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MARCH ■ 1990

DEC Professional

An Independent Magazine from Professional Press

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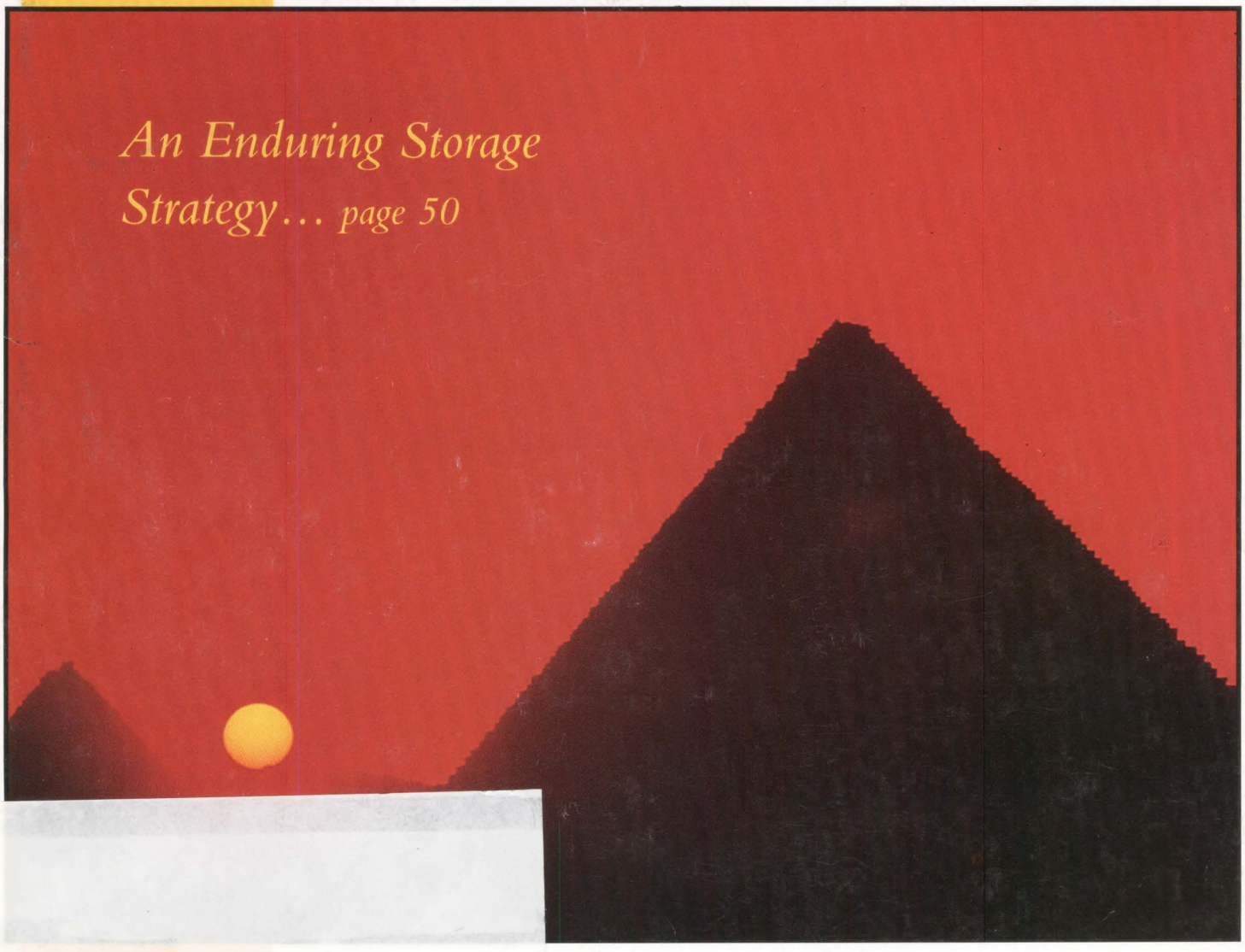
An Enduring Storage Strategy... page 50



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DEC Professional Magazine
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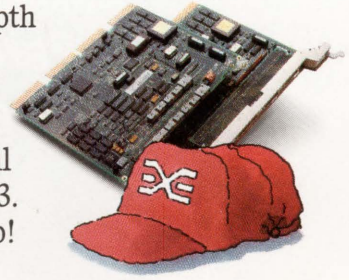

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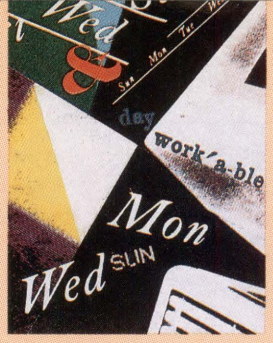

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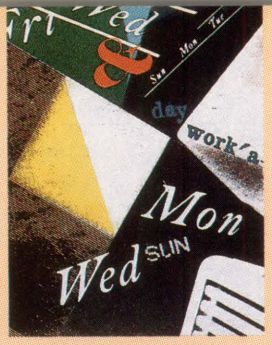

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DEPARTMENTS & COLUMNS

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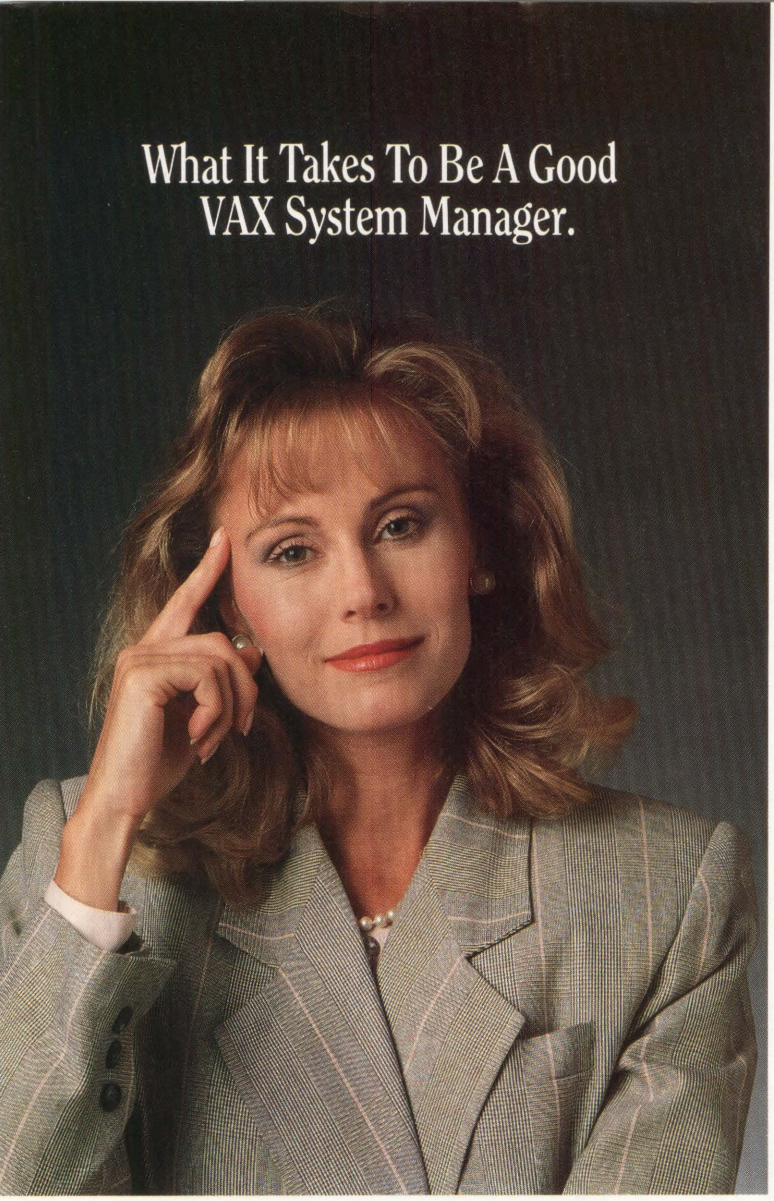

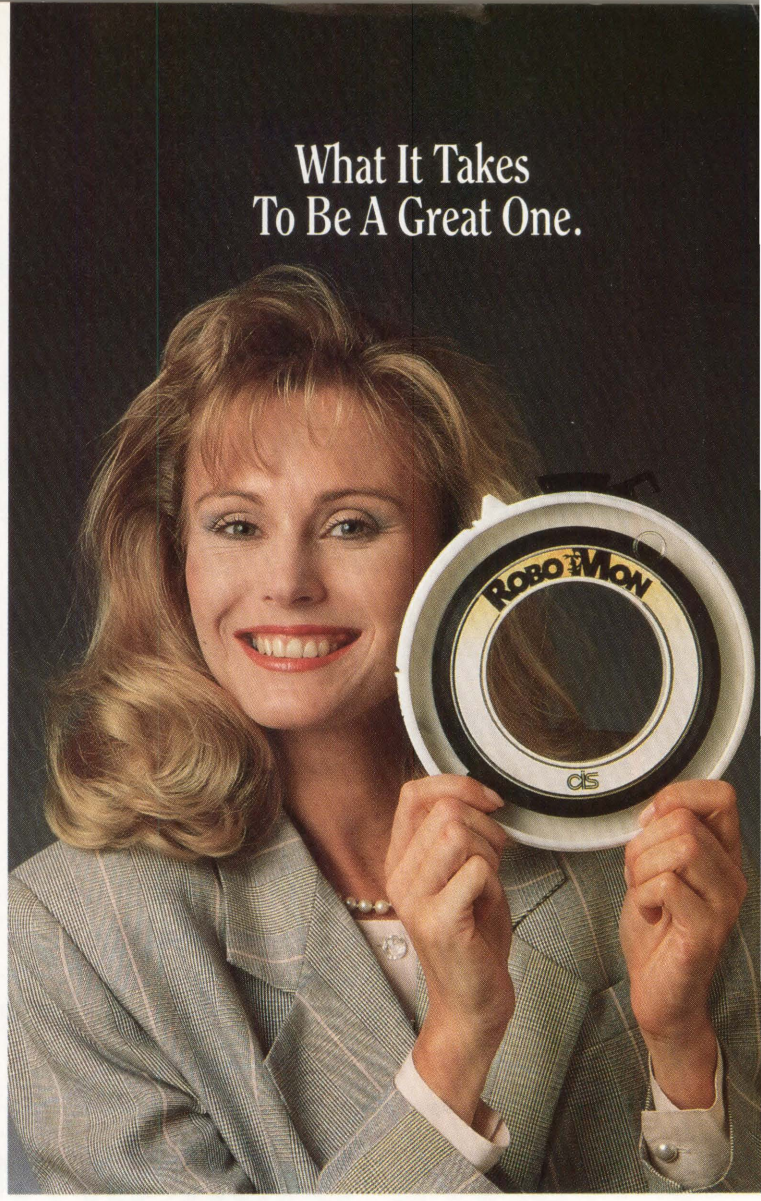

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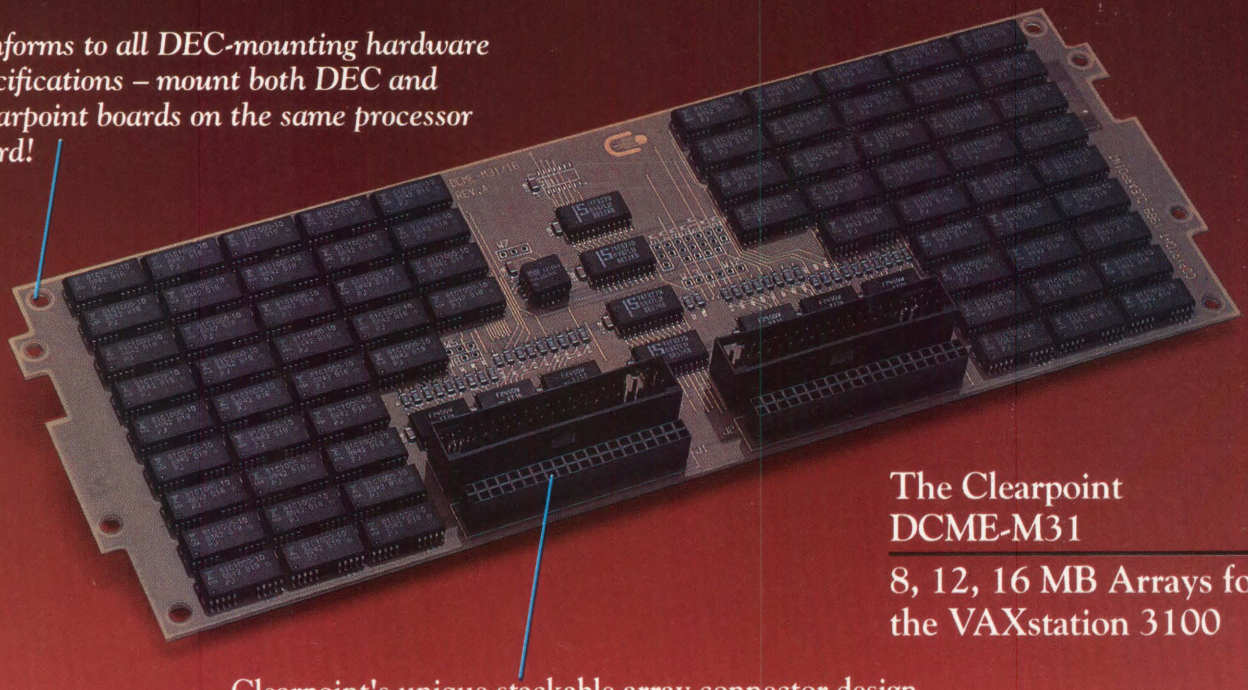

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Call or write for our current catalog, the Designer's Guide to Add-In Memory and Memory Tales, a memory-applications video.

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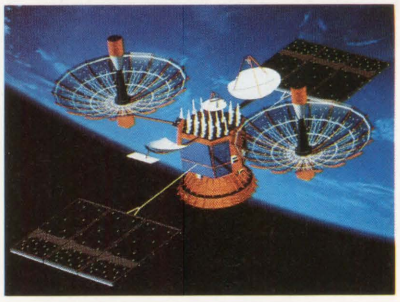

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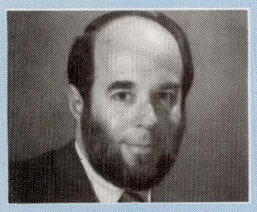

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Carl B. Marbach

Time For Change

In each of Professional Press' 10 years of publishing, we have had to confront a problem: What should we do about our lack of computer power? We grow so fast that our computers can't keep up. And as we ask more of the systems that run our business, they begin to slow, response time increases and users become frustrated.

We've tried adding memory. One year we went from 256 KB to 1 MB on one of our PDP-11s. We've also tried adding processors. One year we added two PDP-11s. When the time was right, we moved into the 32-bit world with our first VAX, and we've continued to add VAXs. But what do we do next?

We have two alternatives. The first is to buy a 7-mip VAX 6000 Model 400-class machine for our 100 processes and 75 users. We'd attach an HSC and enough disks, memory and other goodies to make it perform. This is the traditional path — buy a bigger VAX.

The second alternative is to buy a VAX 6000 Model 200/300-class machine as a file server for a group of MicroVAXs that would service the users. We could begin by adding three MicroVAX IIIs, each servicing 25 users, and put all the files on the VAX 6000. As we add users, we add MicroVAX IIIs.

The price difference between the two alternatives is minimal, but we're getting different opinions as to which topology is best. Alternative one has more raw power in one box but more users to sap that power. The second alternative has fewer mips in one box. It has more total mips, but it will use some of them in coordinating processors. While I/O is optimized over high-speed buses in the first, almost all data will have to be passed over the relatively slow Ethernet at an excruciating 10 Mbps in the second.

Shouldn't the answer to this question come from the vendor? Does DEC know which is best? If so, will it tell?

DEC has a performance laboratory that can simulate interactive loads on a system and measure response and throughput. Originally, it was set up to ensure that operating system performance didn't change dramatically from one version to another. It then became a way to rate systems so that DEC salespeople could suggest the right configuration for customers. But customers and salespeople often don't know how to describe a computer load precisely, so performance testing is more an art than a science. And most of this information is available only to salespeople and therefore hard for customers to get.

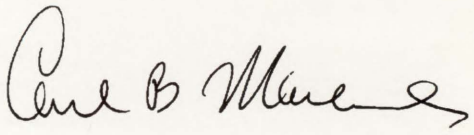
It has never been more important to have this sophisticated performance information. Professional Press isn't the only one trying to decide how to grow. I suspect that the current slowdown in the computer industry is as much because of confusion as economic conditions. Other typical questions involve RISC products, UNIX and ULTRIX, workstations and servers. Which configurations offer the best performance for *my* application?

Computers are too expensive, pervasive, important and time-consuming for trial and error. We need answers, and I believe DEC has them. And DEC isn't alone in withholding information on specific performance — HP and IBM aren't telling either. We even have trouble agreeing which benchmarks are important. Mips, VUPS, tps and Debit/Credit aren't standard or meaningful by themselves. It takes complicated, sophisticated equipment and knowledgeable operators to make real performance evaluations and answer questions such as, "Is a RISC/ULTRIX solution better, faster and more cost-effective than a VMS solution?"

By answering some tough questions, DEC can take the confusion out of the equation. This may be the first step on the road to recovery.

In the meantime, I'd like to ask for your help. Which of the two alternative solutions — VAX 6000 Model 400 or VAX 6000 Model 200/300 plus MicroVAX IIIs — do you favor and why? Please respond on ARIS/BB, uunet or by mail or fax. We'll discuss the results in a future editorial.

Editor's note: For Professional Press' address and fax number and information on using ARIS/BB and uunet, *see page 6.*



MA92, 3480 on the HSC

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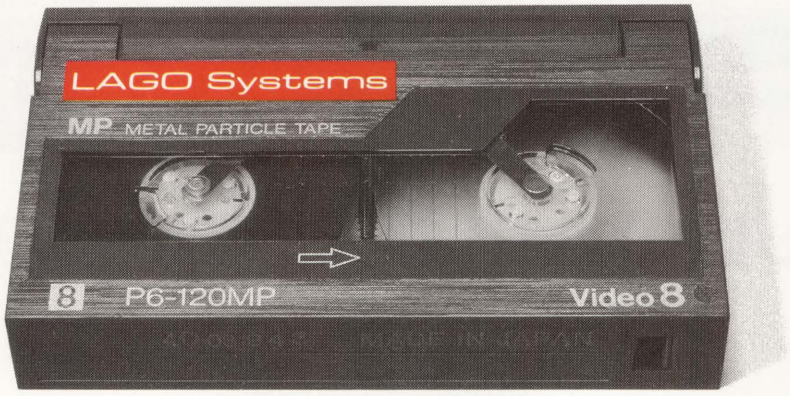

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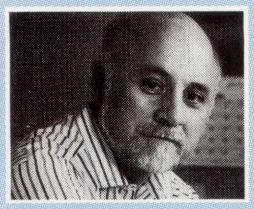

EDITORIAL

Dave Mallery

On The Demise Of U.S. Memories

The United States used to have a basic steel industry. It's gone.

We used to have an auto industry. It's almost gone.

We used to make things. Now we sell services and junk bonds. We have to buy things elsewhere, because we can't make them anymore. The automobile industry plans for the next 10 days. The rest of American business plans for the next three months. Our government plans for the next election.

We used to have a semiconductor industry. After all, we invented it. Now it's gone. We couldn't even start U.S. Memories, a simple nonsubsidized industry consortium to make memory chips, for fear of upsetting our Japanese and Korean masters. They hold the volume contracts that "ensure" U.S. computer makers the continuation of that vital commodity. Only DEC and IBM had the guts to stay in the running. The memory cartel is now firmly in command.

We still have a computer industry, but not for long. Have you looked at the new crop of Pacific Rim workstations? The memory cartel controls the price and availability of DRAM chips. When you control the price of memory chips, you control the finished-goods price of computers, workstations, laser printers, fax machines and almost every piece of electronics made. When you control availability, you also can limit access to the newest technology — you can keep it at home and let the foreigners struggle with the previous generation. Do you remember how far your car ran on empty in the 1970s?

It's sad when you look at what our government subsidizes. A single B2 Stealth bomber would buy U.S. Memories. We continue to build these bombers against a nonexistent threat. The tobacco industry creates a major public health hazard and escalates the nation's health care bill by dozens of billions, yet we continue to pump subsidy money to the farmers who produce that addictive carcinogen.

I'm not talking about protectionism, I'm talking about the national security and survival against real threats.

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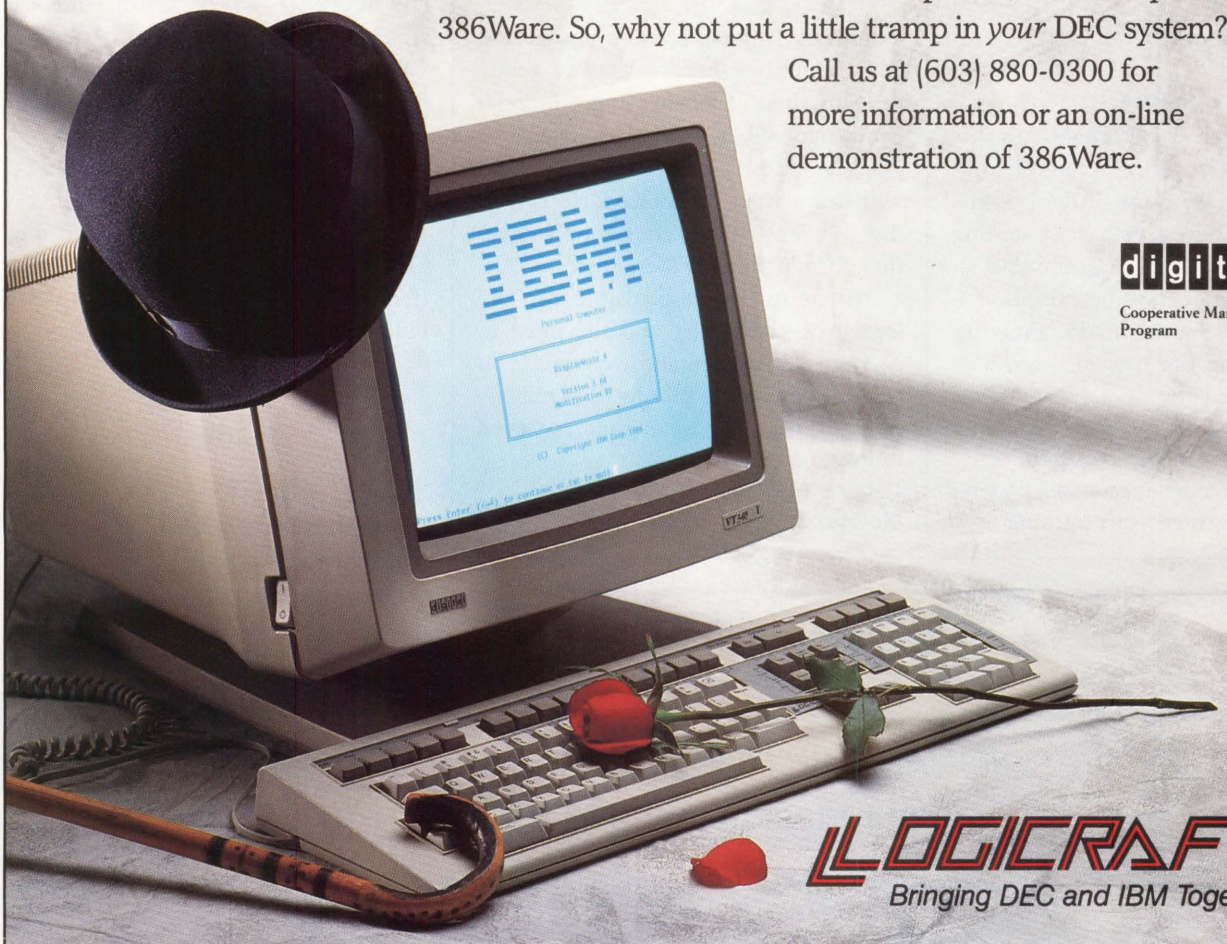

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CIRCLE 141 ON READER CARD

LETTERS

Please address letters to the editor to *DEC PROFESSIONAL*, P.O. Box 218, Horsham, PA 19044-0218. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space. You also can fax letters to us at (215) 957-1050.

DESKTOP DRAIN

In George T. Frueh's Lab review of GraphOn Corporation's OptimaX 200, "DECwindows on the Desktop" (December 1989), a key issue was overlooked. This issue is the CPU time used by the XGO image. The OptimaX 200 is a good alternative for windowing applications, but at a price: CPU.

The author should have mentioned that the "split" implementation of the server functions costs CPU overhead on the host. I measured this overhead at about one to eight percent for one terminal. Imagine what impact 10 or more terminals would have on the CPU.

Paul Buob
Mossville, Illinois

COMPUTER LEGACY

Bully for Carl B. Marbach on his "Educating The Next Generation" (January 1990). With the growing complexity of computers each year, starting the next generation of programmers at an early age would be most beneficial.

Computers have made amazing advances during the past 20 years. The concepts behind the operating systems, networks and user interfaces can't be covered in detail at the collegiate level. Most Computer Science majors spend the first two or three years learning programming languages, code design and data structures before they're ready to learn about database design, theories behind compilers, operating systems or graphics. Most programmers I worked with learn these "advanced" topics on the job. The college courses only cover the introductions to these topics.

All of us are responsible for the legacy of computing and the need to pass our knowledge and experience on to those who come after us. This responsibility should stand alongside our need to improve ourselves.

Patrick Mahan
Newport Beach, California

AS YET UNPHASED

Your January issue was great — I read it from cover to cover. However, in Al Cini's "Building Integrated Systems," the box titled "Digital: Devoted To DECnet/OSI" by Evan Birkhead contains an error. DECnet Phase V didn't begin shipping in September 1987. It may have been announced then, but it's still in design and field test. It hasn't begun shipping even now!

Sam Gentile
Nashua, New Hampshire

Evan Birkhead: Mr. Gentile is correct. DECnet Phase V was announced at DECWORLD '87 in Boston and was scheduled for release before the end of 1990. DEC reports that development is on schedule and that it plans to release the Phase V late this year.

Correction

A listing of optical disk vendors in "The Optical Outlook" by Ron Levine (January 1990) inadvertently omitted Dilog. For more information, contact:

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Anaheim, CA 92806
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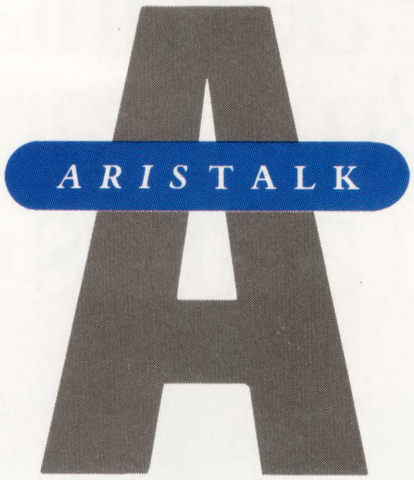
CIRCLE 112 ON READER CARD



NO DELETING

QUERY:

Phil MacDonald *(SIG 33/MESS 470):* I have a user I'll call Dan who has a PPN of [50,51]. Our data files are in [10,2] protection code of <60> (Owner:rw, Group,World).

Dan must read and write to these files, but I don't want him to be able to delete. His protections are gread,gwrite, wread,wwrite. How can I let only Dan read and write?

REPLIES:

Kelvin Smith *(SIG 33/MESS 472):* You have two options:

1. Write access the file within a privileged program. For nonexecutable files, write access includes delete access in the RSTS world.
2. If you want to make it impossible for anyone to delete the file without executing an extra, privileged step:

```
$SET FILE [m,n]FOO.BAR/NODELETABLE
```

and set the protection code to <0>. This means that anyone else can read and write the file. The file will show up on directories with a P after the size, indicating that it's protected. At this point, the only way to delete the file is to:

```
$SET FILE [m,n]FOO.BAR/DELETABLE
```

and then actually delete the file.

It requires some privilege to set or reset the nodelete flag. If you don't want others to read and write the file, set up the program so that only Dan can run it. Either put it in his account or, if unwanted users have wread privilege, put a check at the beginning of the program for the proper account.

Brett Bump *(SIG 33/MESS 475):* Your problem may be more severe than you realize. I wouldn't worry as much about Dan deleting a file as I would about him typing:

```
$ DELETE $LOGIN.TSK
```

or:

```
$ DELETE [*,*]*.*
```

The gread,gwrite privs don't mean much when you already have access to everything else on the system with wread,wwrite. I suggest you remove the world privs and concentrate on group privs. Either place the data files in [50,2] or move Dan to [10,51]. As long as the first number matches, the group privs will work fine. You can protect the data file with:

```
$ SET FILE [10,2]file.nam/NODELETABLE
```

Dan still could wipe out every bit of information in the file, but he couldn't delete it.

PROCESSES IN WAIT STATE

QUERY:

Pedro A. Crespo *(SIG 37/MESS 1132):* I have a problem with our MicroVAX II. For no apparent reason, all new processes go into RWMBX (Resource Wait - Mailbox Full). This happens to the processes right after going through the LOGIN procedure. It gets as far as the initial welcome message and last log in date and time and then freezes. Current working processes aren't affected by this. The only way the system can accept new users is upon reset or reboot.

I don't know what to look for. SHOW MEMORY indicates enough memory. There are no swapped process entries or

How To Use ARIS/BB

Subscribers to *DEC PROFESSIONAL* can call up our on-line bulletin board and log into ARIS/BB, our **A**utomated **R**eader **I**nformation **S**ervice. In ARIS/BB, you can download programs from this publication, communicate with our editors, request a change of address, find additional information about advertisers, order books and back issues, check the guidelines for submitting articles, take a peek at our editorial calendar for the year and communicate with other VAX users.

To log in, you'll need your subscription number from your mailing label. Set your terminal to seven data bits, one stop bit and space parity, or eight data bits, one stop bit and no parity. Set your terminal emulation to VT100 and dial:

- (215) 957-1000 - Pennsylvania
- (818) 577-9100 - Southern California
- (415) 873-2135 - Northern California
- (617) 863-5010 - Massachusetts

Baud rates: 300, 1,200 or 2,400.

When the modems CONNECT, hit Return two or three times.

The ARIS/BB symbol appears at the beginning of each article when the program is downloadable. *VAX PROFESSIONAL* programs are available to subscribers of *VAX PROFESSIONAL* only. For subscription information, contact Phyllis Chandler at (215) 957-1500, 9 a.m. - 5 p.m. EST. Use these recommendations at your own risk. Professional Press is not liable for any damages to your system that might be caused by the hardware, software, programs or procedures discussed here.

XMODEM and KERMIT are available.

SIG Identification

The SIG categories referenced in this month's *ARIS*TALK are:

33 ..... RSTS
37 ..... VMS
45 ..... Programming Languages/AI

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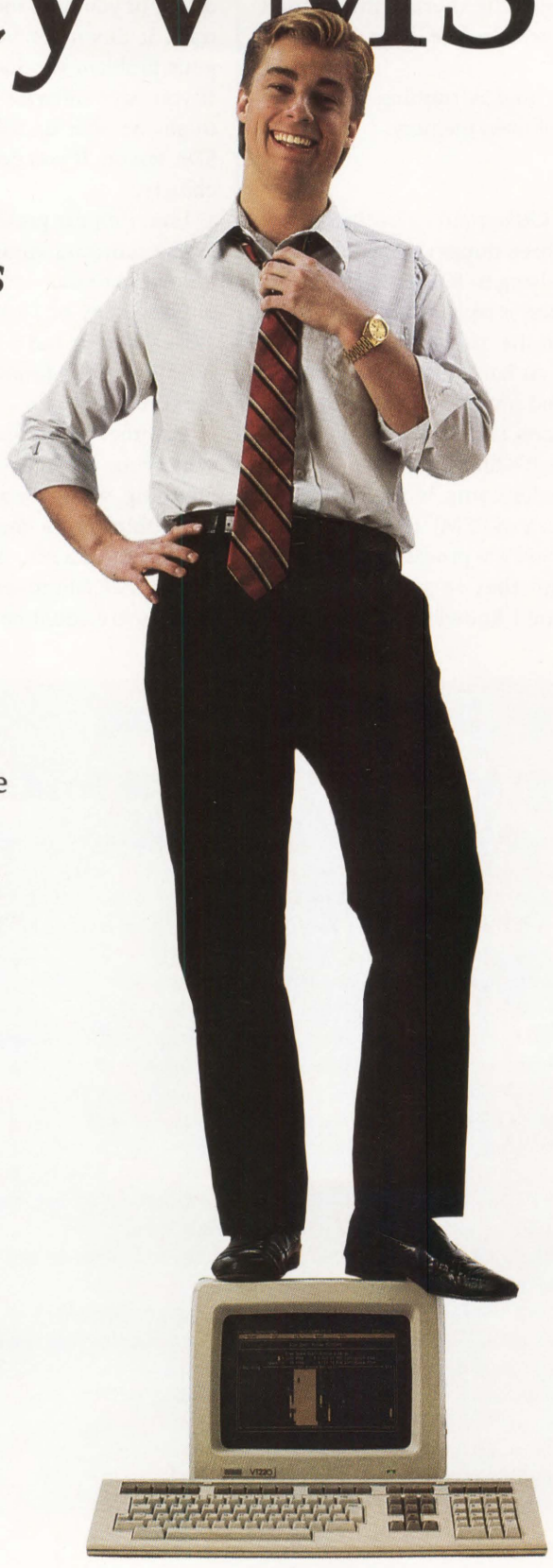

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balance slots. SRP, IRP and LRP have plenty of packets free. There isn't excessive paging, and there's more than enough space on the page files and swapfiles.

The machine is running VMS V4.7 with 9 MB of main memory.

REPLIES:

Richard B. Gilbert *(SIG 37/MESS 1149):* There are three things that would cause a process to hang in RWMBX:

1. The process is trying to read from the mailbox, but the mailbox is empty.
2. The process has written something to a mailbox and is waiting for it to be read.
3. The process can't write to the mailbox because it's full.

It will take some work with SDA (ANALYZE/SYSTEM) to track down which mailbox the processes are waiting on and why they're waiting. It will require a good knowledge of SDA and systems internals and must be done on-site. Normally, you could have Colorado dial in (if you have software support) and track it down for you. The nature of your problem precludes this possibility. If you have software support, Colorado might be able to talk you through an SDA session. If you don't, you have three choices:

1. Live with the problem.
2. Pay someone knowledgeable to track it down for you.
3. Get a copy of *VAX/VMS Internals and Data Structures* and a *System Dump Analyzer Reference Manual*, and figure it out for yourself.

Another possibility is to figure out why your new processes are doing anything with a mailbox. Offhand, I can't think why they should touch a mailbox. Check SYS$MANAGER:SYLOGIN.COM to see if anything you're doing there could be causing the problem. Try the /NOCOMMAND qualifier after the username when logging in to see if not executing LOGIN.COM avoids the problem.

Mike Mikowski *(SIG 37/MESS 1176):* If you're using audit for security, each process that logs on sends an audit mailbox that's processed by the OPCOM process. If you have other processes running at a higher priority and they're CPU-bound, OPCOM won't be able to process these messages and, therefore, the logging in process will be in an RWMBX state.

Tech Harland *(SIG 37/MESS 1209):* If you just want to get these processes going, try adding a line in the LOGIN.COM to stop the process waiting for this undiscovered mailbox interaction:

```
$ SET PROCESS/NORESOURCE
```

This will disable the process from waiting for any resource, including mailbox full or mailbox not yet read.

DETACHED PROCESS DATA TRANSFERS

QUERY:

Mike Chen *(SIG 45/MESS 479):* How do you create a detached process in COBOL and pass data between it and other processes?

System routines LIB$SPAWN and SYS$CREPRC might get me there. What's the difference?

REPLY:

Phil Gravel *(SIG 45/MESS 480):* VMS V4.0 has a manual titled *Guide to Programming on VAX/VMS*. Chapter 3 is "Program Synchronization and Communication." It includes sections on interprocess communication including symbols, logical names, mailboxes, installed common blocks and global sections. I assume VMS V5.0 documentation has a similar manual.

[Report From Dr. R.]

3MAX, ULTRIX V4.0 And More

Editor's note: Dr. R. contributes timely information about upcoming Digital products and strategies. Look for his insights on ARIS/BB and in ARISTALK.

■ The new decade is barely initialized and already there's much ado at DEC. For instance, DEC is on the verge of joining the Object Management Group. DEC stock continues its precipitous plunge into that dreaded abyss known as book value. And, much like Canada geese, a gaggle of unannounced products is migrating toward Maynard.

For example, the 25-MHz R3000-based 3MAX workstation is due out in very short order. This workstation will feature a larger cabinet and a new system bus. A DEC advertisement in the January 22 issue of *Time* features Ken Olsen and a color DECstation. It looks as if the DECstation nameplate is emblazoned with "3200."

■ ULTRIX V4.0 is due this quarter (at last). Everyone knows that it will feature SMP, but few are aware that it will include C-2 security and ULTRIX/SQL, a run-time version of Ingres.

■ DEC spoke loudly and carried a big DECtp II shtick in February when it announced:

1. CIRRUS, the long-awaited fault-tolerant VAX system.
2. VMS V5.4, with embedded two-phase commit, distributed transaction management, enhanced journaling and host-based shadowing.
3. DECintact V2.0. With this gem, DEC users can get their CICS (er, kicks) from new DECforms and CDD/Plus support. Also look for a TP application generator that bears more than a casual resemblance to the VAX Cobol Code Generator.

■ No further details on the R6000-based workstation yet. But you can rest assured that it won't be available at "popular prices."

■ Be on the lookout for a forthcoming turbo-charged version of the ESE20, which boosts throughput from 400 to as many as 1,000 I/Os per second.

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CIRCLE 114 ON READER CARD

Packing A Database Punch

Real Database's ServerCharger Database Peripheral Enhances Oracle Performance

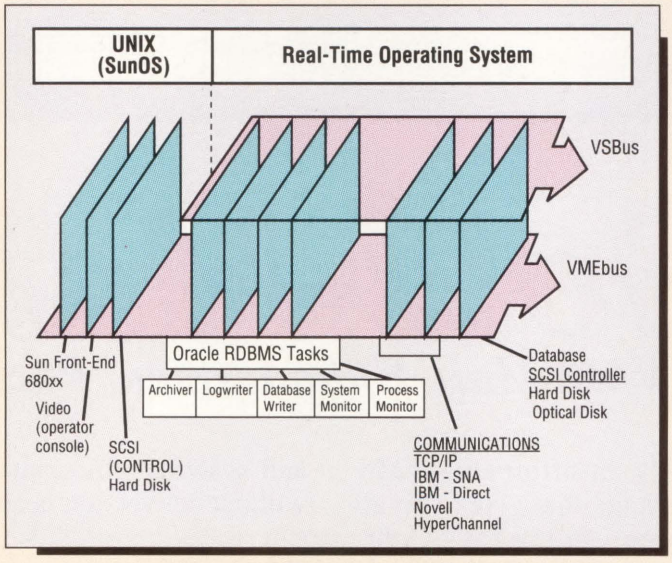
The notion of RDBMSs as the foundation of business information management is gaining acceptance. Industry analysts project RDBMS sales to approach $13 billion by 1992. And system managers continue to seek practical and reliable solutions to overtaxed networks.

Real Database believes that the solution to overloaded Oracle applications is the ServerCharger, a database peripheral that plugs directly into your VAX to offload 95 percent of back-end data processing. The ServerCharger, available in 50- and 100-tps configurations, is a single-function hybrid peripheral customized specifically for Oracle database processing. Composed of a Sun workstation front end for the Database Administration (DBA) and a RISC-based, multiple-CPU back end for database processing, the ServerCharger back-end multiprocessor enhances Oracle performance by designating functions to one of four specifically designed processors.

Relying primarily on real-time robotics and kernel processing technology, the ServerCharger 50 and 100 include an embedded Oracle V6.0 license complete with a transaction processing option.

The ServerCharger 50 offers two SPARC RISC CPUs (at 30 mips each), two 680xx I/O processor CPUs, a 680xx DBA processor, a 1/4-inch tape module and a 700-MB data disk module with 16 MB of RAM (upgradable to 128 MB). The ServerCharger 100 offers four SPARC RISC CPUs (at 80 mips each), three 680xx I/O processors, a 680xx DBA processor, a 1-GB data disk module (upgradable to 96 GB) with 16 MB of RAM (upgradable to 256 MB). The 50 and 100 versions include a free-standing floor cabinet, 19-inch operator's console and high-speed streaming tape drive.

Typical ServerCharger software includes Oracle's V6.0, Realtime OS (back end), UNIX OS (front end) and standard Oracle DBA tools, database diagnostics and performance measurement software.



The Real Database ServerCharger architecture.

The ServerCharger connects directly to the VAX through a bus connection similar to that of other peripherals. Once established, Oracle data is removed from the VAX and reloaded onto the ServerCharger. No code change occurs, because the Oracle application never departs from the host machine. This results in the removal of 95 percent of the database processing load from the VAX, resulting in improved host application performance and better use of the host software because of decreased resource contention.

Offering a maximum of 21 slots in its backplane, the ServerCharger allows 12 slots to be customized to ensure the maximum processing power to satisfy the needs of a transaction-oriented environment. Real Database has dismantled the Oracle code and redistributed it functionally: one CPU for the kernel, one for I/O and one for networking (SQL*NET) with a network-specific daughterboard (Ethernet, DECnet) and memory daughterboard.

Data access and interprocessor communications are reinforced with an additional private bus, granting the monitor program access to the Oracle System Global Area (SGA) for speedy and accurate data transfers during the update and select process. A standard, high-performance VME bus connects every back-end processor to the front-end DBA station.

The ServerCharger 50 and 100 cost $85,000 and $145,000 respectively. The ServerCharger architecture supports industry standards, including DECnet, Ethernet, SQL, UNIX, VME and asynchronous network protocols.

FOR MORE INFORMATION

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CIRCLE 254 ON READER CARD

Dramatic Data Analysis

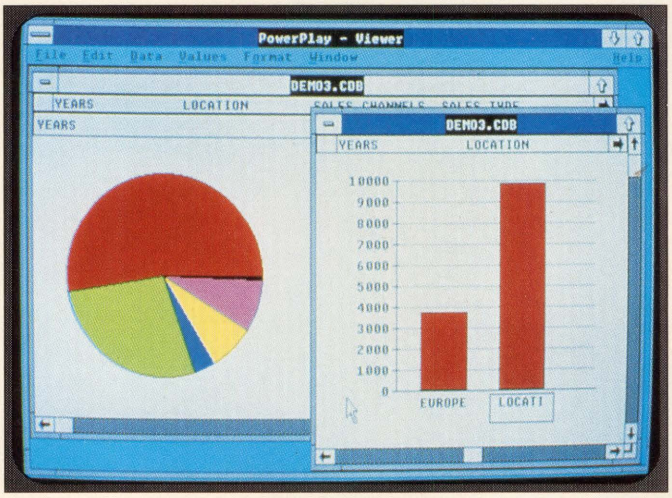
Cognos Inc.'s PowerPlay Raises The Curtain On Corporate Data Access And Manipulation

No application development environment is complete without a tool that lets users access and manipulate corporate information. Cognos Inc.'s PowerPlay is a reporting and data analysis tool for decision-makers. It uses a graphic format and lets you view and report on summarized corporate information from mainframe, micro and mini databases.

PowerPlay is an extension to the PowerHouse 4GL application development environment. Designed for the DEC environment, PowerHouse builds commercial applications and manages data with your DBMS.

Using an intuitive, mouse-driven interface based on the Microsoft Windows environment, PowerPlay lets you manipulate and analyze graphs, cross-tab reports, tables and charts. It provides onscreen manipulation and a multidimensional approach to information analysis. A "drill-down" capability lets you retrieve and report on information at increasing levels of detail and among an unlimited number of categories. Multiple concurrent displays of data and graphs from numerous sources can be created on a single screen.

PowerPlay's most notable capability for data analysis and manipulation is achieved through creation of a series of snapshot extract databases that act as a host repository and server for transactions in a given database. These databases consist of summary-level keys of a transaction database and extraction routines that can be reused to update the databases. They're optimized for rapid retrieval of summarized information with minimum impact on data storage resources. The creation of extract databases offloads processing from online transaction databases to PCs for interactive processing and graphics.



Cognos Inc.'s PowerPlay reporting and data analysis tool features an intuitive, mouse-driven interface based on the Microsoft Windows environment.

PowerPlay lets you view and report on data from any source. To create databases, you only need ASCII files compatible with PowerPlay specifications. These extract databases can include data from local PC-based applications, remote mini and mainframe databases, or any combination of data files. PowerPlay also can export data to Lotus 1-2-3 and Microsoft Excel.

PC requirements include 640 KB of memory, DOS V2.0 or later, Microsoft Windows V2.0 or later and 1 MB of disk space for executable and help files. VAX requirements include 70 KB of memory for a host communications program, less than 100 KB of memory for host maintenance routines, VMS V4.7 or later and 1 MB of disk space for programs.

Cognos also announced InQuizitive, an entry-level report-writing package that offers a menu-driven approach to generating list-style reports on PowerHouse data. Based on intuitive interface concepts, it features a pop-up interface to PowerHouse-supported files, context-sensitive help, a report painter and manager, and data transfer to popular PC-based file formats.

"The two products complement each other, but serve different purposes," explains Ron Nordin, senior vice president of marketing. "PowerPlay can be used for analysis and reporting of PowerHouse and non-PowerHouse systems, while InQuizitive is designed to be used specifically with PowerHouse."

PowerPlay initially is available on VAX/VMS and PC platforms. It costs $995 for each PC component and $15,000 for the host component. It runs standalone on a PC or in conjunction with the host. InQuizitive initially is available on VAX/VMS; a PC version is planned. It costs from $3,500 to $14,000, depending on configuration.

FOR MORE INFORMATION

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CIRCLE 161 ON READER CARD

Improving System Management

Raxco's Raxmaster And Raxmanager Tackle VMS Performance And Resource Management Issues

Are you looking for a performance management solution for VAX/VMS? Raxco Software Inc.'s Raxmaster V2.0 includes full support for VMS V5.3, automated installation through VMSINSTAL and enhancements to Raxmaster's menu interface.

Raxmaster V2.0 addresses the major components of systemwide performance: CPU, I/O and memory. It provides system managers with a proactive performance management strategy. System resources are optimized to meet dynamic workload conditions, maximizing the benefit of existing hardware.

Raxmaster has five components: Disk Optimization, Disk Management, I/O Monitor, Dynamic System Tuning and Virtual Disk/Caching. An integrated menu interface allows each component to be used easily.

Disk optimization eliminates file fragmentation, consolidates free space and optimally places files to improve overall disk I/O performance. Disk management monitors disk storage use and enables system managers to manage and control disk resources.

The I/O Monitor collects systemwide I/O statistics, such as file-level statistics, to identify potential I/O performance bottlenecks. Dynamic System Tuning improves system throughput by dynamically adjusting system parameters in response to changing user workloads. Finally, Virtual Disk and Caching reduces disk I/Os, provides throughput at memory speeds and improves application performance.

Raxmaster V2.0 is available for VMS V4.x and V5.x. Prices range from $3,850 to $19,500, based on VAX configuration.

In February, Raxco released Raxmanager, a comprehensive resource management system that tracks resource use, assists in capacity planning, monitors system performance by identifying potential bottlenecks, provides project accounting and generates invoices for chargeback billing.

The performance analysis/capacity planning component allows for the evaluation of system use data selected from VMS accounting, VMS monitor files and the Resource Accounting Chargeback module. The resource accounting component collects resource consumption data. This includes resources recorded by VMS accounting, disk utilization and application consumption. The disk management component monitors and produces reports on disk storage use.

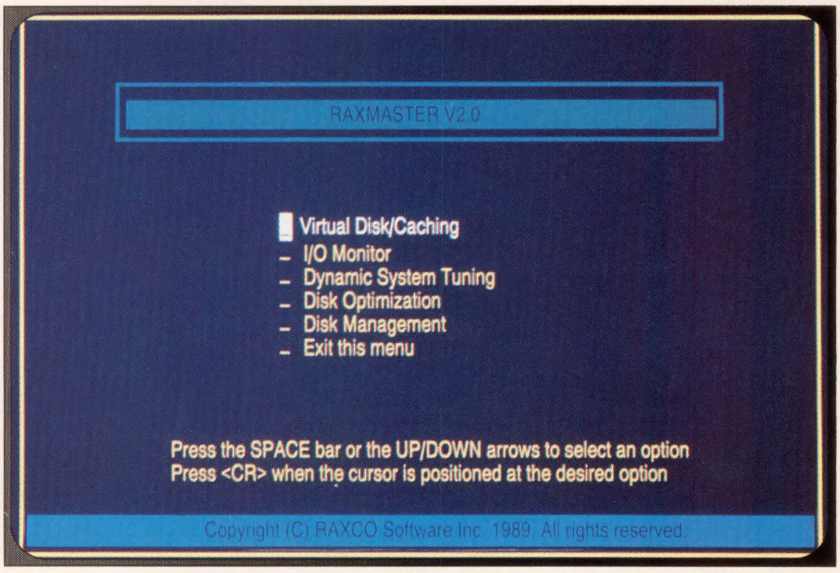
Raxmanager is available for any VAX/VMS configuration. Prices range from $3,300 to $18,750.

Rabbit-11 V2.0 also was released recently. It's a virtual disk generator and caching system developed for VAX/VMS. Rabbit-11 virtual disks are used like physical disks, but access to data is very fast. Caching capabilities include fixed and automatic caching. With fixed caching, the system manager defines the files to be cached. With automatic caching, it monitors file use and automatically keeps the most frequently accessed blocks of data in the cache.

Rabbit-11 V2.0 is priced from $2,050 to $13,750.

FOR MORE INFORMATION

Raxco Software Inc.
2440 Research Blvd., Ste. 200
Rockville, MD 20850
(301) 258-2620
Circle 415 on reader card



The main Raxmaster menu lets you access major components of systemwide performance.

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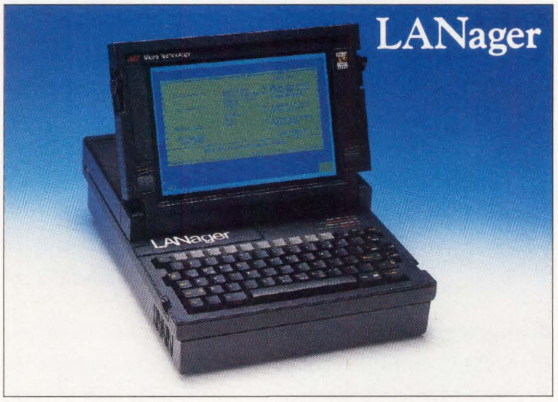

◆ Solutions for keeping your rapidly expanding network under control with our LANager network analysis and monitoring system for Ethernet. The LANager trouble shoots network problems quickly and monitors the performance in real time.

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Developing With C++

Oregon Software's C++ Compiler For VAX/VMS Lets You Go Into Source Code With Full Compiler And Debugger Support

Oregon Software offers a full-featured C++ development system for VAX/VMS. The heart of the system is an optimizing, native-code compiler that supports C++, ANSI C and K&R C (the original C language as defined by AT&T). Oregon C++ requires VAX/VMS V5.0 or later. It supports the VAX run-time libraries, NIH libraries and a source-level debugger.

Because Oregon C++ supports both K&R C and ANSI C, many existing applications can be maintained and/or converted easily to object-oriented code with a single development system.

Oregon C++ also is available on UNIX and XENIX-based computers such as those from Sun, NCR, HP, Motorola and Intel. This allows applications developed on the VAX to be ported easily to a variety of different host architectures.

Oregon C++ uses the VAX standard calling sequence, which lets C++ programs call routines written in other languages such as Modula-2 or PASCAL. This also allows routines written in another language to call C++ routines.

Oregon C++ is an optimizing compiler, which produces small, fast and reliable applications. It performs such things as array-index simplification, common subexpression elimination, constant folding and propagation, dead-code elimination, expression targeting global register allocation, loop invariant removal, range tracking and short-circuit evaluation.

Oregon C++ has three command-line options to access three different compilation modes: C++, ANSI C or pre- ANSI C. The result is one product with one source of support. Support problems encountered with a C++ translator and one or more C compilers are eliminated.

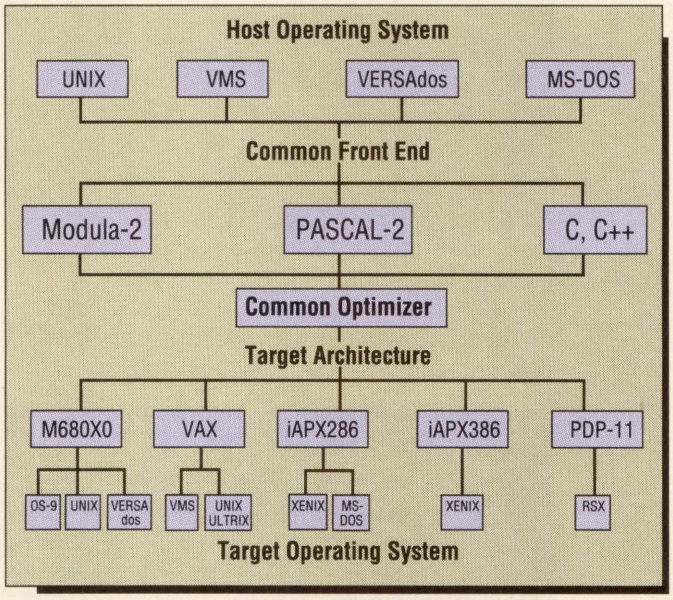
The compiler maintains compatibility with existing C code. It also allows upgrade to the benefits of both ANSI C and C++ to simplify the next generation of development.

