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SEPTEMBER ■ 1989

DEC Professional

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Office Systems

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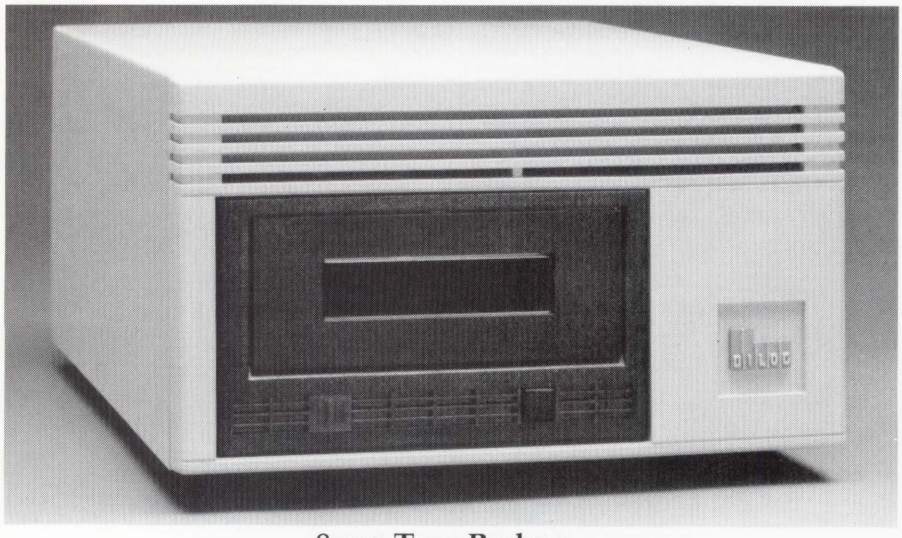

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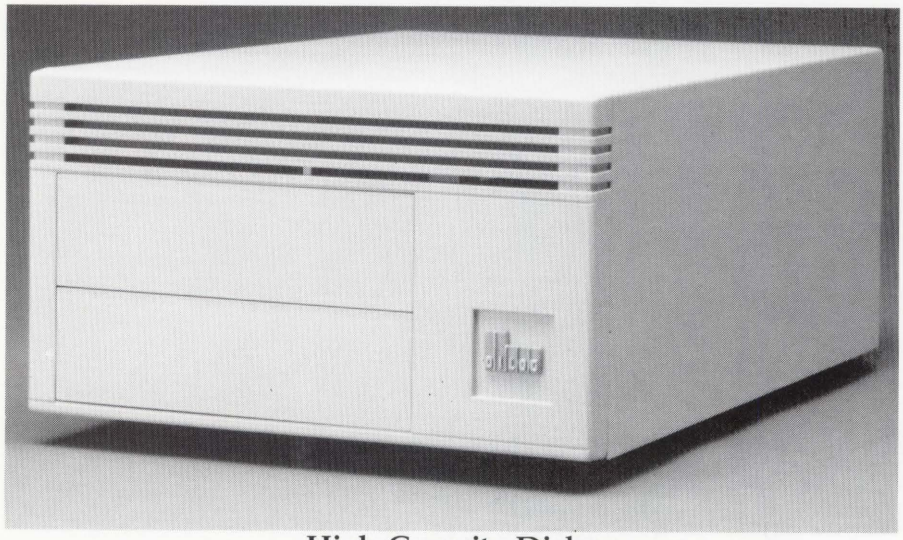

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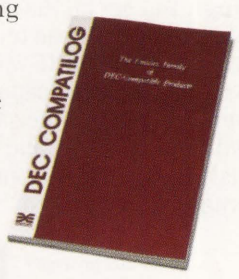

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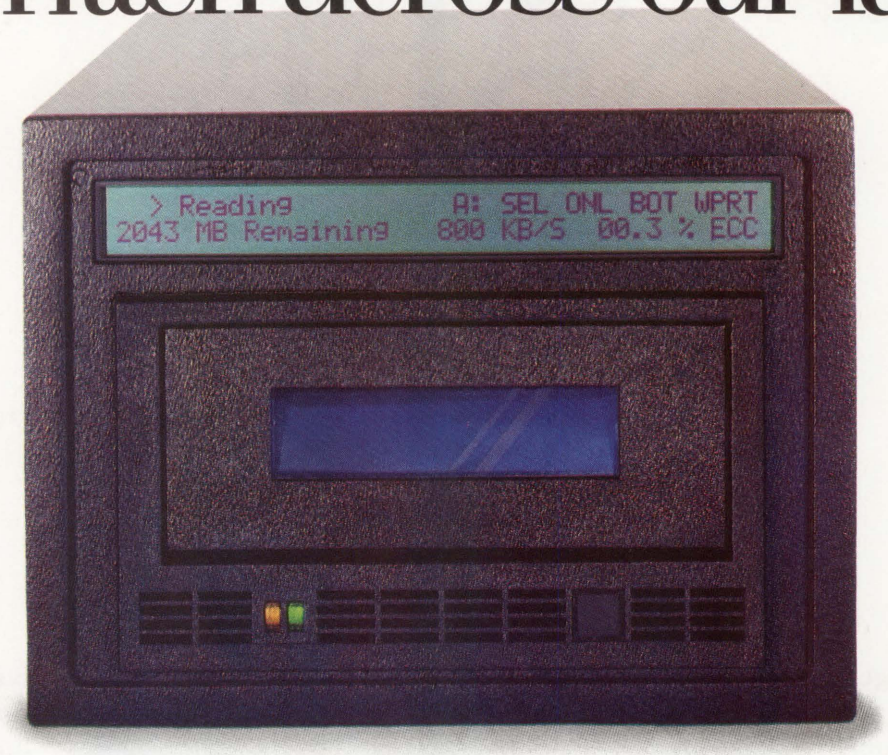

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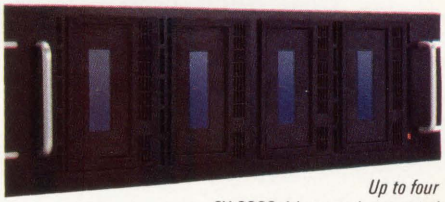

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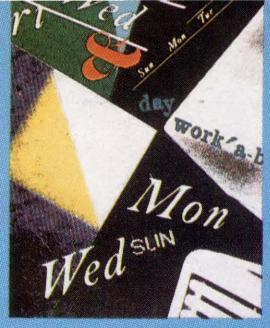

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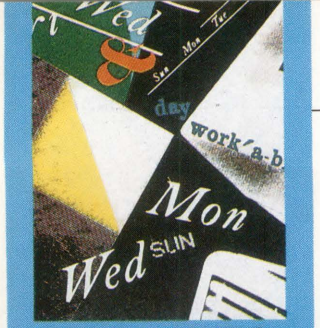

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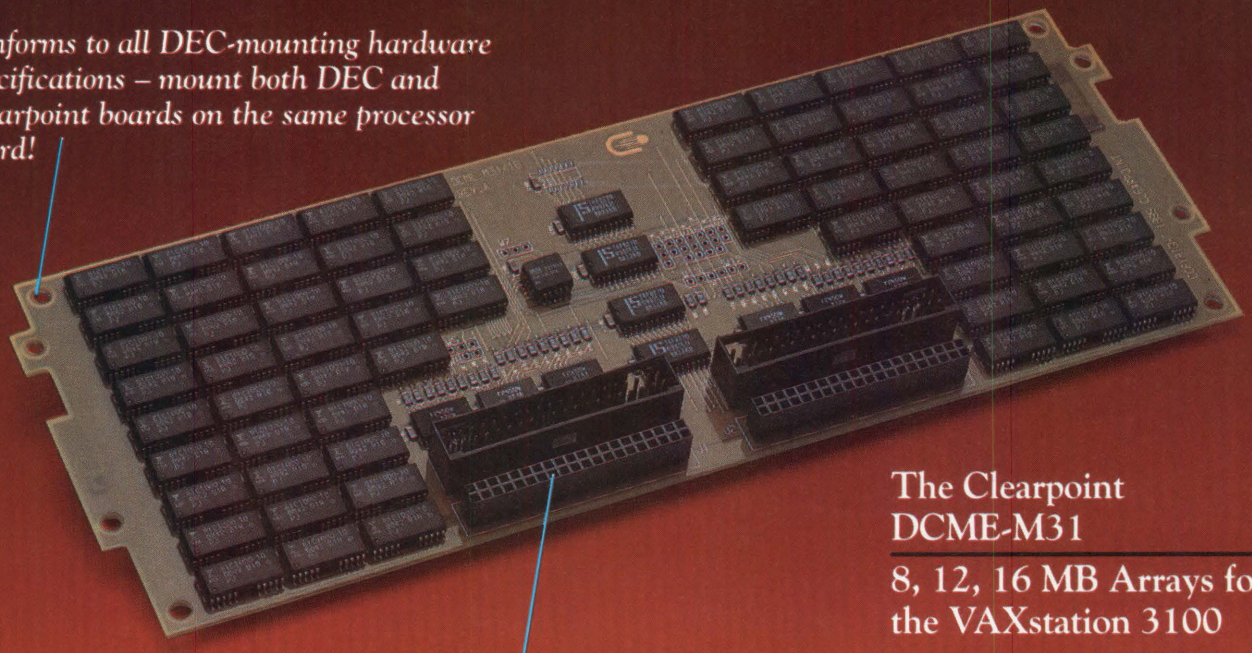

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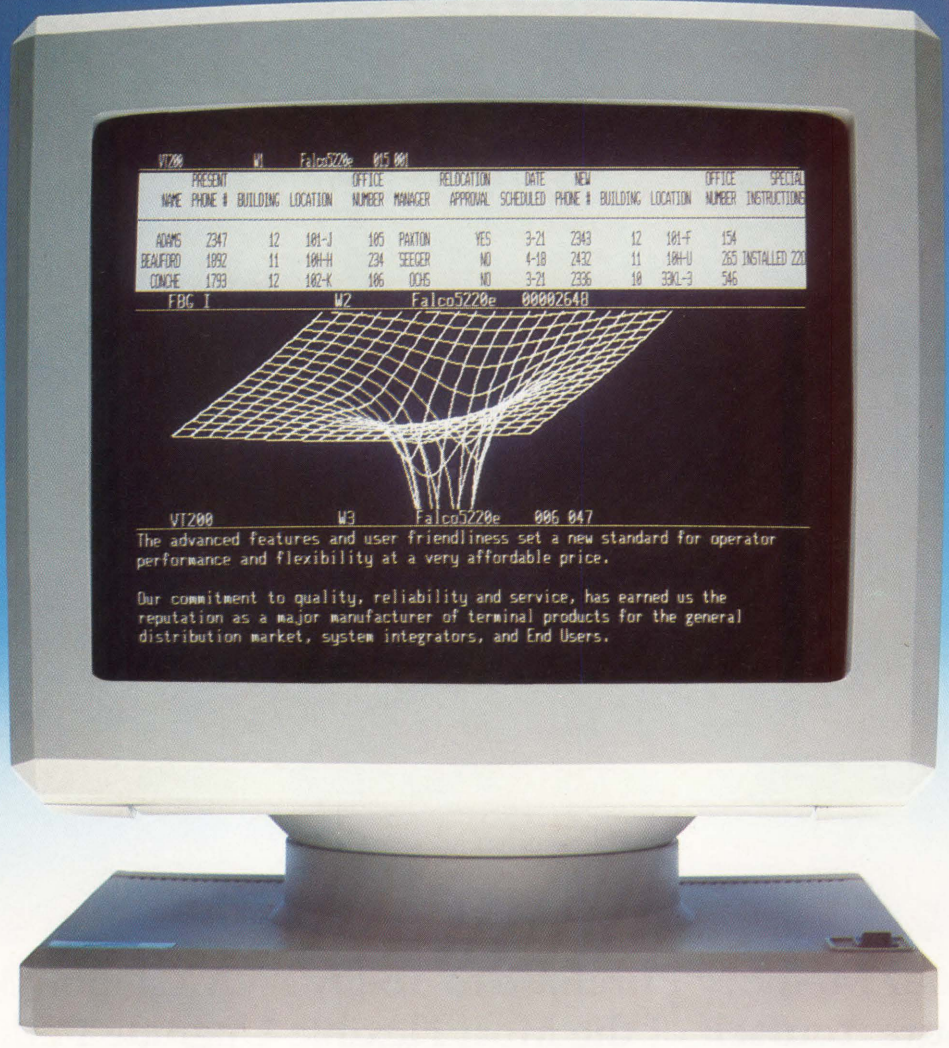

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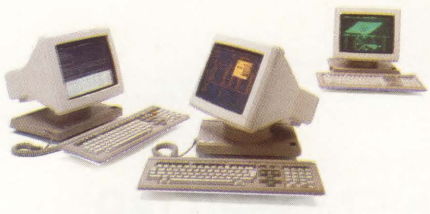

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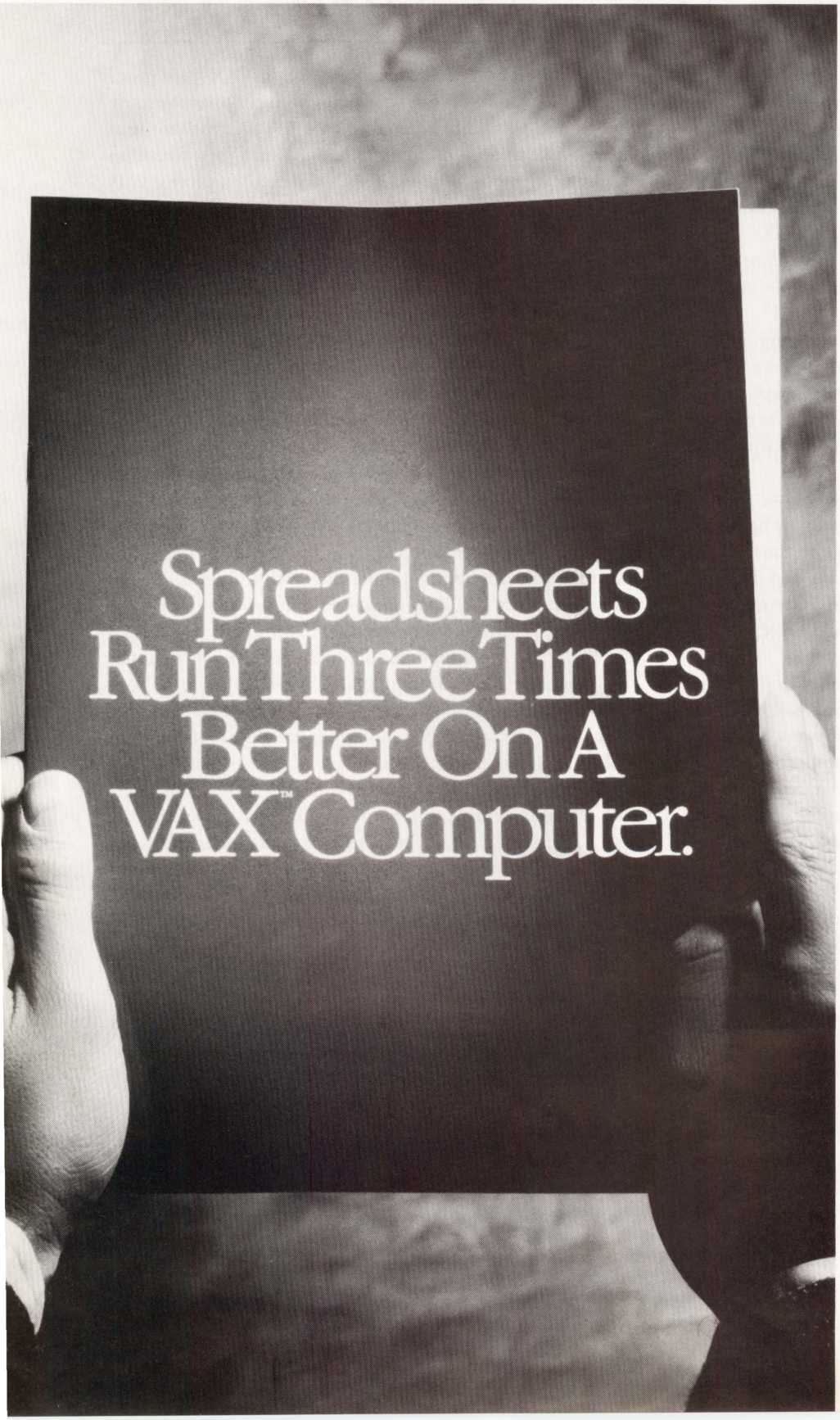

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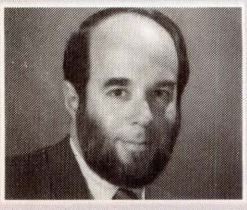

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Carl B. Marbach

Is Coherence Coming?

The world of Digital has fallen apart. The one operating system, one architecture strategy is gone. It's been replaced by RISC machines, ULTRIX and UNIX running alongside VMS on traditional VAXs. The idea that an enterprise easily could connect departmental computers into a coherent cluster is disappearing into the mist of ULTRIX/UNIX RISC and VAX/VMS. Now, there are two architectures, two operating systems, many different footprints — and one headache.

This confusion is compounded by VAX packaging options, none of which seems to make sense. The 3100-series MicroVAXs replace the MicroVAX IIs and 2000s. Leftover 8600 MassBus machines and the 8500 and 8700s overlap into the 8800 space. And the new 6000 series occupies the middle. Confusing? You bet!

What this means may become clear as Digital forms a coherent strategy for the '90s. The company's tactics have confused users and the market before. For example, in the mid '70s, Digital offered PDP-11s, early VAXs, DECnet and Ethernet murmurings and at least four operating systems. By the early '80s, the strategy became clear and the company could assert, "Digital has it now!"

The July 11 VAX 6000 series announcement clarified many things on the hardware end. First, the 6000 box will house the XMI bus, into which you can plug any CPU you want. There will be various-sized boxes to accommodate the number of CPUs and peripherals you require. The initial systems range from the Model 400 at the high end to the Model 200 at the low end. By housing multiple CPUs, each XMI box can hold very powerful multiprocessor systems.

But the more important message is that the 6000 XMI box also can house RISC processors. It will be the box of choice for some very powerful ULTRIX machines when, in the near future, ULTRIX finally supports symmetric multiprocessing.

There's more: Could a single XMI box house three VAX processors and three RISC processors? Suppose in a single computer you could have both VAX and RISC architectures. What about one box with 25 VAX mips and 60 RISC mips that would run ULTRIX and VMS? You could choose the operating interface you want, and the computer could decide which CPU would run the programs.

Digital already has built a machine like this. It ran two operating systems, and its programs decided on which of two CPU architectures to run. This advanced computer was the ill-fated Rainbow PC — designed more than six years ago!

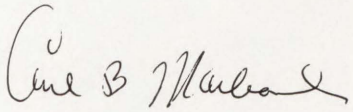
If having a RISC/ULTRIX processor and a VAX/VMS processor in the same box is too strange for you, consider the more conservative possibility of adding an ULTRIX machine to a regular VAXcluster — of having an ULTRIX machine become a real cluster member. When ULTRIX machines can access VMS files as their own, when ULTRIX users can SET HOST to VMS machines, when VMS users can access ULTRIX files as their own and SET HOST to an ULTRIX machine, then the UNIX/VMS problem is solved.

Digital made its mark on the industry by making things simple. Current RISC/UNIX/ULTRIX can coexist with VMS via networking and DECwindows. But contrary to the current Maynard line, this isn't easy. In fact, the current situation places VMS *against* ULTRIX, with parties on both sides more like warring factions than integrated users.

Making it easy is the missing link, just as it was in the '70s. (No one argues VAX versus the PDP-11 today.) Then, the link was Ethernet, the computer system was VAX/VMS and the simplifying configuration was clusters.

Surprisingly, the solution is the same today. By unifying the architectures into one XMI enclosure and logically linking the operating systems into one cluster, there's no difference between a RISC/ULTRIX machine and a VAXstation 2000 in a cluster. The VAXstation might be running DECwindows while the boot member isn't, but do you care? When each node does its own job, when it's plug-and-play Ethernet, there is simplicity.

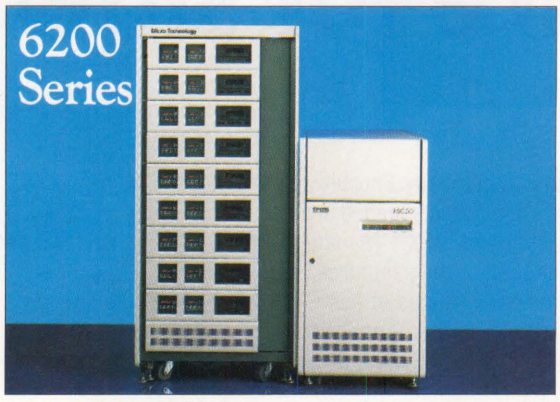
We had to wait for the 6000 box and its coherent XMI bus and choice of processors. We'll now have to wait for software engineers to create systems that can work together to perform the tasks companies need. Clever programs are difficult if not impossible to figure out, and clever hardware/software configurations also are difficult to set up and maintain. In the interim, complications are acceptable. But the real answer requires what Ken Olsen calls simple elegance.



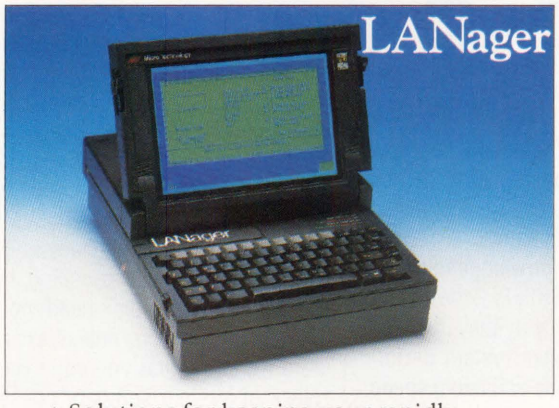
The New Leader

Today VAX and VAX cluster users are looking to Micro Technology for the dynamic solutions they need to solve their networking and storage problems. As the new leader of VAX enhancement products, we have worked hard to respond to the needs of this constantly changing marketplace with the most efficient solutions possible.

◆ Solutions for unattended HSC cluster backup, like our MA-24. The revolutionary MA-24 features 4 gigabytes to 32 gigabytes of unattended cartridge tape backup—the first to offer this capability.



◆ Solutions for capacity problems on your HSC port cards, KDB50 or space on your computer room floor, such as our 6200 Storage Array. 20 gigabytes of disk storage are matched with 20 gigabytes of cartridge tape in one single footprint.



◆ 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.

◆ Solutions for operating your VAX in a secured, classified environment, such as our Intercept removable storage system. Intercept is virtually operator error-proof. It protects the integrity of your data by not honoring spin-down commands until all processes are completed.

But we don't intend to stop here. We intend to remain the leader in high capacity disk and tape subsystems, removable disk enclosures and networking products by continuing to listen to your needs and implementing the solutions you ask for. And backing them with a service commitment with worldwide support. We offer sales and service to over 5,000 customers worldwide. Satisfaction is important to us. That's why we are the leader today . . . and you can count on us tomorrow.

For more information please call Micro Technology 800-999-9MTI.

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'Cure for Slow VAX Revealed'

by Craig Jensen

Through my company, Executive Software, I have been engaged in extensive study of VAX™ Management and VAX Managers for the past three years. It was from the early stages of this market research that DISKEEPER®, the online defragmenter, emerged as the ultimate answer to the VAX Manager's number one headache — fragmentation.

