central machine to be devoted to the few people actually doing design at any given time.

If the users are "power users," though, such as computer science researchers, then individual workstations make sense. At any one time, a large percentage of the users can be expected to make heavy computational demands.

In this case, the economies of scale start to run counter to the way they've run for the last 20 or 30 years. It is cheaper to provide a body of N high-MIPS workstations than it is to buy one gigantic central machine that is N times as powerful as the workstations.

In many environments, a mix of heavy and light users would indicate a mix of "real" workstations and X terminals, allowing a moderately powerful central machine to serve the X terminal users, while those with steadily high demands would be best served by individual workstations.

Of course, use of X terminals means a multivendor environment and all that that entails. Mr. Protocol regrets that the fact that X has become a de facto standard doesn't change the fact that the de facto standard problems accompany it. ➔

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.

An Invitation

Mr. Protocol, gourmand of the late night snack buffet, requests the pleasure of addressing your network and communications questions. He can be reached at amp@expert.com day or night, rain or shine.

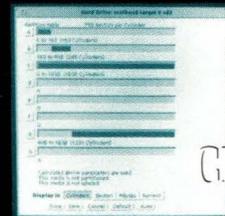
SUNEXPERT Magazine/March 1992

The Power User's Guide To SunOS Disk Drive Management.



CLICK!

SCSI Manager: "Point and click" icon integration of hard disk, tape and CD-ROM drives. Advanced defect management and diagnostics. Print mode page information. Automatic kernel set-up verification.



CLICK!

Partition Manager: Visual controls for customized partitioning. Automatic labeling.



CLICK!

Kernel Configurator: "Drag and click" icons for instantaneous kernel reconfiguration.

Never has something as difficult and error prone as hard drive management been so simple. **SpeedStor for SunOS --- Storage System Installation and Management Software.** For SunOS 4.1 and Solaris 1.0. For all SPARC-stations. For all SCSI drives. For just \$149.95 per workstation. Or \$499.95 per domain. Order today, call 1-800-245-UNIX Ext. 52. Email: info@qualix.com.

SpeedStor[®]

for SunOS[™]

 STORAGE DIMENSIONS

© 1992 Storage Dimensions. SpeedStor is a registered trademark of Storage Dimensions.

Circle No. 42 on Inquiry Card

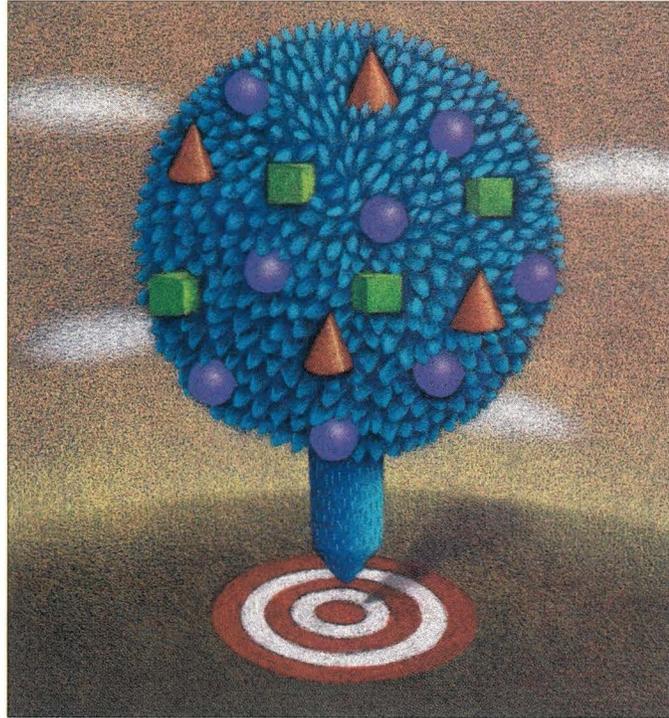


ILLUSTRATION BY KEITH GRAVES

Make: Part II

by PETER COLLINSON, Hillside Systems

In last month's article I talked about `make`, the utility used to control program compilation. I showed that `make` uses a set of dependencies stored in a control file called `makefile` or `Makefile`. The data in the file specifies the relationship among the various files used to create a runnable program. I discussed the built-in rules that Sun's `make` picks up from

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

and showed how these will help make your `makefile` concise. I discussed the use of variables and gave a parameterized `makefile` for a single program.

Multiple Programs

I know that you are all trying to be good UNIX programmers by writing programs that do one thing well. I realize that you will need to know how to manage several programs in a suite by using `make`. It's obviously possible to add multiple targets into a `makefile`, and these targets can easily be separate programs. There are several ways of doing this; here's one:

```
HDRS=prog.h
OBJS1=init.o prog.o op.o
OBJS2=init2.o op.o
DEST=/usr/local/bin
CFLAGS=-O

all: prog1 prog2
    @echo all done

prog1: $(OBJS1)
    $(CC) -o prog1 $(CFLAGS) $(OBJS1)

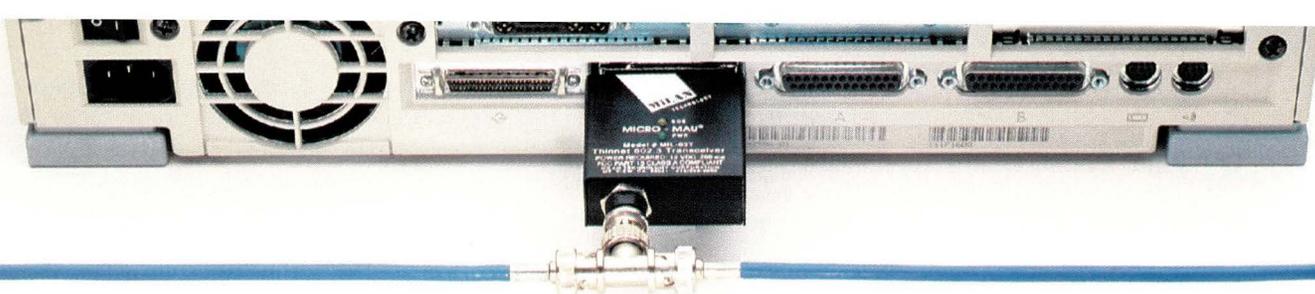
prog2: $(OBJS2)
    $(CC) -o prog2 $(CFLAGS) $(OBJS2)

etc
```

This introduces a "dummy" topmost target `all`. When run as

```
% make
```

with no explicit target, `make` will choose the target from the first rule it finds. The target selected here will be `all`. The



At this price we haven't lowered our standards...

\$89. List Price

We've made it easier for you to raise yours.

In 1990 we introduced the original micro-sized transceiver eliminating bulky and cumbersome drop cables. It was a breakthrough in price, performance and aesthetics for workstation users everywhere. Now thanks to the worldwide acceptance of our original design, we are reducing our list price so you will have no reason not to eliminate those useless cables in your network.

All MiLAN products are manufactured of the highest quality materials in the U.S.A.



Think small. Thank MiLAN, the originator of micro sized networking products. Whether you need 10Base2 or 10BaseT, the Micro Mau and Micro Twist will simplify your desktop. We're working hard to enhance your network with innovative products that give you more for less.

Call or write today for our complete catalog of innovative micro products.

Call for the dealer nearest you.
408 • 752 - 2770
FAX 408 • 752 - 2790
E-Mail: inqinfo@milan.com
© MTC 1991.



MiLAN Technology Corporation
894 Ross Drive, Suite 105
Sunnyvale, Ca. 94089

All other products are trademarks of their respected owners.

Circle No. 32 on Inquiry Card

OUR 19th YEAR

☆ Computer Re-Marketing Specialists ☆

☆ SELL • RENT • BUY • REPAIR ☆

SUN

SPARCstations

4/75 workstations

4/65 workstations

4/60 workstations

4/40 workstations

4/20 workstations

4/490 servers

4/470 systems

4/370 systems

4/330 systems

4/280 servers

4/260 systems

4/110 systems

386i systems

3/470 systems

3/280 systems

3/260 systems

3/180 servers

3/160 systems

3/80 systems

3/75 systems

3/60 systems

3/50 systems

Monitors

Boards

Disks

Tape

etc.

etc.

Best Prices & Availability
Call Today . . .
or tomorrow

WE'LL BE HERE!

**SELLERS: We are buyers of your excess
SUN equipment. Call or FAX your sell list!**

Tel: 408-733-4400

FAX: 408-733-8009

Circle No. 33 on Inquiry Card

Call ...

makefile says that this is dependent on prog1 and prog2, so make will zoom off and check these two programs. After they have been compiled and link-edited successfully, the action associated with the first all target is executed. This prints a single message using the echo command.

It's normal for make to print every command that it executes so you can see what is happening. Sometimes this is just dumb. The at sign "@" at the beginning of the echo is not passed into the shell that runs the command; it is interpreted by make. It suppresses the usual printing action. For echo you just want to see the message and not the command that is executed. Without the @, the output looks like:

```
echo All done
All done
```

You just get the output message when the @ is in place. This is nicer.

Using a Better Structure

It is sometimes convenient to have the source of several programs in the same directory. It's just personal preference; at one time I did this a lot. These days I tend to create a directory structure with a parent directory for the whole project. The source for each program in the suite goes into a separate directory underneath the parent.

The suite will share some routines and some header files. The parent directory has two directories that contain these. The lib directory stores the source of the library and an archive file link-edited into the final programs. The include directory contains shared header files. You can even have a doc directory to contain all the useful documentation that you will write to support the program.

We end up with a directory structure like this:

```
project:
  doc:
    doc.ms
    makefile
  include:
    proghd.h
  lib:
    a.c
    a.o
    makefile
    proglib.a
  prog1:
    init.c
    init.o
    makefile
    prg.c
    prg.o
    prog1
  prog2:
    init.c
    init.o
    makefile
    prg2.c
```

As I develop each program in a suite, I work in the subdirectory to create the sources. Files in the subdirectory will reference include files by:

```
#include <../include/proghd.h>
```

and will be link-edited with the library `proglib.a` in `../lib`. Each program in the suite has its own makefile. All these control files will be broadly similar. The template makefile for `prog1` will be something like:

```
TARGET=prog1
HDRS=../include/proghd.h
OBJS=init.o prog.o
DEST=/usr/local/bin
LIB=../lib/proglib.a
CFLAGS=-O

$(TARGET): $(OBJS)
    cc -o $(TARGET) $(CFLAGS) $(OBJS) $(LIB)

clean:
    -rm -f $(TARGET) $(OBJS) core errs

install: $(TARGET)
    install $(TARGET) $(DEST)

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

To make `prog1`, you compile two source files: `init.c` and `prog.c`. In turn, these include a header file, `proghd.h`. In the makefile, I add two useful additional targets. Typing

```
% make clean
```

will delete the target file, all the intermediate files and all other debris. Typing

```
% make install
```

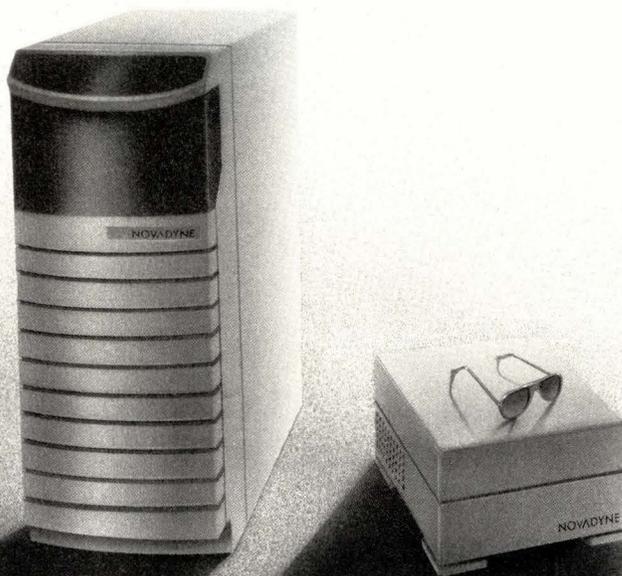
will create the target if needed and install it in a working directory.

The astute of you will probably notice that I don't pay special attention to the library sitting in `../lib`. Some people may believe that it's a good idea to force the makefile for each program to check that the library is current.

It's easy to do. Simply add `$(LIB)` as a dependency and insert an action. The easiest action is to force a directory change into the library directory and run `make` there.

```
$(TARGET): $(OBJS) $(LIB)
    cc -o $(TARGET) $(CFLAGS) $(OBJS) $(LIB)
...
...
$(LIB):
    cd ../lib;make
...
```

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



Introducing Novaport Asynch Expander. The most cost-effective way to expand your system with a single SBus slot.

With the desktop version, you can grow from 32-128 ports via daisy chain. The tower model, with four SCSI peripheral bays for mass storage, accommodates up to 128 ports.

But that's just the beginning. We offer you the Novaport Asynch Expander in combination with nationwide Sun service and operating system support. Only from Novadyne, one of the nation's leading independent field service companies.

So why wait? Call (800) 926-6823 or e-mail (uunet! ncsi! info). And get started today.



NOVADYNE™
COMPUTER SYSTEMS, INC.
The one-word solution.

Sun is a registered trademark of Sun Microsystems, Inc.
Circle No. 36 on Inquiry Card

Remember that the `cd` and the command that it affects must be on the same command line in the `makefile`. This is because each line is executed in a separate shell, so a `cd` affects the commands on that line and that line only.

There is one further problem with this. Because the `$(LIB)` line has no dependencies, its action will be run only when the archive file `../lib/proglib.a` does not exist. This is probably a rare occurrence. The archive file will exist and may even be out of date. We need some way to force the action. This can be done by changing the `makefile` to read:

```
$(LIB): FORCEIT
    cd ../lib;make
```

```
FORCEIT:
```

I have invented `FORCEIT`; it is not special. The `$(LIB)` rule now depends on a target and `make` will go away to evaluate it. It has a null dependency and action. On return, it will have “succeeded,” and so the action associated with the `$(LIB)` target will be run.

On a Sun it’s possible to improve the portability a little. The rule for creating the library can be written using some dynamic macros (you should be aware that this might not work on other systems):

```
$(LIB): FORCEIT
    cd $(@D);make $(@F)
```

The `$(D)` expands to the directory part of the target name, and the `$(F)` expands to the filename part. The win here is that the action of this section of the `makefile` is controlled by the single line at the top.

If I am developing programs myself, I rarely insert this kind of library-management stuff in the `makefile` templates. I know, or think I know, that the library is up to date. I prefer not to have the time delay involved in running another `make`. If I need to update or change the library, I move to the library directory, do the edits and run `make` there.

Library Makefiles

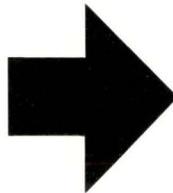
The template that I use to make libraries is different:

```
TARGET=proglib.a
HDRS=../include/proghd.h
OBJS=op.o rout.o str.o files.o
CFLAGS=-O
```

```
$(TARGET): $(OBJS)
    ar r $(TARGET) $(OBJS)
    ranlib $(TARGET)
```

```
clean:
    -rm -f $(TARGET) $(OBJS)
```

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



I want to make `proglib.a`, an `ar` file containing the separate modules that may (or may not) be link-edited into each individual program. I let the default rules take care of making all the `.o` files that I need and then collect them all together in an `ar` library.

In a `makefile` for a library, you sometimes see lines like:

```
.c.o:
    $(CC) $(CFLAGS) -c $<
    ld -r -x $@
    mv a.out $@
```

This redefines the action that `make` takes when it needs to make a `.c` file into a `.o` file. It uses two built-in macros. The sequence `$<` is replaced by the name of the dependency file. If we are making `str.o` from `str.c`, then the dependency file is `str.c` and this is fed into the C compiler. The sequence `$@` is replaced by the name of the current target. For `str.c`, the target will be `str.o`.

Normally, just the C compiler is called to generate a `.o` file. Here, we want to do something a little special because we are making an `ar` file library. For the library, the program is compiled using `cc` to make a normal `.o` file. The `ld` command is invoked with the `-r` flag to preserve the relocation information that is needed to link this module with many others. The `-x` flag removes any non-external names from the symbol table that is added for linking purposes at the end of the object file. Finally, the output from `ld` is moved back to the original `.o` file name.

The thought here is to speed up the final compilation of any program linking to the library. Each `.o` file is partially “stripped;” its symbol table contains only external names. The loader should run faster because it will not need to wade through reams of symbol table data containing symbols that are local to each object file.

These days it's not clear that this is actually a huge win, but you still see it done from time to time. It does demonstrate how easy it is to alter the standard `make` rules to fit your project or implementation.

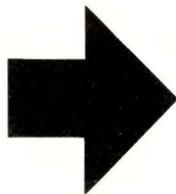
Top Level

Finally, when you have finished all the work of development you may want to create a `makefile` at the top-level project directory. It's nice to have this to take the drudgery out of the action of making all the programs and installing them. The sledgehammer approach is:

```
DIRS=progl prog2

all:
    cd lib;make
    for d in $(DIRS) ; \
    do (cd $$d;make) done

clean:
    for d in $(DIRS) lib ; \
    do (cd $$d;make clean) done
```



Here's how it works.

If you need support for a Sun product, we'd like to suggest a simple, direct course of action.

Call Sun.™

After all, at Sun Customer Support we're focused on being there when you need us. On ensuring that our support services match the same level of quality built into our technology.

And that's why, quite simply, we have the best UNIX® expertise in the business. Why we've invested in a global network of 16,000 service professionals. Why we offer the most comprehensive migration paths available.

 **Sun Microsystems**
Computer Corporation

A Sun Microsystems, Inc. Business

And why we have more than 50 training centers around the world.

All of which means no matter where you are, or what you're looking for — hardware and software maintenance, upgrades, connectivity solutions, education — your shortest route to the answer begins with Sun Customer Support.

Give us a call today at 1 800 821-4643 (in California, 1 800 821-4642), and we'll keep you moving in the right direction.

*When you build great technologies,
the support comes naturally.*

```
install:
  for d in $(DIRS) ; \
  do (cd $$d;make install) done
```

Note the use of `$$d` to get the `$d` into the subshell and the backslash at the end of the line showing that `make` should treat two lines like a single line. You can use the backslash everywhere in a `makefile`; you often see it used when variables are being set from long lists of names. Anyway, to install a cleanly compiled copy, you change into the top-level project directory and say:

```
make clean
make install
```

The neater approach is adapted from Sun's documentation and may also only work using Sun's version of `make`. The `makefile` becomes:

```
TARGETS="" clean install
DIRS=lib prog1 prog2

$(TARGETS):
  make $(DIRS) TARGET=$@

$(DIRS): FRC
  cd $@; make $(TARGET)

FORCEIT:
```

When you type:

```
% make clean
```

using this `makefile`, the `clean` appears in the variable `TARGETS` as something that `make` should try to create. Since `clean` doesn't exist as a file, `make` executes the first command:

```
make $(DIRS) TARGET=$@
```

It is executed with `$(DIRS)` being expanded and the `$$@` macro being replaced by the target `clean`.

```
make lib prog1 prog2 TARGET=clean
```

This runs `make` in the same directory so the same `makefile` is in use. The first target that this invocation of `make` must create is `lib`. The string `lib` appears in the `DIRS` variable so this matches the second rule. We need to use the `FORCEIT` trick to ensure that the command associated with the second rule is always executed. The command run now is

```
cd $@; make $(TARGET)
```

`$$@` is replaced by the target `lib`, and `$(TARGET)` is replaced by its value, `clean`. The command becomes:

```
cd lib; make clean
```

Solve the Electronic Publishing Puzzle with a few pieces from EOS.

The future of electronic publishing will require powerful workstation platforms and will embrace all manner of input, output, and processing tools. EOS has the pieces of this complex puzzle, and can offer a solution to fit your needs today.



The premiere workstation publishing software
FrameMaker
more than a simple document preparation package.

EAKINS OPEN SYSTEMS

TOLL FREE 800-776-5665

How do you measure the quality of a field service company?

We're up even if the Sun isn't.

One Monday at 4:35 p.m., employees at a large Wall Street brokerage house noticed network operations lagging. Seconds later, 30 workstations connected to a Sun[®] Data Center[™] server went down. An entire department of stockbrokers, unable to access the information they needed to make critical buying decisions. With transactions exceeding \$250 million an hour, each minute down could mean millions.

They called Novadyne. In less than four hours, our field service team repaired the server. And restored this critical installation long before the market opened the next morning. Responsively. And expertly.

With top quality, nationwide maintenance on Sun hardware and operating systems. Highly trained field engineers and technicians. Sun upgrades and expansion devices. Automated call tracking and escalation. A multimillion-dollar spare parts inventory. And round-the-clock availability.

Contact us today at 1700 E. St. Andrew Place, Santa Ana, California 92705-6560, (800) 876-6823. We're ready to be your Sun field service company.

Anytime, day or night.

The one-word solution.



NOVADYNE[™]

All trade names referenced are the service marks, trademarks or registered trademarks of their respective manufacturers. © Copyright 1992, Novadyne Computer Systems, Inc. All rights reserved.

Circle No. 37 on Inquiry Card

A third invocation of `make` is run in the first subdirectory, `lib`. This time it will use the local `makefile` to clean up the directory. This is the library template (see above).

When this is finished, `make` III will terminate since it has done its job. The second invocation has another target to `make`, `prog1`. The new directory is entered and a new `make` started.

There are some problems. We must make sure that every `makefile` in a subdirectory has a target that corresponds to a possible target that can be run from the top level. If you look back at the library template, you will see that I left a stub for `install`. You may have thought this odd at the time, but there is method in the madness.

Also, what happens if we just say

```
% make
```

at the top level? This takes its target from the first entry in the `makefile`, the `$(TARGETS)` variable. If you look back, you will see that the first object in the `$(TARGETS)` variable is a null string `" "`. This command executed will be:

```
make lib prog1 prog2 TARGET=""
```

This is executed by the Bourne shell, and the double quotes will be eaten on the way through. When `make` is run, the argument list will be:

```
make lib prog1 prog2 TARGET=
```

The command to move into the subdirectory will be