The Oregon Debugger (ODB) comes with the development system to offer integrated debug support for the compiler. ODB is a source-level debugger, which offers a consistent debugging interface for K&R C, ANSI C and C++ code. Because Oregon C++ is a true compiler, code is debugged and maintained more easily than code produced by translating C++ implementations.

The ODB either can step through or over C++ constructs and destructors. It recognizes C++ scope and allows access to identifiers either by name from within their scope or by C++ scope qualifiers from outside their scope. The debugger lets you set breakpoints and perform other operations on each occurrence of an inline function.

The Oregon C++ compiler resolves ambiguity among overloaded functions through the context of the functions' arguments. In cases of ambiguity during debugging, the ODB displays the appropriate overloaded functions along with their arguments and an identifying integer. The ambiguity can be resolved by entering the appropriate identifying integer.

Oregon C++ is available on TK50 cartridge tape, nine-track tape or 3.5-inch floppy disk. License fees range from $2,000 to $34,000, depending on the nature and configuration of the VAX network or cluster.



Oregon C++ uses the VAX standard calling sequence, which lets C++ programs call routines written in other languages such as Modula-2 or PASCAL.

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Other DCS emulators: EM4105 — Tektronix 4105
EM4010 — Tektronix 4010

CIRCLE 120 ON READER CARD

X-Tending Terminals

C.Itoh Extends Its Product Family With X And Graphics Terminals And Line Printer

C.Itoh Electronics Inc. extended its move into the Ethernet and TCP/IP network communications markets with two recent releases: the CIT-X Network Display Station and the CIT334ET/CIT344ET Ethernet graphics terminals. It also introduced the CI-1000 940-lpm shuttle matrix line printer for high-volume, multitask printing applications.

The CIT-X monochrome network display station is targeted toward the DECwindows and X Window System environments. Its dual processors, which accelerate X Window System performance, include a 12 1/2-MHz 68301 main processor and 32-bit 34010 graphics processor. Display terminal functions, combined with CIT-X's Telnet protocol, let the display station function as a network terminal when it's not used in an X Window System environment.

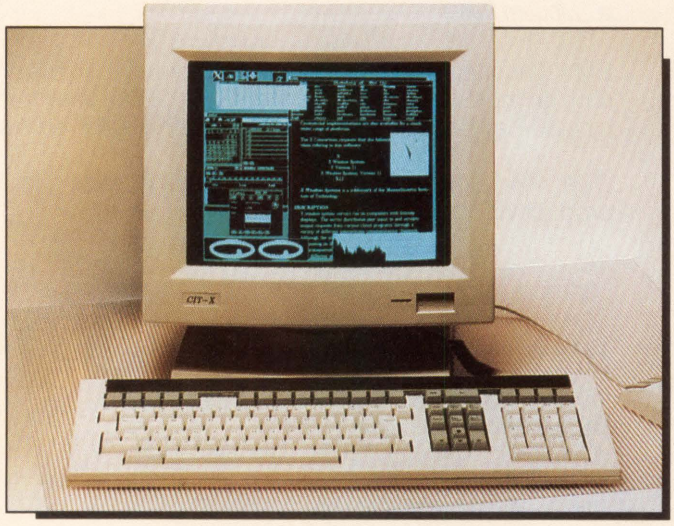
CIT-X emulates VT52/100/220 terminals and has 640 KB of ROM, 1 MB to 17 MB of RAM and 8 KB of nonvolatile memory. It supports TCP/IP, Telnet and "rlogin" protocols for Ethernet communication through thick or thin interface. Additional features include:

1. Default gateway — CIT-X sends data to hosts on another predefined network.
2. Name servers — CIT-X interrogates name servers on the network to find unknown host IP addresses.
3. Host definition table — You can define up to 20 host names and IP addresses through setup. Each host can be kept from remotely connecting to the CIT-X.
4. Auto disconnect — Processes aren't left suspended when CIT-X is turned off.
5. Program initiator — CIT-X automatically boots a predefined client program when the unit's turned on.
6. Fonts — 24 onboard fonts are available; additional fonts on the client host are downloadable.

CIT-X runs on X Window System platforms including UNIX-based minicomputers and workstations.

Expanding its CIT334/344 Tiger family, C.Itoh's CIT334ET and CIT344ET Ethernet graphics terminals allow concurrent connection to LAT and TCP/IP communication protocols. The CIT334ET monochrome and CIT344ET color terminals fully emulate DEC's VT330/340. Through direct connection to the network, you can work in VMS and ULTRIX environments and display both sessions on the same screen. Dual-session support lets you connect multiple sessions from any two network LAT/Telnet hosts, whatever the operating system.

CIT334ET/344ET's Ethernet option lets it establish and maintain up to 10 sessions simultaneously. You can switch between any two sessions at any time and display their output via the terminal's windowing capabilities, while the other eight sessions remain active.



C. Itoh's CIT-X Network Display Station.

FOR MORE INFORMATION

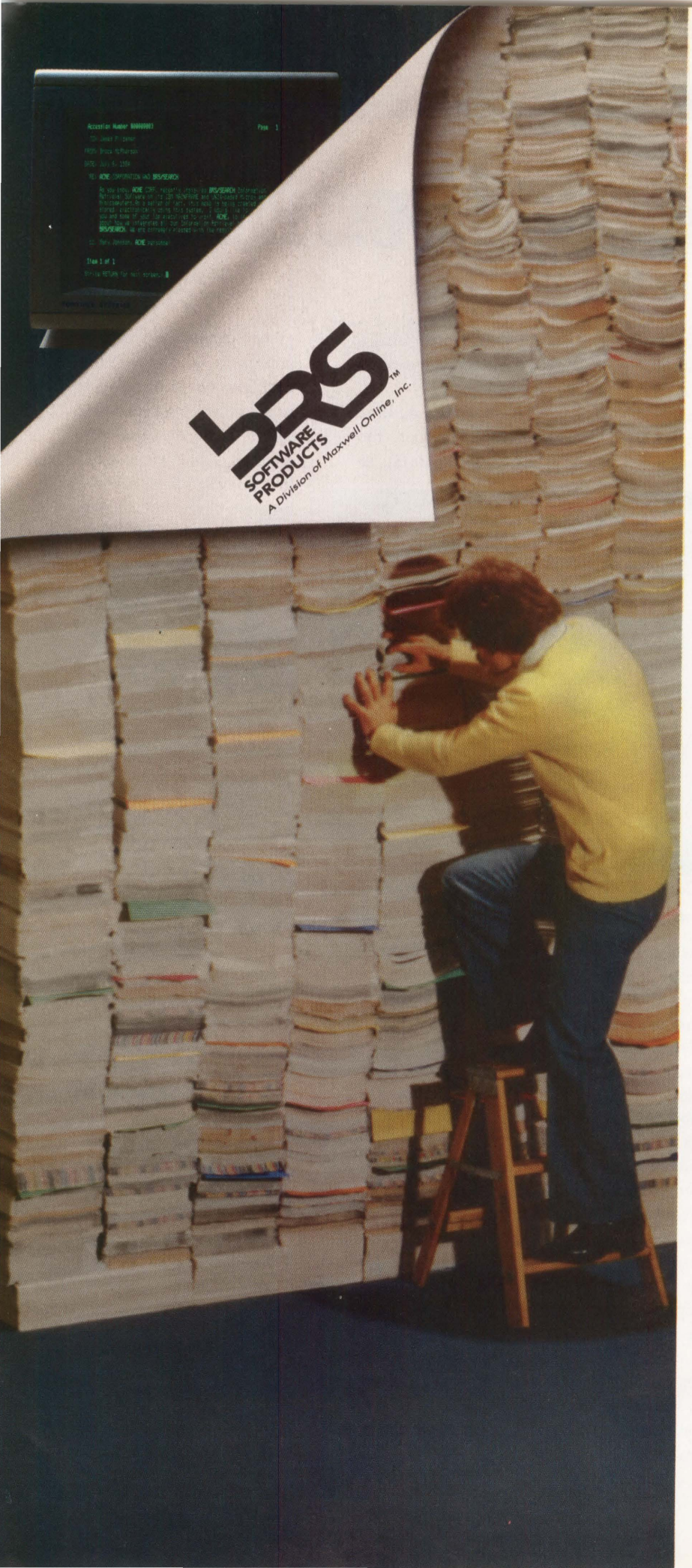
C.Itoh Electronics
2505 McCabe Way
Irvine, CA 92714
(800) 347-2484
Circle 453 on reader card

Mouse- or keyboard-selectable pop-up communications-options menus are presented as needed. The terminals are compatible with ReGIS, Sixel and DEC's graphics software applications, and support Tektronix 4010/4014 graphics protocols.

C.Itoh's 940-lpm shuttle-matrix line printer is compatible with its current family of CI-400/800 printers. The CI-1000 emulates Printronix's P6080 "S"-mode line printer, C.Itoh's GAP-4 bar code/graphics and IBM's ProPrinter II/XL serial printer, making it compatible with a wide range of host minis, mainframes and PCs.

CI-1000 prints at 940 lpm in high-speed draft mode, 700 lpm in data processing mode and 200 lpm in letter-quality mode. An extra-wide 16-inch carriage lets the CI-1000 print up to 233 columns for output of wide data processing reports, spreadsheets and graphics.

The CIT-X Network Display Station costs $2,795, CIT334ET costs $2,495, CIT344ET costs $3,495 and the CI-1000 costs $9,995.



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CIRCLE 186 ON READER CARD

Knowledge-Based Bonanza

AICorp Inc. Enters DEC Realm With Knowledge-Based System

Knowledge-based systems provide system managers with a viable option in complex decision-making applications. Knowledge-intensive applications feature judgment and reasoning capabilities that traditional computer programming tools can't provide. Using an AI inferencing mechanism that adapts to the facts of each case, knowledge-based systems eliminate the rigid, sequential instruction process inherent to procedural languages and tools.

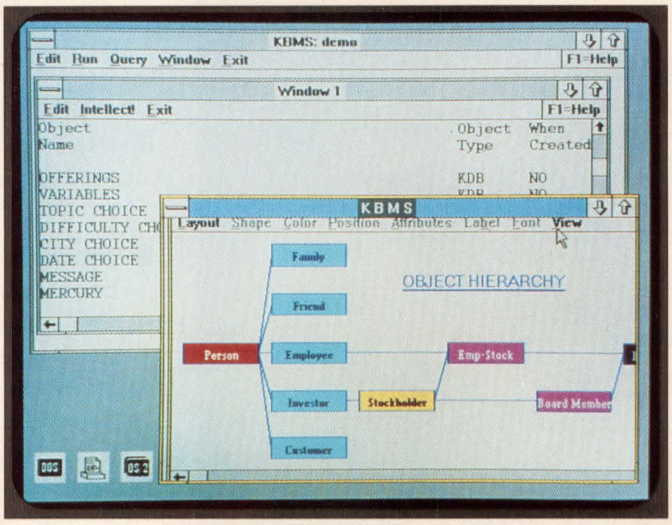
Judgmental-based systems let programmers encode basic rules of reasoning for given situations. They automatically employ these rules in the solution of problems. AICorp Inc., an early developer of judgmental object-oriented expert systems, has entered the VAX marketplace with its KBMS/VAX (Knowledge Base Management System). It's identical to the version currently running on IBM mainframes and PCs, and it incorporates Intellect, AICorp's natural language system.

Providing full database access, KBMS/VAX supports key AI programming methodologies, including forward chaining, backward chaining, hypothetical reasoning and object-oriented programming (OOP). KBMS AI functionality lets application developers combine inferencing strategies within an application via multidirectional reasoning.

KBMS/VAX relies on four key performance elements in its operating system: OOP, transaction processing efficiency, a data flow system and a knowledge manipulation language.

OOP primarily is a problem-solving strategy in which knowledge is represented by objects composed of data procedures. KBMS resides in an object-oriented environment that lets knowledge-based applications be written in fewer rules than normal, thereby reducing processing resources, development time and maintenance. KBMS application logic remains independent of data manipulation, resulting in streamlined data manipulation by the data access system and effective rule processing by the AI inferencing mechanism.

KBMS offers a multiuser architecture similar to those in commercial DBMSs, including multithreaded processing that guarantees application integrity and recovery. A central server architecture allows concurrent access from various subsystems, including CICS, IMS/DC, TSO and batch programs. The code is written in C and is re-entrant and sharable. A RAM disk minimizes paging and I/O processing.



AICorp's KBMS/VAX supports AI programming methodologies and provides full database access.

The KBMS/VAX Data Flow System (DFS) accepts source input in the form of rules or queries and automatically processes the external data, generating SQL for such RDBMSs as Rdb and Oracle. Only when the predetermined programming criteria are satisfied will the data flow system access data while offloading processing to the DBMS as needed. In addition, KBMS relies on a process called Rete technology that eliminates the need to evaluate every application rule during each processing cycle.

KBMS/VAX technology lets the system process multiple records simultaneously, allowing the programmer access to SQL functions. A natural language parser lets developers write rules and lets users query the knowledge base in English.

"By concentrating on the specification of logic and the declaration of data, KBMS can manipulate data from a variety of localities," says Fred Lizza, vice president of marketing. Noting the similarities between the IBM and DEC versions, he adds, "KBMS applications developed on an IBM mainframe will run on a VAX with no programming changes."

KBMS/VAX interfaces with such relational databases as Rdb and Oracle. Prices range from $7,500 to $100,000, depending on VAX size and options and database interfaces selected.

FOR MORE INFORMATION

AICorp Inc.
100 5th Ave.
Waltham, MA 02254
(617) 890-8400
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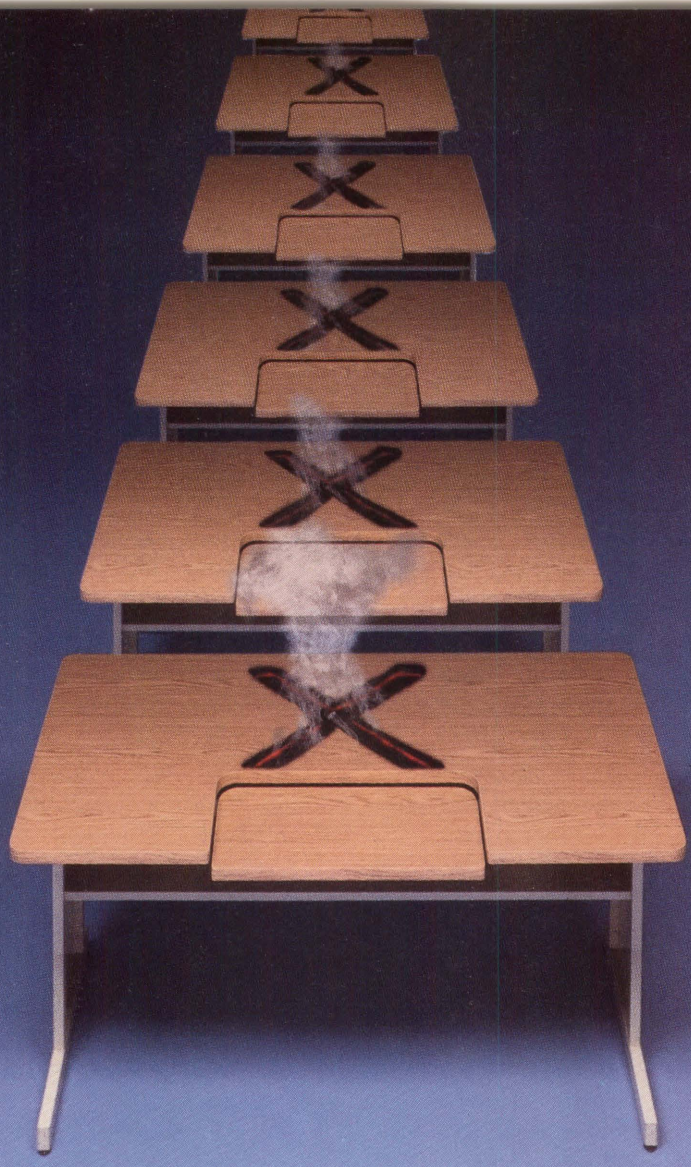

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Enterprisewide Publishing

Xyvision's Parlance Publishing System Offers Link to RISC-Based Products

As heterogenous computing and publishing environments evolve, corporate and commercial publishers face the challenge of managing automated publishing projects. Xyvision is positioned to help meet this challenge with its Parlance family of publishing systems. Parlance integrates Xyvision's publishing software, Integrated Publishing System (IPS) 3.0, within its server and workstation environments, allowing integration with DEC's RISC-based workstation and server architecture.

Parlance can be configured for large and small publishing environments and in corporate, commercial and technical publishing applications. Supporting DEC's compound document architecture (CDA), Parlance runs under ULTRIX software using DECwindows. There are five major building blocks:

1. Xyvision's Integrated Publishing System Software (IPS) Release 3.0.
2. Xyvision's dedicated graphics servers for high-performance graphics processing.
3. Xyview high-resolution typographic workstations.
4. The RISC-based DECstation 2100/3100.
5. The DECsystem 5400/5800 file servers.

These five blocks can be linked in many Parlance configurations on an Ethernet. Mac users can access Parlance configurations through AppleTalk network gateways. Xyvision's graphic servers and Xyview workstations tackle the high-performance graphics processing necessary for high-resolution image input, display and editing.

Correspondingly, Xyvision or DEC workstations can handle composition, pagination, windowing, PostScript output, IBM and AppleTalk network gateways and document database storage needs. Xyvision servers and workstations are compatible with DEC workstations, allowing users access to the same documentation and graphics databases.

Parlance relies on an architecture that segregates the computing environment into interactive user applications (clients) and servers. The client/server arrangement promotes extensive interconnection between desktop/PC or end-user workstations and larger shared systems. Xyvision wagers that its brand of client/server architecture — with database management systems spearheading control, administration and information access — will provide end users with the necessary application tools to access and manipulate the database as needed.

User applications on Parlance include compound-document editing software, author/editorial software, graphic arts and technical illustration, DBMSs and color production.

Parlance uses a publishing server to provide background composition and pagination facilities support, while incorporating a database server to manage document storage in the database. Its process management server manages critical resources and data flow across network documents and platforms. Peripheral and graphic servers support production-resolution page images for I/O devices.

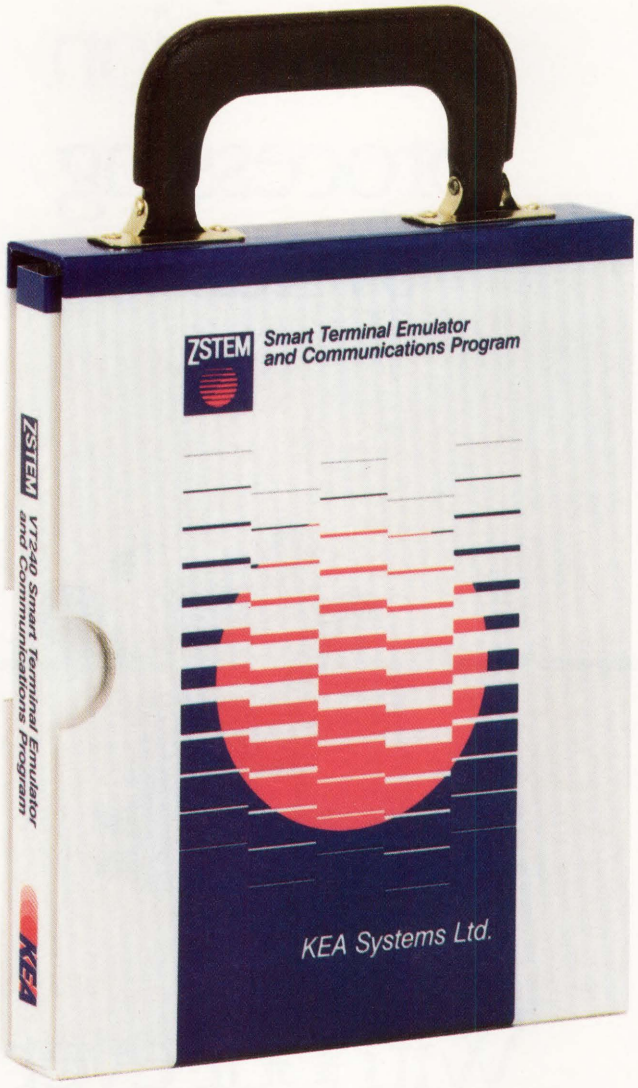
"We feel our product is most beneficial to those projects that must be completed or the business itself is threatened," notes Xyvision Director of Marketing Kevin Cavanaugh. Aircraft manuals, for example, are vital to the interests of an aircraft manufacturer, he notes. "While their first priority is obviously not publishing oriented, in many ways the success of their firms relies on their ability to produce reliable, quality publication materials."

Xyvision's Parlance Publishing System runs under ULTRIX software using DECwindows.

FOR MORE INFORMATION

Xyvision Inc.
101 Edgewater Dr.
Wakefield, MA 01880
(617) 245-4100
Circle 484 on reader card

Our VT240 terminal emulator has changed the meaning of portability.



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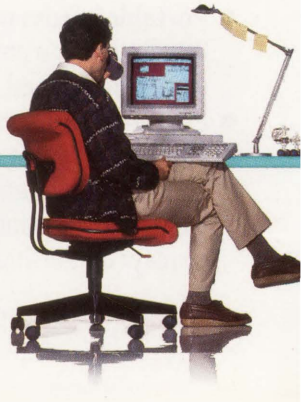

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I/O SUBSYSTEM Performance

Part 4: How to measure and compare disk performance.

BY KENNETH H. BATES

Editor's note: This article is the fourth in a series on I/O Subsystem Performance. Previous articles appeared in 1989 in the April, August and October issues.

IN PREVIOUS ARTICLES, we examined important performance metrics, how the Digital Storage Architecture (DSA) allows for performance optimizations and how I/O workload affects performance. Let's now look at how we can measure the performance of the I/O subsystem objectively.

This subject is worthy of more discussion than you might think because of the difficulty of interpreting published disk specifications. Although these specifications can be useful for such things as comparing products and selecting the best product for an application, there's no standard for measuring the items in which you're interested when considering multiple vendors.

Because of these inconsistencies, it's almost impossible to compare devices based simply on their specification sheets. Moreover, these specifications may not tell the full story and may perform differently from what you might expect.

Specification Trouble

When examining specification sheets, several questions come to mind. Is the specification the average of many measurements, a typical case, a guaranteed minimum or simply a random measurement on a single sample? If it's a typical figure, what amount of variation might be encountered in practice? The answers can have far-reaching impact on the performance of your disk subsystem.

Don't place too much weight on the specifications unless you're certain they're important to the application. Take for example the data transfer rate of a disk drive. As we saw in Part 3 (October 1989), the relatively small request sizes issued by VMS reduce the importance of this figure in most cases. If your application issues very large byte count requests while sequentially reading a large file, this may be the metric to consider. In this case, seek time should be ignored. However, you only should do this after you know which metrics are important to you. This can vary within the overall cluster environment, so selecting different disks to match different applications might be appropriate.

It's difficult to compare specification sheets, because different measurement techniques and assumptions may have been used for different products. One vendor may define seek time as the time

to move the disk heads in the head-disk assembly (HDA), while another may add the time for the SDI command to be received and decoded by the disk. Without knowing how the measurements were taken, comparisons can produce meaningless results.

The first step is to determine which metrics are important to your application. How to measure and compare the performance of these metrics is the subject of this article.

Disk Capacity

You might think this first specification has little to do with performance, but it's so often misunderstood that we must investigate it. This specification deals with the capacity of a disk drive and the difference between formatted and unformatted capacity.

Because DSA was designed to provide extremely reliable data storage, redundant information is deliberately stored on the media. Instead of just one copy of the header (disk address), four copies are present. Although you may think this is wasted space, it allows absolute verification of position, because the controller reads and compares all copies. The error correcting code (ECC) and error detecting code (EDC) are other examples of additional information stored on each sector. You may think that this too is wasted space, but the first time this capability recovers data that otherwise would have been unreadable, it's worth its weight in gold.

Figure 1 illustrates the information contained in a sector of an RA82, which can be considered a typical DSA disk drive. As you can see, about 72 percent of each sector is user data. The remaining 28 percent is DSA information used to increase the reliability of the device. Remember, however, that a DSA disk is divided into several address spaces, only one of which is available for user data.

The main storage area consists of the LBN space, which contains logical blocks. This is where your data is stored, and on an RA82 it consists of 1,216,665 blocks, or about 97.45 percent of the total disk space. This is the formatted capacity of the disk, and it remains unchanged throughout the life of the disk.

There's also one "spare" block (RBN) for each track on the disk. This spare isn't counted in the capacity of the disk and only is used to replace bad blocks through a process called bad block replacement and revectoring. On an RA82, there are 21,405 spare blocks, or about 1.72 percent of the total disk space.

Because revectoring sometimes requires a lookup table, additional space is reserved for the replacement control table (RCT). This space isn't counted in the capacity and occupies 3,420 blocks (0.27 percent) on an RA82.

There's also an area reserved for diagnostic use. Although reserving this area reduces the capacity somewhat, it allows read/write diagnostics to be run on the disk drive without destroying data that may be present in the LBN area. This area, called DBN space, occupies 3,480 blocks (0.28 percent) on an RA82.

Finally, there's an area called the extended block area, or XBN space. It contains information used by the controller such as the serial number of the drive, bad blocks discovered at the factory, when the disk was last formatted, and so on. This area uses an additional 3,480 blocks (0.28 percent) on an RA82.

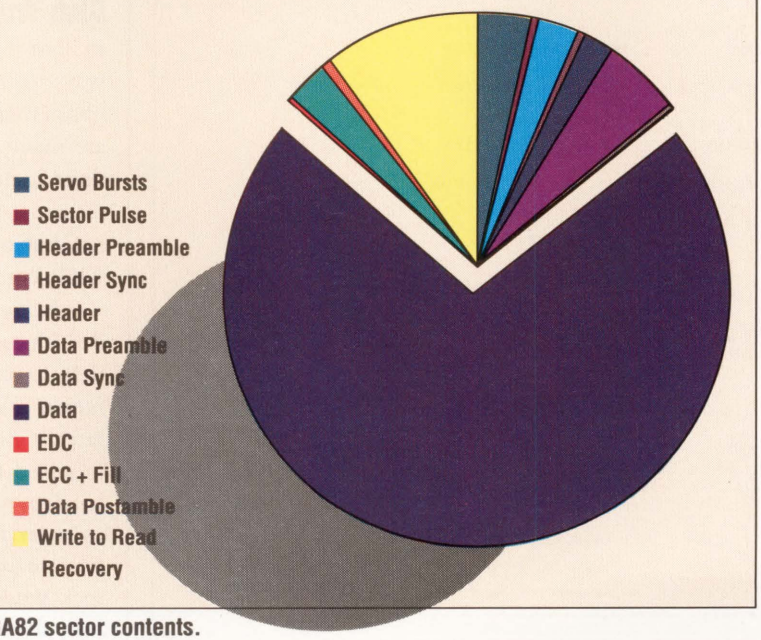
The last bit of information may sound strange, but it deals with "how many is 1 million?" In memory systems, numbers traditionally follow powers of two. As a result, 1 million is 2 to the 20th power, or 1,048,576. In a disk drive, however, 1 million is 10 to the 6th power, or 1,000,000. In effect, one memory megabyte is about 1.048 disk megabytes.

We now can begin to see the difference between formatted and unformatted capacity. Using an RA82 as our example, we get the following:

1. Unformatted capacity is how many bits we can put on the media. For an RA82, this is about 893.9 MB of individual bits. This is fairly high, but knowing this isn't very useful.
2. Formatting the RA82 adds the information shown in Figure 1. Because not all of a sector contains user data, the maximum data capacity is now 639.2 MB.
3. Finally, the effects of the RCT and RBN, DBN and XBN spaces are subtracted, leaving a total of 622.9 MB of usable data storage.

Although it's possible to increase the capacity of the RA82 by removing some of these features, remember that a higher utilization can mean much lower

Figure 1.



RA82 sector contents.

Figure 2.

```
001     PROGRAM SPIRAL
C
C   This program will determine the spiral data transfer rate of the specified
C   disk. For best performance, the buffer should be page aligned with the
C   following LINKER option: "PSECT_ATTR=.BLANK.,PAGE."
C
002     IMPLICIT INTEGER (A-Z)
003     INCLUDE             '($SSDEF)'
004     INCLUDE             '($IODEF)'
005     INCLUDE             '($DVIDEF)'

006     PARAMETER MAX_LOOPS = 1000     ! Maximum number of reads

007     STRUCTURE /IOSB/
008         INTEGER*2 STS
009         INTEGER*4 COUNT
010         INTEGER*2 %FILL
011     END STRUCTURE

012     RECORD /IOSB/       IOSTAT(2)
013     INTEGER*4           CUR_LBN, BUFFER(128 * 127)
014     REAL                START, TOTAL
015     CHARACTER           DEVNAM * 32

016     COMMON BUFFER
C
C       First determine which disk to test and open it
C
017     WRITE(6,18)
018     FORMAT(' Device to test: ', $)
019     READ(5, 20, END = 9999) NUM_CHAR, DEVNAM
020     FORMAT(Q, A)
021     STATUS = SYS$ASSIGN(DEVNAM(1:NUM_CHAR), CHAN,,)
022     IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
C
C       Now get the size of a track to see how much to transfer
C
023     STATUS =LIB$GETDVI (DVI$_SECTORS, CHAN,, NUM_SECT,,)
024     IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
C
C       Set up the initial parameters and fire off the first QIO
C
025     BYTE_COUNT = NUM_SECT * 512
C025    BYTE_COUNT = (127 / NUM_SECT) * NUM_SECT * 512
026     CUR_LBN = 0
027     START = SECNDS(0.0)
028     STATUS = SYS$QIO(%VAL(0),%VAL(CHAN),
        1   %VAL(IO$_READLBLK),IOSTAT(1),,,
        2   BUFFER(1),%VAL(BYTE_COUNT),%VAL(CUR_LBN),,,)
029     IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
030     FLAG = 1
C
C       Now iterate through all desired tracks, double buffering reads
C
031     DO 40 INDEX = 2, MAX_LOOPS
032         CUR_LBN = CUR_LBN + BYTE_COUNT / 512
033         STATUS = SYS$QIO(%VAL(FLAG),%VAL(CHAN),
        1       %VAL(IO$_READLBLK),IOSTAT(FLAG + 1),,,
        2       BUFFER(1),%VAL(BYTE_COUNT),%VAL(CUR_LBN),,,)
034         IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
035         FLAG = MOD(FLAG + 1, 2)
036         CALL SYS$WAITFR(%VAL(FLAG))
037         IF (IOSTAT(FLAG + 1).STS .NE. SS$_NORMAL) THEN
038               CALL LIB$STOP(%VAL(IOSTAT(FLAG + 1).STS))
039         END IF
040     CONTINUE
C
C       Wait for the last QIO, then calculate and print the spiral rate
C
041     FLAG = MOD(FLAG + 1, 2)
042     CALL SYS$WAITFR(%VAL(FLAG))
043     IF (IOSTAT(FLAG + 1).STS .NE. SS$_NORMAL) THEN
044         CALL LIB$STOP(%VAL(IOSTAT(FLAG + 1).STS))
045     END IF
046     TOTAL = SECNDS(START)
047     RATE = FLOAT(MAX_LOOPS) * FLOAT(BYTE_COUNT) / TOTAL / 1024.0
048     WRITE (6, 49) RATE
049     FORMAT (' Spiral rate = ', I4, ' KB per second')

9999    END
```

This FORTRAN program can determine the spiral data rate from disk drive to the host. To run this program, the disk under test must be mounted.

functionality. The real test of disk capacity is how much user data can be stored on it. If your operating system can't store data on a disk, it must be considered unusable.

Measuring this is simple. Under VMS, simply mount the disk and type the following command to DCL (where dev_name is the name of the disk):

```
$ SHOW DEVICE dev_name/FULL
```

The output from this command contains a field called Total Blocks. This is the number of logical blocks to which you have access and is the capacity of the disk in 512-byte blocks. Multiply by 512 and divide by 1,000,000, and you have the "formatted" disk capacity. More important, you have the usable capacity of the disk.

Disk Transfer Rate

In Part 1 (April 1989), we investigated ways to measure the ability of a disk to transfer data to and from the host. There are many ways to measure this, but the most useful appears to be the spiral, or sustained, rate. Put simply, this rate is the amount of data a disk drive can deliver while continuously reading data.

Unlike the peak rate, the spiral rate doesn't count "extra" bits of information, such as ECC and EDC. Instead, it only measures user data. Unlike the on-track rate, it also takes into account the time required by the disk heads to settle as heads are switched. And unlike the on-cylinder rate, it takes into account the time required to perform a one-cylinder seek while reading data. The spiral rate isn't the most impressive data rate, but it's probably the most informative, because it takes all performance factors of the disk drive into account and delivers a useful and realistic figure.

Another factor to consider is the bandwidth of the data path between the disk drive and the host, because data only can flow as fast as the slowest link in the chain. With today's high-speed disk drives, data rate performance bottlenecks can occur in areas other than the disk drive. Consider an RA90 connected to a

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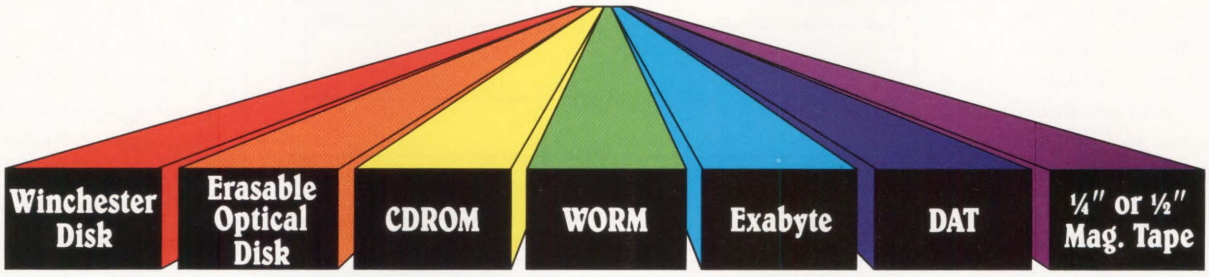

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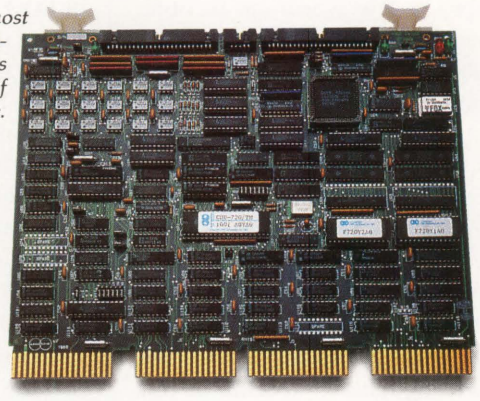

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DRIVE INFORMATION			OPERATIONS STATUS			
DEVICE NAME	VENDOR ID	REV NO.	CURRENT OPERATION	SENSE KEY	REMAINING TAPE (MB)	%REWRITE %ECC
MUA0	EXABYTE		WRITE FILE MRK	OK	1580.857	0.0254
MUA1	EXABYTE	423D	READ	OK	2090.897	0.168

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UDA50 controller. Although an RA90 has a spiral data rate of about 1.7 MB per second, the UDA bandwidth is well under this figure, so data only can be delivered at the rate the UDA is capable of, about 800 KB per second. Therefore, for the most useful information, data rate measurements should take into account all components in the data path: host, controller, I/O bus and the disk drive.

Finally, as we discovered in Part 3, the importance of data rate can be vastly overstated for the typical VMS application. If your application accesses data with small byte counts, then the time spent transferring data is quite small relative to the time spent while the disk is seeking and rotating. In cases such as this, it's unlikely that a disk with a faster data rate will produce a meaningful performance increase.

In cases in which the data rate is a factor, however, it's important to measure this rate accurately. A program that measures the spiral rate of a disk and controller is shown in Figure 2. (The programs that appear in Figures 2 and 4 are available in download on ARIS/BB.) Although the program is fairly self-explanatory, a few words are in order concerning details:

1. To obtain the highest data transfer rates, the I/O buffer should be page-aligned. This can be done with the LINKER command:

```
PSECT_ATTR=.BLANK.,PAGE
```

2. The program uses double buffering to eliminate the effects of VMS and the controller wherever possible. Thus, data always is being transferred from the disk to the host, producing a true spiral rate.

3. Because the I/O bus, controller and disk drive are involved in transferring data, the spiral rate the program prints is the maximum rate for a particular disk on a particular controller. Moving the disk to a different controller can produce different results.

4. The spiral rate of a drive can be attained with a byte count equal to the track size (lines 23 through 25). Some controllers may not be fast enough to process the commands, however, so it may be necessary to have a byte count that's a multiple of the track size. This can be done by uncommenting alternative line 25, which sets the byte count to the largest multiple of a track size that's less than 127 sectors (the maximum currently supported by VMS for a single MSCP transfer on all current adapters).

5. The disk can be mounted normally or foreign. The program requires PHY_IO or LOG_IO privileges to access the disk.

6. For the most accurate and repeatable results, no other activity should take place on the controller or disk drive, and the VAX on which the program is run should be relatively idle.

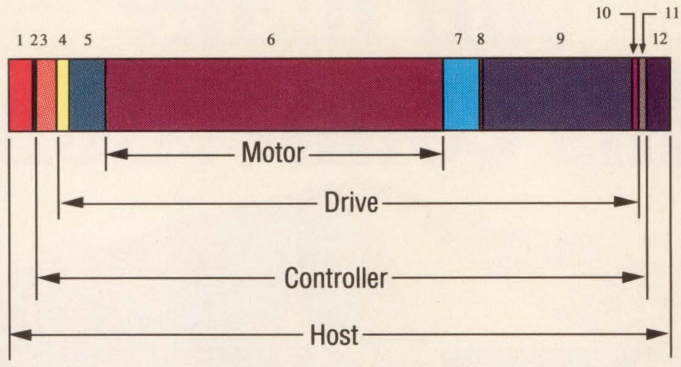
After running this test on your hardware, you should have an accurate picture of the spiral data rates of which your system is capable. This rate can be lower or higher than the specification sheets might lead you to believe, but because it was run on your system, it produces realistic and repeatable results.

Disk Seek Time

Disk seek time is an overemphasized specification. As noted in Part 3, the contribution of seek time can be quite small, because many VMS requests are for very close cylinders. In a typical environment, roughly 10 percent of all MSCP commands are for the next sequential LBN, while another 10 percent are for the LBN that was just accessed. In fact, nearly 50 percent of all VMS requests result in a request that's on the same cylinder as the previous one.

If a seek occurs, the average distance is roughly 10 percent of the capacity of the disk. Because the average seek time shown on the specification sheet represents a seek distance of about 33 percent of a disk's capacity, it's easy to see that you can be misled by specifications.

Figure 3.



RA82 data access time breakdown.

Data Access Time Components

Because the intention of seek time specifications is to provide information on how long it takes to access data on the disk, it might be informative to follow the progress of a QIO request from the time you issue it until it completes. These times are approximate and were measured on only one drive and controller, but they provide a good indication of where the time is spent:

1. The first step is to issue the QIO. Although the time for this varies depending on the processor, it takes about 1.3 ms for a 1-VUP machine. It takes less time, of course, on a faster processor.

2. The MSCP command must be transmitted over the CI. Although this time varies depending on the hardware type and how busy the CI is, it takes a VAX 780 about 135 microseconds.

3. Next, the controller receives and validates the command and sets up the necessary structures to initiate a disk operation. This also varies depending on the controller and microcode version, but an HSC70 running V370 of the code will take about 1.2 ms. If the controller is saturated, this time will be reduced to about 870 microseconds because of in-

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KNOCK, KNOCK, KNOCK, KNOCK,
KNOCK, KNOCK, KNOCK,
KNOCK, KNOCK, KNOCK.

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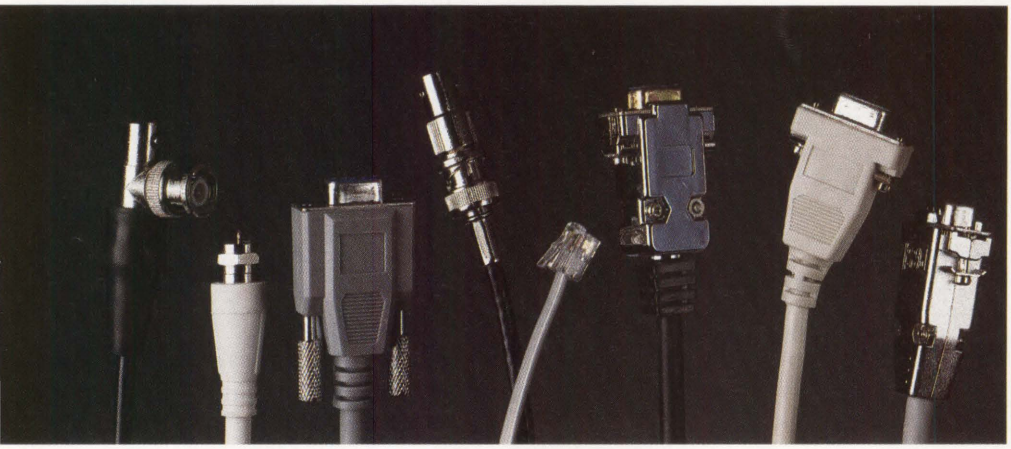

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Figure 4.

```
001     PROGRAM ACCESS
C
C       PROGRAM DESCRIPTION:
C
C       This program will determine the average effective access time of the
C       specified disk over the range of interest.
C
002     IMPLICIT INTEGER (A-Z)
003     INCLUDE                 '($SSDEF)'
004     INCLUDE                 '($IODEF)'
005     INCLUDE                 '($DVIDEF)'

006     STRUCTURE /IOSB/
007       INTEGER*2 STS
008       INTEGER*4 COUNT
009       INTEGER*2 %FILL
010     END STRUCTURE

011     RECORD /IOSB/           IOSTAT(2)
012     INTEGER*4               BUFFER(128), CUR_LBN, SEED
013     REAL                    AVG_ACCESS, LAST_ACCESS, START, TOTAL
014     CHARACTER               ANSWER * 32, DEVNAM * 32

015     PARAMETER               BYTE_COUNT = 512     ! Byte count of transfer
016     PARAMETER               EPS = 0.00005        ! Timing tolerance (in seconds)
017     PARAMETER               MAX_LOOPS = 20000    ! Upper limit on test loops

C
C       First determine which disk to test and open it
C
018     WRITE(6, 19)
019     FORMAT(' Device to test: ', $)
020     READ(5, 21, END = 9999) NUM_CHAR, DEVNAM
021     FORMAT(Q, A)
022     STATUS = SYS$ASSIGN(DEVNAM(1:NUM_CHAR), CHAN,,)
023     IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
C
C       Now get the seek range to test
C
024     WRITE(6, 25)
025     FORMAT(' Seek range in MB (0 for full disk): ', $)
026     READ(5, 27, END = 9999) SEEK_RANGE
027     FORMAT(I)
028     STATUS =LIB$GETDVI (DVI$_MAXBLOCK, CHAN,, MAX_LBN,,)
029     IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
030     IF (SEEK_RANGE .EQ. 0) THEN
031         SEEK_RANGE = MAX_LBN
032     ELSE
033         SEEK_RANGE = SEEK_RANGE * 1000000. / 512.
034     END IF
C
C       Finally, get the buffering (single or double)
C
035     QD = 0
036     DO WHILE (QD .EQ. 0)
037         WRITE(6, 38)
038         FORMAT(' Single or double buffering (S/D): ', $)
039         READ(5, 40, END = 9999) ANSWER
040         FORMAT(A)
041         CALL STR$UPCASE(ANSWER,ANSWER)
042         IF (INDEX(ANSWER, 'S') .EQ. 1) QD = 1
043         IF (INDEX(ANSWER, 'D') .EQ. 1) QD = 2
044     END DO
C
C       Set up the initial parameters and fire off the first QIO
C
045     SEED = 17621
046     AVG_ACCESS = 0.0
047     CHECK = 1000
048     START = SECNDS(0.0)
049     IF (QD .EQ. 2) THEN
050         CUR_LBN = RAN(SEED) * SEEK_RANGE
051         STATUS = SYS$QIO(%VAL(0),%VAL(CHAN),
        1       %VAL(IO$_READLBLK),IOSTAT(1),,,
        2       BUFFER(1),%VAL(BYTE_COUNT),%VAL(CUR_LBN),,,)
052         IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
053     END IF
054     FLAG = 1
C
C       Now iterate until the change in the average is less than epsilon
C
```

(Continued on page 46.)

This FORTRAN program can determine the effective data access time. To run this program, the disk under test must be mounted.

ternal optimizations in the HSC.

4. The controller transmits an SDI command to the drive, instructing it to perform a seek operation. This takes about 0.7 ms.

5. Having received an SDI command, the drive verifies it to ensure that it's legal. On an RA82, this takes about 2 ms.

6. The drive then moves the disk heads to the target cylinder. Although the time this takes varies depending on the drive and the distance involved, the average for an RA82 is 18.7 ms. The reason for the difference between this figure and the traditional 24 ms will become apparent later.

7. After the seek, time is required to allow the heads to settle, ensuring that the positioning is stable. For an RA82, this is about 2 ms.

8. The next sector passes under the head after a slight delay, allowing the controller to verify the drive's rotational position. The time this takes varies from one drive to another, but for an RA82 it's about 187 microseconds.

9. Because the position of the target LBN is random relative to where the heads are, the time to reach the target LBN varies. On the average, it takes a half-revolution, or 8.33 ms for an RA82.

10. The data in the desired LBN must be transferred (this is what we were trying to do all along). For an RA82, 287 microseconds are required for one sector.

11. The data then must be transferred from the controller back to the host. As with Step 2, this varies depending on the hardware type and how busy the CI is. For a VAX 780, this takes about 475 microseconds.

12. Finally, VMS must process the QIO completion. For a 1-VUP machine, this takes about 1.3 ms. As with Step 1, faster processors take less time.

Having examined the data access command in detail, we can determine the average seek time of the drive. Or can we? Looking at Figure 3, what should be the seek time of the drive?

The motor movement time of 18.7 ms (Step 6) is clearly an average seek based on HDA movement, but it fails to tell the

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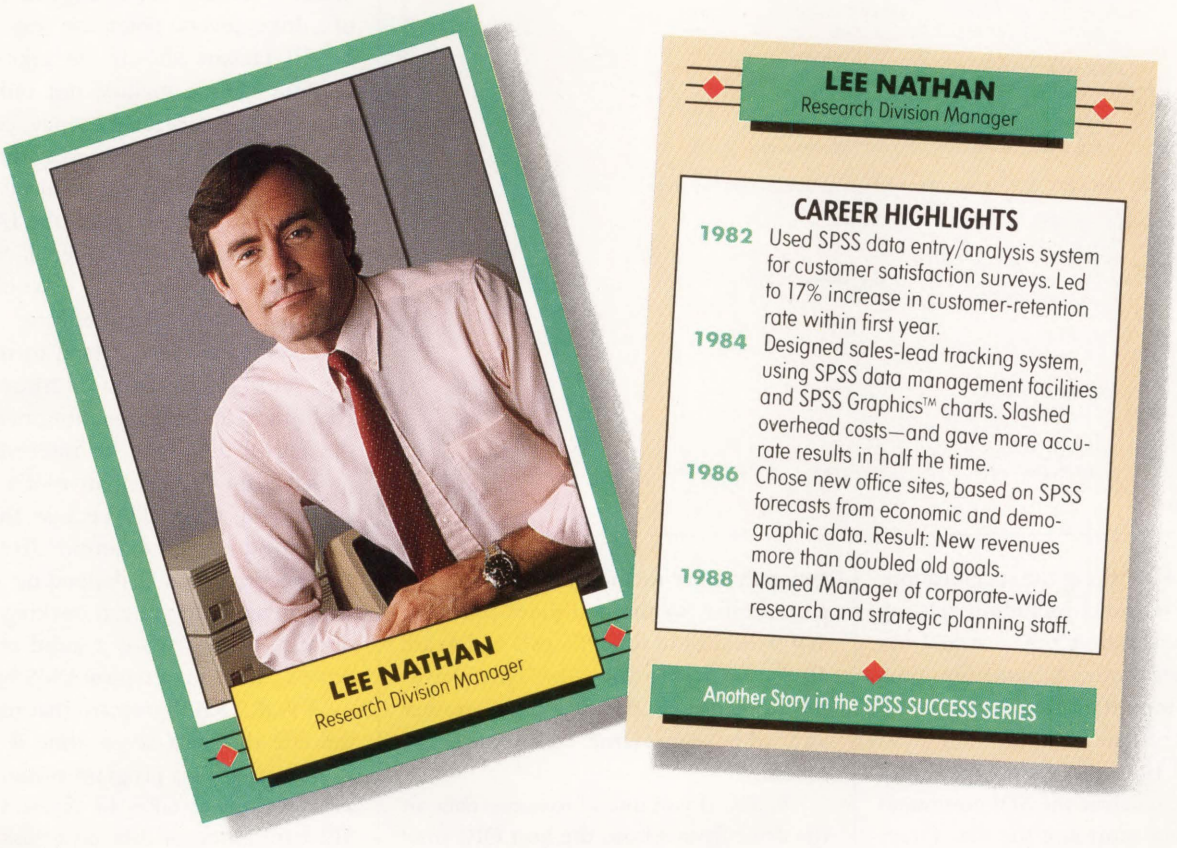

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Figure 4.

(Continued from page 44.)

```
055     DO 71 TOT_SEEKS = QD, MAX_LOOPS
056         CUR_LBN = RAN(SEED) * SEEK_RANGE
057         STATUS = SYS$QIO(%VAL(FLAG),%VAL(CHAN),
        1       %VAL(IO$_READLBLK),IOSTAT(FLAG + 1),,,
        2       BUFFER(1),%VAL(BYTE_COUNT),%VAL(CUR_LBN),,,)
058         IF (STATUS .NE. SS$_NORMAL) CALL LIB$STOP(%VAL(STATUS))
059         IF (QD .EQ. 2) FLAG = MOD(FLAG + 1, 2)
060         CALL SYS$WAITFR(%VAL(FLAG))
061         IF (IOSTAT(FLAG + 1).STS .NE. SS$_NORMAL) THEN
062             CALL LIB$STOP(%VAL(IOSTAT(FLAG + 1).STS))
063         END IF
064         IF (TOT_SEEKS .GE. CHECK) THEN
065             TOTAL = SECNDS(START)
066             LAST_ACCESS = AVG_ACCESS
067             AVG_ACCESS = (TOTAL / FLOAT(TOT_SEEKS))
068             IF (ABS(LAST_ACCESS - AVG_ACCESS) .LE. EPS) GOTO
74
069             CHECK = TOT_SEEKS * 1.5
070         END IF
071     CONTINUE
072     WRITE (6, 73)
073     FORMAT (' Loop count exceeded without convergence')
C
C       Wait for the last QIO, then print the average effective access time.
C
074     IF (QD .EQ. 2) THEN
075         FLAG = MOD(FLAG + 1, 2)
076         CALL SYS$WAITFR(%VAL(FLAG))
077         IF (IOSTAT(FLAG + 1).STS .NE. SS$_NORMAL) THEN
078             CALL LIB$STOP(%VAL(IOSTAT(FLAG + 1).STS))
079     END IF
080         WRITE (6, 81)
081         FORMAT (' Average double', $)
082     ELSE
083         WRITE (6, 84)
084         FORMAT (' Average single', $)
085     END IF
086     WRITE (6, 87) AVG_ACCESS * 1000.0
087     FORMAT ('+  buffered effective access time = ', F4.1, ' ms')

9999     END
```

entire story. Publishing the specifications of an HDA without including settling time, SDI verification time, or SDI-to-SMD (or other protocol) translation time omits many important factors that you'll see on a real system.

The total time the drive takes from the instant it receives the SDI command until it finishes returning the data (Steps 5 through 10) is more indicative of its performance. For Figure 3, this is about 31.51 ms.

Note that the rotation time (Step 9) was taken into account for determining the average drive access time. Although most drives rotate at 3,600 rpms, the RA70 spins at 4,000 rpms, reducing the average rotational latency from 8.33 to 7.5 ms. More important, if the seek distances are small, the rotation time can play a significant part in the overall average access time. Thus, rotation speed shouldn't be ignored.

By the same token, a disk drive is generally more useful if it's connected to a controller, so the controller time and SDI transmission time (Steps 3 and 4) are also useful information. This varies from one drive and controller to another and adds some time to the average access.

Finally, if you intend to access data on the drive from a host, the host QIO time becomes important (Steps 1 and 12).