When this research was begun three years ago, it was obvious to nearly every VAX Manager what was causing their VAX to slow down. They knew that running the same VAX, with the same users and the same job mix, should not result in steadily worsening performance. They knew that fragmented files were the number one reason for slower and slower response time. And they knew that long hours spent doing backup and restore of each disk was the only solution.

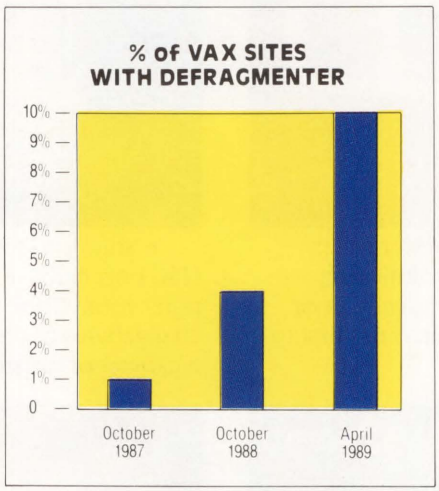
So it was easy for me to sell DISKEEPER. All I had to do was announce its availability and I was swamped with inquiries and orders — tens of thousands of them. Today, two-thirds of the Fortune 500 companies use DISKEEPER.

WHO BUYS DEFRAGMENTERS?

According to Computer Intelligence Corporation, a highly respected source of information about the VAX market, only 1% of all VAX sites had a defragmenter installed in October 1987. By October 1988, the number had grown to 4%. By April 1989, it stood at 10%. That's a remarkable increase and 10% penetration constitutes a market with which many companies would be satisfied. But 90% of all VAXes are still suffering the full effects of fragmentation. Why?

The VAX market has experienced astounding growth in the past three years, primarily due to the MicroVAX II. In that time, the number of VAXes has risen from under 100,000 to over 250,000. Not surprisingly, the ranks of VAX Managers have swelled, too. In fact, most VAX Managers today have three years' experience or less. The second largest group has eight years' experience.

Guess what? It's the eight-year veterans who bought up all those DISKEEPERs when



they first came out. It's the ones who know what real VAX performance should be; the ones who could spot steadily decreasing performance and slow response.

It's no wonder these knowledgeable VAX Managers snapped up DISKEEPER the instant the opportunity arose. The day they installed DISKEEPER, they got better system performance, more personal time and could spend their time more productively. They never had to defragment with backup and restore again. Never.

WHY DISKEEPER?

The large-site VAX Manager uses DISKEEPER because it doesn't force him to stop what he's doing and RUN it. It isn't a utility that has to be told what to do; it's an operating system enhancement that eliminates fragmentation forever from the day you install it on your VAX. Just set it and forget it.

Moreover, they trust DISKEEPER because it doesn't use scratch space to store your data file while scrounging some space to make it contiguous. Your file would be at risk if it were on hold in a scratch space somewhere. What if the system went down or the defragmenter were interrupted? Oh well, let's hope that file was nothing important. With DISKEEPER, your user data files are always intact and accessible by name. We guarantee it.

And you don't pay for defragmentation with costly CPU resources. The overhead of running DISKEEPER is typically under two minutes of CPU time per day, per disk.

OPTIMIZATION VERSUS DEFRAGMENTATION

Some have raised the issue of "disk optimization." They ask why not position files at precalculated optimum locations on the disk; put the most frequently accessed files close together and the rarely-used files off in a far corner of the disk somewhere.

There are three excellent reasons why this should not be done:

1. Common Sense

You have a VAX or VAXCluster™ with lots of disks being accessed simultaneously by lots of users. There is simply no way to determine the exact sequence in which files will be accessed. If you don't KNOW the sequence, and you have no way of finding out access frequency (as the VMS™ file system contains no mechanism for keeping track of file access frequency), how can you possibly optimize disk head movement?

You can't. You can only guess and pretend. And we know that you don't want a critical piece of system software guessing or pretending ANYTHING where the safety of your user data is concerned.

2. Safety

DISKEEPER is designed to restore your file system's peak performance with no risk to user data files. Risk is limited primarily by keeping the scope of DISKEEPER's processing to a single file at a time. Disk optimization requires analyzing and shuffling an entire disk's worth of files all at once.

3. Performance

Every disk has fragmentation unless it has just been defragmented and not used since. And, if you used our Disk Analysis Utility, you know that the costs of fragmentation are enormous. 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 sub-

stantial portion of your VAX to productive use.

Now consider optimization.

If the average access time is 33 milliseconds (RA81) and 24 milliseconds of this are head travel time, the best you can hope for is a 6 millisecond reduction for each file that is optimally optimized.

Each defragmented file, on the other hand, saves one disk I/O per fragment. That's FIVE TIMES the optimization savings even with the bare minimum level of fragmentation. With badly fragmented files, the difference is astounding.

The fact is that it takes only a tiny amount of fragmentation, perhaps only one day's normal use of your VAX, to undo the benefits of optimizing file locations. While "optimization" is an elegant concept to the uninitiated, it will do you no good at all.

That's why DISKEEPER doesn't do it.

KNOW YOUR VENDOR

We dedicate ourselves to being the best in the business; from myself (the company's owner), to the technical support staff who carry beepers so you can reach them at any hour of the day or night, to the shipping people who send everything the fastest possible way because they know you want it NOW, to the salespeople proficient enough to understand and enlighten on the subject of VAX performance and defragmentation, to the marketing people who continually consult VAX Managers for their views.

These are the things that make DISKEEPER a great software product and Executive Software a company you can depend on.

WAITING FOR DIGITAL

Maybe you're waiting for Digital to come out with their own defragmenter so you can have a stable, reliable product with a large installed base. Well, you don't have to wait. DISKEEPER, unique amongst third party system software products, has achieved that status. DISKEEPER's stability and reliability is backed by a 100% money-back guarantee. And as for a large installed base, by way of comparison, Digital recently issued a press release announcing the sale of the 10,000th unit of their RDB product. DISKEEPER passed that milestone long ago.

ASK YOUR FRIENDS

You don't have to take my word for it. Take a look at the letters from DISKEEPER owners below. Ask your VAX Manager friends. Do they use a defragmenter? Which one? What do they think of it?

Listen carefully to what they say. Watch out for rumors about "defragmenters" in general. Your user data is too important to base such a decision on rumors.

Find out who you know that uses a defragmenter and has NO CRASHES and NO LOST FILES — EVER. Ask them what they use for defragmentation. We think we know what you will find. And we are confident you will call Executive Software to find out more about putting DISKEEPER on your VAX.

Get IMPROVED SYSTEM PERFORMANCE and SPEND YOUR TIME MORE PRODUCTIVELY by letting DISKEEPER eliminate fragmentation from your disks forever.

— Craig Jensen, Chairman and CEO, Executive Software, Inc.

Have you heard about **DISKEEPER/*Plus*™ ??**

"18 Defragmenters In One"

DISKEEPER/*Plus* customized online defragmenter now available.

DISKEEPER/*Plus* has vastly expanded its applicability and ease of use and can even be customized to fit the particular needs of every type of site and VAX configuration.

Some of the unique capabilities of **DISKEEPER/*Plus*** are:

- full compatibility with Relational Technology's Ingres™ database management system;
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- special processing modes for OLTP sites;
- special processing modes for Process Control or Realtime sites.

Handle your file and free space fragmentation permanently with DISKEEPER/*Plus*!

Call 1•800•VAX•HELP ext. 2319 today.

LETTERS

On Oct. 14, 1988 we upgraded our CPU to a VAX 11/785 and installed DISKEEPER V2.1 on all 3 of our RA series disk drives (including our system disk). Our goal of annual-only VAX outages had been realized!

We were most impressed with DISKEEPER's reliability, low CPU impact, and safety of operation. The benefits of DISKEEPER provide significant ongoing cost savings. As well, the CPU resources not consumed by VMS dealing with fragmented file creations and retrievals allows more resources to be available for satisfying user CPU needs.

We give DISKEEPER an A+ rating and feel that no VAX system should be without it!

Ernie Dacho
Process Control Supervisor

It is a unique experience to have available a product that delivers as promised and is reasonably priced.

DISKEEPER allows my System Administrator to concentrate on areas outside of disk fragmentation. It installed in just a few minutes and requires no attention. This product works and works well.

Thanks to DISKEEPER, disk performance is optimized. In data processing performance is critical toward success.

Sincerely yours,
The Bodine Company
Frank Freese
Director of M.I.S.

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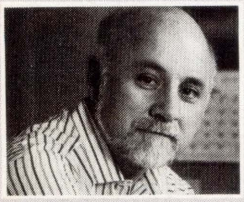


EDITORIAL

Dave Mallery

Moving Day

Before the end of this year, we'll mark the 10th anniversary of the premiere issue of *RSTS PROFESSIONAL*, the first publication produced by Professional Press. Professional Press has come a long way since those days. We've been at the same address since 1982 and have expanded to fill our building completely. At this point, we're nearly exploding out of the structure.

Early in September, we'll move our headquarters to a nearby building that will provide our organization with almost three times the space we have now. This marks another step in the continuing growth of Professional Press and its publications: *DEC PROFESSIONAL*, *VAX PROFESSIONAL*, *HP PROFESSIONAL* and *MIDRANGE SYSTEMS*.

One big benefit of the headquarters will be a new computer room for MIS and the Lab. We'll talk about the task of moving our Lab and the production VAXcluster in a future issue of *DEC PROFESSIONAL*.

Call It VMIX

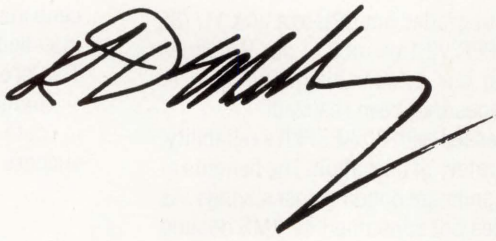
We recently acquired some heavily compute-bound code (in FORTRAN). We wanted to compare run times between a base-line MicroVAX and a Mips Computer Systems engine. At the time, the only RISC processor we had was a Mips M/120 RISComputer System located at our Pasadena, California, office.

Compiling the code wasn't as easy as you might believe. It required a wait of several months for the next release of the compiler before we even could complete the first step — a clean compile. Since we started the exercise, we've bought a DECsystem 3100 for the Lab, but that release of the compiler hasn't reached us yet from Digital.

Technology Editor Philip A. Naecker will report soon on the results of the benchmarking. At present, it shows some interesting figures as far as the VUPS of the Mips box.

We're still very far down on the curve. Transitions to ULTRIX from a full VMS environment still are unthinkable, save for single applications and very bounded situations. This will change at an ever-increasing rate, but much of 1990 will pass before real conversions become possible.

In the meantime, there's a major effort at Digital to confer POSIX compliance on VMS. At some point, I suppose we can start calling it VMIX!



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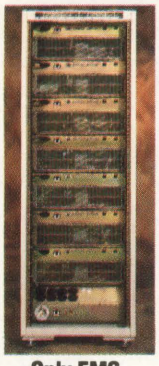

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MAXIMUM INVESTMENT PROTECTION: MAXPORT costs up to 30% less than Digital's drive and by utilizing proven Winchester technology MAXPORT requires significantly less operating dollars than DEC's RA81 or 82. What's more, you can field upgrade your MAXPORT MRA600 (622MB) to a 1200 (1244MB) simply by adding an additional disk actuator — that's *100% investment protection!*

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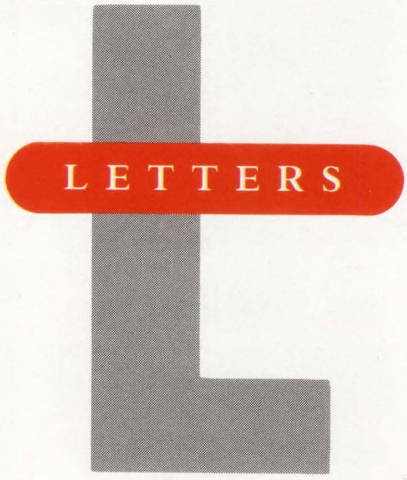

Please address letters to the editor to *DEC PROFESSIONAL* magazine, 101 Witmer Rd., Horsham, PA 19044. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

TREND ANALYSIS ENCORE

I was disappointed with John C. Dvorak's premise and reasoning in "Trend Analysis — A Waste Of Time" (May 1989).

As a fan of Billy Joel and the Beatles, I think that neither sounds dated. The fact that their music has lasted only endears it to us. And it shows that the best things in life are those that last.

This also is true of the computer industry. Since UNIX was created in the 1960s, many operating systems have come and gone. UNIX, however, is still around, not only among a small group of engineers but among a large base of industrial users. For example, the workstation industry, based on the RISC architecture, is choosing UNIX as its standard. The simple concepts that UNIX sticks to are the ones everyone wants. It's easier to stick to the basics than to make a heavy operating system that only takes up space.

Although companies do go out of business when the founder departs, other businesses and products have a lasting impact. Because Don Estridge of IBM, whose impact on the PC industry was so great, has passed away doesn't reverse the PC revolution. It may have changed direction, but this may be because the public wanted it to; Estridge probably would have changed with it. Lotus won't disolve because Mitch Kapor is no longer with the company; nor would any company of that size.

The computer industry will have new generations of people who impact it. Who would have imagined 60 years ago that rock 'n' roll would become a dominant force in the music industry? The WordStar diamond may no longer be the best way of doing word processing, but many things that WordStar did are incorporated into today's word processors.

By the way, Billy Joel's last hit was in 1987.

Howard A. Levy
New Canaan, Connecticut

VAX TUNING TUNE UP

I was pleased with David B. Miller's "VAX Tuning" review (June 1989) of Quantum PT V2.0. However, I disagree with the methodology used for benchmarking the effectiveness of the dynamic tuner.

Quantum PT makes modifications to the memory-resident VMS code of a running VMS system. It adjusts scheduling algorithms to provide a more consistent and predictable overall system response time, dynamically performs process memory reallocation and dynamically adjusts SYSGEN parameters. When the tuner is stopped, the detached tuner process is deleted, but the system is left in the state last set by the tuner. It is possible to restore the original SYSGEN values by running the SYSGEN image and performing USE CURRENT and WRITE ACTIVE.

The only way to restore the original scheduling algorithms in Quantum PT V2.0 (VMS V4.7) is to reboot the system. Quantum PT V2.1 (VMS V5) will allow you to restore the original scheduling algorithms by turning off the VMS adjustments before the tuner is stopped. This feature is present in VMS V5.

For the above reasons, it's not possible to stop the tuner and have the system run as it did before the tuner was started. Therefore, the benchmarking values when the tuner wasn't running don't appear to be accurate. The tests without the tuner running must be done in succession, then repeated with the tuner running. If the benchmarking is done in this manner, I believe you'll see a more striking difference between the two.

Mary Masi-Phelps
Quantum PT Product Manager
Computer Information Systems Inc.
Newton, Massachusetts

David B. Miller: We ran the benchmarks again as suggested using Quantum PT V3.1. This time, we used our Lab's MicroVAX II. We ran the load generation program QUANTUM_PT_LOAD

How To Really Get Digital's "Free" Rdb For *Free*!

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Agree to evaluate SmartStar® for your company by filling out the adjoining postage-paid reply card. Or call us toll-free at 800-235-5787. We'll quickly send you for evaluation: run-time Rdb media, plus the complete SmartStar application development environment, including the full documentation set. And even if you don't buy SmartStar, you can keep run-time Rdb!

Cost: $0.00 (plus your time for evaluation)

Note – Since there appears to be some confusion about what's really free, here are the facts: (1) If you have a current VMS 4.7 or above license, you are now licensed to use run-time Rdb at no charge. (2) You first have to obtain the media before you can use it.

What's our motivation? We are so convinced you'll see the extraordinary functionality of SmartStar teamed with Rdb that we will happily absorb the costs, and really provide Rdb-RT to your doorstep absolutely free! SmartStar is one of today's "big three" in the VAX/VMS 4GL marketplace, with more than a 25% market share;* but more importantly to you:

SmartStar Corporation is the ONLY Digital CMP partner authorized to distribute Rdb run-time media . . . the only company that can make you this "package" offer.

Other Software Vendors Free Offer

Other software vendors don't even tell you how to get "free" Rdb-RT. Just to show you that we are serious about providing customer service, we'll give you that information also. . .even if you decide to evaluate one of the other guys first. Rather than you having to track down the Digital order number for the Rdb-RT media, here it is (for a TK50) with our compliments: QA358AA-H5.

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If you're a serious VMS developer, we know your evaluation of SmartStar and run-time Rdb will revise some long-held (and hard-sold) opinions regarding database engines and what levels of productivity you have a right to expect. Act now, and get a head start on the future of Digital-based application development!

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*Source: Computer Intelligence market report.

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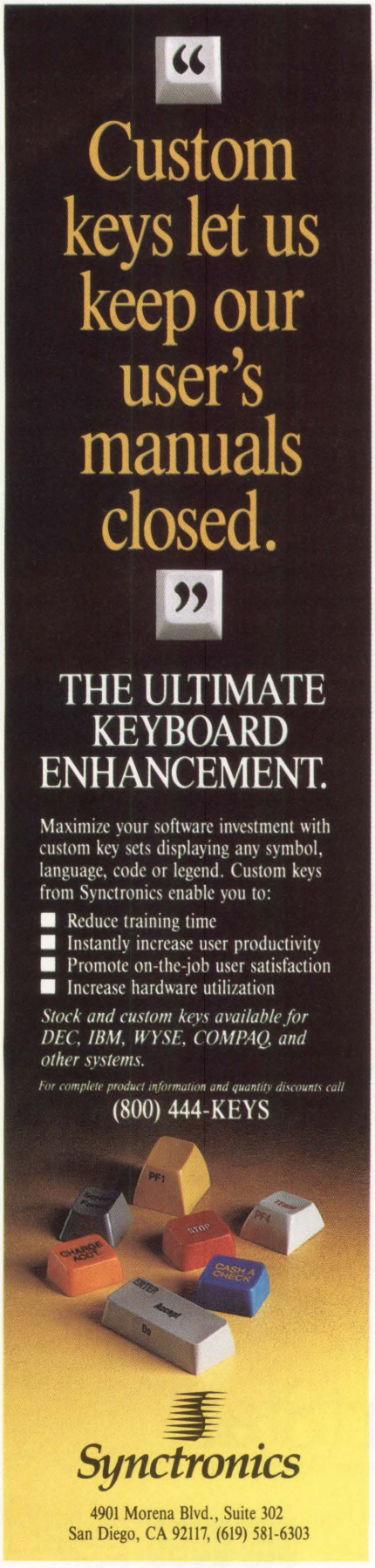

CIRCLE 141 ON READER CARD

in separate subprocesses to create disk, memory, CPU and terminal loads on the MicroVAX. We then ran 20 trials without the tuner, turned on the tuner and ran 20 more trials. Each trial consisted of invoking MAIL and measuring the time it took to get the MAIL> prompt. The average response time with no tuner running was 4.96 seconds. The average response time with the tuner running was 2.24 seconds. These new benchmarks show that Quantum PT improves performance in the MicroVAX. Naturally, results may vary depending on workload and configuration.

MICROVAX CATCH-UP

In regard to the box "MicroVAX Catch-22," in Evan Birkhead's "Education Initiative" (June 1989), we purchased two MicroVAX 3600s last year. We received a letter offering an upgrade to 3900s at the attractive price available before June 30, 1989. The letter mentioned that we might need a memory upgrade (no price was given) and that an exchange credit would be provided.

A sales representative then provided the following prices for each machine (rounded figures in Canadian dollars): $8,000 for the upgrade under our current corporate discount; $32,000 for the 32-MB memory upgrade; $2,000 of exchange credit per card for two of the four 8-MB memory cards. The total cost: $36,000 on a $160,000 machine or about 23 percent of the original system cost for a 50 percent increase in CPU speed.

This isn't a bad offer, but it's much less "startling" than it at first appeared.

Jean-Marc Larsen
Varennes, Quebec

TRENDS: FLAWED ANALYSIS

John C. Dvorak's "Trend Analysis — A Waste Of Time" (May 1989) was off target. His observation that knowing what happened yesterday isn't always a good guide to what will happen tomorrow is correct. However, at the detail level, his data is flawed.

His views of modern music are personal and fail in generalization. I bought some cassettes for my daughter: Judy Collins (alive and well) bored her to tears; Blondie knocked her socks off. Ten years ago, Blondie defined a trend for the '80s.

Likewise, Mitch Kapor may be absent from Lotus, but Microsoft's Excel shows that spreadsheets still are improving. VisiCalc set a trend for the '80s. These examples contradict Dvorak's assertion that the person responsible for a trend must maintain the trend if it's to continue.

When my daughter was a baby and Blondie first appeared, I'd let her crawl over the keyboard of my TRS-80 model 1. A program would make the cassette speaker and monochrome screen go crazier with each keystroke. Recently, she used Info-Trac to perform a literature search. *That's* a trend to consider. And the interesting, if not scary, thing is that no one person is defining the trend.

Michael E. Marotta
Lansing, Michigan

CORRECTION

In "Making Projects Work" (June 1989), a listing of project management vendors incorrectly included Cardinal Data Corp., Needham Heights, MA (recently acquired by Ross Systems); Synergistic Systems Inc., W. Haven, CT; and Target Systems Corp., Marlboro, MA. These companies do not offer project management software. Their correct product lines follow:

- Cardinal Data Corp.: Distribution management; financial management software.
- Synergistic Systems Inc.: Manufacturing software; time and materials billing package.
- Target Systems Corp.: System management tools; office automation applications. ■

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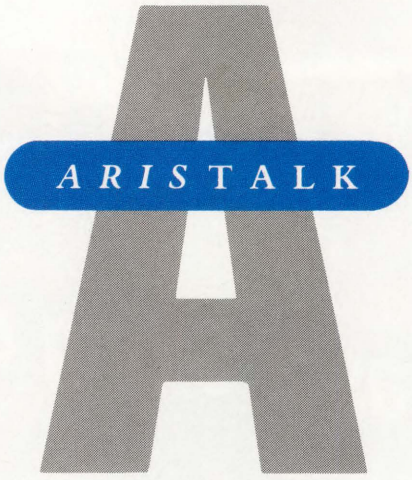

BACKUP TO REMOTE TAPE

QUERY:

Rob Vugteveen *(SIG 11/MESS 388):* We'll be installing an 8mm tape backup system on a MicroVAX II. There will be a VAXstation 3100 standalone system with 300 MB or more of disk storage in the same network. I want to back up the VAXstation disk to the 8mm on the MicroVAX unattended.

Backup won't allow this under normal circumstances, because one node can't allocate the tape drive on another node. There are software products on the market, but I want to do it inexpensively.

Digital Software Information Network (DSIN) has a set of commands that uses the Convert utility to fool the node with the tape drive into writing the saveset from the other node directly onto the tape. What are the pitfalls of doing this?

REPLIES:

Carl Houseman *(SIG 11/MESS 390):* I've done this by using the DSIN article and it works. Make sure your network multiblock count is set high enough. For example, to write 8,192 block records to the tape, your NMBC must be at least 16 (the default is 8). SET/SHOW RMS lets you change/examine it on the running system (it requires CMKRNL). To modify it permanently, use SYSGEN and modify the parameter RMS_DFNBC.

When writing to the remote node with a task-object filespec, your saveset name stored in the backup header will be of that form, while the saveset name on the tape will be what you called it.

This method may be less reliable than backup, because backup avoids using bad spots on the tape. This is definitely a case in which you want to leave /CRC on.