```
cd lib; make
```

This is what we want; we need to call `make` with no argument. All's well that ends well.

Finding Out More

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

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

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.

Reader Feedback

To help *SunExpert* serve you better, take a few minutes to close the feedback loop by circling the appropriate numbers on the Reader Service card located in the back of this magazine. Rate the following column and feature topics in this issue.

Features:

The Big Thaw?
SoftPC: It Even Does Windows

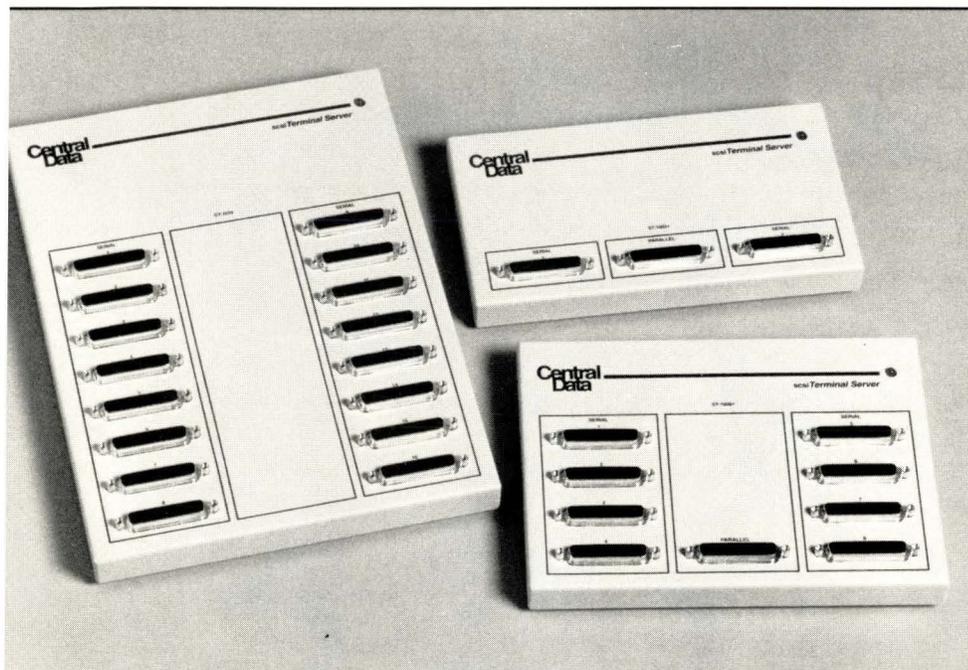
Columns:

Ask Mr. Protocol—The Desktop Dilemma
UNIX Basics—Make: Part II
I/Opener—Free Software Distributions
Systems Administration—Exploiting Cron

Interest Level

High.....	Medium	Low
180	181	182
183	184	185
186	187	188
189	190	191
192	193	194
195	196	197

ONE SOLUTION. No SLOTS.



All you need
to expand
today's
workstations.

THE SCSI TERMINAL SERVER™

to 392 serial and 49
parallel ports via SCSI

Everyone these days is talking about "open
ems" and portability. At Central Data, instead
alking about it, we went to work. The result:

scsiTerminal Server. An
n systems solution for the
IX workstation market.
Quite possibly the last
al/parallel expansion
duct you'll ever need.
By simply plugging into
SCSI port, a scsiTerminal
ver can be added to your
rkstation in as little as ten
utes. Without even
ning the system cabinet, or dealing with
nplex network configurations. Great news for
Rs and integrators.

Model #	Serial Ports	Parallel Ports	Unit Price
Series 1000:			
ST-1002+	2	1	\$695
ST-1008+	8-56	1-7	\$995
ST-1016	16-112	—	\$1,495
SP-1003	—	3-21	\$795
Series 2000:			
ST-2001	Provides link to seven ST-2008+ units		\$695
ST-2008+	8-392	1-49	\$795

And you can easily mix and match multiple
scsiTerminal Servers, making expansion virtually
unlimited. With the new Series 2000 models,
you can add up to 392 serial and 49 parallel
ports, at distances as great as 1500 feet away
from the host system. All without consuming

an internal card slot.

scsiTerminal Servers
support serial rates up to
57.6K baud. And compared
to most multiport boards,
they dramatically reduce
CPU overhead, further
improving overall system
performance.

So whether you're using
the Sun SPARCstation, the
HP-Apollo 9000 family, or IBM's RS/6000, try a
scsiTerminal Server now. It has all the portability
and performance you'll ever need.

Call 800/482-0315 today.

Visit us at
Sun World Expo
(Booth 707)

**Central
Data**

The scsiSystems Company™

02 Newton Drive, Champaign, Illinois 61821 217/359-8010 FAX 217/359-6904 24-hour Literature (217/359-8010 ext. FAX)

scsiTerminal Server is a trademark of Central Data Corporation. scsiSystems Company is a service mark of Central Data Corporation.
All other product names, trademarks, and registered trademarks are the property of their respective owners.

Circle No. 13 on Inquiry Card



Sun SPARCstation™



HP-Apollo 9000 Family
(Series 300, 400, 700)



IBM RISC System/6000™



ILLUSTRATION BY ROBIN JAREAUX

Free Software Distributions

by **RICHARD MORIN**, Technical Editor

Computer users are well acquainted with proprietary software. They have come to expect tidy users' manuals, glossy and expensive packaging and a toll-free support line. Sometimes they even get these amenities.

Many users are also familiar with nonproprietary software, including freeware and shareware. This may be packaged nicely, casually or not at all. A great deal of freeware and shareware is, in fact, distributed over electronic bulletin boards.

Freeware and shareware are redistributable, allowing users to pass copies on to others. Shareware authors request reimbursement, however, and may leave capabilities out of the "free" version. In addition, shareware (and most PC freeware) authors distribute only binary files, retaining control of the original source code. The general lack of programming tools and skills in the PC

community may also help to explain the prevalence of binary distributions.

Redistributable UNIX packages, in contrast, are nearly always available in source form. UNIX users are able to check for security holes, fix bugs, add features or adapt the code to new purposes. Gigabytes of this code are produced, disseminated over worldwide data highways and installed at receiving sites.

As the code is used, it is enhanced; bugs are detected and fixed; features are added; and documentation may be developed or improved. Developers from several cities or even several countries may participate in the creation or maintenance of a freeware package.

UNIX Freeware Distribution

Most UNIX freeware is distributed "over the net," but many UNIX users do not have network access. For any number of reasons (cost, hassle, securi-

ty), most UNIX systems are not tied into the Internet. Many, as well, do not receive the Usenet bulletin board. Some are not even connected to the UUCPNET and are totally isolated from the UNIX world's electronic mail channels.

In addition, it is not always easy to find desired packages. Several hundred sites maintain accessible archives, and the known archives total nearly 100 GB. Which package do I want? Which archives have the latest version?

Word of mouth (or screen) has been the traditional solution, but it often results in the distribution of superseded versions. Mechanized indexes are being developed, but it will take time for them to cover even the major freeware packages. With the explosive growth of freeware, and the informal approach taken by most of its authors, indexing will never be a complete solution.

Once located, a package may not be

ISN'T IT TIME YOU JOINED THE REVOLUTION?



Open Systems,
The Revolution
Everyone Wins.

See the revolution in action at XHIBITION 92.

Four Major Events In One . . . more than 125 vendors showing the latest hardware and software, plus three concurrent conferences that focus on specific needs.

The Open Systems Strategic Conference . . . making the corporate commitment to Open Systems is a major step. Spend two days exploring the implications of moving to Open Systems through presentations, case studies, and interactive seminars. Technologies include Client-Server, the X Window System, and Multimedia. Learn from executives who have already implemented Open Systems. Find out why a corporate commitment to Open Systems will save you money, improve efficiency, and help develop your competitive advantage.

Technology Planners' Conference . . . emerging technologies are difficult to track. This conference, designed for MIS managers and planners, brings the diverse technologies of X, Client-Server, and Multimedia into focus.

Application Developers' Conference . . . after deciding what technology to implement, the question becomes how. Technical papers and presentations take an in-depth look at the programming and implementation issues of Distributed Computing, the X Window System, and Multimedia. Over 30 half and full day tutorials are offered.

Join the Revolution Today! . . . Act now for program and registration details.

1. Call (617) 621-0060
2. E-mail xhibit@ics.com
3. Mail coupon or fax it to (617) 621-9555

CIOs, Developers, MIS managers, Users, Vendors...come to XHIBITION 92 and lead the revolution in Open Systems!

XHIBITION 92

JUNE 15 TO JUNE 19, SAN JOSE CONVENTION CENTER

XHIBITION: A WINDOW ON DISTRIBUTED COMPUTING

XHIBITION 92

201 Broadway, Cambridge, MA 02139

Tell me how to join the Open Systems revolution. Rush show information and registration forms.

Name _____ Title _____

Organization _____

Street _____ Phone _____

City/State/Zip _____



OSI? DCE? FDDI? ISDN? LAT? SMDS? IPX? SNMP? ONC? SNA? TCP/IP? CMIP?

Don't break new ground at the expense of your network or budget. Not when you can attend INTEROP 92 Spring, Washington, D.C. Our 7th Interoperability Conference and Exhibition brings together leading vendors, powerful technologies and far-reaching educational opportunities.

36 Information-Packed Two-Day Tutorials - offer in-depth exploration of relevant topics.

45 Conference Sessions - cover emerging technologies, internetworking strategies and multiplatform applications.

Instructors and Speakers - include world-renowned experts and industry leaders featuring: Nick Lippis on LAN/WAN interconnect; Dr. Douglas Comer on TCP/IP; Scott Bradner on bridges and routers; Richard des Jardins on OSI/GOSIP; Dr. Marshall Rose on ISODE and migration strategies.

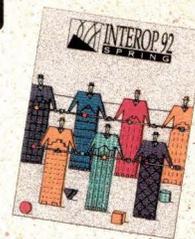
Executive INTEROP - this year, our highly acclaimed forum addresses Electronic Messaging issues at a senior I/S management level.

200 Exhibitors - all connected to a functioning global internetwork provide opportunity for hands-on product demonstrations.

Solutions Showcase™ Demonstrations - put it all to work. See SNMP, FDDI, Frame Relay, X.400, Token Ring, GOSIP/OSI, and SMDS in action.

Attend INTEROP 92 Spring, Washington, D.C. Where the hottest new products are integrated with education and insight. So you can be sure every solution is built on a solid foundation.

INTEROP 92 Spring
18-22 May 1992
Washington, D.C.
Convention Center.
Call today for
your free program
1-800-INTEROP ext. 53



I KNOW IT WORKS, I SAW IT AT INTEROP

Both commercial and free CD-ROM distributions are hitting the streets, and Sun users are in a perfect position to use them.

worth the trouble of installing. Although standards are improving, most freeware is pretty informal stuff. Documentation may be spotty, regression testing is unknown and no support is offered. Consequently, many of the programs in circulation are not "ready for prime time."

Others may be so constrained by legalistic restrictions that a user may not feel safe in letting the programs near a system, lest a lawsuit ensue. My respect for the Free Software Foundation's General Public License has been greatly increased by my perusal of some of these "licenses."

Nonetheless, there are a great number of documented, tested, useful and usable freeware packages around. Their authors may not answer telephone calls, but they will often accept emailed bug reports and may even offer a suggestion or fix.

Freeware Collections

Once released, packages become available for distribution. Barring restrictive license requirements, archivists can pick them up, organize them as desired and sell the resulting collection(s). Vendor-specific user groups have been doing this for years, both to make money and to serve their user communities.

Some collections are optimized toward specific architecture and/or OS variants. By concentrating on a small subset of the total freeware arena, they can include very specialized sets of code. In addition, machine-specific collections can include executable

Support



The right support can mean the difference between a good experience...and a bad one. If the right support is important to you, call us, the computer rental specialists.

**AMERICAN
COMPUTER
RENTAL, INC.**
We Rent Computers. Period.

800-672-7368



Authorized
Rental
Company

2721 Prosperity Avenue Fairfax, Virginia 22031

Circle No. 1 on Inquiry Card

binaries, both as aids for using the collection and as plug-and-play supplements to the source code.

Other distributions abandon optimization in favor of generality. Users are only expected to have the usual sorts of UNIX utilities—*awk*, *cc*, *grep*, *sh*, *tar*, etc. Reasonable vendors supply these, and freeware versions are available to fill in most gaps.

By avoiding dependence on particular architectures or OS releases, collections can be usable on a wide range of machines. If the distribution media are well-chosen, almost any UNIX system should be able to take advantage of them.

Media Choice

It is not easy to know which media to use. Most workstations can read QIC-24 cartridges; most mainframes cannot. Higher-density cartridges (QIC-150, etc.) are even more problematic.

Vendors use a variety of formats—no single density dominates. Reel-to-reel tapes are common on mainframes but seldom seen on workstations.

Going to higher densities, the problems are similar. Exabyte (8mm) cartridges are reasonably common at UNIX sites, but hardware and software incompatibilities can keep machines from reading each other's tapes.

CD-ROM works very well, if your system supports it. Unfortunately, all too many UNIX systems still do not. Or maybe they don't support ISO-9660 (the industry standard format). Most vendors have CD-ROM support in the pipeline, so this problem is temporary. Besides, the typical UNIX user can find a Sun if needed, so the problem is more of a nuisance than a catastrophe.

Just be aware that Sun's early and forceful adoption of CD-ROM was a big win. Both commercial and free CD-ROM distributions are hitting the streets, and Sun users are in a perfect position to use them. (Repeat after me: Thank you, Scott! You got this one right.)

Young Minds

If you are able to use a CD-ROM on your UNIX system, you may also want

to thank Young Minds. These folks were pushing CD-ROM before Sun knew what it was and have continued to promote CD-ROM innovation, standardization and usage.

In particular, they played a major role in the definition of the Rock Ridge Interface Protocol (RRIP). This standard promises to allow UNIX systems to enjoy full UNIX file-naming syntax and semantics. (The current standard, ISO-9660, is limited to a subset of MS-DOS names.) Look for

SOURCES for SOURCES

Cygnus Support

814 University Ave.
Palo Alto, CA 94301, USA
(415) 322-7836
(415) 322-3270 (fax)
info@cygnus.com

Free Software Foundation Inc.

675 Massachusetts Ave.
Cambridge, MA 02139 USA
(617) 876-3296
gnu@prep.ai.mit.edu

PDQ Software

1547 Palos Verdes, #260
Walnut Creek, CA 94596
(800) 786-9907
rab@sprite.berkeley.edu

Prime Time Freeware

415-112 N. Mary Ave., #50
Sunnyvale, CA 94086
(408) 738-4832
cfc1!ptf@apple.com

Sterling Software

NetNews/CD
1404 Fort Crook Road South
Bellevue, NE 68005-2969
(800) 643-NEWS
(402) 291-4362 (fax)
cdnews@sterling.com

Sun User Group Inc.

1330 Beacon St., #315
Brookline, MA 02146
(617) 232-0514
office@sug.org

UUNET Technologies Inc.

3110 Fairview Park Drive, #570
Falls Church, VA 22042
(703) 876-5050
(703) 876-5059 (fax)
info@uunet.uu.net

Young Minds

1910 Orange Tree Lane
Redlands, CA 92374
(714) 335-1350

yngmnds!stapltn@ucrmath.ucr.edu

RRIP in SunOS 4.1.2 and 5.0.

They have also been active in freeware publication, putting out several disks to date. Their current offerings include the GRASS 4.0 and X11R5/GNU disks. Both disks contain full indexes for the source code and have the Young Minds' Viewtool retrieval software.

The GRASS 4.0 disk (\$25) contains a public-domain geographical information system. Along with the source code, it contains binaries for the Data General Aviiion, DEC MIPS/Ultrix, IBM RS/6000 and Sun SPARC machines.

The X11R5/GNU disk (\$50) holds 340 MB of freeware source code. It includes the full core and contributed sources for X11R5 and the complete GNU Project materials from the Free Software Foundation. By using either Young Minds' symbolic-link mapping scheme or an RRIP driver, users should be able to build these tools directly from the disk.

PDQ Software

You don't need a large organization to put out a CD-ROM. PDQ Software is a one-man outfit, but it has put out a very respectable disk. For \$40, PDQ ships you:

- All the GNU source code;
- All the X11R5 sources, including all contributed software;
- All the `comp.sources.x` archives;
- SPARC binaries and libraries for the GNU programs, and for the X11R5 server and clients.

PDQ hasn't marketed the disk in any substantial way. In spite of this, they are selling a fair number of copies. Could rock-bottom prices and a sense of user needs have anything to do with PDQ's success? Nah... By the way, keep track of PDQ; they have several more disks on the way.

Sterling Software

Sterling has two offerings: Usenet on CD-ROM and a NetGems CD-ROM. The first comes as an annual subscription—for \$350 a year they will send you monthly snapshots of the Usenet

newsfeed. Future historians will bless Sterling for this collection—current UNIXoids may find it useful in a number of ways. Remember, however, that the disks will be just as noisy and tempestuous as the Usenet itself.

Sterling also publishes an annual NetGems CD-ROM (\$50, included in the Usenet subscription). This includes the GNU software, X11R5, the assembled Internet Requests for Comment (RFCs) and just about every Usenet source newsgroup in existence. Sounds like a pretty nifty disk.

Sun User Group

The 1991 SUGCD (\$250 for members, \$290 for nonmembers) contains a wide range of Sun-specific programs in both source and (SPARC) binary form. It also contains collections of Sun patches, Sun-related Usenet groups, etc. It also has full-text indexing and the Young Minds' Viewtool. Only SPARC systems can use the tool, however.

The 1992-1 SUGCD disk (\$50 for members, \$90 for nonmembers) is the PDQ disk described above, bundled with a Sony disk caddy. When evaluating these products, remember SUG "profits" go into user services, keeping dues down, etc. Buying a SUGCD can be a useful way of augmenting your firm's contribution to SUG.

Other user groups (DECUS, Interex, etc.) also have freeware distributions, and they will be more than glad to hear from you. Just contact your vendor's sales office and ask about their user group.

Prime Time Freeware

Having told you about all the competition, I guess I can mention my own CD-ROM offering. Prime Time Freeware (\$60) is intended as a semi-annual distribution of UNIX-related freeware. Volume 1, Number 1 (January 1992) contains over 600 MB of compressed source code archives. This translates to more than 1,500 MB of actual source code. The distribution also includes a 50-plus-page introductory and explanatory booklet.

The PTF disk contains documentation files for each included package, to give the user some idea of what the

package is about. Emphasizing bandwidth and portability over optimization, it includes very few binaries and little machine-specific code. Consequently, it should be usable by most UNIX users.

As a way of supporting freeware producers, PTF is collecting two kinds of contributions. Buyers can make a tax-deductible contribution to the GNU Project. PTF will send these funds directly to the Free Software Foundation. You would have sent a check, anyway, but this makes it easier. Alternatively, buyers can contribute to the PTF Software Slush Fund. The SSF is not tax-deductible, but it doesn't stay with PTF. Instead, it is used for buying licenses, joining consortia and sending checks to deserving authors and organizations. In short, it is used to reward the folks who generate freeware.

Free Software Foundation

The Free Software Foundation (FSF) has several distributions for sale. The Emacs tape is loosely focused on Emacs-related programs. The Languages tape contains a wealth of language processors, programming tools, file utilities, etc. The Utilities tape contains source code for smaller GNU utilities and applications.

The X11-Required tape contains X11R5 core software, documentation and contributed client software. The X11-Optional tape contains optional contributed software, including libraries, games, Andrew and other toolkits. Finally, the "Experimental" tape contains an experimental release of source code for the GNU C compiler Version 2, the GNU C library and the GNU Debugger Version 4.

FSF only puts out tapes, but they offer a variety of media and formats. Prices range from \$195 to \$230, depending on the media choice. These prices may seem high compared with those of the CD-ROMs described above. Remember, however, that any extra funds go back into generating more freeware.

FSF sells printed manuals for a number of GNU packages. These include the Bison, Gawk, GDB, GNU Emacs, GNU Emacs Lisp Reference, GNU

Networking



The right networking can mean the difference between a good experience...and a bad one. If the right network is important to you, call us, the computer rental specialists.



Authorized
Rental
Company

800-672-7368
2721 Prosperity Avenue Fairfax, Virginia 22031

Circle No. 2 on Inquiry Card

NEW!

Ultra **PLANNER**[®] Project Management with **GUI Sizzle and Substance** for UNIX and VMS

Ultra PLANNER FEATURES:

- Full Functionality
- Real-Time Performance
- Groupware
- Enterprise Consolidation
- Designed for Today's Computing Environment



Productivity Solutions

36 Washington Street
Wellesley, MA 02181
TEL 617 • 237 • 1600
FAX 617 • 239 • 1780

Circle No. 39 on Inquiry Card

9 Out of 10 Software Developers Rely on PVCS for Configuration Management.



What Does This Mean to You?

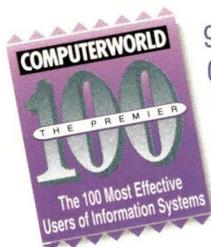
It means you can choose PVCS Version Manager with confidence. It means 9,000 companies did the homework and chose PVCS to provide change management for their critical software projects.

They chose PVCS Version Manager because it adapts to the way their developers work and only PVCS operates seamlessly across MS-DOS, OS/2, AIX, UNIX and LANs. PVCS Version Manager also synchronizes with mainframe library managers.

The Best LAN Solution

PVCS is architected for networks via distributed file capability, enhanced security, and network filename support. It provides complete control over the configuration of your software and its components whether you work alone; in a group on a LAN; or in heterogeneous networks with multiple operating systems.

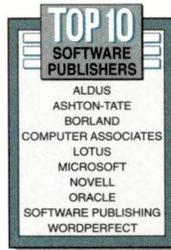
PVCS' heterogeneous network support promotes reusability because portable modules can be developed and maintained on whatever platform makes sense.



97 of Computerworld's Premier 100 companies manage development with PVCS.

“We use PVCS to track several thousand files among multiple development efforts. This task would be unbelievably onerous without version control and PVCS provides us with a system that has proven extremely robust.”

Geoff Geis, Senior Specialist, MCI



Nine of the ten top software publishers rely on PVCS to ensure product quality.

“We depend on PVCS to control all software development at Aldus. Over 100 developers use PVCS to track changes through engineering, beta, QA and production. Without PVCS, building a complex product like PageMaker would be extremely difficult.”

Steve Dowd, Principal Software Engineer, Aldus Corporation

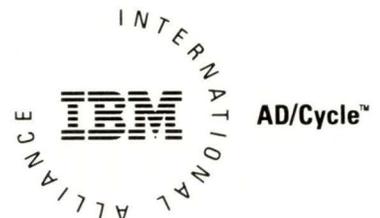
PVCS Provides:

- Revision Control for the modules that make up your project.
- Version Control to manage changes to your software system. Any revisions or versions can be recalled at any time.
- Support for any file type.
- Unlimited branching for safe parallel development and alternate or special versions.
- Extensive project and audit reporting capabilities.

Precise, Conformant Builds

Teamed with PVCS Configuration Builder, PVCS provides automatic builds of any version with absolute repeatability and conformance to standards. Promotion of versions from engineering through production is flexible without compromising control. Any prior version can be precisely duplicated, even to the degree of re-creating the original environment executables were produced in.

Software development is hard enough without getting stranded in a backwater by the tools you choose. PVCS is the industry standard and it links to standards. PVCS features seamless integration with the Programmers Workbenches from Microsoft and Micro Focus. Find out for yourself why INTERSOLV is the leader in configuration management. Call today for an evaluation copy.



“We have over 50 developers using PVCS and PVCS Builder to manage production of software that we would otherwise be unable to create. They save us thousands of hours every year by controlling the chaos that major development work creates. We couldn't live without them.”

Matt Severski, Senior Engineer
Kodak-Edicon Division

Single User Pricing

PVCS Version Manager \$600
 PVCS Configuration Builder \$250
 PVCS Version Manager and PVCS Configuration Builder run on MS-DOS, OS/2, AIX, SunOS, SCO UNIX & other UNIX platforms. Call for Multiple User License Pricing. INTERSOLV, Inc. 3200 Tower Oaks Blvd., Rockville, MD 20852. 301-230-3200, Fax: 301-984-3047

1-800-547-4000
 30 Day Money Back Guarantee

INTERSOLV

Emacs Calc, Make, Termcap and Texinfo manuals. They also have reference cards for GDB and GNU Emacs.

Cygnus

Cygnus Support is principally a service organization, providing contract support for GNU code. They are good, but they aren't cheap: "Leveraged" support starts at \$100,000 per year, and "Core" support starts at \$35,000 per year. Yes, they do have a substantial and growing number of customers.

They also offer a distribution of "Vintage" GNU software. This may be the ticket if you need a working set of GNU tools and don't want to be on your own while installing it. The distribution comes with a month of installation support, which should be plenty to get you up and running. After that, you can decide if a support contract makes sense.

UUNET

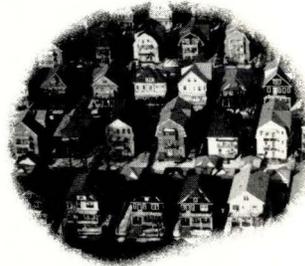
The UUNET Archive tape (varies, \$150 for 8mm) is a snapshot of the famed UUNET archives. It contains over a gigabyte of (mostly compressed) files, organized into a rough topical hierarchy. If you know what you are looking for, you will probably be able to find it on this tape. Don't expect any concessions to user-friendliness, however. This tape is for folks who know what they want, what it's called, etc. →

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.

A Little Help for Your Friends

If you know someone who should be receiving *SUNEXPERT Magazine*, please feel free to pass along a copy of the qualification card located elsewhere in this magazine.

Availability



Availability can mean the difference between a good experience...and a bad one.
If availability is important to you, call us, the computer rental specialists.

 **AMERICAN
COMPUTER
RENTAL, INC.**
We Rent Computers. Period.

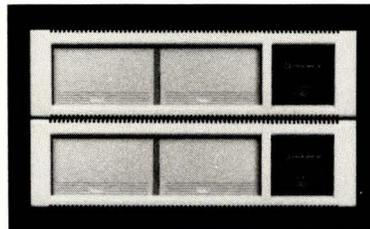


Authorized
Rental
Company

800-672-7368
2721 Prosperity Avenue Fairfax, Virginia 22031

Circle No. 3 on Inquiry Card

DIGITAL VIDEO DISK



- CCIR 601/SMPTE 125 Interface
- 6 to 46.8 Minutes
- HDTV Models Available
- Optional HIPPI Connection
- Digital VCR Software
- Optional Image Processors
- Optional Integrated 8mm Tape

The VideoDISK Real Time Array records and replays digital video much in the same way as an analog VCR. The digital domain recorder, however, offers many advantages not possible with analog recording such as unlimited replay, looping, variable speed, random access and compression.

Let us help you with your toughest video acquisition, processing and storage requirements.

Call or fax for immediate information.



341 Ski Way
P.O. Box 8510
Incline Village, NV 89452

Phone: (800) 2 GET RCI
(702) 831-0473
Fax: (702) 831-8035

Circle No. 40 on Inquiry Card

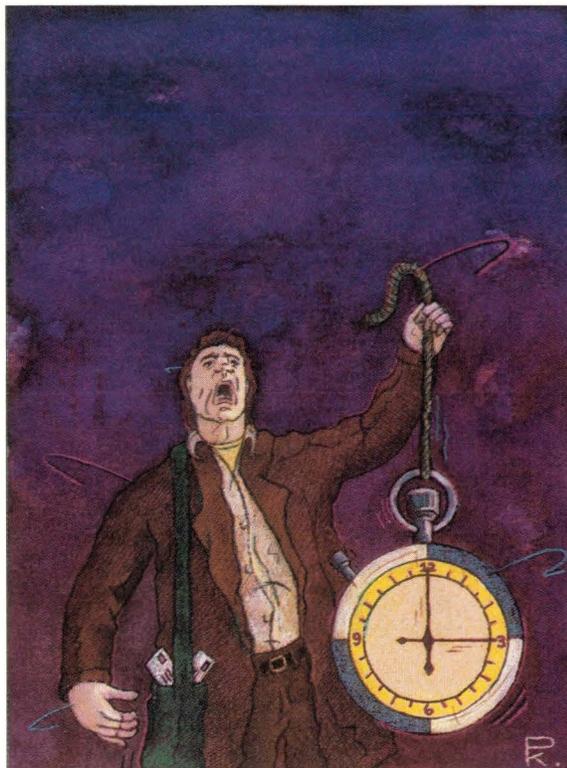


ILLUSTRATION BY PETER KALABOKIS

by S. LEE HENRY

Exploiting Cron

The cron utility for scheduling routine tasks is very much underused at many sites. Properly deployed, cron enables you to put a lot of administrative processing on autopilot.

In this month's column, I suggest a lot of uses for cron and detail a reboot script that you might modify and use from root's crontab file to do those occasional reboots you've always known were a good idea. I also explain how you can invoke changes to your crontab files without having to edit the file manually on each of your systems. The crontab files stored in `/var/spool/cron/crontabs` are named after each user with a cron process table. The format of the crontab files is straightforward as long as you can remember which column is which—this is not in the man pages for cron or crontab. You also have to remember to use full paths for processes. cron does not acquire the same environment as the logged-on user. Also, you must specify explicitly which shell you are using or cron uses the Bourne shell. As an experiment, run `printenv` to display the environment from root's crontab file by inserting the following into `/var/spool/cron/crontabs/root`:

```
15 9 * * * /usr/ucb/printenv > /dev/console
```

This command will execute at 9:15 in the morning. Adjust it to be a few minutes from now and watch your console window.

cron, by the way, is very social and sends you mail when it can't do what you ask or when it doesn't know where to send your output. If you entered simply

```
15 9 * * * /usr/ucb/printenv
```

for the line above, you'd get mail like this:

```
Your "cron" job
/usr/ucb/printenv
produced the following output:
HOME=/
LOGNAME=root
PATH=:/usr/ucb:/bin:/usr/bin
SHELL=/bin/sh
USER=root
```

Regularly Scheduled Tasks

There are many administrative tasks that you could benefit from running regularly within `cron` to help monitor the health of your network. You should consider setting up daily, weekly and monthly scripts for automating those tasks that you want run at these intervals. For example, on a daily schedule, you might want to remove junk files that are more than a few days old from `/tmp` or transfer directories, prepare reports on disk usage and quotas, massage and process log files, locate broken links, or detect and report that important system files have changed. On a weekly schedule, you might want to rotate log files, run `fsck`, make a report on printer usage. On a monthly basis, you might want to prepare monthly accounting files.

If you set up these periodic scripts, you can call them from your `crontab` file and run them overnight very easily. The lines in your `crontab` file would look something like what is shown below:

```
# killbyname
kill `ps ax | grep $1 | sed 's/^ *//' | sed 's/ .*//` > /dev/null
2>&1
```

Killbyname (first line is blank)

```
0 3 * * * /bin/sh /usr/adm/daily 2>&1 |
mail root
0 2 * * 1 /bin/sh /usr/adm/weekly 2>&1 |
mail root
0 1 1 * * /bin/sh /usr/adm/monthly 2>&1 |
mail root
```

Editing a `crontab` file is properly done through the `crontab -e <userid>` command. This is because `cron` needs to be clued in to the fact that the file has changed. The `crontab -e` command is a convenience that lets you make the change and invoke it in one operation, but it still must be run on each system, and some of us have hundreds or even thousands of systems to administer. We therefore will accomplish the same thing by appending a line to the bottom of the file, and killing and restarting `cron`.

Our script to add a line to `cron` first checks if the line is already there and adds the line if it is not. It kills `cron` via a

Crontab update script

```
wizard# foreach host (`ypcat hosts | awk '{print $2}'`)
? echo $host
? set OK = `ping $host | tr '\040' '\056'`
? if ($OK == '$host.is.alive') then
? set exists = `rsh wizard cat /var/spool/cron/crontabs/root | grep soft_reboot | wc -l`
? if ($exists == 0) then
? rcp /usr/local/bin/soft_reboot $host:"/usr/local/bin/soft_reboot
? rsh $host "echo '0 4 * * 1,15 /usr/local/bin/soft_reboot 2>&1' >> /var/spool/cron/crontabs/root
? rsh $host /usr/local/bin/killbyname cron
? rsh $host /usr/etc/cron
? endif
? endif
? end
```

```
15 9 * * * /usr/ucb/printer>/dev/console
^ ^ ^ ^ ^ ^ ^
| | | | | |
| | | | | +- command +- what to do with output
| | | | +- day of week
| | | +- month
| | +- day of month
| +- hour
+- minute
```

Format of a crontab entry

“killbyname” script so that we don’t need to be concerned with `cron`’s process ID. Killbyname is a generally useful script to have around, but you need to be careful when you specify what you want to kill since it uses `grep` to match the process name. If you were trying to kill a lockscreen and simply said `killbyname lock`, you’d kill `rpc.lockd` and any locks you might have sitting on your desktop as well.

The Reboot Script

Our reboot script, `soft_reboot`, first shuts down any processes that require a special shutdown procedure. In the sample, we are shutting down the SunLink communications

process that emulates an IBM 3274 cluster controller on an SNA connection. We might also shut down license managers, database systems and many other applications.

```
#!/bin/sh
# This script is run from crontab
/usr/sunlink/sna3270/stopsna &
  <== substitute your processes here
# Sync the disks and reboot
cd /etc;sync;sync;reboot &
```

In the sample session shown below, we will add the reboot script to root’s `crontab` file for every host on our NIS domain. We are explicitly asking each system to reboot at 4 a.m. on the 1st and 15th of each month.

Crontab Update Script

If you want to build a user-friendly script for making this change across to a single workstation (you might want to

include this as part of a setup or installation script), you might try a variation on the script shown below.

It will take a while to ping each of the workstations, but we won't try to run the remote shells on a host that is down or disconnected. You might want to add an else clause to the ping logic and make a list of those systems you were not able to add the reboot command to. Don't be concerned about the messages that `cron`'s death sends to your console.

Security and Cron

There are two security issues that you need to consider when using `cron`. For one, you need to be sure that `crontab` files are not writable except by the owner, especially in the case of `root`. `root`'s `crontab` file on a Sun system is set to 400 (`-r-----`) by default. The other issue is whether or not you want to restrict usage of `cron` to a specific set of users; if this is the case, you will use the `cron.allow` and `cron.deny` files in `/var/spool/cron`. By default, the

`cron.deny` file exists but is empty. The `cron.allow` file does not exist. This provides unlimited access to `cron`. If you create a `cron.allow` list, then only users specifically mentioned in that file will be able to use `cron`. `cron` can do a lot of work for you if you take the time to set it up. On a large network, the work of setting it up on a large number of hosts can be minimized. Take advantage of it.

Acknowledgments and References

Thanks to Susan Lamb for her thoughts on gentle reboots. Frisch, Æleen, *Essential System Administration*, O'Reilly & Associates, 1991. ➔

S. Lee Henry is a system administrator for a large network of Suns in the federal government and is also president of The Next Page Inc., a consulting firm specializing in systems documentation. Her email address is `slee@expert.com`.

Script for installing `soft_reboot`