Thus, we can unequivocally state that the average data access time of an RA82 is between 18.7 and 36.61 ms! While true, this information isn't very helpful.

If this is confusing, remember what we were after when we started examining disk seek specifications: How long will it take to get the data? Although seek times contribute to this figure, they don't tell the entire story. More important, *it's impossible to measure disk seek times from a host processor*, because such elements of seek time as SDI verification time and SDI-to-SMD translation time (if present) can't be distinguished by a host processor. Seek times only can be measured by specialized test equipment. Measurements taken from the host are only an approximation.

A more realistic measurement is the average time it takes to access a single block of data on a disk drive, taking all factors into account.

Measuring Access Time

When evaluating the average access time of a drive, several points are key:

1. All factors should be taken into account. These include not only seek time but also rotational latency, controller latency and host processing time.
2. Measurements should be made on the system of interest. Because the I/O bus, host processor and controller all contribute to this response time, it would be a mistake to exclude their effects.
3. The distance over which to measure the seeks is of prime importance. Although the average obtained over the entire disk may be interesting, it probably isn't representative of a typical application, especially because the relative standings of different drives can change dramatically depending on the seek distance. In general, seeking over a distance of 100 MB is a good test of a drive's ability on a typical VMS system.

A FORTRAN program that measures the effective data access time is shown in Figure 4. This program measures the average time it takes to access a single 512-byte block of data on a disk drive, taking all components in the path into account.

When running the program, the question "Seek range in MB (0 for full disk):" should be answered with the expected range. A value of zero produces the average effective access time over the entire disk. A value of 100 produces the most realistic results for VMS. If you wish to evaluate the performance for a specific file size, simply enter the length of that file (in megabytes).

The question "Single or double buffering (S/D): " also deserves some explanation. By answering "D" for double

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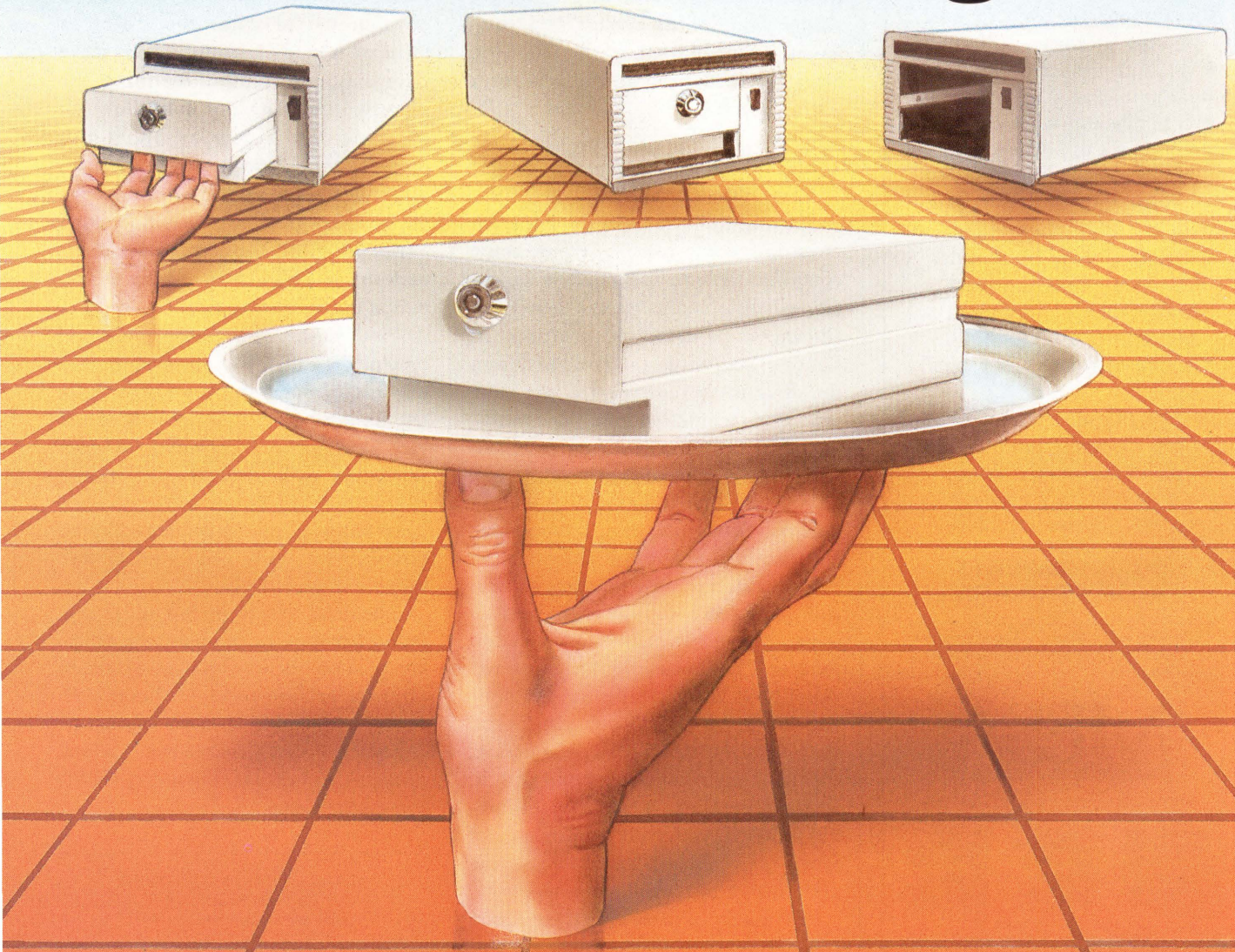

Makers of memory products for: DEC, IBM PS/2, Apple, AST, Compaq, Sun Micro, Toshiba and H-P LaserJet.

CIRCLE 269 ON READER CARD

buffering, the program always maintains one I/O outstanding. Because the disk drive is never idle in this case, the time the host and controller take overlaps with the disk processing. In effect, Steps 1, 2, 3, 11 and 12 are eliminated from the response time.

Answering the question with "S" allows only one I/O at a time, so the resulting time includes all components. In general, the test should be run twice. The differences between the single- and double-buffered times can be attributed to host and controller processing.

If your application accesses data with byte counts larger than 512 bytes, you might consider modifying the program to account for this. Line 015 specifies the byte count, so if you wish to change from the default value of 512, simply change this value. An average VMS transfer size is about 2 KB, so the following change provides the access time for a 2-KB transfer:

```
015 PARAMETER BYTE_COUNT = 2048
```

Varying this value can provide even more interesting results, because some controllers perform data transfer fragmentation at byte counts greater than 4 KB, allowing some degree of parallelism. In this case, because data is transferred from the drive to the controller at the same time as it's transferred from the controller to the host, the total time to obtain all the data is somewhat reduced.

Another interesting test is to run on a shadow set. In this case, the performance increases obtained by shadowing can be dramatic. You may question if this is really a fair test of the subsystem, because it uses the performance optimization features of shadowing. Ultimately, however, how long it takes to get your data is what counts. If you plan to use shadowing in your final configuration, then you might consider testing with it. At the same time, realize that shadowing won't increase the performance of writes and actually can decrease the performance by a small percentage.

The results of this test provide a good indication of the overall performance of the I/O subsystem when accessing data. This is more meaningful than just seek time or data rate, because it takes all factors into account. Such things as the rotation speed of the drive, transfer rate of the disk, service time and parallelism of the controller, host I/O bus and speed of the host processor contribute to the service time of a request. Because this test measures all factors (in single-buffered mode), the performance of the I/O subsystem can be evaluated objectively. More important, it's tested on your system in your environment, allowing you to compare different configurations with the assurance that you have meaningful results.

ALTHOUGH SPECIFICATION sheets contain useful data, the different techniques used by manufacturers make comparisons difficult. Running the suggested programs not only allows an apples-to-apples comparison, it also provides much more realistic data on your particular system. Because the environment in which a disk subsystem exists plays an important part in its performance, it's best to test the subsystem in its final configuration.

Finally, the application workload presented to the disk subsystem plays a major role in performance. Data transfer rate, rotational speed and seek time can vary in importance depending on your application. By knowing the performance metrics that affect your application and by running the appropriate tests on your system, you easily can evaluate disk subsystems objectively.

The next article in this series will investigate how to configure the different portions of the I/O subsystem to improve performance. — *Kenneth H. Bates is a consulting software engineer for Digital Equipment Corporation in Colorado Springs, Colorado, and a member of the I/O Performance Group.*

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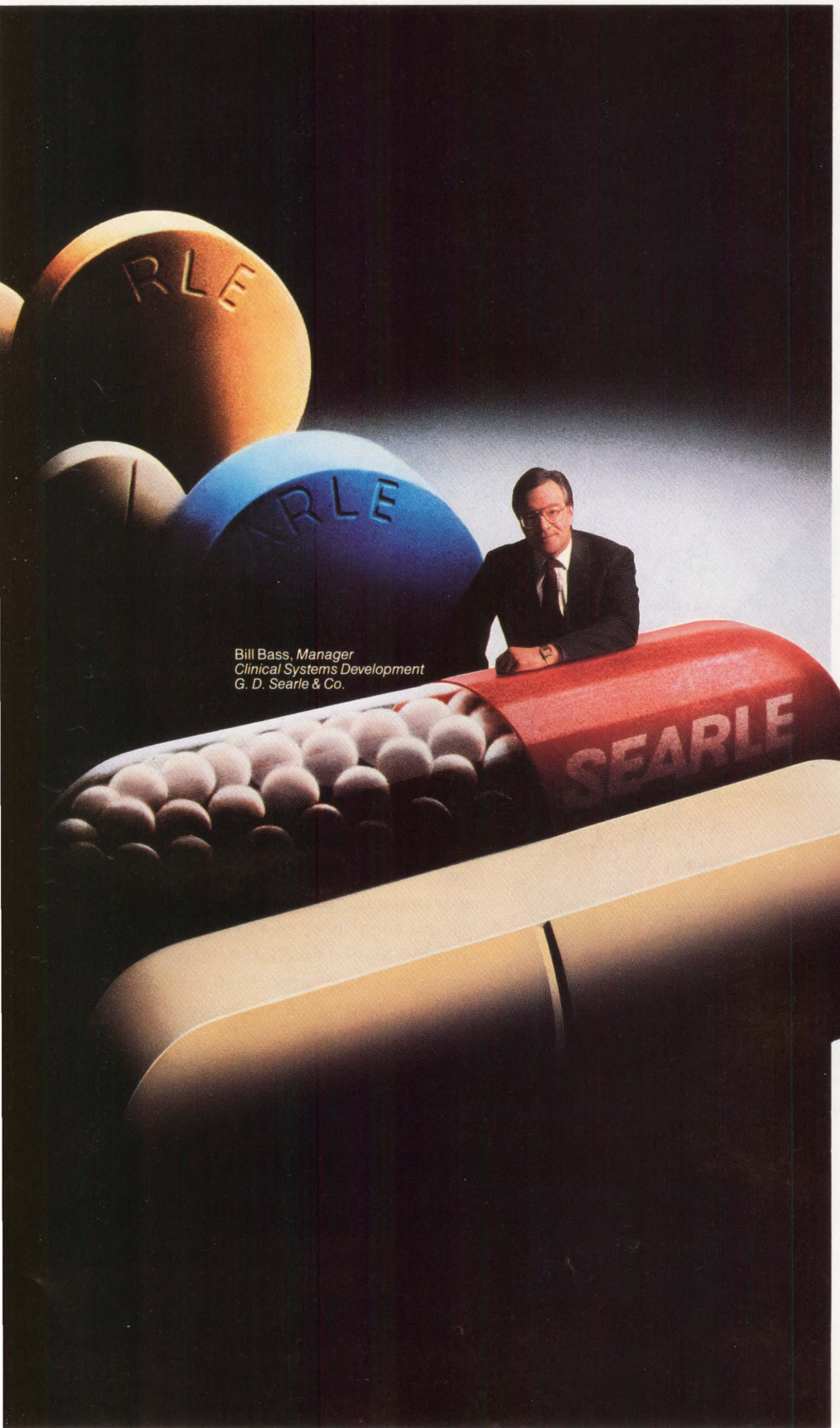

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Preserving Disk Technology

Storage hierarchies and clustering technologies ensure the role of disks in the 1990s.

BY EVAN BIRKHEAD

IF YOU BELIEVED industry analysts, you'd already have attended several wakes for the demise of the magnetic Winchester hard disk. This allegedly archaic storage device was to have been phased out by the development of erasable optical disks, helical scan tapes and, most recently, solid-state disks. It inevitably will be declared outmoded again during this decade.

But magnetic disk technology has matured at a pace that has kept it well-suited to the storage needs of today's network manager. This has occurred despite the perpetual redefinition of the data center and quantum leaps in processor speeds, i.e., RISC.

The disk's role in today's hierarchical storage configurations is testimony to its staying power. In this popular networked storage design, data is stored according to how often it's accessed. The most frequently accessed files are easily accessible in a large RAM. Less frequently accessed files are stored on disks. Seldom-accessed files are archived on optical disks (see Figure 1).

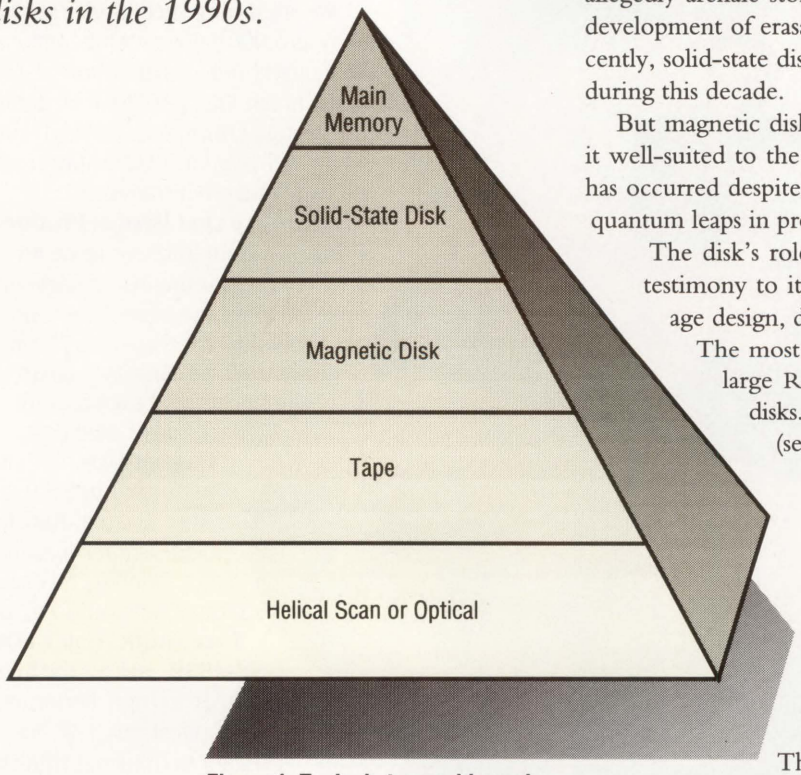


Figure 1: Typical storage hierarchy.

In hierarchical storage configurations, a centralized data management system handles data storage, providing the network nodes with transparent, high-speed storage. American Digital Systems' MasterDisk/Data-Library, for example, serves as a huge centralized repository using magnetic and optical media for 20 to over 100 GB of online storage.

A role exists for each type of storage media. The role of magnetic disks still involves mainstream, online storage applications, particularly in large networks.

The Hardy Disk

The basic technology behind magnetic platters and read/write heads hasn't changed much in 20 years. It's similar to the development of the automobile engine: While still essentially the same under the hood, most changes have involved safety, luxury and engineering tweaks such

as fuel efficiency. Likewise, most of the disk's improvements have been subtle technological enhancements. These enhancements include high-speed caches, intelligent controllers, better interfaces, the ability to store data more densely and the ability to defragment data so that it can be read more quickly.

The result is a continual increase in capacity and reliability with a corresponding decrease in footprint and cost per megabyte. Today's disks boast previously unheard of form factors (3 1/2-inch drives are common at the low end), MTBF ratings (200,000 hours isn't uncommon), and price/capacity. The industry has evolved from 100 MB on a 14-inch spindle to 100 MB on a 3 1/2-inch spindle. The oft-OEMed eight-inch VAX-compatible disk drives from Fujitsu Microsystems recently attained a 1.8-GB capacity for less than $7,000.

While read/write access speeds have not improved much during the past 20 years (from 3 to 4 Mbps), network managers have compensated with creative implementations that use the strengths of disk technology. Disks demonstrate a versatility of configuration that sustains the manager's bottom line: keeping user productivity high. In large networks, this often involves the chaining of disks so that they can be shared by processors and appear to the system as a few simple, large-capacity storage devices.

Newer software capabilities, such as more efficient methods of aligning and compressing data on platter surfaces and more functional management software for networks, have contributed to the remarkable knack of disks to adapt to and keep pace with current network and client/server architectures.

The hard disk's place in these networks, commercial and scientific, is secure. In fact, disk technology is the pivotal element of servers and is recommended as the storage medium for many workstation sites.

THE ADVENT OF X terminals underscores a return to mainframe-style centralized processing.

Centralized Storage

The advent of X terminals underscores a return to mainframe-style centralized processing. Today's mainframe, however, is the network. The centralized network storage concept still has relatively few backers. The fundamental concepts behind this suddenly born-again idea involve:

1. Redundancy of data via multiple storage devices.
2. The traceability of data to application and database servers.
3. The use of diskless nodes.
4. Accommodations for network processor and storage management architectures.

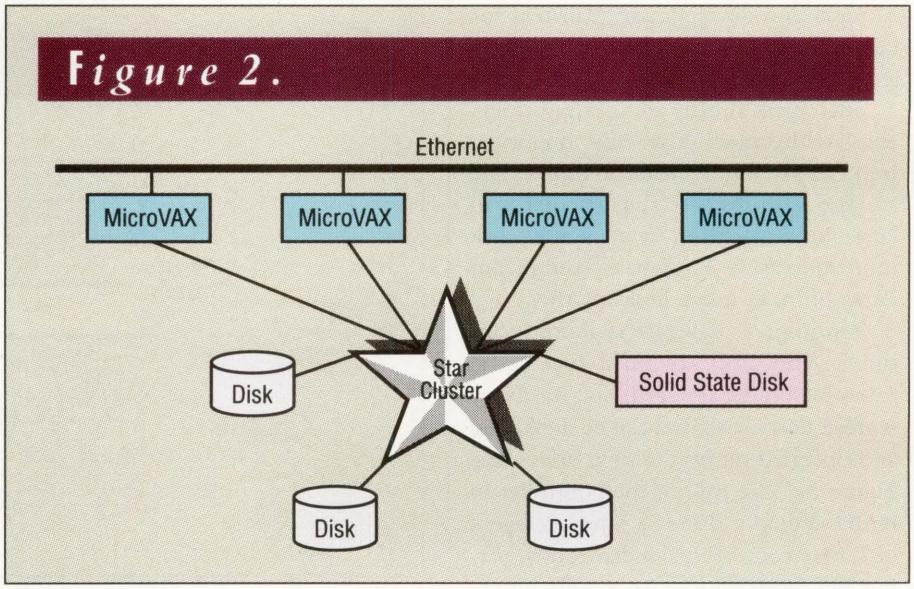
This implies that, in an ideal scenario, processors and storage devices scattered throughout a network are transparently accessible from any node. Emerging technologies that permit disk functions to be clustered and shared by multiple processors further ensure a prominent role for disks in the 1990s.

LAVcs represent one instance of this type of sharing (see Figure 2). VAXclusters, introduced by Digital in 1983, involve distributed areas of storage that can be shared by multiple processors. Based on MicroVAX boot nodes, the LAVc disk-sharing architecture features a single operating system that's booted across the LAN, file sharing to the record level across all nodes, centralized system management, and sharing of print resources and disk space by all processors on the LAN.

This type of efficient disk use has been modified by new technologies that promise to keep disks around for a while. For example, System Industries' Clustor links up to 16 hard disks (more than 27 GB) with up to eight MicroVAX-sized processors while supporting solid-state disks as an alternative, higher-availability medium. Several manufacturers are backing cluster technology. Configurations from Emulex and Micro Technology similarly allow multiple high-end VAXs to share HSC storage.

The key to shared storage is provid-

Figure 2.



Local area VAXcluster.

ing data availability without sacrificing network performance. To accommodate this, server redundancy has become an important element of efficient disk sharing. Dilog and others, for example, support multiple processors on the SCSI bus. The Clustor is based on a multitasking disk server that supports such features as striping, simultaneous data transfers, overlapping seeks and command queuing, all high-performance functions pivotal to fast access times in shared disk settings. Digital's DECnet System Services (DSS) has several facilities devoted to sustaining network performance by efficient bandwidth and storage device use.

RAID

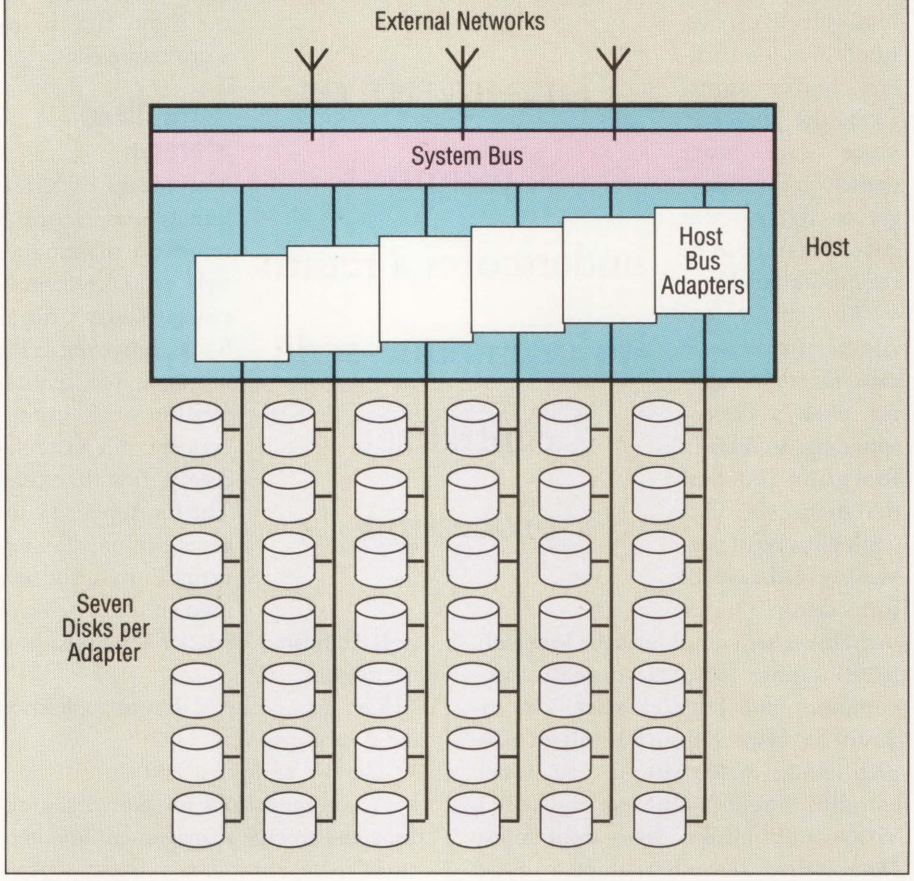
The pursuit of I/O bottleneck solutions characterized much of the 1980s. The Ethernet itself is a significant bottleneck, restricted to 10 Mbps, poor for distributing storage from a single node. Multiple processors and multiple storage devices have become a standard part of the solution. In these configurations, the balancing of files becomes an important component of the file distribution.

System managers' requests for faster throughput and greater data availability have been the catalyst in the trend toward perfecting the science of shared storage systems. System Industries, for example, is in the midst of a five-year research and development plan that focuses on designing a broad-reaching shared storage architecture.

Such plans already are yielding workable architectures. The most important trend for the future, maintain analysts and storage manufacturers, particularly in large network sites, is a parallel disk implementation known as Redundant Array of Inexpensive Disks (RAID).

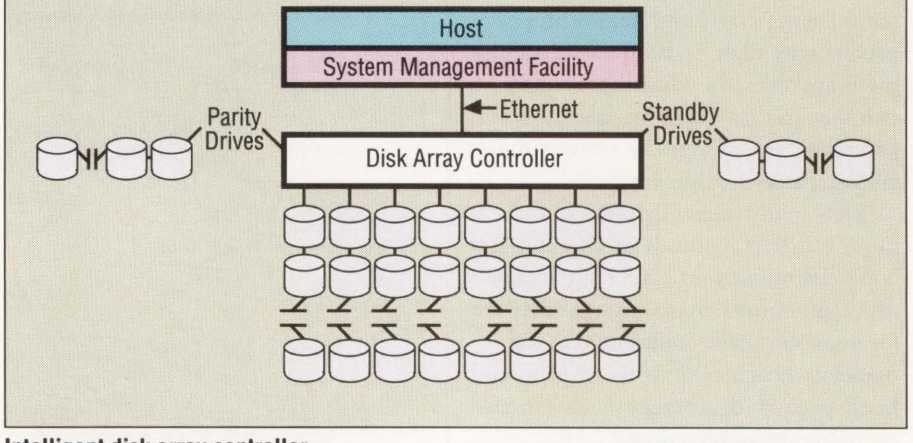
The object of RAID is short access times. The disks are small (currently, 5 1/4-inch disks are used) and reliability is great, because all data can be duplicated and operated on by multiple drives (see Figure 3). The role of the controller in RAID settings is that of a superintelligent disk array controller, simultaneously storing and accessing data on standby drives for backup, and redundant drives for par-

Figure 3.



RAID prototype.

Figure 4.



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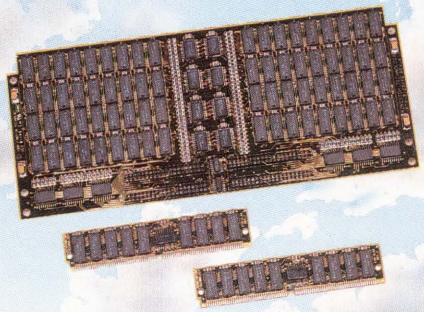

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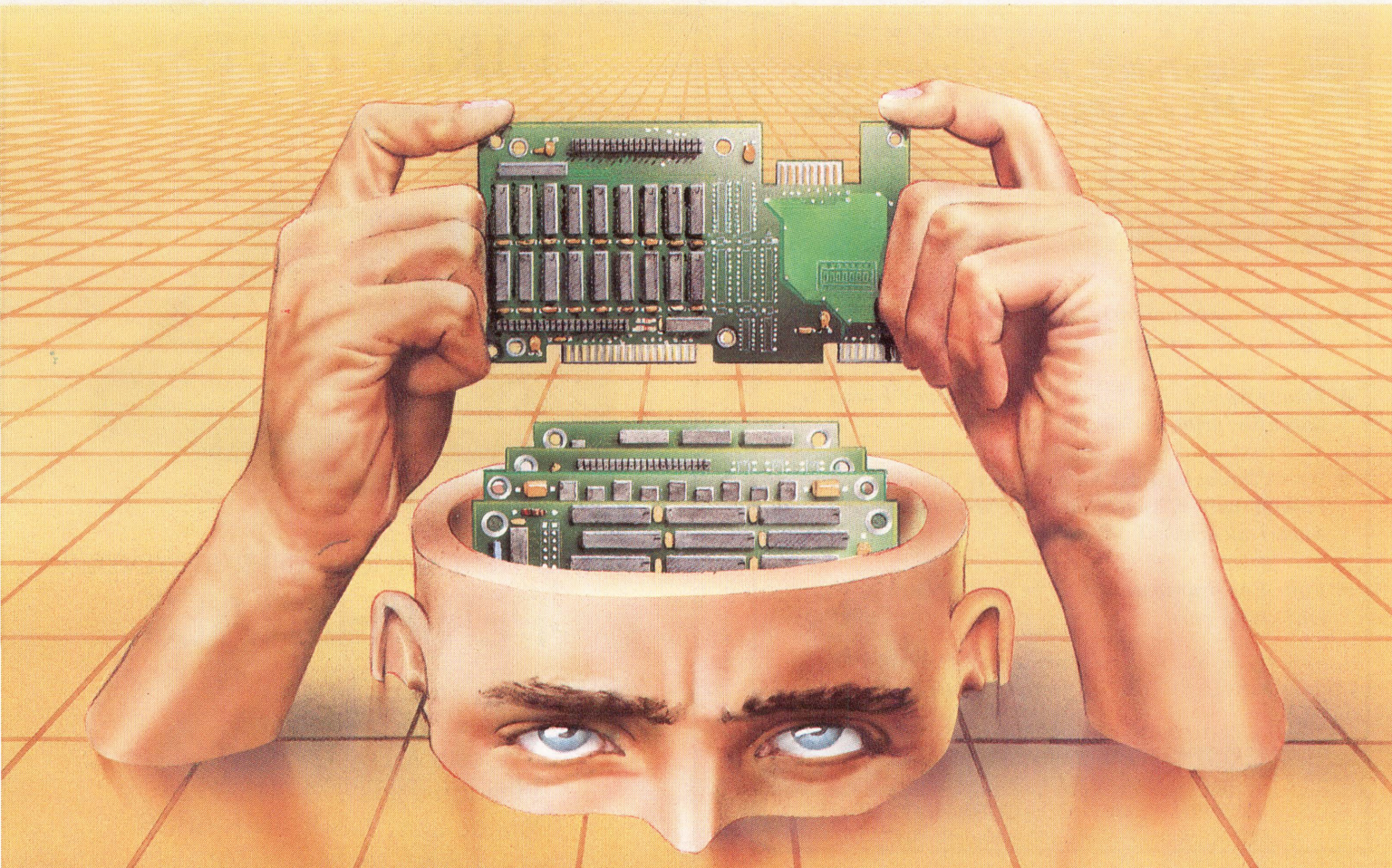

Makers of memory products for: DEC, IBM PS/2, Apple, AST, Compaq, Sun Micro, Toshiba and H-P LaserJet.

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VMS And BACKUP

With VAX/VMS V5.2, Digital made sweeping improvements to the BACKUP utility. In addition to improving disk performance between 30 and 1,100 percent, depending on the application, the company redesigned the CTRL-T function, which provides information on the backup in progress to the system manager.

This information includes statistics such as data on the last file that was scanned. Several bugs were reported in the backup facility of V5.2, but they were resolved to the satisfaction of many system managers in V5.3. Consultants recommended skipping V5.2 and moving directly to V5.3.

The major bug that restricted file access and affected every SAVE operation can be repaired in two ways, according to Keith Walls, VMS file system architect:

1. A patch for V5.2 that increases the access to the files.
2. An upgrade to V5.3, in which the problem is resolved.

Otherwise, V5.3 includes only minor stabilizations to the BACKUP utility. It offers no additions or functional extensions.

Digital plans to add a disk defragmentation utility in VMS V5.4, due later this spring.

ity (see Figure 4).

In January, Digital declined to comment on its internal RAID development, but several third-party storage companies are in beta test, and at least one, Maximum Strategy, has been shipping controller products for some time. The concept and implementation of RAID was pioneered at the University of California at Berkeley's Electrical Engineering and Computer Science department by Randy Katz. Katz's group continues to devote much research to the area.

RAID configurations transfer and store data in parallel. Maximum Strategy's controllers can use both ESDI and SMD drives. The company began shipping a controller for 16 parallel drives in 1986 and one for double that capacity in 1988. The advantage is having several read/write heads operate simultaneously. For example, eight parallel disk drives can convert a data rate from bits per second to bytes per second (see Figure 5). ECC codes and MTBF ratings increase by orders of magnitude in this configuration.

The problems of RAID involve synchronization. When searching for a file, for example, a large disk first would find an index mark. Parallel disks must search for an index mark on each drive, which

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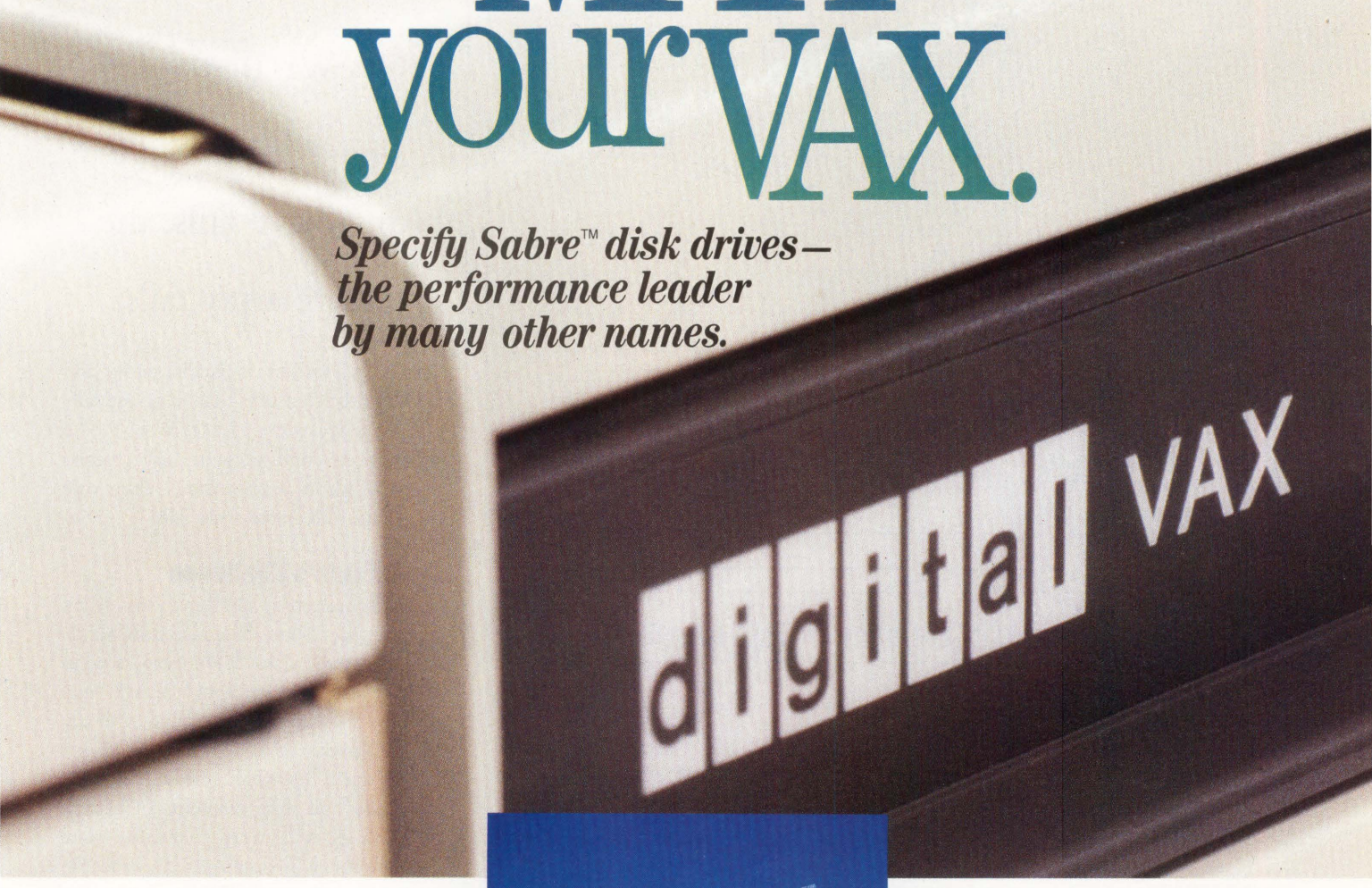

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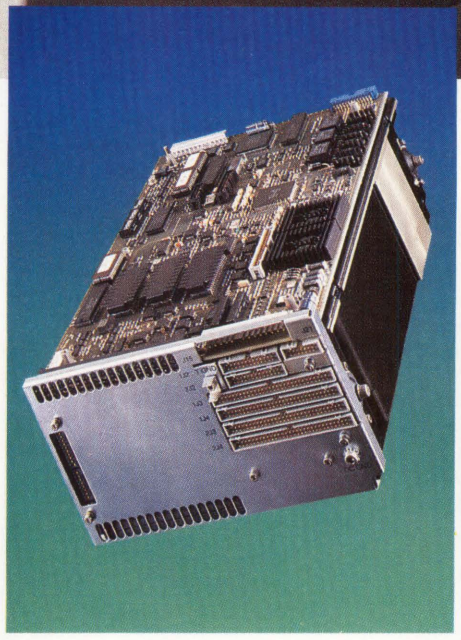

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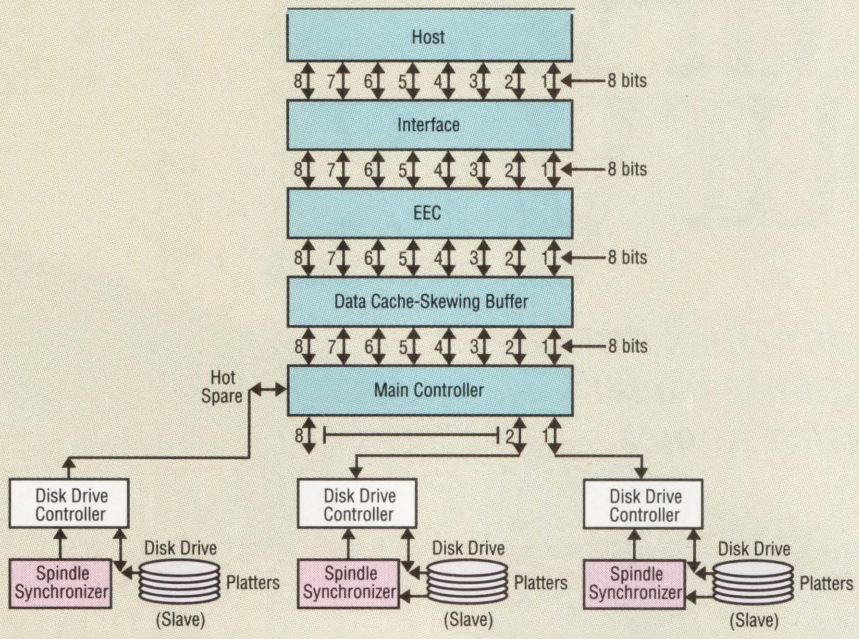
Figure 5.



Parallel disk operation.

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must be treated as a range of one — that is, synchronized — by the controller.

With all drives linked to a common controller, problems such as these have been solved by management software.

WITHOUT parallelism, when one drive fails, the entire array fails.

The incorporation of parallel parity and backup drives ensures reliability and fail-safe data transfers. Therefore, RAID shouldn't be confused with daisy-chained disks. Without parallelism, when one drive fails, the entire array fails.

Solid State's Challenge

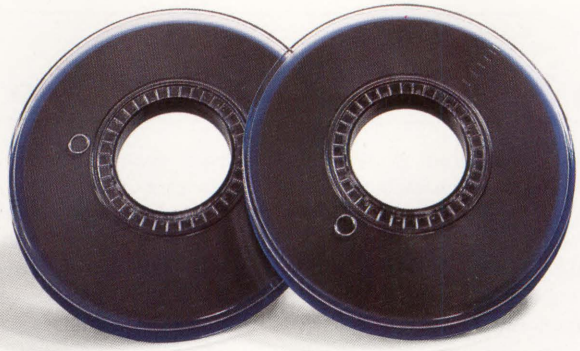
The fundamental challenge to disk's status in the 1990s will come from solid-state electronic disks (SSD). Introduced in 1978, these large memory arrays have become increasingly affordable with the declining price of the DRAM. Additionally, the next four-fold increase in DRAM capability and improvements in battery technology will mean that solid-state boards soon will sustain 4-, 16- and 64-megabit DRAMs. With 1-megabit DRAMs, prices were about $500 per megabyte (4-megabit DRAMs will mean 256 MB of storage on each board).

"At the huge capacity levels associated with mainframes, magnetic disk and tape will be alive for a number of years," says EMC's Vice President Dave Guy. "But we will see solid-state technology take over at the low end — workstations and minicomputers."

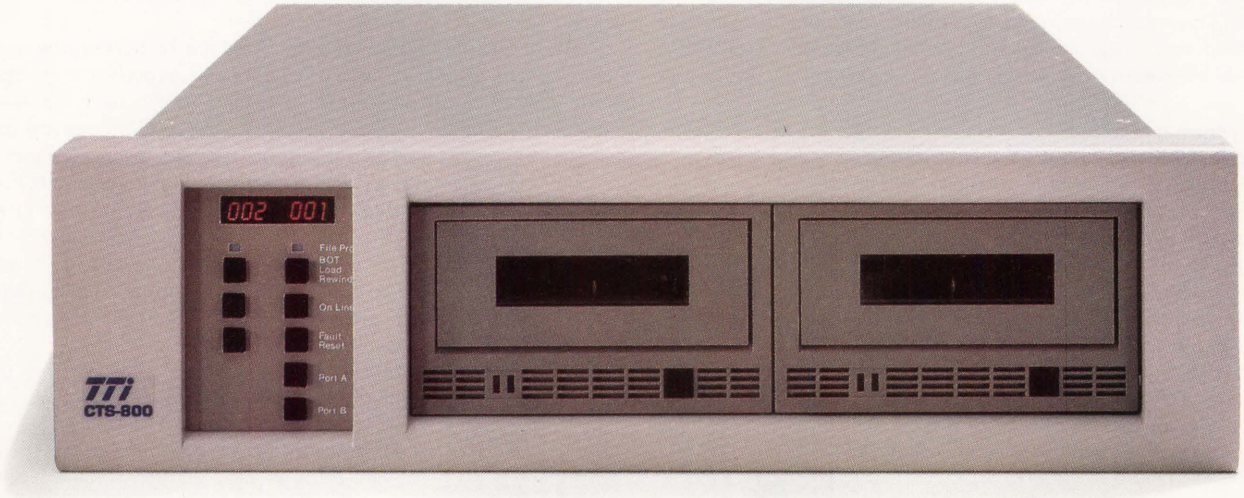
The technology is undeniably better-suited for storing frequently accessed files. With solid-state devices, disk access times are eliminated.

THE FUTURE OF STORAGE in VAX-based networks can be predicted fairly accu-

Backing up a VAXcluster can be reel slow.



Or real fast.



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rately. Disks and SSDs will play complementary roles in large networks and workstation sites. Optical disks and other archiving technologies will be most cost-effective for infrequently accessed files.

Your investment in disks will remain secure thanks to such parallel technologies as RAID. Despite Digital's persistence in developing nine-inch products, the prevalent industry format for online storage in large Digital networks is the eight-inch form factor. For large networks and clusters, eight-inch drives are available in a variety of interfaces, with transfer rates approaching the SMD controller limit of 3 Mbps. Because they're better-suited for SCSI workstation and PC network-style applications or disk arrays, 5 1/4- and

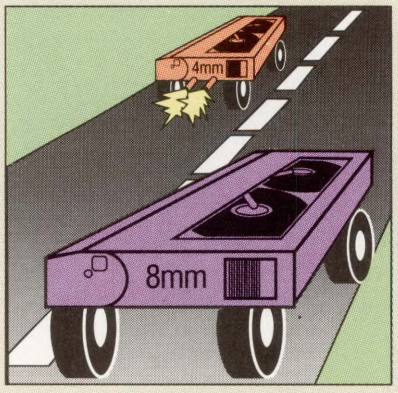
4mm Vs. 8mm: A Tale Of Two Tapes

In November 1989, Digital announced its intention to use 4mm cartridge-based Digital Audio Tape (DAT) as the new storage backup technology for the Digital Data Storage (DDS) architecture, beginning shipment of 4mm DDS devices this summer. The move jolted the storage industry, where for three years the standard backup technology for small computers — workstations, servers and low-end multiuser systems — has been the 8mm videotape format.

In 1989, virtually every workstation manufacturer, including HP, Apollo Division and Sun Microsystems along with minicomputer makers such as Data General, IBM and Prime Computer, threw their collective support behind 8mm. Most of them were OEM 8mm drives from Exabyte, the sole manufacturer. By backing 4mm, Digital, usually a staunch supporter of industry standards, has become an isolated maverick.

Peter Van Roekens, manager of Digital's Tape and Optical Group, says that advantages of 4mm over the alternatives include "the extensibility in capacity, ruggedness, reliability, the future size reduction, and cost savings." Digital wouldn't comment on whether it will OEM the 4mm subsystem from outside sources or develop the drive on its own.

"There are a number of advantages to 4mm," says Malcolm Krongelb, who heads Digital's Backup Division. "It has backing from multiple companies. The single source of 8mm has concerned some of our customers." Krongelb says that Digital prefers 4mm because it was "designed from the ground up to be digital," as opposed to 8mm, which initially was designed for analog applications. The greater wrap angle of tape around the drum is 90 degrees in 4mm and 200 degrees in 8mm, so less tape comes in contact with the drum in 4mm, according to Krongelb. He also maintains that the cost per megabyte of 4mm will drop below that of 8mm in coming years.



With the advent of 4mm devices, the jury is still out on whether Digital made the right move.

If nothing else, the decision was gutsy, and Digital's justification may prove farsighted. Analysts maintain that 4mm will evolve into a better platform for future storage technologies. Others say that it's a flashy, upstart technology that won't be as useful and isn't as proven as 8mm, which is flashy in its own right. At this point, satisfactory arguments exist for each side, leaving the final decision to the customer. The likelihood for the near future is that the two will coexist, finding better fits in slightly different markets.

Not A Threat

Four-millimeter DAT drives didn't ship in volume until 1989. As recently as 1 1/2 years ago, 4mm was quickly dismissed as no threat to 8mm. It was too expensive, critics said, and nowhere near the necessary storage capacities. And why use a drive smaller than an 8mm shirt-pocket cassette?

Because one 8mm cassette can back up more than 2 GB of data (equivalent to 10 large reels of nine-track tape) and because the next generation of Exabyte drives, announced in November 1989, will double that capacity, the technology appeared set for the 1990s. "We are close to having 8mm declared an ANSI standard," insists Exabyte's president, Peter Behrendt.

There are several advantages to the 8mm format over reel-to-reel tapes. The diminutive 8mm cartridge is ideal for storing and shipping. Many companies leave their 8mm drives locked in vaults overnight — they only need them when changing tapes. Cost savings are extensive, too. At less than $5,000 from most OEMs, the drives are a steal when measured per gigabyte. Nine-track tapes are 25 times more expensive than 8mm tapes. With a 20,000-hour MTBF and fewer parts, 8mm also delivers big savings on maintenance costs compared to nine-track tapes.

Sony's 8mm deck adds a fixed erase head that obliterates tape noise before recording over it, which is currently impossible with 4mm heads. That's because of the smaller and shorter data tracks on 4mm tapes. And with 8mm, the write head writes data during the first half of a revolution, and the read head makes sure it was written perfectly during the second half.

The downsides of cassette backups are based on personal judgment. For example, the security of a tiny tape that holds all of a company's data can be a concern. But supporters maintain that if someone wants to steal data, they'll always find a way to do it.

Early on, there were complaints that the technology wasn't adaptable to large systems, but companies such as Micro Technology, System Industries and Transitional Technology have brought 8mm to HSC clusters in a variety of ways. Also, Exabyte has announced a jukebox (starting at $75,000) that stores 116 cartridges and four drives — a total of 0.5 terabytes with unattended backup. Summus Computer Systems also announced an 8mm jukebox device.

The slow backup speeds compared to nine-track drives never mattered to many, because backups are done overnight. To compensate, system managers often run more full backups and fewer incremental backups on their 8mm drives.

Audio Versus Video

Because 4mm is generally similar to 8mm, it offers similar benefits and pitfalls. Both are based on helical-scan recording formats and metallic media, although 4mm uses a different coating.

The recording mechanism is the fundamental difference. The DDS format was developed and promoted by Hewlett-Packard and

3 1/2-inch drives will proliferate.

Digital has stated its intention to continue development in all of these areas of storage technology. Because of its emphasis on CPUs and system software, however, Digital will continue to defer to the third party in terms of implementing and shipping advanced storage products.

The third party will be interesting to watch during this decade, with a shakeout in some areas coinciding with new players for emerging technologies. As DRAM prices decrease and disk densities increase, the user will be the winner.

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High 501 Medium 502 Low 503

Sony and is noteworthy for its high data reliability.

The 4mm format now shipping appears to offer slightly more than 8mm in terms of gigabytes per dollar. It already has made inroads. It's widely agreed, however, that the biggest boost the technology received was Digital's endorsement.

Exabyte finds itself in the middle of the hubbub. It has been the golden child of the industry since it began shipping its 8200 Series 8mm drive in 1987. That year, the company had $3 million in revenues, a figure that skyrocketed to $85 million in 1989. Today, the company has 360 employees, an installed base of more than 65,000, and 87 OEMs and VARs, 20 of which are in the Digital marketplace. Exabyte went public in October 1989.

The 8mm format has thrived with the success of video, and Sony, which subcontracts the read/write head and deck subassembly for Exabyte, reports that it builds more than 2 million decks each year, mostly for home entertainment. Much of the 8mm/4mm battle will be fought over acceptance in the home market, audio versus video. DAT is at an immediate disadvantage with competition from compact disks and existing cassette tape technology, while VHS knocked Beta out of the market years ago.

	8mm	4mm
Original Function	VHS video camera/player	Digital Audio Tape
Installed Base	65,000+	1,000 - 5,000 (approx.)
Storage Capacity	2.5 GB	1.3 GB
Near-Future Capacity	5 GB	2.7 GB
Linear Density	43,000 bpi	61,000 bpi
Areal Density	35,000,000 bits/sq. in.	114,000,000 bits/per sq. in.
Transfer Rate	246 Kbps	183 Kbps
Form Factor	5 1/4 in.	5 1/4 or 3 1/2 in.
Standard ECC Rates	1 error in 10 [13]	1 error in 10 [15]
Computer Connection	Single-ended or differential SCSI	Single-ended or differential SCSI
MTBF	20,000 to 30,000 hrs.	10,000 to 50,000 hrs.
Price	$5,000 (approx.)	$3,000 (approx.)

Comparison of 4mm and 8mm backup technologies.

Big With Digital

Behrendt estimates that VAX sites make up 40 to 45 percent of the overall installed base of Exabyte's 8mm drives, the single largest environment. This is no surprise, because the typical Digital system has in excess of 1 GB of data. But Digital has supported the 8mm trend only in some instances. Digital's support has included OEMing an Exabyte 8mm drive in Japan, buying considerable numbers of 8mm drives in Europe, and recommending 8mm as a backup for the DECstation 3100.

Although Digital endorsed the 4mm format at Comdex in November 1989, it won't sell (or resell) 4mm drives until this summer. Exabyte itself endorsed the 4mm format more than two years ago but never reached the product development stage. "We could do it if we wished," says Behrendt, "but our customers have expressed a clear preference for 8mm. We have the knowledge and the capability, but 4mm hasn't been exciting for people who buy the things." Additionally, Behrendt sees limits to 4mm technology.

That hasn't stopped a lot of companies from entering the business. Many storage manufacturers and startups have jumped into the 4mm business (see Figure). Digital saw this as an advantage for 4mm, as Digital historically has preferred multiple sources for its TK50 and TK70 tape storage products.

Storage Advantage

Besides multiple sources, 4mm's proponents see several other advantages. Today's 4mm drives have lower prices, which means a slight advantage in price per gigabyte. Prices for 4mm and 8mm drives are expected to drop during the next few years as competition increases and subassemblies are developed more cheaply. DAT tape players will hit the consumer market in quantity late this year.

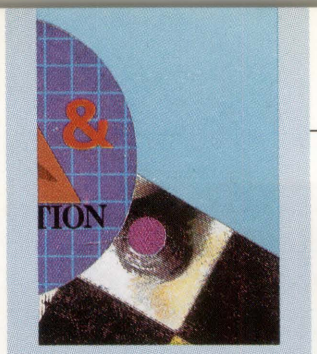
Four-millimeter can search through data at higher speeds, which is a fundamental advantage at many sites. In terms of capacity and data rate, 8mm has the edge. Estimates of error correction code reliability give a substantial advantage to 4mm. DAT drives are capable of no more than 1 error in 10^{15} bits, versus 1 error in 10^{13} bits, the number most often reported for 8mm drives.

Additionally, 4mm, because it is a smaller media, has a much higher areal density than 8mm. Areal density defines how many data bits fit on a square inch of tape. Behrendt says there's a limit to the number of bits you can get on a square inch of tape and that 4mm is already close to that ceiling. "But 8mm is very far down from what is doable," he explains. "We doubled our capacity with 8mm recently, and the areal density allows us to double it again."

Manufacturers of 4mm are expected to compensate for this with compression algorithms and thinner tapes, both of which reportedly are running in beta sites. These roadblocks certainly haven't stopped one DAT media manufacturer, 3M Data Products, which says it plans to offer a 2.7-GB cartridge by 1991, a 5.4-GB cartridge in 1993 and a 10-GB or greater cartridge in 1995.

WHY ARE THERE so many 4mm manufacturers and only one 8mm manufacturer? The question pertains to the difference in the technologies, and the answer may reveal a great deal about the potential for each to succeed. Besides the fact that Exabyte has patented all the electronics and formats, it's easier and less expensive to develop with 4mm. Eight millimeter required throwing away all electronics and formats that have to do with video and designing a new format for computer data from scratch. DAT, which is already digital, requires comparatively minor format changes.