Phillip Crews *(SIG 11/MESS 393):* Bad spots on tapes will be passed over by the magtape driver. Backup may be more forgiving, but if tapes are very bad, you don't want to use them anyway.

Backup creates XOR redundancy records within a saveset regardless of its destination (unless you specify /GROUP=0). These redundancy records will be written to the tape along with the rest of the data and will be used in a restore if any single record is unreadable.

VMS V5.2 will improve the backup utility so that it will avoid the CRC instruction, which is emulated on all MicroVAX and 6xxx processors. This should speed backups that use /CRC.

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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:.

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- (415) 873-2135-Northern California

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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 Karol Hughes 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:

11.....Clustering/Networking
28 .....Laser Printers
42.....Communications/File Transfer

QUEUED LN03+

QUERY:

Craig Boyhont *(SIG 28/MESS 65):* I have a queued LN03+ through a DECserver 200 that goes into controller error code 32 when printing a long, complex document. Our CSC recommends cutting the baud rate to 2,400, which doesn't solve the problem. We're running VMS V5.1, the LN03+ has a memory cartridge and XON control is enabled at the DECserver/LN03+.

REPLIES:

Richard Gilbert *(SIG 28/MESS 66):* I use an LN03+ at 19,200 baud with no problems. The following commands set it up:

```
$
$ ! Set up local characteristics for the applications devices.
$
$ SET TERMINAL /PERMANENT /NOBROADCAST /NOWRAP
  /NOSECURE_SERVER /NODISCONNECT
  /SPEED=19200 /WIDTH=256 /PAGE=66 /HOSTSYNC
  /DEVICE_TYPE=LN03      _LTA6:
$
$ ! Set the protection on the devices so that only the
$ ! symbiont can access them.
$
$ SET PROTECTION=(S:RWLP,O,G,W) /DEVICE _LTA6:
```

Kitty George *(SIG 28/MESS 67):* If Richard's reply doesn't fix your problem, check the DS200. I had the same problem with an LN03 on a DS100 that

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didn't go away with swapping printers or ports on the DS100. It disappeared when I swapped to a port on another DS100. All setups were identical on both servers.

NETBIOS FOR VMS

QUERY:

John Thomason *(SIG 42/MESS 490):* We're looking for a NETBIOS emulator that will run on VAX/VMS with Ethernet. It must run with DECnet. Does anyone know of such a thing?

We have several PC ATs gathering data via FactoryLink, which runs under DESQVIEW, a multitasking environment for DOS. FactoryLink has a NETBIOS interface to talk among the PCs, but we want to communicate with our MicroVAX II as a peer to store long-term data.

We've tried using DECnet-DOS, but it won't cohabit with DESQVIEW on the PC: everything hangs. DEC Customer Support says DECnet-DOS has its own multitasking, which won't work with other multitaskers.

We're using a file transfer method using Novell's Netware for VMS. It doesn't have the task-to-task communications we need. If the file server (MicroVAX II) goes away (either down or disconnected from the Ethernet), the PCs hang. This is undesirable, because the PCs are unattended.

REPLY:

Phil Anthony *(SIG 42/MESS 491):* Unless someone knows of a non-standard solution, you may be out of luck. Any non-multitasking workstation in a hierarchical network like Novell's will hang when it tries to access a server for required data or program files if the server has disappeared. Handling of search paths in both Novell and MS-DOS is implemented at the operating-system level rather than in the application. If a search path (map) isn't available, the driver considers it a critical error and turns control over to DOS.

Maybe you're really saying that IBM-compatible PCs running MS-DOS aren't suitable for your application. DESQVIEW is an attempt to make up for the deficiencies of MS-DOS. Some of those deficiencies need to be made up elsewhere, such as MS-DOS' non-reentrant system calls.

Consider switching to a genuine multitasking system, such as Santa Cruz Operation's XENIX or Microport's UNIX. Both have DOS shell software that may fit your application. Or look at a PC and operating system such as Amiga, which is designed for multitasking, or an MC68K system such as the GMX running Microware's OS/9 (probably the former, because work is being done to put DECnet up on the Amiga).

However, with UNIX or XENIX, you'll still probably have to kludge process-to-process communication over your network, because only DEC and DEC-specific third-party vendors (mostly application oriented) really support VMS system services.

This is complicated by the fact that the charts I've seen illustrate that DECnet is incompatible with other major network implementations, until you get down to the transport level. Ultimately, DECnet on the Amiga might make more sense.

Last, if the Ethernet or the VAX go away frequently, I'd look for serious problems with either the software you're running on the VAX or your network. If the application is critical, you may want to install a hot backup VAX with a mirrored disk. ■

[Report From Dr. R.]

Radical Changes

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

■ Look for Digital to unveil a double-density version of the RZ55 in the near future. The Maynard Mass Storage Mavens already have cut a deal with Micropolis, so the new SCSI disk should debut soon. There's also a chance that Digital will take an equity position in Micropolis.

■ Once again, Digital has verified my prognostications by formally announcing the products I've preannounced in this forum. Based on Digital's July 11 announcement, I'm confident the Maynard Microprocessor Mavens are crafting a next-generation computer architecture based on a 64-bit implementation of the Mips Rxxxx RISC platform.

You needn't possess the clairvoyant skills of the Wizard of OZIX to conclude that Digital's VAX Architecture eXtended (VAX II) platform will incorporate vector processing, dynamic reconfiguration of multiple processors, instruction-level fail-over, crossbar memory and new communications registers that support hardware-based parallelism. No wonder Digital claims that the VAX architecture will undergo radical changes during the next decade.

■ Digital soon will unveil Superclusters, second-generation VAXclusters that support twice the processor nodes, eight times the I/O bandwidth and much greater node-to-node distances than existing CI clusters. Also slated are the much-vaunted HSC100 controller and an active star coupler. Superclusters are likely to be announced in conjunction with the VAX 9000-series Aquarius processors.

■ Roger Heinen's DECwest OS/SB crew is hard at work hacking a Digital C++ compiler. The compiler almost certainly will hit the streets before OZIX, OS/SB's UNIX implementation for OLTP applications.

■ DEC soon will announce the Integrated Services Delivery System, a service offering that includes Site Service Processor hardware and AI-based predictive diagnostic software. But if an Aquarius mainframe VAX is on your shopping list, don't make a separate trip to buy your SSP, because a MicroVAX-based SSP will be concealed in the cabinet of every commercial Aquarius system.

■ After years of providing an operating system bereft of robust project-based accounting facilities, Digital is hacking up just such an offering for VMS. Could this be related to a massive VMS system software development program that was sparked by the forthcoming Aquarius system's need for mainframe-class data center management software?

DIANA WALKER/TIME MAGAZINE

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PRODUCT WATCH

RDBMS For ULTRIX

Ingres Release 6.2 Sports Improved Applications Developer And DEC's Blessing

Relational Technology Inc. (RTI) of Alameda, California, has produced major software enhancements for its most recent upgrade, Ingres release 6.2.

Significantly, DEC has chosen Ingres as the RDBMS and toolset to be bundled with ULTRIX V3.1. DEC and RTI also have an agreement through which DEC sells and distributes the Ingres user and development tools with VAX Rdb. Tandem and Data General have similar agreements with RTI.

Release 6.2 provides many additions and enhancements to Ingres release 6.0 (see "Multiserver Data Manager Keys Ingres Release 6.0," January 1989, p. 32). Most changes improve the system's application development performance. Release 6.1, which began shipping early this year, introduced improved applications portability and a multiserver architecture that optimized performance in distributed processing applications such as OLTP.

The applications development toolset in release 6.2 was designed to take advantage of both the multiserver architecture and portability. The SQL-based system combines the Ingres 4GL with Cadre Technologies' Teamwork interactive CASE tools.

The development environment, called the Applications-By-Forms System (ABF), now has a common visual catalog. This point-and-click menu system provides access to all the tools. It's self-documenting and can trace all database and external library procedures. Documentation is stored in the Ingres data dictionary, which is used to design tables, queries, graphs, reports and other objects.

A 4GL Interpreter has been added to the ABF that provides rapid prototyping and testing. According to Ingres, it offers a four-to-one reduction in application test-run times. The Interpreter displays error messages in a scrollable window.

Ingres has added several capabilities to its 4GL that make handling complex interactive database procedures less cumbersome through improved database access. The 4GL accesses operating systems commands, host languages, user programs and the toolset.

A new Forms system adds many design and display facilities to make the creation of screens and fields easier. It offers a timeout feature that logs out unattended applications to maintain security.

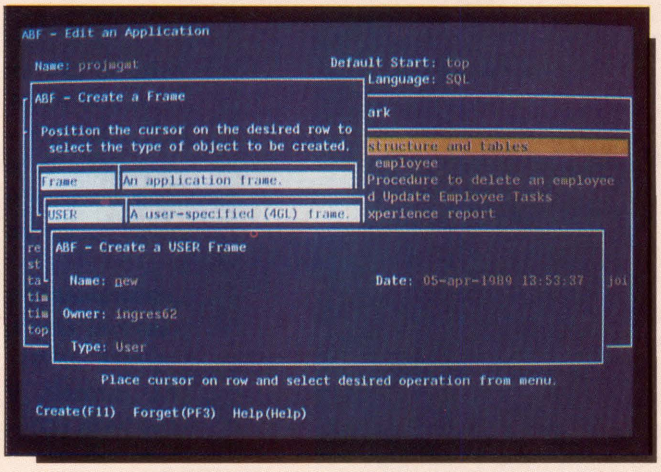
These new application development tools are based on Ingres Open SQL, a documented subset of Ingres SQL that interoperates with other SQL dialects through optional Ingres gateways or the Ingres/Star distributed data manager.

VAX/VMS V4.7 or later and at least 80,000 blocks of disk space are required to run Ingres release 6.2. The new release is free to those with current Ingres maintenance contracts.

For more information, contact Relational Technology Inc., 1080 Marina Village Pkwy., Alameda, CA 94501-9891; (415) 769-1400.

Circle 413 on reader card

—Evan Birkhead



These windows in Ingres' ABF prompt the application developer to design a screen.

TALARIS PRINTSTATIONS

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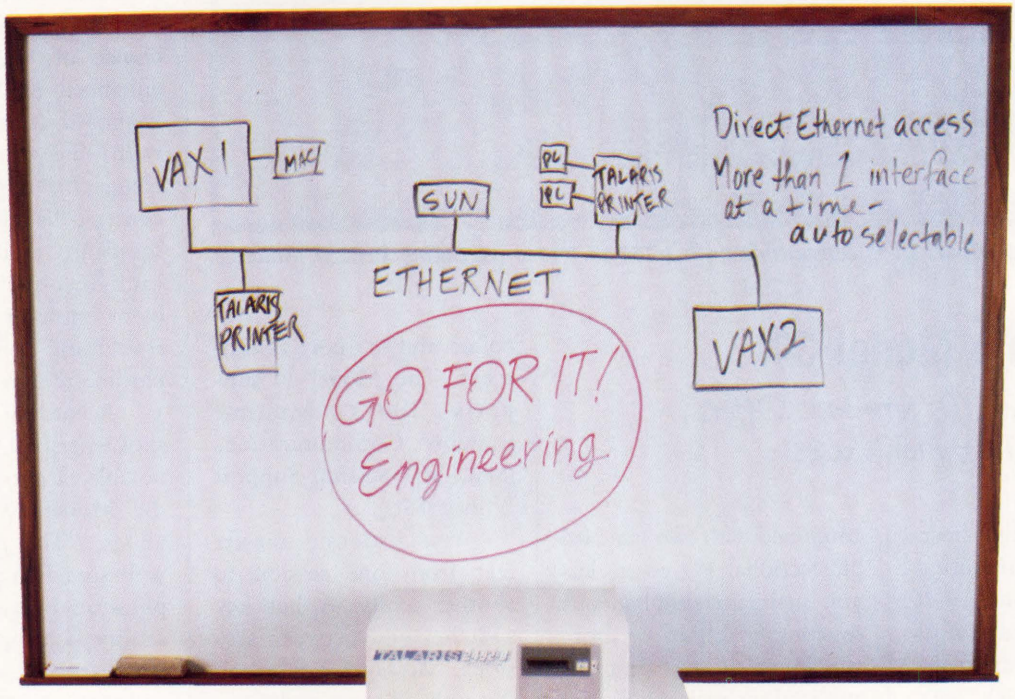
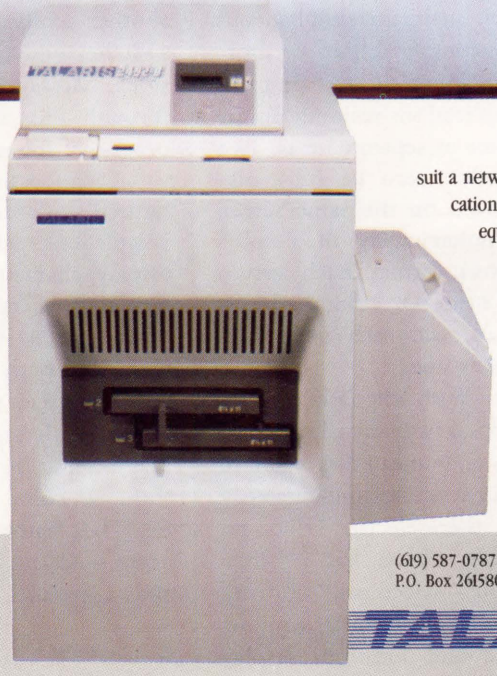


There's no better way to keep your multiuser system friendly than by connecting it all together via Ethernet. And now, thanks to Talaris Printstations, your network of users can even share printers. That's share and share alike — because the 2492-B Printstation doesn't play favorites. It has emulations, fonts, and options to suit a network full of different applications. Then too, the 2492-B is equally at home with DECnet and TCP/IP networks. So why not go for it? You'd have to go a long way to find a better laser printer to be friends with your network users.



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The Teleray Model 30 is compatible with VT52 to VT340 (excluding ReGIS) protocols.

The Multiple Model 30

Teleray's Model 30 Terminal Offers Multihost, Multisession Access

Today, a multiple-host, multiple-OS computing environment isn't unusual. If you operate in a multihost communications environment and require DEC, UNIX and Tektronix color graphics capabilities in a single processing terminal, Teleray of Minneapolis, Minnesota, may have a solution. The Model 30 is a color graphics, multihost, multisession terminal. It supports VT52 to VT340 (excluding ReGIS) protocols. It also features Tektronix 4207/4205 and Honeywell Bull VIP 7824/7813/7300 graphics compatibility.

The Model 30 multisession management capability, combined with two standard bidirectional I/O ports, lets you maintain simultaneous sessions with two or more alphanumeric and graphics applications residing on the same or separate hosts. Two sessions can be fully displayed on the same screen simultaneously in a split-screen format. Each session is 80 or 132 columns by 24 lines, and each includes a status line.

With the addition of two factory-installed serial ports, you can display up to four sessions simultaneously in user-selected windows. Each session has its own menu selections, allowing choice of protocol, window size and location, display colors and I/O port assignment. The Model 30 supports DEC's Multiple Systems Communications (MSC) and Session Support Utility (SSU).

You also can transfer text from one session to another easily. A hot key switches you between sessions. Messages guide you through the cut-and-paste procedure for text transfer.

Each session is configured with its own nonvolatile setup parameters and display characteristics. The Model 30 offers eight pages of 80- or 132-column text memory with attributes. Graphic screen resolution is 640 x 480. It can display 16 graphic and 16 text colors from a color palette of 262,144. It features two serial ports — RS-232 or RS-422 — and a parallel Centronics interface for ASCII, ANSI and color printers. It accepts data via mouse, barcode reader, page scanner or other input device.

A parallel port lets you output to a printer. You can create screen prints of full or partial display, and you can print a single window or a multiwindow display. You also can create a document that incorporates charts, graphics and text from several hosts or applications.

The Model 30 allows a choice of VT220 or IBM-enhanced PS/2-compatible keyboard. It can be ordered with one of three VGA-compatible monitors: a high-contrast flat 14-inch color monitor, a conventional high-resolution 13-inch color monitor or a high-resolution 14-inch monochrome monitor.

According to Teleray spokesperson Dennis Liila, a notable target audience for the Model 30 is graphics OEMs. "The Model 30 is well-suited to graphics applications because of its versatility — it supports different keyboards and monitors and can run multiple sessions simultaneously. Particularly, it lets you update a graphics file on-line."

The Model 30 costs $1,195, including keyboard. Monitors are priced optionally from $295 for a 14-inch monochrome to $999 for a 14-inch flat-screen color.

For more information, contact Teleray, a division of Research Inc., Box 24064, Minneapolis, MN 55424; (612) 941-3300.

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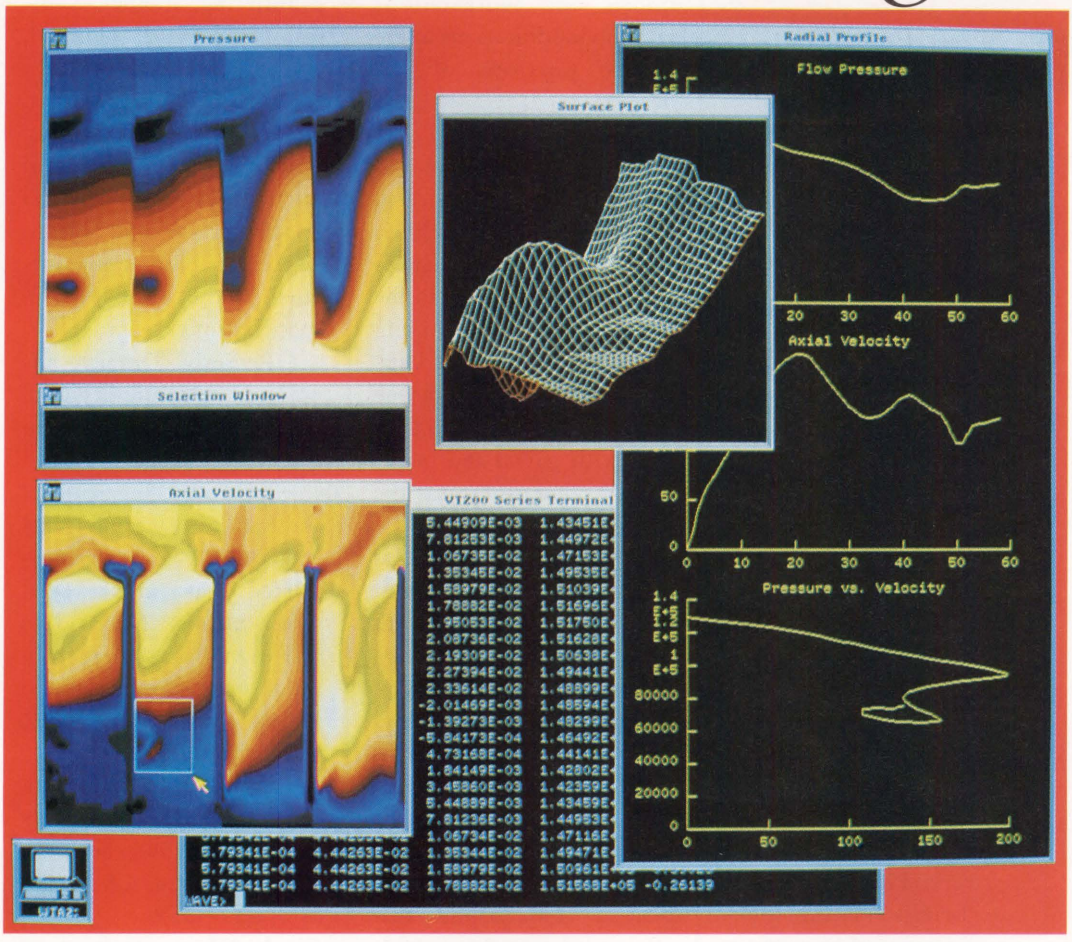
—Eric Schoeniger

Better Science Through Pictures



Results of computational fluid dynamics (CFD) analysis using data from Holset Engineering as visualized on a VAXstation 2000. At the left, powerful image processing features quickly show an overview of the full data set. From there, features and trends are identified interactively and displayed as surfaces and line graphs. PV~WAVE is ideal for quickly viewing large data sets to gain important insights. Using this new information, it is then possible to select features and subsets for further review and analysis.

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Let Them Use PHIGS

Template Graphics' Figaro Series Provides Hardware-Independent Versions Of PHIGS

In some ways, PHIGS could be called the open system of the graphics world. This ANSI standard — Programmer's Hierarchical Interactive Graphics Standard — is designed to bring a common device interface and programming base to graphics hardware devices. This lets graphics systems and applications developers concentrate on the graphics application rather than on mundane device specifics.

PHIGS depends largely on graphics libraries of objects used in a hierarchical fashion. For instance, if you want to design several 3-D models of ships, you might design one from the bottom up, starting with the "atomic" parts such as bolts, nuts and other single-unit items. After it was designed, all of the objects would be stored in a library. You then could design another ship model by drawing on components of the first model.

As a hierarchical standard, PHIGS allows a top-down design as well as a bottom-up development effort. The standard, which describes graphics functions, error conditions and FORTRAN, C and Ada language bindings, can be considered a graphics machine.

Template Graphics Software Inc. (TGS) of San Diego, California, has been working on commercial implementations of the PHIGS standard since 1984 and claims to provide 80 percent of the commercial PHIGS software in the marketplace. Its major products are Figaro version 2.0 and Figaro+ version 2.0 — icon-based, menu-driven, hardware-independent versions of the PHIGS standard.

Hardware independence makes such packages valuable. According to TGS, applications designed with Figaro or Figaro+ look the same on machines ranging from PCs to Convex supercomputers. TGS claims that with little practice, an applications developer can write graphics code that requires no modification when transporting and rebuilding systems. The software runs on a variety of DEC platforms, and a version of the software, Figaro/X version 2.0, brings PHIGS functionality together with X technology, allowing the software to run on X terminals and workstations with no modifications to the Figaro portions of the design.

Figaro serves the developer working on 2-D or relatively unsophisticated 3-D applications. It includes TGS performance enhancements and extensions to the PHIGS standard, including the ability to render and update graphics objects in one or more specific views to deal with trivial and incremental alterations to the display.

These enhancements also include advanced input functions, such as full-event input, programmable triggers, and soft input devices, including screen buttons and sliders. The latter functions replace the need for a function-key hardware device by emulating it on the screen. Figaro also features a post-to-view capability that allows color coding within an image and viewing of the image from different angles. Z-buffering, another extension to the PHIGS standard, is included.

Figaro+ adds lighting, depth cuing and shading functionality needed to deal with sophisticated 3-D images such as solid objects. These capabilities are outlined in the ANSI PHIGS+ specifications.