```
#!/bin/csh
# This script sets up rebooting at a specified time on the 1st and 15th of each month
if (-f soft_reboot) then
    mv soft_reboot /usr/local/bin/soft_reboot
    chmod 744 /usr/local/bin/soft_reboot
endif
if (-f killbyname) then
    echo "Installing killbyname in /usr/local/bin"
    mv killbyname /usr/local/bin/killbyname
    chmod 755 /usr/local/bin/killbyname
endif
echo -n "Hour for reboot? (0-23)> "
set hour = $<
echo -n "Will reboot 1st and 15th of each month at "
if ($hour == 0) then echo midnight
else
    if ($hour == 12) then
        echo 12 noon
    else
        if ($hour >= 12) then
            set hr=`expr $hour - 12`
            echo $hr PM
        else
            echo $hour AM
        endif
    endif
endif
echo -n "If this is OK, hit return (^C to abort) "
set answer = $<
set exists = `grep soft_reboot /var/spool/cron/crontabs/root | wc -l`
if ($exists == 0) then
    echo "0 $hour 1,15 * * /usr/local/bin/soft_reboot & 2>&1" >> \
    /var/spool/cron/crontabs/root
else
    echo "Changing old soft_reboot entry"
    set oldtime = `grep soft_reboot /var/spool/cron/crontabs/root | awk '{print $2}'`
    sed "/soft_reboot/s/$oldtime/$hour/" < /var/spool/cron/crontabs/root > \ /tmp/cron.tmp
    mv /tmp/cron.tmp /var/spool/cron/crontabs/root
endif
/usr/local/bin/killbyname cron
if (-f /var/spool/cron/FIFO) then
    rm /var/spool/cron/FIFO
endif
/usr/etc/cron
```

W

hat do you do when **96** users need the power of a SPARCstation™ and you only have the budget for one?



Introducing the **DEI-2 WorkServer**.™

The world's first **expandable** SPARCstation, ethernet, terminal, modem and printer server.

The DEI-2 WorkServer™ provides users with mainframe performance at PC prices by combining the power of a 28.5 MIPS Sun SPARCstation 2™ with GNP's expandable multiport serial and parallel product.

Now with Multiport Menus™ we also offer a completely menu driven program to easily install and maintain multiple terminals, modems and printers.

- Sun SPARCstation 2 motherboard with two free SBus slots
- Ethernet, SCSI, 16 serial, 2 parallel and 2 synchronous ports
- Expandable to 96 serial and 12 parallel ports
- Full TERMIO baud rates (75 to 38.4KB)
- Full modem support on all serial ports
- STREAMS device driver and Multiport Menus
- Communications: X.25, T1, FDDI, Token Ring
- Supports SunOS™ or Solaris™



GNPComputers

1254 E. Colorado Blvd., Pasadena, CA 91106

Founded By Caltech Grads

Tel: 818-577-4252

Fax: 818-577-4263

© 1991 GNP Computers. All product names are registered trademarks of their respective owners.

Circle No. 22 on Inquiry Card

SPARCalikes

For a while last year, it looked like Scott was going to get his wish. The market for SPARC-based workstations—or SPARCalikes, as we tend to call them around here—had started out with a bang. But the aftershocks of an ongoing recession, coupled with a crackdown by Sun Microsystems Inc. to prevent its resellers from carrying “clones” (see “Sun Lays Down the Law”), wiped out more than a few of the up-and-coming SPARCalikes.

After the dust settled, a few companies merged. Others restructured. Some opted to quit the business entirely. But even more upstarts rose to take their

“My dream is that thousands of SPARC clone companies will go out of business. Out of 10 failures, there’s bound to be one success.”

—Scott McNealy, president and CEO, Sun Microsystems Inc.

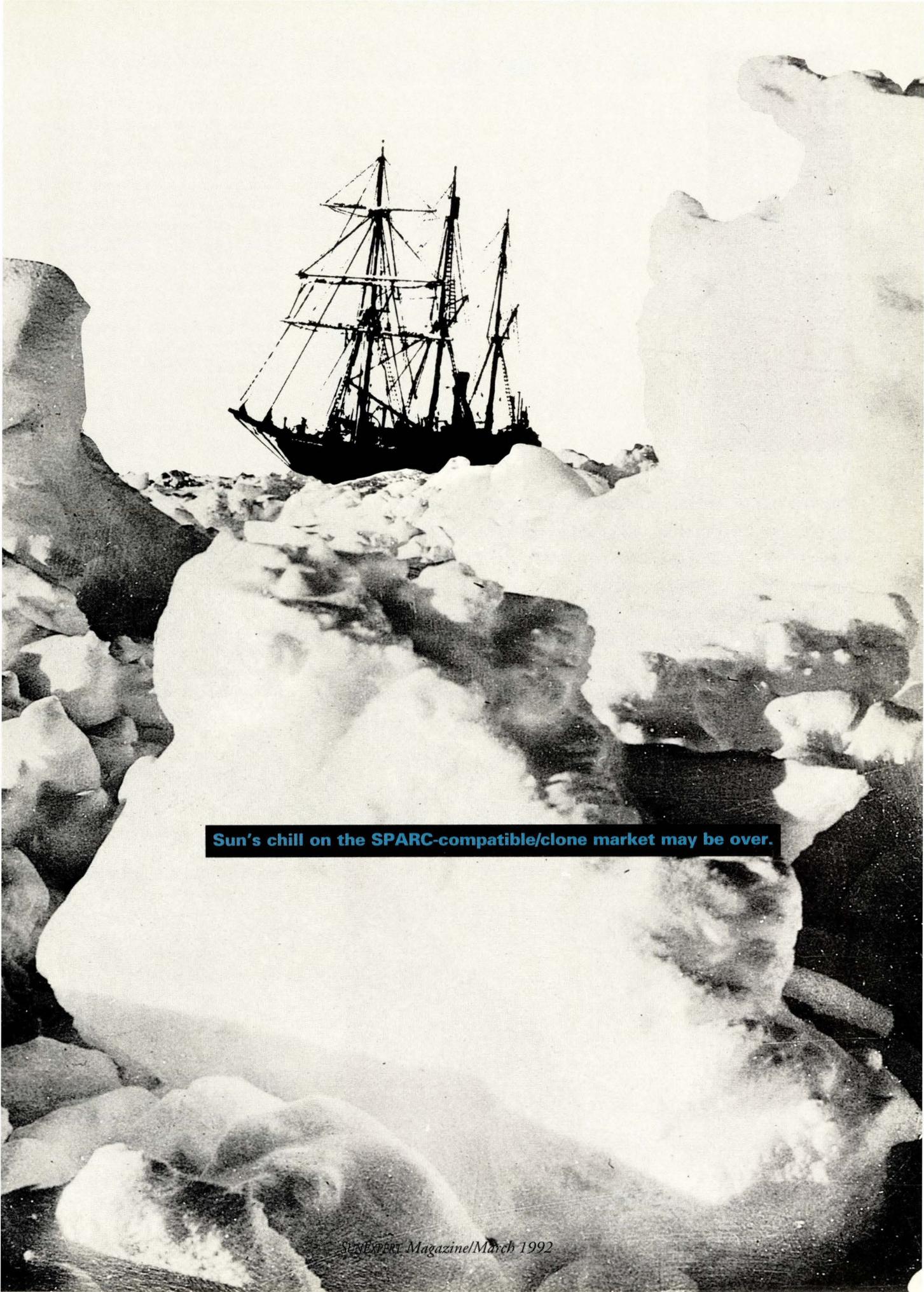
The Big Thaw (Maybe)

by **Mary Jo Foley**, Senior Editor

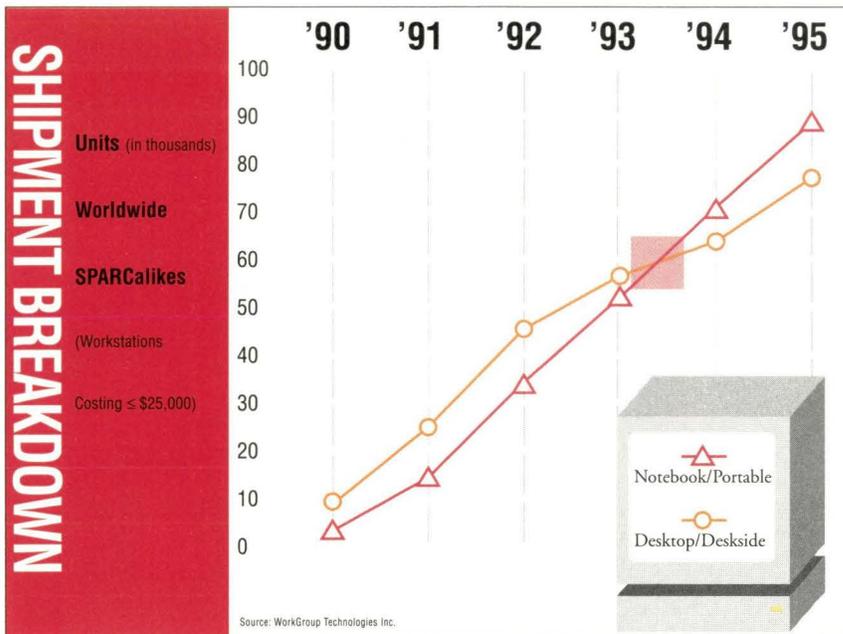
least a few SPARCalike companies managed to move product last year, according to Hampton, NH-based market-research firm WorkGroup Technologies Inc. WorkGroup says that vendors sold 25,960 fully configured desktop and desktside SPARC-based workstations costing \$25,000 and less in 1991. And SPARC-based notebook and portable system vendors sold 15,880 fully configured machines last year, WorkGroup claims. A large percentage of sales in both cases occurred in Japan and the rest of the Far East, says WorkGroup vice president John Dunkle.

places. As a result, the 1992 SPARCalike market features a number of companies you have probably never heard of. There are, however, a few battle-scarred stalwarts, a year wiser and a lot leaner and meaner. (See “A Sampling of SPARCalikes” for more on SPARCalike vendors and their products.)

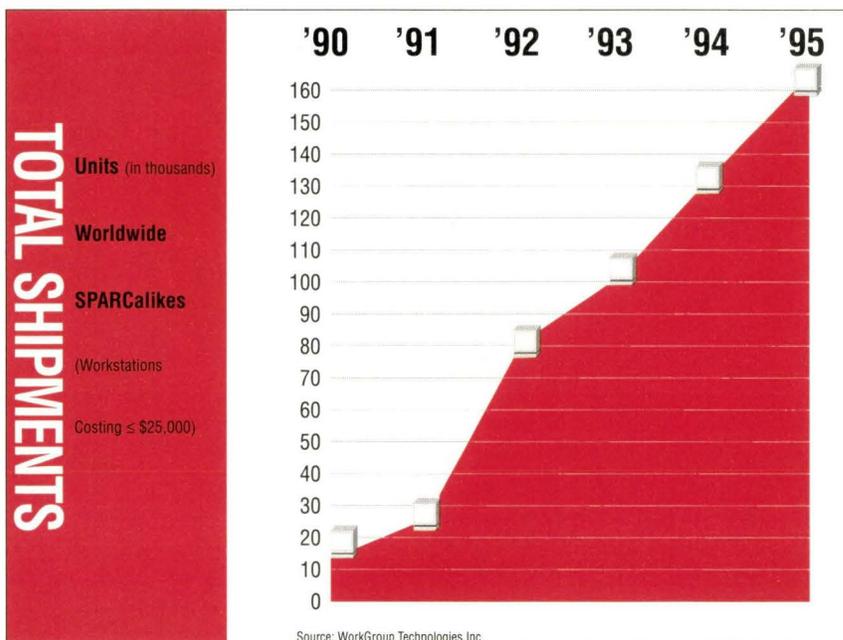
Despite the turmoil, at



Sun's chill on the SPARC-compatible/clone market may be over.



The number of portable/notebook SPARCalikes shipped by vendors will surpass the number of desktop/deskside SPARCalikes (\$25,000 or less) shipped in 1993, according to WorkGroup Technologies Inc. The Hampton, NH, market-research firm tracks worldwide shipment data for fully configured machines (i.e., systems fully loaded with extra memory, disk and system software). Based on this criterion, most desktop/deskside SPARCalikes fall into the \$15,000-plus price category (as opposed to the \$10,000-and-under one, the range for entry-level/base configurations). Portable/notebook SPARCalikes, even when fully configured, tend to be in the \$15,000-and-under range.



In fact, for WorkGroup's numbers to add up, nearly all of the sales to date must have come from Far Eastern vendors, such as Toshiba and Fujitsu Ltd. Among U.S. vendors, SPARCalike sales were anything but rosy. CompuAdd Corp. is thought to have sold about 4,000 of its SS systems last year. Opus Systems says it sold 1,500 of its Model 5000s. RDI Computer Corp. is claiming a total installed base of 2,500 to 3,000 BriteLites as of the end of 1991. Other SPARCalike companies now concede that their initial projections of selling 10,000 or more systems in 1991 were "a bit" on the optimistic side.

What Went Wrong?

Going into 1991, "[SPARC] compatibles were between one and three generations behind Sun [systems]," admits Majid Eskandari, workstation product manager for Tatung Science & Technology Inc. (TSTI), the U.S. arm of Tatung Co. To aid companies like TSTI in speeding product to market (among other less altruistic reasons), Sun spun off separate divisions, such as SunSoft and SunTech, a move most of the clone and compatible vendors welcomed.

But right on the heels of the reorganization, Sun pulled the rug out from under its protégés by announcing its "SPARC clone exclusivity policy." Sun forbade its resellers to carry SPARC clones, which in Sun's definition are any products that fall between laptops/notebooks and mainframes and which compete directly with Sun's existing products—in other words, all of the existing desktop SPARCalikes.

"The reseller strategy decision by Sun prolonged the acceptance process," Eskandari acknowledges. Fortunately, he says, "TSTI never relied on Sun resellers." At press time, TSTI counted 30 resellers in its fold, with another 20 pending.

"We performed slower than our expectations," concurs David Hu, senior vice president of sales and marketing for Solarix. "We only sold a few hundred systems in 1991, due to the slow economy, plus Sun's abrasive

[reseller] policy." Sun's exclusivity rule led Solarix to shift its marketing and distribution strategy from its original direct-sales focus to a complete reliance on OEMs, and to a lesser extent, systems integrators and VARs.

As if these goings-on weren't enough for the SPARCalike vendors, Sun threw them one more not too surprising curve ball: In July it slashed the prices of its SPARCstation SLC, IPC and 1+ in order to make way for the ELC, IPX and 2. Although Sun's new prices were still considerably higher than those of the SPARC clone and compatible vendors, the price cuts put additional pressure on already shrinking SPARCalike margins.

Many SPARCalike vendors had been anticipating price slashing from Sun. "We had done some research on the 1+ market but didn't invest much money there," says Martin Fenner, CEO of Marner International Inc., a SPARCalike vendor with a Swiss parent, Fenner Elektronik AG. "We sold tens of our 1+ [compatible] machines last year, mostly in Europe," Fenner continues. "But there wasn't much of

a market for them once Sun dropped the price." Marner has instead concentrated more of its efforts on selling its SPARCstation 2-compatible, the S-2.

"There's a price war under way," agrees Charles Leadford, manager of CompuAdd's advanced systems group. "Sun continues to attract the top tier of resellers," he says. At the low end, "there's heavy discounting from the offshore vendors." And at the same time, there's increasing competition from Digital Equipment Corp., Hewlett-Packard Co. and IBM Corp. "It's an all-out war," Leadford concludes, "not a dinner dance by any means."

Who Bit the Dust?

For a number of vendors, these upsets proved to be too much. For example, AFE Computers Ltd., the first European vendor to dabble in the SPARC-compatible waters, basically dropped most of its Sun-compatible work in September 1991. However, the company is continuing to develop an industrialized SPARC-based machine and plug-in graphics accelera-

tors, graphics boards and motherboards for Sun OEMs (see "Miles and Miles and Miles," *SunExpert*, February, Page 67).

Another casualty is Fusion Microsystems Inc., the Los Altos, CA, vendor that unveiled its Fusion 1 at UniForum in January 1991. The Fusion system was a takeoff on the TriGem Corp. 20-MHz SPARCalike. According to the company's founders, Gregory Leonard and Susan Mason, Fusion became an experiment, or a test case, designed to demonstrate that it was feasible to build SPARC clones. Once this was established—and apparently before any sales were achieved—the company was disbanded.

The Mexican SPARCalike vendor Intelec S.V. is out of the market too. The company introduced a prototype of its 20-MHz clone, the Numen RISC S-20 at Comdex in 1990. It planned to ship product during the first quarter of 1991. It's unclear whether Intelec S.V. ever sold any systems.

Mars Microsystems Inc., the Mars, PA, vendor that pioneered the concept

More often than not, the SPARCalike market's sluggishness in 1991 is attributed by many of the SPARCalike vendors to Sun Microsystems Inc.'s SPARC clone exclusivity policy. According to this policy, the 1,000 or so Sun VAR and national value-added dealer (NVAD) outlets are not to carry SPARC clones under the threat of losing their Sun VAR designation.

This policy was criticized severely by SPARCalike vendors, the trade press and many users when Sun first made it public in mid-1991. Since that time, companies have regrouped and refocused. A few resellers have seemingly found ways to skirt Sun's ordinance. And Sun has voiced multiple justifications for its actions.

"We don't believe we don't have open channels," says Chuck Berger, vice president of U.S. marketing for Sun. "There are huge numbers of VARs and dealers out there. We're only using a few of them."

Sun points out that it must make a substantial investment in a reseller in order to bring it up to

speed. "We take a lot of time to teach them UNIX, client/server computing and, many times, one or more vertical applications. A clone maker could just come in and use the infrastructure we've put in place." Sun does not require its resellers to drop their Digital Equipment Corp., Hewlett-Packard Co., IBM Corp. or other workstation lines, however. Berger explains: "All of these vendors use proprietary boards, buses and different proprietary operating systems. This means each of them has to make the same initial investment [in the resellers] as we did."

Sun hasn't yet decided how it will proceed with resellers that carry the Solaris-on-Intel systems, once they become available. "But we can't imagine our existing VARs who carry PCs won't be allowed to continue to do so," Berger says.

Sun's policy is in place for one overriding reason, according to Berger: "If all of us [SPARC-system vendors] were concentrated on the same resellers, we wouldn't be expanding the market."

**SUN
LAYS DOWN
THE LAW**

of combining the AT bus and the SPARC processor, still exists as an independent vendor and development partner of Tatum. But Mars is no longer in charge of selling the Mariner 4i; TSTI is now doing all of the Mariner marketing and support. Both Mars and TSTI attribute the shift in responsibilities to dissatisfaction on both sides with sales of the Mariner. Reportedly, Mars will continue to do some sort of SPARC development work, although in what capacity and with or without Tatum's backing remains to be seen.

A similar arrangement has evolved—or, one could say, dissolved—between TriGem Corp. and RDI. The two companies jointly developed a laptop SPARCalike. For a few months, starting in early 1991, they were selling very similar implementations, each with its own name (BriteLite from RDI and SLT-100 from TriGem). Shortly thereafter, RDI began selling a modified version of the BriteLite, incorporating Sun's IPC board, while TriGem continued selling the original LSI Logic Corp.-based product.

"They [TriGem] struggled like all of the other clone makers last year," explains Rick Schrameck, RDI's CEO. "So we took the SLT and brought it under the BriteLite name." RDI has begun touting the SLT, rechristened as the BriteLite LC, as "the lowest cost workstation in the world" and is targeting the machine at the education market. During the first quarter of this year, RDI was expecting to sell the system through Sun's educational discounting program for approximately \$4,000. (As you can see from the buyers guide that follows, even with the discount the product is far from the lowest priced SPARC workstation.)

Alive and Kicking

Not every SPARCalike vendor has thrown in the towel. CompuAdd, Opus Systems, TSTI, RDI, Solbourne Computer Systems Inc. and a select group of other diehards are still kicking. CompuAdd, Opus and TSTI are all shipping 40-MHz, SPARCstation

2 clones/compatibles in addition to their 20-MHz and/or 25-MHz SPARCalikes.

Opus has moved into the "second phase" of its SPARC strategy, says product manager Marcia Kennedy, by focusing the bulk of its efforts on distributing its SPARCcard. The SPARCcard is an AT add-in board that allows PC users to run SPARC applications at SPARCstation-1+ speeds and performance levels, according to the company. The turnkey SPARCcard

‘We don’t
have a clear
understanding
of where SMCC
does and doesn’t
want us to be.’

kit includes the SPARC-based board, 8-MB DRAM, color frame buffer, on-board Ethernet, DOS interface software and Opus' port of SunOS 4.1.1, and lists for \$4,495. Kennedy says Opus had shipped 500 of these cards as of January.

RDI continues to lead the SPARC-alike pack in terms of sheer numbers of different products introduced. (The company has a way to go before it can claim to be shipping all of the different systems it has introduced, however.) In addition to several different BriteLite configurations, the company has shown a desktop system (RDI Solution); a "convertible" (RDI Profile—a version based on SPARC, as well as a Macintosh-compatible one); and an IPC-based docking workstation. Unlike the majority of SPARCalike companies, RDI has found a way to tap into federal and military demand. Schrameck says RDI expects 45% of

its 1992 revenues to come from civilian and military government sales.

Continuing to bill itself as "the server company that also sells desktops," Solbourne keeps rolling along. "It's rare for us to sell an S4000 alone without a [Solbourne] server," says vice president of marketing Travis White, "even though the S4000 is a good little database server on its own." Solbourne's most recently introduced SPARCalike, the S4000DX (Design Xcellerator), made its debut in July last year. The system is a souped-up S4000 with second-level cache designed to accelerate compute-intensive design applications. At the same time, Solbourne added the S3000, a "compact desktop" developed jointly by Solbourne and Matsushita Electric Industrial Co. Ltd. (MEI), to its repertoire of systems available internationally. (The S3000 had been marketed through MEI in Japan since October 1990.)

And then there are the SPARCalike vendors that have somehow managed to hang on, even though they've shipped little, if any, product. Solarix comes to mind here, as do Hyundai, Sampo Technology Corp. and Twinhead Corp., among others.

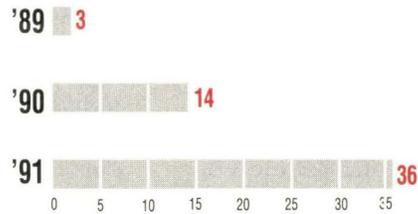
Solarix, a division of Able Technologies Inc.—a private firm financed by U.S., Singapore and Taiwanese backers—announced two workstation families (with a third pending) during 1990 and 1991. It ended up putting its Personal Workstation 20, a SPARCstation 1+-compatible, on indefinite hold. It sold a few hundred, at most, of its 25-MHz Personal Workstation Plus almost entirely in the Far East and Europe, admits vice president Hu. Hu says Solarix installed four systems in the United States.

In January of this year Solarix unveiled its PW+/40. The company bills the system as delivering "greater performance and functionality than Sun's SPARCstation 2 at a lower price," and as being "upgradable to superSPARC [the next generation of superscalar SPARC processors] by exchanging [the] MBus SPARC module." At press time, Solarix was promising that the PW+/40 would

SPARC MARKET

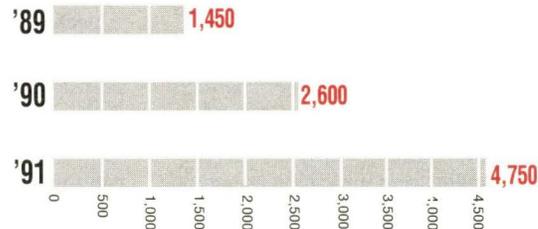
Infrastructure
Growth (Units)

SPARC System Vendors*



*Vendors shipping product

SPARC Third-Party Solutions



Source: SPARC International

Difficult market conditions don't seem to have put much of a damper on the SPARC aftermarkets, according to SPARC International.

begin shipping in January. To date, the company has had trouble making good on its ship dates, a fact Hu attributes to problems in getting the MBus to work. "The [MBus] operating system is different and the chips required are new," he explains. But "now we are ahead of the other guys implementing MBus," he says, including Sun itself, which has yet to deliver an MBus desktop. (The SPARCstation 3 will be its first attempt.)

During the past few months Hyundai has reorganized internally and spun off a separate workstation division in the hopes of capturing SPARCalike market share. "We tried to leverage our PC channels" to sell workstations, says Mark Johnston, executive vice president of the workstation division, "but that didn't work." Now, a more focused Hyundai is poised to enter the SPARCalike arena. "Our new focus will be the compatible, not the clone," Johnston says.

In February 1992, the workstation division unleashed its VS-210, a 40-MHz, 28.5-MIPS system, on the user community. This product, built by Hyundai Electronics Industries Inc. in South Korea, is strictly a clone, Johnston acknowledges. But the U.S.-based workstation division plans to

announce another new system during the second quarter that will be "different in form and functionality" than existing SPARC desktops, according to Robert Novak, the division's senior director of marketing. Novak hints that these systems will make use of some of the new peripheral chipsets that are coming to the market. And "multiprocessing is something we plan to look at very closely," he adds.

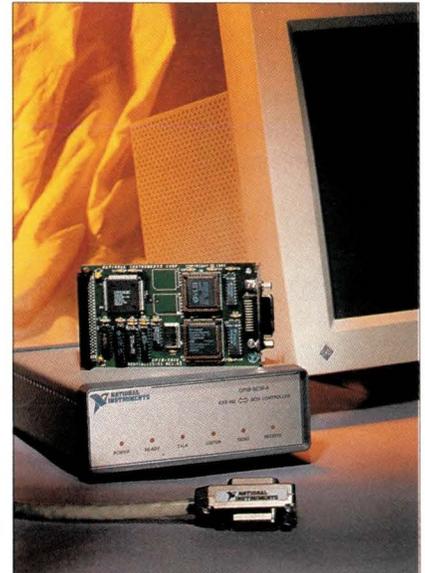
Whither the Market?

Hyundai's reorganization and subsequent strategy shift highlight issues that concern SPARCalike vendors and users alike. First, how does a company differentiate product in a clone/compatible market? Second, how does it distribute and sell product in such a market?

Because of its PC clone roots, Hyundai is especially attuned to the similarities and differences between the PC and SPARCalike worlds. While the company claims PC channels are not the way to go with RISC workstations, it refuses to divulge what it *does* consider to be the way to sell SPARCalikes. "Our goal is to expand the size of the total SPARC market," Johnson says. "Right now, there seems to be a lack of cohesion. The enemy isn't SMCC [Sun

IEEE-488.2

for Your Sun SPARCstation



Plug-in SBus Interface

- SBus single-slot IEEE-488.2 interface
- NAT4882™ IEEE-488.2 Controller chip
 - Optimized GPIB functionality
- Turbo488® performance chip
 - 1 Mbytes/sec reads and writes
- Multitasking SunOS software included

External SCSI ↔ GPIB Controller

- Complete IEEE-488.2 control using GPIB-SCSI-A Controller
- RAM buffer
 - Maximized system throughput
 - SCSI disconnection/reconnection
- Multitasking SunOS software included

Call for Free 1992 Catalog



6504 Bridge Point Parkway
Austin, TX 78730-5039
Tel: (512) 794 0100
(800) 433 3488
(U.S. and Canada)
Fax: (512) 794 8411

Branch Offices
AUSTRALIA 03 879 9422 • BELGIUM 02 757 00 02
CANADA 519 622 9310 • DENMARK 45 76 73 22
FRANCE 1 48 65 33 70 • GERMANY 089 714 5093
ITALY 02 4830 1892 • JAPAN 03 3788 1921
NETHERLANDS 01720 45761 • NORWAY 03 846866
SPAIN 908 604 304 • SWEDEN 08 984 970
SWITZERLAND 056 45 58 80 • U.K. 0635 523 545

Product names listed are trademarks of their respective manufacturers. Company names listed are trademarks or trade names of their respective companies.
© Copyright 1991 National Instruments Corporation.
All rights reserved.

Circle No. 35 on Inquiry Card

Microsystems Computer Corp.]. We need to understand where to compete and where to differentiate so that all of the [SPARCalike] vendors aren't competing for the same piece of pie. But right now, we don't have a clear understanding of where SMCC does and doesn't want us to be."

One area in which Hyundai and a number of other SPARCalike vendors are seeking immediate clarification

A number of 'low-end' players are expected to add SPARC-based servers, some based on MBus.

from Sun is in its hopes and plans for the Solaris-on-Intel market. Some vendors fear the PC companies could become a whole new pack of competitors to contend with. Vendors such as Hyundai, Tatung, Twinhead and others with a strong PC-clone capacity are expecting more synergy than competition, but still want more details. "We're looking for SunSoft with Solaris to compete head-to-head with Microsoft [Corp.] Windows/NT," says Johnston. "We need somebody to be our Microsoft."

Other vendors are focusing on more immediate, or some might say, lingering, worries—namely, how to create sales channels when Sun has a stranglehold on a large number of the existing, qualified UNIX VARs. Some SPARCalike companies, mostly those with substantial financial wherewithal, are building their own channels.

Solbourne, which derives as much as 80% of its sales from its direct sales force, also has trained and invested in 40 U.S. VARs and 24 international distributors. Director of marketing White says the company is looking to

expand its total number of VARs, "especially in the database and other value-added software areas." He says that Solbourne might begin carrying other SPARCalike vendors' systems, but he won't name names.

Tadpole Technology plc, the company that brought out the first notebook SPARC system when it shipped the SPARCbook in January, is going nearly 100% direct. Company president Bob Gilkes expects Tadpole's direct sales force to generate 60% of sales, and its telemarketing group to bring in most of the rest.

CompuAdd relies on direct channels for 80% of its SPARCalike sales. The CompuAdd sales force, the 120 CompuAdd retail stores and the company's Outbound catalog generate these sales. But the company is also cultivating VARs, distributors and OEMs, hoping they will contribute 50% to 60% of SPARCalike sales by the end of the year. "We're looking for people with UNIX backgrounds and who are already selling UNIX products," says Leadford, manager of the advanced systems group. "We're looking at minicomputer VARs, LAN VARs and even some ex-Sun VARs. We're even looking at some ISVs [independent software vendors] that want to add hardware to their product lines."

Unlike the majority of SPARCalike companies, CompuAdd is adamant that it intends to position itself as a clone, rather than a compatible, vendor. "We even use the same floppy boot ROM chip that Sun uses, a chip that is no longer commercially available," Leadford says. "We run SunOS unmodified. We didn't want any of the problems associated with being a 'compatible,'" he explains.

New kid on the SPARCalike block StoneSystems Inc.—a division of the Stone Group, the largest privately held company in the People's Republic of China—likewise is pursuing a pure clone path. Its StoneStation 1+ SPARCstation 1-compatible ships this quarter; its StoneStation 2 SPARCstation 2-compatible is slated to be announced this quarter and ship during Q'2. What distinguishes StoneSystems' machines? "One thing and one