If 4mm can work out kinks inherent to audio technology, its advantages could mean the difference. If it can establish a viable user base and build momentum, we could have a horse race that will be interesting — albeit a bit confusing. —*Technology Editor Philip A. Naecker contributed to this article.*



STANDARDS

NDEPENDENT COMPUTING

By Bradford T. Harrison

RISC/UNIX, RPCs, SCSI And X Take The Computer Industry Toward Vendor-Independent Networks.

Editor's note: DEC PROFESSIONAL *welcomes Bradford T. Harrison as Networking Editor. He will contribute feature articles in addition to the regular Networking column.*

Industry-standard computing — that is, development of computing platforms that conform only to standards that exist independently of any single vendor — is the dominant force in today's computer industry. Industry-standard computing may occur to different degrees within any given environment, but it's possible to build entire systems based only on industry standards.

To be sure, there are still holes and incompatibilities, but the fundamental components are in place, giving computer personnel the opportunity to build networks that are open, fast, expandable, fully programmable, well-supported and free from the marketing plans of any single vendor.

De Facto Vs. Formal

Figure 1 on page 66 shows the standards hierarchy. Formal standardization activity occurs at the top. ANSI, IEEE and ISO have given us many useful and widespread standards such as Ethernet (IEEE 802.3) and SCSI (ANSI X3.131-1986). Numerous government (MIL specs, GOSIP, FIPS) and educational/research (RFCs from the Internet Activities Board [IAB]) organizations contribute, as well.

Below that, consortiums of vendors acting as pseudo standards bodies are creating and bringing to market many proposed standards — such as OSF's Motif and UNIX International's UNIX V.4. The intent is that these "standards" eventually will be specified formally by one of the bona fide standards organizations.

At the bottom of the hierarchy is where the least formal but often most meaningful standardization activity occurs — in the field, where real products from real vendors solve real problems. Here's where de facto standards are made, enabling customers to implement field-proven products to accomplish the goals required of their computing environments. At this level we find de facto standards such as Sun Microsystems' NFS and AT&T's UNIX. Many standards that are specified formally tomorrow (in one form or another) get their start here.

Digital, HP And IBM

If we were to define tomorrow's standards as those most commonly implemented today, then surely everyone not already there would migrate to the $50 billion-per-year IBM environment. However delighted IBM would be with the prospect, the costs are far too great for many organizations, and IBM customers often bemoan the fact that they're at the mercy of IBM.

Therefore, de facto standards must be defined in terms of the number of vendors supporting them, not just by the quantity of dollars spent on products. Here's where the corporate philosophies of Digital and IBM contrast sharply: Digital is committed to bringing into its environment all widely held de facto industry standards, plus those Digital feels most im-

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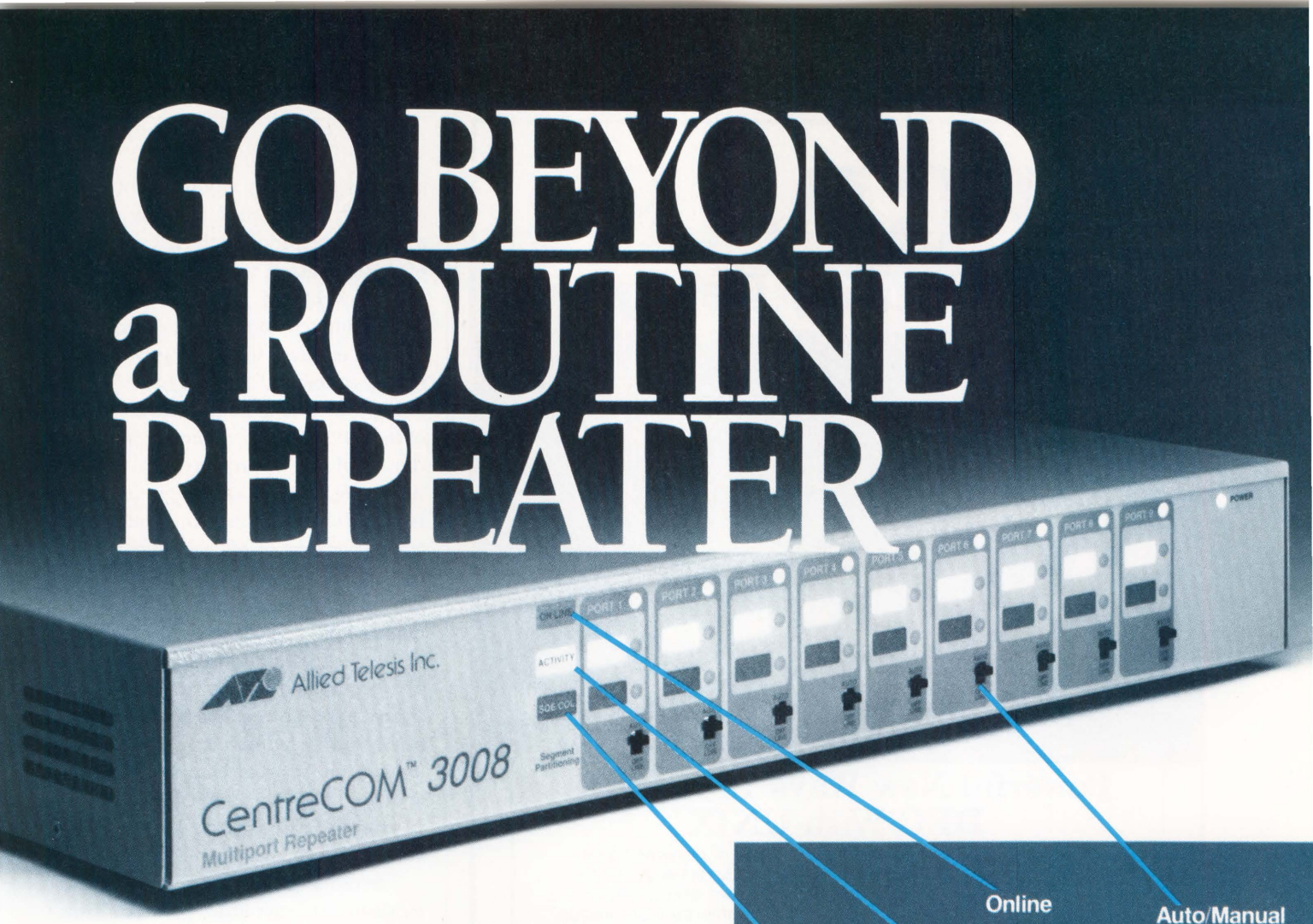

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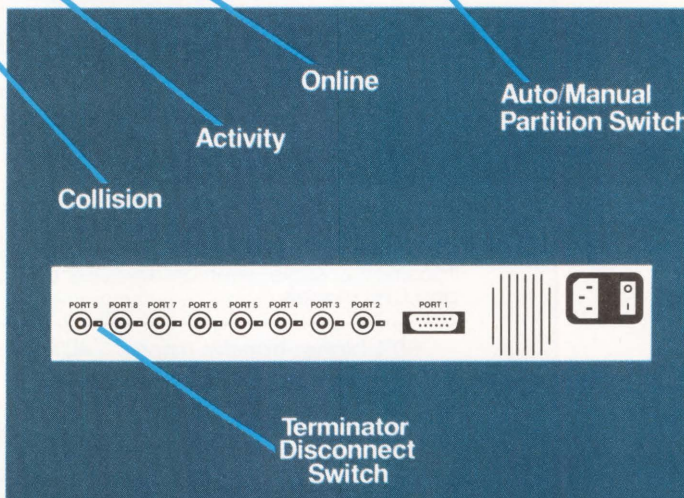

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portant to its own environment. The company has adopted a strong policy toward participation in the advancement of these standards to the formal specification level. IBM, on the other hand, favors a limited number of standards.

"We ensure a standards growth path for our customers," says Jim Isaak, POSIX strategy director at Digital and chairman of the IEEE POSIX committee. "We take the wholesale approach to standards, supporting them from the ground up." Isaak says that, during the sometimes lengthy process of official definition by standards committees, Digital provides the interim services for customers to implement the standards as they develop.

Because of its historical position as premier minicomputer vendor, Digital always has been required to address the multivendor environment. The capability to connect at both the high and low ends has long been a trademark of Digital gear. Today, Digital employees are involved with some 140 standards bodies.

"Avoid any company that says it has *the* standards," says Isaak. "The standards process is dynamic, culminating in an ANSI, IEEE or ISO specification." Isaak predicts that in the near future there will be formal specifications for environments as diverse as supercomputing, transaction processing, CAD and desktop computing. He believes that a rich variety of vendors will bring plug-and-play connectivity to these arenas by implementing the standards along with many individual extensions and enhancements.

By guiding customers away from companies that claim to have *the* standards, Isaak indirectly takes a shot at HP, which currently is enjoying solid growth because of its decision several years ago to invest in RISC/UNIX. With the HP Precision Architecture (HP/PA) and the HP-UX UNIX-based operating system firmly established, HP salespeople have been calling on Digital accounts. They've been pitching the HP RISC/UNIX solution as a firmly embedded standard, steering Digital customers away from Digital's less-established RISC/ULTRIX products.

But, according to Isaak, the standards

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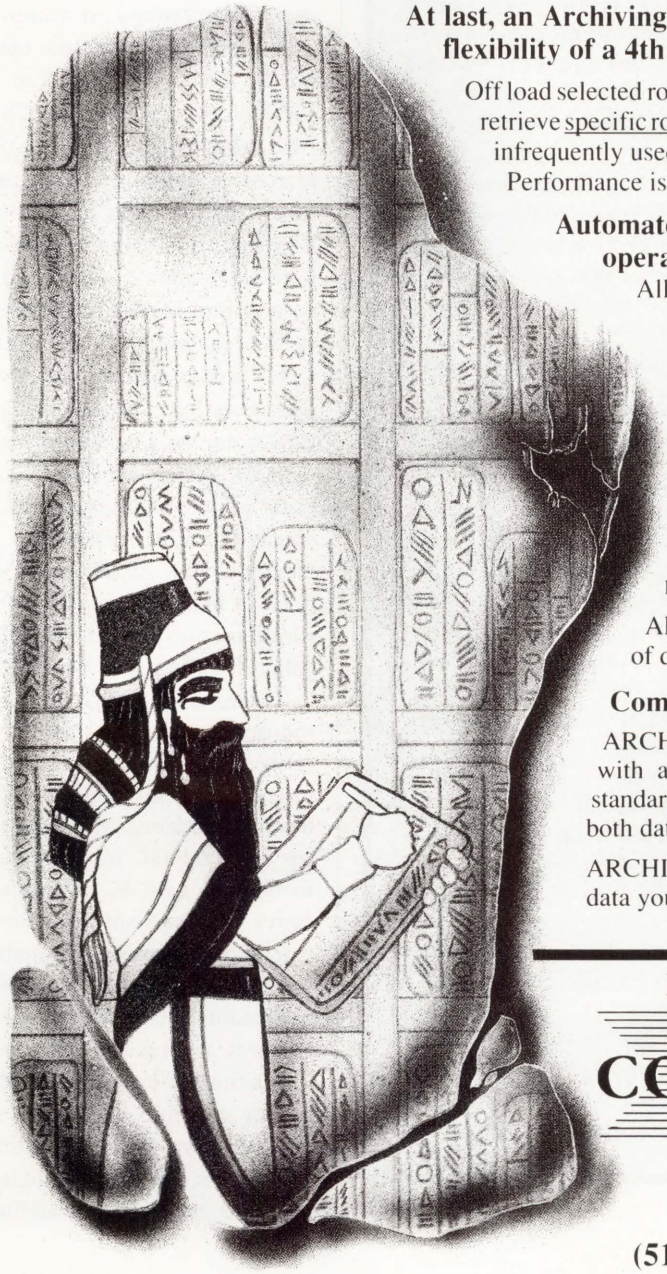

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SCSI Or ESDI?

SCSI and ESDI have emerged as the dominant 5 1/4-inch disk drive interface standards. The intelligent peripheral interface (IPI) has entered the competition as well but for now is confined strictly to the high-performance realm. Solid disk interface standards are critical to the industry-standard multivendor environment, because they allow plug-and-play upgrades to greater disk capacities using the same form factors from several competing manufacturers.

For mass consumption via high-volume production of 5 1/4-inch Winchesters, SCSI and ESDI have taken the industry by storm. Each brings unique capabilities to the market: ESDI is ideal for device-level control (i.e., direct addressing of tracks on specific cylinders), and SCSI features a bus onto which multiple SCSI devices — including tape and disk — can be combined and handled as logical rather than physical units.

SCSI's intelligent interface handles all conversions from logical to physical addressing, so a device driver programmer uses a relatively high-level command set. However, this prevents him from achieving the control that may be required of very high-performance disk arrays in which spindle synchronization is required to eliminate rotational latency.

This latter level of control is chiefly available from ESDI and remains its strongest characteristic. In addition, ESDI is used to retrofit 5 1/4-inch drives to subsystems in which another, older interface is in use, as in the case of HSCs on VAXclusters. Low-level control of the drive still is required in these applications.

But according to Gene Milligan, manager of product marketing at Seagate Technology and chief U.S. delegate to the ISO, ESDI's days are numbered. "The industry is swinging very rapidly to SCSI," says Milligan, citing that shipment of SCSI drives now outnumbers ESDI drives. "ESDI remains a common bridge in some environments, but with SCSI II you'll be able to get all the functionality from SCSI that you can from ESDI — including use of zero-latency techniques to eliminate spindle sync problems."

David Gordon, president of Array Technology, a manufacturer of Berkeley Redundant Array of Inexpensive Disks Level 5 (RAID-5) subsystems that use SCSI, agrees. "I can get anything out of SCSI drives that the others are getting out of ESDI — seek times and throughput." Gordon boasts throughput rates of 40 MBps, with rates tripling that figure expected from his implementation of SCSI II.

Such companies as Auspex Systems, Epoch Systems, Mips Computer Systems, NetFrame Systems and Omni Solutions have introduced dedicated disk servers that implement large arrays of 5 1/4-inch SCSI Winchesters. These servers feature architectures designed explicitly to serve data to the network at the highest possible speeds and support multiple Ethernets with up to 30 diskless workstations per segment, saturating the Ethernet transfer rate of 10 Mbps. The Auspex server can handle 240 diskless workstations using eight Ethernets and a RAID-5 SCSI subsystem.

ESDI clearly has a difficult time ahead. Seagate's new 1.2-GB Wren VII offers only a SCSI interface, because the company's zone-bit recording techniques are too sophisticated for use with a low-level interface such as ESDI's. Zone-bit recording techniques are leading the industry toward superhigh capacities in the 5 1/4-inch form factor.

"SCSI I and SCSI II will be completely plug-compatible," says Milligan, "while SCSI II brings advanced caching and command queuing capabilities to the interface." He points out that distributors and OEMs usually focus on software enhancements when integrating SCSI into systems as opposed to changing the hardware in any way that prevents plug-and-play connectivity. And now the Common Access Committee, Saratoga, California, a consortium dedicated to standardizing SCSI driver software, is promising SCSI plug-and-play compatibility in all respects within two years.

Finally, it appears that an ISO SCSI standard is on the horizon. "But don't be misled," warns Milligan. "ESDI and IPI are being standardized by ISO, too." Brian Fifield, director of product marketing at Dilog, also warns that you must keep your eye on all the standards. "Five years ago they told me SMD was nearly dead. That's hardly the case today."

process is more complicated than that. "To be successful in today's environments," says Isaak, "we're all wearing three different hats — competitor, co-operator and vendor/customer. We're cooperating with HP on NCS [Network Computing System] but are offering a competing RISC/UNIX strategy. You have to be flexible. Standards are great, but they're mostly a process until they're finally specified by ANSI, IEEE or ISO."

RISC/UNIX Leads The Way

So far, standards growth has been haphazard. The two standards at the heart of the industry-standard computing platform were developed with other goals in mind. UNIX, written by Ken Thompson and Dennis Ritchie at AT&T's think tank Bell Labs, was designed for use by programmers within that organization. After it was rewritten in the high-level C language, it became the industry's first portable operating system and thus made its way into many environments. AT&T collects licensing fees on every copy of UNIX sold, whatever the particular implementation, but that doesn't make UNIX any less a de facto standard.

RISC came into being because computer architects wanted to take full advantage of VLSI technology. The complexity of CISC architectures was just too great to fit onto small bits of silicon and simultaneously yield the performance gains we're just now beginning to see.

Interestingly, RISC's becoming an industry-standard architecture is a side effect of the reduction in the number of instructions employed by RISC. With fewer instructions, there's far more overlap among RISC implementations than there is among CISC designs, so it's much easier to move software among RISC machines. Optimizing compilers are used to yield maximum performance from application software, which, under RISC, requires a greater number of machine instructions to execute. And the percentage of machine-dependent features of system software is reduced greatly, yielding an overlap that facilitates moving even this usually highly architecture-de-

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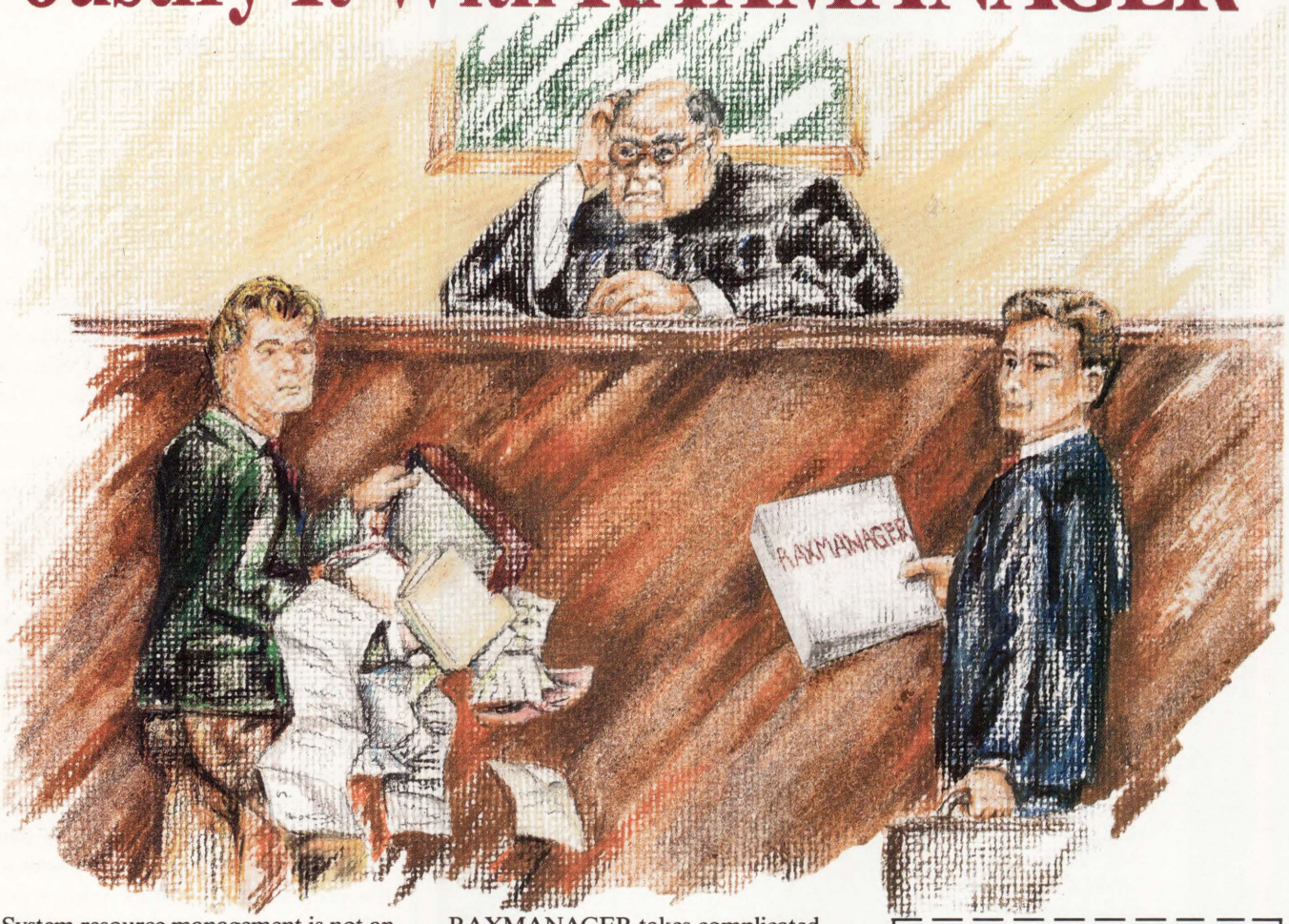

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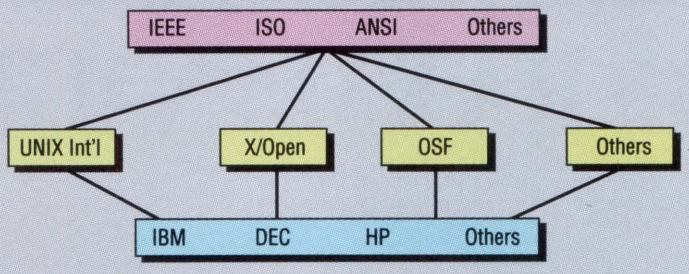
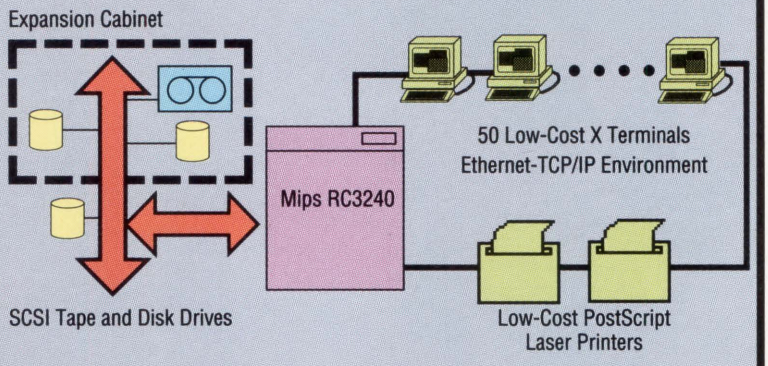
FIGURE 1.



The standards hierarchy.

FIGURE 2.



Configuration 1 Basic Components	Qty.	Unit Price	Total
Mips RC3240 •Rated at 18 mips •RISC/os •8 MB memory •663-MB SCSI disk drive •Cartridge tape drive	1	$33,500	$ 33,500
Additional 8-MB memory boards (additional 40 MB memory)	5	$ 5,400	$ 27,000
Mips expansion cabinet	1	$ 2,900	$ 2,900
•663-MB SCSI drives (additional 1,326 MB storage)	2	$ 7,500	$ 15,000
•Cassette tape drive	1	$ 6,500	$ 6,500
Uniplex Office Automation* (48-user license)	1	$18,400	$ 18,400
BGL Tech. Unileader Mark I Printer •PostScript-compatible •Built-in Ethernet-TCP/IP support •12 ppm	2	$ 9,690	$ 19,380
Acer X Terminals+	50	$ 1,000	$ 50,000
*Includes OSF/Motif X, word processor, spreadsheet, relational database, screen and menu builder, and advanced office system. +Available only through VARs and OEMs.			$172,680 ($3,450 per seat)

Entry-level industry-standard configuration.

pendent software among architectures.

The combination of UNIX's portability, optimizing C and other language compilers as well as the similarities among RISC architectures has laid the foundation for the industry-standard computing platform. But there's much more.

Unveiling The RPC

The fundamental component of communications among machines on LANs is the remote procedure call (RPC). Any program, whether part of the operating system or an application, must use RPCs to tap into the variety of resources on the network. This level of computing just now is coming into its own with compiler-based products such as HP, Apollo Division's Network Interface Definition Language (NIDL) and Netwise's RPC Tool. These products allow programmers to write their applications to execute across the network, using all resources, including idle processor time, as required.

The RPC now is being standardized (see box, "NCS Or ONC RPCs?"). Sun's NFS is built on its RPC, so it already exists at thousands of installations. And now Digital and HP are providing solid backing for HP-Apollo's NCS, based on an Apollo-developed RPC.

The RPC is the central element in network computing and thus is a fundamental component of the industry-standard platform. Without an easy way for the programmer to work with RPCs, he'd have no simple method for dealing with the network as a whole in the same way that he currently deals with a single computer.

RPCs are implemented across operating systems, hardware architectures and languages. Thus, they mask system incompatibilities, uniting even widely disparate machines. NFS is an excellent example. Another good example is an environment in which minisupercomputers are combined with RISC-based workstations for complex 3-D applications such as molecular modeling. The chemist doesn't know where the parts of his application are executing, but his

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modeling runs fast and interactively because the processor-intensive work is being performed on the minisuper.

The X Window System

The X standard performs this same function, but from a single display's point of view. Programs written in the X environment can be run from any terminal, workstation or display station that supports the X protocol. And though several implementations of X exist, including DECwindows, Open Look and OSF/Motif, all can function within the same environment (and as multiple windows on the same display) with a surprising consistency in look and feel.

In addition, X programming libraries are available across operating systems and architectures, ensuring that X applications written on one machine will recompile on another. Therefore, in addition to the fact that X applications can be run from many nodes on the network, X unifies architectures by ensuring that X applications can be recompiled on a variety of machines.

Add the capabilities brought to the multivendor network by the RPC, and it's clear that the problem of incompatibility on multivendor networks has been neutralized. We haven't reached Utopia, but it isn't far off.

Easy Ports

The power of the multivendor, industry-standard RISC/UNIX environment lies in the fact that all operating systems use common file structures and methods of handling I/O, plus similar kernel calls within 32-bit hardware architectures. ANSI-standard C is the core programming language in all systems, providing programmers with a wide variety of tools to build complex, customized software environments tailored to many user requirements.

In fact, no matter which RISC architecture is predominant on your system, if that architecture lost all support tomorrow, it would be simple to move your system software and applications to another industry-standard machine. Add to this the current standards work being done on SVID, POSIX, OSF/1 and UNIX V.4, and it becomes clear that soon portability problems will stop no one from migrating to any industry-standard platform. Even vendor-unique extensions will be moved easily.

Mips Computer Systems, the company that designed the RISC architecture Digital has popularized, has demonstrated the potential for this portability better than anyone. With its range of compilers and migration tools, you can port from almost any environment onto a Mips machine. In addition to standard C, PASCAL and FORTRAN environments, Mips supports migrations from COBOL, PL/I, Ada, DIBOL and even IBM midrange RPG I and II machines onto its RISC platforms.

Difficult ports demonstrate the ease with which users in the industry-standard

NCS Or ONC RPCs?

Critical to a tightly integrated multivendor LAN is an effective method of implementing remote procedure calls (RPC). The two major RPCs currently in use are Sun Microsystems' Open Network Computing (ONC) and HP, Apollo Division's Network Computing System (NCS).

OSF is in the process of standardizing the RPC. Digital is coordinating with HP-Apollo for the NCS submission, while Sun and AT&T are pushing the ONC submission. Hewlett-Packard has included support for NCS in its latest version of HP-UX, while AT&T has included support for ONC in UNIX V.4.

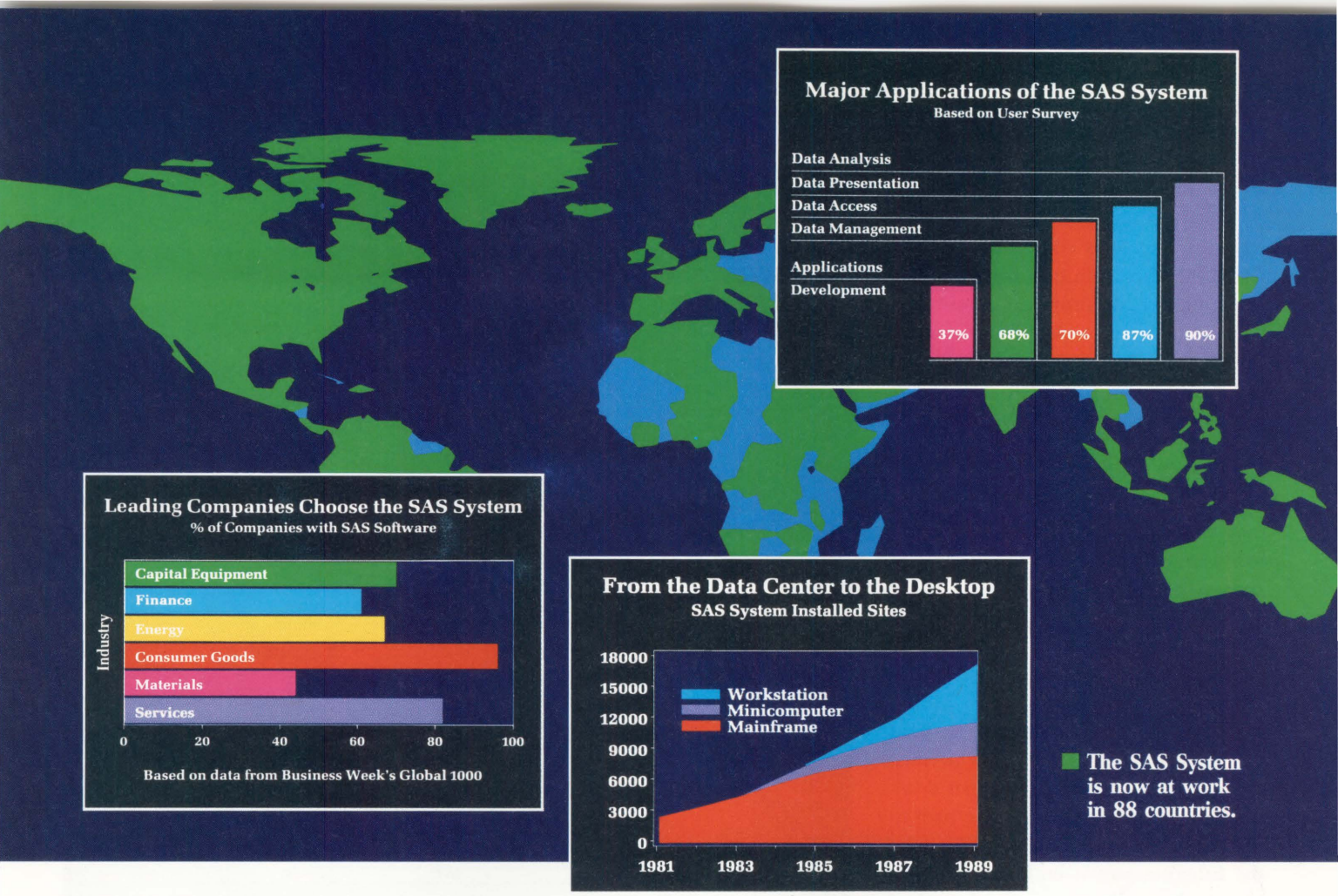
Further, Sun is working with Netwise to get the Sun RPC established as a de facto standard. Netwise developed a compiler-based product called RPC Tool that provides applications programmers with the ability to design distributed applications quickly across a variety of operating systems and transport layer protocols. NCS has supported multiple transport layer protocols from the start, and now Sun offers this important feature, as well.

RPC Tool supports ONC RPCs and the lesser-known ISO RPC. RPC Tool includes support for the Transport Layer Interface (TLI) developed by AT&T to support the RPC mechanism transparently on top of any transport layer protocol. This releases the ONC RPC from reliance on TCP/IP, which Sun originally used to develop NFS, and opens the RPC development environment to a large number of networks.

When the most common operations on LANs were file transfers and terminal emulation, TCP caused no unnecessary delays, because these operations don't require a high-performance network to execute quickly. But with hundreds of RPCs occurring every second on a busy multivendor LAN, TCP has come under fire for introducing too much overhead. HP-Apollo avoided the problem by building the NCS RPC on top of raw datagrams rather than using connection-oriented protocols such as TCP.

Especially dependent on performance issues for functionality are NCS's Location Broker (LB) and ONC's Yellow Pages (YP). Using the NIDL compiler or RPC Tool, programmers partition their programs into many small pieces that can be run in parallel or sequentially on a variety of machines across the LAN. The LB and YP allow the programmer to compile his routines on many different machines so that, at run time, they execute on the least-burdened or otherwise most appropriate machine automatically. NCS and ONC run-time mechanisms "register" or "list" available routines and current load status with the LB or YP so that they can direct RPCs to the most appropriate machines capable of executing them.

NCS has approximately 160 licensed vendors, while ONC claims some 260, primarily because of NFS. Many vendors support both, and according to Geoffrey Baehr, Sun's manager of network platforms, coexistence of the two is the most likely scenario. "You'll probably see RPC development environments that support both NCS and ONC on the same network," says Baehr. "Just tell the compiler which one you want — an NCS RPC or an ONC RPC — and it'll pop it out." Baehr notes, however, that this doesn't imply a shared technology agreement between long-time rivals Sun and Apollo. "Of course, we're still aiming our torpedoes at the East Coast," he jokes.



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environment can move among RISC/UNIX machines, whether those RISC/UNIX architectures come from Digital, HP, IBM, Mips, Sun or a company implementing a Motorola- or Intel-based RISC architecture such as Data General. Mips offers a gateway to the multivendor environment that many companies, especially Digital, are taking advantage of.

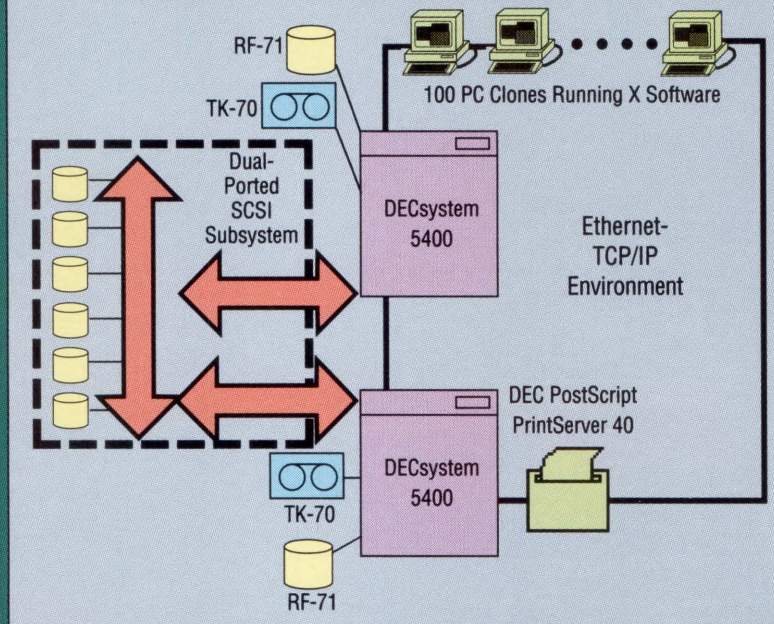
Hardware Modules

Equally important to the multivendor, industry-standard environment are the hardware components of Ethernet, SCSI and VME. Ethernet interface cards are available for all open architectures and will be replaced easily with FDDI interface cards when the cost of implementation for that standard drops. Meanwhile, bridges and routers will be used to tap Ethernet LANs for every drop of throughput. Avoid machines that don't offer a simple hardware upgrade path to FDDI. If a simple path isn't available (i.e., the Ethernet port is built into the machine), then talk to your vendor. Customer demand creates the industry-standard environment.

In addition, SCSI continues its push (see box, "SCSI or ESDI?"). Since it was standardized by ANSI in 1986, SCSI has grown at a phenomenal rate. SCSI II, with support for 16- and 32-bit data paths and special "fast" SCSI options, promises to take the standard even further. Add the benefits of the Berkeley Redundant Array of Inexpensive Disks (RAID) architecture and rapidly dropping costs on 5 1/4-inch SCSI drives, and the standard promises to deliver huge amounts of the low-cost storage required by graphically oriented networks.

Shakeouts continue to occur in bus structures, with the Q-bus, VME, PC-AT and Nubus locked in a struggle. For now, Motorola's VME offers the greatest selection of board-level products for LAN environments. Sun's workstations are the most successful machines sporting a VME, while Mips' computers use the PC-AT and VME buses, the Mac II uses the Nubus, and Digital has granted an even longer life to the Q-bus by incorporat-

FIGURE 3.



Configuration 2 Basic Components	Qty.	Unit Price	Total
DECsystem 5400 •Rated at 16.6 mips •ULTRIX •16 MB memory •400-MB disk drive •Cartridge tape drive	2	$49,900	$99,800
ULTRIX Unlimited User License	1	$35,200	$35,200
Additional 16-MB memory boards (additional 80 MB memory between two DECsystems)	5	$12,000	$60,000
Dilog SCSI Storage Subsystem •Dilog DQ3726 Q-bus SCSI interface boards •702-MB SCSI disk drives (additional 4.2 GB storage)	1	$34,670	$34,670
DECwindows Office Automation* (100-user license)	1	$60,000	$60,000
DEC PrintServer 40 •PostScript-compatible •Built-in Ethernet-TCP/IP support •40 ppm	1	$49,900	$49,900
Clones Samsung S-330 PC Clone •Monchrome monitor •Graphics board •640 KB memory •Floppy disk drive	100	$545	$54,500
Ethernet Adapter Board	100	$150	$15,000
Locus PC Xsight/640 X software (with Locus TPC/IP)	100	$225	$22,500
*In addition to the extensive DECwindows software bundled with ULTRIX (including a relational database), this includes DECwrite, DECchart, Access' 20/20 spreadsheet and Execucom's project management software.			$431,570 ($4,315 per seat)

Industry-standard Q-bus-based system.

ing it into some of the DECsystem machines. HP builds its own buses but supports all major interface standards via removable cards.

Further, the Extended Industry Standard Architecture (EISA) — an upgrade to the PC-AT bus (ISA) — and IBM PS/2 Microchannel battle promises to produce a competitive bus structure that many hardware vendors intend to support. HP already has built EISA into its PCs.

All components of the industry-standard hardware environment must be basically plug-and-play. This makes service and upgrades a snap. Keep spare modules on hand. If you have a big installation, keep entire components, such as disk drives and workstations, as spares or build redundancy into your network according to one of the many methods coming online. The most important feature of an industry-standard network is that it's built from simple modules into complex systems, whether those modules are interface boards or the structured components of UNIX.

Finally, it's important to keep in mind a network management strategy. Industry-standard network management products have been slow to arrive, but with the recent interest in and support for the Simple Network Management Protocol (SNMP), a viable option is here today. SNMP is a classic example of the power of the third party to develop popular standards that exist independently of any single large vendor.

Developed in academia and now available from a variety of sources (most notably PSI/NYSERNet and SNMP Research), SNMP is defined by the IAB, and all major computer manufacturers are including support for the standard in their network management products. Digital has licensed its implementation from PSI/NYSERNet.

Currently, SNMP is highly dependent on TCP/IP, but work is being done to make it transport layer-independent. Industry sources indicate that SNMP will enjoy solid growth over the next few years and provide a migration path to ISO's Common Management Information Protocol (CMIP) as it solidifies.

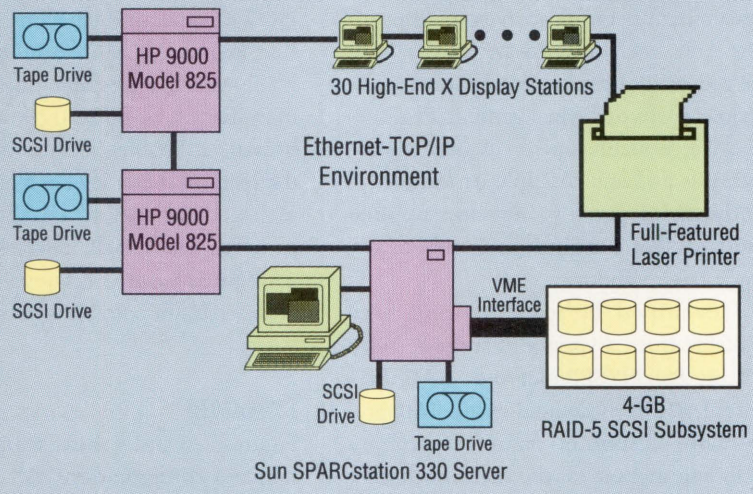
SNMP is especially popular among manufacturers of bridges and routers, because it enables simple monitoring of the load on these devices from a network management station. Using information gathered via SNMP, devices can be reconfigured by the management station to redirect traffic and thus alleviate bottlenecks.

Freedom

Figures 2, 3 and 4 show sample industry-standard configurations. All are based on RISC/UNIX engines, X, SCSI drives and Ethernet-TCP/IP.

Figures 2 and 3 are appropriate for departmental-level applications and small to midsize organizations, while Figure 4

FIGURE 4.



Configuration 3			
Basic Components	Qty.	Unit Price	Total
HP 9000 Model 825S •Rated at 8 mips •HP-UX •8 MB memory •304-MB disk drive •Cartridge tape drive	2	$41,400	$82,800
HP-UX 32-User License	1	$10,500	$10,500
Additional 16-MB memory boards (additional 80 MB memory between two Model 825Ss)	5	$12,000	$60,000
Array Tech. Array Disk System •4.3 GB visible storage •8 620-MB SCSI drives (7 data, 1 parity) •250 I/Os per second (max.) •150,000 hours mean time to data unavailability	1	$70,000	$70,000
HP software development pack with FORTRAN 77 and Pascal compilers and X development system (C is bundled with HP-UX)	1	$12,400	$12,400
Talaris T2492-B Printstation •Handles all commonly used engineering drawing sizes •PostScript-compatible •24 ppm	1	$22,740	$22,740
Network Computing Devices NCD16 •16-inch screen •2.5 MB memory	30	$2,840	$85,200
Sun SPARCstation 330 •Rated at 16 mips •SunOS •8 MB memory •327-MB SCSI disk drive •Cartridge tape drive	1	$28,900	$28,900
			$372,540 ($12,420 per seat)

High-end industry-standard system.

supports technical environments in which individual workstations aren't required but solid graphics capabilities are. Equipment that isn't industry-standard (as defined in this article) is included, because it comes bundled with some of the industry-standard components or, in the case of tape drives, serves as the sole method of loading vendor-supplied software onto the system.

Figure 2, based on one of the least-expensive multiuser RISC/UNIX systems, illustrates how inexpensive a fully featured industry-standard configuration can be. It serves as an ideal "gateway" system into the industry-standard environment. Figure 3 shows how a current DEC site might take advantage of Q-bus storage devices and PCs already in use. A likely scenario for a setting as described in Figure 3 would be to implement NCS to make full use of all processors on the network (Digital as well as PC) for a maximum of nearly 100 mips distributed processing power.

Figure 4 illustrates the capabilities of a high-end industry-standard system in which technical professionals are provided with advanced capabilities at a cost significantly lower than if individual workstations were implemented. The HP engines, although rated relatively low in mips, feature strong floating-point performance for graphics processing. The RAID subsystem is served to the network via NFS. This configuration already is supported by more than 500 technical applications.

The payoff for those courageous enough to forsake single, large vendors and march alone into industry-standard territory is a huge base of inexpensive but powerful and fully compatible equipment supported by nearly every vendor. Your technical personnel will remain as important as ever in this environment, but with a supportive third party, a mature computer industry and system managers willing to take a chance, the multivendor industry-standard environment can't help but grow stronger.

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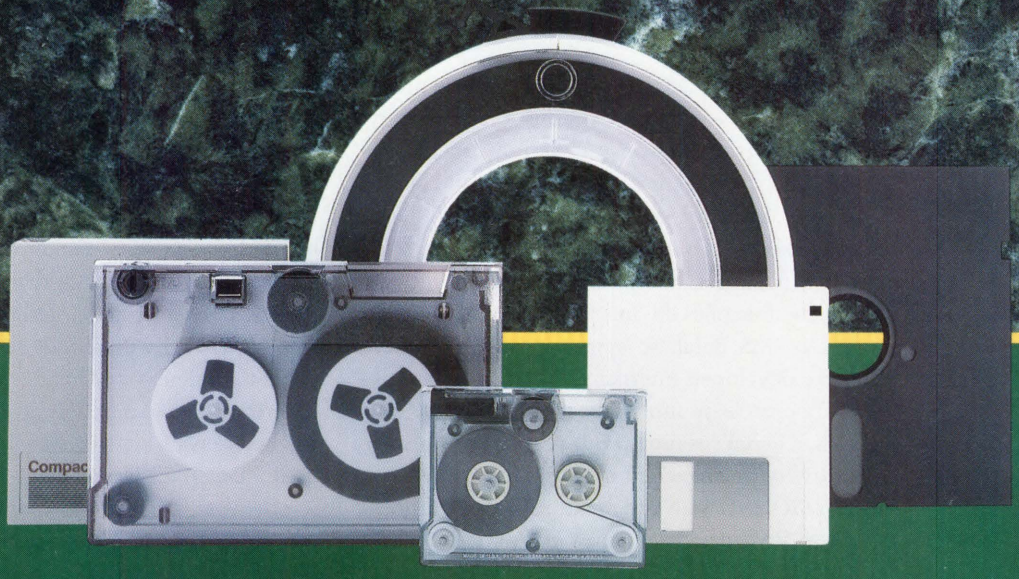

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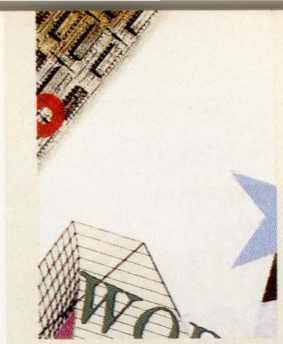

DATABASES

ELEGANCE FOR RDB

By Evan Birkhead

Digital Introduces Two Software Packages That Complement And Extend The Capabilities Of Rdb And VAX DBMS.

Digital's product introductions on February 27, which focused on transaction processing-oriented enhancements to databases and applications, were highlighted by the debut of DEC RdbExpert V1.0 and DECtrace V1.0. These software packages complement and extend the capabilities of Rdb and VAX DBMS, Digital's VAX/VMS database systems. Both products were developed internally.

A prerelease interview with Mike O'Connell, Digital's senior product manager for database performance tools, provided *DEC PROFESSIONAL* with timely information of interest to VAX database managers and designers.

DECtrace

Digital's timer-based programs, such as the VAX Performance Advisor (VPA) and the System Performance Monitor (SPM), provide VMS performance information at the systems level. Before DECtrace, there was no facility available from Digital for collecting statistics on performance from within production software applications.

DECtrace is a general event and data performance collection mechanism that collects application performance and event data and stores that information in Rdb (see Figure 1). Performance information that can be collected includes statistics on disk I/O, CPU activity and memory usage. For example, in a transaction processing environment, DECtrace can record how often each user makes transactions, the load of each transaction and performance-related statistics about each transaction. By providing the mechanism to log information from within the application itself such as usernames, log in times and CPUs in use, DECtrace also can be used as a security tracker.

O'Connell anticipates that DECtrace will be used as a general logging utility for performance analysis, capacity planning, database tuning and system efficiency information. The system can determine how much of a resource is being used or is available from within the application itself. "DECtrace has no provisions for interpreting the data," explains O'Connell. "It was built for presenting it in an organized format for analysis." DECtrace should also be able to replace many home-grown logging mechanisms now in use.

The program was designed to run off-the-shelf with some of Digital's proprietary software systems, but O'Connell reports that application developers can instrument their own code for a variety of tasks including performance analysis, error logging and application benchmarking. "There are no language restrictions for standard 3GLs," he explains.

Among the Digital software products that have been instrumented for DECtrace are ALL-IN-1 V2.4, Rdb V3.1, DBMS V4.1 and ACMS V3.1.

The application code is instrumented with procedure calls to DECtrace. These calls provide the ability to execute a point event or a duration event. Transaction processing or other applications can be instrumented with events of performance or application data logging up to

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32 KB per event.

Instrumented applications are "registered" with the DECtrace administration database using the DECtrace administration function. This adminstration function provides a central mechanism for identifying and describing each instrumented application and its corresponding events. The SHOW REGISTER command displays all available applications from which data can be collected. The SCHEDULE command sets a time and duration for event collection. Using DECtrace, the collected event data can be formatted into an Rdb database or RMS file for access and reporting.

DEC RdbExpert

RdbExpert is an AI-based physical database design tool that enhances the performance of new or existing VAX Rdb/VMS and VAX DBMS databases. Using a DECwindows interface (commands also can be used), the database administrator builds a database design repository that contains information about the site's specific online applications, databases and transactions. Using this information, RdbExpert generates a redesigned data definition language (DDL) system environment for the optimized database, considering each site's unique combinations of applications and database usages.

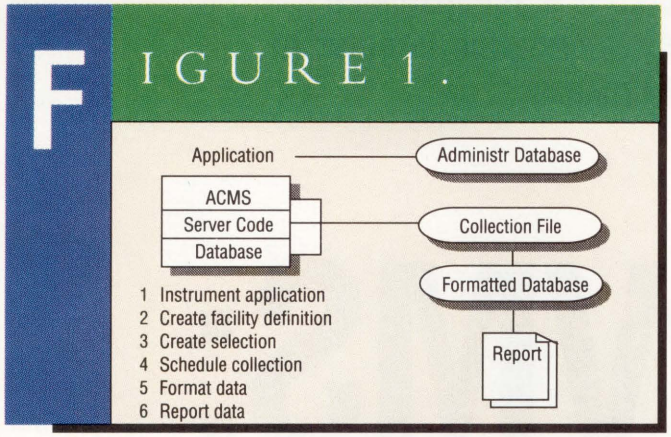
"For those who don't understand the internals of Rdb or DBMS, RdbExpert provides knowledge about their system and makes design decisions for them," says O'Connell. The software also provides a design report that explains why each decision was made by the AI program. These reports can be used as educational tools for database administrators.

DEC RdbExpert bases its decisions on fundamental information, including data on the logical schema, as well as the amount of data to be stored in the database, such as the number of records and unique column values. DEC RdbExpert also requires workload information, for example, the database query statement and the number and frequencies of transactions that generally are executed against the database. RdbExpert uses DECtrace to catalog much of this information, which it can subsequently import into its design repository (see Figure 2).

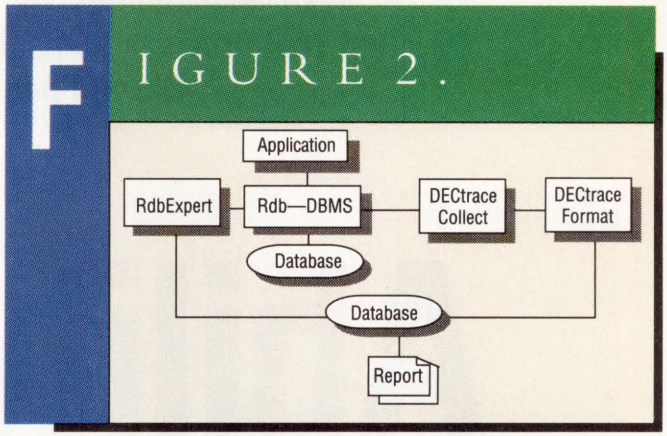
RdbExpert provides the settings to tune a database. Among the attributes it sets are:

1. Hash or B-tree structures.
2. Recording placements and clustering.
3. Index note sizes.
4. Storage area locations and allocations.
5. Page formats, sizes, threshold values.
6. Locking granularity.
7. Data clustering and file location.

RdbExpert lets you import the database workload information and logical designs for Rdb and DBMS schemas. From here, the system prompts the developer to prioritize the workload on a 1-to-10 scale. The system breaks the pri-



DECtrace functional block diagram.



RdbExpert and DECtrace interaction.

oritization into four levels: applications, user-written programs, data transactions and Data Manipulation Language (DML) requests. On a given application scale, for example, payroll may be the highest priority (10), then shipping products (9), and so on.

This information is used by RdbExpert in its decision-making process. After it imports this information and makes its decisions, you then tell it to generate, says O'Connell. The generate phase provides executable procedures to recreate the optimized database. It also provides for VAX Rdb/VMS, the Resource Management Utility (RMU) unload and load scripts for reorganizing a redesigned VAX Rdb/VMS database.

DECtrace and RdbExpert run with VAX/VMS V5.2 and later. The base price of DECtrace is $3,427; the base price of RdbExpert is $12,750. Clusterwide and traditional tier licenses are offered. The products will be available this summer.

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Avail Technologies' AbilityVMS Is A Sophisticated Tool That Provides Management Information Targeted At Disks, Files And Processes.

AbilityVMS:

Rest For The Weary

DAVID W. BYNON

There never seems to be enough time to keep up with VAX system chores. It isn't such operational tasks as disk backups or account management that rob your time, it's the unexpected duties. For instance, how long does it take to track down the culprit when you run out of disk space? And how long does it take to check file security for the whole system?

Because time is limited, it's easy to get excited about new system management tools. I was delighted when safe VAX disk defragmenting utilities became available. I'm also an avid fan of DEC's SYSMAN utility. Back in the days of VMS V4.x, I spent weeks writing programs and procedures to do some of the things SYSMAN can do. Now there's a new time-saving system utility: AbilityVMS V1.1 from Avail Technologies.

Ability is a new concept in VAX system management software.The documentation describes Ability as a "sophisticated system software product that provides powerful facilities to help you manage your VAX systems." My best description of Ability is that it's a VAX management information tool. There's no single tool in VMS that provides as much information about the running system as this software.