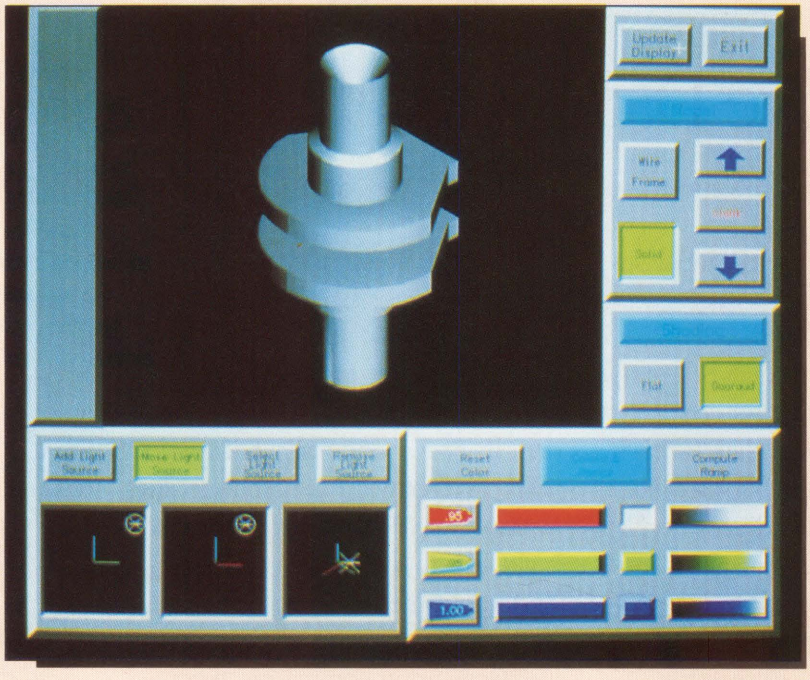
Recently, Template announced compatibility with DEC RISC platforms running DECwindows.

Figaro 2.0, Figaro+ 2.0 and Figaro/X 2.0 run on VMS and ULTRIX and are supported on most DEC workstations, MicroVAXs and VAXs. Prices range from $4,500 on a workstation to $40,000 for a license on a VAX 8978 or 8974.

For more information, contact Template Graphics Software Inc., 9685 Scranton Rd., San Diego, CA 92121; (619) 457-5359.

Circle 452 on reader card

—Elaine L. Appleton



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CIRCLE 135 ON READER CARD

Sending Messages To The World

Soft-Switch Connects, Manages And Optimizes Multivendor E-Mail Networks

It's remarkable how far electronic mail technology has evolved since its infancy 10 years ago. One forward-thinking company in this area is Soft-Switch Inc. of Wayne, Pennsylvania, which integrates multivendor e-mail systems.

Soft-Switch designs systems for such enduring protocols as X.400, SNADS and TCP/IP. The theory behind Soft-Switch's networking strategy is the loading of multiple dissimilar networking protocols onto a backbone mail switcher that runs through an entire organization. The backbone protocol reduces the complexity involved in managing the network and contains a set of services that provide applications to the various subnetworks.

Recently, Soft-Switch added several new software products (including tools to extend the backbone infrastructure), plus an X.400 box, which enhance its networking capabilities significantly at each of three levels.

At the connectivity level, Soft-Switch added the X.400 Gateway, a hardware and software solution that extends the Dell 310 PC, a 386-based, 20-MHz unit, with two 68000 communications chips.

One acts as a network adapter for X.25 networks, the other for SNA networks. The X.25 software needs no additional software on the IBM host or controllers, and the SNA network is physically secured from the public X.25 network.

Protocol executions take place in a UNIX System V.3 environment, but the system provides a full-screen user interface to all utilities, so you needn't know UNIX. A four-level security system governs the network. X.400-compliant networks include Telemail and MCI Mail.

If you use ALL-IN-1, this Gateway lets you receive mail from a variety of mail systems, including PROFS. The mail looks as if it were sent by another VMS user. ALL-IN-1 addresses and messages are stored in ALL-IN-1 format. To reply, the system provides a valid return address. You needn't identify the protocol as, say, X.400. The mail system determines which protocols must be converted. Soft-Switch offers a configuration menu, a sort of administrative screen on the X.400 gateway, that lets you define the network structure.

Soft-Switch also released two other connectivity products. One is the Simple Mail Transfer Protocol (SMTP) Gateway, which allows each Soft-Switch Central backbone traffic manager to connect to TCP/IP networks, such as UNIX Mail. X.25 networks and Ethernet bridges link this system to other TCP/IP networks.

Soft-Switch's X.400 Gateway is a 386-based unit with network adapters for X.25 and SNA networks.

The other is the SNADS Gateway for Network Courier. Network Courier is a LAN-based mail system. With the IBM PC-based SNADS Gateway, it's accessible from 3Com's 3+Mail, Banyan's Banyan Mail and Enable Software's Higgins.

At the management level, Soft-Switch added Directory Services and an Access Control Facility. The Directory Services contains a Names Directory, with statistics on network mail users, including location, X.400 attributes, native mail address and information on their internal network. SMTP and X.400 users automatically are registered on the system. Users also can register themselves.

The Access Control Facility lets a system administrator permit or deny access to any sender or recipient on the network. Both systems are maintained by Soft-Switch Central.

At the applications level, Soft-Switch provides Distributed Print Services, which enables network users to route messages through the Names Directory to specified printers; Distributed Library Services, which lets you create databases at any Soft-Switch Central node that's accessed by sending mail to that database; and the Soft-Switch Application Program Interface (SAPI), a client/server set of remote procedure calls and applications toolkit for writing interfaces to the IBM host applications. This is a utility within the VM and MVS operating systems. SAPI services include those provided in Soft-Switch Central and Directory Services.

The X.400 Gateway costs $60,000; the SMTP Gateway costs $25,000; the SNADS Gateway/Network Courier ranges in price from $4,995 to $60,000, depending on configuration; the SAPI costs $5,000; the Distributed Library Services costs $20,000 per Soft-Switch Central; and the Distributed Print Services costs $2,500 per Soft-Switch Central. The Directory Services and Access Control Facility are included in the Soft-Switch Central backbone.

For more information, contact Soft-Switch Inc., 640 Lee Rd., Wayne, PA 19087; (215) 640-7410.

Circle 551 on reader card

—Evan Birkhead

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CIRCLE 374 ON READER CARD

SQL On Tap

TechGnosis Inc.'s SequeLink Lets Mac Users Access SQL-Based Systems On VAXs

With the release of SequeLink 2.0, an application program interface that connects Mac applications users with SQL databases on VAXs, TechGnosis Inc. of Boca Raton, Florida, claims to have taken a giant step toward truly transparent cooperative processing.

SequeLink's access to VAX-resident databases is accomplished over AppleTalk and DECnet. The database access is supported on the Mac through applications such as Apple's HyperCard and Acius' 4th Dimension. The accessible SQL databases include Rdb, Sybase, Oracle and Ingres.

The product consists of a VAX server process that ties into the host SQL database and a driver with a choice of interface modules that reside on each networked Mac. SequeLink supports OLTP functionality and vendor-specific extensions to the SQL database.

SequeLink users needn't be trained, because they use the same Mac database software and user interface they usually use. Because SequeLink is buried in the lower levels, a Mac developer might summon it from HyperCard, for example. Also on the Mac side, you can use 4th Dimension, HyperCard or the C, ASSEMBLER and PASCAL libraries that TechGnosis provides as supplements so users can write their own connections.

SequeLink can access different manufacturers' databases located on separate VAXs. "We want to build total transactional systems," explains Peter Goossens, president of TechGnosis.

Goossens says that release 2.0 is fully upwardly compatible with 1.0 and that the newer system is more modular, with a more open architecture. On the Mac side, the modules include the Mac databases and programming libraries, real-world transactional applications, the SequeLink driver and standard AppleTalk or Alisa TSSnet. On the VAX side, the modules are AppleTalk for VMS or DECnet, the SQL database or databases, the RDBMS interface and the SequeLink server.

A No-Wait mode permits the parallel execution of operations on the client and server, reducing elapsed transaction times. A Cursor-Caching mechanism uses cursor mirroring, which keeps executed statement contexts in memory and reduces the network traffic and server load.

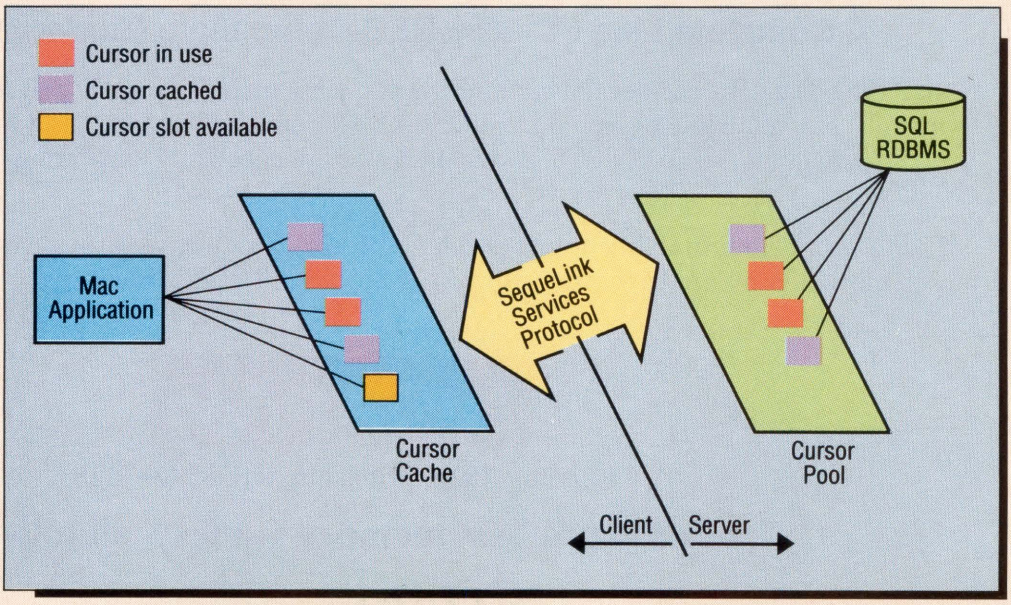
TechGnosis also offers a HyperCard-based developer's tool called Stack Shaper, which generates open HyperCard stacks. This provides both an open-application-generation environment (the Shaper) and open generated frames, target application stacks containing run-time code (the Shape). The Shaper uses SequeLink to implement basic transactional screen applications on the SQL databases. The Shaper's objective is to perform automatically 80 percent of the tedious repeat work involved in design.

Pricing is based on the number of workstations that will access the VAX server simultaneously. The cost is $4,995 for the VAX server module and $200 to $700 for each workstation. The new version of SequeLink is being delivered as a free upgrade to users of SequeLink 1.0. A full set of documentation and sample database calls are included in the system.

Alisa Systems Inc., a supplier of Mac-to-VAX connectivity products, is an OEM for SequeLink. In Europe, the package is distributed by Prasis, a wholly owned subsidiary of Gnosis N.V. of Antwerp, Belgium (TechGnosis' parent company). TechGnosis plans to expand SequeLink to other workstation and server platforms.

For more information, contact TechGnosis Inc., One Park Pl., Ste. 325, 621 N.W. 53rd St., Boca Raton, FL 33487; (407) 997-6687.
Circle 550 on reader card
Alisa Systems Inc., 221 E. Walnut St., Ste. 175, Pasadena, CA 91101; (818) 792-9474.
Circle 400 on reader card

—Evan Birkhead



SequeLink mirrors its cursor cache from server to client side to speed OLTP applications.

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4105 EMULATION

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CIRCLE 329 ON READER CARD

Reducing The Wait State

Telematics' Transaction Accelerator Reduces Load On VAXs And Improves Terminal Response

If you're a commercial user of transaction processing or work in the telecommunications industry, the Transaction Accelerator network system from Telematics International Inc., Fort Lauderdale, Florida, may be an alternative to an expensive VAX upgrade. The Transaction Accelerator provides an efficient method for connecting large numbers of local and remote terminals to the VAX. The VAX host is freed from terminal handling to provide better application throughput.

The Transaction Accelerator consists of an Ethernet-attached front-end processor and remote VT cluster controllers. The front-end processor handles network processing and management for VAX hosts. The VT cluster controllers provide remote users with local terminal handling, screen management and network links to one or more VAXs.

The Transaction Accelerator is compatible with VMS V4.6 and later and with the standard VMS terminal driver. It can coexist with DECnet or any other Ethernet application and can run all of Telematics' Net 25 network-access software. For example, the Net 25-based Transaction Accelerator can be loaded with Telematics' software, which will make it a switch, an access node for Systems Network Architecture (SNA) traffic, or both.

The Transaction Accelerator uses packets efficiently. When a standard XXX PAD is used to input a 10-character field, 20 packets are sent to input and echo each character. The Transaction Accelerator generates just two packets: one to request the field and one to supply the data after the input is completed. Packages of data are sent between the VAX system and the Transaction Accelerator front end over the Ethernet LAN.

The Transaction Accelerator uses an Open Systems Interconnect (OSI) transport server that runs layer one through layer four (TP4) of the OSI protocol over Ethernet. An X.25 gateway module can be added to the Transaction Accelerator to further speed response time for the terminal user.

All character handling is done local to the terminal network, thereby reducing network loading 60 to 80 percent. VAX computer systems can support up to 30 percent more users with the Transaction Accelerator. Because line loading is reduced substantially, significant savings can be realized on leased-line charges.

Most of the VAX terminal support facilities work with the Transaction Accelerator. For example, the standard VAX printer spooler will drive printers attached locally to the front end or remotely to a VT cluster controller. The VAX terminal configuration commands (i.e., "SET/TERMINAL=" DCL commands) function compatibly with the Transaction Accelerator.

Session Services, available through Telematics in late 1989, will be an enhancement to the Transaction Accelerator. Session Services presents the terminal user with a simple menu.

From here, the user selects from various services available on one or more VAXs. This lets terminal users have multiple connections to different tasks on a single VAX or multiple VAXs concurrently.

"The new DEC access products will address changing communications needs and evolving network technologies, such as T1 and ISDN," says Wayne Furman, Telematics' vice president of marketing.

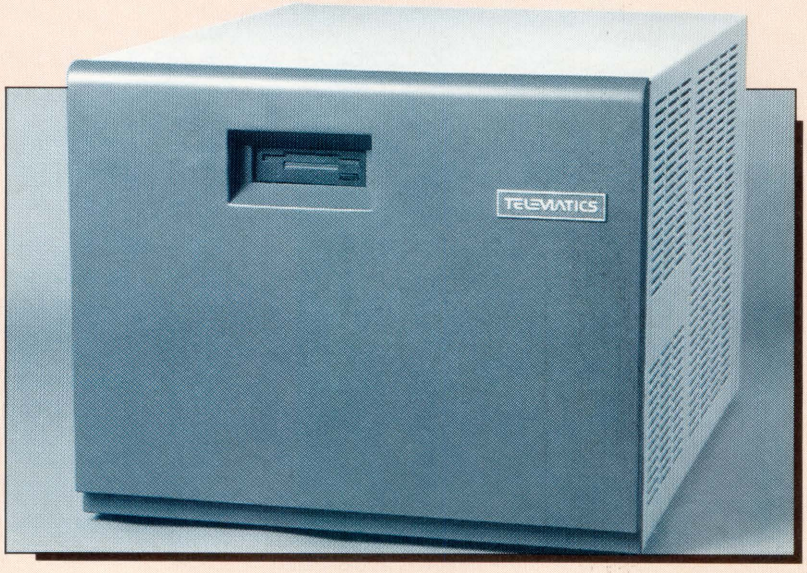
Targeted markets for Telematics Transaction Accelerator include banks, investment houses, credit services and retail businesses. Applications include sales entry, customer services, credit verification, automated clearinghouses, material tracking and inventory control.

The Transaction Accelerator is priced from $45,000.

For more information, contact Telematics Int'l Inc., 1201 Cypress Creek Rd., Fort Lauderdale, FL 33309; (305) 772-3070.

Circle 577 on reader card

—George T. Frueh



The Transaction Accelerator efficiently connects large numbers of local and remote terminals to the VAX.

Terminal emulation doesn't have to be this way.

We've all been there. Trying to remember whether the "Do" key is really <Ctrl-F1>. Or was it <Alt-F1>? And the editing keypad. Can you be absolutely sure you're about to press the "Select" key and not the "Remove" key? The results can be disastrous.

That's why KEA developed the PowerStation. The PowerStation, an exact VT200 layout keyboard bundled with VT240 or VT220 terminal emulation software, turns your IBM PC or compatible into a key-by-key replica of a DEC terminal – without messy labels!

But what does that get you?

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CIRCLE 119 ON READER CARD

O·F·F·I·C·E INTEGRATION

Standards such as ODA, CDA, CALS and EDI are promoting interoperability. But there's a long way to go.

BY LYNN HABER

OFFICE AUTOMATION FOR the 1990s is riding a new wave called document processing. It adds richness of functionality far beyond that of word processing of the 1980s.

"Office automation is entering a utility stage of development," says Martyn Roetter, manager of the information industry consulting practice at Arthur D. Little Inc. of Cambridge, Massachusetts. "For the 1990s we see an environment in which office automation is part of an infrastructure, with many office automation and data processing functions integrated into a single logical system."

The objective of this wave of development, according to Roetter, is to define elements of a single logical system that can be accessed via a single user interface and integrated into a seamless application. Until recently, the most sophisticated level of office integration only could be provided by a single vendor within a proprietary architecture. Even then, some of the major office system vendors couldn't provide integrated office systems across their own disparate platforms.

Lee Doyle, manager of LAN research at International Data Corporation (IDC), argues that the term integrated office system is a misnomer, with system vendors failing to deliver a full suite of office functionality. But according to Doyle, with the emergence of such things as Digital's Network Application Support and IBM's OfficeVision, vendors are tackling the problem of integration, albeit with individual strategies.

But Roetter asserts that there's confusion as to how this integrated environment will be developed as vendors and users muddle through this transition stage. "Standards are key to developing a new environment — standards that deal with document interchange for both textual and non-textual information and allow applications to interoperate at both the intravendor and intervendor levels."

Digital calls its set of standards Compound Document Architecture (CDA), part of the company's overall approach to its Application Integration Architecture (AIA).

At the international level, the International Standards Organization's (ISO)

Office Document Architecture and Interchange Format (ODA/ODIF), ISO standard 8613, also is intended as a complex document standard. It's aimed at the commercial environment. Special-purpose standards, such as Computer-Aided Acquisition and Logistic Support (CALS) proposed by the Department of Defense (DoD) for publishing, and Electronic Data Interchange (EDI) for the computerized exchange of standard business documents or forms transactions such as purchasing, also are gaining momentum.

Understanding The Goal

Ideally, the highest level of systems integration is transparent interoperability among various vendors' hardware and software.

Barbara Babcock, IDC's vice president and service director of office information systems, suggests a way to understand interoperability in terms of levels. It begins with the lowest level, distribution, which is followed by final form interchange, revisable form interchange and transparent accessibility.

Distribution is the ability to send a document but not be able to do anything with it unless users are working with the same editor. Final form and revisable form interchange exist as de facto standards, e.g., using IBM's DCA as an interchange facility, notes Babcock. Companies have written software that lets users convert from one format to another, and independent vendors offer a variety of bridges, gateways or black boxes that take in format A and turn out format B. But again, notes Babcock, without standards there's no clean way for interchange: "Users are impeded by bridges and gateways, which are forced to deal with the lowest common denominator. As a result, users often lose application functionality."

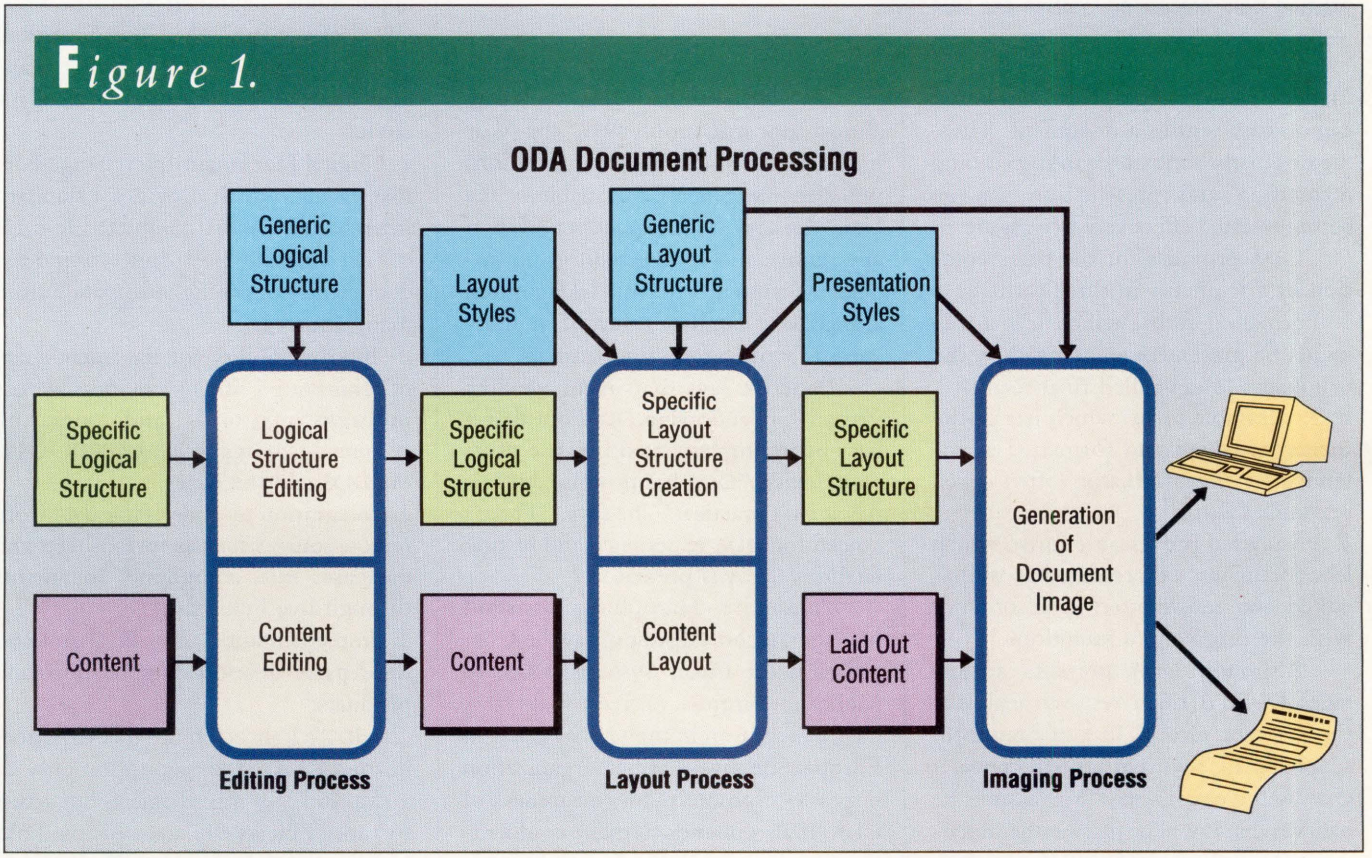
Although, with the advent of standards such as X.400 and other tactical products, you can exchange mail among systems, it still isn't integration. What must happen, Babcock says, is that document contents such as graphics and charts must be interoperable. "Standards such as X.400 and ODA are helping to move toward an increasing degree of integration," she notes.

Evolving Standards

There are a number of industry-recognized standards for documents: X.400 as a transport mechanism for e-mail, Computer Graphics Metafile (CGM) and Initial Graphics Exchange Standard (IGES) for graphics, and Standard Generalized Markup Language (SGML) for text. However, a new group of standards is emerging for a compound document architecture.

In the public arena, the purpose of ODA is to facilitate the interchange of documents, or parts of documents, so

Figure 1.