thing only," says Daniel Elles, international director of sales and marketing: "Price. We will be a market follower and compete in this clone market based on distribution—selecting key, reputable distributors and VARs and supplying them with higher margin clones that will compete on price."

But other vendors see differentiation as the only way to survive. (Whether they actually achieve the differentiation they tout is another matter.) A number of "low-end" players are expected to add SPARC-based servers, some based on MBus, to their product line-ups in the coming year. Marnier International already has unveiled Data Vault, a secure, VMEbus server offering high data-transfer rates. Opus, Solarix and TSTI are among those also expected to expand upwards. At the same time, many vendors are toying with the idea of adding laptops and/or notebooks based on SPARC to their families.

And then there are a handful of companies that are marching to their own drumbeat. Tadpole expects to introduce two new SPARCbook models in calendar 1992, according to Gilkes: a board-level SPARCbook and a multiprocessing model.

A newcomer to the market, Trivision Systems Ltd., is working on developing "convergent visual-processing solutions" in conjunction with its partner Radstone Technology plc, one of the largest European VME board and sub-system vendors. Trivision is developing a family of graphics and image-processing subsystems that are compatible with SPARC and is working on a software platform called Open Graphics Architecture (OGA) that will enable SPARCware programs to run on Trivision's subsystems and boards. OGA encompasses graphics library functions for SunView, OpenWindows and Motif environments. As of January, Trivision was shipping product and had just installed its first system.

"We're selling to people who need graphics performance, not just people who want the best price," says Ian Smith, managing director. "We all need to learn to be not so reliant on what Sun does." ➔

Pushing the Edge of Capacity... 1.65 GB in a 5.25-inch Form Factor.

Edge-to-Edge Performance

The DK516C-16 uses Hitachi's advanced proprietary technology to deliver 1.65 GB of capacity and a fast 13.5 ms average access time.

Its SCSI interface provides a maximum data transfer rate of 5.0 Mbytes/sec (synchronous), with a 256 Kbyte data buffer and read look-ahead cache.

Or, if you have an ESDI application, look into Hitachi's 1.54 GB DK516-15 with a 14 ms average seek time and a 2.75 MB/sec data transfer rate.

Edge-to-Edge Quality

Choose the DK516 and you get a drive backed by the quality and reliability of Hitachi—a \$54 billion company. Unlike other drive manufacturers, we design, build, and test all key components in-house.

For more information about the DK516, or any Hitachi disk drive, call 1-800-HITACHI.

Hitachi America, Ltd.
Computer Division, MS500
Hitachi Plaza
2000 Sierra Point Parkway
Brisbane, CA 94005-1819

 **HITACHI®**
Our Standards Set Standards

Authorized Distributors:

CONSAN 612-949-0053
(IA, IL, IN, KS, KY, MI, MN, MO, ND,
NE, OH, Pittsburgh, PA, SD, WI)

HITACHI (CANADIAN),
LTD. 416-826-4100 (Canada)

GENTRY ASSOCIATES
800-877-2225 (AL, D.C., FL,
GA, LA, MD, MS, NC, SC, TN, VA)

R SQUARED 800-777-3478
(AZ, CA, CO, NM, OR, UT, WA, WY)

SIGNAL 800-228-8781
(CT, MA, ME, NH, RI, VT)

SPECIALIZED SYSTEMS
TECHNOLOGY 800-688-8993
(AR, LA, OK, TX)

Circle No. 25 on Inquiry Card

A Sampling of SPARClikes

compiled by MAUREEN MCKEON

Co., Model, Date announced	Ship date	Packaging	Processor (Clock speed-MHz)	MIPS	SPECmarks	MFL/OPS	Main memory (MB)	Bus width (bits)	Internal disk (MB)	Internal diskette (inches)	Memory slots	I/O slots	Interface	Bundled software	Base configuration	Price
CompuAdd Computer Corp. , Advanced Systems Group, 12303 Technology Blvd., Austin, TX 78727. Circle 100																
SS1+																
7/91	7/91	desktop	LSI (25)	15.8	12	1.7	8-64	32	104	3 1/2	16	3	SCSI	Solaris 1.0, Open Look	monochrome, 19 inches	\$4,495
SS2																
1/92	Q1'92	desktop	LSI (40)	28.5	25	4.2	8-64	32	104	3 1/2	16	3	SCSI	Solaris 1.0, Open Look	color, 16 inches, 210-MB drive	\$9,995
DCM Data Products , 1200 Quail St., Ste. 280, Newport Beach, CA 92660. Circle 101																
Superstation 1+																
10/91	1/92	desktop	LSI (25)	15	10.2	1.75	8-64	32	207	3 1/2	1	2	SCSI	SunOS 4.1 (Solaris), SunView	color, 19 inches, 200-MB drive, 3 1/2-inch floppy	\$5,900
Superstation II																
1/92	3/92	desktop	LSI (40)	28	24	4.2	8-64	32	207	3 1/2	1	2	SCSI	SunOS 4.1 (Solaris), SunView	color, 19 inches, 200-MB drive	\$7,699
DTK Computer Inc. , 17700 Castleton St., Ste. 300, City of Industry, CA 91748. Circle 102																
DTK Station 1+																
10/91	11/91	desktop	LSI (25)	16	—	1.4	8-64	32	207	3 1/2	7	3	SCSI	SunOS 4.1/SPARCOS 4.1.1, X11, SunView, NeWS, OpenWindows	color, 19 inches	\$6,295
DTK Station VME																
10/91	Q1'92	deskside	Cypress (33)	21	—	3	8-64	32	207	3 1/2	16	3	SCSI-2	SunOS 4.1.1, (Solaris), SunView, NeWS, X11	color, 19 inches	\$6,900
DTK Station VME 2																
10/91	Q1'92	deskside	Cypress (40)	28	—	5	8-64	32	207	3 1/2	16	3	SCSI-2	SunOS4.1.1, (Solaris), SunView, NeWS, X11	color, 19 inches	\$8,900
DTK Station 2																
10/91	Q2'92	desktop	LSI (40)	28.5	—	4.2	8-64	32	207	3 1/2	7	3	SCSI	SunOS 4.1/SPARCOS 4.1.1, X11, SunView, NeWS, OpenWindows	color, 19 inches	\$9,300
Elitegroup Computer Systems , 45225 Northport Court, Fremont, CA 94538. Circle 103																
ECS VS-1000																
1/92	3/92	desktop	LSI (25)	15.8	10.25	1.75	8-64	32	207	3 1/2	16	3	SCSI	Solaris 1.0	color, 17 inches	\$4,995
ECS VS-2000																
1/92	6/92	desktop	LSI (40)	28.5	24.2	4.2	8-64	32	207	3 1/2	16	3	SCSI	Solaris 1.0	—	\$9,995
Ether Technologies , 6F No. 317, Tun Hwa S. Rd., Sec.1, Taipei 106, Taiwan, China. Circle 104																
Etherstation																
5/91	7/91	desktop, deskside	LSI (25)	15.8	—	1.7	8-64	32	200	3 1/2	8	3	SCSI	Solaris	—	\$5,490
GoldStar Co. Ltd. , Lucky-Goldstar Mapo Bldg., 275 Kongdok-dong, Mapo-Gu, Seoul 121-721 Korea. Circle 105																
GWS-25																
10/91	1/92	desktop	LSI (25)	15.8	10	1.7	8-64	32	207	5 1/4	16	3	SCSI-2	Solaris 1.0, SunOS 4.1.1, SunView, OpenWindows, DeskSet, GX Drivers, C compiler	color, 14 inches	\$4,595
—	—	desktop	LSI (40)	28.5	21	4.2	8-64	32	207	5 1/4	16	3	SCSI-2	Solaris 1.0, SunOS 4.1.1, SunView, OpenWindows, Deskset, GX Drivers, C compiler	color, 14 inches	\$4,595
HiTech International Inc. , 1435 McCandless Drive, Milpitas, CA 95035. Circle 106																
SAM3001/20																
Q4'91	Q4'91	laptop	LSI (20)	12.5	—	1.7	8-16	32	120	3 1/2	16	3	SCSI-2	SunOS 4.1, SunView, X11, Motif, Open Look, C, Pascal, FORTRAN	monochrome, 9.5 inches	\$8,995
SAM3001/25																
Q4'91	Q4'91	laptop	LSI (25)	15.8	—	1.7	8-16	32	120	3 1/2	16	3	SCSI-2	SunOS 4.1, SunView, X11, Motif, Open Look, C, Pascal, FORTRAN	monochrome, 9.5 inches	—

Co., Model, Date announced	Ship date	Packaging	Processor (Clock speed-MHz)	MIPS	SPECmarks	MFLOPS	Main memory (MB)	Bus width (bits)	Internal disk (MB)	Internal diskette (inches)	Memory slots	I/O slots	Interface	Bundled software	Base configuration	Price
Hyundai Workstation Division , 166 Baypointe Pkwy., San Jose, CA 95134. Circle 107																
VS-210																
2/92	2/92	desktop	Tera (40)	28.5	21.1	4.2	8-64	16	200	3 1/2	16	3	SCSI	Solaris 1.0, OpenWindows	monochrome, 19 inches	\$4,999
Marnier International Inc. , 1611 93rd Lane N.E., Blaine, MN 55434. Circle 108																
S-2																
12/91	1/92	desktop, deskside	LSI (40)	28.5	24.7	4.2	16-64	32	200	3 1/2	16	3	SCSI	Solaris 1.0.1, OpenWindows	color, 19 inches	\$9,995
MicroMuse Ltd. , Unit 1L, Chelsea Reach, 79-89 Lots Road, SW10 ORW, London, U.K. Circle 109																
Muse ix/2000																
11/90	12/90	desktop	LSI (25)	18	11	1.7	8-64	32	207	3 1/2	16	3	SCSI	SunOS 4.1.1, X11, Motif, x.desktop, MicroMuse Deskset	color, 20 inches	\$10,000
Muse ix/3000																
12/91	1/92	desktop	LSI (40)	28	20	4.2	8-64	32	424	3 1/2	16	3	SCSI	SunOS 4.1.1, X11, Motif, x.desktop, MicroMuse Deskset	color, 20 inches	\$14,000
Mobius Computer Corp. , 5635 W. Las Positas, Bldg. 4-410, Pleasanton, CA 94588-4039. Circle 110																
Mirage IPS																
11/91	11/91	desktop	LSI (25)	16	11.8	2.1	8-64	32	340	3 1/2	16	3	SCSI-2	Solaris 1.0, Open Look, Motif, Clarity Rapport	color, 17 inches, diskless	\$4,990
Mirage IPS/2																
1/92	1/92	desktop	LSI (40)	28.5	25	4.2	8-64	32	340	3 1/2	16	3	SCSI-2	Solaris 1.0, Open Look, Motif, Clarity Rapport	color, 17 inches, diskless	\$9,990
Opus Systems , 329 N. Bernardo Ave., Mountain View, CA 94043 Circle 111																
5120																
10/90	10/90	desktop	LSI (25)	15.8	10.6	1.7	0-64	32	213	3 1/2	16	3	SCSI	Solaris 1.0, Sun View, OpenWindows, C compiler	monitorless	\$4,500
5124																
12/91	12/91	desktop	LSI (40)	29	21	4.2	0-64	32	213	3 1/2	16	3	SCSI	Solaris 1.0, Sun View, OpenWindows, C compiler	monitorless	\$6,795
Orange Systems Inc. , 13 First Field Drive, Gaithersburg, MD 20878. Circle 112																
Series 2000/25																
7/90	7/90	tower	Cypress (25)	18	13	3.17	8-96	16	200	3 1/2, 5 1/4	—	4	SCSI	SparcOS 4.1.1., SunView, Open Look	color, 19 inches, DOS coprocessor	\$10,995
Series 2000/40																
—	—	desktop	Cypress (40)	18	13	2.00	8-96	16	200	3 1/2, 5 1/4	—	4	SCSI	SparcOS 4.1.1., SunView, Open Look	color, 19 inches, DOS coprocessor	—
RDI Computer Corp. , 6815 Flanders Drive, San Diego, CA 92121. Circle 113																
Britelite LC BLC640-212																
12/91	12/91	laptop	LSI (20)	12.5	8.3	1.6	8-48	32	212	3 1/2	12	2	SCSI	Solaris, SunView, OpenWindows	monochrome, 9.5 inches, 212 MB, 3 1/2-inch floppy	\$7,995
Britelite IPC Docking Workstation																
12/91	1/92	laptop, desktop	Sun (25)	17.4	11.8	2.2	8-48	32	240	3 1/2	12	2	SCSI	Solaris, SunView, OpenWindows	color, 20 inches, 240 MB, 3 1/2-inch floppy	\$9,995
Britelite 1152x900 BLI 1152x240																
3/91	9/91	laptop	Sun (25)	17.4	11.8	2.2	8-48	32	240	3 1/2	12	2	SCSI-2	SunOS 4.1.1, SunView, OpenWindows	monochrome, 11.2 inches, 240 MB, 3 1/2-inch floppy	\$9,995
Britelite IPX BLx1152-240																
12/91	1/92	laptop	Sun (40)	28.5	24.2	4.2	16-64	32	240 MB	3 1/2	4	2	SCSI	SunOS 4.1.1, SunView, OpenWindows	monochrome, 11.2 inches, 240 MB, 3 1/2-inch floppy	\$12,500
Britelite IPX Color BLX 640x240																
12/91	1/92	laptop	Sun (40)	28.5	24.2	4.2	16-64	32	240	3 1/2	4	3	SCSI	SunOS 4.1.1, SunView, OpenWindows	color, 12 inches, 240 MB, 3 1/2-inch floppy	\$14,995
Sampo Corp. of America , 5550 Peachtree Industrial Blvd., Norcross, GA 30071. Circle 114																
Sampo 9020																
10/91	Q1'92	desktop	— (20)	12.5	—	—	8-64	32	100	3 1/2	16	5	SCSI	none	color, 20 inches	\$6,995

Co., Model, Date announced	Ship date	Packaging	Processor (Clock speed-MHz)	MIPS	SPECmarks	MFLOPS	Main memory (MB)	Bus width (bits)	Internal disk (MB)	Internal diskette (inches)	Memory slots	I/O slots	Interface	Bundled software	Base configuration	Price
Sidus Systems Inc. , 25 Minthorn Court, Thornhill, Ontario, Canada L3T-7N5 Circle 115																
SPARCstation 25																
6/91	6/91	desktop	LSI (25)	15.8	10.6	1.7	8-64	32	212	3 1/2	16	3	SCSI	SunOS, SunView, C compiler	color, 19 inches	\$6,995
SPARCstation 40																
6/91	6/91	desktop	LSI (40)	28.4	22.3	4.2	8-64	32	212	3 1/2	16	3	SCSI	SunOS, SunView, C compiler	color, 19 inches	\$10,995
Solarix Systems Inc. , 46791 Fremont Blvd., Fremont, CA 94538. Circle 116																
PW+/40																
1/92	1/92	mini-tower	Cypress (40)	28.5	20	4.2	8-64	64	208	3 1/2	16	3	SCSI	Solarix OS 1.0, SunView, OpenWindows	color, 16 inches	\$9,995
Solbourne Computer Systems Inc. , 1900 Pike Road, Longmont, CO 80501. Circle 117																
S4000 DX																
7/91	7/91	desktop	Panasonic (36)	28.3	18.3	2.3	8-128	32	200	3 1/2	16	3	SCSI	OS/MP 4.1A.1, Open Interface Toolkit	monochrome, 19 inches	\$6,995
S3000																
7/91	7/91	trans-portable	Panasonic (33)	25.5	13.3	1.7	8-104	32	200	3 1/2	8	3	SCSI	OS/MP 4.1A.1, Open Interface Toolkit	monochrome, 16 inches	\$11,995
Solflower Computer Inc. , 2362 Qume Drive, Ste. A, San Jose, CA 95131. Circle 118																
SFVME-400																
9/91	10/91	desktop	LSI (40)	28.5	21.8	—	16-128	32	107	3 1/2	16	3	SCSI	SunOS 4.1.1, OpenWindows	monochrome, 19 inches	\$15,500
Sparktrum Microsystems Inc. , 2860 Zanker Road, Ste. 210, San Jose, CA 95134. Circle 119																
SPK-200																
12/91	2/92	desktop	Tera (40)	28	21	6.15	16-64	32	207	3 1/2	16	3	SCSI-2	Solaris 1.0	color, 20 inches	\$9,950
StoneSystems Inc. , 5201 Great American Pkwy., Ste. 3202, Santa Clara, CA 95054. Circle 120																
StoneStation 1+																
9/91	Q1'92	desktop	LSI (25)	16.2	14.3	1.86	16-96	64	607	3 1/2	16	3	SCSI-2	SunOS 4.1.1, SunView	color, 21 inches	\$9,895
Tadpole Technology Inc. , 8310 Capital of Texas Hwy., Ste. 375, Austin, TX 78731. Circle 121																
SPARCbook 1																
10/91	1/92	notebook	Cypress (25)	18	—	3.1	8-32	64	85	3 1/2	0	0	parallel	Solaris 1.0.1 (SunOS 4.1.2) or Solaris 2.EA (Early access)	monochrome, 11.8 inches	\$4,950
Tatung Science & Technology Inc. , 2060 Ringwood Ave., San Jose, CA 95131. Circle 122																
microCOMPstation 20																
10/90	11/90	desktop	LSI (20)	12.5	8.3	1.4	8-64	32	207	3 1/2	2	3	SCSI	Solaris 1.0, Motif, X11, x.desktop	color, 15 inches, diskless	\$4,290
COMPstation 25																
7/91	7/91	desktop	LSI (25)	15.8	10.25	1.75	8-64	32	207	3 1/2	2	3	SCSI	Solaris 1.0, Motif, X11, x.desktop	color, 19 inches	\$6,990
Mariner 4i																
8/90	9/90	desktop	LSI (25)	17.3	12.3	2	8-96	24	200	3 1/2, 5 1/4	1	4	SCSI	Solaris 1.0, Motif, X11, x.desktop	color, 19 inches, diskless	\$6,995
COMPstation 40																
10/91	11/91	desktop	LSI (40)	28.5	24.7	4.2	8-64	32	207	3 1/2	2	3	SCSI	Solaris 1.0, Motif, X11, x.desktop	color, 19 inches, graphics accelerator	\$9,990
TriGem Corp. , 6815 Flanders Drive, Ste. 150, San Diego, CA 92121. Circle 123																
SDT-250																
9/91	10/91	desktop	LSI (25)	15.8	10	1.7	8-48	32	212	3 1/2	12	2	SCSI-2	Solaris 1.0 (SunOS 4.1.1), OpenWindows, SunView	color, 20 inches	\$5,995
TriVision Systems Ltd. , 5 Rodney Road, Cheltenham GL50 1HX, U.K. Circle 124																
VPX-100																
11/91	1/92	desktop	Cypress (40)	31	—	4	16-64	32	200	3 1/2	16	3	SCSI-2	SunOS 4.1.1, SunView, OpenWindows, OGA1.0, Xlib, XGL, SunPHIGS	color, 19 inches	\$9,000
Twinhead Corp. , 1537 Centre Pointe Drive, Milpitas, CA 95035. Circle 125																
Twinstation																
11/91	2/92	desktop	Cypress (40)	31	28.5	—	8-128	32	425	3 1/2	8	2	SCSI	SunOS, OpenWindows, C compiler	color, 17 inches	\$9,985

How to get a Sun Education at the push of a button.



For more information, contact your nearest Sun
authorized training center or sales representative.
In the United States, call 1.800.USA.4SUN,
prompt 2, then 2.

Imagine a Sun™ training course that allows you to stop and replay the instructor's lecture at any time. Then consider that the classroom could be virtually anywhere, perhaps even your own home.

Finally, think of all this as a permanent resource at your fingertips. Which would mean you could review key sections as needed, or share the information with co-workers.

Look at it that way, and you'll begin to understand why our new Self-Paced Learning Series is getting rave reviews from Sun users around the world.

The curriculum ranges from material specific to Sun, such as Introduction to SunOS™ and OpenWindows™, to more general areas, including the UNIX® Video Workshop and the C Video Workshop. Each course is designed for hands-on, interactive learning, and comes complete with student workbooks and reference materials, as well as instructional videotapes.

To find out more, get in touch with us today. Because once you've seen Sun's new Self-Paced Learning Series, we know you'll agree it's right on the button.

 **Sun Microsystems**
Computer Corporation

A Sun Microsystems, Inc. Business

© 1991 Sun Microsystems, Inc. Sun, Sun Microsystems, the Sun logo, SunOS, and OpenWindows are trademarks or registered trademarks of Sun Microsystems, Inc. UNIX is a registered trademark of UNIX System Laboratories, Inc. All other product or service names mentioned herein are trademarks of their respective owners.

Circle No. 44 on Inquiry Card



I've long been mesmerized—both fascinated and horrified—by the possibilities of one computer emulating another. Almost 10 years ago, I asked a gathering of University Computer Centre executives the question, “What will a per-CPU license mean in a world where you can easily emulate a small single-user CPU on a mainframe?” I never got an answer, but that possibility has been here for some time. Just a few years later I was busy porting, from PDP-11 UNIX to 4.2BSD on a VAX, a package that emulated DEC's RT-11 operating system. The VAX 11/780 hardware had a mode that emulated the PDP-11 hardware, and the software package emulated RT-11 under UNIX. Man, it was S-L-O-W. But it did work. In December 1991, my friend D'Arcy Cain posted the (alpha) source for a CP/M and Z80 emulator to the Usenet group `alt.sources`. And I reviewed Sun's MS-DOS emulator DOS Windows in the January 1990 issue of this magazine.

A similar product has arrived for review, and for some reason the editor thought I should review it; he must think I like turning Sun Microsystems Inc. workstations into PCs. I don't, but sometimes you have to run some bit of DOS software, or you want to. Almost everyone knows that there is more software for MS-DOS than for just about any other computer system. Despite the emergence of the SPARC binary compatibility regime, MS-DOS' single standard for binary compatibility is something that most UNIX software vendors covet.

If for some curious reason—like running thousands of low-cost applications—you want to turn a SPARC system into a synthetic PC/AT, here's a painless option.

Soft PC

by IAN F. DARWIN,
for Computer
Publishing Labs



If you sometimes need to access DOS under SunOS, SoftPC will do the trick.

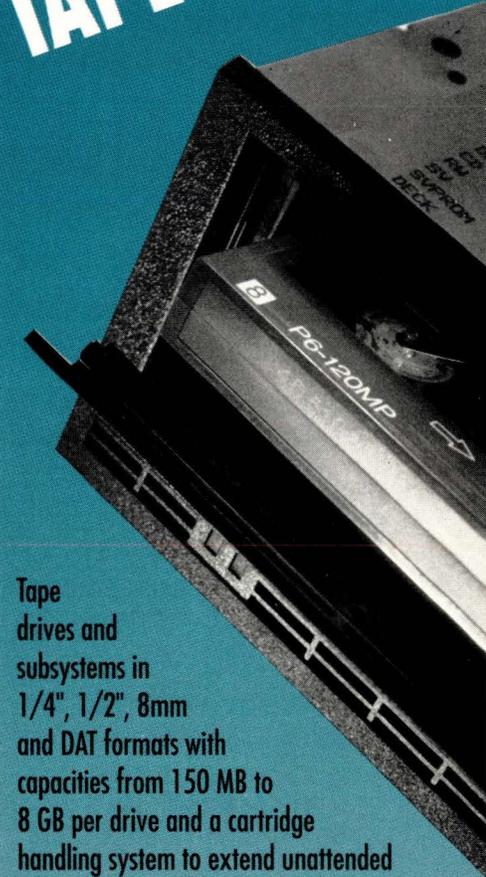
And UNIX users can envy it, too, for it results in a lot of low-cost software being available. But most of those UNIX users don't want to buy a dedicated standalone PC just to run some inexpensive DOS package, particularly now that Sun's ELC is more powerful than a 486/33 for the same cost as a fully configured 386 system. What's needed is a way to run DOS software on the SPARCstation or SPARCserver. That's where SoftPC from Insignia Solutions Inc., Andover, MA, fits in. Costing less than many of the upper-crust DOS applications it can run, SoftPC provides "synthetic hardware," or an emulation of the PC/AT's 80286 processor, on your SPARC.

As with Sun's DOS Windows DOS emulator, SoftPC provides virtual hardware and a real copy of MS-DOS, so that there are none of the compatibility problems that might plague an emulation of MS-DOS itself. "And, as with DOS Windows," I was about to say, but then I realized I'd have to start most of my sentences that way. Instead I'll start by listing some of the differences. The most important is that SoftPC talks either to SunView or to the X11 part of OpenWindows, both under SunOS 4.1, while DOS Windows only talks to SunView. In order to achieve acceptable perfor-

mance keeping the screen display in sync with the emulated PC's video memory and with the overhead of the X11 protocol, SoftPC uses the MIT shared memory (MIT-SHM) extension to X11. Fortunately, OpenWindows includes this extension. The resulting screen performance is quite peppy, more than you'd expect given the emulated PC's CPU speed. You lose this speed advantage when displaying the simulated PC's screen on an X terminal or remote workstation; since "MITSHM" only works locally however, the response time is still acceptable. However, and also unlike DOS Windows, SoftPC can be used, for non-graphics applications, on an ASCII terminal connected to the SPARCstation. In theory, you could also run non-graphics applications remotely under X, by running a `cmdtool` or `xterm`, logging in to the machine with the software, and running `softpc -dt` (for dumb-terminal mode). In practice, it worked fine with `xterm`, but, with `cmdtool` under OpenWindows, I encountered a newline mapping problem that I didn't take the time to battle with, since `xterm` worked fine. My only objection to the dumb-terminal mode



TAPE TOWN



Tape drives and subsystems in 1/4", 1/2", 8mm and DAT formats with capacities from 150 MB to 8 GB per drive and a cartridge handling system to extend unattended capacity to 75 GB. All drives and subsystems include a 12-month warranty; subsystems include chassis, power supply, terminator and cable. Mix-and-match with any of our optical and or disk drives for a complete external subsystem.

The last word in Workstation Peripherals.

800-876-7818



formerly UNISUN PERIPHERALS

FAX: 619-558-8283
 E-MAIL: ZZYX@SALES@UCSD.EDU
 5893 Oberlin Drive, San Diego, CA 92121
 619-558-7800
 DALLAS 214-708-0560
 DENVER 303-830-8100
 PHOENIX 602-897-0393

Company and product names ©™ their owners

Circle No. 51 on Inquiry Card

SUNEXPERT REPRINTS

Keep up with the latest in SUN technology with the best minds in the industry. Use reprints to *promote, inform, and sell.*

Reprint Management Services™ provides you the opportunity to obtain reprints of reviews, articles, and features in **SUNEXPERT.**

High-quality editorial reprints will help your company in many ways:

- Increased EXPOSURE for your product or service
- Credible, believable information that consumers TRUST
- Excellent SALES tool for trade shows, mailings and media kits
- Powerful EDUCATIONAL RESOURCE for consumers and employees

Reprints are completely customized to your needs. Call today for additional information!

Peter Sigal
Reprint Operations Specialist

REPRINT MANAGEMENT SERVICES™

505 East Airport Road
P.O. Box 5363
Lancaster, PA 17601
Phone: (717) 560-2001
Fax: (717) 560-2063

was that some of the escape sequences seemed a little cryptic.

The most important question about such a product for emulating software is not "How fast does it run?" since Sun and the others are always building faster hardware, but rather "Does it run at all?" or, more specifically, "Does it run PC/AT DOS software reliably?" So we'll start this review by running some DOS software. Then we'll look at questions of installation and integration, performance, floppies and serial ports, and printers.

Installation and Integration

I was surprised to see that SoftPC did not use `extract_unbundled`, Sun's semi-standard for installing add-on software. Instead, it has a single tar file, and instructions on how to extract the files you need. Because there is no environment variable you can set to tell the software where the files it needs reside, you must either extract all of the files directly into `/usr/lib/SoftPC`, or install them elsewhere and make a symbolic link into there. This is, ahem, inconvenient if you are reviewing the software on several different workstations and don't have the root password on all of them. However, it should not be a problem for most users on most workstations most of the time. For either SunView-only or SunView plus OpenWindows, the instructions for unloading the tape are simple to follow. There are no instructions for an OpenWindows-only install, so here they are: Do a SunView plus Open-Windows install, and `rm` the SunView fonts. A single binary, named `SoftPC`, services either window system.

Licensing is simple. There are no separate license daemon(s) to soak up CPU time and swap space on your machine. You get a license token and password when you buy the software. A program (`SoftPC_install`) checks the license number and password and stores them in a file in `/usr/lib/SoftPC`. That's it!

The license token includes the number of users it is valid for, and

only that number of login accounts can use the software at any time. A user, however, can have multiple sessions going, provided there's enough memory and swap space. (A detailed guide in the installation notes will help you plan resource usage.)

One minor problem I had with the install program is its failure to use the UNIX standard library function `perror()` to print a standard error message when things go wrong. Let me explain. When you have two preschool children, it's easy to get interrupted in the middle of a software installation (have I overstated this?). The next morning, I logged back in to continue the installation by running `SoftPC_install`. I typed the license and password carefully, and was rewarded with the message