Ability concentrates on three areas:

```
ACCESS                                  AbilityVMS V1.1                 Page 4
Accessibility of Files                                                  14-DEC-1989 17:08

                                        File Specification              File UIC
User Username                           User UIC                        Privileges

Filespec: V8350$DUA0:[SYSCOMMON.SYSEXE]SYSUAF.DAT;1                     [SYSTEM] (cont'd)

A1$XFER_IN              [TEMPSHUT]      TMPMBX NETMBX
A1$XFER_OUT             [SYSTEST]       TMPMBX NETMBX
ALLIN1                  [ALLIN1]        CMKRNL SYSNAM GRPNAM PRMMBX TMPMBX
                                        OPER EXQUOTA NETMBX VOLPRO PRMGBL
                                        SYSGBL SYSPRV SYSLCK
BYNON                   [BYNON]         (all)
.                                       .
.                                       .
SYSTEM                  [SYSTEM]        (all)
SYSTEST                 [SYSTEST]       (all)
T_BYNON                 [T_BYNON]       TMPMBX NETMBX
```

The ACCESS SENSITIVE_FILES report lists accounts that can access user authorization.

"How to Improve Disk Performance"

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disk management, file management and process management. These areas often require the most attention, and they represent the greatest investment in any VAX system.

Ability's Facilities

Although Ability has a menu interface, most expert VMS users will prefer to use its DCL commands. After you learn the five Ability facilities, remembering the commands is easy. Less-experienced DCL users will appreciate the menu interface. It's easy to use and a good teacher. When you select an Ability function from its menu, the appropriate DCL command is displayed at the bottom of your screen.

The five Ability facilities are:

1. The ACCESS Facility — Ability's ACCESS facility has tools that report potential security problems. The 11 reports range from who can access specified files to who can access sensitive files.

The diagram on page 78 shows a screen from the ACCESS SENSITIVE _ FILES report. This report provides a detailed listing of the accounts that have access to SYSUAF.DAT, NETUAF. DAT, RIGHTSLIST.DAT and VMSMAIL.DAT. The command used to generate this re-

Figure 1.

```
DISK                          AbilityVMS V1.1                 Page 1
Disk Information                                              14-DEC-1989 16:32

                    Disk V8350$DUA0: Volume V8350_SYS
                    Free Space Distribution Display
                          # = 100% free  + = 51% to 99% contiguous free
                    <space> = 0% free    . = 1% to 50% contiguous free
Beginning                   597 blocks per cell                        End
          ##   ##+####################                          ###
          .#   ######################                          ###  .
           #   ######################                          ###  .
           #   ######################                          ###
           #   #######+##############                          ###
           #   ######################                          ###
           #.  ######################+                        .###
           +   ######################                          ####
           .  .######+##################+                      +###  +
           #  ######################.                          ###
           #  #.####################.                           .##
           #  . ######################                          ##
           #    ######################                          ##
           #    ######################                          ##+
           .    ######################                          ###
                .####################                           ###
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                .  ###################                          ###
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                 ####################                           ###
                 ####################                           ###
           +     ####################                           ###
           #     ####################+                        ###
           #     ######################                         ###
           #.   .#.####################                         ###
           ##   ######################                         ###
           ##   ##+####################                         ###
0                          608332                                  1216664
                    Free Space Distribution Summary
                    Largest free extent is 238410 blocks at LBN 369924
                    Free disk space is 407484 blocks, 33.4% of capacity
Extent     Extent     Total      % of                Percentage of Free Space
Size       Count      Blocks     Free Space          0% 50% 100%
     1+    2              6      0.00
     4+    2             15      0.00
    13+    1             24      0.00
    28+    5            234      0.05
    73+    3            228      0.05
   298+    3           1293      0.31
   748+    3           3777      0.92
  2998+    4          20754      5.09                +
 14998+    2          42756     10.49                +++
 29998+    2          99987     24.53                ++++++++
149998     1         238410     58.50                ++++++++++++++++++++
```

The DISK FREE_SPACE report displays a graph of free space as a map of logical blocks.

port was:

```
$ ABILITY ACCESS
/TYPE=SENSITIVE_FILES/ACCESS=W
```

The same kind of report can be generated for an entire disk or directory. For instance, the command:

```
$ ABILITY ACCESS
/USERNAME=SMITH/DISK=$1$DUA2:
/TOPIC=WHATS_ACCESSIBLE
```

reports all the files on disk 1DUA2: that user Smith can access, as well as who owns the files. This is a powerful feature for security-minded sites.

2. The DISK Facility — Ability's DISK facility reports information about disk volumes. Four reports impart useful information: DISK CLUSTER SIZE, DISK FREE SPACE, DISK STATUS and DISK VOLUME SUMMARY. They provide information not available from VMS SHOW commands. For instance, the DISK STATUS report shows everything the DCL command $SHOW DEVICE D does (i.e., device name, error count, volume name and free blocks), but it adds the percentage of free space available. This is important performance information, because VMS disk performance suffers when free space drops below 25 percent.

The DISK FREE_SPACE report is useful on systems that don't have disk defragmenting software (see Figure 1). It displays a graph of free space as a map of logical blocks. Most defragmenting

utilities use a display of this type. It's a visual indication of free space consolidation. If you don't have a defragmenting utility, you can use this report to determine when a full backup and restore is necessary.

3. The FILES Facility —The FILES facility produces reports that tell you how your disk space is being used and who's using it. Unlike the facilities discussed so far, the FILES facility has a handful of file maintenance routines that duplicate DCL commands, although Ability adds functionality. For example, the command:

```
$ ABILITY FILES/TOPIC=BIG_FILES/PURGE
```

purges all files with a block size greater than or equal to 500 blocks. Without the /PURGE qualifier, this command lists the big files.

My favorite reports from this facility are WHERE DID IT GO and WHO TOOK IT. Figure 2 is a WHO TOOK IT report that clearly shows which account is using the majority of the disk space on volume DUA0:. Another great report is TOP USERS, which lists users by the amount of file spaces they've used/allocated. With this report, you can see who the disk hogs are at a glance. In all, 28 reports or actions are available in the FILES facility.

4. The OWNER Facility — The OWNER facility is used to scan directories for files that don't have the same ownership as their parent directory. The REPAIR_FILES and REPAIR_ DIRECTORY options let you interactively fix ownership inconsistencies as they're reported. In this way, you can decide which files and directories are correct and which aren't. Ability's OWNER facility reports are similar to one another, differing only by how you want the information sorted, e.g., by directory, directory UIC or file UIC.

5. The VIEW Facility — The VIEW facility reports information about processes. Again, Ability provides information not available from VMS utilities. Say you want to know who's operating with privileges other than the VMS default. To get this information, use the VIEW SECURITY report. To get this information from VMS, you'd have to write a command procedure using the F$GETJPI lexical function. The procedure would be slow and cumbersome. Using Ability, you issue the command:

```
$ ABILITY VIEW   /TOPIC=SECURITY
  /OUTPUT=SECURITY.RPT/WIDTH=80
```

This command produces the report shown in Figure 3. Other VIEW reports let you see open files, users, interactive processes, batch jobs and what's running. Although this information is available from DCL SHOW commands, Ability's flexibility is far superior.

For example, the DCL command $SHOW DEVICE/FILES displays all open files on a device, but you can't select a single user's files. With Ability, you can. The OPEN FILES report allows you to display open files by username or UIC. Another useful report is WHATS RUNNING. It shows you what image users are

Figure 2.

```
FILES                    AbilityVMS V1.1                 Page 1
File Information                                         14-DEC-1989 16:58
                                                 Number of File Size
File UIC                 File Username           Files    (Used/Alloc)
[SYSTEM]                 SYSTEM                  26       10607/15117
[BYNON]                  BYNON                   22       508/624
[DECNET]                 DECNET                  1        1/3
                                          Total: 49       11116/15744
Total files selected: 49
```

Part of the FILES facility, this WHO TOOK IT report shows which account is using most of the disk space on volume DUA0:.

Figure 3.

```
VIEW                              AbilityVMS V1.1                    Page 1
Process Information                                                  14-DEC-1989 19:12
VAX/VMS V5.2 on node V8350 14-DEC-1989 19:12:03 Uptime: 1 17:57:15

                                                                     Job
Process Name     UIC              Term   Process Privileges          Type
AUDIT_SERVER     [SYSTEM]                CMKRNL DETACH PSWAPM ALTPRI DET
                                          SETPRV TMPMBX WORLD OPER
                                          EXQUOTA NETMBX SYSPRV SYSLCK
BYNON            [BIS,BYNON]     TXA4:  (all)                       DIAL
CACHE_SERVER     [SYSTEM]                (all)                       DET
CLUSTER_SERVER   [SYSTEM]                (all)                       DET
CONFIGURE        [SYSTEM]                CMKRNL LOG_IO PRMMBX BYPASS DET
                                          SHARE
ERRFMT           [TEMPSHUT]              CMKRNL WORLD BYPASS         DET
EVL              [SYSTEM]                (all)                       DET
HITMAN           SYSNAM                  PRMMBX WORLD OPER           DET
                                          EXQUOTA SYSPRV
JOB_CONTROL      [SYSTEM]                SETPRV                      DET
M11CAL_ALARM     [SYSTEM]                (all)                       DET
M12              [SYSTEM]                (all)                       DET
NETACP           [SYSTEM]                (all)                       DET
OPCOM            [SYSTEM]                CMKRNL SETPRV WORLD OPER    DET
                                          EXQUOTA NETMBX SYSPRV
REMACP           [1,3]                   CMKRNL SYSNAM LOG_IO TMPMBX DET
                                          NETMBX
SMISERVER        [SYSTEM]                (all)                       DET
SWAPPER          [SYSTEM]                (none)                      DET
SYMBIONT_0001    [SYSTEM]                SETPRV                      DET
SYMBIONT_0002    [SYSTEM]                SETPRV                      DET
SYMBIONT_0003    [SYSTEM]                SETPRV                      DET
VAXsimPLUS V1.2  [TEMPSHUT]              SYSNAM DIAGNOSE PRMMBX SETPRV DET
                                          TMPMBX OPER EXQUOTA BUGCHK
                                          BYPASS
VPA_DC           [SYSTEM]                CMKRNL GRPNAM DETACH PSWAPM DET
                                          ALTPRI WORLD EXQUOTA SYSLCK
Total processes selected: 21
```

This VIEW SECURITY report shows who's operating with privileges other than the VMS default.

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Data filtering	•	•	•
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running. This information isn't available from the DCL $SHOW SYSTEM command. For years, I've used a homegrown utility to get this information.

Menus And Screens

The product's developers used SMG and MACRO-32 as development tools. Consequently, Ability is very fast.

The menu system is based on the common light bar approach. Choices are put on the screen, and you make a selection by moving the light bar with the arrow keys. This is how the main Ability options are selected. Other options, such as EXIT or HELP, are presented in a menu bar at the top of the screen. To move the cursor to the menu bar, press PF1. At the bottom of the screen, an information window tells you what Ability is doing while a report is created.

As good as Ability's menu is, it can only take you so far. The professional Ability user will use the DCL interface to create customized reports. Also, most system managers will find it beneficial to create Ability reports in batch. Many file system and security reports can take several minutes to run. Why wait, and why put the load on the system during normal interactive hours? Using the /OUTPUT qualifier, you can direct Ability output to a file.

For those who hate manuals, Ability installs help in the system help library. The help is thorough and provides most of the information about Ability you'll ever need. Documentation is clear and concise.

Unfortunately, Ability doesn't provide clusterwide process information. This could have been achieved easily by writing a system application driver (SYSAP) that takes advantage of System Communication Services. Clusterwide process management is important to VAX system managers. This is especially true when you manage a cluster of four or more VAX CPUs.

AVAIL PRESIDENT Michael Sigourney reports that several improvements will appear in Ability V2.0. First, the menu will support process spawning. By pressing a function key, a subprocess will be spawned, so you can perform other tasks, such as taking a corrective action. Another important upgrade is an option that lets you access VMS MAIL from anywhere within Ability. At the DCL level, a /BATCH qualifier is being added that lets Ability DCL commands be submitted directly to batch. Finally, you'll be able to perform actions (suspend, resume, stop, priority, notify, and so on) on selected processes.

In sum, Ability is cleanly executed and is a valuable tool for daily system management tasks. ■

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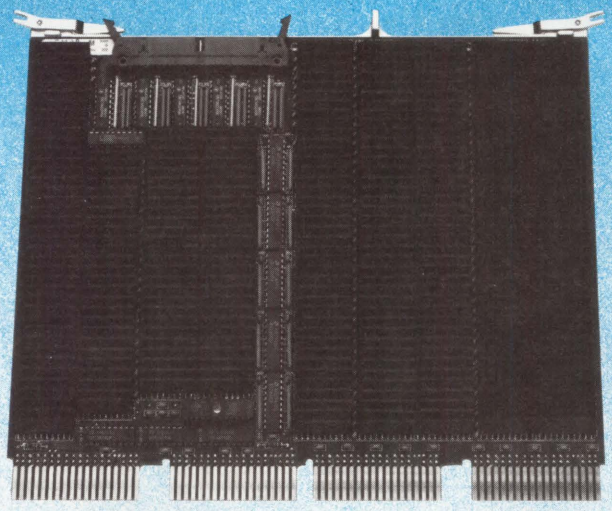

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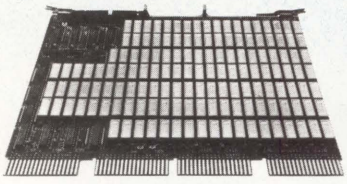

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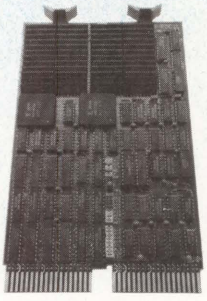

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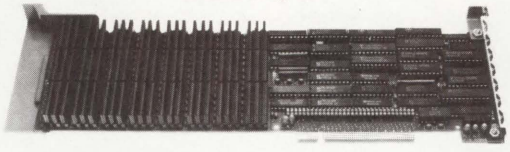

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The Ins And Outs Of Installing A Seagate Sabre SCSI Disk Drive On A DECsystem 3100

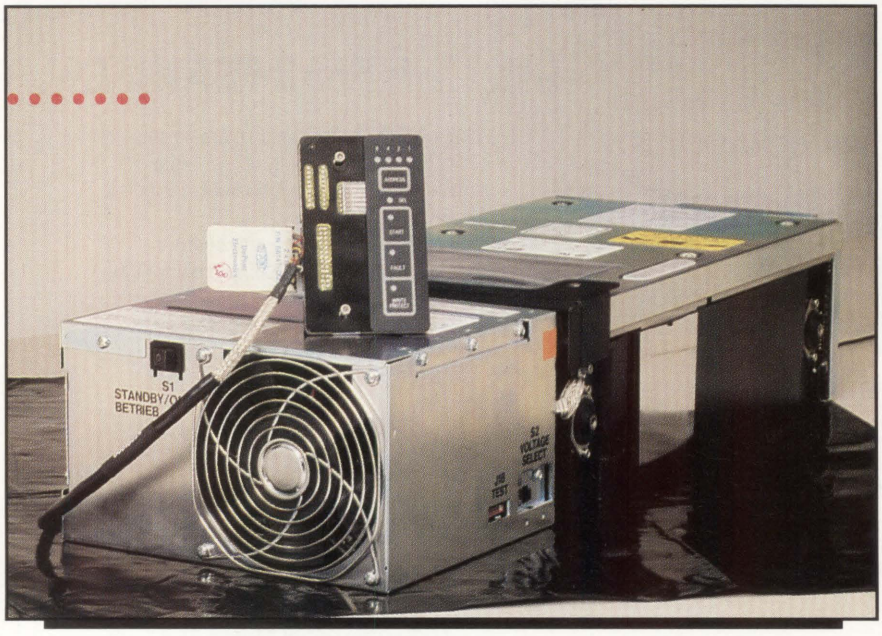

Photo: Stephen Krouch

We have been using Seagate Technology Inc.'s Sabre drives — formerly made by Imprimis Technology, which recently was purchased by Seagate — on our production VAXcluster for a while now. They've proved to be fast, highly reliable disks. A project we recently envisioned for our DECsystem 3100 was to install a third-party SCSI drive to complement the system's RZ55. A Seagate Sabre 1.2-GB drive is the first in what we hope will be a series of "foreign" drives we'll put on the 3100.

Although attaching the drive to the CPU was straightforward, configuring ULTRIX to recognize the drive fully posed a challenge. There isn't much detailed "cookbook" installation information to help you configure ULTRIX. Apparently, my problem wasn't unique. Much interest in installing third-party drives (Seagate products in particular)

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on DECsystem 3100s is evident on UUNET.

UUNET was a source of a number of good solutions. Following the suggestions offered, I could get our Sabre operational. The procedures outlined below were derived from a large dose of UUNET advice and a good deal of searching in Seagate and DEC manuals. I also found the *UNIX System Administration Handbook* by Evi Nemeth, et al. (Prentice-Hall Inc.) extremely helpful.

Hardware Installation

Mounting and attaching the drive to the system was easy. The instructions from Seagate are clear and detailed. It's hard to go wrong if you stick with the documentation. Hardware installation consisted of attaching the power supply and a control panel to the drive. A standard SCSI cable attached the Sabre to an existing SCSI device on the 3100.

DIP switches on the drive's SCSI I/O board can be used to set the SCSI ID, enable/disable parity checking, set the power-up sequence and enable loopback for diagnostic purposes. Of a group of switches on top of the unit, the only one you need to look at determines whether to allow or prevent write operations.

Jumpers also are located on the top of the unit. The jumpers of interest determine the behavior of the drive during sweep cycle operations. Sweep cycles cause periodic movement of the drive heads to different areas of the disk during idle periods. These cycles can improve drive reliability. During a 13-hour period, sweep cycles consume only 11 seconds. Seagate encourages the use of sweep cycles, but foregoing them won't affect your warranty.

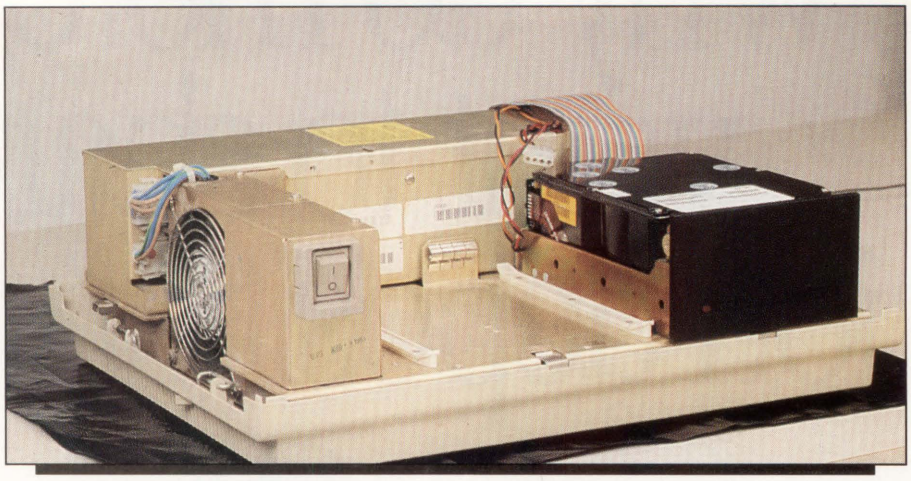


Photo: Stephen Krouch

DEC Rainbow PCs, with their power supplies, make excellent disk drive cabinets.

Physical operation of the drive is simple. A four-switch operator's panel is for SCSI address selection, drive start, fault clear and write protect. An extended operator's panel is available with a keypad to help you perform diagnostics.

Does It Do ULTRIX?

After physically installing the drive, ULTRIX must be configured. Doing a test -c at the monitor prompt, you'll see the drive information appear on the console. Seagate's manuals include detail on this data. Information displayed at boot time also tells you that the system senses an unknown disk drive is attached (see Figure 1).

To create device-special files, do a **cd** to **/dev** and run **MAKEDEV**. Because the Sabre was set to come up as **rz1**, we did a **MAKEDEV rz1**. This created the device-special files **rz1a** through **rz1h** and **rrz1a** through **rrz1h**.

Next, the **/etc/disktab** file was edited to add disk geometry information for the new drive (see Figure 2). Here's what the entries mean.

Line one specifies the drive name the system recognizes along with a descriptive character string. Line two specifies the drive type (ty), number of sectors per

Figure 1.

```
Ultrix V3.0 (Rev. 7) System #2: Thu Nov 30
05:55:22 EST 1989
real mem = 8388608
avail mem = 5410816
using 204 buffers containing 835584 bytes of
memory
DECstation 3100 - system rev 1
cpu0 ( version 1.6, implementation 2 )
fpu0 ( version 2.0, implementation 3 )
rz0 ( RZ55 )
rz1 ( UNKNOWN )
tz5 ( TK50 )
se0 ( ethernet address 8-0-2b-d-c1-fa )
```

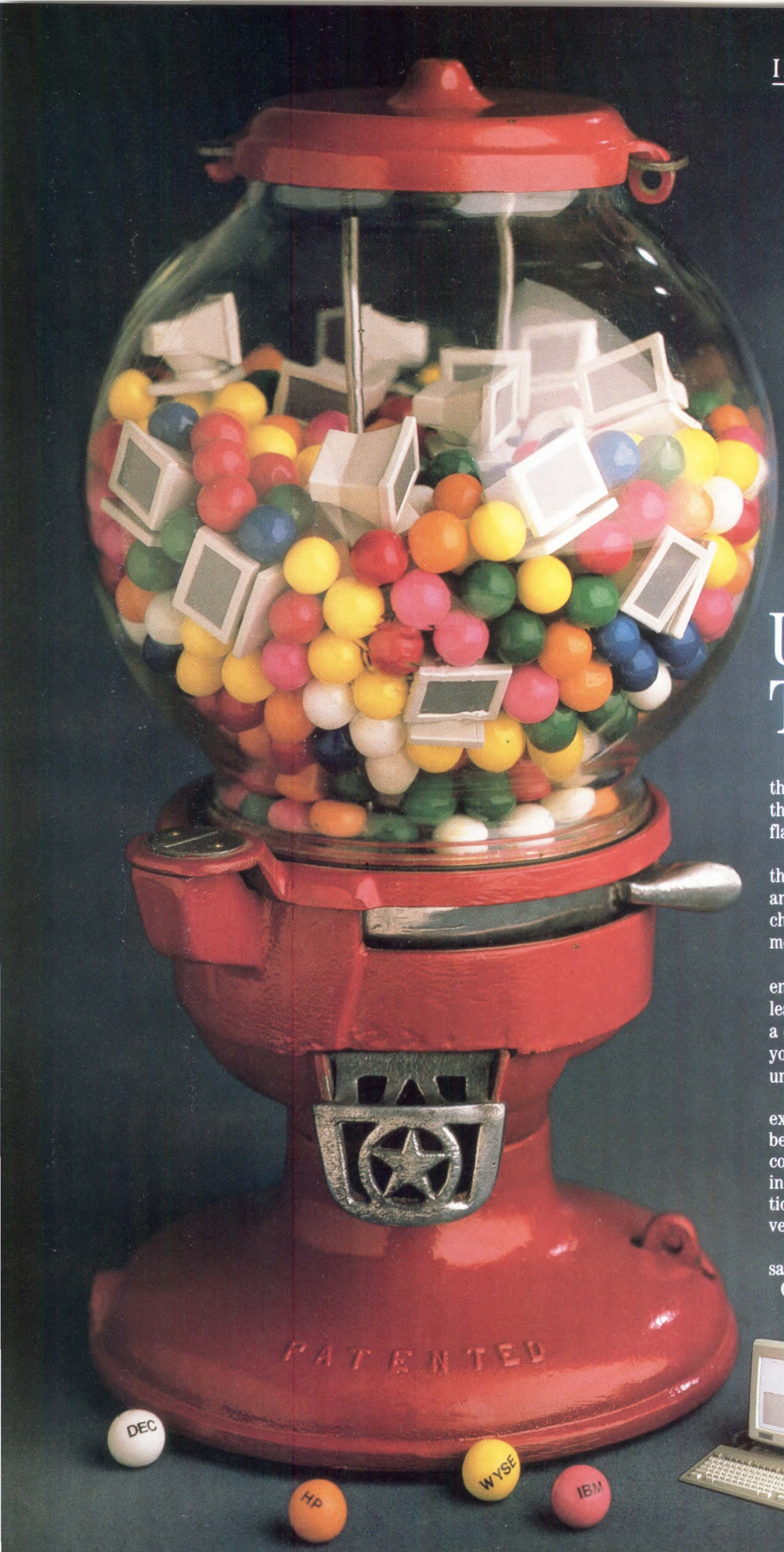
Console display upon booting the DECsystem 3100. Before configuring the Sabre into the kernel, it appears as an (UNKNOWN) device.

Figure 2.

```
rzsa|RZSA|Seagate Sabre 1 GB SCSI Drive:\
        :ty=winchester:ns#84:nt#15:nc#1635:\
        pa#32768:ba#8192:fa#1024:\
        pb#131072:bb#8192:fb#1024:\
        pc#2060100:bc#8192:fc#1024:\
        pd#524288:bd#8192:fd#1024:\
        pe#524288:be#8192:fe#1024:\
        pf#847684:bf#8192:ff#1024:\
        pg#1896260:bg#8192:fg#1024:
```

The /etc/disktab entry showing the partition layout and geometry of the Sabre.

INFINITY SERIES TERMINALS



Unexpected Treats

Is a terminal like a gumball? Some people think so. Yet even though they all look alike on the outside, on the inside, they're all different flavors. With different features and capabilities.

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Figure 3.

```
sz_rzsa_sizes[8] = {
        32768,      0,          /* A=blk 0 thru 32767 */
        131072,     32768,      /* B=blk 32768 thru 163839 */
        -1,         0,          /* C=whole disk */
        524288,     163840,     /* D=blk 163840 thru 688127 */
        524288,     688128,     /* E=blk 688128 thru 1212415 */
        -1,         1212416,    /* F=blk 1212416 to end */
        -1,         163840,     /* G= D + E + F */
        0,          0,          /* H= 0 (default) */
},
```

The structure entry defining the new default partition table we chose for the Sabre. This table was compiled into the new kernel and copied into the superblock of the Sabre's partition a.

track (ns), number of tracks per cylinder (nt) and number of cylinders per drive (nc). Lines three through nine define each partition's size, blocking factor and fragment size. Information to complete the **/etc/disktab** entry can be found in the Sabre's manuals. We looked at the way DEC partitions its drives and played follow-the-leader. The partitioning scheme you choose will depend on your preferences and applications.

The command **newfs -v /dev/rrz1c rzsa** creates a new file system on the drive's c partition. The **mount -v /dev/rz1c /mnt** mounts the new file system. You also can add the mount information to **/etc/fstab** so that the file system automatically is mounted when the system is rebooted.

My gleanings from UUNET told me that the disk would be perfectly usable this way as long as I stuck to using partition c, which, according to our configuration, encompassed the entire disk. If I wanted to get adventurous and use other partitions, I could configure a partition table into the kernel.

Default partitioning information is held in **/usr/sys/data/scsi_data.c**. You'll find a number of entries for DEC disks after which you can model the Sabre entry. You must pay attention to the **/etc/disktab** entry you created. Our **scsi_data.c** entry is shown in Figure 3. Make sure you're in the correct section of code before proceeding. The #ifdef vax and #ifdef mips sections look alike at first glance.

Figure 4.

```
{"CDC     EMD 97201 (1.2)", 8,
"RZSA", SZ_DISK, sz_rzsa_sizes,
SCSI_TRYSYNC|SCSI_STARTUNIT|
SCSI_REQSNS|SCSI_TESTUNITREADY|
SCSI_READCAPACITY, 0 },
```

Farther down the scsi_data.c file, this entry is added for the Sabre.

Farther down the **scsi_data.c** file, a **scsi_devtab** structure entry for the new disk must be added (see Figure 4). The first string is returned by the drive when the CPU polls it for its identification. The second string is printed by the kernel at boot time. In our example, the (UNKNOWN) string we got at boot time for **rz1** was replaced by (RZSA). Again, I modeled my entry after DEC's.

Now the kernel must be rebuilt. Instructions for doing this can be found in the *ULTRIX Configuration File Maintenance* manual. I followed the section that guided me through a manual rebuild of the kernel. After rebuilding the kernel and moving it to **/**, you reboot your system. You'll know that the system recognizes the drive correctly when you see the entry for the new disk change from (UNKNOWN) to (RZSA) or whatever you called your disk in **/usr/sys/data/scsi_data.c**.

Edit the **scsi_data.c** file and rebuild

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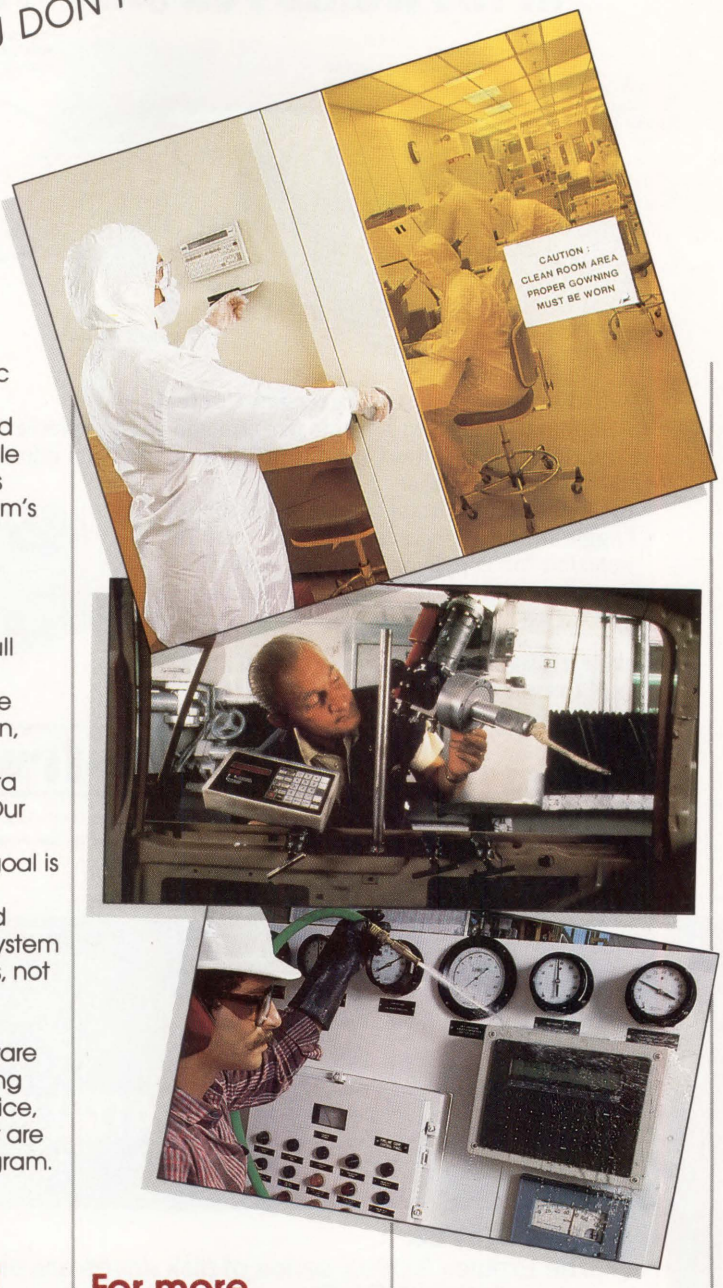

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the kernel as needed until you have a functional drive recognized by the system as more than just (UNKNOWN). It took a few iterations of **edit scsi_data.c/rebuild the kernel/try rebooting** to get it right.

One extra step I took was to copy the new partition table I built to the superblock of the a partition of the Sabre. I followed the guidelines in DEC's *Guide to System Disk Maintenance for RISC Processors* and the *System Management Reference Pages* under the **chpt(8)** command.

Thanks to detailed manuals from Seagate and DEC, excellent information in the *UNIX System Administration Handbook* and help from our friends on UUNET, our DECsystem 3100 is alive and well with an RZ55 and a 1.2-GB Sabre.

Fueled by this success, I'm installing a Seagate Wren VI in the same system. If the drive's base in the photo on page 88 looks familiar, you probably recognize it as a Rainbow. It provided a good power supply and drive cabinet.

Do you have concerns about adding third-party peripherals to your DECsystem 3100? I'd like to see your solutions to the DECsystem 3100 third-party disk drive problem. Send suggestions to me at Professional Press Inc., 101 Witmer Rd., Horsham, Pennsylvania 19044 or on UUNET at uucp%miller@propress.com. ■

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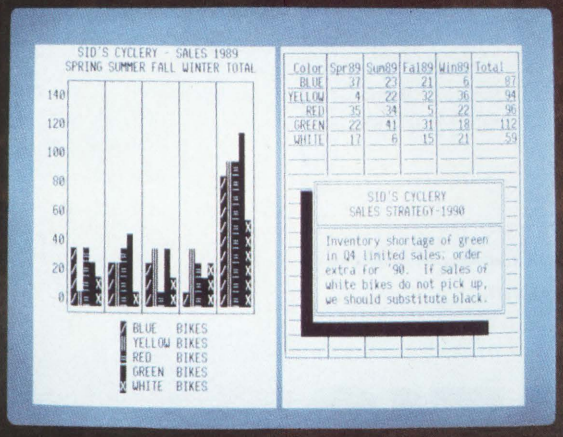

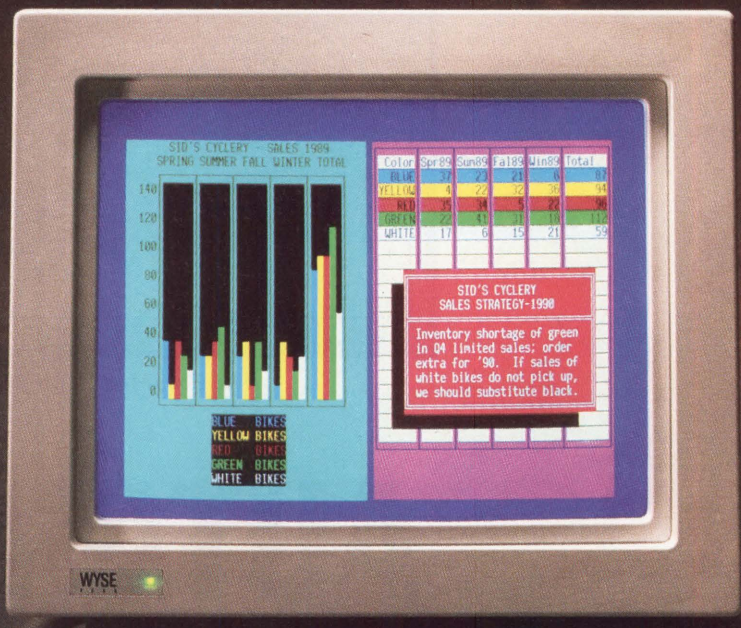

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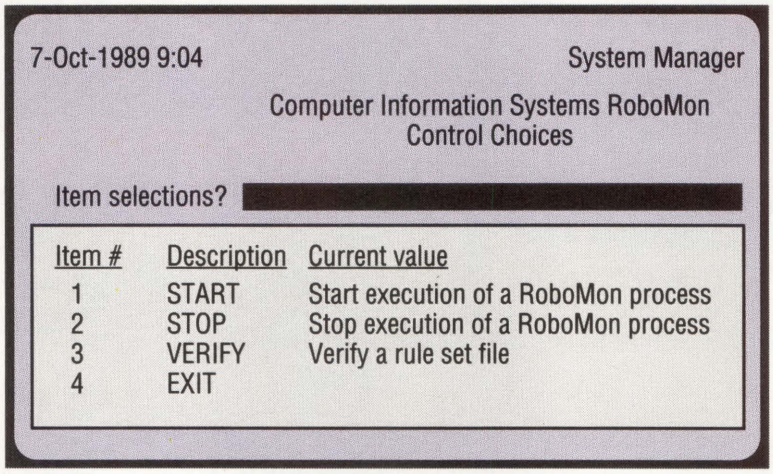

The RoboMon Control Choices screen.

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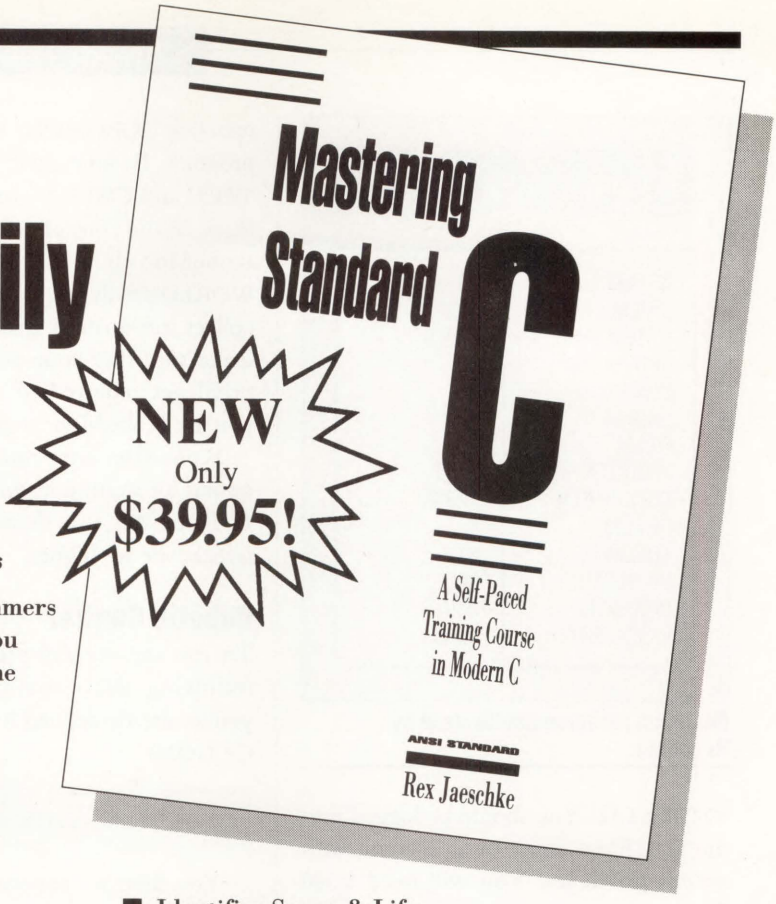

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Figure 1.

ASTLM	24
BIOLM	18
BYTLM	26000
CPULM	0
DIOLM	18
ENQLM	50
FILLM	30
JTQUOTA	2048
PGFLQUOTA	12800
PRCLM	6
TQELM	31
WSDEFAULT	300
WSQUOTA	800
WSEXTENT	2000

Minimum resource quotas used by RoboMon.

VMSINSTAL. You should be logged into the SYSTEM account or an account with system privileges. You will need 5,300 free blocks on your system disk during installation. This space will be freed up after the product is installed. You will also need 5,300 free blocks for the RoboMon files on the disk where you will be installing the program. By default, RoboMon's files are installed in a directory called [ROBOMON].

Before starting the RoboMon process, you need to assign a logical, ROBOMON_LOCATION, to point to the device and directory where the RoboMon files are located:

```
$ ASSIGN/SYSTEM/EXECUTIVE -
_$ 'location' ROBOMON_LOCATION
```

where 'location' is the device and directory where the RoboMon software resides.

To automate the procedure, place the line in your system startup file immediately followed by:

```
$$ @ROBOMON_LOCATION:
 ROBOMON_ASSIGN_LOGICALS.COM
```

We'll examine how to start the RoboMon process at system startup later.

RoboMon runs as a detached process using the ROBOMON.EXE image. The process is started and stopped by the interactive ROBOMON_ CONTROL.EXE program. Be sure your process has DETACH and CMKRNL or SETPRV privileges, or the control program won't start RoboMon. It would be useful to have WORLD privilege to allow RoboMon to collect information systemwide. Finally, make sure that your process has all the privileges required to take the actions you ask RoboMon to perform.

RoboMon uses minimum resource quotas for starting its process (see Figure 1). RoboMon uses these values or yours, whichever are higher.

Robotic Control

To run the control program, issue the following DCL command (note that you've already defined ROBOMON_ LOCATION):

```
$ RUN ROBOMON_LOCATION:ROBOMON_CONTROL
```

You then are presented with the CIS RoboMon copyright screen quickly followed by the top-level Control Choices screen shown on page 94.

Select Item 1, START (it defaults to that option at the Item selections? prompt). You're then prompted for a rule set file,which contains rule set definitions that tell RoboMon which conditions to monitor and which actions to take. The RoboMon Startup screen presents run-time options, including start and stop times, destination for any rule set error listings and any output messages for the process (action output destination). The defaults are shown in Figure 2.

When you're satisfied with the options, choose Item 7, START, the default in this screen as well. RoboMon then prompts you for confirmation. You must answer yes or RoboMon won't start. The rule set file you've specified is verified for syntactical errors, and the RoboMon process is started. The process name defaults to "ROBOMON_" appended with the system time that you took the START option in the Control screen, i.e., ROBOMON_10:20. A startup confirmation message shows the process's PID. You can start multiple RoboMon processes using different rule set files. To stop a RoboMon process, enter the STOP screen from the Control Choices screen. You also can STOP/ID the process from DCL.

Follow The Rules

When you specify a rule set file when STARTing RoboMon, it can either be a source file or a compiled rule set file. If you specify a source file with the default extension .RUL, the control process

Figure 2.

7-Oct-1989 09:04 System Manager

Computer Information Systems RoboMon
RoboMon Startup

Item selections?

Item #	Description	Current value
1	Rule set file	SAMPLE.CRL
2	Date and time to start	Now
3	Date and time to stop	Never
4	Rule set error listing	TT:
5	Action output destination	ACTION.LOG
6	RoboMon process name	ROBOMON_09:04
7	START	
8	EXIT	

The RoboMon Startup screen presents run-time options.

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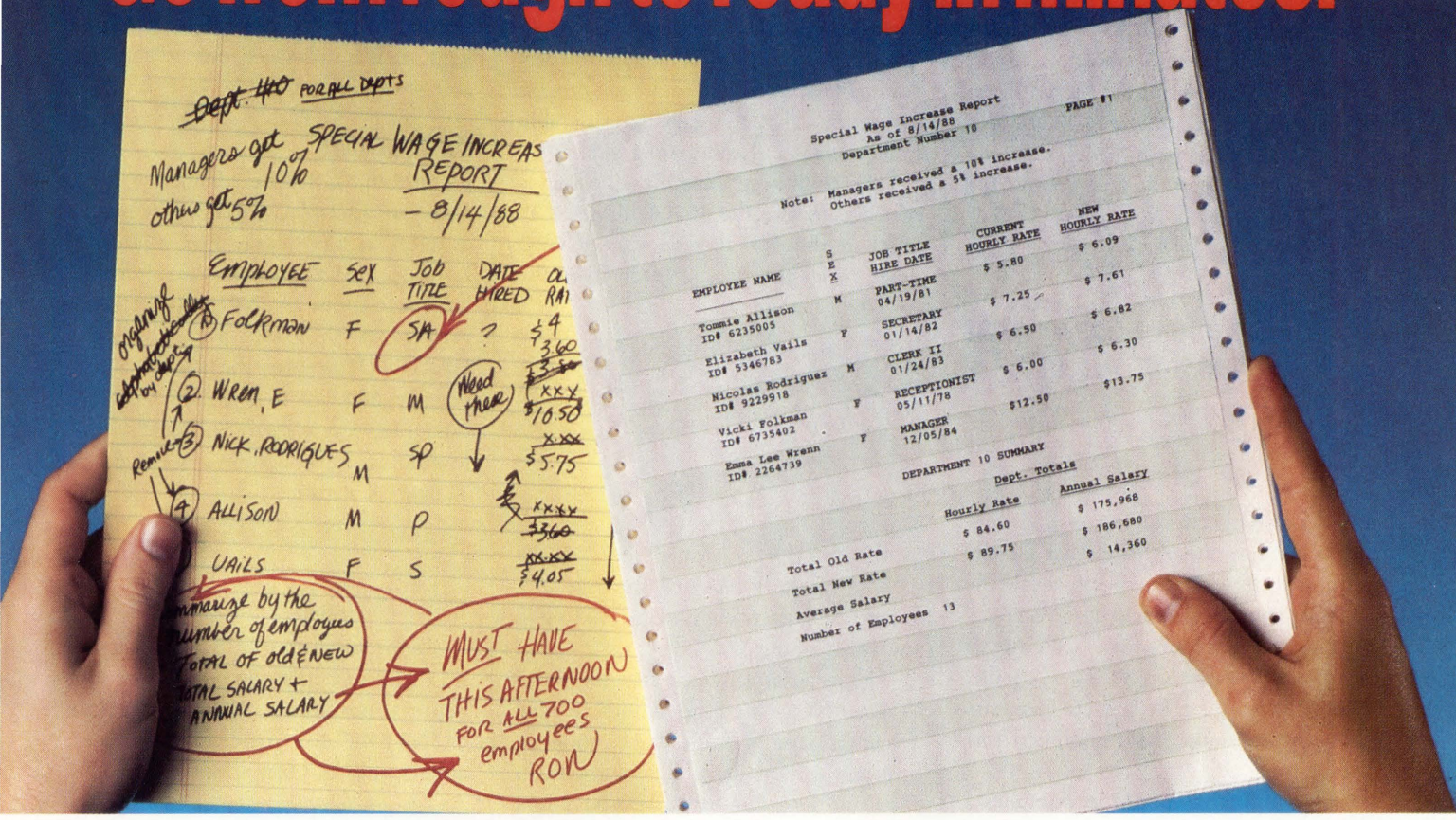

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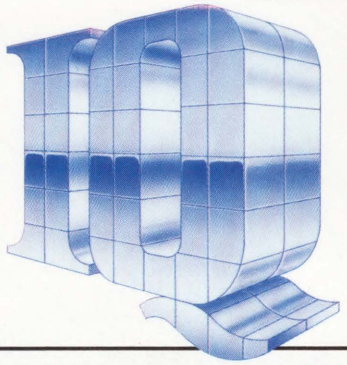

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compiles it as part of the verification process before it starts RoboMon. If you specify a compiled rule set file with the default file extension .CRL, ROBOMON_CONTROL only checks that it was compiled using the current or a compatible version of RoboMon.

> **RoboMon doesn't care what file extension you use.**

RoboMon doesn't care what file extension you use. If you specify a rule file without an extension when you START a process, it first looks for a .CRL file. If it can't find one, it looks for a .RUL file. This way, you can keep your filenames the same for source and compiled rule files.

Even though RoboMon compiles a source file before it uses it, it doesn't save the compiled version after it starts a process. To do that, choose Item 3, VERIFY, from the Control Choices screen to bring up the Rule Set Verification screen. After entering a rule set file name, choose Item 5, VERIFY (the default selection), to verify that file.

A rule set source file is just an ASCII text file that you create with a text editor such as EDT. The syntax is straightforward and easy to master even if you have little or no programming experience. The keywords are English and unambiguous.

A rule set file is composed of rule sets made up of rules. A rule is simply a stated condition you want to monitor and an action you want to take. In fact, CONDITION and ACTION are the two basic keywords. Conditions are RoboMon-supplied or user-derived statistics.

Taking Action

Actions can be RoboMon statements or procedures that execute within a single subprocess maintained by RoboMon, such as MAIL or PROCEDURE, which performs a DCL command procedure. The RoboMon PROCEDURE/SPAWN command spawns a separate subprocess for actions that can take considerable time, such as a file purge of a disk.

The following example rule logs a message to the file PERFORMANCE.LOG in the default directory if CPU usage meets the criteria specified in the ACTION statement:

```
RULE CHECK_CPU
! This rule logs a message if the CPU
  becomes greater than 95% busy.

    CONDITION
        CPU_BUSY_PCT>95
    ACTION
        LOG/FILE=PERFORMANCE.LOG
        Investigate CPU bottleneck

 END RULE CHECK_CPU
```

The result of inserting this rule in a simple rule set file with one rule set is shown in Figure 3.

Figure 3 has only one rule set: PERFORMANCE. It's a good idea to plan which conditions you'd like to monitor and take action on and organize them into rule sets. For example, you might organize checks on memory, including page fault rate and free memory checks, or CPU-related conditions, such as processes in the compute queue and percentage of CPU usage, in a rule set called PERFORMANCE. You might define another rule set to examine disk-related items such as disk space, disk I/O and file access.

On Your Own

RoboMon has many predefined statistics. Some are available as rates or percentages as well as raw data. For example, FAULTS_HARD provides the number of hard page faults, FAULTS_HARD_RATE represents the rate, and FAULTS_HARD_PCT returns the data as a percentage of FAULTS_TOTAL. You also can DEFINE your own statistics. The following example defines a CPU_BOTTLENECK statistic:

```
DEFINE STATISTIC CPU_BOTTLENECK
  CPU_BUSY_PCT>95 OR
  (PROCESSES_COM+PROCESSES_COMO)>3
END STATISTIC CPU_BOTTLENECK
```

At the beginning of the rule set file, it's useful to define the context for subsequent monitoring. You can DEFINE CONTEXT for processes, devices, queues, jobs and files with the syntax:

```
DEFINE PROCESS CONTEXT=*
DEFINE DEVICE CONTEXT=$1$DU*
```

Note the asterisk (*), the standard DCL wildcard character.

If a task will be repeated throughout the rule set file, you can save keystrokes

Figure 3.

```
RULE SET PERFORMANCE, INTERVAL=15:00
! This rule set executes every 15 minutes.

   DEFINE DEVICE CONTEXT=$1$DU*
! Device rules operate on each $1$DU* device.

   RULE CHECK_CPU
! This rule logs a message if the CPU becomes greater than 95% busy.

     CONDITION
         CPU_BUSY_PCT>95
     ACTION
         LOG/FILE=PERFORMANCE.LOG Investigate CPU bottleneck

   END RULE CHECK_CPU

   RULE CHECK_DEVICE
! This rule sends a mail message if any $1$DU* device incurs errors.
! The error message indicates which device to check. Once mail is
! sent for a device, the  rule becomes inactive for that device for
! 1 hour to allow time to investigate.

     CONDITION
         DEVICE_ERROR_COUNT>0
     ACTION
         MAIL/USER=SYS_MGR Investigate errors on (DEVICE)
         DISABLE/INTERVALS=4 CHECK_DEVICE

   END RULE CHECK_DEVICE

END RULE SET PERFORMANCE
```

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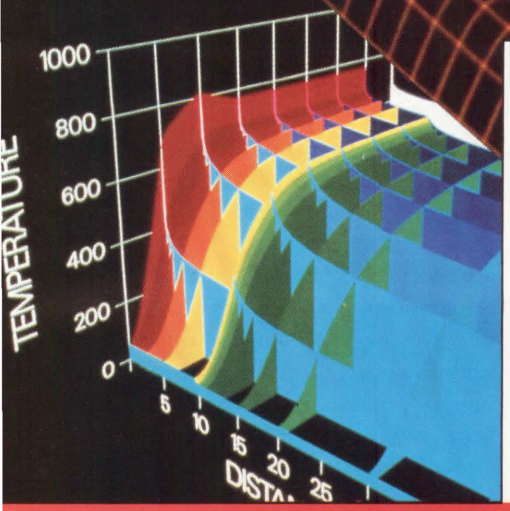

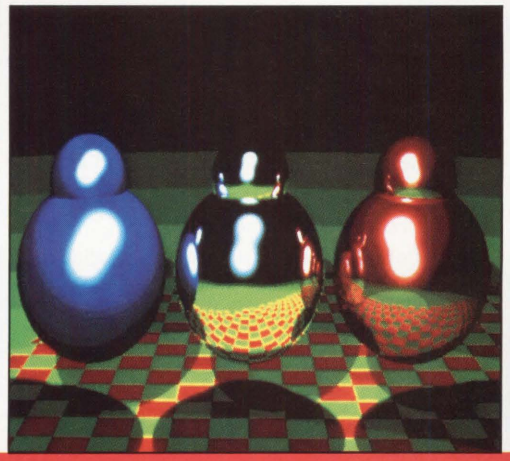

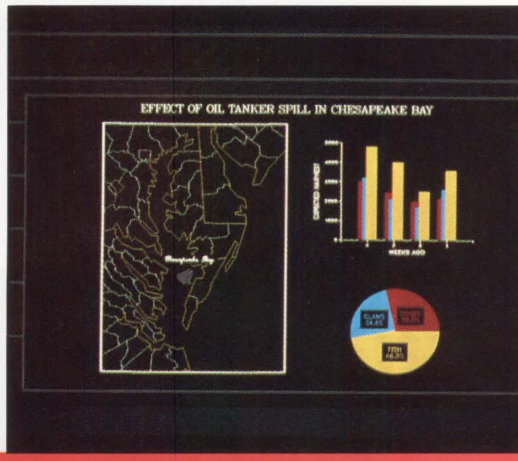

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CIRCLE 110 ON READER CARD

and aid readability by defining a macro. The following defines a macro to write the result of actions to a log file:

```
DEFINE MACRO LOG_PERFORMANCE
LOG/FILE=ROBOMON_LOCATION:PERFORMANCE.LOG
END MACRO LOG_PERFORMANCE
```

Sample Files

The RoboMon package includes sample and tutorial files to help you get started writing your own rule set files. The documentation set includes tutorial information based on these files.