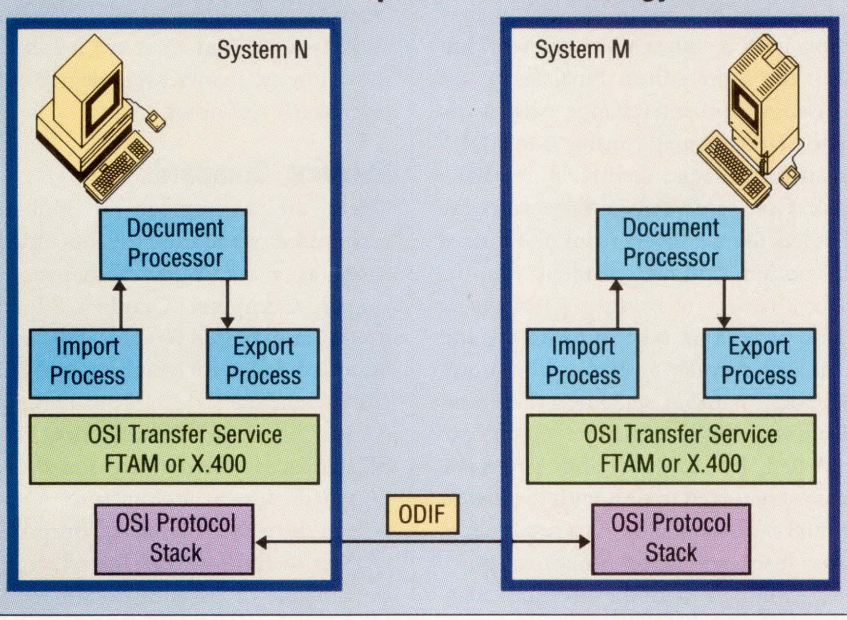


Courtesy NIST

The processing model for ODA is similar to older document processing systems such as UNIX, which separates editing and layout.

Figure 2.

Courtesy NIST



An implementation strategy for early implementors is to provide a software filter function between existing word processing systems and ODA/ODIF.

that text, images, graphics and sound can coexist within a document. Thus, the originator's intent regarding editing, formatting and presentation can be communicated effectively (see Figure 1).

ODA provides for the representation of documents in three formats:

1. Formatted form, which lets documents be presented as intended by the originator (often called final form).
2. Processable form, which lets documents be edited and formatted as intended by the originator (often called revisable form).
3. Formatted processable form, which lets documents be presented as well as edited and reformatted in accordance with the originator's intentions.

Although ODA presents advantages, David Artman, research analyst at the Gartner Group Inc. of Stamford, Connecticut, says that no one knows if ODA will work. Even if it is feasible, he believes that it will be just another document format in the U.S., coexisting with vendor-specific formats.

"We believe that ODA will play almost no role until 1991, the year industrial-strength ODA applications will become generally available in the U.S.," he says. "We expect very few, if any, native-mode ODA editors to appear. Most will offer an ODA option alongside a familiar array of vendor-specific word processing formats."

Babcock says that major vendors verbally are endorsing ODA, but that it isn't being implemented because of its complexity. "ODA has promise, but today it isn't practical," she says. "There's a need for ODA experience and testing facilities. ODA is premature."

Alexandra Haropulos, assistant manager, technical support at the Corporation for Open Systems (COS) of McLean, Virginia, agrees that ODA hasn't caught on in the U.S. as it has in Europe. She says that her organization hopes to promote public awareness of ODA. It also intends to make conformance testings available for ODA compliancy (see Figure 2).

CDA, Digital's standard for handling networked compound documents, will, according to Rex Lint, CDA program manager, provide an interchange of information among applications. CDA specifications define a complete networked environment for creating, revising, managing and distributing compound documents containing live links to text, graphics, images, spreadsheets, charts and tables. Live links allow automatic updating of data contained in a compound document when the source of information is changed. Future versions of the CDA specification will address documents containing voice and video.

According to Lint, the CDA specification is consistent with the goals of ODA, SGML and Adobe's PostScript page description language. "We'll support ODA by providing a mechanism to get into and out of it, but we won't replace CDA with ODA," he says.

Digital has begun to roll out CDA applications, beginning with DECwrite, DECdecision and VAXimage. According to Les Apigian, CDA marketing manager at DEC, key features of CDA include:

1. Digital Document Interchange Format (DDIF), which provides a standard interchange for the complete life cycle of networked, electronic compound documents containing information from many sources.
2. Interoperability for the interchange of compound documentation across multiple platforms and operating systems including VMS, ULTRIX, OS/2, MS-DOS and the Mac.
3. Integration of underlying data from remote sources such as spreadsheets and databases into compound documents through live links.
4. Implementation by Digital- and third-party-developed applications and products.

IDC's Babcock notes that CDA goes beyond ODA. "DEC set up not only an architecture for mixed objects but access to those objects via a set of live links between them," she says. She believes that companies such as Digital and IBM

"Fast, friendly, flicker-free. So why do they call them Tigers?"

If you're thinking about ordering a Digital VT330 or VT340 graphic terminal, don't—at least not until you've seen the C.Itoh Tiger Terminals. The C.Itoh CIT334 and CIT344 Tigers offer some powerful advantages you won't get with DEC.®

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And more.
Tigers can also run two sessions at once, and dynamically size and position the windows anywhere on the screen. They have pop-up menus for easy setup using keyboard or mouse.

Feature	CIT344	VT340	CIT334	VT330
Drawing Speed (Regis)	2x	1x	2x	1x
Pages of Memory	6	3	6	3
Dynamic Windows	Yes	No	Yes	No
Pop-Up Menus	Yes	No	Yes	No
Colors Per Session	16/262K	16/4K	—	—
Color Text Attributes	Yes	No	—	—
Screen Refresh Rate	70 Hz.	60 Hz.	70 Hz.	60 Hz.
Overscan/ Borderscan	Yes	No	Yes	No
Ethernet Interface	Option	No	Option	No
RGB Interface	Option	No	—	—

A standard Apple Desktop Bus lets you use any ADB device for terminal cursor control, so you can choose from a mouse, keyboard or tablet. The Tigers also have a faster refresh rate—70 Hz as opposed to 60—so they're flicker-free, making them easier on the eyes.

We think C.Itoh's CIT334 and 344 are simply more terminal for the money than the DEC VT330/340. And when you compare, we think you'll agree.

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CIRCLE 327 ON READER CARD

Having It ALL-IN-1™

The most successful integrated office system to date is Digital's ALL-IN-1. With a reported 1.7 million ALL-IN-1 users at the end of 1988, Digital holds about 47 percent of the integrated office automation software market. Its success is the result of planning, vision and Digital's understanding that, above all else, easy access to information is what ALL-IN-1 must provide.

Far more than just integrated word processing, spreadsheets and electronic mail, ALL-IN-1 is an open office information system. It provides the environment and facilities necessary to build a tailored, integrated office information system for a user or groups of users. Like a computer operating system, ALL-IN-1 provides a framework into which applications can be integrated.

ALL-IN-1 has four primary subsystems: electronic mail, a File Cabinet facility, external communications and time management. It also features a form-based user interface, word processing and a powerful script language used to develop applications. Additional support is provided through a bidirectional VMS interface: ALL-IN-1 applications can execute VMS commands and command procedures, and ALL-IN-1 functions can be called from VMS (from a subprocess).

ALL-IN-1 is an open platform for product development. Software developers can easily integrate their applications with ALL-IN-1. Popular software packages, such as Wordperfect and MEC's Mass-11, replace or complement Digital's WPS-PLUS. Other products, such as Access Technology's 20/20 spreadsheet for ALL-IN-1, add functionality.

The ALL-IN-1 File Cabinet provides compatibility among integrated software products by separating data content from the storage format. In this way, ALL-IN-1 can store information with different data formats for many different applications. If an application is integrated with ALL-IN-1 at the Document Storage Attribute Block (DSAB) level, the File Cabinet will convert document types automatically for the application. In the future, you'll be able to integrate third-party editors and desktop publishing systems that conform to the CDA specification with ALL-IN-1.

Many ALL-IN-1 users use PCs or Macs to access the VAX and ALL-IN-1. Mac-to-VAX and PC-to-VAX integration products bridge the gap between the computers. For instance, Keyword Office Technologies' KEYpak+1 lets PC users transfer documents into and out of their ALL-IN-1 File Cabinet.

ALL-IN-1 To DECwindows

One of the many ALL-IN-1 user debates is the lack of a modern graphical user interface. Digital, too, realizes that ALL-IN-1 would benefit from a face lift. Recent Digital announcements have reported that ALL-IN-1-to-DECwindows integration is in progress. The developments will be released in stages during the next two years. An ALL-IN-1 integration of DECwrite and CDA will be included in the update.

Many user complaints about ALL-IN-1, such as features lacking in the WPS-PLUS word processor, the inability to select and act on multiple documents and a lackluster time management facility, have been resolved in ALL-IN-1 version 2.3. This version is packed with features for both the ALL-IN-1 user and the administrator.

In addition, Digital recently introduced a personal licensing policy for ALL-IN-1. Prior to the availability of this usage-based license option, ALL-IN-1 licenses started at about $14,000, which was difficult for MicroVAX customers to justify. An ALL-IN-1 Personal License is priced at about $650, which is about what a PC user would pay for word processing, spell checker, thesaurus and time management software. Additionally, ALL-IN-1 Starter software, which includes WPS-PLUS, File Cabinet, electronic mail, and MAILbus functions, costs about $440 per user.

When ALL-IN-1 is molded into the framework of an organization successfully, it becomes invaluable. The user interface lacks pizazz, but it's easy to use. After you've organized your work in ALL-IN-1, you'll wonder how you got along without it.

—David W. Bynon is a VAX system consultant based in Rockville, Maryland, and author of a comprehensive guide to ALL-IN-1 to be published later this year by Professional Press.

will be the first to set standards in their environments, followed by third-party vendors that will cooperate with one or both of these leading vendors. A second wave of system vendors such as HP and Data General and independent system vendors will go with the industry leaders' de facto standards or ODA, or they'll do something on their own.

Special-Purpose Standards

CALS and EDI are examples of document interchange standards for specific application environments. But while CALS is a special-purpose standard for weapons systems procurement, it's being extended to other areas of the government, as evidenced by the announcement of the Federal Information Processing Standard (FIPS) 152, which implemented SGML governmentwide as of March 31.

CALS is the DoD's initiative to streamline the acquisition and implementation of weapons systems by exchanging information in a digital form. The standard addresses technical information such as training and maintenance manuals, which include illustrations and product definition data such as engineering drawings and specifications.

CALS is a collection of evolving standards, with initial specifications including SGML, IGES, CGM and CCITT Group 4 for raster images. By 1990, contractors must submit weapon system documentation text, engineering drawings and images to the DoD in electronic form.

According to Follet Carter, vice president and director of corporate publishing strategies at Gartner, at a time when only the leading-edge publishing users are implementing heterogeneous systems, the DoD has established that it can rely on no one vendor to dominate the marketplace. "One of the key premises of CALS is the establishment of standards for all vendors so that technological obsolescence can be slowed to a manageable degree," he says.

While a number of vendors such as IBM and Interleaf publicly have com-

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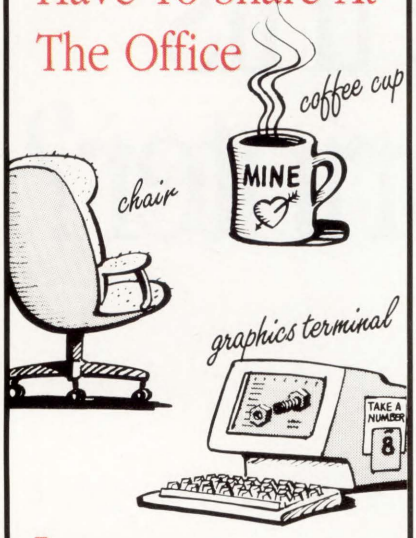

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mitted to and tentatively have demonstrated full CALS support, office automation vendors such as Digital, HP, Unisys and Wang haven't. "DEC won't support CALS directly," says Lint, "but we will provide format converters." DEC appears to be relying on vendors such as Interleaf for CALS software, notes Carter.

Interleaf is a strong advocate of CALS. The company's first CALS product is a CALS Preparedness Package that consists of software, training and technical support for users.

Electronic Data Interchange

According to Victor S. Wheatman, manager of the Electronic Data Interchange planning service at Input of Mountain View, California, EDI is the application-to-application exchange of business data represented in forms transactions via a telecommunication media in a standardized format, ANSI X12.

EDI is networking, communications, e-mail and directories. "It's a set of skills and a set of products that virtually define systems integration," he says.

It's a way to streamline and better manage information. "For most companies, it isn't a matter of whether they'll implement EDI but when," he says. Wheatman notes that about half the *Fortune* 1000 companies have EDI in place or have pilot-tested EDI.

A top issue for EDI users is standards, says Wheatman, because EDI is a data format issue as well as a communications issue. "Today, companies successfully and beneficially can implement EDI using existing standards and grow with them as they develop," he says.

DEC reportedly will introduce an EDI/VAX translator with X.400 capability in the U.S. very soon. The company offers a similar product in Europe.

Vendors Respond

ADL's Roetter says that the push for standards comes from sophisticated users who want to link their equipment and not depend on a single vendor for business solutions. But, he notes, as much as users want open systems, they also want the advantage of sophisticated applications.

While leading system vendors pledge allegiance to evolving standards, they don't want to be handcuffed to them. For their part, independent software suppliers want to address the

largest market possible via vendor independence. As a result, we see independent software suppliers committed to both de facto and international standards. According to Digital, more than two dozen software developers have committed to supporting CDA specifications.

Carol Karels, spokesperson for Microsystems Engineering Corporation, says that the company currently is working on supporting CDA and CALS. "Working with standards is critical to our success as well as that of our customers," she says. "We try to comply with de facto industry standards as fully as possible. But we must comply with standards being defined by international committees if we want to continue to be a player in the marketplace."

Eldon Greenwood, manager of DEC product marketing at WordPerfect Corporation, notes that standards are important to the company's strategy to provide interoperability among office products across networks and platforms. The company supports CDA and is watching the requirement for standards such as SGML, CALS and X.400.

Jit Saxena, president of Applix Inc., says his company is strongly committed to standards, because they allow users to make their buying decisions based on the application or software as opposed to hardware. Jeff Weidler, vice president of marketing and sales at Marc Software International, notes that the company will be compliant with Digital's CDA and the DoD's CALS. There are no plans at the moment for complying with ODA, he adds.

FIVE YEARS AGO, there were no standards for system interoperability. Today, a number of standards are emerging. According to Babcock, it will take another 10 years of standards work to achieve integration. *—Lynn Haber is a Boston-based free-lance writer specializing in computer and communications technology.*

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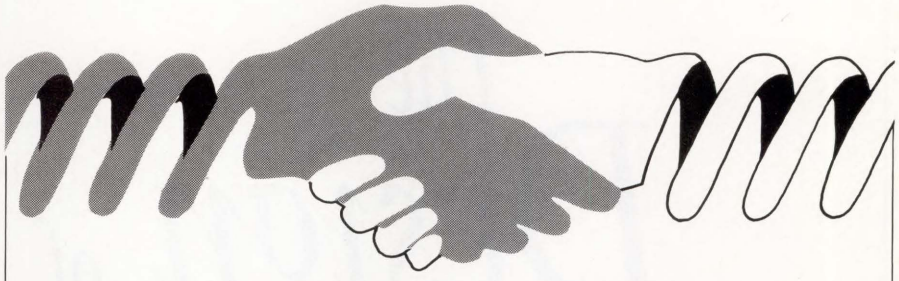

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The Design of Departmental LANS

Maximizing throughput and data availability on expanding departmental LANs.

BY BRADFORD T. HARRISON

AS THE TECHNOLOGY of the technical computing marketplace moves into departmental computing, important industry standards, such as UNIX and TCP/IP, continue to march out of the technical environment and into the industry at large.

This trend brings new products and capabilities to office networks and new headaches to departmental LAN managers. The technical environment has created hardware and software solutions that, as mainstream products, now challenge and coexist with many Digital products. Further, many DEC-based departmental LANs already support multiple protocols. A sophisticated bottleneck is near at hand.

Joining The Fray

With the introduction of the DECstation 3100, Digital split its product offerings into two groups. VAX/VMS remains its proprietary technology, while the industry-standard product line joins the fray of other industry-standard products.

This line will compete directly with similar products for technical and scientific environments from Sun Microsystems, Hewlett-Packard, Apollo and others. But with the spillover that's occurring from the technical environment into the departmental environment, LAN managers must be prepared to handle both product arenas on a single LAN. Many LAN managers soon will need to deal with clusters and data-sharing techniques that borrow from both worlds.

Three years ago, when Digital introduced the LAVc, industry observers applauded the technology. Led by the still-young MicroVAX, LAVcs tapped the full potential of the VAX/VMS architec-

ture and retained the functionality of full-sized VAXclusters, although on a much smaller scale.

Features included the use of a single operating system that was booted across the LAN, high data availability via file sharing to the record level by all nodes, sharing all print resources and disk space by all processors on the LAN, simple plug-and-play connection of additional nodes, and centralized system management.

It all depended on VMS, and VMS only ran on the VAX. If you wanted the new capabilities, you had to buy VAXs.

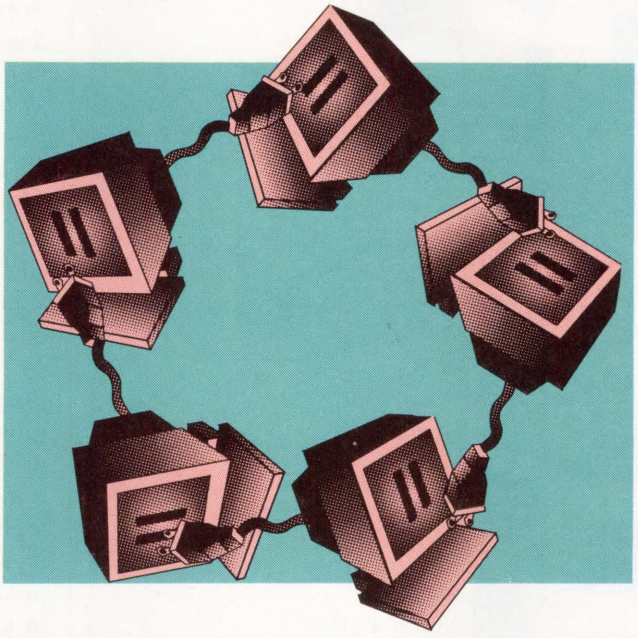
Meanwhile, Sun was working on a similar technology. This technology was based on UNIX, which was finding acceptance as the standard operating system for technical environments, and TCP/IP, which had been specified by the Department of Defense (DoD) and was being made available industrywide to parties interested in developing communications products for the DoD.

Now, Sun's Open Network Computing (ONC) has found industrywide acceptance. ONC brings to the LAN the same functionality as LAVcs but is being adopted by a wide variety of vendors.

The Network File System (NFS), the most widely implemented ONC service, is available from Digital under VMS. VMS/ULTRIX Connection lets VAX and VAXcluster users share files with other NFS nodes. It supports a TCP/IP programming interface and a simple File Transfer Protocol (FTP) utility for file exchange with non-NFS, non-VMS nodes. In the next year or so, many more products are expected from DEC that will unite its two disparate product lines.

Although the ONC protocols must be licensed from Sun, NFS is considered an industry standard, especially on UNIX systems. Sun originally developed NFS for use on networks of its technical workstations. But as NFS moves into the industry at large and as Sun continues opening its product lines to other applications, NFS is finding acceptance in all environments.

UNIX rapidly is becoming the industry-standard operating system. The Open Software Foundation (OSF) of Cambridge, Massachusetts, of which Digital is a member, and UNIX International of Parsippany, New Jersey, are proposing industry-standard operating systems based on UNIX.



In addition, many vendors are porting their UNIX operating systems to Reduced Instruction Set Computing (RISC) platforms. Because UNIX is written mostly in C, it's the most portable of operating systems, and RISC is the easiest architecture to port to because of the small but powerful instruction set. A good C compiler and a little customization are the only requirements. In fact, DEC's port of ULTRIX to the RISC-based DECstation 3100 reportedly occurred without a hitch. Other vendors offering the UNIX/RISC combination are HP (Precision Architecture/HP-UX), Sun (SPARC/SunOS), Mips Computer Systems (MIPS RISC/RISCos) and IBM (RT RISC/AIX).

Thus, two separate but powerful LAN environments soon will be united: UNIX/RISC/NFS and VAXclusters. Although VMS has a larger installed base, many products exist in both environments. Some products tie the two together: Wollongong's combination DECnet-TCP/IP software, for example, and Digital's VMS/ULTRIX Connection.

Furthermore, many products have counterparts across environments. Two examples are Alisa Systems' AlisaShare and Kinetics' K-Spool. Both provide AppleShare-compatible VAX file and print services for the Mac, but AlisaShare runs under VMS, and K-Share runs under ULTRIX and other UNIX-based operating systems.

Companies such as Pacer address both environments with a single product family. The PacerShare extension to the PacerLink communications product lets Macs share files stored on VAXs running either ULTRIX or VMS, even if both operating systems are in use on the same network. Multiwindow terminal emulation and print services are included.

The layers of software are becoming deeper, and the requirements that departmental LANs be stable, fast and easily expandable are becoming more rigid.

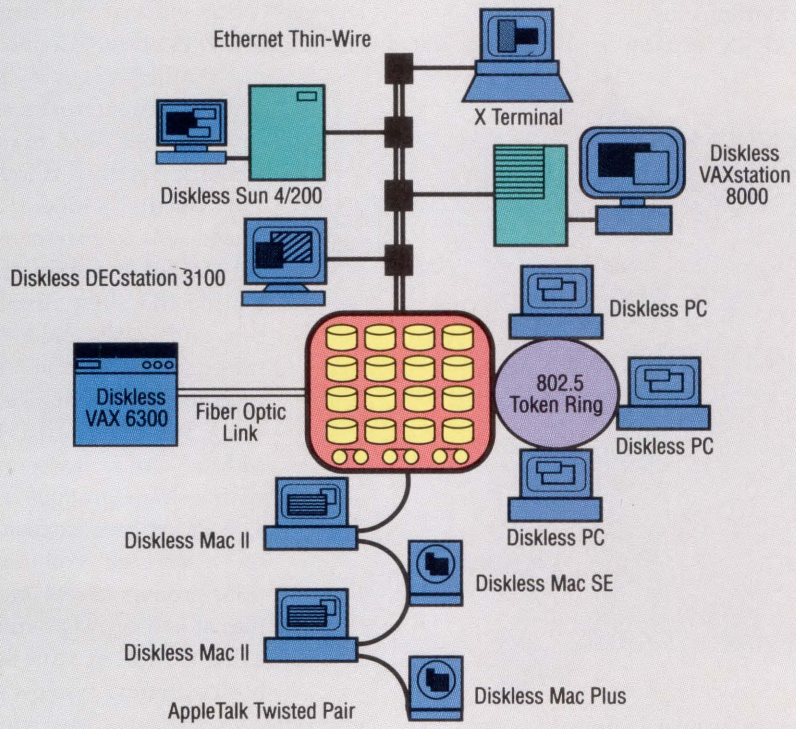
Centralizing

Ideally, all network storage would be located on a single server, and all data would be served at extremely fast speeds so that all nodes would be diskless (see Figure 1). The server would incorporate technology that would prevent it from failing. If it failed, built-in redundancy would prevent loss of service to users. Data management and backup would be a snap, and network management schemes would be implemented easily.

In the unlikely event that any part of the network bogged down in traffic, the situation would be remedied easily by subdividing that part and reconfiguring so that each new sections would be connected directly to the server.