```
Cannot authorize,  
      check installation
```

I saw the words "cannot authorize," and thought I'd make a mistake typing the license number or password. `SoftPC_install` obnoxiously clears the screen after each, so you can't see anything you've done. Type it again, same thing. After the third try, it occurs to me that something else is wrong. Try running SunOS' wonderful `trace` command, and we see the problem instantly. After making, you type the license and password (26 digits total, and painstaking). Then and only then, it tries to open the file into which it will store the results. It failed, with EACCES (Permission denied). Of course! I forgot to `su` to root when I resumed the installation. But what a roundabout way of finding out. The industry-standard message consisting of the filename that failed to open and "Permission denied" would have given the answer in a second instead of in five minutes. Many UNIX software vendors make this mistake, but why? `perror()` has been around for decades! In fairness to `SoftPC`, the latest release notes do warn that this message can be caused by trying the install without becoming root first.



Example 1. Booting DOS

SoftPC-AT V2.05 - (C)Copyright Insignia Solutions Inc. 1987, '88, '89, '90

License number XXXX-99999999-0001

Drive Access Arbitrator: Version 2.3
Drive C: is now safe from simultaneous access.
Insignia Expanded Memory Driver Installed
EMS version 4.0

256 pages of expanded memory available

SoftPC File Sharing Architecture Version 2.01
Driver successfully installed.

```
C>path=c:\;c:\dos;c:\insignia
C>c:\insignia\fsadrive e:
C>c:\insignia\mouse.com
```

-- Installing Insignia MOUSE (3.36) : Device Driver 6.10

```
C>prompt $p$g
C:\>net use f: /usr/lib/SoftPC
C:\>net use g: /tmp
C:\>echo on
C:\>ver
MS-DOS Version 3.30
```

```
C:\>
C:\>dir
```

```
Volume in drive C is MSDOS_BOOT
Directory of C:
COMMAND      COM      25276   2-03-88     2:31p
DOS           <DIR>    9-15-89     3:01p
INSIGNIA     <DIR>    9-15-89     3:14p
CONFIG       SYS      143      1-01-80     8:39p
WINDOWS     <DIR>    7-31-91     1:33p
AUTOEXEC    BAT      150      5-01-90     7:12p
6 File(s) 118784 bytes free
```

With the authorization done, I tried to run SoftPC. The install script doesn't link it into any standard bin directory, so you must either add YAVSD (yet another vendor-specific directory) to your search path, or sym-link it into a public bin directory. I chose the latter approach, and chose to link it as /usr/local/bin/soft-pc, ignoring the SiLIY CaSe SwItChEs in the original name.

The X11 font files are copied into /usr/lib/SoftPC/fonts/X by

default. The install document recommends that you add

```
xset fp+ /usr/lib/SoftPC/fonts/X
```

into every user's .xinitrc file. An easier and more efficient way is to get each user to put the line

```
setenv FONTPATH =
    /usr/lib/SoftPC/fonts/X
```

in the .login (or set and export it

"ROLL YOUR OWN" SUBSYSTEM



Actually, we'll "roll" it for you. You get to choose from single disk capacities up to 2.5 GB (but you can have more than one), add a 4 or 8mm tape drive with up to 8 GB capacity, maybe throw in a 1 GB erasable optical drive, and possibly a CD-ROM. We'll pre-configure everything, put it all in one external chassis with its own power supply, include the cables and terminators, and ship you a plug-n-play subsystem.

The last word in Workstation Peripherals.

800-876-7818



formerly UNISUN PERIPHERALS

FAX: 619-558-8283
E-MAIL: ZZYX@SALES@UCSD.EDU
5893 Oberlin Drive, San Diego, CA 92121
619-558-7800
DALLAS 214-708-0560
DENVER 303-830-8100
PHOENIX 602-897-0393

Company and product names ©™ their owners

Circle No. 52 on Inquiry Card

Example 2. Accessing DOS

```
G:\>net use S: /usr/src/cmd

G:\>dir/w s:

Volume in drive S is CMD
Directory of S:\

.           ..           FLEXELIN 9%2  FILE           XCHMOD
ISPPELL    HOC           PS2BITS       BAR            FANOFLIN WXD
RCS        WEBSTER      PAINTER SH    T CX          GENEAL
TNT FN8    TNT LF0      XNEWSBUG M62  PLAN-PGMC     XREF
LOGO       DFORMAT     NAM           CHED          TIMEWORT &JL
TIMEWORT  K4J PSFIG   SCROLLIN I!S  XREF HT8     IPRSEND
PSGRAPH   XREF MAN    DICTIONARY    LAB3UP C     OLIT !K7
FIXUSQIF!AS PAINTER    DECHO C      CONV-LIT 6%A SPIN
TREEPAR   CPMULATO %R% NEWS-ILL &@8  331          ILEAF
RC-1 0L~   MSH         CHARS        CCHK         SH
THACK     I C         OVER C       MA           .BPATCH I6A
BEHEAD SH  TCP        QUOT C      BITMANIP    TARFIX
FMT C     CB C       SEARCH C    LASTLOG 1   LASTLOG C
... etc ...