When you're satisfied with your rule set file, your next step should be to compile it by taking the VERIFY option. After it verifies with no errors, you can choose to use the compiled rule set file in an automated RoboMon startup procedure.

The first step in automating RoboMon startup is to replace the line that should already be in your system startup file:

```
$ @ROBOMON_LOCATION:ROBOMON
  _ASSIGN_LOGICALS.COM
```

with:

```
$ @ROBOMON_LOCATION:ROBOMON_STARTUP.COM
```

This procedure starts the RoboMon control program using the script file ROBOMON_STARTUP.SCR. A script file is just another ASCII file containing menu selections and dialogue responses to the prompts in the running program. The documentation provides instruction on how to create your own script files. Script files also can be created on the fly as you interactively enter your responses to the file prompts. You should edit this file to replace SAMPLE.SCR with your own compiled rule set file.

RoboMon supplies four categories of help. PF2 provides syntax help, PF3 provides data help (it lists valid responses), PF4 provides context help and typing HELP provides detailed, DCL-like help at any prompt.

ROBOMON DOCUMENTATION is complete. It explains all RoboMon statistics and includes a rule set file reference and a tutorial. The installation guide displays a typical installation scenario.

As we go to press, Computer Information Systems is announcing RoboMon V.3. This release incorporates reporting, graphics and data-management features. Rule set files are included to aid the system manager in monitoring his system. System problems are analyzed and solutions recommended.

Significant in RoboMon V.3 is the ability to store VMS data in normalized data files. A normalized file is an ASCII file that can be read and processed by RoboMon to produce reports and graphs. Graphics are in GKS format. Line, bar, pie, area and scatter graphs can be produced.

You also can create tabular and free-form reports. The data management feature provides "what if" capabilities in a spreadsheetlike format. Data now can be imported and exported from other software packages for use by RoboMon.

RoboMon is a well-thought-out and logically organized tool for novice as well as experienced system managers. With a little forethought, you can use it to better prepare for system events. ■

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PRICE: From $750 to $20,000, depending on configuration

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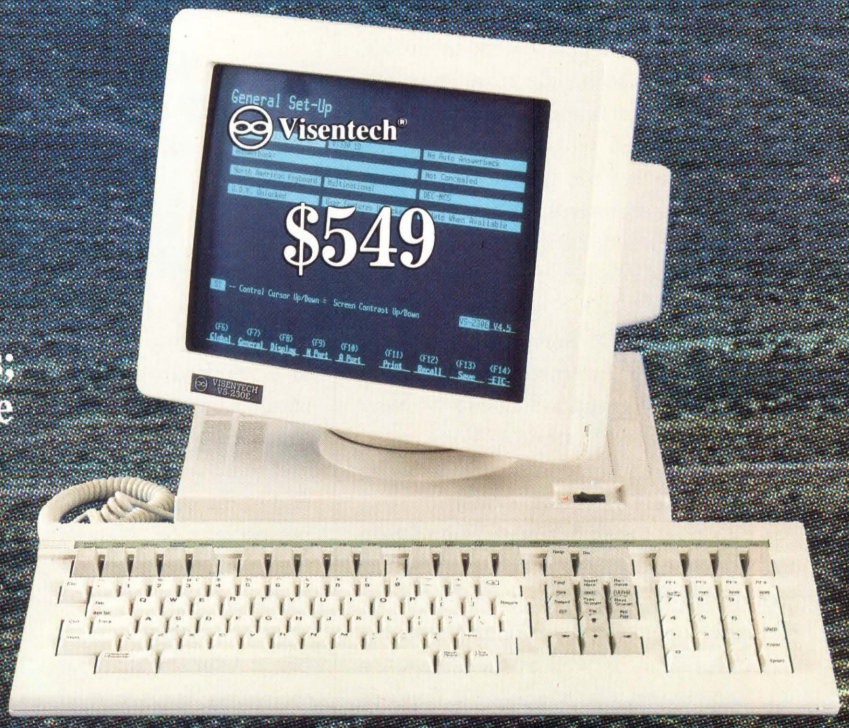

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UNIX

Elaine L. Appleton and Bill Sharp

Saving The Goose

Dissent in the UNIX flock might begin to abate this year. Angry customers have voiced concerns to DEC and other UNIX firms, pointing out that continued foul play would endanger the growth of an open systems UNIX. In the face of irritated customers, companies on both sides now seem less interested in making feathers fly and more concerned with safeguarding the UNIX goose and the golden egg that an open system represents.

As 1989 ended, cackling and honking among UNIX vendors erupted again with the release of UNIX System V Release 4 by AT&T's UNIX Software Operation (USO). UNIX International (UI), the users' advisory group in Parsippany, New Jersey, backing System V Release 4, claims 174 vendors committed to using the new AT&T operating system.

UI's rival Open Software Foundation (OSF) in Cambridge, Massachusetts, countered by announcing OSF/1, its alternative operating system due for release later this year, as well as the follow-on OSF/2, based on Mach and Encore Computer's TCP/IP. OSF reports 175 member organizations in support of its position.

UNIX users, both existing and new, are the big losers in the endless posturing by vendors, UI and OSF, all seeking to gain advantage in some new pecking order.

"DEC is definitely hearing from its major customers about the importance of straightening out UNIX standards," says Roger Heinen, manager of Digital's Open Software Group. "Customers are horribly confused. I feel it's up to the vendors to straighten out that confusion and come through with the promises that they have not fulfilled yet. It comes down to the fact that the industry has failed to live up to the promise of UNIX as a standard operating system, and it's about time that the industry got its act together."

> ***Help for those weary of controversy is on the way...***

Heinen isn't alone in calling for an end to the confusion. Ken Sills, a spokesperson for OSF, is certain customer confusion has had a serious effect on profits in the industry. "End users are confused now and afraid to make investments in brand A for fear that brand B will win and vice versa, and we all understand that."

USO tells a similar tale. "Anything that reduces the level of confusion in the industry is going to be good, both for the industry and for end users," says Dick Muldoon, USO spokesperson.

Help On The Way

Help for those weary of controversy is on the way in two forms. One is the effort by both OSF and UI to stop ruffling each other's feathers and cooperate more. The other is the new willingness by AT&T to consider allowing other firms to share in the ownership of USO, the part of AT&T that controls UNIX System V Release 4.

Even as contestants in the market took part in the early November flap, behind the scenes feathers were smoothed and discussions begun on a closer working relationship for UI and OSF. And while UNIX continues to have strong market growth, participants feel growth would be much faster with universally supported standards, if not one UNIX. AT&T and Hewlett-Packard, knowing they must limit the damage if the market is going to stay profitable, jointly proposed a more amicable relationship, and the talks started.

"We are conceptually coming toward an arrangement," says Dave Sandel, UI marketing vice president. "We're hopeful that the industry is going to see a structure that allows industry standards on everything from the operating system through the applications environment."

Heinen is similarly positive about a better working relationship. "We're very enthusiastic about the unification of the UNIX industry around a common standards body," he says. "We're also very committed to the guiding principles of OSF. We'd like to see the unity proposal that has come to light from AT&T and HP end up in a situation where we'd have the principles of OSF, with one standards body and one standard for UNIX. We believe this would serve the public and the industry quite well."

In fact, OSF and UI already cooperate with each other on three standards working groups and have worked together effectively. Still, reports of the tone of the negotiations seem contradictory. This is a reflection of the extremely complex inter-relationships, business deals and licensing agreements that seem to cross and recross this market.

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It's unlikely that negotiations will produce one unified UNIX soon. More likely, multiple implementations will adhere to standards ensuring compatibility in key areas.

"We don't think it's necessary to have one organization and one product to fill the needs of users," says OSF's Sills. "We may all have the same application interface, for example, based on X/Open. If you have standards at the man-machine interface and there's a layer of software that shields the idiosyncrasies of the machines so that applications are truly portable, then we've achieved what the users are asking for."

Heinen echoes this thought. "We'd like to see a strong standards body and a commitment to a validation suite and a commitment to having a reference implementation but certainly not the only implementation," he says. "The industry produces as many implementations as the market will bear — that will ensure that we can compete with de facto standards such as OS/2."

UI's Sandel reports that UI/OSF negotiations are continuing and are aimed at improving technical cooperation on specific topics such as multiprocessing stan-

Industry Watch

Database Wars — The battle for superiority on the relational database front intensified as DEC announced a cooperative sales and distribution agreement with Cognos. The agreement marks DEC's ongoing efforts to ally itself with relational database vendors on an international basis. Under the terms of the deal, Cognos will distribute Rdb/VMS, while DEC will resell Powerhouse, Cognos' fourth-generation application development language. The alignment is unique in that DEC's Third Party Business Program will allow its sales force to provide Cognos products directly to customers.

Chipped Away — An industrywide effort to undermine Japanese domination of the computer memory chip market unravelled because of its failure to attract investors.

U.S. Memories, a seven-company consortium that included DEC, HP and IBM, was formed in 1989 as a result of industry frustration concerning inadequate and expensive DRAM chips. Included in the original blueprint was a $1 billion chip plant to be funded by the seven high-tech outfits. Says Robert Palmer, DEC's vice-president of semiconductor and interconnect technologies: "We believe that the system companies who failed to support this venture adequately have missed an outstanding opportunity to work with the semiconductor industry to solve systems industry problems."

Back To School — A DEC and IBM eight-year agreement to help fund an MIT workstation program passed a milestone recently when MIT announced the installation of the project's 1,000th workstation. MIT's Project Athena, a $100 million joint venture undertaken by DEC, IBM and MIT in 1983, represents the largest funding agreement between the two industry giants to date. According to Project Director Earl Murman, DEC and IBM have contributed $40 million each in hardware, software, technical support staff, maintenance and networking to the program. An additional $20 million has been financed by the university.

On a related note, DEC's Database Systems Research Group currently is recruiting visiting scholars to perform original research in database systems theory and practice. Visiting academians will be encouraged to study areas ranging from design and management tools for distributed relational databases to image and multimedia DBMSs. DEC "sabbaticals" generally will be limited to one year in duration, although summer-long projects will be allowed. Interested parties should contact David Wahl at DEC's Database System Research Division, Colorado Springs, Colorado.

Aftershock Relief — As authorities in Northern California administer relief to the 10 counties affected by last October's devastating earthquake, DEC joined McDonnell Douglas in contributing an infrastructure management system to the state of California to aid in relief efforts.

The $250,000 system is installed at the Office of Emergency Services (OES) in Sacramento and will assist the OES in sifting through state and federal assistance applications and monitoring repair work on roads, buildings and other property damaged by the quake.

Sequor Agreement — DEC has signed an agreement with Sequor Software Services to acquire Pricewatch, Sequor's real-time financial market monitor. DEC will seek to benefit from Pricewatch's array of page- and record-based digital market data feeds. Additionally, Pricewatch offers security and accounting real-time data capabilities as well as data storage and analysis features.

Siemens Flexes Muscle — West German electronics heavyweight Siemens AG announced the purchase of beleagured West Germany-based Nixdorf Computer AG for $600 million. The merger will result in combined assets of $7 billion after Siemen's purchase of 51 percent of Nixdorf's stock, creating the largest computer company based in Europe.

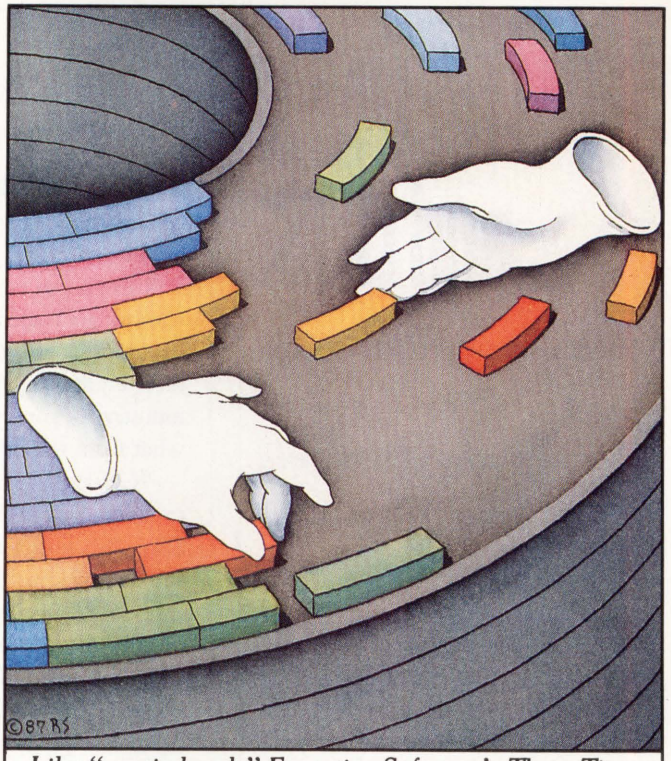
The merger hinges on the approval of West Germany's Antitrust agency, although industry sources maintain that the deal is a fait accompli. Siemens is West Germany's second largest company, while Nixdorf is that country's second largest computer maker. Nixdorf's 1989 losses were roughly $300 million.

Raking In Interleaf — DEC and Interleaf have entered into an agreement under which DEC will provide onsite hardware service for Interleaf customers. Under the terms of the agreement, DEC will supply hardware training and documentation on DEC workstations and peripherals as well as printers and scanners installed on HP-Apollo workstations.

Real-Time Speed — Real-time UNIX technology stands to gain speedier deterministic levels after an agreement among Concurrent Computer, Heurikon and Wind River Systems. Concurrent will combine its 6000 RTU-based family of multiprocessors with Wind River's VXworks, a real-time development and run-time environment, and Heurikon's HK68/V30XE 32-bit, 68030-based single-board computers.

DECWORLD Sites — DEC has decided on Boston and Cannes, France, as the sites for DECWORLD '90, its worldwide information system symposium. The Boston exposition will take place July 8 through August 1, while the Cannes event is scheduled for September. —*Brian O'Connell, East Coast Editor*

"How Badly Is File Fragmentation Slowing Down Your VAX™?"



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How Does Fragmentation Occur?

VAX/VMS tries to allocate space for a file as close to the beginning (logical block number zero) of the disk as possible. It does so even if there is plenty of free space near the end of the disk and placing the file near the beginning requires that the file be split up into many pieces.

When you consider the long-term effects of this allocation strategy on a disk in continuous use, you can readily see that fragmentation can become extreme. Before **DISKEEPER/*Plus***, the recommended remedy for disk fragmentation was to backup the fragmented disk to tape (or another disk), reinitialize the disk and restore the files from the backup save-set.

How Does Fragmentation Affect Performance?

Every disk has fragmentation unless it has just been defragmented and not used since. A file fragmented into two pieces can take twice as long to access as a contiguous file. A three-piece file can take three times as long, and so on. Some files fragment into hundreds of pieces in a few days' use. Imagine the performance cost of 100 disk accesses where only one would do! Defragmentation can return a very substantial portion of your VAX to productive use.

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dards as well as looking "at the feasibility of a structural consolidation."

USO On The Block

Meanwhile, AT&T's USO finds itself, at least unofficially, up for sale. Not much is known yet about details, although rumors go back several months. USO's Muldoon says, "It's likely that AT&T will offer equity in USO to members of the industry. Beyond that, it's too early to say what form the offer will take."

"Clearly AT&T has indicated it wants to divest itself of that division," says OSF's Sills. "It's losing money and has created some image problems for AT&T. I don't think AT&T sees it anymore as a core business that it wants to be in as a corporation. One of the central aspects of these discussions is how and who will be the new owners of the division."

Heinen says, "We've heard reports that AT&T is considering a public offering and spinning [USO] off so that it could be equally owned by members of the industry. We would have to look at it carefully to consider being an investor — we've only heard rumors so far."

Although Heinen officially wouldn't admit that DEC is interested in investing in USO, he would say, "What Ken [Olsen] has said is that we are interested as a company in getting to the bottom of this confusion, and if that's what we have to do as a company, we'll do it. We've also heard rumors that AT&T isn't going to sell [USO]."

But while efforts to end the confusion continue, so does the posturing. Says UI's Sandel, "System V Release 4 is here today. If OSF comes out with technology that's useful to the industry, we'll look to incorporate that. Don't be concerned about whether or not System V Release 4 is a safe investment. Our position is that System V Release 4 will be the standard. We believe that the industry has made its choice."

DEC believes the rumor that people will defect to System V Release 4 is untrue, "unless they want to put their future into the hands of AT&T, and DEC for one isn't ready to do that," responds Heinen.

Yet talks continue, and participants say they understand the need to end their flap and bring the flock back together before the magic goose is cooked and its golden egg addled. —*Elaine L. Appleton is UNIX Editor for* DEC PROFESSIONAL, *and Bill Sharp is Contributing Editor for* HP PROFESSIONAL. *They are partners at Fresh Air Communications, Newburyport, Massachusetts.*

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THE MAC CONNECTION

Al Cini

Mail Architectures

The biggest piece of unfinished business in the Mac-VAX/VMS connectivity marketplace — e-mail — will be addressed by several new products in 1990, a few of which currently are being field tested. This article reviews the important architectural aspects of such "cross-cultural" mail products and positions important recently announced products against them.

How E-Mail Works

The various commercially available Mac and VAX e-mail software products share a common client/server network orientation. A mail user client doesn't directly send or receive mail to and from other user clients. Instead, mail users exchange messages through a common server node on the network, which, like a real-world post office, provides the necessary mail sorting and delivery services (see Figure 1).

Client/server mail software packages for the Mac include Microsoft Mail and CE Software's QuickMail. Their server ends normally run on a dedicated Mac node in the organization's AppleTalk network. Similar mail utilities for VAX/VMS include the familiar VMS MAIL utility bundled with VAX/VMS and the e-mail function in ALL-IN-1. For these products, DEC's Message Router software provides the necessary mail server features, using DECnet networking protocols.

To convert mail between VMS MAIL and ALL-IN-1, DEC enhanced the basic "store-and-forward" capabilities of its Message Router several years ago by adding a Message Router Gateway feature (MRGATE) through which mail messages can be addressed by users operating in these two environments. Since then, DEC has added several message gateway functions to MRGATE, providing mail bridging services through an SNA gateway to IBM's PROFS or through X.25 networks to X.400 mail systems.

A commercially successful Mac-VAX e-mail product not only must be able to route mail messages electronically between these two Mac and VAX/VMS mail environments but also convert mail messages, as required, so that they can be used properly at either end of the connection. Our discussion of the fundamental architectural aspects of these products begins with a review of message routing alternatives.

As with most other networking appli-

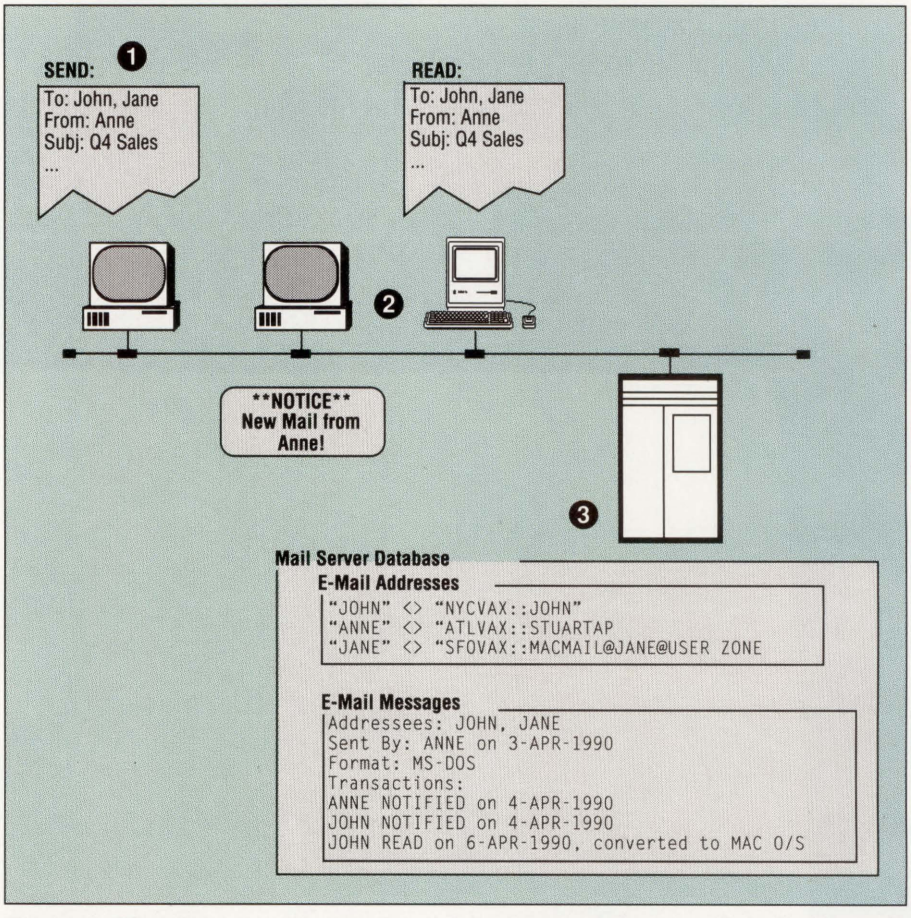

Figure 1: Client/server mail architecture. John, Jane and Anne use their client e-mail software to compose and address mail messages (1). The messages are sent to corresponding server e-mail software, which first notifies the recipients, then converts and forwards the messages as needed (2). Database-oriented e-mail servers support multiprotocol addressing, efficient message storage, document conversion and message transaction tracking (3).

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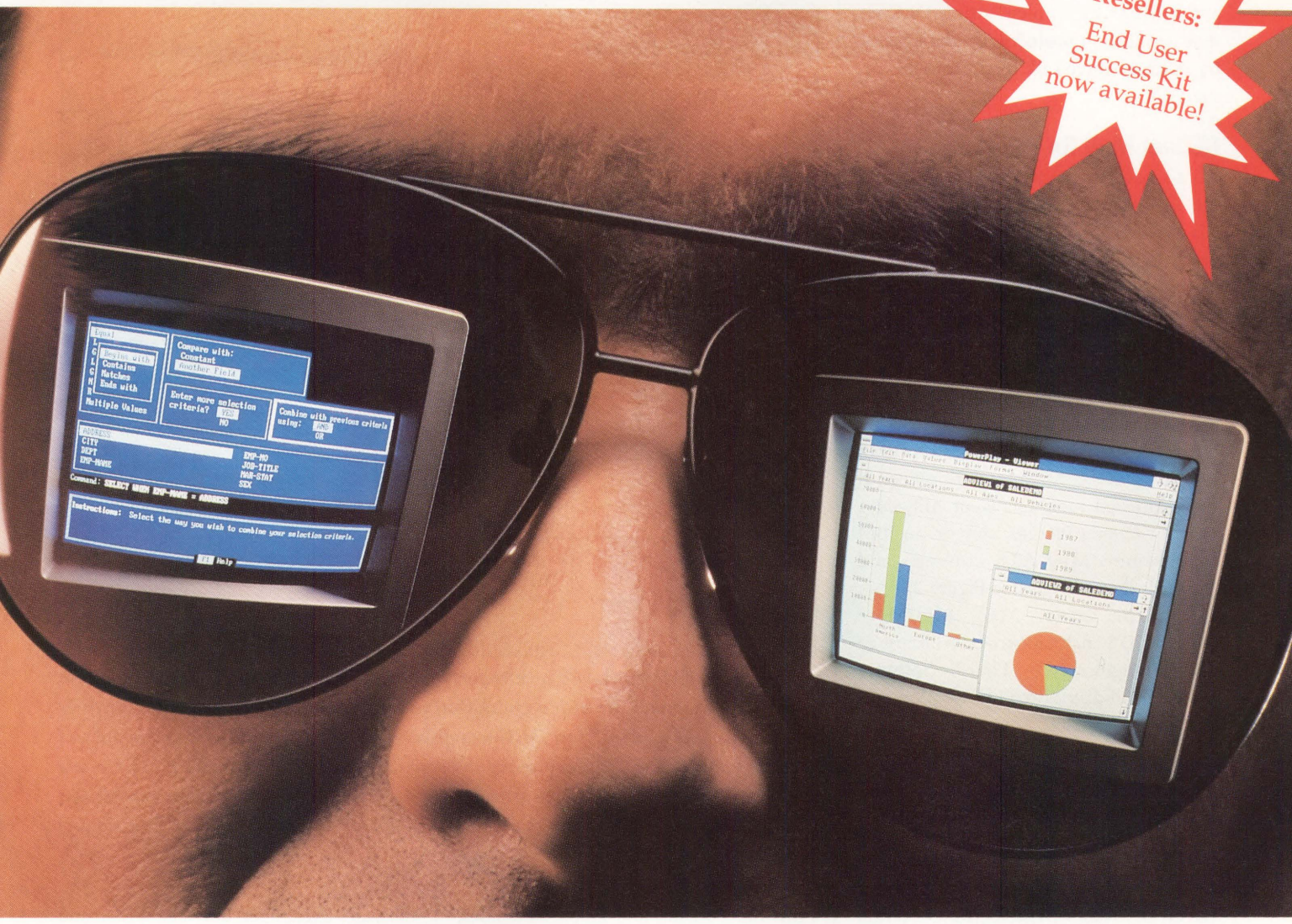

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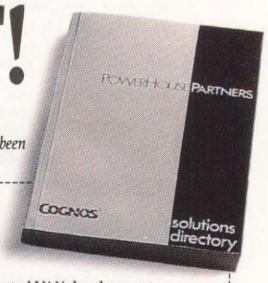

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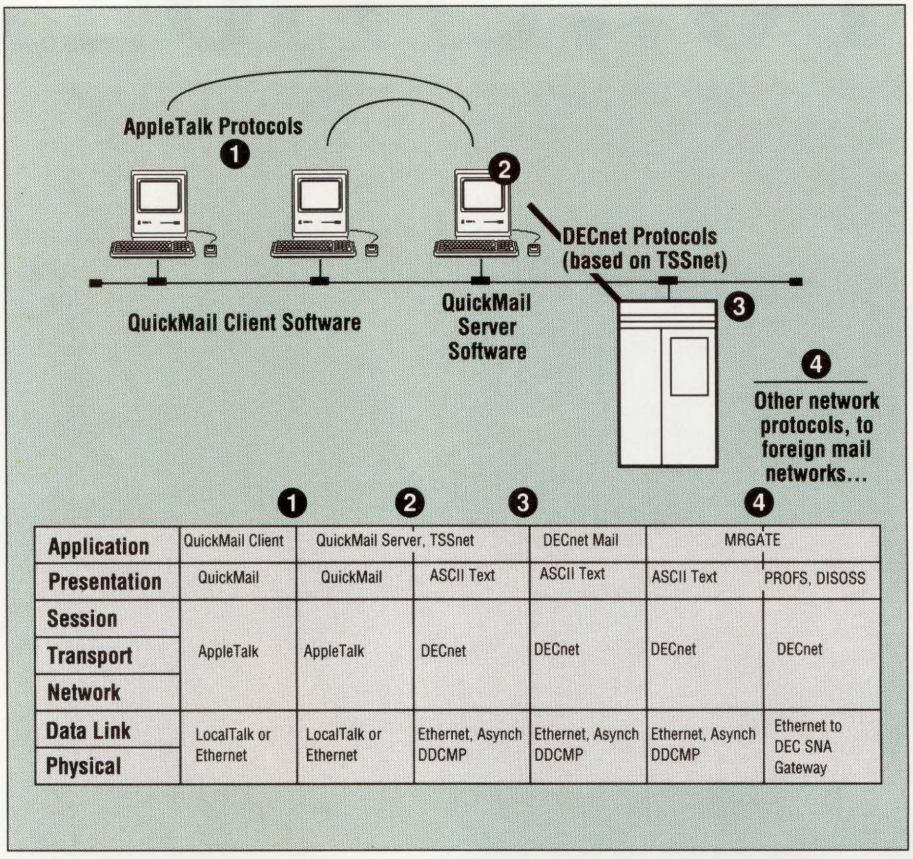
cations, there are basically two ways to route e-mail messages between a Mac and a VAX: by implementing DECnet mail application protocols on the Mac or by putting AppleTalk mail protocols on the VAX.

DECnet Mail On The Mac

Alisa's recently announced MailMate/QM software runs on an organization's Mac-based QuickMail server. QuickMail users on other Mac nodes in the organization's AppleTalk network exchange messages with one another through this server. In turn, the MailMate software on this server node uses standard DECnet networking protocols to route mail messages as needed to VAX-based VMS MAIL users through an adjacent VAX/VMS system's DECnet Mail network object. If the addressed recipient is an ALL-IN-1 user (or even a PROFS user on an IBM mainframe), MRGATE converts and forwards the message (see Figure 2).

On the server Mac, MailMate uses the DECnet task-to-task library in TSSnet (engineered by Thursby Software Systems and distributed by Alisa) to provide the necessary DECnet protocol stack. The hardware connection between this server Mac and the VAX/VMS network node running MRGATE can be a common Ethernet and asynchronous point-to-point connection or a Kinetics (now owned by Novell) FastPath bridge between the Mac's twisted-pair LocalTalk network and an Ethernet. In the latter case, the FastPath must be configured as a DECnet level-1 router, a capability found in the latest release of the FastPath Manager software.

While the administration of a DECnet network node — even if it's a Mac — can seem strange to the average Mac user, it's important to remember that only the QuickMail server runs DECnet. QuickMail clients on other Mac nodes use familiar AppleTalk networking to communicate with the server. Because the server Mac must be administered regularly as a QuickMail post office "mail center" anyway, including routinely deleting and adding user addresses on both the DECnet and AppleTalk sides, the DECnet setup demands only a little additional effort.



	1	2		3	4	
Application	QuickMail Client	QuickMail Server, TSSnet		DECnet Mail	MRGATE	
Presentation	QuickMail	QuickMail	ASCII Text	ASCII Text	ASCII Text	PROFS, DISOSS
Session	AppleTalk	AppleTalk	DECnet	DECnet	DECnet	DECnet
Transport						
Network						
Data Link	LocalTalk or Ethernet	LocalTalk or Ethernet	Ethernet, Asynch DDCMP	Ethernet, Asynch DDCMP	Ethernet, Asynch DDCMP	Ethernet to DEC SNA Gateway
Physical						

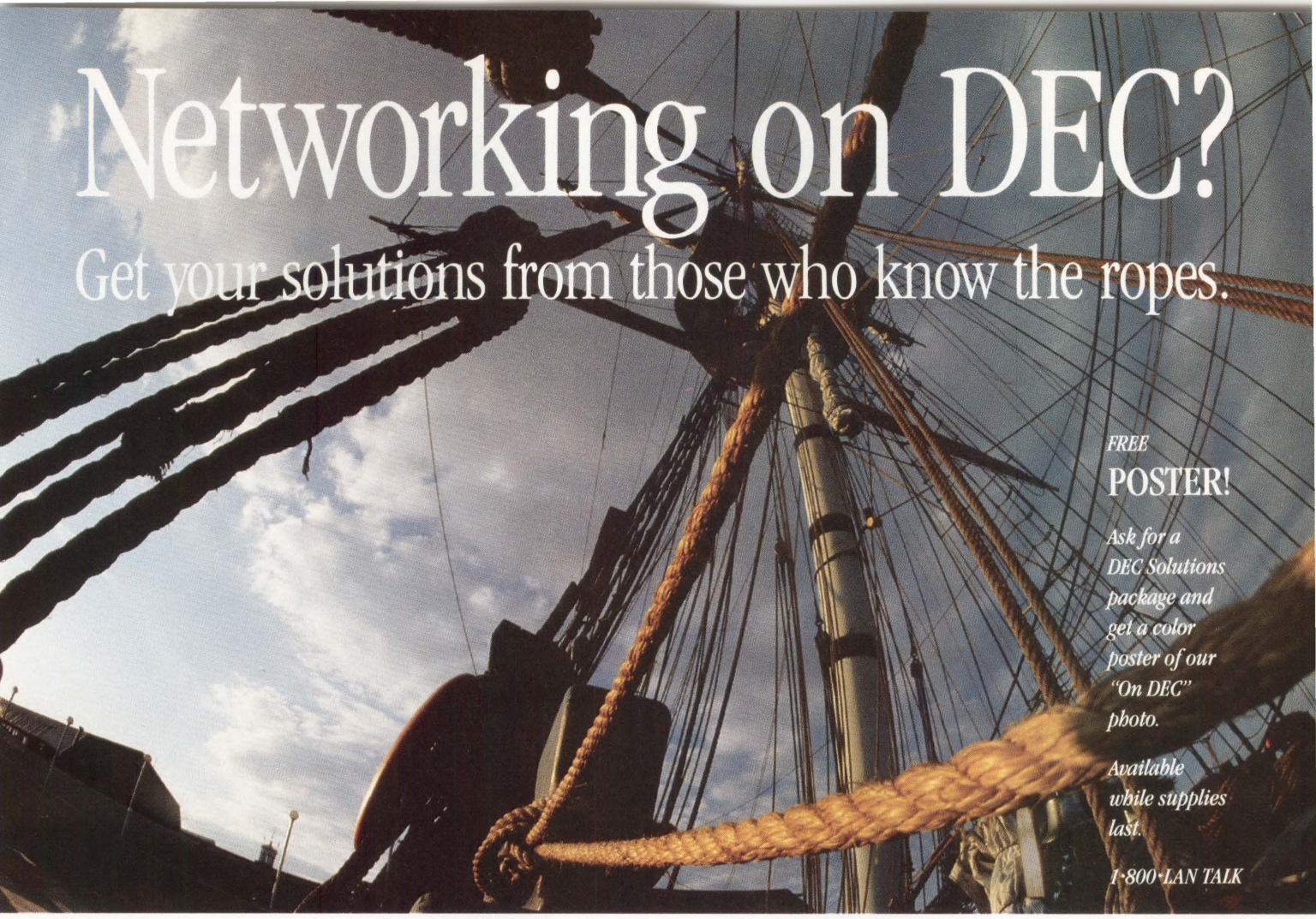
Figure 2: MailMate network architecture. QuickMail client software uses AppleTalk protocols to communicate with a QuickMail server (1). MailMate, running concurrently on the server and using TSSnet DECnet software, uses DECnet protocols to forward text mail messages to DECnet mail server software (2). From here, MRGATE can forward the message into foreign e-mail networks (3, 4). The DECnet connection between the QuickMail server and the VAX can use LocalTalk LAN hardware, with DECnet routing provided by FastPath (not shown).

MailMate-style Mac-VAX e-mail offers several advantages. Because no layered software need be installed on the host VAX (MailMate on the QuickMail server looks just like DECnet-based e-mail running on another VAX), a fairly ambitious hybrid mail network can be built for little more than the cost of the Mac client software, avoiding potentially expensive VAX software licensing costs. MailMate also skirts the various political problems associated with instituting a new, unplanned e-mail architecture within a large corporation.

MailMate's underlying message storage architecture handles only text messages exchanged between a Mac and a VAX. Further, tending to the numerous MailMate servers needed to support a corporation's e-mail users could be prohibitive. Despite these restrictions, MailMate/QM is a cost-effective way to get moderate-sized groups of QuickMail users in touch with their ALL-IN-1, VMS MAIL and PROFSmail peers. Future MailMate releases will do the same for Microsoft Mail and other Mac client/server e-mail products.

AppleTalk Mail On The VAX

Alisa's AlisaMail and Pacer Software's PacerPost implement a Microsoft Mail server under VAX/VMS. Using Apple's



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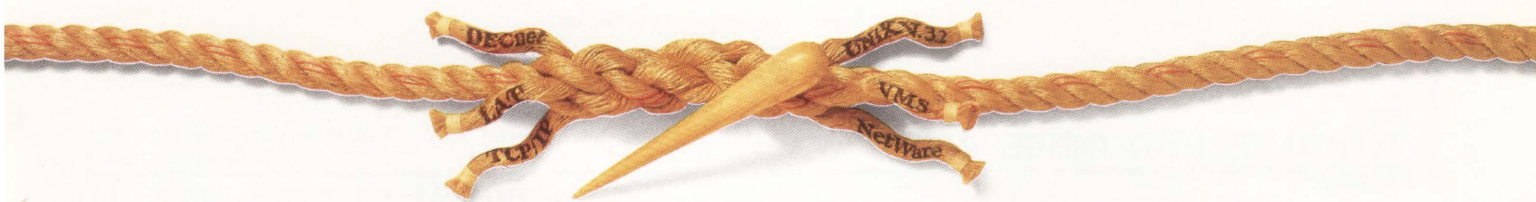

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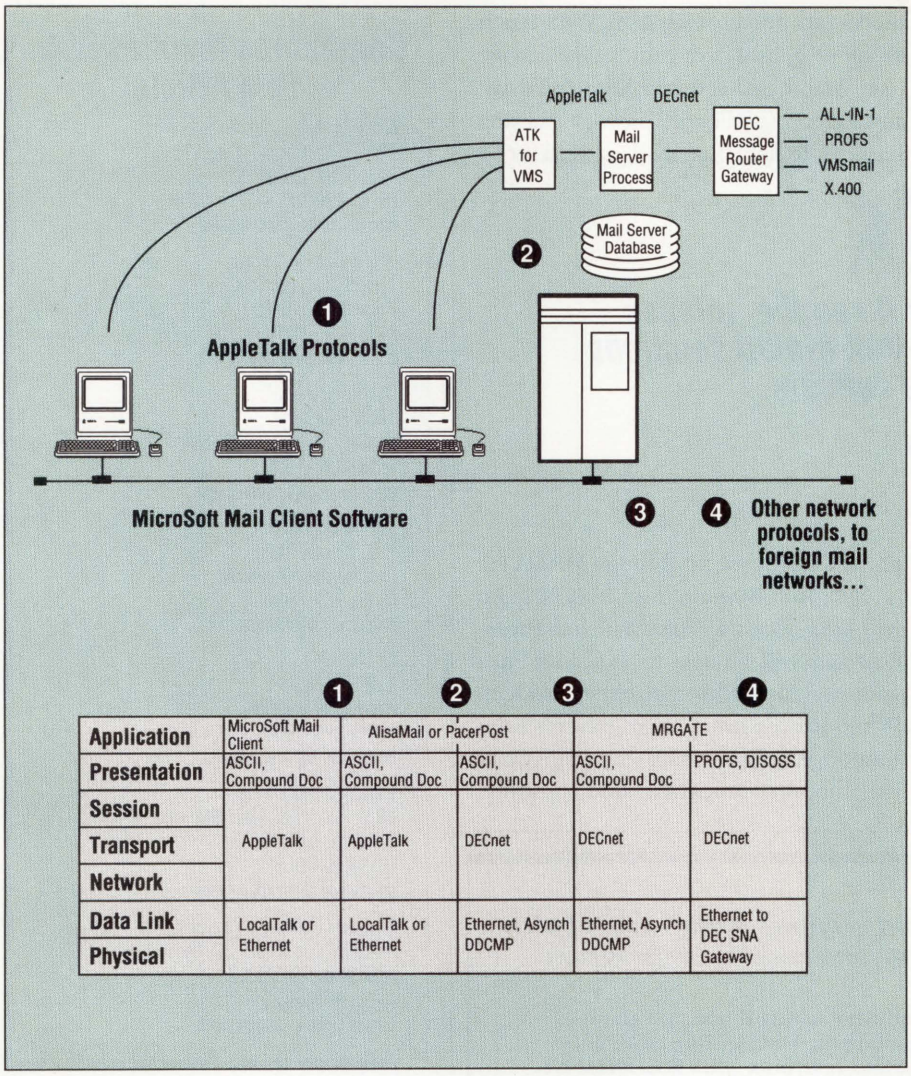

	1	2	3	4	
Application	MicroSoft Mail Client	AlisaMail or PacerPost		MRGATE	
Presentation	ASCII, Compound Doc	ASCII, Compound Doc	ASCII, Compound Doc	ASCII, Compound Doc	PROFS, DISOSS
Session	AppleTalk	AppleTalk	DECnet	DECnet	DECnet
Transport					
Network					
Data Link	LocalTalk or Ethernet	LocalTalk or Ethernet	Ethernet, Asynch DDCMP	Ethernet, Asynch DDCMP	Ethernet to DEC SNA Gateway
Physical					

Figure 3: Mac clients (1) communicate with AlisaMail or PacerPost on the VAX, both of which use AppleTalk for VMS to emulate a Microsoft Mail server under VAX/VMS (2). This mail server process, managed by its server database, controls Mac-to-Mac mail messaging functions and works with other VAX/VMS software to route e-mail into foreign mail networks. The server's database can store binary-format compound document messages, but certain foreign networks may not be able to accept them.

AppleTalk for VMS developer's toolkit for the necessary AppleTalk protocol stack support, these products look just like Mac-based Microsoft Mail servers to Mac users running Microsoft Mail client software (see Figure 3).

AlisaMail and PacerPost offer a far richer, database-oriented message handling and storage architecture than the relatively simple, text-only scheme found in MailMate. While the functional details of PacerPost's proprietary mail database were unpublished as of this writing, Alisa announced that its message architecture would be built on a full-blown relational database (the "Information Switch"), complete with disaster recovery and system failover features as well as SQL-based administrative functions.

A more comprehensive message database, supporting the storage of each part of a mail message as a separate item — including its representation format — makes it possible to exchange compound documents (i.e., documents comprising

multifont text, graphics and potentially sound or voice) among foreign mail networks. Beyond the mere exchange of Mac-based "enclosure" files among Mac users on different networks, this capability eventually will mean the exchange of compound documents, perhaps in DEC's Compound Document Architecture (CDA) format, between Mac and VAX users.

Because these products are VAX-based, many of their administrative functions, such as adding and removing users, can be automated in VMS batch mode — a distinct operational advantage over Mac-based servers. Also, AlisaMail and PacerPost will offer message gateway services to DECnet mail as well as to other, foreign systems through MRGATE.

Microsoft Mail users on IBM PCs also will have access to AlisaMail and PacerPost and will be able to exchange mail with Mac users through either product. While Pacer's future plans haven't been announced, future releases of AlisaMail will support QuickMail and, possibly, other Mac-based e-mail client software products.

> ***As 1990 matures, we'll see the release of comprehensive Mac-VAX e-mail solutions from several vendors.***

Companies Mentioned In This Article

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IN MAC-VAX CONNECTIVITY, the waning '80s saw terminal emulators, file and print services and networked database access. As 1990 matures, we'll see the release of comprehensive Mac-VAX e-mail solutions from several vendors. If you'll be in the market for such products this year, find out how many users you'll need to support, with which foreign mail networks you'll need to communicate, whether or not you'll need to bill your mail clients for the electronic postage they use and what kinds of datatypes you'll need to exchange in your messages. Look for products whose network routing and message storage architectures will solve your immediate and future needs. ■

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WORKSTATIONS

VAXstation Upgrades

David W. Bynon

Like so many others, I bought into DEC systems because DEC has a reputation for compatibility. With DEC's system compatibility comes a certain amount of investment protection not offered by other computer manufacturers. A case in point are DEC's Q-bus workstations.

I bought my first VAXstation in 1984. It was a VAXstation I with 4 MB of memory, a 30-MB hard disk and a dual floppy. It was about as lazy as they come, but it ran my VMS software and supported 4014 graphics. At the time, that was all that mattered.

Six months later, DEC announced the VAXstation II. I was furious, because my DEC sales representative didn't inform me that this new machine was so close to announcement. (I later discovered that I wasn't the only one who got burned.) After weeks of barking at the right people, DEC upgraded my VAXstation I to a VAXstation II for the difference in cost. One year later, DEC began offering MicroVAX I-to-MicroVAX II upgrade kits.

By today's price/performance standards, the upgrade kit was expensive ($10,500). However, when purchased in 1986 and 1987, the upgrade kit represented a valuable enhancement to a substantial investment. At $10,500, the VAXstation upgrade kit was about half the cost of the entry-level VAXstation II. The kit included a KA630 CPU board, a 4-MB memory board and an RQDX-3 disk controller. Later, DEC raised the kit's price but added a TK50 tape drive and controller.

VAXstation Longevity

I still have my VAXstation I/II. It's been through a power supply cable, a fan and thermostat upgrade, a cabinet upgrade, numerous storage device upgrades and two 19-inch displays, but it's still the same old workhorse chassis. As a personal system, my VAXstation I-turned-VAXstation II has served me well. But now, with the advent of DECwindows and GUI-based software, the KA630 CPU is getting sluggish.

I was considering a VAXstation 3100 as a replacement for the VAXstation II. At 2.7 VUPS, the 3100 has the performance I need for a personal VAX. The decision to purchase or not to purchase the 3100 is difficult, because I have a substantial investment in the VAXstation II hardware. Besides, I like the expansion capability of the Q-bus. One of my inclinations was to purchase a diskless 3100 and use the VAXstation II as a server. I was soon discouraged when I tried this setup at another site. Without local disk storage, I couldn't detect much of a performance difference between the diskless 3100 and the VAXstation II.

Then last November, I received a letter from DEC's MicroVAX upgrade program manager. I called the number listed on the letter and was connected with a VAXstation 3 upgrade support consultant who asked questions about my configuration. She then gave me two part numbers and quotes:

1. 2T-KA650-UB (VAXstation 3), $10,745.
2. 2T-KA655-UB (VAXstation 3+), $20,600.

The first includes the KA650 CPU (MicroVAX 3500/3600) and an MS60-AA 8-MB memory board. The second includes the KA655 CPU (MicroVAX 3800/3900) and an MS60-BA 16-MB memory board. DEC is concerned about the cus-

FIGURE 1.

Workstation Upgrade Analysis 1

Part	Description	Price
PV014-BC	VAXstation 3100 Model 30 standalone workstation, 8 MB, 19-inch mono, two 104-MB disk drives, 3 1/2-inch floppy, CD reader, KB, mouse and VMS licenses.	$15,500
	Third-party 8-MB add-in memory board.	$ 3,000
RZ55-FA	322-MB hard disk in expansion box.	$ 6,500
	10 percent trade-in allowance.	$ -2,500
	Total:	$22,500

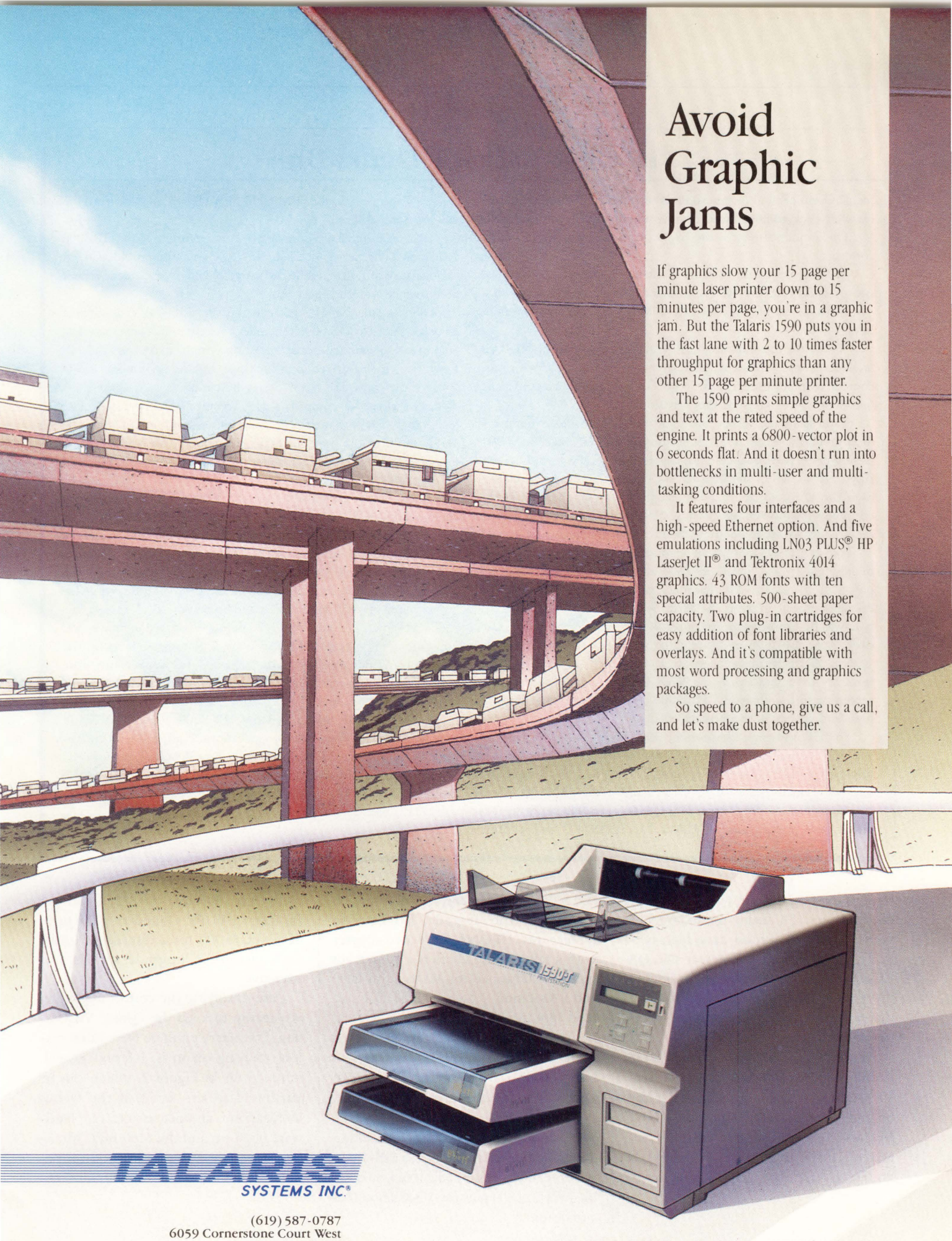
Workstation Upgrade Analysis 2

Part	Description	Price
2T-KA650-UB	VAXstation II-to-VAXstation 3 upgrade kit with KA650 CPU and 8 MB of memory.	$10,745
DELQA-M	Q-bus Ethernet 802.3 adapter.	$ 2,750
	Third-party 8-MB add-in memory board.	$ 3,000
	Total:	$16,495

Workstation Upgrade Analysis 3

Part	Description	Price
2T-KA655-UB	VAXstation II-to-VAXstation 3+ upgrade kit with KA650 CPU and 16 MB of memory.	$20,600
DELQA-M	Q-bus Ethernet 802.3 adapter.	$ 2,750
	Total:	$23,350

An analysis of the VAXstation 3100 versus the VAXstation 3.



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Hewlett-Packard Thinks Big

In an announcement certain to reverberate throughout the industry, Hewlett-Packard introduced 24 new systems and servers on January 10. The announcement is the largest in the 50-year history of the company.

At New York's Rockefeller Center, HP unveiled 13 multiuser systems and 11 servers. HP claims that the release will triple its RISC performance and significantly extend its HP 3000 and 9000 product lines.

"With this introduction, HP solidifies its leadership in RISC technology and offers customers a system product line with more choices to meet their needs," said Doug Chance, executive vice president, Networked Systems Division.

Featured in the release are high-end CMOS-based symmetric multiprocessing systems. HP is promoting the HP 3000 and 9000 as having price/performance ratios superior to systems from DEC and IBM. HP's CMOS implementation enables customers to increase their processing capabilities via a single VLSI chip. The VLSI chip consumes less power and produces less heat, so HP's new systems require less power and cooling than traditional mainframes.

The company announced eight multiuser HP 3000 systems, highlighted by the Series 980/100 and Series 980/200, the most powerful computers HP has ever offered. The Series 980/100 operates at 60 to 70 tps. The Series 980/200 offers fully symmetric two-way multiprocessing and runs at 100 tps, tripling the performance of HP's previous high-end system, the Series 960. HP's new high-end systems offer performance equal to an IBM 3090 mainframe at one-third the price and equal to a VAX 9000 at two-thirds the price, according to the company. HP 3000 customers can upgrade to the high-end systems with a board exchange.

The HP midrange addition, the 3000 Series 949, costs $230,000 and aims at toppling midrange performance standards. Using the same single-chip VLSI as the existing Series 955, the Series 949 clocks in at 32.2 tps, about the same OLTP performance as the VAX 6000 Model 430 but at half the price, according to HP. Series 949 performance is double the performance of IBM's largest AS/400 and measures favorably against low-end IBM 3090s. It's a board upgrade from the existing Series 935.

HP also announced a series of low-cost extensions to the HP 3000 collection. The Series 922 LX, 922 RX and 922 provide OLTP performance of 7.7 tps, while the Series 932 offers 60 percent greater performance than the Series 922.

Rounding out the HP 3000 field, the Micro 3000 RX can support 24 users. Priced at $18,000, it includes a system disk, a tape cartridge, a console, 16 terminal ports, operating system, a database and HP Easytime, a menu-driven interface that simplifies system operation.

The five new HP 9000 Series 800 multiuser computers are patterned after the company's HP Precision Architecture RISC technology, led by a multiprocessing unit providing four times the performance of the previous high-end model. The new low-end, midrange and high-end systems almost double the size of the HP 9000 product line.

HP also announced a series of servers aimed at the burgeoning client/server OLTP customer base. The 10 new HP 3000 servers run the HP MPE/XL operating system, and the HP 9000 servers run HP-UX. The newest additions to the HP server group include the high-end 960, 955 and 950; midrange 949, 935 and 925; and low-end 932, 922, 922 RX and 922 LX. The 922 LX supports 32 users, while the 960 supports several hundred PCs and boasts 85 GB of storage.