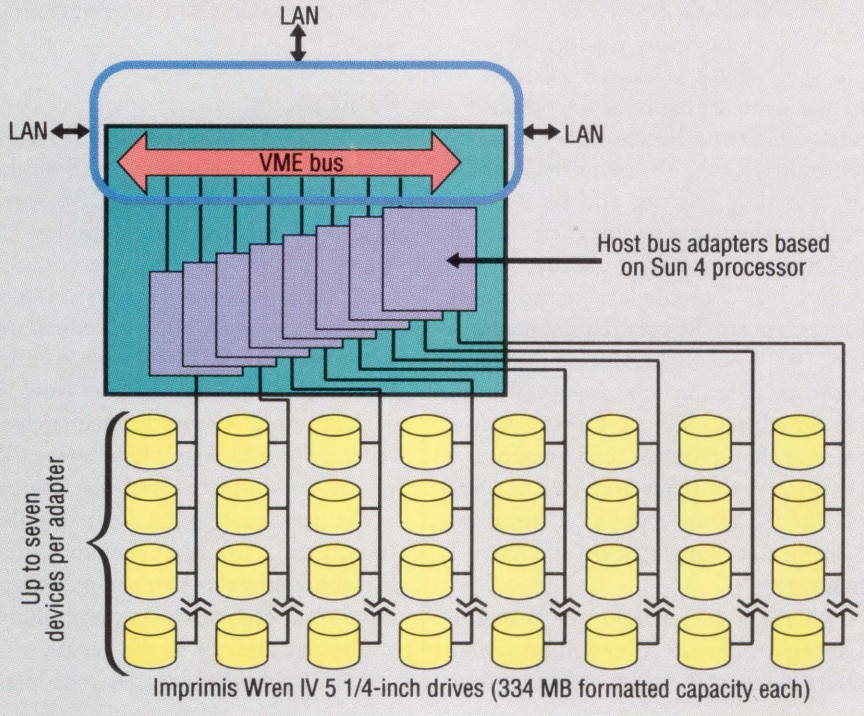
With this ideal in mind, many start-

Figure 1.



Parallel storage support from one central server.

Figure 2.



Berkeley RAID prototype.

ups are bringing centralized server products to market. NetFrame Systems, whose NetFrame 100 and 300 can be configured to support hundreds of disk drives and numerous operating systems, network protocols and types of networks, is best known. For example, a single department could use 802.5 Token Ring and 802.3 Ethernet and support NFS under UNIX as well as an AppleTalk LAN and a network of PCs under Novell's NetWare. The company is positioning the product against VAXclusters and LAVcs (depending on the size and configuration of the model purchased), although it doesn't expect to compete directly with Digital right away.

Two Silicon Valley startups — Auspex Systems and Omni Solutions — provide similar products in the UNIX marketplace. The Auspex solution is rumored to support multiple Ethernet segments under NFS and uses a new high-performance SCSI for storage. The product is scheduled to be announced in October and is aimed primarily at large Sun workstation installations.

Omni Solutions' product is similar, but the company focuses on file system performance as a key ingredient. It believes that its storage subsystem and other components will provide such high performance that the system's software will be hard-pressed to keep pace. If this is true, an important milestone in server performance will have been reached: The mechanical devices no longer create the bottleneck, rather the bottleneck is created by how the data residing on them is managed. This product is expected by early 1990.

High-performance, reliable storage arrays are critical to the success of the centralized storage solution, and methods of shortening data-access time receive much attention. Several companies, including Auspex Systems, are looking at a technology called Redundant Arrays of Inexpensive Disks (RAID) being studied at the University of California at Berkeley. Some companies, such as Maximum Strategy, already have developed products based on it.

In the RAID model (see Figure 2),

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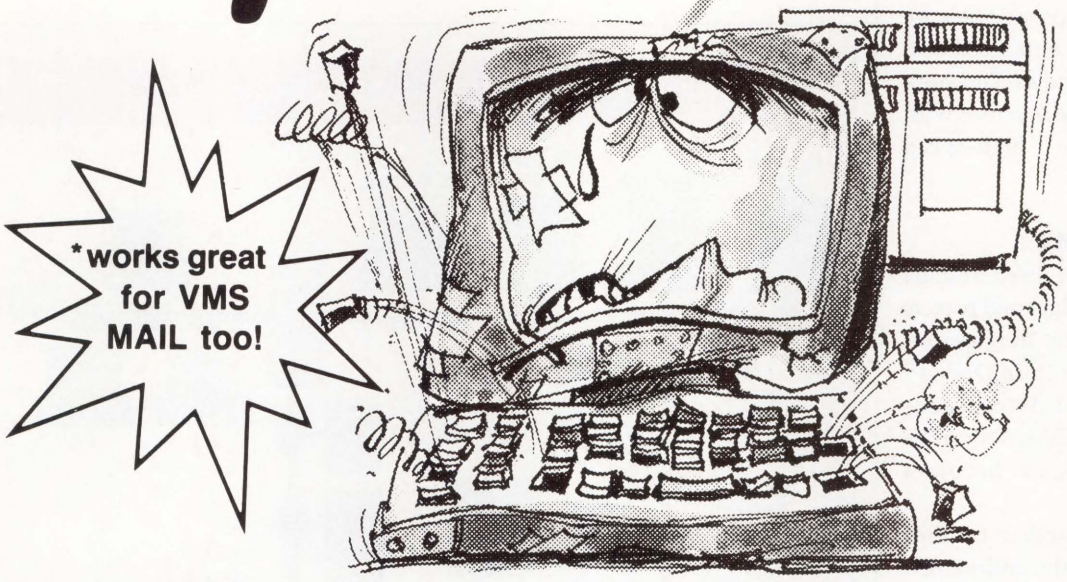

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access times are short, because the disks are small, and reliability is great, because all data can be duplicated and operated on by multiple drives. RAID configurations provide the capability to access data in parallel and offer low-cost alternatives to Parallel Transfer Drive (PTD) technology.

The concept of hierarchical storage also is finding support. Here, data is stored according to how often it's accessed. For example, least-frequently accessed files are kept on optical disk while most-frequently accessed files are kept in a large RAM. A centralized data management system handles data storage, providing the network nodes with completely transparent, high-speed storage.

Bridging And Routing

In contrast to the centralized storage concept is the use of bridges and routers to control network traffic and improve performance (see Figure 3). In Digital's terminology, an extended LAN consisting of one or more subLANs can be created easily if a LAN becomes overloaded.

Bridges localize packets so they aren't broadcast across the entire LAN. Thus, traffic is restricted to the areas where it's used, yet nodes retain the ability to communicate with nodes on other areas of the extended LAN. Bridges, such as the Digital LAN Bridge 100, are self-learning, which means they learn whether or not a node is to the right or left and build tables accordingly.

Some vendors offer bridges that can be configured in the self-learning mode or programmed from a node. A self-learning bridge doesn't need to be reprogrammed when nodes are added to the LAN or moved from one subLAN to another.

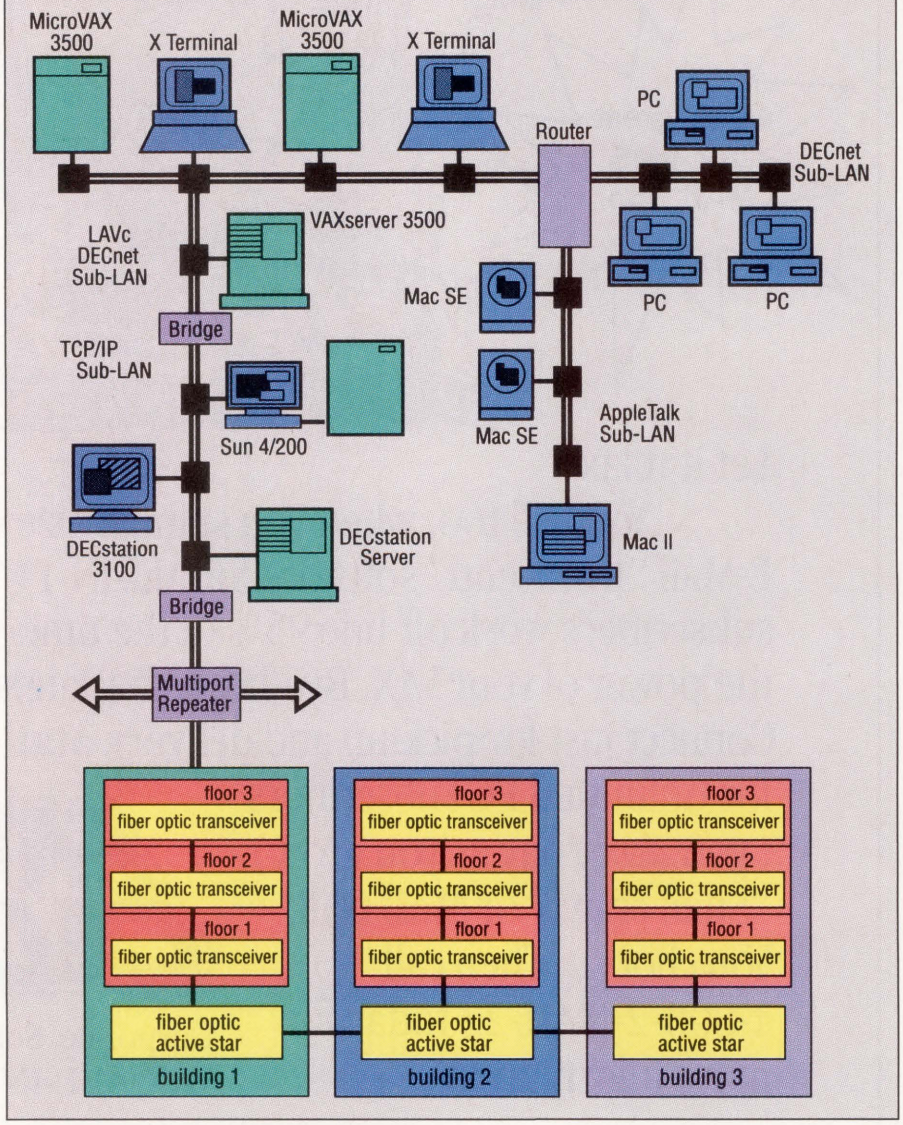
The problem with bridges is that they filter packets without regard for packet type. In a common configuration, the LAN Bridge 100 connects two Ethernet cables and filters DECnet, TCP/IP, LAT and XNS packets without affecting them. This allows the bridge to be very fast but of limited intelligence.

Routers, on the other hand, can make decisions based on information contained within the packet. These range from simple routing decisions to decisions that allow for the construction of radically dissimilar networks into hybrid LANs. The additional capabilities slow the router but add such a large degree of functionality that such companies as Advanced Computer Communications predict that the market of the 1990s will show a substantial movement away from bridges and toward routers.

Bridges operate at the data link layer of the International Standards Organization (ISO) stack, whereas servers operate at the network layer. In contrast, gateways operate several layers higher at the application layer, making them the slowest method of interconnecting networks.

Upgrading LANs to 100-Megabit-per-second Fiber Distributed Data

Figure 3.



Fiber optic backbone supporting extended LAN.

Interface (FDDI) is likely for the 1990s, although opinions vary widely as to when the cost will be low enough to make this feasible. DEC currently sells backbone fiber optic products for companies expecting to upgrade to FDDI in the near future (see Figure 3).

DEC's recent agreement to sell and support Chipcom's ORnet Fiber Optic Ethernet System indicates that it's counting on many customers upgrading to FDDI, but spokespeople for Auspex and NetFrame are skeptical in regard to fiber's near-term prospects. They cite high cost and lack of products as reasons to avoid fiber for a while, implementing it only as a backbone if at all.

Cluster Construction

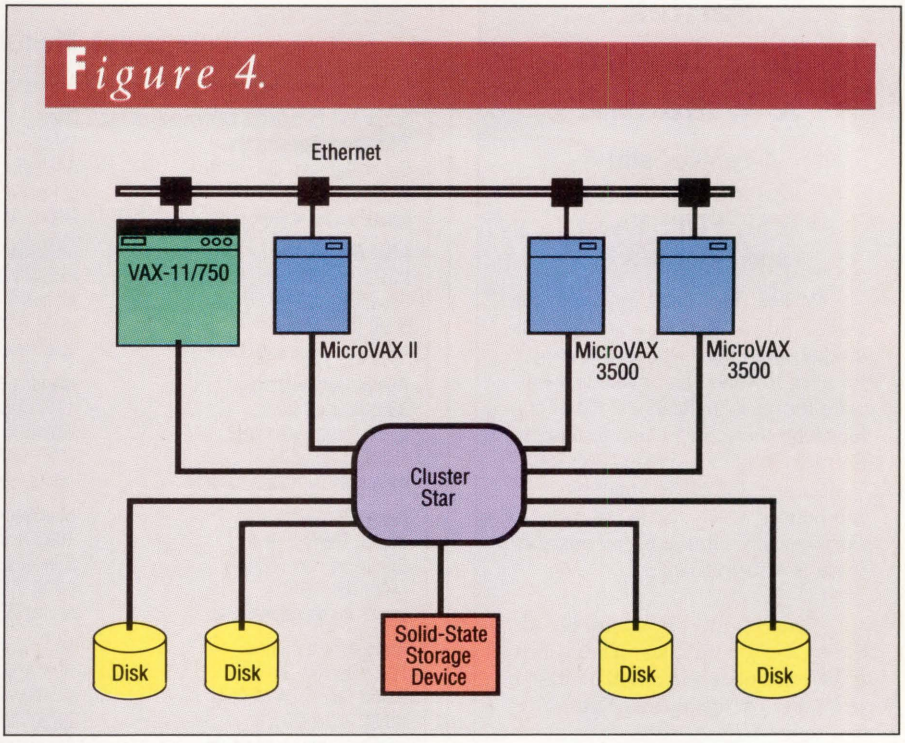
Unless the centralized data storage concept finds widespread acceptance, LAN managers will need to be very creative in determining the methods by which they'll successfully configure and distribute storage on their networks. The big problem is the relatively slow throughput of LAN technology, specifically Ethernet. At just 10 Megabits per second, Ethernet quickly runs out of steam, so distributing storage from a single node is a poor solution.

Clusters, or distributed areas of storage that are shared by multiple nodes, are the most immediate remedy to providing program and data availability without sacrificing network performance. Data required by a node is at the node most of the time, and each node keeps copies of the applications it runs most often. The problem is that data backup and management are difficult, and if one node goes down, so does all of its storage.

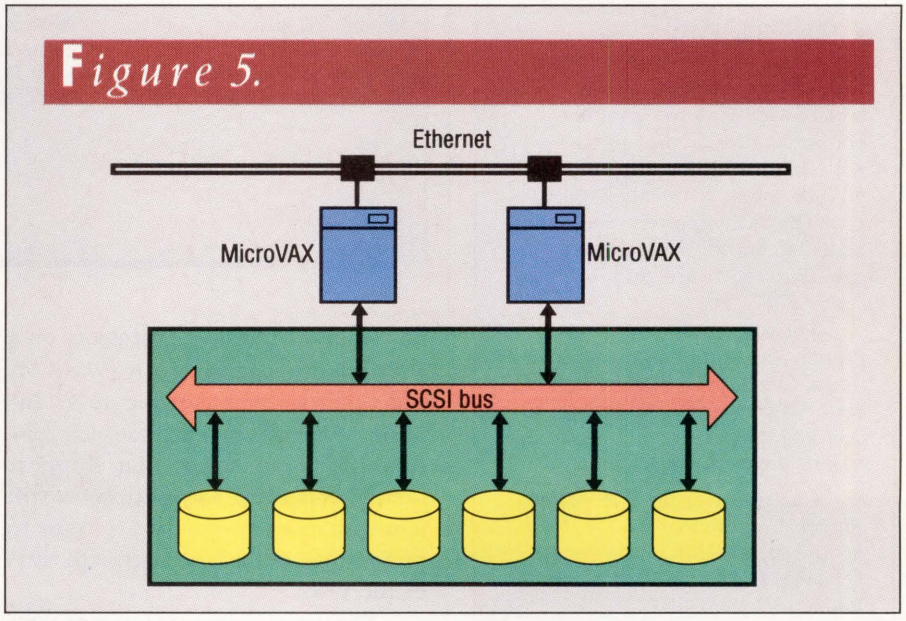
There are several methods of configuring clusters, and each has its own strengths and weaknesses. These range from unrestricted distribution of storage across the LAN to centralizing storage areas while allowing nodes to use local disks as caches to some degree.

The Clustor series from System Industries lets multiple VAX nodes share storage via a construction almost identical to a VAXcluster with CI bus and HSCs (see Figure 4). This provides a very high-performance, fully featured solution at the LAN level. This functionality includes redundancy via multiple processors sharing the same array of disks. If this same high data availability and redundancy are critical on an LAVc, the LAVc must be integrated with a full-sized VAXcluster, although performance still will be slower.

Other configurations are becoming available to provide server redundancy and other multiported storage arrangements. Companies such as Dilog



Full-featured cluster at LAN level.



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now support multiple processors on a SCSI bus for connection to VAX/VMS and other systems (see Figure 5). Industry observers believe that such configurations as these that support industry-standard hardware soon will join with industry-standard software to provide one of the largest growth areas of the 1990s.

The use of distributed storage areas shared by all nodes on the network can occur to different degrees. Digital's DECnet System Services (DSS) provides a set of networking products that enables use of separate copies of an application at the individual nodes, for example, while all data is shared by a common server. This reduces traffic on the network dramatically, because no applications are transmitted, and all paging and swapping occurs to the local disk.

Clients And Servers

A database can be distributed across a network in many ways. It can be served from a central location and accessed according to the traditional client/server model, or it can be distributed so that each node functions as both client and server. Most database products use ANSI-standard SQL as the language by which clients and servers communicate, while many vendors are constructing communications schemes on top of SQL for even higher-level functionality. Both client and server functions are controlled by the programmer, depending on the application.

It's also possible to keep the data-

base on a single server and allow each node to maintain copies or tables of the data required by executing applications. The database server is responsible for tracking where data is duplicated. When an instance of the data is updated, it's updated across the network by the server. Configurations like this are important to companies such as Odesta, which integrates Mac applications with databases stored on the VAX.

Digital's Vision

According to company spokespeople, Digital is working toward networks in which the physical location of the data makes no difference to the user. The user will see one large system whose physical configuration remains a mystery that needn't be solved. In reality, programs will run across processors according to network management algorithms, and data will be stored on servers according to function rather than physical proximity to where it's used. Users will interact with the system via mnemonic names instead of obscure system or file designations.

Digital is developing highly reliable networking products, and with solutions such as VAXclusters and VAXsimPLUS, downtime is being reduced to insignificance. DEC also is opening its systems to other vendors and is participating in product and standards development across companies. Standards such as UNIX, Apollo's Network Computing System (NCS), and MIT's X Window System either are or soon will become standard fare on DEC networks. And with the new DECstation/DECsystem product line, Digital networks will support important products such as HP's NewWave, even without DEC's direct participation.

In addition to this software Utopia, all hardware on systems of the future will support industry standards, enabling software and hardware from all vendors to be mixed and matched. It's to be hoped that DEC's direction in software will prove profitable enough to allow it to again open its buses to all third parties.

The guts of the system — the network operation and management software — always will be Digital's. And Digital will provide consulting and service for the network. Perhaps most of the hardware will contain redundant logic, and fail-over will be automatic. The system may be self-maintaining.

At that point, DEC's presence will be defined according to the predominant hardware architectures and to system management products in place. The user need only know the company that has the nameplate on the specific display/print station he or she uses. *—Bradford T. Harrison is a Fort Collins, Colorado-based free-lance writer specializing in DEC systems.*

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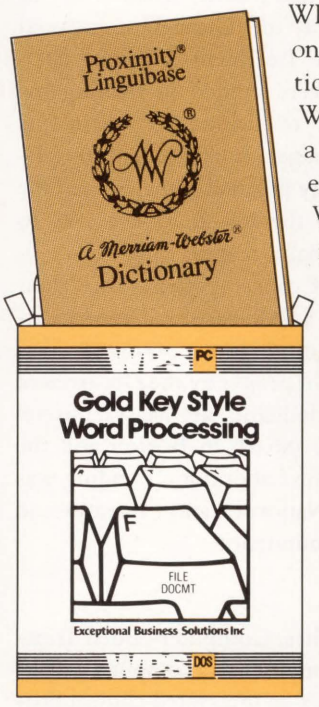

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GRAPHICS

IMAGING THAT SAVES LIVES

By Leonard A. Hindus

VAX Program Adds New Dimension In Cancer Treatment.

Cancer is a three-dimensional disease that grows in and around healthy tissue. Prior to the development of Three-Dimensional Computer-Aided Treatment Planning (3D-CATP), doctors were limited in treating inoperable tumors to using 2-D treatments guided by 2-D images. A new radiation technique, high-energy proton beams, offered the potential for 3-D therapy. It took a VAX to make that potential a reality.

Hundreds of cancer patients owe their lives to 3D-CATP, a VAX-based radiation treatment and planning tool. 3D-CATP was developed as a joint project by the Department of Radiation Medicine at Massachusetts General Hospital (MGH) in Boston and the Harvard Cyclotron Laboratory. Funding was provided by the National Cancer Institute and the Whitacker Foundation.

Imaging

As the name implies, Computer-Aided Treatment Planning is more than a computer graphics application. It's an integrated clinical program for creating accurate 3-D images of tumors and surrounding anatomy, using those 3-D images to plan radiation treatments, and manufacturing the beam-shaping devices to deliver the planned therapy.

"Our goal was to design and implement an integrated system to improve the quality of radiation therapy care for our patients," explains MGH Project Director Dr. Michael Goitein. "The VAX is one of several critical technologies we use in that process. Other critical technologies include the cyclotron, which accelerates the protons; and the Computed Tomography (CT) scanner, which produces the diagnostic images we use as input."

Goitein explains that the first step in developing a 3-D therapy plan is to develop an accurate 3-D image of the tumor and the surrounding healthy anatomy. The 3-D image is created from 2-D images generated by the CT scanner. The CT scanner produces a series of 2-D cross sections, or slices. The MGH CT scanner, which uses a Data General computer, produces 2-D images in the form of 320- x 320-pixel arrays. There are typically 50 to 80 2-D slices in a complete scan. The CT slices are transferred to the VAX via magnetic tape. Each of the 102,400 pixels in each slice contains a 12-bit gray-level value representing tissue density and is stored as two 8-bit bytes on the VAX.

After the slices have been loaded onto the VAX, each slice is analyzed carefully by a radiologist. The images are displayed on an Adage 3400 image processor that's equipped with a track ball. The radiologist uses the track ball to outline the tumor, treatment area and critical anatomical structures. Special care is taken to outline structures, such as the brainstem, optic nerves and kidneys, that are particularly sensitive to radiation. The object is to deliver a lethal dose of radiation to the tumor while sparing, as much as possible, these radiation-sensitive structures.

The marked-up CT slices are compiled into a 3-D matrix on the VAX. This 3-D matrix (320 x 320 x the number of slices) provides the basis for the imaging and treatment planning.