                122 File(s) 4276224 bytes free

G:\>
```



under `sh` or `ksh`) before starting OpenWindows. This works and avoids the unnecessary step of running `xset`. Or, if you already have a local OpenWin font directory, you could just install the fonts there. Speaking of fonts, they arrive not only in `.ff` and `.fb` format but also in `.snf` format, which worked fine on an NCD X terminal.

The `.SoftPC` file is, like most “dot files,” used to customize the program’s environment. However, the install document suggests that you copy it to each user’s directory. Again, suitable for small shops, but not something you want to do automatically if you have 512 users online. And, if you miss a user and that user invokes SoftPC, the program doesn’t read the master file in `/usr/lib/SoftPC`. It makes the user play twenty questions, and creates a `.SoftPC` file for that user.

Finally, the program is installed. How does it behave? First, be aware that although it runs with OpenWindows, this is not an Open Look program at all. The default version’s menus look like something from the early days of X, as do the dialog boxes. However, they work.

The documentation does not discuss the X Resources (the standard

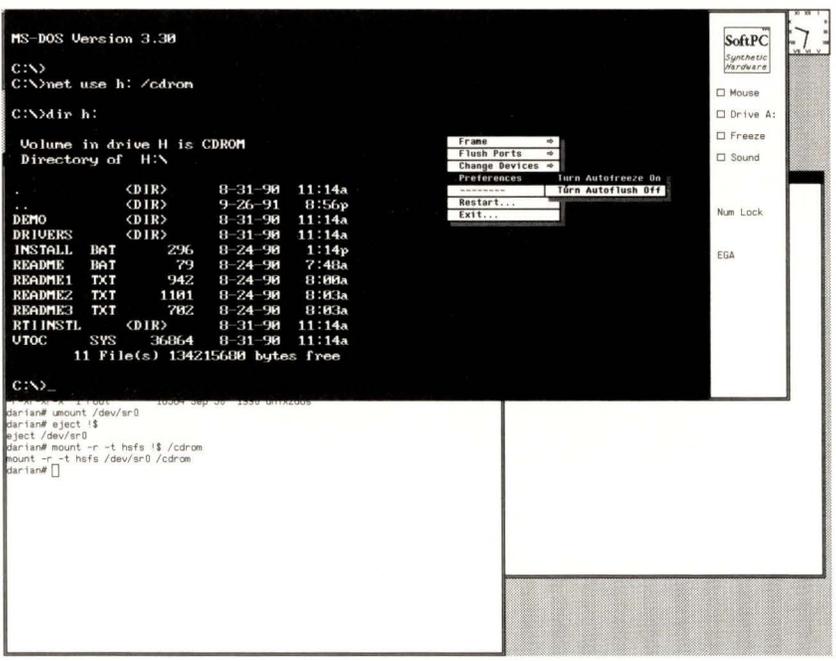
way for X programs to be configured) used by the program, other than to direct you to install an “app-defaults” (program default resource values) file in the standard system directory, `/usr/lib/X11/app-defaults`. The resources simply aren’t documented. Versions 2.06 and above do feature an

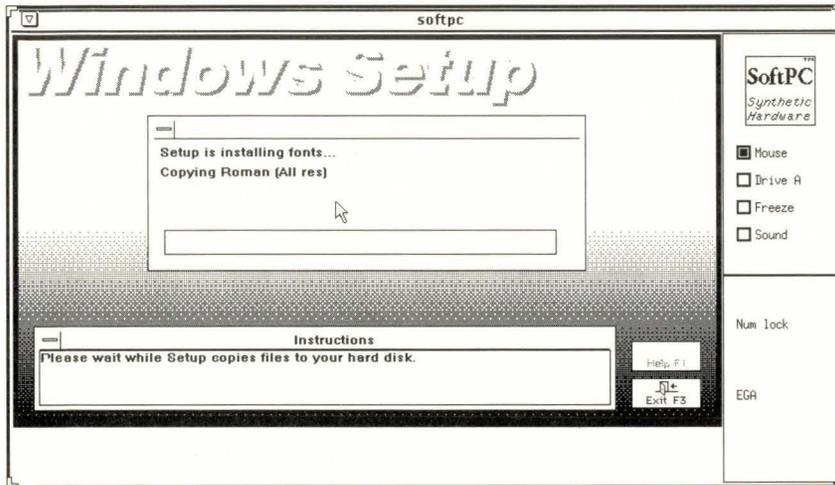
`app-defaults` file customized for Motif. Nor does the program accept the standard SunView/XView “tool arguments” such as `-WP` for window position, etc. Not even the X standard `-display` option is parsed: You must set the `DISPLAY` environment variable for occasional remote use. And why can’t the program figure out whether to run with SunView or OpenWin automatically? You have to specify `sv` under SunView, even though OpenWin isn’t running. These minor shortcomings will, I hope, be rectified in future editions of the program and documentation.

And the OpenWin version allows itself to be resized but doesn’t change the scale of the image when you do so. Instead, a configuration option lets you choose from two different display sizes, large and regular. X applications that can’t usefully be resized should probably refuse the resize request, in my opinion. The Open Look specification states that an application can turn off resize corners. And even non-Open Look applications can refuse a resize, as does the widely used (non-Open Look) contributed client `Xloadimage` when displaying a small bitmap.

One set of problems occurred only with the OpenWindows version, and

Figure 1. Accessing DOS CDs





SoftPC even does Microsoft Corp. Windows.

only on some 4/110 machines. I tried it on two different systems (one color, one monochrome), and under OpenWindows 2.0 and 3.0, just to be sure. The OpenWin (X11) menus did not work properly on the 4/110. Some

The documentation provides a fair bit of information on configuring serial ports.

pop-up boxes were jumbled or had infinitesimally small sizes. Insignia suggested the problem might be lack of swap space, but increasing the swap space to double on the test SPARCstation did not resolve the problems. None of these problems came up on the SPARCstation line, nor on the SunView version on the 4/110s. Nor did they interfere with nonmenu operations; I was even able to run MS-Windows on SoftPC on the 4/110. These problems went away with version 2.1 of SoftPC.

But these are issues of installation.

The measure of a PC emulator is not in its conformance to some GUI standard, but how well it emulates a PC. As we'll see, SoftPC emulates a PC/AT quite well. The emulation is in fact so faithful that you should beware of viruses when loading software into SoftPC from unchecked sources.

Performance

A complete copy of MS-DOS is in SoftPC, and a DIR listing of C:\DOS lists many familiar (to DOS users) faces. Here is a session of booting up (DOS users will notice that the `autoexec.bat` file is missing an `ECHO OFF` command) and getting a listing of the root directory (see Example 1).

The DOS directory includes all the standard MS-DOS utilities. Also in there are `FORMAT` and `FDISK`, which you use in making virtual hard disks. Huh? Virtual means imaginary, but hard means physical. What d'ya mean? Well, real PCs can have one, two or more real hard disks, whose file-names are `perforce C:`, `D:`, etc. Since you're unlikely to dedicate a real hard disk to a DOS emulator (since you probably don't want to bother hanging a 10- or 32-MB hard disk on your SPARCstation...), DOS emulators let you have "virtual hard disks." Each of these is a single (large) file on your SPARCstation (or server) hard disk, but it appears to be a complete disk, with multiple DOS files and directories in it, to the emulated DOS system. Initially `C:` is the system-provided disk,

"Here's what you get for your money..."

If you need peripherals, talk to Bart Denson. Bart believes he can earn your business. He starts by making every effort to understand your needs and to insure that you understand what he can do to fill those needs. He makes sure you know exactly what you're getting; no surprises. And, if you need configuration help you'll find he's one of the most knowledgeable guys ever to wear a head set. Bart is a ZZYX sales rep. They're all like that.

The last word in Workstation Peripherals.

800-876-7818



formerly UNISUN PERIPHERALS

FAX: 619-558-8283
E-MAIL: ZZYX!SALES@UCSD.EDU
5893 Oberlin Drive, San Diego, CA 92121
619-558-7800
DALLAS 214-708-0560
DENVER 303-830-8100
PHOENIX 602-897-0393

Company and product names © ® ™ their owners

Circle No. 53 on Inquiry Card



SOFTWARE REVIEW
Networked To Our Center

and D: is unassigned.

Importantly, you can also allocate other "drive letters" to UNIX directories,

using the `net use` command (syntax stolen from various MS-DOS networking packages). The default system files attach G: to `/tmp`, as shown in the example above. You might make H: your home directory, S: a source directory, and so on. To mount `/usr/src/cmd` on the DOS drive S:, for example, give the command

```
net use S: /usr/src/cmd
```

Once mounted (see Example 2), the given directory appears as the "root" of that drive's disk, and you can access it just like any other DOS files. For example, the DOS command `DIR/W` is similar to `ls -C`.

Normal UNIX filenames don't map very well into the procrustean bed of the MS-DOS file system, so some translation has to be done. File `cb.c` can be accessed as `CB.C` in DOS; it shows as `CB C` in a DOS listing. But file `overwrite.sh` gets mangled to

`OVERWRIT #P3`. This is part of the price you pay for dealing with such a limited operating system as MS-DOS. However, Sun's DOS Windows and PC-NFS products, which must of course do similar mangling, give you a command to display the real filename. SoftPC apparently does not.

I was even able to access a DOS CD-ROM using the SunOS 4.1 "HSFS" filesystem support, without having to worry about "MSEX," the bane of many a lost soul in the MS-DOS world according to my reading of the `alt.cd-rom` newsgroup. Figure 1 shows a shelltool window in which I mount the CD-ROM using `-t hsfs`, and above it a SoftPC session in which I access it and do a `DIR` listing on the top-level directory.

As a pathological case, I mounted the CD-ROM demo (ReferenceSet demo disc from Reference Technology Inc., Boulder, CO) on an NFS server, exported it with NFS, NFS-mounted it to my workstation (don't forget the `-r` option) and mounted it under SoftPC. Searches on the database, using the CD-ROM search techniques

built into Reference Technology's search engine designed to work with MSCDEX, worked flawlessly even in this somewhat bizarre setup. This is no guarantee that every possible CD retrieval engine will work, but it does convey the notion that SoftPC's emulation of MS-DOS and the PC is pretty darn good.

Anyone who's picked up a PC magazine in the last year knows that Microsoft Corp.'s MS-Windows is all the rage this year. Though it's beyond me why anyone would want to run an emulated version of MS-Windows under OpenWindows, that old fatal attraction with emulation took hold, and away I went. Installing MS-Windows was quite straightforward. It figured out the emulated machine's configuration quite well, although it somehow concluded that "the network software" (which package?) was installed; maybe it found the `net` command used to mount UNIX directories. I overrode this, and the installation continued.

I didn't do anything useful with MS-Windows, but concluded that if

Memory, Drives, and . .

... more, much more. With one of the broadest lines of workstation memory available, extensive technical support, and unbeatable prices, MEGABYTE has become a leading supplier of quality memory expansion products for the workstation industry.

But, did you know that MEGABYTE also offers disk, tape, removable and rewritable optical drives, as well as displays, network devices, and cables? *MEGABYTE isn't just for memory anymore!*

- Expan. Brds
- SIMM's
- Disk
- Tape
- Optical
- Removable
- Network devices
- Displays
- Cables
- and more



- Samsung
- Toshiba
- Dataram
- Clearpoint
- Fujitsu
- Seagate
- Maxtor
- Exabyte
- Archive
- Allied Telesis
- Xylogics
- Z Micro
- and more



1•800•748•5798
619-793-1104 • fax 619-793-1124
11772 Sorrento Valley Rd. Su. 160 San Diego, CA 92121

Circle No. 31 on Inquiry Card

The SPARCs are going to fly.

We put SoftBench on Sun. So you can put your CASE on autopilot.

SoftBench automates all those tedious, repetitive tasks in the software development process. This gives your developers more time to think and speeds up the project life cycle, while reducing errors and rework. And now it runs on



Sun SPARCstations, as well as HP and Apollo workstations.

A tool integration platform, with its own set of tools, SoftBench provides distributed computing services, tool communication, and a common user interface that's easy to learn and use. Add Encapsulator, and you can integrate your favorite CASE tools. Now and in the future. Without even having to change source code.



SoftBench will make your software development process far more efficient, cost-effective and accurate than ever before. It will protect your present and future hardware and software investments, too.

Call **1-800-637-7740, Ext. 2199** for complete product information. And get the best CASE environment under the Sun.



Circle No. 24 on Inquiry Card

© 1991 Hewlett-Packard Company CSSE001



you had to, you could do so under SoftPC.

For normal DOS work, the emulation is so good that it's

sometimes scary. For example, the F3 key is mapped to do just what DOS users expect it to do, a paltry one-line shell history. And scrolling of text is occasionally "blinky," just like on a real IBM PC/AT. As another example, one time the emulated PC hung up during a reboot. This happened several times in a row until I noticed that I had a non-System disk in the SPARCstation's floppy drive, and SoftPC was actually trying to boot from it! Perhaps fortunately, I didn't have an MS-DOS 3 1/2-inch boot floppy to try booting from. ...Sadly, however, the MS-DOS "three-finger salute" (Control/Alt/ Delete) to force a reboot does not work; you must use Restart from the main menu. At least, Control/Alt/Delete doesn't work unless you have the keyboard mapping exactly right. SoftPC Version 2.1 comes with a bundle of "keyboard

mapping files" in addition to the normal Sun-3 and Sun-4 keyboard maps. The NCD X terminal mapping worked fine, right down to the Control/Alt/Delete to reboot. The only hitch: You must copy the mapping file into /usr/lib/SoftPC under the name Type 3 or Type 4. There is no command-line option other than Type 3 and Type 4 to specify the keyboard. This procedure is a real inconvenience on a multiuser system.

Peripheral Issues

The designers of the original IBM PC inflicted several pieces of brain damage on it, notably the segmented, eight-bit 8088 CPU and the tiny (by today's standard) 640-KB memory limit. The DOS world has come up with two competing standards for overcoming the 640-KB barrier, Extended Memory and Expanded Memory. The latter is also called LIM, for Lotus Intel Microsoft, and is what SoftPC supports. Expanded memory is stored in a file in your home directory and mapped into the emulated CPU's address space. There

are several configuration options to handle just about any permutation of memory that a physical PC could support. You can specify the size of this memory in megabyte increments, from 1 MB to 32 MB.

The display driver can pretend to be any of the common devices: Hercules, CGA, EGA and, effective with Release 2.1, VGA. The VGA driver does a credible job on a color display, and even a not-bad job on a monochrome display, though it doesn't halftone. It just "clips" the image; light tones to white, dark to black. For example, when it runs a color VGA Scrabble game called Scramble, by Diana Gruber, on a monochrome NCD display, it looks like the upper screen in Figure 2. The seven lines at the bottom of the screen should have letters drawn above them and do on a color screen; on monochrome, the letters disappear, and the game is unplayable. This is no fault of the game, nor is it likely that reasonable performance could be had by halftoning the display. It seems a reasonable compromise between per-

SUN® CABLES

★ SPARCstation SCSI Cables ★

★ IBM RS-6000 SCSI Cables ★

★ VAXSTATION 3100 & 5000 SCSI Cables ★

with either DB50 or Centronics on drive end - Any Length!

SHIELDED SCSI CABLES

DB50 or CENTRONICS Interface

Can be MOLDED with YOUR company's NAME or LOGO

★ IPI Cables and Terminators

★ SCSI Terminators - DB50, Centronics, or "Micro-D"

★ SCSI "Shoebox" Cables - Internal "Loop Cables
DB50, Centronics or "Micro-D" Interface



(714) 259-9100

CS ELECTRONICS

1342 Bell Ave.
Tustin, CA 92680

Circle No. 15 on Inquiry Card

The SUNEXPERT Market

...offers a selection of low-cost advertising vehicles with results-oriented appeal. Each section offers you the flexibility you need in order to get your products and services into the hands of the volume buyers in the Sun and Sun-compatible market.

MARKETPLACE

2/9th -- 4½" x 3"

or 2¼" x 6"

1/9th -- 2¼" x 3"

PRODUCT SHOWCASE

1/4 Page -- 3½" x 5 ¼"

CLASSIFIED SECTION

Ads sold per column inch
(2¼" x 1")

Don't Miss
The Chance To
**EARN
FREE ADS**

Call
Carol Flanagan

(617) 738-3404

formance and function. If you want color, get a color monitor.

Serial ports and modems are supported by the SPARC CPU's serial ports (ttya and tryb). The documentation provides a fair bit of information on configuring serial ports and the problems you might run into with programs that ignore modem status indicators and timing problems with "dongle" copy-protection devices. Insignia claims to have tested Smart-Com II, Chitchat, Procomm and other modem communications. The serial port can also be used as a printer port with modern printers; Insignia claims to have tested the Apple Computer Inc. LaserWriter and Imagewriter, sev-

eral Epson America Inc. printers and an IBM Corp. Graphics Printer in this mode. Alternately, you can direct the MS-DOS print output either into a file (by giving its UNIX filename) or down a pipeline to a command (most commonly `lpr`, but anything you want can be used), and you can do this either in your SoftPC file or from a configuration menu.

Floppies—flexible disks—are an important distribution and backup media in the DOS world. You can access the SPARCstation's 3 1/2-inch floppy drive as an MS-DOS device, assuming you have it configured (it is enabled by default). If you try to start a second session, the second session is

denied access, but you can still continue running. Later, you can release the floppy from the first session, and attach it to the second, from the Devices menu.

If you need to access a 5 1/4-inch floppy, or your SPARCstation doesn't have a floppy drive, you can connect a real PC over a serial port and run a well-named program called `slavepc`, which Insignia sells separately. This "takes over" the real PC and directs floppy requests from SoftPC to the physical floppy on the PC. I did not test this aspect of the system.



Documentation

The documentation consists of one 5-by-8-inch booklet. The table of contents looks like this:

- 1: About SoftPC
 - 2: The SoftPC Session
 - 3: The Sun Keyboards
 - 4: Hard disks and drives
 - 5: Flexible disks and drives
 - 6: Using files and directories
 - 7: Pipes, files, printers, plotters and modems
 - 8: Using SoftPC on a Terminal
- Appendix A: Error Messages
Appendix B: Installation
Appendix C: MS-DOS Software Items

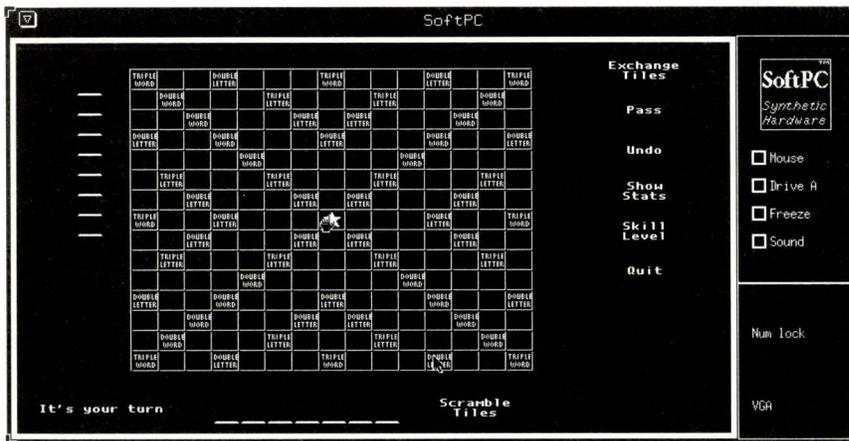
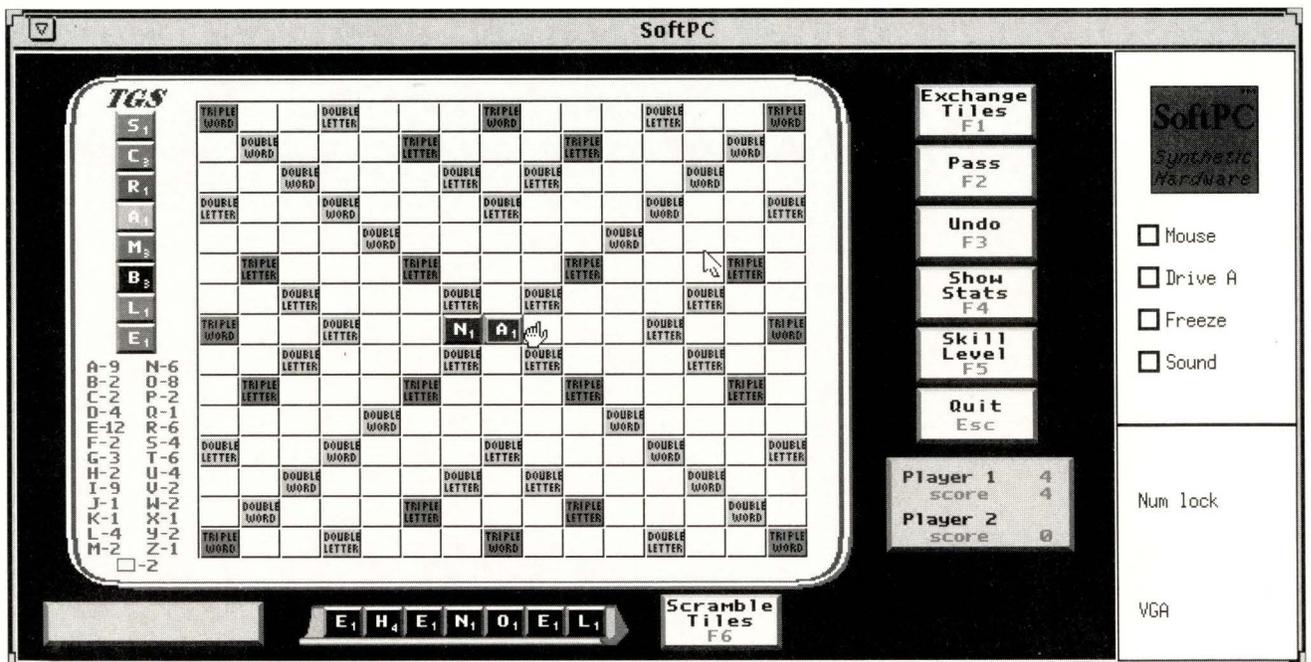


Figure 2. The difference a VGA (below) makes.



more

SoftPC V2.1

Insignia Solutions Inc.

6 Campanelli Drive
Andover, MA 01810

Circle 100

Reviewed on:

SPARCstation IPX, SunOS 4.1.1, 16 MB, cg6 graphics

Requirements:

SPARCstation or compatible ("sun4" operation also possible). 8 MB real memory (more recommended): 16 MB of total system swap space for SunView use, 36-MB system total with OpenWindows. SunOS 4.1; SunView 4.0 or OpenWindows 2.0 or later.

Price:

\$695, single right to use



Appendix D: Serial Port Emulation
Appendix E: The .SoftPC file
Appendix F: SlavePC
Appendix G: SoftPC Support
The booklet covers the ground, but it isn't as slick as it could be. It just looks

like something from the '70s. Most importantly, there is no index. Unlike the case with Sun's DOS Windows offering, you do not receive MS-DOS or GW-Basic(!) manuals; the latter, at least, is a blessing. A summary of standard MS-DOS conventions and commands would be a useful addition.

Future Directions

Insignia has told me that it has contracted with Sun to replace Sun's "DOS Windows" product with a version of SoftPC. In fact, I've heard that Sun now either sells SoftPC or refers customers to it, in preference to its previous product. At any rate, I hope Insignia makes the new product Open Look-conformant, expands the documentation and takes out a few other wrinkles along the way. If the company can do all this, it will have a very good product to sell as DOS Windows 2.0. One wrinkle Insignia needs to address is the lack of a -c command. The su, sh and csh programs have a -c command option that causes them to run the one specified command, then exit. Sun's DOS Win-

dows wisely copied this feature. For example, you can say