Each server includes the HP Vplus/Windows interface, PC networking software and HP NewWave Office system services. The HP Vplus/Windows allows HP 3000 and PC applications from multiple HP 3000 servers and systems to be displayed simultaneously on overlapping windows.

In addition, HP announced the HP 9000 Model 645SV all-purpose server for client/server applications. Equipped with an HP-PA CPU, a two-user HP-UX server license, 32 MB of memory, 1.3 GB of storage and networking software and hardware, the 645SV provides 23 mips, 1 1/2 times faster than the Model 635SV. —*Brian O'Connell, East Coast Editor.*

tomer's existing disk subsystem and Ethernet adapter. To qualify for an upgrade, your MicroVAX II must have high-performance disks and the newer DELQA Ethernet adapter. If your system doesn't meet these qualifications, DEC requests that you purchase the appropriate components as part of the upgrade.

With these numbers in hand, I ran through some VAXstation 3100 versus VAXstation 3 evaluations to see if the upgrade would be a bargain or a bust. My VAXstation II is equipped with 760-MB of disk space (on two drives), a floppy, a TK50 tape, 13 MB of memory and a 19-inch monochrome monitor. To qualify for the upgrade, I'll have to replace my DEQNA Ethernet adapter with a DELQA. DEC offers a 10 percent trade-in allowance for VAXstation 2000 and VAXstation II owners. The analysis I used appears in Figure 1.

As it turns out, DEC's upgrade program for VAXstation II owners is a bargain, but only because you can keep your investment in hardware. For $16,495, I can upgrade my 0.9-VUPS VAXstation II to a 2.7-VUPS VAXstation 3 with additional memory (16 MB total). A comparably equipped 3100 would set me back $22,500 plus my VAXstation II as a trade-in.

For an additional $6,855, I can get another 1.1 VUPS. Considering the price of about $5,700 for a diskless 3100, the VAXstation 3+ upgrade kit isn't as attractive.

After justifying the cost of upgrading as a reason to keep the Q-bus VAXstation, I wondered if there were other reasons to hang on to it. I found several, summed up in Figure 2, which can be attributed to the fact that the Q-bus VAXstation is an open architecture hardware platform and the 3100 isn't. Memory, storage and third-party add-on peripherals are important to me.

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FIGURE 2.

	VAXstation 3	VAXstation 3100
CPU/FPU	CVAX	CVAX
Performance	2.7 VUPS	2.7 VUPS
Backplane	Q-bus	None
Maximum Memory	64 MB	32 MB
Disk Storage	Virtually unlimited	2.3 GB
Optical Disk	Yes	Yes (limited vendors)
TK70 Support	Yes	No
VAXimage Support	Yes	No
Third-Party Graphics Hardware Support	Yes	No

Memory, storage and third-party add-on peripherals are among the reasons for keeping a Q-bus VAXstation.

FIGURE 3.

VAXstation I, II and 3 Cost Analysis	
Original VAXstation I	$16,400
VAXstation II Upgrade	$10,500
760-MB ESDI Disk Subsystem	$ 7,600
BA123 Cabinet Upgrade	$ 2,300
4-MB Memory Upgrade	$ 2,800
TK50 Tape Upgrade	$ 5,700
VAXstation 3 Upgrade	$16,495
Total Investment:	$61,795
VAXstation 3500 Cost Analysis	
VAXstation 3500 with 16 MB, 19-inch mono, KDA50, 280-MB RA70 disk and TK70	$56,905
280-MB RA70 disk upgrade.	$ 9,828
Total Investment:	$66,733

In the configuration shown, upgrading to the VAXstation 3 costs less than the comparable VAXstation 3500.

I was curious about one more thing: If I had purchased a VAXstation 3500 to begin with, how much would I have spent? This is a valid question, because with the VAXstation 3 upgrade kit, my system (at least specification-wise) is a VAXstation 3500. The results of this comparison are shown in Figure 3. The bottom line is that, even with all of the upgrades to my system, upgrading to the VAXstation 3 will cost less than the comparable VAXstation 3500.

IF YOU HAVE A VAXstation II and are considering dumping it in favor of a VAXstation 3100 Model 30, do your homework. I think you'll find, as I did, that the VAXstation 3 upgrade program is a pretty good bargain. ■

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LET'S C NOW

Rex Jaeschke

C Pointer Puzzle And I/O In C++

Editor's note: This month, C Editor Rex Jaeschke dissects a pointer problem and leads us through the ins and outs of C++'s I/O mechanism.

In my five-day "Introductory C" seminar, students work on many lab exercises, and the one with which they have the most trouble is the first one that involves pointers. This isn't surprising, because the concept and syntax of pointers have kept many of us puzzled for hours. However, this problem also involves other interesting issues. Let's look at the exercise.

Write a function called **reverse** that accepts one argument, a pointer to the first character in a null-terminated string. It reverses the characters in the input string in place and returns the address of the string to the caller. The function **reverse** must be able to handle an arbitrary-length string without allocating storage for the whole string locally. Test the function with various-length strings, including odd and even lengths. Also, reverse a null (empty) string. Can you use a string literal as an argument to **reverse**? After all, it results in a **char *** being passed. The following is the solution I hand out:

```
#include <stdio.h>
#include <string.h>

main()
{
        static char str1[] = "Even";
        static char str2[] = "Odd";
        static char str3[] = "";
        static char str4[] = "Hello";
        char *reverse(char *);

        printf("str1          is >%s<\n", str1);
        printf("str1 reversed is >%s<\n", reverse(str1));

        printf("str2          is >%s<\n", str2);
        printf("str2 reversed is >%s<\n", reverse(str2));

        printf("str3          is >%s<\n", str3);
        printf("str3 reversed is >%s<\n", reverse(str3));

        printf("\nstr4 >%s<, reversed >%s<\n",
                  str4, reverse(str4));
}

char *reverse(char *str)
{
        char *pstart = str;
        char *pend = pstart + strlen(pstart) - 1;
        char temp;

        while (pend > pstart) {
                  temp = *pend;
                  *pend = *pstart;
                  *pstart = temp;
                  ++pstart;
                  --pend;
        }

        return (str);
}

str1          is >Even<
str1 reversed is >nevE<
str2          is >Odd<
str2 reversed is >ddO<
str3          is ><
str3 reversed is ><

str4 >olleH<, reversed >olleH<
```

Before I discuss the reverse function, let's look at the last line of output concerning **str4**. Many students write something like this, expecting to get both the old and new strings displayed together. The problem is that there's only one string, and **reverse** reverses it in place. At any one time, you can either be looking at the before-reverse or after-reverse versions, but never both. Because **reverse** returns the pointer passed to it, both the second and third arguments to **printf** are the address of the first character in **str4**. Because **reverse** must be called and the string reversed before **printf** can be called, **printf** displays the reversed string twice.

The trick to implementing **reverse** is to find the first and last characters in the string, swap them over and move in toward the middle — swapping until the middle is reached. The last character in the string is the one before the trailing null. If you swap the trailing null with the first character, the string will begin with a trailing null and nothing will be displayed. Hence the - 1 in **pend**'s initializer.

We can't make a copy of the input string inside **reverse**, because we don't have advance knowledge of the size of the string and therefore can't define a local array large enough to hold it. (We could use **malloc** to create temporary space, but the solution used above is simpler and more efficient.) We can, however, use a temporary **char** variable to swap the first and last characters. And because we only swap one character pair at a time, we only need one temporary character, regardless of the length of the string.

The question about odd and even lengths is a red herring. If you use the right algorithm, the length doesn't matter. I could have written **while (pend >= pstart)**. For even-length strings, the test would fail after the middle pair was swapped. For an odd-length string, **pend** and **pstart** would finish both pointing to the middle character, which would be (unnecessarily) swapped into itself. Therefore, **>** is better than **>=**.

Those on the lookout to save a few characters when writing source code no doubt will write the loop as follows:

```
while (pend > pstart) {
        temp = *pend;
        *pend-- = *pstart;
        *pstart++ = temp;
}
```

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This version is no easier to read (it may be harder for some), and for any modern optimizer it probably generates the same code as my version. Unless you can prove that a (possibly) more obscure approach is more efficient, I suggest you favor overt code, because we programmers spend an inordinate amount of time in debugging and maintenance. The easier code is to follow, the better off we'll be.

The last part of the problem asks whether or not a string literal could be used as an argument to **reverse**. After all, it results in a **char** * being passed. Specifically, will the following work?

```
printf("string reversed is >%s<\n", reverse("Testing"));
```

Actually, the output produced on some systems (including VAX C on VAX/VMS and various MS-DOS compilers) is:

```
string reversed is >gnitseT<
```

indicating that the answer is yes. In fact, ANSI C says it's undefined behavior, because string literals are permitted to be (and often are) stored in write-protected memory location. As such, when **reverse** attempts to modify its first character, the program can fail. It happens that the compilers I used stored strings in read/write locations.

A similar problem exists with the following version, in which we don't appear to be passing in a string literal, yet we're still asking **reverse** to modify a string. The only way to be sure that the memory you're going to modify is writeable is to define a non**const** character array and initialize it, and don't use string literals:

```
main()
{
        char *pstr = "Hello";
        char *reverse(char *);

        printf("string          is >%s<\n", pstr);
        printf("string reversed is >%s<\n", reverse(pstr));
}
```

There's a lot more to be said about this puzzle. I'll cover the rest next month.

A Look At I/O In C++

Like C, C++ has no I/O capability defined within the language — it's all done via the library and by using the primitives already provided in the language. Because C++ essentially is a superset of ANSI C, all of the usual headers, including **stdio.h**, are provided. However, C++ has an alternate way of performing I/O using the header **stream.h**. Although you can perform I/O using either **stream.h** or **stdio.h**, don't use both methods simultaneously for the same file (or stream, as C++ calls it).

There are several reasons to have an alternate way to perform I/O: C's I/O can't handle user-defined types, but C++'s can; C provides one family of routines to talk to standard I/O and another to talk to files, whereas C++ overloads the same ones; and the interfaces to some of the C routines (e.g., **scanf**) are clumsy and/or error-prone, whereas C++ provides a more

This isn't to say that C++'s I/O facility is superior to C's. Both approaches have good and bad points.

elegant solution. This isn't to say that C++'s I/O facility is superior to C's. Both approaches have good and bad points. I'll give you evidence and let you decide if C++'s approach is better or just different.

Let's begin by reading from the keyboard and writing to the screen:

```
#include <stream.h>

main()
{
        int start, value;
        int count;

        cout << "Enter start value: ";
        cin >> start;
        cout << "Enter loop count: ";
        cin >> count;

        for (value = start; value < start + count; ++value)
                cout << value << "\t" << value * value << "\n";
}

Enter start value: -5
Enter loop count: 11
-5      25
-4      16
-3      9
-2      4
-1      1
0       0
1       1
2       4
3       9
4       16
5       25
```

To use the alternate I/O approach, you must **#include <stream.h>**. This contains numerous class definitions, function prototypes and enumeration definitions.

C++ has equivalents to **stdin**, **stdout** and **stderr**. They're called **cin**, **cout** and **cerr**, respectively, and are defined only by including **stream.h**. These identifiers aren't **FILE** pointers, they're objects of type **istream**, **ostream** and **ostream**, respectively. In **stream.h**, the two main classes defined are **istream** (for input files) and **ostream** (for output files).

The following source lines write a string to standard output and then read an integer into the variable **start**:

```
cout << "Enter start value: ";
cin >> start;
```

These operations work by using the **<<** and **>>** operators. In C, these operators mean left shift and right shift. They mean the same in C++, provided they're used with integer operands. One interesting feature of C++ is that it lets you redefine existing operators for your own purposes. In this case, **<<** is redefined (or overloaded) when used with an **ostream** left operand to mean "write this right operand to the output stream." Similarly, **>>** is overloaded to mean "read into the right operand from this input stream."

Default formatting is used, because it's known by the compiler, and unlike **scanf**, **cin** doesn't need things to be given via address. Simply state the object's name, which is a more natural way to do it.

As shown in the last line of the program, multiple **<<** operators can be used in the same statement. (You can see how some of this is achieved by looking at the contents of **stream.h**. To understand it completely, you'll need more information than we've covered.)

For a quick comparison, here's the C version of the same program:

```
#include <stdio.h>

main()
{
        int start, value;
        int count;

        printf("Enter start value: ");
        scanf("%d", &start);
        printf("Enter loop count: ");
        scanf("%d", &count);

        for (value = start; value < start + count; ++value)
                printf("%d\t%d\n", value, value * value);
}
```

As mentioned earlier, **cerr** is C++'s equivalent of **stderr**:

```
#include <stream.h>

main()
{
        int errval = 100;

        cerr << "Error detected: " << errval << "\n";
}
```

C++ lets you overload any of its operators. However, an operator always has the same precedence and associativity as defined in the language (and in C). This means that, although **<<** has been overloaded in the following example, the **<<** operator still associates right to left:

```
#include <stream.h>

main()
{
        cout << (5 ? 10 : 20) << "\n";
        cout << 1 << 5 << "\n";
        cout << (1 << 5) << "\n";
}

10
15
32
```

The second line to **cout** uses **<<** for two purposes: as both a left-shift and an output operator. To get the correct answer, grouping parentheses are needed as shown in the third line. They're also needed in the first line, because without them, **<<** has higher precedence than **?:**, and a compilation error results.

Output Formatting

cout uses some default output formatting. For example:

```
#include <stream.h>

main()
{
        char c = 'A';
        int i = 'A';
        long l = 123456;
        double d = 123.4567e2;
        static char ca[] = "text";
        char *pc = "Hi there\n";

        cout << "c = " << c << " i = " << i << "\n";
        cout << "(char)i = " << (char)i << " l = " << l << "\n";
        cout << "d = " << d << " (int)d = " << (int)d << "\n";
        cout << "ca = " << ca << " pc = " << pc;
}

c = 65 i = 65
(char)i = 65 l = 123456
d = 12345.67 (int)d = 12345
ca = text pc = Hi there
```

Integer expressions are written as decimals, including those of type **char**. Only the significant digits are displayed. You may want to override these defaults, and you can do so with a set of functions as follows:

```
// display chars A-Z as graphics, dec, oct, & hex.

#include <stream.h>

main()
{
        int i;

        cout << " char  dec  oct  hex\n";
        for (i = 'A'; i <= 'F'; ++i)
                cout << chr(i, 4) << "    " << dec(i)
                     << oct(i, 7) << hex(i, 7) << "\n";
}

char  dec  oct  hex
  A    65  101   41
  B    66  102   42
  C    67  103   43
  D    68  104   44
  E    69  105   45
  F    70  106   46
```

There's also another, **str**. Each function takes an optional second argument specifying the field width. It defaults to zero.

Constructing lengthy lists of **<<** operators and operands is tedious and unreadable. Therefore, an equivalent to **printf**'s formatting, called **form**, is provided. In the following example, **form** is used to produce the same result as the previous example:

```
#include <stream.h>

main()
{
        int i;
        cout << " char  dec  oct  hex\n";
        for (i = 'A'; i <= 'F'; ++i)
                cout << form("%4c%7d%7o%7x\n", i, i, i, i);
}
```

form has the same set of edit masks as **printf**.

Stream Member Functions

The standard I/O streams aren't special. They're the same type as those established with other files. And because C++ permits function names to be overloaded, different versions of the same function can be defined by the same name. They also can be made member functions of the classes **istream** and/or **ostream**, enabling them to be used with all files of that type:

```
// copy standard input to standard output

#include <stream.h>

main()
{
        char c;

        while (cin.get(c))
                cout.put(c);
}

This is a test.<return>
This is a test.<return>
```

get is defined as a member function of class **istream**, while **put** is a member function of class **ostream**. As such, they can be called for the standard I/O streams as well as any other explicitly opened files.

The **get** member function is overloaded. There's a version that takes one **char** argument only and another that takes up to three arguments. The latter version reads a string into a buffer and takes an optional maximum length and terminating character. For example:

```
// copy standard input to standard output

#include <stream.h>

main()
{
        char text[11];

        cout << "Enter text (10 chars max): ";
        cin.get(text, 11);
        cout << "text = " << text << "\n";

        cout << "Enter text (10 chars max): ";
        cin.get(text, 11, ' ');
        cout << "text = " << text << "\n";

        cout << "Enter text (10 chars max): ";
        cin.get(text, 11, ' ');
        cout << "text = " << text << "\n";
}

Enter text (10 chars max): 1234567890
text = 1234567890
Enter text (10 chars max): abc def
text = abc
Enter text (10 chars max): text =
```

In the first case, **get** reads up to 11 characters (including the trailing null character it adds to the end of the buffer). The third argument defaults to **'\n'**, indicating that either 11 characters

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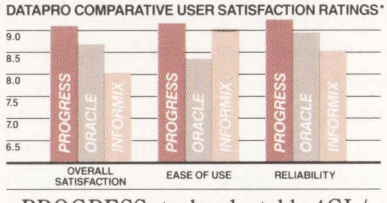

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or up to the first new-line character should be read, whichever comes first.

In the second and third cases, reading proceeds until a space is seen. Note that the new-line terminating the first input wasn't seen by the first read, because 10 characters already were read. The new-line then became the first character read in the second case. The second read terminates at the space between **abc** and **def**. When the third read is attempted, the terminating space from the previous read is still in the input buffer, so the scan immediately is terminated there again. You must remove the terminating character explicitly if you want to get past it and not keep it.

Elementary File I/O

Like C, C++ has some functions to open, close and access files. For example:

```
// create lower-case version of input file

#include <stream.h>
#include <stdlib.h>
#include <ctype.h>

main()
{
        filebuf in, out;
        char c;

        if (in.open("input.dat", input) == 0) {
                cerr << "Can't open input file\n";
                exit(1);
        }
        istream oldfile = istream(&in);

        if (out.open("output.dat", output) == 0) {
                cerr << "Can't open output file\n";
                exit(1);
        }
        ostream newfile = ostream(&out);

        if (oldfile.bad())
                cout << "old file (bad)\n";
        else if (oldfile.eof())
                cout << "old file (eof)\n";
        else if (oldfile.fail())
                cout << "old file (fail)\n";
        else if (oldfile.good())
                cout << "old file (good)\n";

        while (oldfile.get(c)) {
                newfile.put(tolower(c));
        }

        if (oldfile.eof())
                cout << "old file (eof)\n";
}

old file (good)
old file (eof)
```

filebuf is a buffer type declared in **stream.h**. You must allocate an object of this type for each file you want to open explicitly at the same time.

open is a member function defined to operate on objects of class **filbuf**. Notice that the function **open** operates on the object indirectly. Therefore, there's no need to pass it by address or to initialize anything explicitly as you must with C's **FILE** pointers.

Establishing access to a file is a two-step approach. Once a file buffer has been allocated and initialized using **open**, you must create a stream object for that file. This is done using:

```
istream oldfile = istream(&in);
ostream newfile = ostream(&out);
```

Here, **oldfile** and **newfile** are defined to be objects of class **istream** and **ostream**, respectively, and are initialized with the address of their respective buffers. The format of the initializer is that of a constructor, something we haven't defined yet. For now, trust me. You need to do it this way. A more common way to define these streams is:

```
istream oldfile(&in);
ostream newfile(&out);
```

The two are equivalent, but the second looks like a (incorrect) function declaration.

One interesting aspect of these two declarations is that they occur in the middle of executable code, something not permitted by C. C++ allows declarations and code to be intermingled freely if something is declared before it's needed.

One confusing aspect is that you use the **filebuf** object name to open and close a file, but you use the stream object name to do other operations on that file.

The functions **bad**, **good**, **eof** and **fail** are defined member functions for **istream** and **ostream**. **get** and **put** now are being used to read from and write to files, whereas we previously used them with **cin** and **cout**.

Is C++'s Approach Better?

My initial reaction to C++'s I/O mechanism is that it isn't any easier than C's. I can see the benefits of using member functions here and in the ability of the user to extend the I/O package to handle user-defined types. But then C never really had an industrial-strength I/O capability, and I strongly suspect that in many (if not most) C++ programs, third-party DBMSs and the like will be used instead. However, using member functions and some of the other unique aspects of C++ should make the I/O task easier.

READERS ARE ENCOURAGED to submit C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia 22091 or via e-mail to uunet!aussie!rex. —*Rex Jaeschke is an independent consultant, author and lecturer. He's* DEC PROFESSIONAL*'s representative on the ANSI C Standards Committee and the U.S. Representative for ISO, as well as editor of the* Journal of C Language Translation, *a quarterly publication for C implementers. His new book,* Mastering Standard C, *is available from Professional Press. To place an order, call Trish Dunkerley at (215) 957-4265.*

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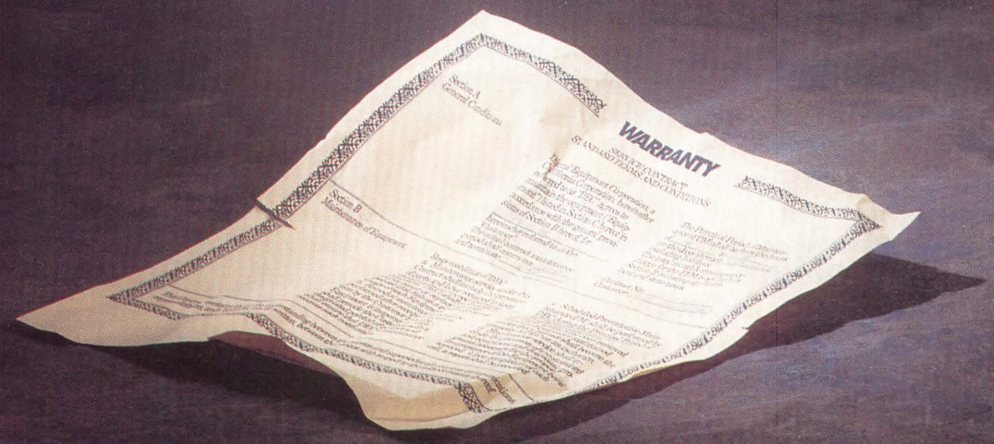

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Searching For Perfect Power

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Despite the frequency of power problems, there's nothing basically wrong with the input power supplied by utility companies. However, our electrical delivery system originally was intended to provide electricity for lighting and power for electric motors, not for complex electronic devices. For most uses, our power system works well — even the very stringent requirements of computer systems usually are met. However, the narrow tolerances specified in today's equipment may not always be addressed.

Dr. Alex Severinsky, president of UPS manufacturer Viteq, states in "Solutions to Power Problems," an article on power disturbances in the *Encyclopedia of Computer Science and Technology* (Marcel Decker Publishing, New York), that the MTBF for minicomputers is in the 3,000- to 10,000-hour range, while the MTBF of the utility company's supplied voltage is between 24 and 700 hours.

Power disturbances, depending on the type and severity, affect computer operations and can cause the malfunction of data processing equipment. What are the most common input power faults encountered? According to studies by IBM and Bell Laboratories (as documented in IEEE publications C74-199-6, "Monitoring of Computer Installations for Power Line Disturbances," and CH1818-4/82/0000-0028, "The Quality of U.S. Commercial AC Power"), they are:

1. Surges — Amplitude increases of at least 110 percent over the nominal value that last for less than several seconds. These fluctuations can cause computer power supply failures.

2. Sags — Amplitude decreases to 90 percent or less of the nominal value lasting less than several seconds. This condition causes the loss of RAM data and may cause other data losses if it occurs during I/O operations.

3. Spikes — Overvoltage conditions lasting up to 100 microseconds. Small spikes cause erratic system behavior, and large ones can cause the total loss of data processing equipment.

4. Oscillations — Waveform distortions exceeding five percent of main voltage amplitude. These conditions cause a variety of computer operational problems including data loss, unreliable data processing and transfers, damage to magnetic media, and keyboard lockup. Oscillations also can cause premature degradation and failure of power supplies.

5. Voltage Failure — A zero voltage condition lasting for more than half of one cycle.

Other power disturbances are deliberately induced by the electric utilities to protect themselves, including:

1. Blackouts — The scheduled loss of power in selected areas at specified times, which controls power demands exceeding the ability of the utility company (for example, during extremely hot days when many air conditioning units are being used).

2. Brownouts — The scheduled reduction of voltage in selected areas at specified times to control excessive power demands that strain the ability of the utility to meet user needs.

> ***"Fluctuations in incoming power can cause computing problems ranging from hard system failures to intermittent loss of data."***

Several types of power conditioning devices improve the quality of the input power: ferroresonant power conditioners, standby UPSs, ferroresonant standby UPSs and online UPSs. They improve incoming electrical power to meet the needs of the computer system.

Ferroresonant power conditioners eliminate oscillations (the most frequent power disturbances) and provide voltage regulation, thereby reducing the occurrence of sags and surges. But these devices don't have auxiliary power

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LBO Of McDonnell Douglas Field Service Company?

As we go to press, negotiations are near completion for a management leveraged buyout (LBO) of the McDonnell Douglas Field Service Company (MDFSC). In an interview, Bert Novak, president of MDFSC, confirmed that he's heading up the LBO team and that when the deal's completed, probably by the beginning of March, he'll be CEO of the new independent service company.

Although rumors have circulated for months about possible buyers for the division, McDonnell Douglas gave management "first rights" and has never considered other bids, according to Novak. Major issues involved in selling the business to management were agreed upon quickly. The months of holdup mostly were due to a combination of:

1. The parent company, McDonnell Douglas, finalizing the sale of its TymNet operation to British Telecom.
2. Negotiations for MDFSC to pick up the exclusive distribution rights for all McDonnell Douglas Computer Systems Company products throughout North America.

Although the new field service company isn't officially formed or named, it already has a major contract — supplying service and support for the British Telecom TymNet division. Novak states, "The new company won't be in the service-only business but also will be an added-value supplier and service these additional products. We won't distribute products through an end-user sales force, but through dealer and VAR channels. However, maintenance services will continue to be marketed by our own end-user force."

The new service, sales and support company will continue to support the products of DEC, Data General, Honeywell and Sun, as well as IBM PCs and compatibles. New products and support services will be offered in addition to those of the past. "We'll be a much stronger competitor in all areas and without the McDonnell Douglas affiliation, we'll have lower overhead," states Novak.

With revenues of over $100 million and over 150 service locations, MDFSC aims to be a major player and a visible force in the distribution and service/support business. The LBO management team doesn't believe the move to independence will affect its relationship with Digital. The purchase price of the division is near $100 million.

storage and thus don't eliminate power failures.

UPSs contain an internal energy source to provide electricity to the computer system when the primary power source fails. There are three main types of UPS.

Standby UPS

The standby is the oldest type of UPS. It employs an internal voltage generator to replace the incoming power signal when the incoming source's amplitude falls below a predefined tolerance. Typical "switch over" time from the primary input power source to the UPS' generated output is about one-half of one cycle (about 0.010 seconds). Standby UPSs provide auxiliary power but don't filter oscillations.

There are many standby UPSs on the market from a host of manufacturers. They vary in performance by the type of voltage waveforms generated (square waves or sinusoidal waves) and their required external-to-internal power transfer times (from less than 0.002 seconds to more than 0.02 seconds).

Ferroresonant Standby UPS

This is an improved version of the standby UPS. It not only supplies auxiliary power but also eliminates most power disturbances. However, it doesn't prevent sags created by the UPS' own transfer process. This may not be a tolerable condition for your load. If your system can accept this power fluctuation, then this equipment will increase the MTBF of the input voltage to the 20,000- to 40,000-hour range.

Note that the installation of a ferroresonant UPS can cause major problems. These devices require a significant amount of current for optimum operation of their voltage regulation system, a higher current-carrying capacity than that usually associated with computer operations. This may necessitate rewiring to accommodate an electrical service with a higher current rating.

Online UPS

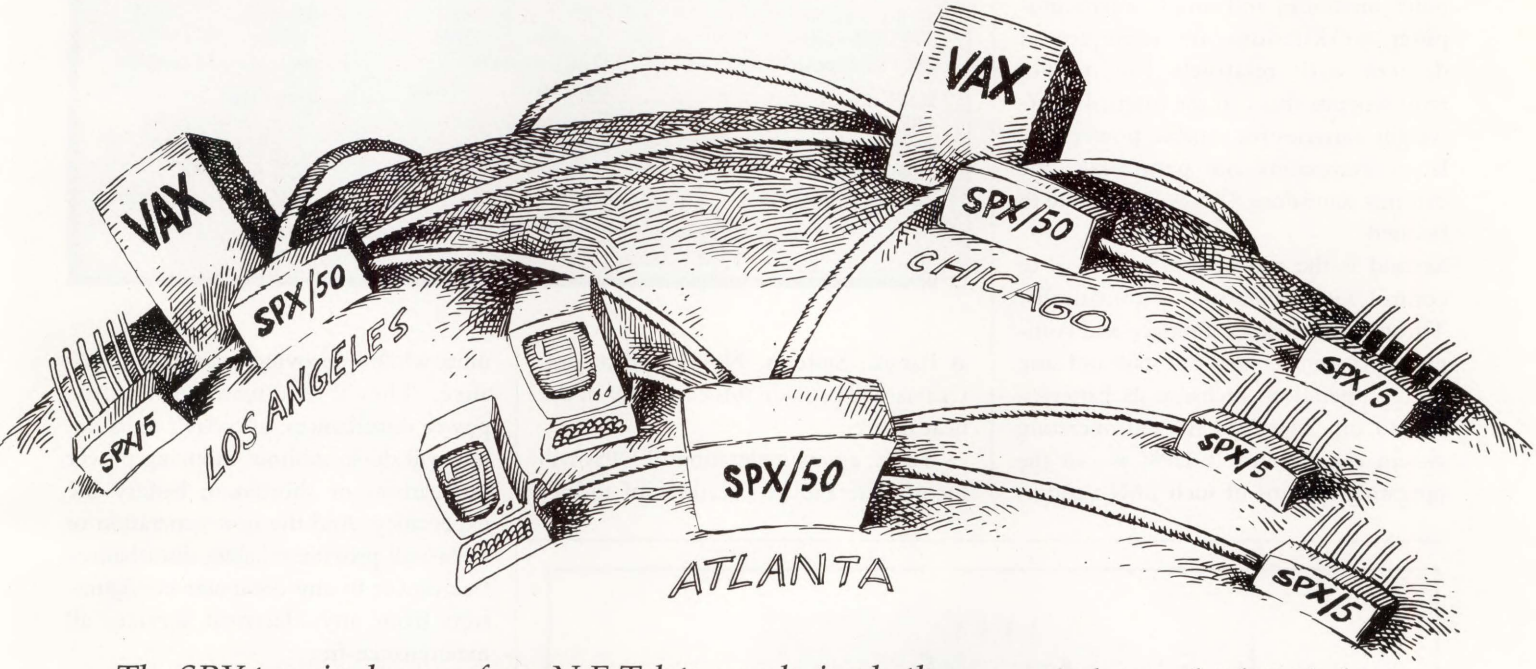
Online UPSs provide the most dependable power filtering technology. They combat all types of power line disturbances. They supply input power to the computer system continuously from an internal battery and inverter. Power fluctuations on the utility's incoming power line are filtered at the battery — never reaching the output waveforms sent to the computer.

The internal power-generating system of this device is always "online," i.e., continuously feeding the computer's input power circuits. The UPS' battery is recharged continuously to ensure reliable operation.

However, an additional power disturbance can be induced by an online UPS. Voltage sags can result upon equipment startup. This can be overcome by oversizing the UPS versus the peak load (which you can do with all the power conditioning devices described here). You can also employ a bypass circuit to let the UPS tap into the electric utility's input power for start-up operations, then switch back to the internal power generation capabilities of the UPS for continuing operations.

Other deficiencies inherent to online UPSs include a resulting output current that can be as low as 50 percent of the input current and a shortened storage battery life expectancy because of the pulsating currents constantly fed to it by the internal charger and inverter circuits. All in all, online UPSs are the best technique available for delivering reliable

Why limit yourself to a terminal server that only serves the terminal down the hall?



The SPX terminal server from N.E.T. lets you design both wide area and local terminal networks exactly the way you want. And grow the network as you must.

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The SPX from N.E.T.™ serves both wide-area and local connectivity needs. You're spared the significant costs of additional multiplexer and terminal server purchases.

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What makes the SPX network so unique and cost efficient is this:

The SPX/SI Software Interface installs on any DEC® VAX™ host running VMS™, and shares the host's standard Ethernet® controller. This enables your VAX to communicate directly with SPX™ terminal servers, providing both wide area and local terminal connections.

Unlike DEC's LAT solution, our protocol extends LAT functionality to the wide area.

You get optimum wide-area performance and flexibility. With automatic rerouting to assure reliable connectivity over any wide-area topology. And redundant links for critical applications.

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And you get local terminal server capabilities that offer many advantages over LAT-based solutions. Unlike LAT, an SPX terminal server excels in a mixed host environment. And it supports asynchronous DECnet™ for superior host-to-host connectivity.

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Power Conditioning For The '90s

In the continuing search for perfect power, three trends are apparent.

First is the incorporation of UPSs within equipment. Battery-backed computer memories and simple microcomputer workstations are examples of devices with relatively low power requirements that can use internal lightweight batteries for reliable power. For larger computers and peripherals, the external standalone UPS will continue to be used.

Second is the use of data interfaces to control UPS operations automatically. Through a hardware interface and computer program, a host can start and stop a UPS operation, recharge its batteries, and so on. The IBM AS/400 operating system can monitor a UPS, as can the operating systems of such LAN vendors as Banyan Systems, Novell and 3Com. Others will provide this capability in the near future.

Third, a new generation of UPSs will incorporate the best features of today's units while improving overall performance. They'll eliminate utility line power disturbances, as today's units do, but will do so without inducing power fluctuations or shortening battery life expectancy. And the new generation of UPSs will provide reliable, disturbance-free power to any computer configuration from any electrical service, all maintenance-free.

To achieve reliable data processing operations, clean power is necessary. Managers and others responsible for computer operations should be familiar with power conditioning devices available and the differences between them. Selecting the one to meet your needs isn't easy, but it's critical to the reliability of your computer operations.

Editor's note: For detailed information on power disturbances and their effects on computer operations, technical comparisons of common power conditioning devices and performance criteria for selecting a UPS, read Dr. Alex Severinsky's "Solutions to Power Problems," in the *Encyclopedia of Computer Science and Technology*. We thank him for his input to this article.

For a listing of power protection devices, including vendors and equipment specifications, consult the *DEC PROFESSIONAL Hardware Buyers Guide*. For information about the guide, contact Lea Smith at (215) 957- 4285. ■

Companies Mentioned In This Article

Banyan Systems Inc.
115 Flanders Rd.
Westboro, MA 01581
(508) 898-1000
CIRCLE 486 ON READER CARD

British Telecom Tymnet
2070 Chainbridge Rd., Ste. 200
Vienna, VA 22182
(703) 827-9110
CIRCLE 526 ON READER CARD

Data General Corp.
4400 Computer Dr.
Westboro, MA 01580
(508) 366-8911
CIRCLE 460 ON READER CARD

Honeywell Inc.
P.O. Box 5227 MS:211
Denver, CO 80217
(303) 773-4491
CIRCLE 524 ON READER CARD

McDonnell Douglas
Field Service Co.
1801 E. St. Andrew Pl.
Santa Ana, CA 92705
(714) 566-4000
CIRCLE 511 ON READER CARD

Novell Inc.
122 E. 1700 S.
Provo, UT 84606
(801) 379-5900
CIRCLE 487 ON READER CARD

Sun Microsystems Inc.
2550 Garcia Ave.
Mountain View, CA 94043
(415) 960-1300
CIRCLE 525 ON READER CARD

3Com Corp.
3165 Kifer Rd.
Santa Clara, CA 95052
(408) 562-6400
CIRCLE 489 ON READER CARD

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Lanham, MD 20706
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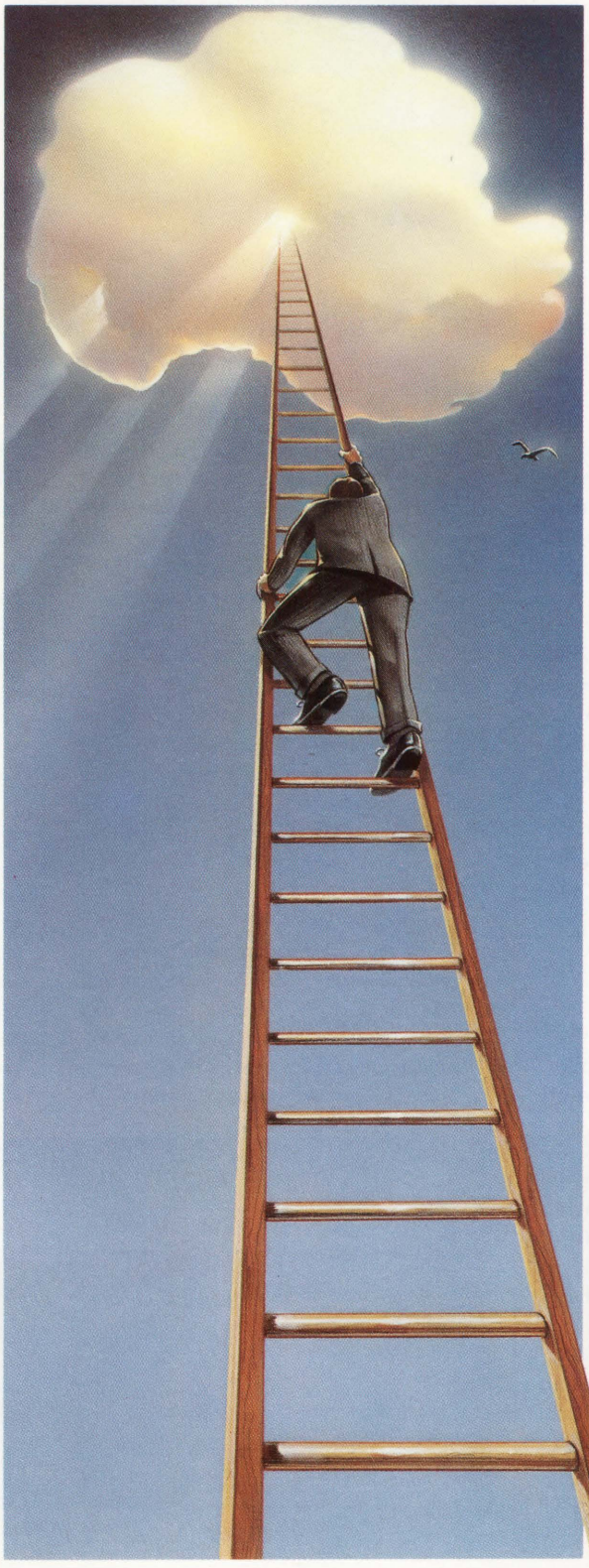

There are two ways to take your Ethernet LAN from where it is now to the wonderful world of wide-area networking.

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Or you can add MICOM's ™InstaGate1500 terminal server gateway (together with our INSTANET™ network server) and save lots of bucks.

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But beyond that, it gives you access to a broader range of wide-area networks than any terminal server. It lets you connect your LAT or TCP/IP network with X.25 networks, T1 trunk lines, remote MUXes, 56-Kbps to 64-Kbps digital links, IBM SNA/SDLC, FAX, the gamut.

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PRODUCTS

HP LAN Protocol Analyzer Addresses DEC Protocols

Hewlett-Packard Company announced software enhancements for the HP 4972A LAN protocol analyzer that provide DECnet users with detailed analysis tools for testing DECnet protocols on Ethernet LANs.

The HP 18225A DECnet performance analyzer and HP 18224A DECnet protocol interpreter offer DECnet and LAT protocol-testing solutions. Both enhancements use LAT technology licensed from DEC. The HP 18225A provides information on individual node performance and traffic characteristics. A node-list measurements feature provides fast determination of node activity on all nodes transmitting and receiving on the network. A connection-measurements feature provides information on connection throughput, response times, duplicated packages and packet size. The HP 18224A provides full-text descriptions of DECnet and LAT protocols that aid problem isolation and increase productivity. It automatically recognizes which protocols are running on the network.

The products are priced at $950 each.
For more information, contact Nancy Teater, Hewlett-Packard Co., 3000 Hanover St., Palo Alto, CA 94304; (415) 857-7567.

Circle 401 on reader card

PMDF V3.1 Precompiles Configuration Information

Innosoft International Inc. announced the Pascal Memo Distribution Facility (PMDF) V3.1. It outperforms previous releases by a factor of two to three.

PMDF is a general-purpose system for delivering computer-based mail. It provides a uniform distribution environment that can be interfaced to multiple user interfaces and transport mechanisms. It uses the standard VMS Mail facility as its user interface and supports the PhoneNet asynchronous dial-up protocol as its primary transport mechanism. It also supports PhoneNet and SMTP over DECnet, DECnet-based Mail-11 Mail, Jnet, ANJE, SMTP over TCP/IP and an arbitrary I/O channel, SMTP and PhoneNet over X.25 links, and PSImail and UUCP as transport mechanisms. V3.1 precompiles configuration information into a configuration data image. The image is written in a format compatible with the VMS image activator, so you can use the VMSINSTAL utility to install the image for additional performance gains.
For more information, contact Innosoft Int'l Inc., 250 W. 1st St., Ste. 240, Claremont, CA 91711; (714) 624-7907.

Circle 402 on reader card

Innov8 Sustains 716-KBps Data Transfer Rate

MegaTape Corporation announced Innov8, a high-speed, high-capacity tape array for its line of devices to back up multiple multigigabyte Winchester disk drives. It provides a storage capacity of 6.6 GB and sustains a data transfer rate of up to 716 KBps or 42.9 MB per minute.

Three 8mm streaming tape drives operate in parallel. In read and write operations, data is buffered by a 1-MB cache that holds data in the form of separate records. The array can process data at rates in excess of that needed to stream three 250-KBps 8mm tape drives. During a write operation, data from the host is split into bytes. Each successive byte is written on a different 8mm tape drive.

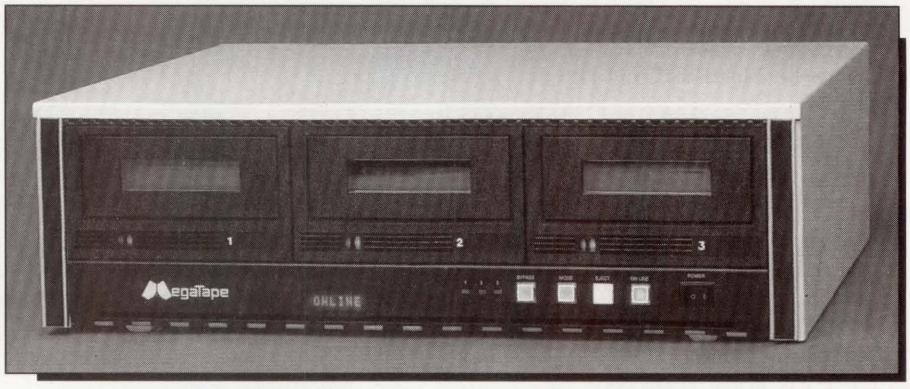
The Innov8 tape array with a compliment of 8mm drives costs $17,850. A complete subsystem for connection to the VAXBI bus costs $28,850. A subsystem for the MicroVAX 3000 costs $19,900.
For more information, contact Clyde Cornwell, MegaTape Corp., 1041 Hamilton Rd., Duarte, CA 91010; (818) 357-9921.

Circle 408 on reader card

InterBase V3.0 Increases Kernel Functionality

Interbase Software Corporation announced the InterBase RDBMS V3.0. It increases the functionality of the database kernel and enhances its ability to support complex applications running on multivendor networks. It supports comprehensive distributed database processing among the HP-UX line, HP-Apollo line, VAX/VMS line, VAX/ULTRIX line, the DECstation and all Sun workstations.

V3.0 brings knowledge about the application — such as commonly called functions, business rules and semantic information — into the database kernel and out of the application code. It includes event alerters, array support and blob filters. Event alerters are signals sent by the database to waiting programs to indicate that a change has been made and the transaction has been committed. Array support lets large or small structured objects be stored in the database.



MegaTape Corp.'s Innov8 tape array provides high storage capacity.

Blob filters eliminate the code requirement for translating blobs.

The product is priced from $5,000 to $100,000, depending on machine configuration.

For more information, contact Gail Spector, Interbase Software Corp., 209 Burlington Rd., Bedford, MA 01730; (617) 275-3222.

Circle 403 on reader card

Interlink's SNS/VT V2.0 Provides VT220 Support

Interlink Computer Sciences Inc. announced SNS/VT V2.0. It offers VT220, 132-column and multinational character set support.

SNS/VT lets users with IBM 3270s or PCs running as 3270s emulate VT52/100/220s. VT220 support lets users in the IBM environment access applications designed for access by native VT220s. Users with Interlink's SNS/SNA Gateway can access applications and data on DECnet networks by using IBM terminals on an SNA network. SNS/SNA Gateway products provide transparent connectivity and interoperability between mainframe computers running IBM's VM and MVS on an SNA network and DEC computers residing on a DECnet network. Other SNS/VT features include support for retrieve and local edit capabilities of the last command entered; support for applications that use "read, verify" messages that allow data to be verified locally; autoskip function support, which is used in processing screens set up as forms; and 80-column support.

For more information, contact Don Parkman, Interlink Computer Sciences Inc., 47370 Fremont Blvd., Fremont, CA 94538; (415) 657-9800.

Circle 404 on reader card

ZSTEM 240 Enhancements Include Reduced Memory Use

KEA Systems Ltd. announced the ZSTEM 240 V2.2. This terminal emulation software lets an IBM PC or compatible emulate a VT240/241/340.

Enhancements include reduced memory use, more network and printer support, and improved color and softkey functionality. Dynamic overlaying reduces the minimum memory required from 340 to 220 KB. This lets larger programs reside in memory with ZSTEM concurrently. To extend network functionality, a TELNET interface has been added for connection to FTP's TCP/IP, Excelan's TCP/IP, Sun's PC/NFS and Wollongong's WIN/TCP. The CTERM Access Interface is supported. With LAT and CTERM, ZSTEM can run over LANs and WANs using DECnet on Ethernet or asynchronous DDCMP connections. Printer capabilities includes an interface to let you write your own printer drivers. Text and graphics support is included for the LN03, HP LaserJet, OKI API, Epson LQ and Toshiba 1351.

The product is priced at $295.

For more information, contact Eric Alexandre, KEA Systems Ltd., 2150 W. Broadway, Vancouver, BC V6K 4L9; (604) 732-7411.

Circle 405 on reader card

Lanex Enhances Ethernet LAN Components

Lanex Corporation announced improvements to its Lanexpress line of Ethernet LAN components.

LAN-Lock is standard in Lanex's local and remote bridges. It lets you build filters for LAN bridge activities. It prevents users from exiting their LAN over a bridge, prevents users from accessing a specific device on another LAN, and prevents individual protocols from exiting a specific LAN.

A fiber optic interface for Lanex's REM8023 Remote Ethernet Bridge supports 50/125, 62/125 or 100/140 fiber cable and terminates with either SMA or ST connectors. Distances to 3km can be achieved at 10 Mbps. A T1 DSU interface option for the REM8023 eliminates the need for an external unit to attach a remote Ethernet bridge to T1 services.

The options are priced at $995 each.

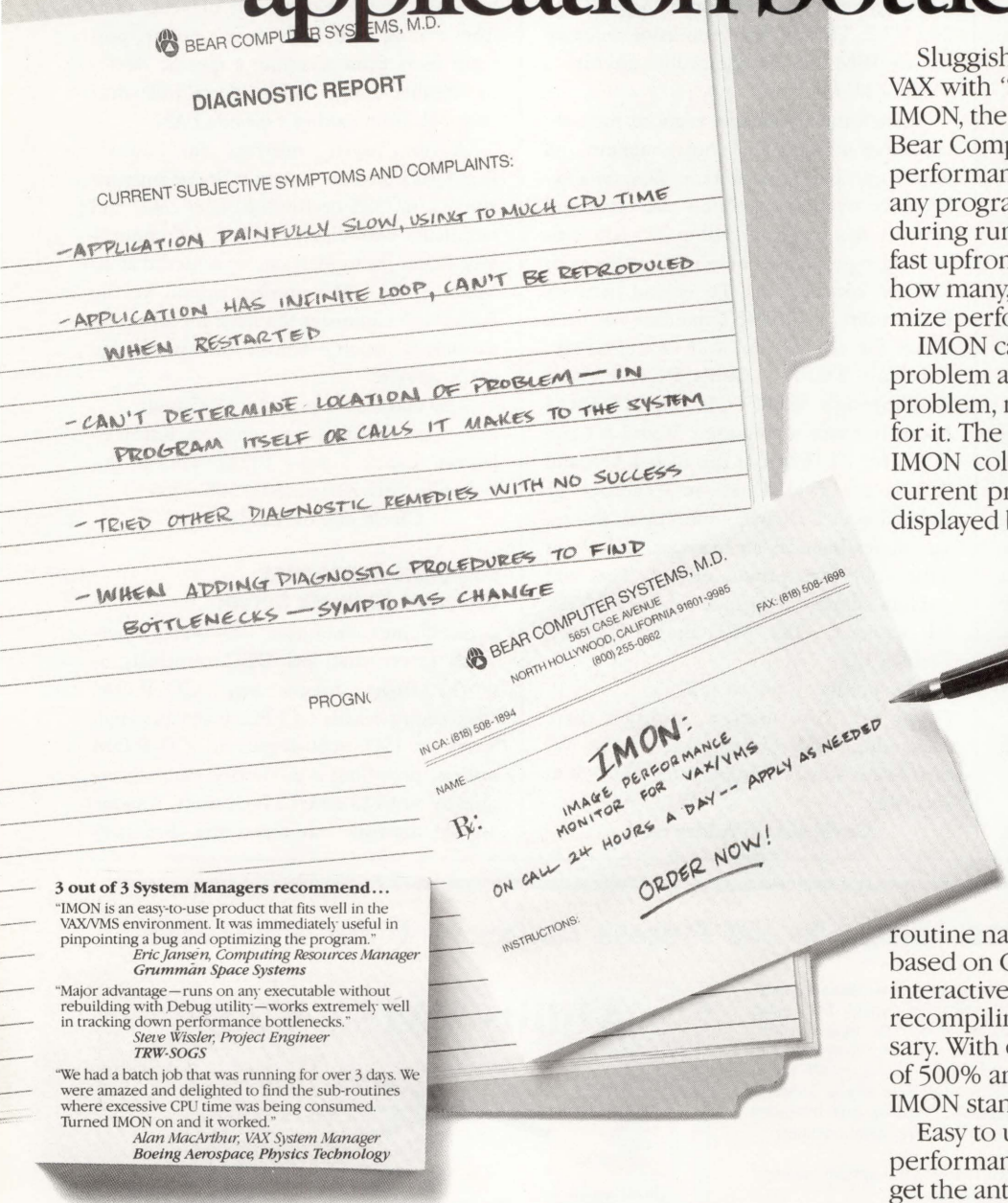
For more information, contact Kathleen Janson, Lanex Corp., 10727 Tucker St., Beltsville, MD 20705; (301) 595-4700.

Circle 406 on reader card

Logicraft Announces CD-Ware Network Server

Logicraft Inc. announced CD-Ware, a network server that lets DEC terminals or workstations access any CD-ROM application available on a PC. It attaches High Sierra or ISO 9660-formatted CD-ROM readers, providing a dictionary stand accessible by all VMS or ULTRIX users. Anyone on the network can access the dictionary

The programmers' antidote to VAX/VMS application bottlenecks.



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Eric Jansen, Computing Resources Manager
Grumman Space Systems

"Major advantage—runs on any executable without rebuilding with Debug utility—works extremely well in tracking down performance bottlenecks."
Steve Wissler, Project Engineer
TRW-SOGS

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Alan MacArthur, VAX System Manager
Boeing Aerospace, Physics Technology

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stand. Up to 16 users can access the same CD-ROM disk simultaneously. The product supports up to four drives on a controller card. Multiple CD-ROM controllers can be added, allowing up to 16 drives on a system.

The company also announced that its 386Ware line supports interactive graphics on DEC workstations. The 386Ware DOS server lets any terminal or workstation on a DEC network run IBM PC software. Users of 386Ware previously could run static graphics such as Lotus bar and pie charts on their DEC terminals and workstations. The new feature lets workstation users run such graphics-intensive packages as Excel, MS Windows, AutoCAD and Flight Simulator. Its implementation of DECwindows uses X or UIS to display interactive graphics.

For more information, contact Jennifer Tyrrell, Logicraft Inc., 22 Cotton Rd., Nashua, NH 03063; (603) 880-0300.

Circle 407 on reader card

Oracle Links Its RDBMS To RMS File System

Oracle Corporation announce SQL*Connect to RMS, which is a member of the Oracle SQL*Connect gateway product family. SQL*Connect provides access from Oracle applications to data in non-Oracle databases and files.

SQL*Connect to RMS links the Oracle RDBMS to RMS, the file system native to VAX/VMS. It lets VAX users preserve their investment in RMS data while stepping up to the functionality of Oracle and its development tools and applications. It lets you query existing RMS data using standard SQL commands and gives RMS users complete control over the migration from RMS files to Oracle. Now, any Oracle application can join data from Oracle with data stored in IBM's DB2 and VAX RMS files.

The product ranges in price from $2,300 on a MicroVAX II to $95,500 on a VAX 6000 Model 460.