"After we have the matrix on the VAX, the rest of the imaging is simple but tedious," points out Mike Stracher, who was then senior

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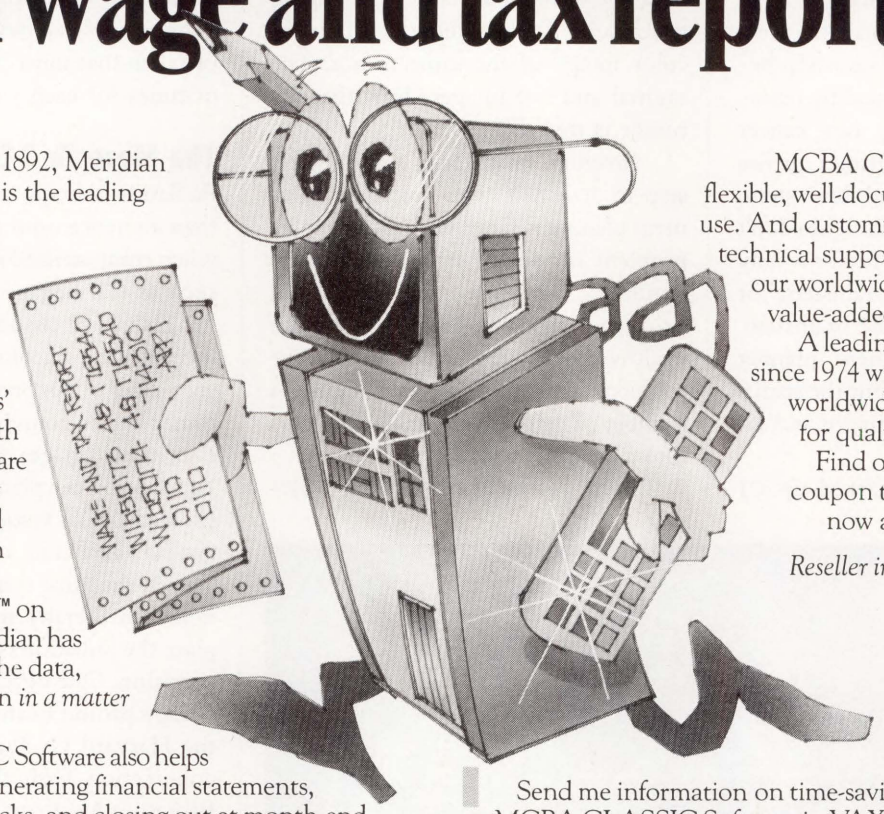

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programmer for the project. "It's simply a matter of applying the appropriate matrix rotation algorithm."

The 3-D construct created on the VAX shows the spatial relationship between the cancer and healthy anatomy. For the first time, the clinician not only can view the tumor in context in three dimensions, but also can rotate the view to visualize the precise relationship between the tumor and the healthy tissue.

For example, a very rare cancer called a chordoma sometimes grows near the optic nerve and brainstem. Conventional imaging techniques don't always reveal whether the tumor is only wrapped around the brainstem or whether it has invaded the brainstem. 3D-CATP lets the treatment planner rotate the image to determine the spatial relationships between the tumor and the surrounding anatomy.

Photo 1 shows a marked-up CT image, with the tumor and brainstem outlined. Photo 2 shows a computer-generated sagittal projection of the same patient. In anatomical terms, the sagittal plane divides the body into right and left halves. This sagittal view, generated by the VAX, is a 2-D image that can't be obtained using conventional imaging techniques. Photo 3 shows a 3-D false-color image of the same tumor. The sagittal and 3-D images show that the tumor is treatable.

Imaging, however, is just the first step in 3D-CATP. The radiation treatment planner is faced with the complex problem of evenly irradiating an irregularly shaped tumor while not delivering a damaging dose to the healthy tissues around the tumor. The problem is solved by combining a number of narrowly defined treatments into a treatment plan.

Each treatment consists of a particular beam angle and geometry. Varying the beam angle spreads the dose to the healthy tissues and permits coverage of the entire tumor. Various combinations of beam geometries must be compared to develop an optimum treatment plan. In combining a number of treatments into a plan, the radiation therapy planner is faced with a complex 3-D problem that must be solved a number of times for each patient.

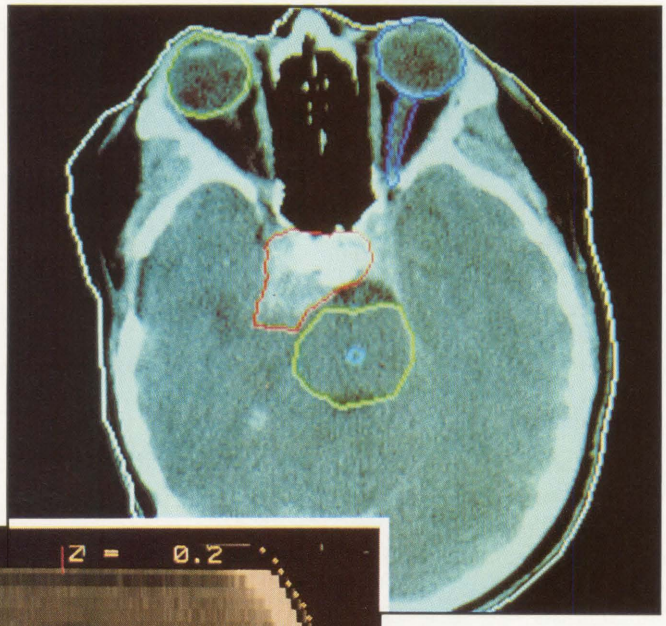

Photo 1: A marked-up CT image. The tumor is outlined in red, the brainstem and globes of the eyes in green, the optic nerve in blue.

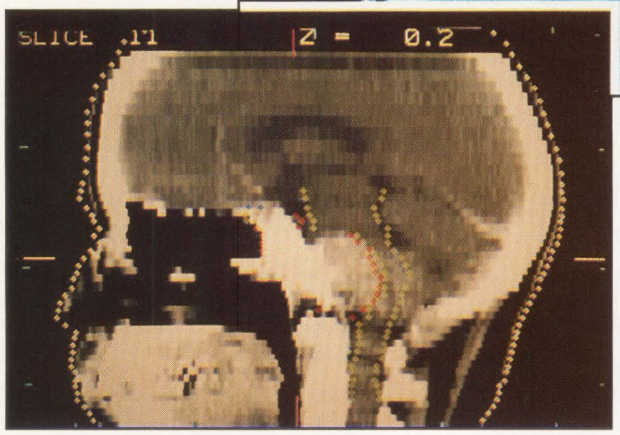

Photo 2: A sagittal projection generated by the VAX. The sagittal plane divides the body into right and left halves.

The Move To 3-D

Radiation therapy was more of an art than a science until about 15 years ago, when computerized imaging techniques, such as CT, began to provide detailed images of soft tissue. For the first time, the radiation oncologist (a doctor who specializes in tumors) could visualize the tumor and surrounding anatomy. However, these images were limited to flat 2-D slices in the plane of the scan. They showed a cross section of the tumor but not its shape and volume.

At the same time, developments in radiation therapy made it possible to place the radiation dose with increasing precision. One development, the high-energy proton beam, was pioneered at the Harvard Cyclotron Laboratory in conjunction with the Department of Radiation Medicine at MGH.

Unlike conventional X-ray treatments, proton beams can provide 3-D radiation dose control. The high-energy photons in X-rays pass through the patient. The use of X-rays for diagnostic imaging depends on this. The treatment planner is limited to control of only the outer shape of the path the X-ray beam takes through the patient.

Protons, on the other hand, have controllable depth of penetration. They penetrate a limited distance into the tissue before they lose their energy and are absorbed. Their depth of penetration depends on the energy level of the protons and the density of the tissues in their path. If the density of the tissues in their path is known, it's possible to control the energy level of the protons

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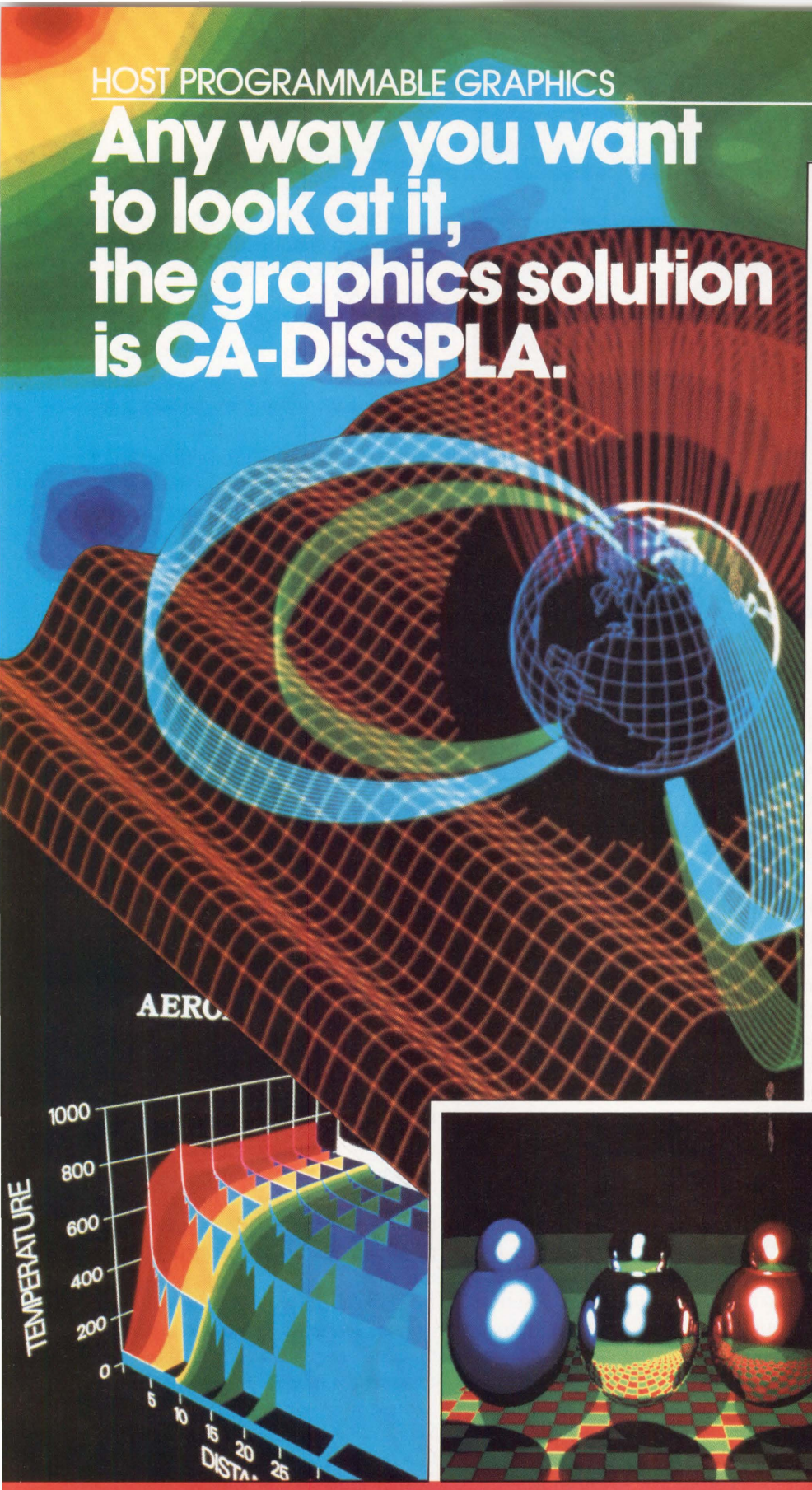

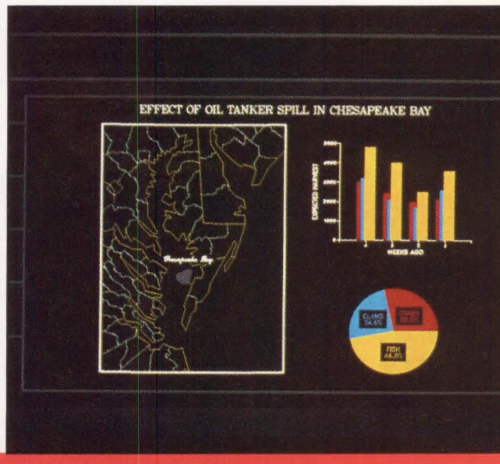

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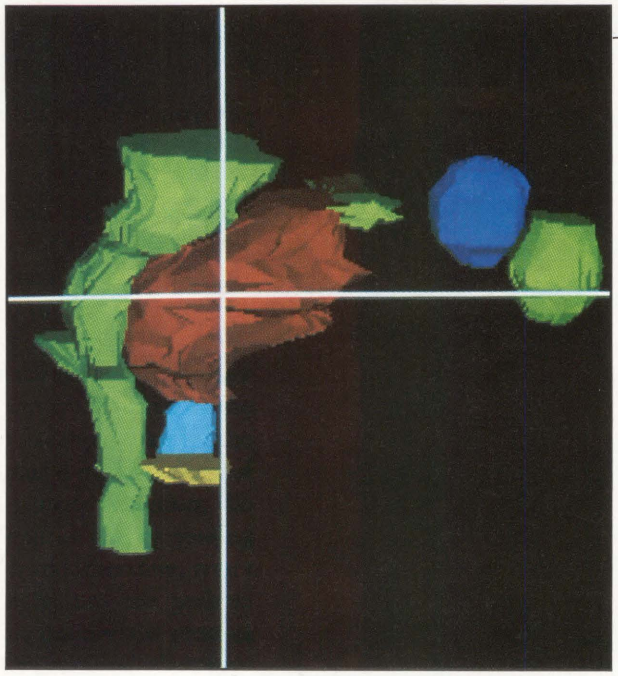

Photo 3: A 3-D false-color image. The brainstem and optic nerves are green, the tumor is red, and the globes of the eyes are green and blue.

to provide a 3-D beam front that's shaped to match the exact contours of the tumor.

The VAX's Role

Each pixel in the 3-D matrix is represented by a 12-bit gray scale indicating the tissue density. Thus, the VAX can calculate the exact tissue density for any given beam path. This enables the 3D-CATP system to simulate a single treatment or an entire treatment plan accurately.

Dose calculations are the most critical and CPU-intensive calculations the system performs. The system must interrogate every pixel in the path of the beam. To derive the radiation dose at any point, the system must take into account the beam's energy profile and the density of the tissue (gray-scale value of the pixels) preceding that point. The system then looks up the dose in a depth-dose curve table. The system also takes into account a scattering factor through another table look-up. None of the individual calculations is particularly complex, but the number of calculations required for each dose distribution is enormous.

The dose distributions can be displayed in several formats. They're most often displayed as a color wash display overlaying a display of relevant anatomy. They also can be displayed as classical iso-dose curves imposed on a CT scan. Either way, the user interactively can query the system for an exact radiation dose at any point on the display. Another display, the dose-volume histogram, shows the cumulative frequency distribution for doses within a specified volume.

Using the system, the treatment planner can "test drive" various beam geometries to see what effect the treatment will have. The system can combine multiple treatments into a plan and display the 3-D dose distribution for each plan. This makes it easier for the treatment planner to detect hot spots where the radiation is too intense and cool spots where the tumor won't receive a sufficient dose to kill the cancerous cells. The therapist can correct the plan and run the simulation again.

This interactive process helps the treatment planner devise the combination of treatments that comes closest to meeting the overall treatment goals, while minimizing the dose to healthy tissues. Only after the optimal plan is devised and reviewed will the patient undergo radiation.

But the VAX doesn't stop there. After each treatment has been planned and approved, the VAX calculates the outer shape of the treatment beam and the ideal energy level for every point in the beam. The VAX drives a CAM interface on a MicroVAX to produce the beam-controlling devices.

One device is the collimating aperture, which controls the outline of the beam. The collimating aperture is a thick piece of brass with a precisely machined hole in the middle. Another beam-controlling device is a compensating bolus, which shapes the energy profile of the beam front to match the contours of the treatment area. The compensating bolus is machined out of lucite. Where the lucite is thicker, the protons will lose more energy passing through the bolus and, therefore, won't penetrate as deeply into the patient. Where the lucite is thinner, the protons will retain more energy and, therefore, will penetrate more deeply. The combination of the aperture and the bolus makes it possible to place proton radiation fields with an accuracy of 2mm.

The system designs the bolus by dividing the treatment beam into a number of small-diameter pencil beams. It calculates the path of each pencil beam from the skin surface to the distal surface of the tumor. It compensates for the density of the tissues along the path of the pencil beam. It then calculates the bolus thickness to give that pencil beam the desired depth of penetration. This process is reiterated for each pencil beam until the entire bolus has been designed.

Clinical Application

Goitein stresses that 3D-CATP is a practical clinical application that has been used to treat more than 1,500 patients. These patients owe their lives to treatments that wouldn't have been possible without 3D-CATP running on the VAX.

For example, chordomas and chondrosarcomas are rare brain tumors that don't respond well to conventional treatment. Only 35 percent of the patients treated with surgery followed by X-ray radiation therapy were disease-free after five years. However, 76 percent treated with proton therapy designed with the 3D-CATP programs were disease-free after five years.

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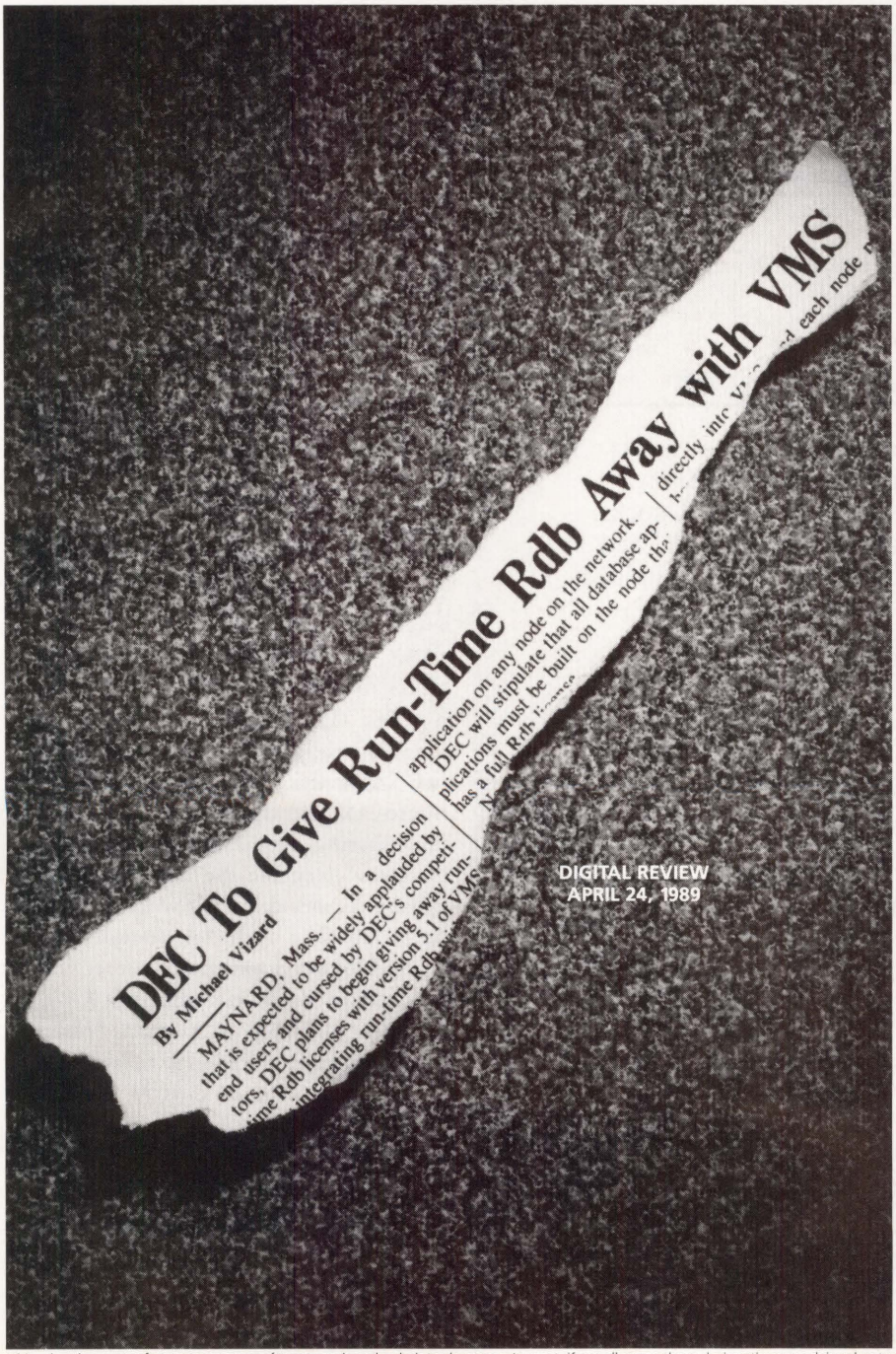

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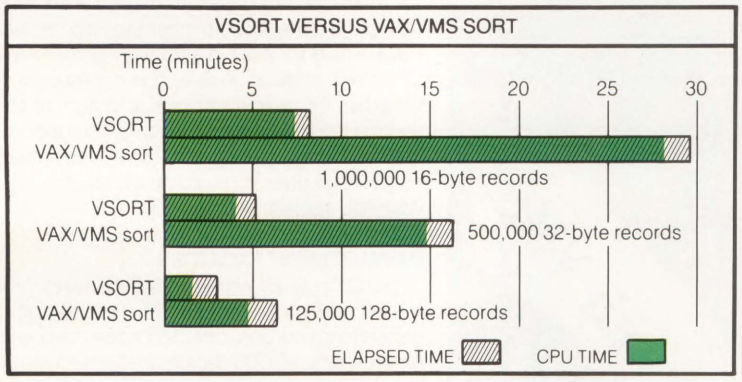

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Because of its proven clinical success, 3D-CATP has become the model for 3-D treatment planning programs around the world. MGH is one of fewer than a dozen places that offers charged particle radiation treatments.

Many charged particle treatment centers have decided to adopt the 3D-CATP program. For example, Lawrence Berkeley Laboratories offers high-energy Helium ion treatments. It developed its own 2-D and 3-D treatment planning programs but has decided to use 3D-CATP.

THE DEPARTMENT OF Radiation Medicine developed 3D-CATP on one of the first VAX 11/780s Digital produced, explains Greg Moulton, VAX systems manager. That same VAX 11/780 is still in use today. "Sometimes people kid us about using old technology," Moulton laughs, "but after all, a VAX is a VAX is a VAX. As long as our 780 continues to be reliable, we'll use it."