```
dos -c 123 $file
```

to run the DOS version of Lotus in an emulated window without having to invoke 1-2-3 from the DOS prompt. SoftPC has no such option.

If you sometimes need to access MS-DOS software under SunOS, the SoftPC program will do the trick. It faithfully emulates an 80286 PC/AT machine, even to the point of emulating the F3 key and running Microsoft Windows. It works well although a few aspects (keyboard mapping, command line options) are at times cumbersome. It's not yet an Open Look-compliant application, but that will probably come with time and future releases. ➔

Ian Darwin may not exist at all. Rumor has it that he is, after all, just an emulation. Email can be sent to his input redirector at ian@sq.com or uunet!sq!ian



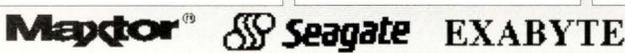
Data Storage Marketing, Inc.

Largest Worldwide Distributor of Maxtor Drives

SUN STORAGE DEVICE SPECIALISTS

Voted Best Overall Performer in *Computer Reseller News*' 1991 Preferred Distributor Survey

Internal Hard Drive Solutions	External Hard Drive Solutions	External Tape Drive Solutions	External Tape/ Hard Drive Combinations
<p>HS-I213/15</p> <ul style="list-style-type: none"> <input type="checkbox"/> MAXTOR 213MB Formatted Hard Drive <input type="checkbox"/> 15 MS Access Time <input type="checkbox"/> 1 Year Warranty <p>HS-I340/15</p> <ul style="list-style-type: none"> <input type="checkbox"/> MAXTOR 340MB Formatted Hard Drive <input type="checkbox"/> 15 MS Access Time <input type="checkbox"/> 1 Year Warranty <p>HS-I426/14</p> <ul style="list-style-type: none"> <input type="checkbox"/> SEAGATE 426MB Formatted Hard Drive <input type="checkbox"/> 14 MS Access Time <input type="checkbox"/> 1 Year Warranty 	<p>HS-676/17</p> <ul style="list-style-type: none"> <input type="checkbox"/> MAXTOR 676MB Formatted Hard Drive <input type="checkbox"/> 14.5 MS Access Time <input type="checkbox"/> 2 Year Warranty <p>HS-1050/15</p> <ul style="list-style-type: none"> <input type="checkbox"/> SEAGATE 1050MB Formatted Hard Drive <input type="checkbox"/> 15 MS Access Time <input type="checkbox"/> 1-5 Year Warranty <p>HS-1352/11</p> <ul style="list-style-type: none"> <input type="checkbox"/> SEAGATE Elite 1352MB Formatted Hard Drive <input type="checkbox"/> 11 MS Access Time <input type="checkbox"/> 1-5 Year Warranty 	<p>TS-150</p> <ul style="list-style-type: none"> <input type="checkbox"/> 150MB/250MB with Extended Tape WANGTEK 1/4 Inch Tape Drive <input type="checkbox"/> 1 Year Warranty on Tape Drive <p>TS2.5</p> <ul style="list-style-type: none"> <input type="checkbox"/> 2.5 GIGABYTE EXABYTE 8MM Tape Drive <input type="checkbox"/> 1 Year Warranty <p>TS5.0</p> <ul style="list-style-type: none"> <input type="checkbox"/> 5.0 GIGABYTE EXABYTE 8MM Tape Drive <input type="checkbox"/> 1 Year Warranty 	<p>HS-676M/TD150</p> <ul style="list-style-type: none"> <input type="checkbox"/> MAXTOR 676MB Hard Drive with 150 MB 1/4 inch WANGTEK Tape Drive <input type="checkbox"/> 14.5MS Access Time on Hard Drive <input type="checkbox"/> 2 year Warranty on Hard Drive <input type="checkbox"/> 1 Year Warranty on Tape Drive <p>HS1420/TD150</p> <ul style="list-style-type: none"> <input type="checkbox"/> SEAGATE 1420MB Formatted Hard Drive with a WANGTEK 150MB 1/4 Inch Tape Drive <input type="checkbox"/> 15MS Access Time on Hard Drive <input type="checkbox"/> 1-5 Year Warranty on Hard Drive <input type="checkbox"/> 1 Year Warranty on Tape Drive



1-800-543-6098

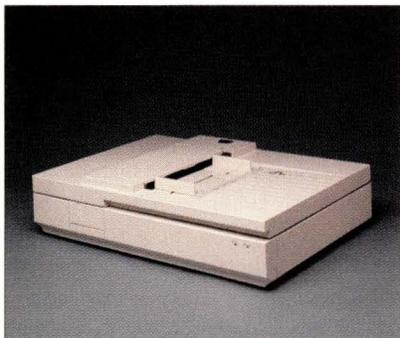
Circle No. 18 on Inquiry Card

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.

High-Speed Gray-Scale Scanner

Apunix Computer Services is shipping the Ricoh IS-410 high-speed scanner along with the company's OpenScan software. The IS-410 links to a workstation via a SCSI II interface. It handles documents up to 11 inches by 17 inches at up to 20 ppm, at 300 dpi in one-bit mode. Data is transferred to the Sun as one-bit binary or eight-bit gray-scale images.

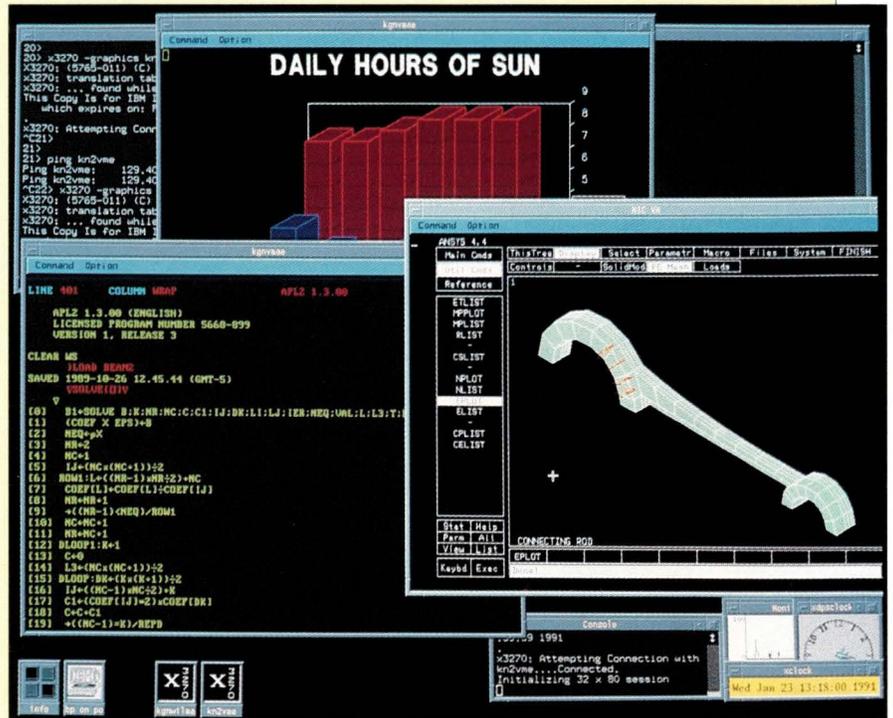


Apunix's OpenScan software includes a SCSI driver with automatic installation script, a user interface, the Network Scan Server Daemon (which allows the scanner to be shared in a workgroup environment) and a programmer's library command scan utility. The SCSI driver allows the scanner to link to Sun-3, Sun-4, SPARCserver and SPARCstation systems. Pricing begins at \$5,300.

Apunix Computer Services
5575 Ruffin Road, Ste. 110
San Diego, CA 92123
Circle 132

CD With GNU Source

PDQ Software has introduced a CD-ROM containing all the GNU source code, all the X11R5 sources with all the contributed software, the comp.sources.x usenet archives



IBM Offers Sun Products

IBM has introduced two new products for SPARC systems. Big Blue has gotten into the Sun market with a 3270 emulator and an Optimization Subroutine Library. The emulator, the x3270/S, is described as a port of the company's existing 3270 emulator for the RS/6000, the x3270/6000. The emulator gives Sun users access to applications running under VM or MVS on IBM mainframes. Users can run multiple 3270 sessions on the host, with each session appearing as a different window on the workstation screen. Pricing begins at \$795.

The Optimization Subroutine Library (OSL), meanwhile, is a collection of high-performance mathematical subroutines for use by application programs that solve optimization problems. It includes features to deal with linear programming, quadratic programming, mixed integer programming and so on. OSL is currently available for Sun-4 systems. Pricing begins at \$5,238.

OSL is available from the
IBM Mathematical Services Group
1503 LBJ Freeway
Dallas, TX 75234-6032
Circle 130

The x3270, meanwhile, is from
IBM x3270 Marketing
Department 85CA/228
Neighborhood Road
Kingston, NY 12401
Circle 131

and SPARC binaries and libraries for the GNU programs and the X11R5 server and clients. The format of the disk is ISO-9660, so it is readable from MS-DOS, Macs, etc., as well as SunOS. The price of the CD-ROM is \$39.95 for one disk and \$19.95 for each additional disk.

PDQ Software
1547 Palos Verdes, Ste. 260
Walnut Creek, CA 94596
Circle 133

Demo Program for X

A set of programs that allows developers working in X to create demos of their software has been introduced by Non Standard Logics. The XDemo-Maker and XDemoPlayer allow independent software vendors and other software developers working under X to produce demo versions of their product and inexpensively distribute them without crippling license agreements. The developers pay only an

initial purchase price and then are not charged for the demo programs shipped with NSL's software.

XDemoMaker facilitates the rapid assembly of sequences of X-terminal program screens. The product incorporates editing tools for fine-tuning. XDemoPlayer, meanwhile, provides

the playback mechanism for the demos. It is licensed to purchasers for use of specific platforms with unlimited copying rights.

Single-unit price for XDemoMaker is \$6,000. XDemoPlayer is licensed at \$4,000. Currently the products are available for Sun, IBM, DEC and HP

UNIX workstations.

Non Standard Logics Inc.
4141 State St., Ste. B-11
Santa Barbara, CA 03110
Circle 134

88K-based Multiprocessor

A multiprocessor minicomputer that supports both RISC and the Reality Pick-compatible operating environment has been introduced by Novadyne Computer Systems. Called the Series XT machines, the machines are based on between two and four tightly coupled Motorola 88100 processors. While the Series XTs can be used as network servers, the company says they are geared to shared logic-style processing. They can support 64 to 256 simultaneous users.

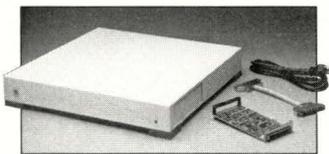
The company says the XT is optimized for on-line transaction processing. To this end, the company provides a multithreaded version of UNIX, called UMAX. The Reality environment, meanwhile, provides Pick functionality, with its native relational database and the DataBasic programming language. The XTs are rated at 33 MIPS, for a total of 132 MIPS for the four-processor model. They support between one and six disk drives, for a total mass storage of 600 MB and 6.3 GB. Tape drives are also available. Pricing ranges from \$62,000 to \$83,000.

Novadyne Computer Systems Inc.
1700 E. St. Andrew Place
Santa Ana, CA 92705
Circle 135

Multiflow System

Bell Atlantic has introduced a new version of the Multiflow TRACE server. Multiflow was a company that introduced several micro-supercomputer systems that exploited very long instruction word (VLIW) techniques. Bell Atlantic acquired much of the company's installed base, and this introduction represents relatively small changes in the Multiflow hardware and relatively major enhancements in its software. Bell Atlantic says that it has a software environment that automatically parallelizes

"Best Product of The Year?" Can't we do better than that?"



SEC 100 SBus Expansion Chassis



"Best Product of The Year in Its Category." The Integrix SEC 100 extends the SBus into six master/slave slots via a single slot adapter. The result? Easy expansion of your SPARCstation into new applications. Gives you SCSI bus options, too.

How do we beat that? Here are our answers for '92.

SFD 100 Flat Panel Subsystem

The largest and fastest flat panel display for SPARC-based workstations. Space-saving 16-inch, 32-bit, four times faster than our nearest competitor.

S4+ 500 Keyboard

Combines the best features of Sun and PC keyboards. Lets you migrate easily between PC and Sun platforms.

SGX 100 Graphics Accelerator

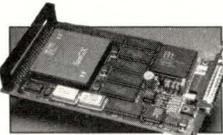
Cost-effective solution that dramatically accelerates text and all 2-D/3-D graphics. Single slot, plug and play. Sun GX compatible for easy installation.

SFB 200 Color Frame Buffer

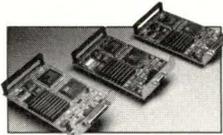
Up to 1280 X 1024 resolution at 76 Hz screen refresh ensures high resolution, flicker-free display. Ask about the S20 frame buffers for Sun CG3 and BW2 compatibility.



S4+ 500
Keyboard



SGX 100
Graphics Accelerator



SFB 200
Color Frame Buffer



integrix Engineered by Fanatics

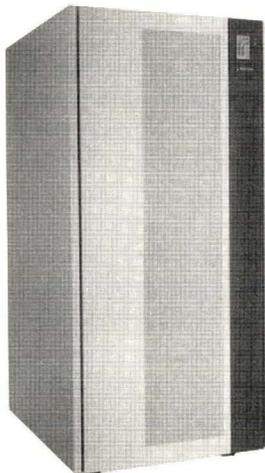
For Further Information:

(805) 375-1055

See us at
SunWorld Expo
Booth
#205

Integrix, Inc. • 1200 Lawrence Drive, Suite 150 • Newbury Park, CA 91320 • FAX (805) 375-2799
All trademarks mentioned are property of their respective companies.

Circle No. 28 on Inquiry Card



many program functions without the programmer becoming directly involved. The company makes available parallelizing compilers for FORTRAN, C, Ada, Pascal and Lisp.

The Trace machines are multiprocessor devices with between two and four clusters of proprietary Multiflow integer and floating-point units. The 7/300 has one cluster and supports a VLIW length of 256 bits for a total of

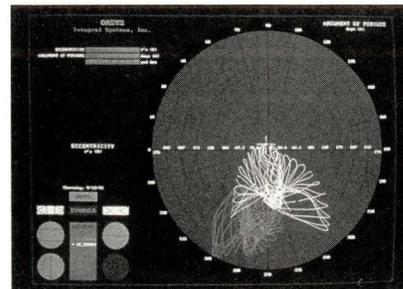
53 peak MIPS. The 14/300 has two clusters, a VLIW length of 512 bits and 107 peak MIPS. The 28/300 has three clusters, a VLIW length of 1,024 bits and peak MIPS of 215. Pricing begins at \$29,500.

Bell Atlantic Business Systems Services
 Multiflow Business Unit
 31 Business Park Drive
 Branford, CT 06405
 Circle 136

Satellite Control System

A satellite telemetry, tracking and control earthstation based on Sun and other UNIX workstations has been introduced by Integral Systems Inc. Traditionally, satellite earthstations have been based on multiprocessor minicomputers costing up to \$500,000. However, the Integral product, the Epoch 2000, performs the same functions with a loosely coupled LAN of Sun machines—with satellite control and tracking functions distributed across the network.

Epoch supports payload integra-



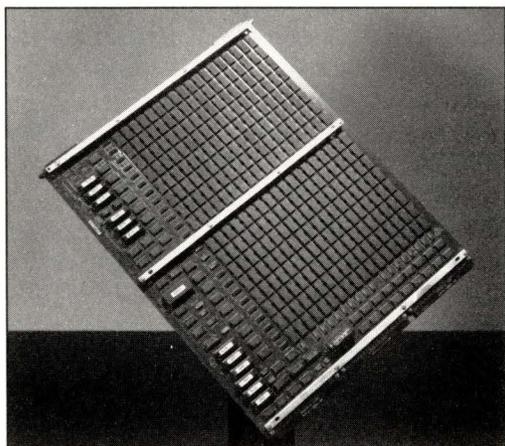
tion and testing, satellite integration and testing, as well as launch and on-orbit operations. In addition to Sun workstations, it is available for a number of other workstations, including DEC VAX, DG Eclipse and the Concurrent Concept 32. Pricing ranges from \$30,000 to \$60,000.

Integral Systems Inc.
 5000 Philadelphia Way, Ste. A
 Lanham, MD 20706-4417
 Circle 137

Hybrid PC/Sun Keyboard

A keyboard that combines features of the Sun Type 4 keyboard and the IBM-standard PC 101 keyboard has

SOLBOURNE MEMORY



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

Call for pricing at **1-800-RAM-ANTEL**



ANTEL

625 Digital Drive, Suite 107
 Plano, Texas 75075

Circle No. 4 on Inquiry Card

Invisible SBus Expansion!

High reliability, superior data integrity, flexible placement, field-proven, plug-and-play installation. Important attributes for SBus expansion. Works so well you can forget that it's there.

Aurora invented SBus expansion - **SBox™**

Proven - large installed base.

Simple installation - no software required.

Flexible - SBox can be placed over 100 feet from the host.

Special configurations - dual graphics card support.

More slots - up to 8 slots from 1 host slot.

AURORA
 TECHNOLOGIES

Call for more information!

SPARC is a registered trademark of SPARC International. SBox is a trademark of Aurora Technologies.

Lifetime Support

Intelligent Products for SPARC® Workstations



Catalyst Advantage Program

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

Circle No. 10 on Inquiry Card

been introduced by Integrix. The S4+ keyboard has characteristics of both the older Sun keyboard, which had 107 keys and used the "L" and "R" keys for special functions, and the 101-key PC keyboard.

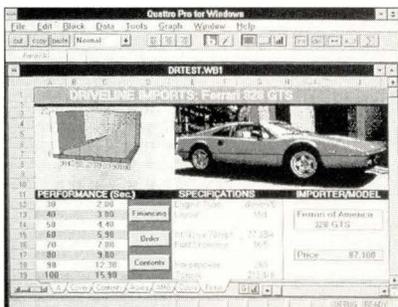
Integrix says that Sun has itself recently adopted the IBM-style keyboard in its attempt to popularize the SPARCstation as a business system but that some users have expressed a preference for the former configuration. The company says that its product allows buyers to have both the PC standard and the unique functions of the older 107 configuration. The S4+ retails for \$150.

Integrix Inc.

1200 Lawrence Drive, #150
Newbury Park, CA 91320
Circle 138

Automated Software Tester

Mercury Interactive has introduced an automated software tester for Sun and a variety of other UNIX platforms. Called TestRunner, the product is a PC loaded with test software, plus digital-signal-processing hardware that gathers screen, keystroke and mouse data. In effect, TestRunner plugs into a target system, such as a SPARCstation, and functions as an automated user, putting an application through its paces and



collecting data on its behavior.

The company says that TestRunner enters specified inputs, compares results with an expected outcome and records relevant errors for later review. The product is priced at \$7,500 to \$20,000, depending on configuration. There is also a one-time charge of between \$45,000 and \$55,000 to cover what the company calls "Test-Runner Infrastructure," by which it means a

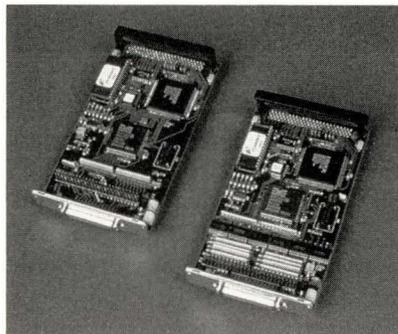
variety of functions including network software and a database accelerator.

Mercury Interactive Corp.

3333 Octavius Drive
Santa Clara, CA 95054
Circle 139

Add-In SBus Module

Performance Technologies has announced 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 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 140

Battery-Powered SCSI Hard Drive

A portable, battery-powered SCSI hard-disk drive has been introduced by Maxen. The Maxen Freedom

120/240, which is meant for laptop and notebook systems, can attach to any standard SCSI interface. It weighs under four pounds but comes with a battery pack and power supply that provide over four hours of continuous use. Moreover, the company says that since it has its own battery, it does not drain the battery of its host system.

The Freedom 120/240 offers 120 or 240 MB of storage. It also has power-protection features, as well as alarms that sound when the battery pack needs recharging.

Maxen

6696 Mesa Ridge Road
Building A
San Diego, CA 9121
Circle 141

SNMP-based Multiplexed Hub

Fibronix International has introduced an intelligent, fiber-optic multiplexed hub that supports Ethernet, token-ring, LAN distribution and real-time protocols in the same chassis. Called the Unimax V, the product combines the functions of several types of hub under the Simple Network Management Protocol. It can be implemented as a multiplexer with the backbone connected in a point-to-point, ring or star topology and as a hub to support local network distribution.

The company says that Unimax V combines Ethernet and token-ring LAN distribution with Time Division Multiplexing technology to enable users to centrally manage cabling systems, including roughly 20 different computer systems, network topologies, PBXs, etc. over a fiber-optic backbone. Over 20 real-time and LAN protocols are supported, including IBM 3270, AS/400, RS232 and V.35. Pricing begins at \$5,100.

Fibronix International Inc.

One Lowell Research Center
847 Rogers St.
Lowell, MA 01852
Circle 142

High Wattage UPS Systems

Two uninterruptable power supplies (UPSes) for larger systems have been



introduced by Oneac. The company says that the two new products, the 900-watt Model EG 1109 and the 1,300-watt Model 1113, are sized for use with superservers and multiple-server configurations.

Oneac believes that the machines have roughly twice the run time of similar machines. In addition, the new UPS models include low-impedance, transformer-based power conditioning

with a stable reference ground at all frequencies. The two models offer a five-year warranty. The 1109 is \$1,595, while the 1113 begins at \$1,795.

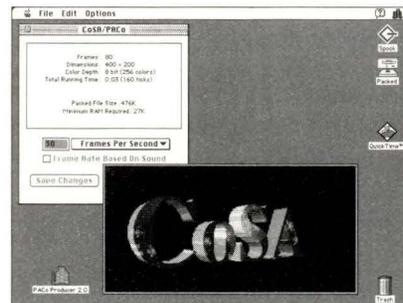
Oneac Corp.
27944 Bradley Road
Libertyville, IL 60048
Circle 143

Quicktime for Suns

An audiovisual playback system that allows video produced in the Apple Quicktime environment to be displayed on Sun SPARCstations has been introduced by CoSA.

Called PACo 2.0, the software effectively makes Quicktime platform-independent. Movies, videos and animation developed on the Macintosh can be displayed on any SPARC, SPARClike, PC or even older, 68000-based Macintoshes that normally cannot display Quicktime productions.

PACo includes PACo Producer 2.0, which compresses and presents animations, digital videos, visualizations



and audio files. The playback module, the PACo SPARCstation player, runs on the workstation and handles the actual display. There is also a PACo Windows Player for Intel-based PCs. Pricing starts at \$199 for each package.

The Company of Science & Art
14 Imperial Place, Ste. 203
Providence, RI 02903
Circle 144

FORTRAN GUI and Tool

An interactive graphical X Window System interface combined with an analysis tool for FORTRAN users has been introduced by Dynetics. Dynet-X can be used to give exist-

RENT TO OWN

Conserve your capital budget on our special off lease and demo systems.

SPARCstation IPC	SUPER SPARC 2
\$495/mo 12mo*	\$1,595/mo 12mo*
4/40FC8 P40	4/75 GX32-P40 + 1.3GB
8 mb Memory	32 mb Memory
16" Color Monitor	20" Sony Color Monitor
207 mb Disk	207 mb Internal Disk
KBD Mouse	1.3 GB Shock Mtd. Disk
New Warranty	KBD Mouse
	New Warranty

*Subject to credit approval; First month rent + security deposit.
Title will pass after 12 monthly payments + security deposit is received.

OFF LEASE SPECIALS

SPARCserver ... 4/470-S-32-P20	\$34,500
SPARCstation .. 4/65 C8-P3*	7,900
SPARCstation .. 4/60 M4-P3*	4,500
SUNstation 3/80 M4	2,500
SUNstation 3/60 C8 327 Disk, 60 MB Tape	2,495
SUNstation 3/60 M8	1,995
SUNserver 3/260 or 3/280 (many)	Call
SUN OS 4.1.1 SS2-07 Cart Tape	250

Spare boards & parts available - Call

BUY • SELL • LEASE • TRADE
"WANTED: USED SUN SYSTEMS"



(714) 632-6986
FAX: (714) 632-9248

Circle No. 16 on Inquiry Card

Scan

Add high quality images
to your printed material for
exceptionally low cost.

The FirstScan™ product provides
everything you need to use the
Hewlett Packard ScanJet Plus with
your SPARC workstation.

FirstScan software, using the
OpenWindows™ GUI, provides full
control of scanning process.
Images can be saved in Sun Raster,
PostScript®, or TIFF formats for
easy integration into your documents.

Make the intelligent choice in
SPARC workstation scanning —



OpenWindows is a trademark of Sun Microsystems, Inc. SPARC is a registered trademark of SPARC International; FirstScan is a trademark of Aurora Technologies, Inc. PostScript is a registered trademark of Adobe Systems Corp.

One Year Warranty • Lifetime Support

Circle No. 11 on Inquiry Card

**Intelligent
Products
for SPARC®
Workstations**



Catalyst
Advantage
Program

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

ing FORTRAN programs access to the X Window System environment, without the need for extensive recoding. The company says that this can be a significant advantage to users who have large investments in dusty-deck FORTRAN applications but lack the resources needed for a massive conversion to C to fully exploit C-based X Window System toolkits.

Moreover, Dynet-X provides a variety of routines for plotting run-time results of FORTRAN programs. The company says that Dynet-X can also help in restructuring a program as a distributed application. In fact, Dynetics says that one of its chief markets will be individuals who are currently running on supercomputer-class machines but now wish to take their existing software to less expensive Sun networks. Pricing for Dynet-X begins at \$2,200.

Dynetics Inc.
800 Hingham St.
Rockland, MA 02370
Circle 145

Brixton Enhances

Brixton Systems has announced significant enhancements to its BrxPPP Point-to-Point Protocol software. Brixton added software support for high-speed T1 routing cards to BrxPPP, improving the product's ability to transmit large packets of data, such as those generated by financial institutions, in a high-speed fashion. Brixton's BrxPPP enables SPARCstations to use dial-up/leased phone lines for connecting remotely located machines to local SPARCstations utilizing the Point-to-Point Protocol.

The Brx3270 terminal emulator allows users to communicate interactively with applications on IBM mainframes from a variety of UNIX-based computers. Several new enhancements to this product extend compatibility for IBM display terminals to include Model 3279, Model 2A, 2B, 3A, 3B and 3278 Model 1-5. The 3270 now supports an expanded number of GUIs, including Open Look, Motif and SunView. Additionally, X support allows Brx3270 to execute on any X

server. Workstations from HP, DEC and IBM, as well as X-terminals from NCD and others, can now use the SPARCstation as a gateway to IBM mainframes.

Other enhancements to the 3270 include file transfer, whereby users can move files to and from IBM mainframes. Distributed EHLLAPI is another new feature allowing users to develop programs to this standard 3270 API or port existing applications from PCs to the SPARCstation. Printer emulation has been enhanced, allowing SPARCstations to handle print data, including post-processing capabilities for mail, ftp and quality print, or storing the 3278 print data.

Pricing for the BrxPPP with T1 support is \$995. T1 hardware boards sell for \$1,695 per board, and both products sold as a bundled package sell for \$2,595. The Brx3270 sells for \$1,950.

Brixton Systems Inc.
185 Alewife Brook Pkwy.
Ste. 4200
Cambridge, MA 02138
Circle 146

Save Your SBus. We've got the Connections.



The VPX-128 Multiplexer connects one parallel and seven serial devices to each RS-232 port on Sun Microsystems SPARCstation, Sun3 or 386i workstations.

The VPX-128 Multiplexer features transparent access to each device while saving the SBus for more specialized applications.

VECTOR TECHNOLOGIES 3289 E. Hemisphere Loop Tucson, Arizona 85706-5028
Telephone: (602) 741-0120 • FAX: (602) 889-5790 • TELEX: 706064

SPARCstation, Sun3, and 386i are registered trademarks of Sun Microsystems.

Circle No. 48 on Inquiry Card

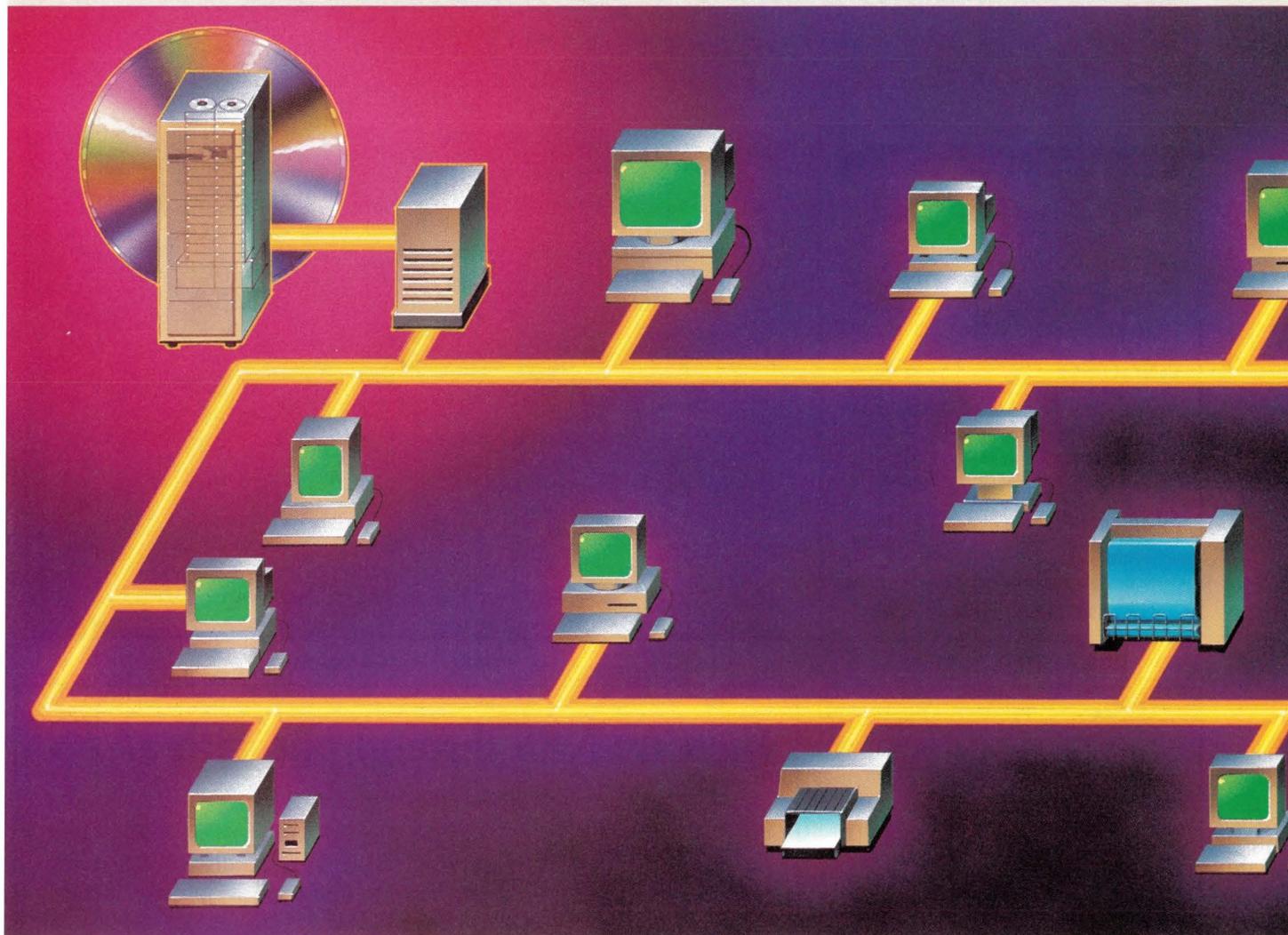
SUNEXPERT Magazine/March 1992

T/O/F/S™

NETstor
Transparent Optical File System

Imagine!

20 to 372 Gigabytes, On-Line!



*Rewritable optical
subsystem expands
your Sun file
server capacity
with performance
comparable to your
current disks.*

If your network never seems to have enough on-line storage, imagine having easy, on-line access to 20 GB—372 GB of data storage on rewriteable optical platters stored in automated libraries for only 25% of the cost of magnetic disk. Zetaco's Transparent Optical File System (TOFS™) offers just such a subsystem for Sun servers.

And, performance doesn't suffer! TOFS caches the optical with fast magnetic disk, in a truly hierarchical storage system, thereby overcoming optical's inherent slowness.

Large capacity, on-line, fast access, integral backup, and transparent operation. Call us now for complete information—and you'll have to imagine no longer!

Circle No. 50 on Inquiry Card

Zetaco
CARLISLE

Corporate
11400 Rupp Drive
Burnsville, Minnesota 55337
FAX: 612-890-0791
Phone: 1-800-423-3020

European Sales Office
No. 2, Marash House
2/5 Brook Street, Tring
Hertfordshire HP23 5ED, England
FAX: (44) 0442-890439
TEL: (44) 0442-891500

The SunExpert Market

ATTENTION READERS/BUYERS:

For more information on the products/services advertised in this section, please circle the appropriate reader service numbers on the reader inquiry card.

ADVERTISERS:

To advertise your product/service in the next issue, please call Carol Flanagan at (617) 738-3402.

COMPUTER CONNECTION

BUY & SELL NEW & USED
Sun Microsystem Equipment
Standard 90-day Warranty

Sun Monitors

17" Sony Trinitron 355-1113	\$1200.00
16" Sony Trinitron 365-1079	\$ 895.00
19" HI RES Mono 365-1123	\$ 895.00

Systems

3/60FC-4 (New)	\$1500.00
4/60FC-8	\$4995.00
4/60FM-8	\$3495.00

Sun Frame Buffers

GX Frame Buffer 501-1645	\$2200.00
3/60 Col FR BUF 501-1210	\$ 300.00

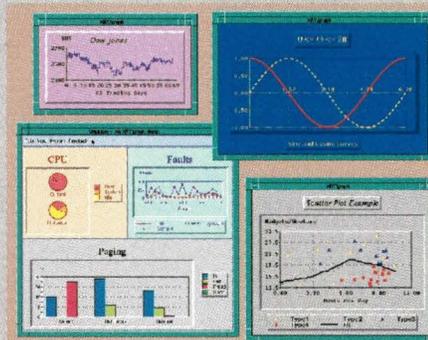
Sun Storage

207-MByte	\$ 895.00
327-MByte Disk Pack	\$1200.00

US (315) 724-2209 Fax (315) 724-0794 Canada (613) 723-2359
311 Turner Street, Utica, NY 13501

Circle No. 300 on Inquiry Card

XRT/graph™ Widget



For: Motif, XView, OLIT

- » Real-time updates
- » PostScript Output
- » User-feedback
- » no royalties or run-time fees

Includes *Builder* - a point-n-click prototyping and development tool

XRT/graph is a trademark of KL Group Inc.

For a free information kit contact KL Group Inc.

Phone: (416) 594-1026 uunet.UU.NET ! klg ! xrt_info

Circle No. 301 on Inquiry Card

Direct Response POSTCARDS

from

SunExpert Magazine

...reach more Sun workstation users than any other publication.

JUNE mailing

MATERIALS DUE MAY 8, 1992

OCTOBER mailing

MATERIALS DUE SEPTEMBER 28, 1992

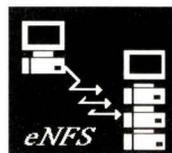
DON'T DELAY!

For more information call Carol Flanagan at (617) 738-3402.

Circle No. 303 on Inquiry Card

Increase NFS throughput with eNFS

"It's the best thing since sliced bread!"



Call Now to
B O O S T
your N F S
Performance

"We have *much* faster response time on our servers. We tried eNFS on two machines and were so impressed we ordered a copy for every server..."

Jack Stanley, Houston Chronicle, Houston TX

INTERSTREAM

1501 Reedsdale Street, Pittsburgh, PA 15233
PHONE: 412-323-8000 FAX: 412-323-1930

1-800-677-7876

Circle No. 302 on Inquiry Card

SPARC Compliant ... \$5,995



25 MHz LSI SPARC
8 MB RAM
64 KB Cache
207 MB Hard Disk
1.44 MB Floppy
20" Color, 1280x1024
Keyboard & Mouse
Solaris/SunOS 4.1.1
1-year warranty

Memory (1MB - 16MB SIMM)
Hard Disk (207 MB - 3.0 GB)
Tape Drives (150 MB - 5.0 GB)
Scanners (75 DPI - 600 DPI)
Lotus 123, dBase IV, WordPerfect

For a new light on your workstation

Xpert Image, Inc.

2550 Gray Falls (713) 558-6788
Houston, TX 77077

Circle No. 304 on Inquiry Card

Parallel Computers
Complete turnkey systems
at great prices . . .

STARTING AT \$29,500
PARALLEL PERFORMANCE without
user involvement!

Our advanced automatic C & Fortran
optimizing parallel compilers require no
user guidance or special programming.

Expandable to 215 MIPS and 120
MFLOPS performance.

Supports up to 512 MB memory and 20
GB disk.

Includes Unix 4.3 BSD, FTN & C
compilers, VAX compatibility suite,
NFS, OSF-Motif, X-11-R4, and more!

TRACE Systems are sold and supported nationwide by:

Bell Atlantic Business Systems

For great prices, great service, and great
support, call Mr. Steven Eskenazi,
Program Director, at 203-488-5377

Circle No. 305 on Inquiry Card

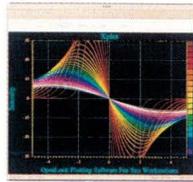
LIST RENTAL

Target your direct mail campaign
to buyers in the
Sun workstation market.
SunExpert subscribers can be selected
across a broad spectrum
of applications through our
list rental program.

Contact:
Debby Moore,
Circulation Manager
for more details
(617) 738-3415

Call the above listed telephone number

Plotting more than 100,000 data points is a big job...



Xplot makes it easy!

Get an early, colorful, and quick look
at large volumes of data and eliminate
unnecessary information before
it is printed. **Only \$495**

*"There's nothing that compares
with it for ease of use."* - Sandia Labs

SimCity™
on Sun

World Class Award, 1991 MacWorld



**CALL
NOW!**

Coming Soon to UNIX!

1-800-543-4999

See us at
SunWorld Expo
Booth #957
Fax: 415-967-5528



Circle No. 306 on Inquiry Card

Login to The World®



A Public Information Utility 617-739-WRLD

Public access unix • Global electronic mail
• AlterNet access • International software
archives • Online Book Initiative •
ClariNet • Over 2000 USENET topics •
Internet relay chat • Nationwide access via
CompuServe's Packet Network

Rates

\$5/month + \$2/hour *or* \$20/month for
20 hrs/month

No Risk Trial Offer

Create an account, try it out for one hour, no
charges incurred. Modem support 9600
(PEP, v.32, v.42), 2400 (MNP/5), and
1200 baud connections use settings 7, E, 1.

Software Tool & Die

1330 Beacon Street, Brookline, MA 02146
Voice: (617) 739-0202 E-mail: office@world.std.com

Circle No. 307 on Inquiry Card

RS/Magazine

The Journal For IBM Workstation Users

**RS/Magazine is a monthly magazine designed
specifically for users of IBM's RISC System/6000.**

RS/Magazine provides: Technical know-how from RS/6000 and AIX experts,
Independent third-party product reviews, Product surveys, Essential buying-
decision information, Industry and market news, and On-site user profiles.

RS/Magazine also provides in-depth analysis of users' concerns - from applications
portability to enterprise-wide networking - in a frank, straightforward way.

Subscribe Now - **GRATIS**

Send for a FREE subscription form to the address below.

RS/Magazine

1330 Beacon Street, Brookline, MA 02146-3202 (617) 739-7001 FAX (617) 739-7003

Advertiser's Index

THE AD INDEX IS PUBLISHED AS A SERVICE TO OUR READERS. THE PUBLISHER DOES NOT ASSUME ANY LIABILITY FOR ERRORS OR OMISSIONS.

national sales manager: **LINDA LIEBICH**

SALES OFFICES

New England

Joan Donahue
The Donahue Company Inc.
 31 Shipway Place
 Charlestown, MA 02129
 Phone: (617) 242-3042
 Fax: (617) 241-2815

New York/Mid-Atlantic/Southeast

D. Douglas Johnson
 1625 Oak Hill Rd.
 Chester Springs, PA 19425
 Phone: (215) 935-8522
 Fax: (215) 983-0655

Mid-West/Mountain States/Southwest

Linda Liebich
 11782 Jollyville Rd., Ste. 102A
 Austin, TX 78759-3966
 Phone: (512) 331-7076
 Fax: (512) 331-7788

Southern California/Nevada

Diane Hargrave
 World Savings Center
 11601 Wilshire Blvd., 5th flr.
 Los Angeles, CA 90025
 Phone: (310) 575-4805
 Fax: (310) 575-1890

Northern California/Oregon/Washington

Robert S. Pack
 1030 East Duane Ave., Suite F
 Sunnyvale, CA 94086
 Phone: (408) 732-0818
 Fax: (408) 730-0702

Product Showcase/Classifieds/ Postcards

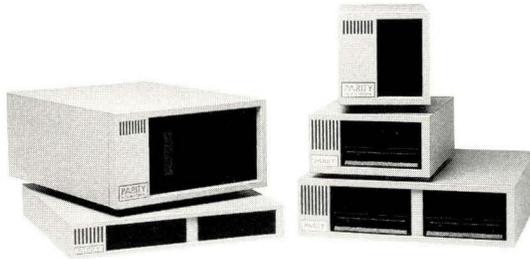
Carol A. Flanagan
 Manager, telemarketing sales
 1330 Beacon St., Suite 220
 Brookline, MA 02146-3202
 Phone: (617) 738-3402
 Fax: (617) 739-7003

CIRCLE NUMBER.....	PAGE
1.....American Computer Rental	39
2.....American Computer Rental	41
3.....American Computer Rental	43
4.....AnTel	73
5.....Apex Computer	11
6.....Apunix Computer.....	19
7.....Artecon	6
8.....Artecon	7
9.....Aspen Technologies.....	16
10.....Aurora Technologies.....	73
11.....Aurora Technologies.....	75
12.....CenterLine Software	9
13.....Central Data.....	35
14.....Cranel.....	22-23
15.....CS Electronics	68
16.....Datalease	75
17.....Dataram.....	20
18.....Data Storage Marketing	70
19.....Eakins Open Systems	32
20.....Engineering Design Team.....	18
21.....FirstBase Software.....	14
22.....GNP Computers	47
23.....Helios.....	15
24.....Hewlett-Packard	67
25.....Hitachi America	55
26.....ICS	37
27.....IGM.....	back cover
28.....Integrix	72
.....Interop '92	38
29.....Intersolv	42
30.....IO Tech	12
31.....Megabyte Memory Products	66
32.....Milan Technology	27
33.....Mini Computer Exchange	28
34.....Morning Star Technology	10
35.....National Instruments	53
36.....Novadyne Computer Systems.....	29
37.....Novadyne Computer Systems.....	33
38.....Parity Systems	inside back cover
39.....Productivity Solutions	41
40.....Recognition Concepts	43
.....Reprint Management Services.....	62
41.....RISC Management	17
42.....Storage Dimensions	24-25
43.....Sun Microsystems	30-31
44.....Sun Microsystems	59
45.....Tadpole Technology	inside front cover-1
46.....TGV	5
47.....Transitional Technology	13
48.....Vector Technologies	76
49.....Visual Information Technologies.....	2
50.....Zetaco	77
51.....ZZYZX	61
52.....ZZYZX	63
53.....ZZYZX	65

Parity offers you one complete UNIX source, from memory to subsystems.

Visionary Products for Sun, DEC, SGI, IBM, HP & Solbourne.

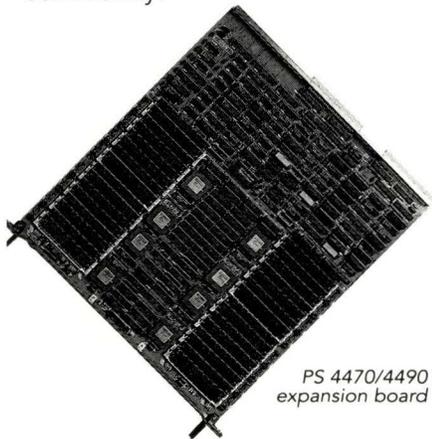
Parity Systems designs, tests, manufactures and supports a wide range of products for the workstation and file server community.



Clockwise lower left: 5300, 5000, 5100, 5800, & 5700 subsystems

Fantastic Price and Service.

Parity offers you powerful solutions and maximum system flexibility. You get fast and easy upgrades, fantastic service, unequalled warranties, and the most cost-effective product line around!



PS 4470/4490 expansion board

Offering high performance solutions at lower cost, with better warranties and faster deliveries.

Endless Flexibility from Parity.

Subsystems, configured to order with your choice of disk, tape, or optical drives in an overwhelming array of capacities. Parity expansion boards and SIMMs (1-16 MB) offer you an endless variety of solutions to meet your memory requirements. And our Glovebox™ allows you to expand disk capacity of the SPARC™ BriteLite™ Laptop also offered, up to an additional 611 MBytes.



12 device Tower subsystem



Glovebox subsystem and SPARC BriteLite Laptop

Quick Delivery.

For more information on how you can be up and running with solutions for your UNIX environment, call Parity Systems today at

408/378-1000.



CORPORATE

TEL 408/378-1000

FAX 408/378-1022

SOUTHWEST

TEL 619/247-8383

FAX 619/247-8413

SOUTHEAST

TEL 407/242-0034

FAX 407/242-0706

EASTERN

TEL 216/836-0247

FAX 216/836-4978

EUROPA GMBH

TEL 49 6144 6420

FAX 49 6144 6431

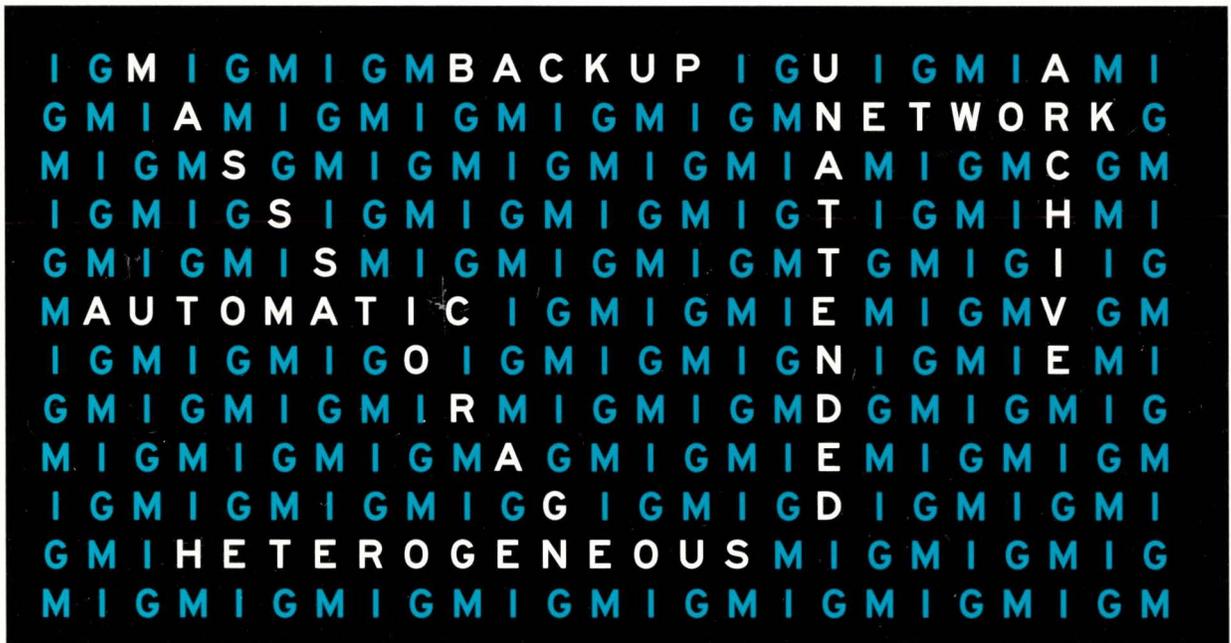
All product names are trademarks of their respective companies.

Circle No. 38 on Inquiry Card

The Mass Storage Search



22¢/MB



The Solution: IGM

CALL 713/578-2500



IGM
4041 Home Road
Bellingham, WA 98222
713/578-2500