For more information, contact Brian Owen, Oracle Corp., 20 Davis Dr., Belmont, CA 94002; (415) 598-3711.

Circle 409 on reader card

Pinnacle Announces Optical Storage Systems

Pinnacle Micro Inc. announced erasable optical storage systems for DEC machines. The REO-650 and REO-1300 subsystems are designed for use with the MicroVAX II, MicroVAX 3000 series and the LSI-11/2, 11/23, 11/53, 11/73 and 11/83. UNIBUS systems include the VAX 700, 6000 and 8000 series.

The REO-650 offers 600 MB of storage capacity per removable cartridge. It's available as a desktop system or in a rack-mount configuration. The REO-1300 offers 1200 MB of storage capacity using two removable cartridges. It can access one disk, span both disks and perform on-the-fly disk shadowing. It's available as a desktop system or in a dual rack-mount configuration.

For more information, contact Scott Blum, Pinnacle Micro Inc., 15265 Alton Pkwy., Irvine, CA 92718; (714) 727-3300.

Circle 411 on reader card

poly-LINK Integrates VAX Systems With PC LAN Users

Polygon Inc. announced poly-LINK V1.0, a PC-to-DEC integration product. It provides VAX/VMS services for Ethernet-based PCs, including transparent file, file transfer, and disk and print services between PC workstations and a VAX.

The product integrates VAX systems with PC LAN users on 3Com 3+ and 3+Open LAN Manager, Banyan Vines and Novell NetWare/386 networks. The PC LAN and VAX systems can be on the same Ethernet network and be connected without gateways. This lets you access LAN-based e-mail or database applications while the VAX appears as a local PC drive or printer. You can store information on the VAX and share files with PC or terminal users connected to the VAX. A separate RMS file is created by poly-LINK for each PC file copied to the VAX, letting PC users read and copy the files. If the files are ASCII, terminal users can access the files from the VAX-based directory.

Polygon's poly-LINK is priced at $349 per user.

For more information, contact Russ Bacon, Polygon Inc., 1024 Executive Pkwy., St. Louis, MO 63141; (314) 576-7709.

Circle 412 on reader card

Sherpa Manages Product Information

Sherpa Corporation announced a multiplatform, networkable version of the Sherpa Design Management System (DMS) V3.0.

Based on Serpa's Freedom Architecture, the product manages engineering and manufacturing product information files distributed through a networked and/or clustered heterogeneous mixture of DEC, HP, HP-Apollo and Sun workstations and servers, as well as IBM-compatible PCs and Macintoshes. It provides comprehensive product information control and lets you optimize the flow of management procedures to ensure that only correct product information is used in complex CAD/CAE/CAM environments.

For more information, contact Bryan Stolle, Sherpa Corp, 611 River Oaks Pkwy., San Jose, CA 95134; (408) 433-0455.

Circle 417 on reader card

Process Software Enhances Networking Software Family

Process Software Corporation announced V2.0 of its TCP/IP family of networking software products for TSX-Plus. It provides users of PDP-11s running TSX-Plus with a high-speed, multivendor network. It lets you operate in heterogeneous environments with systems from DEC, HP, IBM and others.

The release includes FTP-TSX, a file transfer networking product, and TELNET-TSX, a virtual terminal networking product. FTP-TSX implements the client and server sides of FTP. It supports a file transfer utility that lets you copy files to or from remote systems. Popular file formats are supported for file transfer, and password protection is implemented for account security. TELNET_TSX implements the client side of TELNET that allows TSX-Plus users to log into remote systems. It reduces hardware costs, because dedicated terminals and serial ports aren't required.

FTP-TSX and TELNET-TSX cost $995 and $795 respectively.

For more information, contact Phil Denzer, Process Software Corp., 959 Concord St., Framingham, MA 01701; (508) 879-6994.

Circle 413 on reader card

Progress 4GL Interfaces With Rdb

Progress Software Corporation announced Progress V6.0. It includes an interface gateway that lets Progress 4GL users build distributed applications using data stored in Rdb/VMS. It also runs on Oracle and transparently reads and writes RMS files.

Progress with ANSI-standard SQL interfaces with Rdb through a database gateway using DEC's Rdb SQL. DEC users can build and run distributed applications in VAX/VMS, VAX/ULTRIX and RISC/ULTRIX with support for such networking protocols as DECnet and TCP/IP, regardless of the database used. Its Data Dictionary provides a central repository to manage data stored in Rdb databases, RMS files and Progress-supported distributed databases. With the same program, you can process data simultaneously and transparently from Rdb, RMS, Oracle and Progress databases. It supports CDD/Plus and all native DEC editors. Its client/server architecture lets you run Progress-based applications across DECnet networks and VAXclusters.

The Progress Rdb gateway is offered as a front-end application development module at prices ranging from $2,550 to $115,000. For more information, contact John Ricciardone, Progress Software Corp., 5 Oak Park, Bedford, MA 01730; (617) 275-4500.

Circle 414 on reader card

Racal-InterLan Provides DECnet Connectivity

Racal-InterLan announced two communications products that provide DECnet connectivity to users of PC ATs running UNIX or MS-DOS. The NP642 and NP647 combine Racal-InterLan's NP600A intelligent protocol processor with software to deliver two-way file sharing and remote log in capability between DECnet nodes and single or multiuser PC ATs on thick or thin Ethernet.

Designed for 386-based PCs under UNIX System V 3.2, the NP642 supports up to 32 concurrent users. Using UNIX multitasking capabilities, workstations attached to the PC can communicate with up to 1,023 DEC nodes in an area. The product is compatible with Phase IV DECnet and implements DNA Phase IV. Remote file transfer capabilities and remote directory listings are provided with client and server virtual terminal support (CTERM). The NP647 lets PC ATs under MS-DOS or Novell NetWare communicate with other DECnet nodes on an Ethernet network. Because it handles DECnet protocol processing onboard the NP600A, it frees host memory for DOS applications. It provides client virtual terminal support and remote file transfer capabilities.

For more information, contact Mark Williams, Racal-InterLan, 155 Swanson Rd., Boxborough, MA 01719; (508) 263-9929.

Circle 531 on reader card

Rabbit-1 Simplifies Setup Procedures

Raxco Software Inc. announced the Rabbit-1 Resource Accounting/Chargeback System V4.3. Features include menus that simplify setup procedures, automated summary reports and efficient information retrieval from active accounting files.

Rabbit-1 is a resource management tool used to track system resource consumption. It monitors system performance by providing information for identifying system bottlenecks, tracks utilization trends for capacity planning, provides project accounting, and equitably distributes DP expenses by charging users for resource consumption. Menus

simplify and automate setup procedures for accounting, disk accounting, project accounting and the shift monitor. Recap reports are automated to produce quick and flexible summaries by account, project, username, node, date, time, queue, port-ID and process type. During a billing run, Rabbit-1 accesses accounting information directly from the active accounting file.

The product is priced from $2,495 to $8,995, depending on VAX configuration. For more information, contact Bill Joyce, Raxco Software Inc., 2440 Research Blvd., Ste. 200, Rockville, MD 20850; (301) 258-2620.

Circle 415 on reader card

SES/workbench Enhances System Design Process

Scientific and Engineering Software Inc. announced SES/workbench V1.1. This system-level design tool models and evaluates the performance of computer hardware and software systems, communications networks, VLSI circuitry and other electronic systems. Design engineers can evaluate alternative architectural solutions and iteratively refine the design at finer levels of detail.

V1.1 enhances the system design process with such features as graphical post-processing of simulation results and speed increases in model compilation and execution. For example, a model of a hypercube communications system and a model of a VLSI CPU compile and execute twice as fast with V1.1. The product includes enhancements to the built-in text editor and integration of the network license manager. It's available for engineering workstations from DEC, HP-Apollo, Solbourne and Sun.

For more information, contact John Mannix, Scientific and Engineering Software Inc., 1301 W. 25th St., Ste. 300, Austin, TX 78705; (512) 474-4526.

Circle 416 on reader card

Parametric Extends Design Automation Products

Parametric Technology Corporation announced the Pro/Manufacturing extension to its Pro/Engineer family of integrated design automation products. Pro/Engineer applications are available on workstation platforms from DEC, HP, IBM and others.

Pro/Manufacturing provides tools that let you characterize a Pro/Engineer parametric solid model in terms of the process steps and operations required to manufacture the design. It retains the intermediate physical shapes and drawings of each process step in a single data structure that contains the product design definition. The menu-driven product supports process plan generation, display of completed tool paths, automatic material removal, capture and display of intermediate process steps and documentation, and output of cutter location files that can be post-processed into NC machining instructions.

Pro/Manufacturing prices begin at $7,000 as part of Pro/Engineer V5.0. Pro/Engineer parametric modeler prices begin at $9,500. For more information, contact Lou Volpe, Parametric Technology Corp., 128 Technology Dr., Waltham, MA 02154; (617) 894-7111.

Circle 410 on reader card

PDI 16 Transfers Data From VAXBI Host

Simpact Associates Inc. announced the PDI 16, a licensed, high-speed parallel data inter-

face for VAXBI systems. It's functionally equivalent to two DR11-W interfaces and provides DR11-W functionality, including software compatibility, on a single VAXBI module. It provides a migration path for users who want to move applications from UNIBUS to VAXBI but need to preserve investments in existing device drivers and applications software.

The PDI 16 is a general-purpose I/O adapter that transfers 16-bit parallel data between a VAXBI host and processors, peripherals and application-specific devices at rates of up to 1.3 MBps. It occupies a single slot in the VAXBI backplane and is compatible with DEC's short- or long-line DR11-W interfaces, providing connections at distances up to 1,000 feet. This native-mode VAXBI option eliminates the need for a UNIBUS communications interface and gives the CPU a direct bus path to the PDI 16 module.

The product is priced from $8,985 to $10,040.

For more information, contact Steve Adams, Simpact Associates Inc., 9210 Sky Park Ct., San Diego, CA 92123; (619) 565-1865.

Circle 418 on reader card

Sky Computers Announces Accelerator Board

Sky Computers Inc. announced an application accelerator board that combines the Intel i860 and i960 RISC-based microprocessors. With 40 mips and 80 Mflops computational power, the single-board SKYbolt provides near-supercomputing performance for Sun workstations and other VME-based systems.

Key to SKYbolt's performance is a suite of compilers and software tools that help you optimize your applications for SKYbolt's architecture. SKYVEC C and F77 are professional-level C and FORTRAN compilers based on MetaWare's High C and Lahey's FORTRAN f77L software. Sky has embedded a second-generation vectorizing module to these compilers that automatically produces vectorized code during the compilation. SKYbolt is a 9U-sized VMS card with up to 64 MB of memory that's shared with the main processor. It features a direct memory access engine and separate onboard channel for external devices. A 32-bit VME interface connects the product to the host system and other VME devices.

The product is priced from $12,450.

For more information, contact Colin Barton, Sky Computers Inc., 27 Industrial Ave., Chelmsford, MA 01824; (508) 250-1920.

Circle 421 on reader card

Spider Provides Remote LAN Management Capabilities

Spider Systems Inc. announced Ethernet LAN remote monitoring software for the SpiderMonitor 220 and SpiderAnalyzer 320. SpiderRemote lets network managers remotely perform all LAN management capabilities offered by the 220 and 320, including collecting network and station statistics, setting filters and capturing packets, decoding protocols, and setting up and reviewing alarms.

SpiderRemote runs directly over the net-

work without a serial line or terminal server connection. A master station can access a slave located in another building, state or country at network speed. The network manager can dynamically determine which station on the network will serve as master or slave. This Dynamic Master Definition enables any SpiderMonitor or SpiderAnalyzer on the network to be defined as a master or slave.

SpiderRemote costs $950, plus $295 for each remote segment.

For more information, contact Jennifer Gooding, Spider Systems Inc., 12 New England Executive Park, Burlington, MA 01803; (617) 270-3510.

Circle 422 on reader card

Computerfone Communicates With Computer Via Telephone

Suncoast Systems Inc. announced the Computerfone. This intelligent peripheral is a commercial-quality, two-way telephone-to-computer voice digitizer and phone control product.

Computerfone accepts, digitizes, stores and transfers incoming speech, dials phone numbers, answers incoming calls and converts incoming tones to standard ASCII characters for processing. Other functions include operator notification, external switch recognition and remote contact closing. Optional features include precision call progress, Special Information Tone (SIT) recognition, a digital modem and up to 1 MB of expandable memory. This standalone device can operate with any operating system or computer using industry-standard RS-232/ASCII protocol, including VAX/VMS. It lets you communicate with a computer through an ordinary telephone, receive a voice response, store messages and execute commands.

Computerfone costs $695.

For more information, contact Paul Simard, Suncoast Systems Inc., P.O. Box 7105, Pensacola, FL 32514; (904) 478-6477.

Circle 423 on reader card

SI2480 Connects To HSC VAXcluster Storage Controller

System Industries announced the SI2480, a rack-mountable 3480-compatible cartridge tape subsystem for direct connection to the HSC VAXcluster storage controller.

The SI2480 conforms to the IBM 18-track 3480 standard and provides industry-wide compatibility. It comes with an automatic tape cartridge stacker with either five or 10 cartridge bins. Its capacity of 200 MB per cartridge lets you back up from 1 to 2 GB without operator intervention. It features a maximum transfer rate of 3 MBps. Up to four units can be housed in a 60-inch cabinet. A typical configuration includes a master and three slaves connected to a single HSC port. Each tape unit features 15,000 MTBF, and the formatter unit has a reliability rating of 50,000 hours. The subsystem plugs directly into HSC5X-CA and HSC5X-DA cards without modification. It provides TMSCP and either TA78 or TA90 emulation and requires no software modifications to the host.

The product is priced at $55,200 for a master unit and $36,800 each for up to three slave units.

For more information, contact Brian Edwards, System Industries, 560 Cottonwood Dr., Milpitas, CA 95035; (408) 432-1212.

Circle 424 on reader card

Catch Up to Your VAX

VAX technology doesn't slow down. DEC just had its busiest year of product introductions. You've *got* to keep pace.

DEXPO South 90 helps you catch up. With more than 10,000 DEC computing and connectivity products. Fast solutions for your personals, workstations, PDP*s, VAX*s, mainframes and supercomputers. Timely VMS*, ULTRIX*, and multi-vendor interoperability enhancements. 250 exhibitors to keep you on track.

If you attend the DECUS Symposium, DEXPO is only five minutes away. Just catch one of the free shuttle buses--they run continuously. (DECUS* is not affiliated with DEXPO and requires separate registration.)

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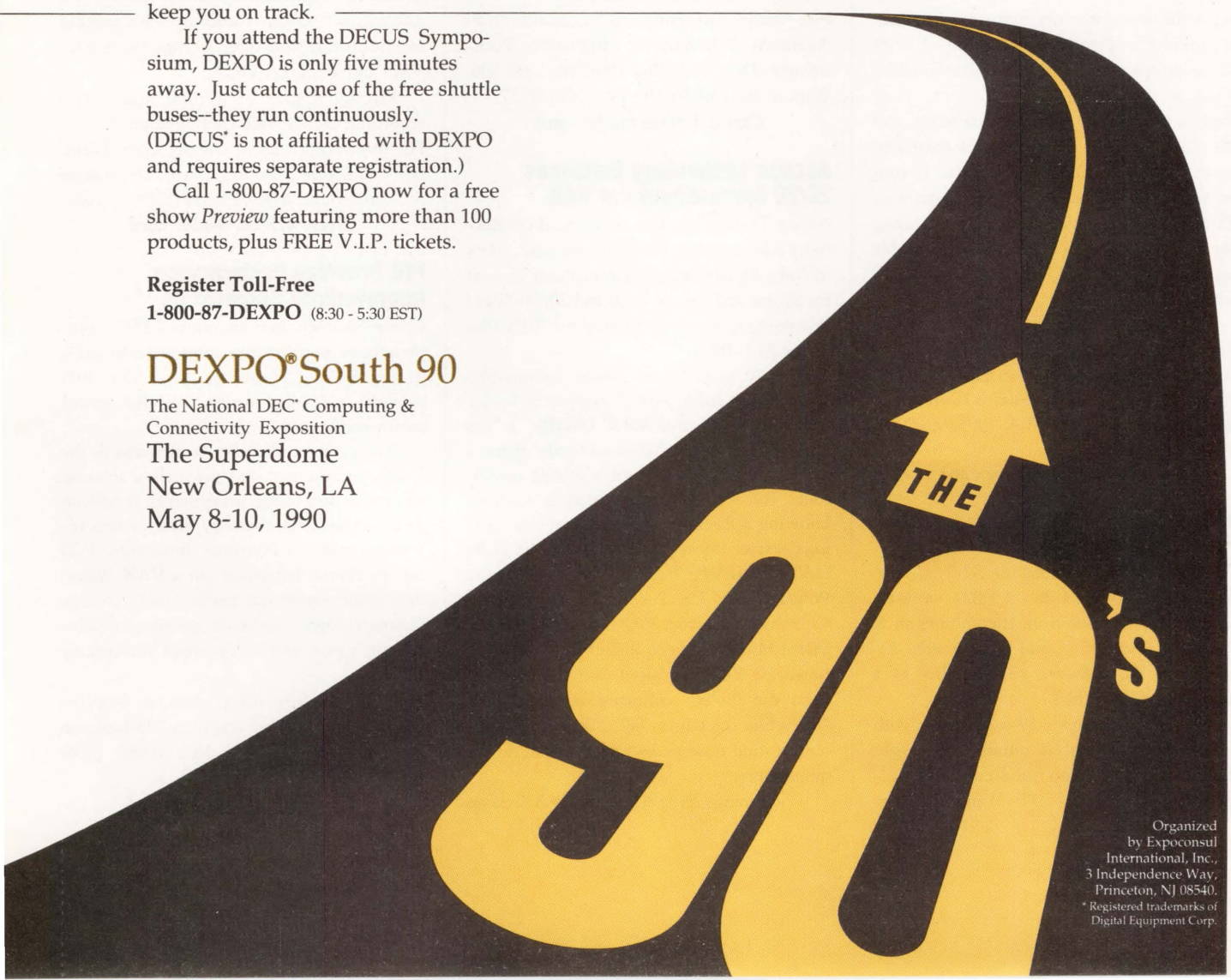

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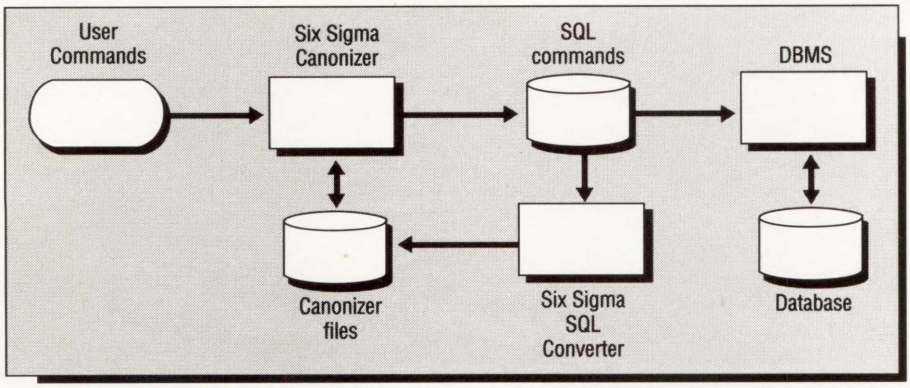


Six Sigma CASE Inc.'s Canonizer normalizes databases.

The Canonizer Automates Database Normalizing

Six Sigma CASE Inc. announced the Canonizer CASE tool. It automates the complex and time-consuming task of normalizing databases for UNIX applications.

Normalizing to the third normal form, the Canonizer creates an ANSI-standard SQL script for use with UNIX DBMSs, including Informix, Ingres, Oracle, Sybase, Unify and others. It provides a data dictionary containing definitions for every item in a database. It provides a spreadsheetlike interface with menu-driven commands, automatic scrolling windows, and online help. You can view displays of relations between data items, and you have full edit capabilities of databases, views, data items and relationships. It runs on such UNIX-based operating systems as BSD, Sun OS, System V and XENIX using character-based serial terminals. Compatible hardware platforms include DEC, NCR and Sun.

The product is priced at $1,295 for a single-user version.

For more information, contact Hunter Zuker, Six Sigma CASE Inc., 14405 S.E. 36th St., Ste. 210, Bellevue, WA 98006; (206) 643-6911.

Circle 420 on reader card

XN7 Graphics X Station Features X Interface

Tektronix Inc. announced the XN7 Graphics X Station, with 1,280 x 1,024 workstationlike display resolution. It combines an X interface, networking and large-screen display with the software compatibility of a monochrome terminal.

The XN7 features a 19-inch screen with a 70-Hz noninterlaced refresh rate. Eight fonts are standard, with hundreds downloadable through the XN7's TFTP and NFS support. It's powered by a 15-MHz Motorola 68020 processor. Standard RAM is 2 MB, expandable to 8 MB. Connectivity options let the XN7 fit into heterogeneous compute environments that include workstations, minis, terminals, mainframes and supercomputers. An Ethernet TCP/IP LAN interface and RS-232-C host port are standard. DECnet support is optional. Hosts that don't support X are accessible through a TELNET window with VT100 emulation.

For more information, contact Joan Auerbach, Tektronix Inc., Interactive Technologies Div., P.O. Box 1000, M.S. 60-380, Wilsonville, OR 97070; (503) 685-2927.

Circle 419 on reader card

Access Technology Enhances 20/20 Spreadsheet For VAX

Access Technology Inc. announced connectivity add-ons to its 20/20 spreadsheet. They include 20/20 Database Connection support for Sybase and Oracle V6.0 and 20/20 Word Processing Connection support for WPS-Plus under ALL-IN-1.

The 20/20 Database Connection provides VAX 20/20 users with a transparent bridge between 20/20 and VAX DBMSs. It lets you retrieve information directly from a database and place it into a 20/20 spreadsheet for reporting and analysis without knowing a database query language or exiting the spreadsheet. It's also available for Rdb, DATATRIEVE, Ingres, Oracle V5.0 and PowerHouse. The 20/20 Word Processing Connection provides VAX users with a transparent bridge between 20/20 and VAX WP packages. You can input WP files directly from the 20/20 command line and send 20/20 files directly to WP documents without creating intermediate files or exiting the spreadsheet.

Prices range from $250 on a VAXstation to $6,600 on the VAX 8800.

For more information, contact Geoff Spillane, Access Technology Inc., 2 Natick Executive Park, Natick, MA 01760; (508) 655-9191.

Circle 400 on reader card

BBN Software Announces Quality Control Package

BBN Software Products Corporation announced RS/QCA II, a second-generation quality control analysis package. It combines a full set of statistical process control capabilities with application development tools.

RS/QCA II software is designed for manufacturing and quality engineers who perform quality data analysis such as control charting, process capability studies and Pareto analysis; shop floor operators; and programmers who build customized, site-specific quality software solutions. Its menu-driven interface simplifies data entry, reporting and online charting and graphics display. It features customization tools that accommodate specialized industry application requirements, as well as integration capabilities that let you integrate RS/QCA II software with existing manufacturing software. It runs on VAX/VMS and VAX/ULTRIX.

Pricing begins at $2,000 and varies according to hardware configuration.

For more information, contact Lynn Hearl, BBN Software Products Corp., 10 Fawcett St., Cambridge, MA 02238; (617) 873-5000.

Circle 425 on reader card

PID Provides Performance Improvement Diagnostics

Comp-Shooters Inc. announced PID, comprehensive performance improvement diagnostics for the entire line of VAXs. PID provides a detailed analysis of VAX price/performance ratio.

The product identifies bottlenecks in the VAX environment and provides a solution to present and future investments. It collects data on the CPU, memory, disk, system resources and maintenance functions. PID reports reveal deficiencies in a VAX system that hinder optimum performance. Comp-Shooters assigns a technical specialist to evaluate the report and recommend site-specific solutions.

For more information, contact Stephen Stymiest, Comp-Shooters Inc., 285 Littleton Rd., Ste. 10, Westford, MA 01886; (508) 692-0756.

Circle 431 on reader card

Concurrent LAT-TCP/IP? It's no biggie.

In a very small way, Lantronix has just revolutionized the terminal server.

Fact is the Lantronix ETS-8 packs 8-channels, Ethernet compatibility and dual protocols in an incredibly small package.

Actual size? A mere 2.6″ x 8″ x 5.2″.

To put it in proper perspective, you get both LAT and TCP/IP terminal support in a unit 1/8 the size of a single-protocol DECserver 200.

No big price tag either. The ETS-8 is by far the lowest cost dual-protocol terminal server on the market today.

And it's the only real solution when you're adding just a few terminals or printers.

The savings are even greater when you figure your total cost per installed terminal. Because the ETS-8 is designed to be installed close to your workgroup's terminals, you eliminate the needless expense of cabling each terminal to a centralized location.

Getting big ideas about what our little terminal server can do for you? Call Lantronix toll-free for complete technical specifications and pricing information: **1-800-422-7022.**

Lantronix, 26072 Merit Circle, Suite 113, Laguna Hills, CA 92653. Phone: (714) 367-0050. FAX: (714) 367-0287.

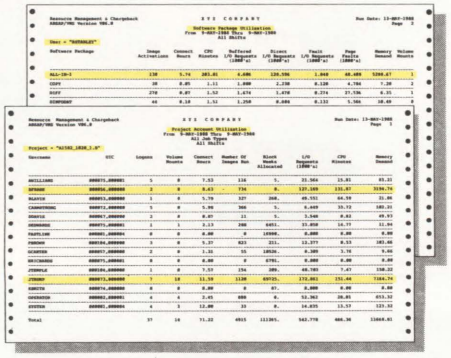
LANTRONIX

CIRCLE 140 ON READER CARD

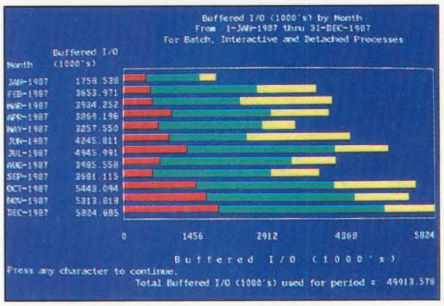
ARSAP™

The system accounting product that stacks the DEC™ in your favor.

With ARSAP you can do it all. Everything from capacity planning to performance management to project accounting. ARSAP was designed to work with VMS, so you don't need to change your operating procedures to put this comprehensive system to work for you. And because of its exclusive options, ARSAP is the most efficient and powerful system accounting product available today.



Manage users and control project costs using ARSAP reports.



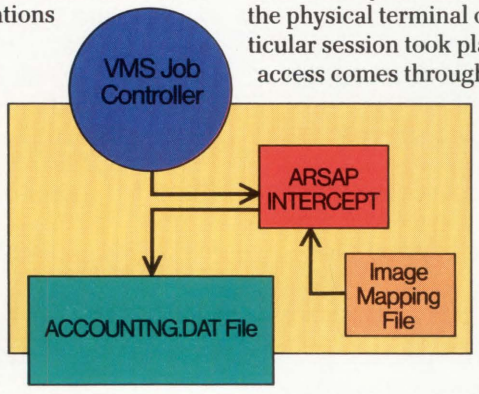
Analyze historical data to plan system resources required for future growth.

Disk Management and Global System Reporting aid long-term capacity planning.

With ARSAP, you can generate easy-to-read bar chart capacity reports for any accounting statistic available from VMS, including CPU time, memory utilization, buffered I/O's, direct I/O's, connect time, and more. And our disk management reports identify amount of space allocated to each user and total amount of free space remaining.

Selective Image Accounting reduces accounting files by as much as 90%.

Only ARSAP allows you to select and report on the specific applications you choose, instead of the familiar "all or nothing" alternative offered by other systems. This valuable option saves thousands of I/O's to your system disk and reduces the space requirements of accounting files by as much as 90%!



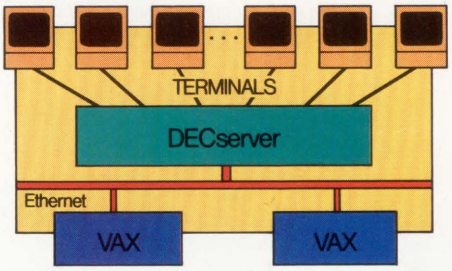
Terminal Reporting tracks usage for control and troubleshooting.

ARSAP's exclusive terminal reporting feature lets you track usage and locate the physical terminal on which a particular session took place, even when access comes through virtual terminals, Intergraph™ workstations or DECservers (LATs).

Use "ARSAP Intercept" to automatically select image data for software reporting.

Get the details on ARSAP today.

ARSAP (version 6.0) is the product of 11 years of system accounting design. No other software package is better suited to your DEC system or your system accounting needs. Only ARSAP offers you a *complete* solution. For more information about how ARSAP can meet *your* needs call GEJAC today.



ARSAP gives you the "evidence" to effectively allocate limited hardware among users.

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- ☐ Printer Forms Tracking
- ☐ Performance Evaluation
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- ☐ Software Package Reporting
- ☐ Other

I have these VAX/VMS systems:

# of systems _____ Model #'s _____

CIRCLE 128 ON READER CARD

CA-SuperCalc Features ALL-IN-1 Integration

Computer Associates International Inc. announced CA-SuperCalc V5.1, corporate spreadsheet software for VAX/VMS.

The CA-SuperCalc system offers integrated spreadsheet and data consolidation capacities for the DEC, IBM and PC environments. CA-SuperCalc for VAX is a 3-D spreadsheet, permitting formula linking and dynamic updating of up to 1,000 spreadsheets in memory and unlimited access to spreadsheets on disk. It features ALL-IN-1 integration, direct access to RDB and the Computer Associates Masterpiece series of financial, distribution and decision support software. It provides boardroom-quality graphics and supports key devices and file formats, such as laser and thermal printers, PostScript and CGM, plotters and cameras.

For more information, contact Beth Winkowski, Computer Associates Int'l Inc., 711 Stewart Ave., Garden City, NY 11530; (516) 227-3300.

Circle 432 on reader card

Striped Lightning For VAX Provides Shop Floor Control

Peripheral Software Concepts Inc. announced Striped Lightning for the VAX. This online real-time data collection and shop floor control system is for manufacturers in government or commercial marketplaces.

Striped Lightning for the VAX provides a migration path with total compatibility from the MicroVAX to the VAX 9000. It includes bar code data collection technology and provides complete visibility of activities on the shop floor. The modular system lets you track and control labor, WIP materials and machine use. It provides on-demand finite capacity scheduling capabilities needed to validate MRP schedules and track production on a planned versus actual basis.

For more information, contact Louis Harm, Peripheral Software Concepts Inc., 600 Johnson Ave., Bohemia, NY 11716; (516) 563-7000.

Circle 446 on reader card

Sbrowse Helps Manage Unfamiliar Programs

Computer Enterprises Inc. announced Sbrowse, an interactive source language browser for ULTRIX on VAXs, UNIX on minis or micros, and MS-DOS on PCs. It makes large and unfamiliar source programs comprehensible.

Sbrowse requires no links to written or inline documentation. It manages large source programs in C, C++, Lex and Yacc. You can integrate your favorite editor easily with the point-and-shoot interface. You can call Sbrowse from within the editor, stack Sbrowse and editor calls, and switch back and forth between Sbrowse invocations using job control. Sbrowse answers questions from a symbol index that it constructs the first time it's used on the source files and reconstructs only if a source file has changed or the list of source files is different. When the index is reconstructed, the data for the unchanged files is reused, keeping performance at optimal levels.

Single-user prices start at $950 for the MicroVAX 2000.

For more information, contact Ann Winter, Computer Enterprises Inc., P.O. Box 8, Port Jefferson, NY 11777; (516) 473-7500.

Circle 433 on reader car

Convex Expands COVUE Integration Tools

Convex Computer Corporation announced four CONVEX-To-VAX User Environment (COVUE) additions: COVUEnet/Multibus V2.0, COVUEnet/VME V2.0, COVUElib V1.0 and COVUEbinary V1.0.

Both COVUEnet/Multibus V2.0 and COVUEnet/VMS V2.0 offer increased performance and compatibility. In V2.0, all protocol code has been moved from the Excelan controller into the CPU side of the ConvexOS kernel. COVUElib V2.0, the VMS run-time library, features 98 new routines, making it easier for you to port VMS applications written in C and FORTRAN to the Convex supercomputer platform. COVUEbinary V1.0, the VAX binary data file format utility, serves as a bridge between VAX/VMS files and Convex FORTRAN. Its primary operation is to convert files to a record format that's understood by the Convex or VAX system.

Prices begin at $16,500 for COVUEnet/Multibus V2.0 and COVUEnet/VME V2.0, $7,300 for COVUElib V2.0 and $8,200 for COVUEbinary V1.0.

For more information, contact Donna Burke, Convex Computer Corp., 3000 Waterview Pkwy., Richardson, TX 75080; (214) 497-4230.

Circle 434 on reader card

RAF Print Spooler Decreases VAX Overhead

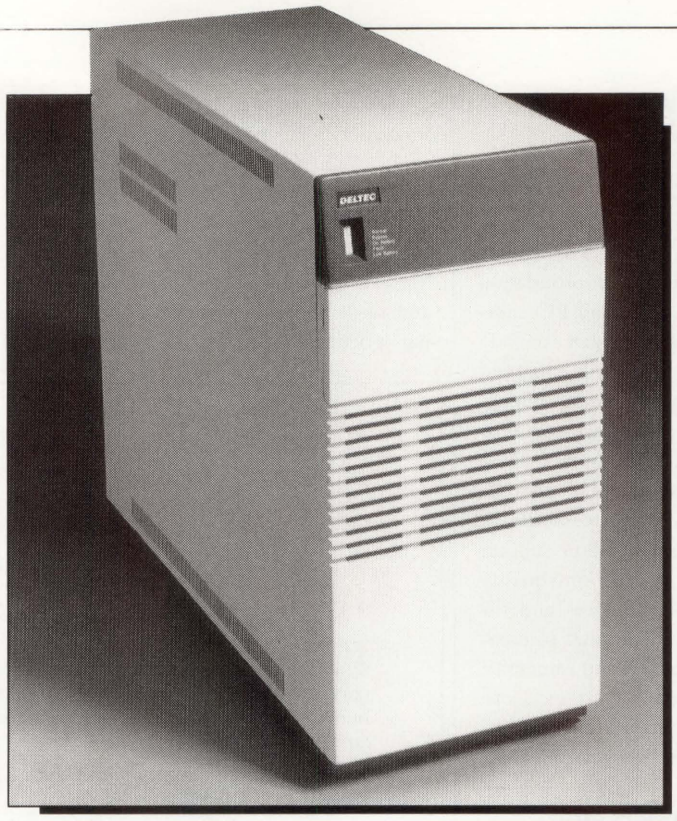
Datability Software Systems Inc. announced RAF Print Spooler, a PC software product that lets PC and VAX users share network-based printers. It accelerates printer response time and decreases VAX overhead.

The product lets PC users on a LAN use network-based printers connected to DEC-compatible terminal servers or other PCs as if the printers were connected directly to the PC. VAX users can access the same servers or PC-based printers. Consisting of a 5 1/4-inch floppy disk, it requires 6 KB of resident memory for existing RAF users or 40 KB if RAF isn't installed. It's supported by MS-DOS V2.0 and later on IBM PC, XT, AT and PS/2 and compatibles over standard IEEE Ethernet via ThinWire, twisted-pair or transceiver cable wiring. It can be used with Datability's Vista communications server, a DECSERVER or other LAT-compatible terminal server, and printers hung from PCs equipped with RAF Print Server.

The product costs $95 per PC copy.

For more information, contact Leslie Schinto, Datability Software Systems Inc., 322 8th Ave., 11th Fl., New York, NY 10001; (212) 807-7800.

Circle 435 on reader card



Deltec Corp.'s 2000 Series UPS provides backup protection for small multiuser minis, LANs and clustered micros.

DMG Announces VAX-To-FAX Reporting

Digital Management Group (DMG) announced an enhancement to its VAX-to-FAX system, DMG/FAX. A new set of standard reports aid in accounting for FAX use.

The standard reports make it possible for users with no programming background to report on their fax transmissions. The data is stored in a standard RMS file that can be used to prepare custom reports. The Confirmations List provides online information. DMG/FAX is integrated with ALL-IN-1, VMSmail and Word-11 word processing. It can be accessed directly from any VMS application that benefits from printing to remote fax destinations.

DMG/FAX is priced at $3,500 for a primary license, including the standard reports feature.

For more information, contact John Dightam, Digital Management Group, 4711 Yonge St., Ste. 600, North York, ON M2N 6K8; (416) 225-7788.

Circle 438 on reader card

Deltec UPS Features No-Break, Online Design

Deltec Corporation announced the 2000 Series UPS, designed to provide continuous, low-cost backup protection for small multiuser minis, LANs and clustered micros.

The 2000 Series features a no-break, online design that eliminates the risk of inverter switching, thereby providing constant reliable power. It handles nonlinear switching power supply loads and supports minis, micros, AS/4000, MicroVAX, small LANs, telephone switch gear, small process controllers and CAD systems. It features input/output plug/receptacle configurations, an RS-232 communications interface, a remote emergency power-off interface, audible alarm silence and automatic circuit breakers. Options include automatic shutdown and monitoring features for the AS/400. A caster-mounted design internally houses a 10-minute, maintenance-free backup battery.

The 2000 Series is available in models from 2 to 3KVA and costs from $3,500 to $5,000.

For more information, contact Deltec Corp., 2727 Kurtz St., San Diego, CA 92110; (619) 291-4211.

Circle 437 on reader card

DEMAX DLB TUNES VAXES 1,000,000 TIMES A DAY AND SAVES MY SANITY EVERY HOUR.

It's no wonder that DEMAX's Dynamic Load Balancer (DLB) is the number one VAX tuner worldwide, tuning VAXes more than a million times a day.

Before DLB, I used to spend more time manually tuning my VAX for varying system demands, than I spent really managing systems.

You know the kind of situation, you've got lots of users running lots of small applications, a few users running a few big applications, and then everybody running everything.

And all the time I'd be going crazy, continually trying to balance the system load.

Then I discovered DEMAX's (DLB) system and my life hasn't been the same since. DLB checks on the performance of each of my VAXes about a thousand times a day, keeping them balanced and tuned.

It works without supervision and continually monitors system performance parameters; picking up on processes that cause bottlenecks, then balancing the system to handle more processes simultaneously and to significantly speed throughput.

And because DLB is covered by the DEMAX Pledge, they won't require changes to VMS to run, they stick to DEC standards and if I have any questions I just call their customer support center and talk to experienced system managers.

Maybe that's why more than 1000 DEC system managers count on DLB to safely tune their VAXes over a million times a day.

To find out how DEMAX can help you, simply call, 1-800-283-3629 and request a free trial.

DEMAX

System Software Solutions.

1989 digital review TARGET AWARDS WINNER

CIRCLE 118 ON READER CARD

Synergy Applications Support Communications Toolbox

Synergy Software announced the VersaTerm V4.1 and VersaTerm-PRO V3.1 Mac terminal emulation and communications applications. They support Apple's Communications Toolbox and VT220 text terminal emulation.

An installation disk allows Mac users with System 6.0.2 or later to add the Communications Toolbox software. By dropping in Connection Tools and File Transfer Tools provided by Apple and other third parties, the products connect to new networks/protocols and support file transfer protocols that aren't built-in. VT220 text terminal emulation includes downloadable character sets, host-definable function keys, 7- and 8-bit operation, double-high double-wide characters, protected fields, selective erase and the DEC multinational character set. Other new features include pop-up soft keyboard support for simulating the Apple extended keyboard, VT220 keyboard and Data General D200 keyboard.

VersaTerm costs $149; VersaTerm-PRO costs $295. Updates cost $20.

For more information, contact Barbara Maxwell, Synergy Software, 2457 Perkiomen Ave., Reading, PA 19606; (215) 779-0522.

Circle 447 on reader card

ezBRIDGE Features Token Ring Support

Systems Strategies Inc. announced LU6.2 Token Ring support for its ezBRIDGE IBM-to-DEC connectivity software. With ezBRIDGE Token-Ring, VAX/VMS users on the DECnet have direct, high-speed access to IBM resources on the Token Ring LAN.

The product offers a high-performance, network-to-network interoperability solution for exchanging data between VAXs and IBM AS/400s, System/3Xs, PS/2s and mainframes. With one VAX connected to the Token Ring, any VAX on DECnet transparently can access any system on the Token Ring as if it were attached directly to the IBM. Products released with Token Ring support include ezBRIDGE Peer-to-Peer (for application-to-application cooperative processing) and On-Line (for terminal log in). For users with SDLC links, a transparent migration path to the Token Ring is offered. The product supports 4-megabit Token Rings; 16-megabit support will be added.

Prices range from $10,000 to $25,000. For more information, contact Lynn Tusa, Systems Strategies Inc., 225 W. 34th St., New York, NY 10001; (212) 279-8400.

Circle 448 on reader card

TextLAW Provides Litigation Support

Data Retrieval Corporation announced TextLAW, a litigation support application for DEC and IBM systems based on the company's text management software tools. It features a full-text DBMS and sophisticated retrieval functions.

TextLAW lets you research, track, modify and update legal documents; prepare pretrial memoranda, interrogatories, briefs and proposed findings of fact; control exhibits and correlate facts; and maintain cases and financial information. It can interface with other legal applications, maximizing existing corporate resources. It can store proprietary legal documents, so counselors can access key facts from historical data and related notations. The application is function-key driven

Digital Products

■ DEC announced enhancements to its integrated electronic image processing, including:

1. DECimage Storage Manager. It lets you develop and access large, centralized image information files using a client/server configuration. Image data can be stored on DEC's RV64 write-once optical jukebox and all DEC magnetic disk media. The product also allows image data to be migrated between optical and magnetic devices. License fees range from $1,000 to $31,000.
2. DECimage Application Services V2.0. This NAS product is a programmer interface for building image-capable applications that facilitates multivendor integration. V2.0 supports the ULTRIX programming environment and photographic and color processing. License fees range from $268 to about $4,700.
3. DECimage Scan Software V2.0. Features include scanner setup and the ability to scan, preview, crop and rotate images. It allows for reading and creating DDIF image files and supports the ULTRIX programming environment. License fees range from about $112 to about $1,125 for the client software and from about $3,100 to about $31,000 for the server software.

DEC also announced deployment of Image Expertise Centers throughout the U.S.; fax and OCR development services; and relationships with 10 hardware and software vendors, including an enhanced relationship with Eastman Kodak to develop image-related products.

■ DEC's PrintServer 20 networked laser printer now supports TCP/IP Ethernet computing environments running ULTRIX or Berkeley-based UNIX. It supports PostScript and attaches directly to Ethernet networks, providing a shared printing resource for workgroups with printing volumes of up to 40,000 pages per month. It features printing speeds of up to 20 ppm, two-sided or duplex printing, and input of 1,000 sheets. The product costs $22,900.

DEC also announced the PrintServer 40 Plus upgrade kit. The PrintServer 40 Plus laser PostScript printer attaches directly to Ethernet networks. It features a CMOS-based MicroVAX controller. The upgrade kit costs $9,500.

■ DEC enhanced its VAX DECrad radiology information management system. V4.0 integrates voice- and text-based medical information. It implements the HL7 industry-standard application interface and includes an interface for speech recognition systems.

The product tracks and indexes case histories and offers such risk management and quality assurance features as patient incident reporting. It provides 24-hour-per-day telephone access to diagnostic reports, which are relayed in computer-synthesized speech. It also allows access to dictation reports recorded on industry-standard dictation systems.

For more information, contact your local DEC sales office or call (800) DIGITAL.

and includes add, modify, delete and cut-and-paste capabilities. It's available for systems with VAX/VMS and IBM MVS/CICS 1.7 or later.

Prices begin at $14,625 for IBM nongraphics applications. Applications with graphics capabilities are priced from $20,625.
For more information, contact Data Retrieval Corp., 8989 N. Deerwood Dr., Milwaukee, WI 53223; (414) 355-5900.

Circle 436 on reader card

I/O Plus Analyzes Disk File Input/Output

Touch Technologies Inc. announced I/O Plus, a software utility for VAX/VMS. This menu-driven monitor, analyzer, pinpointer and suggester generates comprehensive reports and graphs.

I/O Plus analyzes disk file I/O and lock use for VAX/VMS-based systems and performs complete cluster lock mastering analysis for VAXclusters. It pinpoints files that are robbing the system of resources. It analyzes hot files, pinpoints files that are mastered on remote nodes, and analyzes distributed VAXcluster lock mastering activity.

Primary licenses are priced from $995 on a MicroVAX to $3,995 on a VAXcluster.
For more information, contact Touch Technologies Inc., 9990 Mesa Rim Rd., Ste. 220, San Diego, CA 92121; (619) 455-7404.

Circle 449 on reader card

Maple V4.3 Runs On Digital Machines

Waterloo Maple Software announced Maple V4.3 for the DECsystem 2100/3100/5400/5800 based on the Mips R2000 and R3000 RISC chips.

Maple is an interactive computer algebra system that performs symbolic and numerical computations, including indefinite integration and summation; linear algebra; power series expansions, asymptotic expansions and limits; and numerical root finding, eigenvalues, integration and linear systems. It also can handle polynomial factorization, resultants and greatest common divisors; finite field arithmetic; solve systems of linear and polynomial equations; and solve systems of differential and recurrence equations.

Maple costs from $895 on the DEC system 2100/3100 to $1,245 on the DEC system 5400/5800.
For more information, contact Waterloo Maple Software, 160 Columbia St. W., Waterloo, ON N2L 3L3; (519) 747-2373.

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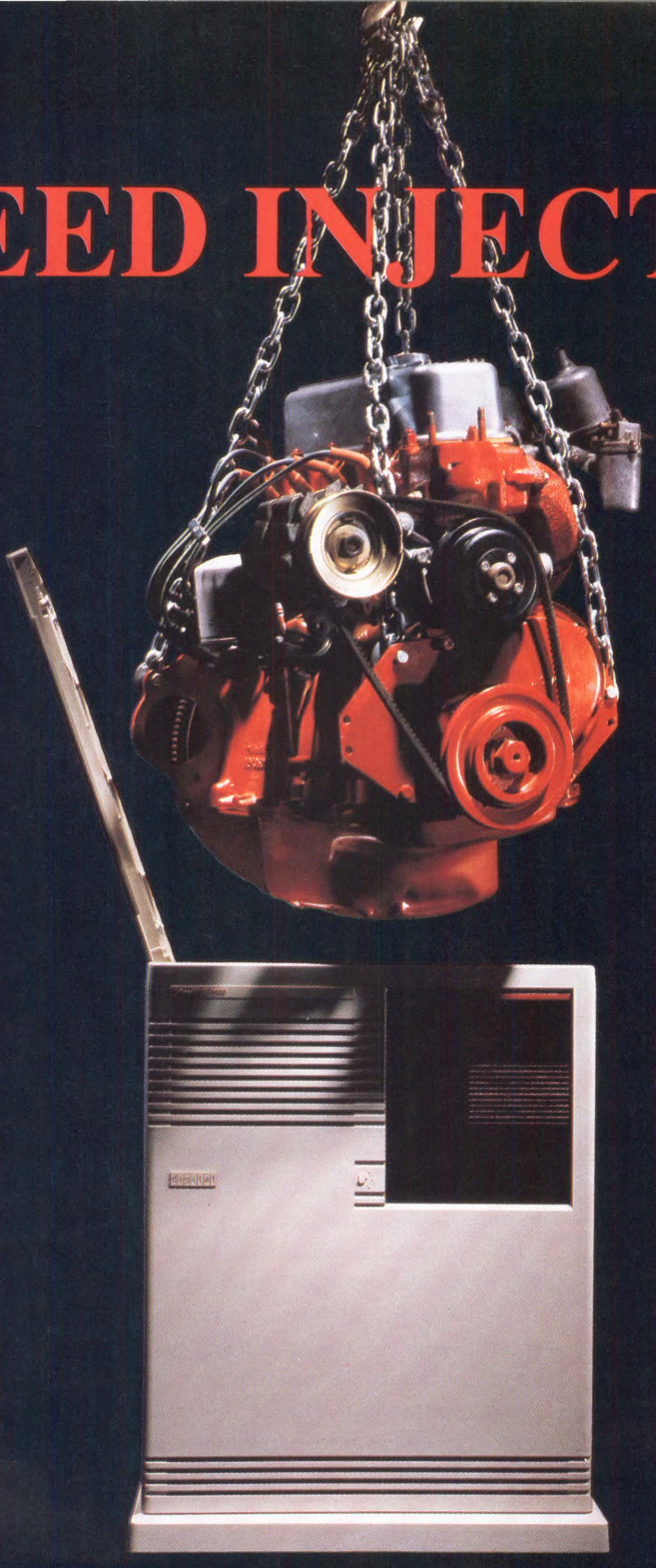

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Avalon Computer Systems, Inc., 510 Castillo St., Santa Barbara, CA 93101

BACK END

John C. Dvorak

An Open Letter To DEC

The last decade of the 20th century presents an opportunity for DEC to become the world's largest and most important computer company. The methodology for this won't be obvious immediately to DEC, especially because it requires DEC to retrace steps that, when last walked, led to failure.

I'm talking about DEC returning to the desktop and PC scene to become the dominant player and new leader. The current desktop road is a dead end. The dominant microprocessors come from just two companies and aren't second-sourced, which is a bad idea. Worse, they rely on the old-fashioned microcode-oriented CISC architecture, which can't progress much further.

DEC has made the wise decision to move toward a RISC design. RISC, by removing the microcode to software (where it belongs) and adding a high-speed cache on the silicon, always will outperform CISC. In fact, the current CISC design, the Intel 486, just caught up with the first generation of RISC performance — four-year-old designs. The next generation of RISC won't be caught by the CISC architecture. I doubt that we'll see a 586 unless it's a RISC chip.

To me, this means that the computer scene is at a performance impasse. Within the next few years, the entire desktop scene probably will make a transition not unlike that made in 1981 when the IBM PC was introduced to a world of CP/M machines and Apple II computers. It took about two years for the new market to blossom and bury the 8-bit world.

Since then, the 8088 chip has been the lowest common denominator in a world of 286, 386 and even 486 machines. Almost all software is written for the 8088. The situation creates a need for change. People were looking for a change in 1981, and they'll be looking for a change in 1991.

The change that will excite the masses is a jump to personal/desktop RISC by a company that shows leadership. IBM doesn't want to do it. It can't figure out why everyone doesn't buy PS/2 machines. Compaq Computer wants to do it, but it may not be accepted as a leader by those who feel more comfortable being led by a more "established" company. And it hasn't discovered RISC yet. Sun also wants to do it, but nobody except disgruntled DEC customers has heard of the company.

Only DEC has the potential for this role. As the leader, it can lead users into a world not dominated by IBM. It also can stop Compaq's weird and successful entry into the minicomputer scene by attacking Compaq's low-end dominance. Then DEC can finish off Compaq by seriously upping the ante in the minicomputer market.

DEC must bring out a new, inexpensive, super desktop RISC machine that can run old PC software. It must be powerful, cost-effective, stylish and open, and it must use an advanced bus.

DEC can use its fleet of service trucks to assuage newer, more paranoid buyers. But it must avoid gouging the customer for this service. It must produce not only a cost-effective desktop killer machine but also one whose pricing is so aggressive that buyers find it irresistible.

DEC's first venture into the PC scene with its Rainbow line should be reexamined as a corporate case study. Few companies have the opportunity to analyze their screw-ups this closely. Therein lies the rub for DEC: Can it change the way it does business? In 1981, IBM avoided its internal fogyism by spinning off the Entry Systems Division and sending workers to Boca Raton, Florida. DEC could do worse than use this model. Unfortunately, nobody believes that IBM took the PC seriously in 1981, and if it had it would have taken a different and less successful tack. In fact, the "Send them to Boca" attitude would be hard to duplicate today.

DEC took itself seriously when it entered the fray one year later. Expecting to become the market leader in PCs, its arrogance, combined with a bull-in-a-china-shop bumbling, led to immediate disaster. Dealers complained about harsh and unrealistic requirements.

DEC violated the basic premise of selling by creating many barriers. Barriers prevent sales, a simple precept DEC couldn't fathom. DEC then irked users by not offering a disk formatting program, hoping to nickel and dime the customer to death by selling preformatted, "approved" diskettes expensively.

Then, because DEC unwisely chose CPM-86 as its operating system, it had to cajole software vendors into making special versions of all their software. Much of this was branded by DEC and shown at pathetic mini trade shows.

Ironically, the defunct DEC machines were solid and well-made. The keyboards were outstanding and the look and feel of the machines was terrific. DEC even tried to popularize the tower configuration before it was to become a widespread look of the 286 and 386 era. In short, the engineers did all the right things, and marketing did all the wrong things.

It turned out that marketing was more important, a lesson DEC never may accept, because it obviously has engineers doing the marketing. I hope that was the reason for this fiasco. But if DEC has learned something and if it makes a bold move, it will rule the computer world. ■

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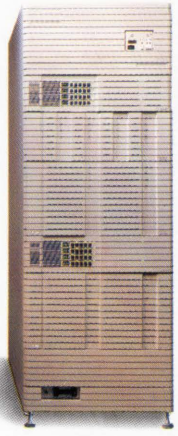

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