The Department of Radiation Medicine is in the process of installing two VAXstation 3500s clustered with a MicroVAX 3600 that's used for general time-sharing applications. The VAXcluster will enable the department to expand its services. This won't replace the 11/780. One of the VAXstations will be used for development, the other will be used to provide additional X-ray treatment planning. *—Leonard A. Hindus is general manager of Ribbledale Communications in Hudson, Massachusetts. He has written extensively about DEC computers and medical technology.*

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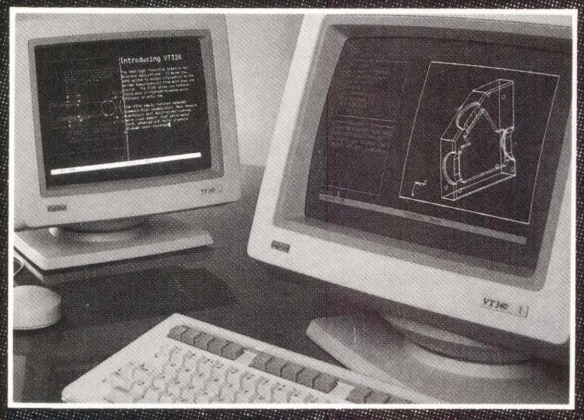

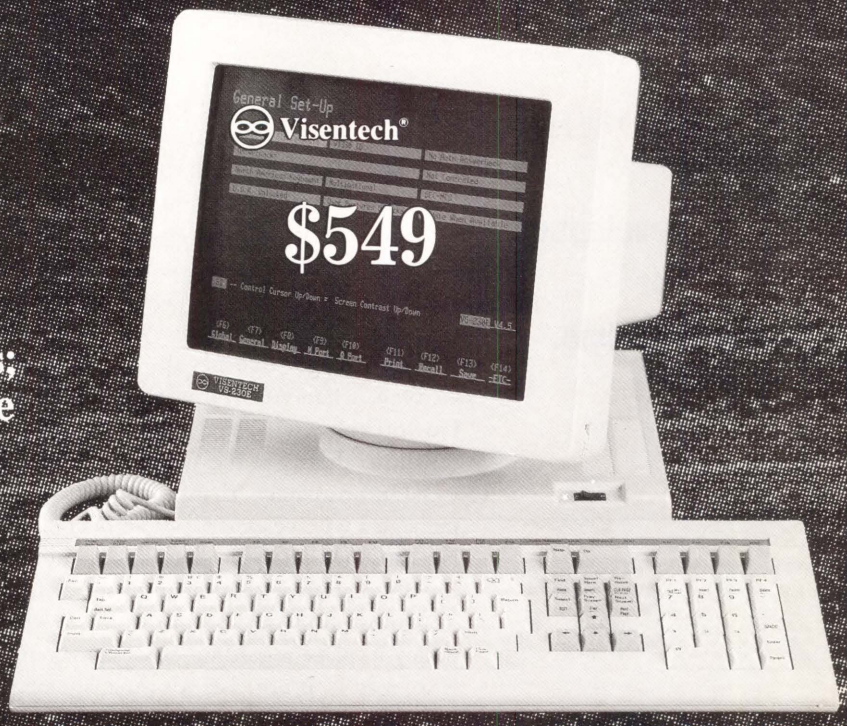

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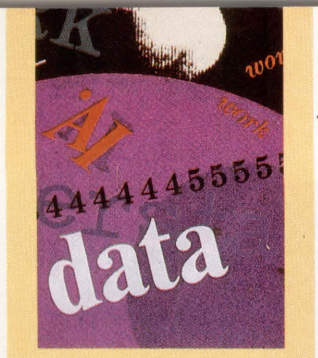

SECURITY

FREEZE, SYSTEM MANAGER!

By Christina L. Sidrow

Part 1: Developing A Case For Computer Crime.

There you are, standing at the OP CONSOLE, when suddenly the console bell rings and messages are printed as fast as you can read them. They're security alarms that have been activated by a username you don't recognize. The file being threatened is SYSUAF.DAT. Someone is trying to delete it! But you're the only system manager that has the privilege to do so. Now what? Are you watching a break in? Do you know what to do next? Why did you set those alarms in the first place?

Unfortunately, there are many system managers who've experienced this nightmare. For those who haven't, there's something you can do to prepare yourself and your company. You must find out if your company has a policy in place regarding crisis management. If so, read it. If not, ask your management to help you establish guidelines for your actions in the event of a possible break in.

To Secure Or Prosecute?

A company usually has security guidelines for one of two goals:

1. To stay as secure as possible and abort attempted break ins.
2. To follow up security violations with prosecution.

After you know your company's goals, you can establish and implement procedures for you and anyone else on the crisis management team. With that in place, you can define and set up the operating system environment and programs to be used on your VAX without overburdening it.

To secure your VAX, you need to know how to use the tools available to you: VMS utilities and commands such as ACCOUNTING, MONITOR, the AUDIT features, ACLs and alarms. There are also third-party products to enhance your monitoring of individual users and terminals. In addition, you can keep the CPU in a restricted room or area.

If your company decides to prosecute a suspected hacker, you need to secure your VAX and put in place the necessary tools and procedures to prove that a crime has been committed. As a system manager or programmer, you can develop these tools if you know what information to collect as evidence that a crime has occurred.

What's A Crime?

Computer crimes, like all other crimes, are defined within federal and state laws. Federal laws govern conduct that involves:

1. U.S. government data, equipment or facilities.
2. Computer activity that threatens the security or commerce of the U.S.
3. Computer activity that causes damage or reaction across state lines. State laws govern conduct that takes place within a particular state.

Each definition is composed of elements of that crime. For example, in California, the elements of robbery are:

1. The taking of property from the person of another.

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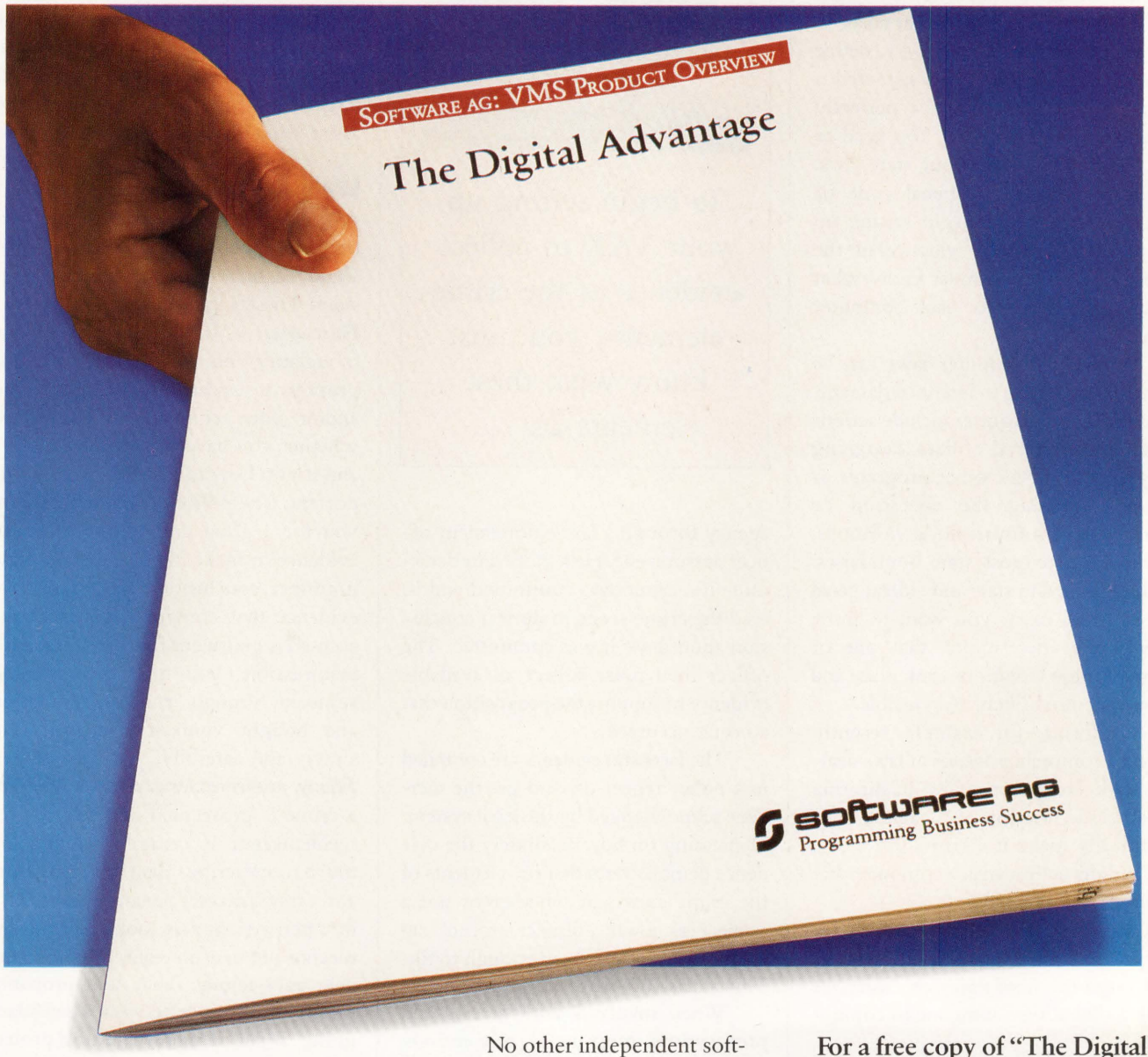

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2. Without the victim's consent.
3. With the use of force or fear.

If any of these three elements is missing, the district attorney won't file a robbery complaint against the suspect.

Each state has its own laws to define computer crime. What's considered a crime in California may be perfectly permissible in Wyoming. You need to become familiar with your state laws, found in your state's penal code or criminal statutes. To begin setting up your VAX to collect evidence of the crime elements, you must know what these elements are for each computer crime.

Generally, computer laws can be grouped according to intent or damage. Some of these categories include actions to defraud; retrieval of data; designing programs to violate other programs or systems; causing the alteration or destruction of software; local violations; and those that cross state boundaries. Each is defined in state and federal penal codes. In all cases, you want to show how you've determined that one or more of these violations took place and who was most likely responsible.

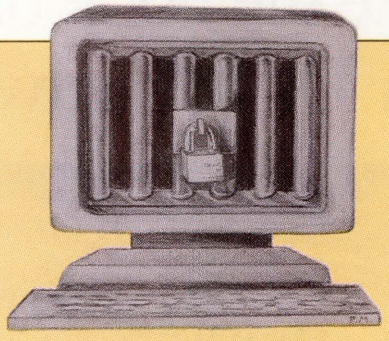
California, for example, recently passed a comprehensive set of laws dealing with computer crime (California Penal Code, section 502). These laws specifically make it a crime to:

1. Take any action with a computer that defrauds someone else.
2. Cause, permit or aid someone else in the unauthorized retrieval of data.
3. Design a hardware or software system that allows someone to commit fraud.
4. Maliciously alter or destroy any software or aid anyone else in doing so.

Many other states, however, don't yet have such comprehensive laws. In those states, you must look to the general theft statutes and try to fit the particular crime into the existing laws.

How To Build A Case

Not all crimes are reported. Of those that are, most are reported to a police



To begin setting up your VAX to collect evidence of the crime elements, you must know what these elements are . . .

agency through a law enforcement officer at the scene. He's trained to determine if a crime was committed and to read the crime scene to draw a conclusion about how it was committed. The officer then must collect all available evidence to support the proposition that a crime occurred.

The facts and evidence are compiled in a police report used to get the incident acknowledged by the legal system. Depending on how accurately the evidence demonstrates that the elements of the crime exist and whether or not a suspect is known, a district attorney can decide if the case is good enough to file. This starts the prosecution process.

When involved with arrests and prosecutions, most people rely entirely on law enforcement agencies to handle all aspects of the case. But there are two important aspects of computer crime that you may want to consider:

1. Law enforcement and prosecution agencies have plenty of experience in handling the cases so as to minimize any legal risk to themselves, but they may not concern themselves with *your* liability.
2. An investigating officer usually handles everything from car thefts to burglaries to computer crimes. He usually isn't, however, a computer expert. Therefore, you should consider giving him all of the technical help you can. The material that follows will guide you through two main areas of specific importance to you. The first area is getting your legal savvy, and the second is targeted toward the use of your VAX to assist your investigation.

Legal Savvy

As you or your company anticipates becoming involved with criminal prosecutions, there are many factors to consider. These include:

False arrest — If you suspect someone of violating your system, and if you improperly prosecute him, he can sue you and/or your company. Finding out whether you have reasonable cause — and if not, how to get it — is very important. The police officer will rely on you for a good deal of the technical evidence to make his case. If you draw improper conclusions, or if you have evidence that convinces you that the accused is guilty but for some reason it's inadmissible, you may have accused someone wrongly, ruined a reputation and bought yourself a lawsuit. Go slowly and carefully.

Felony, misdemeanor or civil — Whether a crime is prosecuted as a felony or a misdemeanor is critical. Felonies are much more serious than misdemeanors and carry a greater penalty. An activity by a perpetrator may look like a misdemeanor but may, in reality, be prosecutable as a felony. That will probably mean the difference between a defendant going to jail or merely getting probation, a small fine and a slap on the wrist.

Also, a felony conviction may mean your company gets the right to be reimbursed for some or all of the loss you suffer. Finally, a criminal act may also be such that your company could file a civil suit as well to recover damages and expenses.

Preparing affidavits — If you suspect someone of violating your system, you may want to get a search warrant to enable the police to check his home, car

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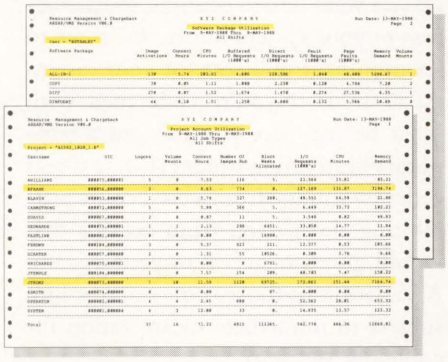

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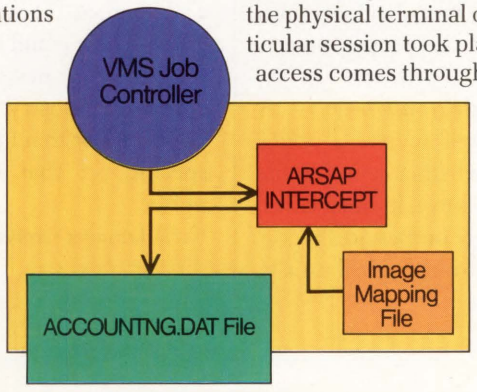

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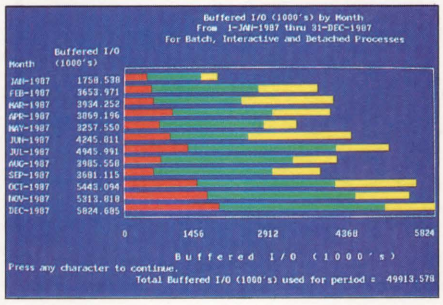

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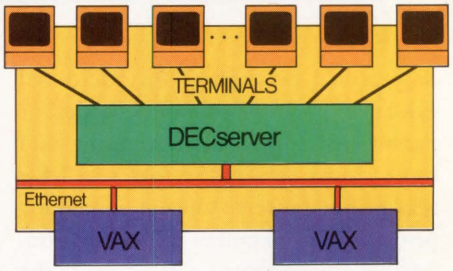

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The Computer Security Act of 1987

On January 8, 1987, the Computer Security Act (Public Law 100-235) was signed into law. It has far-reaching implications for the way you handle and protect computer information. The overall purpose of the act is to improve the security and privacy of sensitive information in federal computer systems.

By providing for the creation of a Computer Standards Program to be administered by the National Institute of Standards and Technology, the act is aimed at creating a means for establishing minimum acceptable security practices without limiting the scope of security measures already planned or in use. The act also requires the creation of information security plans by all operators of federal computer systems that contain sensitive information, as well as the updating of some at least annually. To minimize security breaches resulting from human error, the act also requires a formal program of security training for all persons involved in the management, use or operation of all such computer systems that contain sensitive information.

Sensitive information is defined by the act as all "unclassified information which, if lost, misused, accessed or modified in an unauthorized way, could adversely affect the national interest, the conduct of federal programs, or the privacy of individuals."

Information is considered sensitive if its loss or abuse could result in loss of life, loss of property or funds by unlawful means, violation of personal privacy or civil rights, helping competing government contractors gain unfair commercial advantage, loss of advanced, proprietary technology useful to competitor contractors, or the disclosure of proprietary information trusted to the government. National security information, already classified by executive order and other acts of Congress, isn't targeted for protection by this act.

or personal belongings for additional evidence, such as printouts, codes or passwords. To get such a warrant, you must convince a judge that you have reasonable cause to invade someone's privacy. This requires affidavits from reliable informants, setting out the evidence you already have.

Private searches — There are certain types of searches that you — or private investigators you may hire — can conduct to look for evidence that the police can't conduct. If a police officer or district attorney's investigator conducts an unreasonable search and finds evidence as a result of that search, the court will exclude that evidence and any other evidence located as a result. This is called the doctrine of the "fruit of the poisoned tree." On the other hand, there's no such exclusionary rule for evidence located by private individuals. You may want to confer with a security consultant to see what types of investigation you can do on your own to gather evidence in ways that the police can't.

Preservation of evidence — You may find something in your investigation that convinces you that a person is guilty of computer crime. But finding it and getting it into a form that will constitute admissible evidence in court are two different things. You need to know about Hearsay Evidence, the Best Evidence Rule (requiring originals rather than copies of documents, or requiring an actual document to be produced in court rather than allowing you or someone else to testify about what was in the document), the Business Records Rule, and so on. Putting your evidence into admissible form at the proper time is an art.

Liason with a district attorney — A district attorney will review a police report and decide whether or not to file your case. He's too busy, in most cases, to take an incomplete or marginal report and try to make it stronger. He'll usually just reject it.

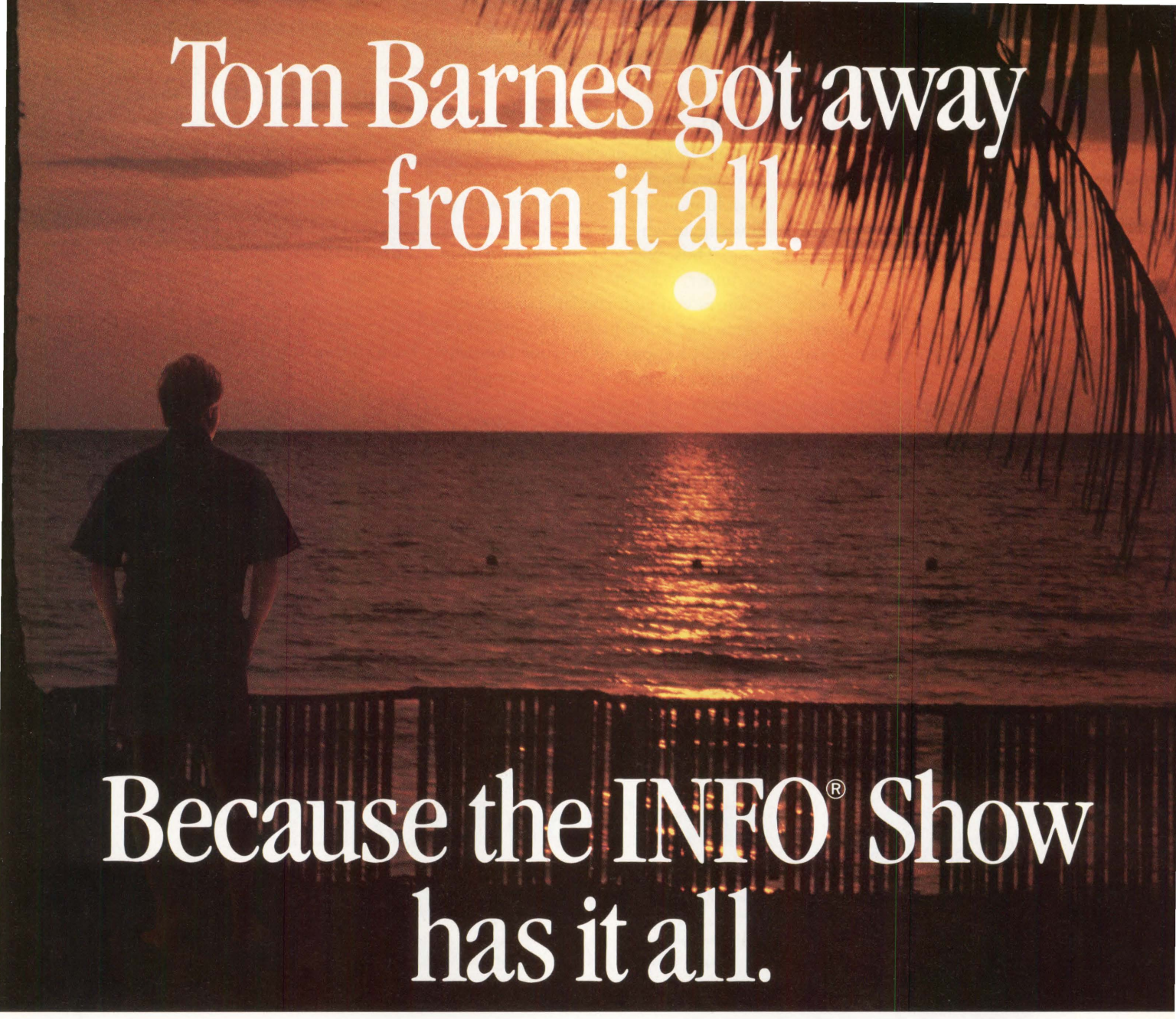
Be sure you have someone on your team who knows not only how to prepare the police report so that it convinces the district attorney to file the case but also how to work with the district attorney after the report is submitted to provide such additional information, evidence or affidavits that the district attorney may require. A lot of cases that otherwise would be rejected eventually are filed because a knowledgeable person followed up, located the deficiency in the report, obtained the additional evidence and secured a filing.

Expert witnesses — In cases in which a jury isn't likely to know about technical matters, such as the workings of a VAX and how a hacker could gain access to your system, you'll need expert witnesses. This requires locating a person with good technical skills, a willingness to testify and qualifications that will impress a jury. This is often one of the most difficult areas of preparing your case.

Temporary restraining orders — If you suspect an employee of computer crime, do you want him to continue to have access to your system during the three to six months it will take for your case to go to trial? If you're concerned with what he may do, you can get a temporary restraining order (TRO), a direct order by a judge from a civil court prohibiting the person from actions that would give him access to your system. A violation of those orders makes him subject to immediate incarceration for contempt of court.

Sentencing and probation — You may want a special sentence from the judge for various reasons. Based on legal precedent, a court probably could be requested to order special restrictions on a defendant convicted of computer crime. These could include an order that the defendant never again work in the computer industry, that he move out of your state or that he do or not do some specific act that would protect the public.

Civil damages recovery — Even if a judge



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orders a defendant in a criminal case to pay back direct losses to a company, these usually won't include the attorneys' and investigators' fees incurred in prosecuting. It won't include pay for the time your employees spent tracking down the defendant and the evidence. And it won't include the loss of clients or computer time while debugging and preserving evidence. Therefore, a civil suit for damages should be considered, at which time all of the above damages can be recovered.

Using Your VAX To Catch Criminals

Under VMS, a system manager can watch activity through the SHOW USER, SHOW SYSTEM and MONITOR commands. If done regularly, you can patrol your system to demonstrate a usual activity pattern, just as a policeman patrols your neighborhood. After a usual pattern is established, abnormal activity would become apparent and easy to articulate in legal documents. Certainly, any abnormal activity on your system should pique your curiosity enough to investigate why the situation is occurring. Thus, when an apparent break in is under way the investigation procedures you've formulated can be implemented immediately. This procedure should be approved by your company to justify the goals of its security policy, as mentioned earlier.

The Accounting utility is effective in identifying a particular user and what images that user is activating. Printouts or files of the brief summary are useful in tying the username to the activity. All users on your system should be aware that they're responsible for the use of their usernames. The command DIRECTORY/PRINT/DATE/SIZE/OWNER/PROTECTION could be used to get snapshots of directories before, during or after possible break ins.

BY NOW YOU CAN SEE the similarities between computer crimes and other crimes. Just because computers are boxes of electronics doesn't mean the severity of the crimes against the public is less than that of grand theft, bank robbery or public disturbance. If you witnessed any of these and could identify a suspect, you wouldn't hesitate to call the authorities to arrest the perpetrator.

Editor's note: In Part 2, Sidrow will present information on surveillance and evidence collection for your VAX under VMS. *—C.L. Sidrow and Associates is a technical consulting firm, based in San Dimas, California, which publishes the newsletter "Computers and the Law" for data processing managers and VAX/VMS system managers. Sidrow is a VAX system manager and a Los Angeles County Deputy Sheriff.*

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Serving Up LAT

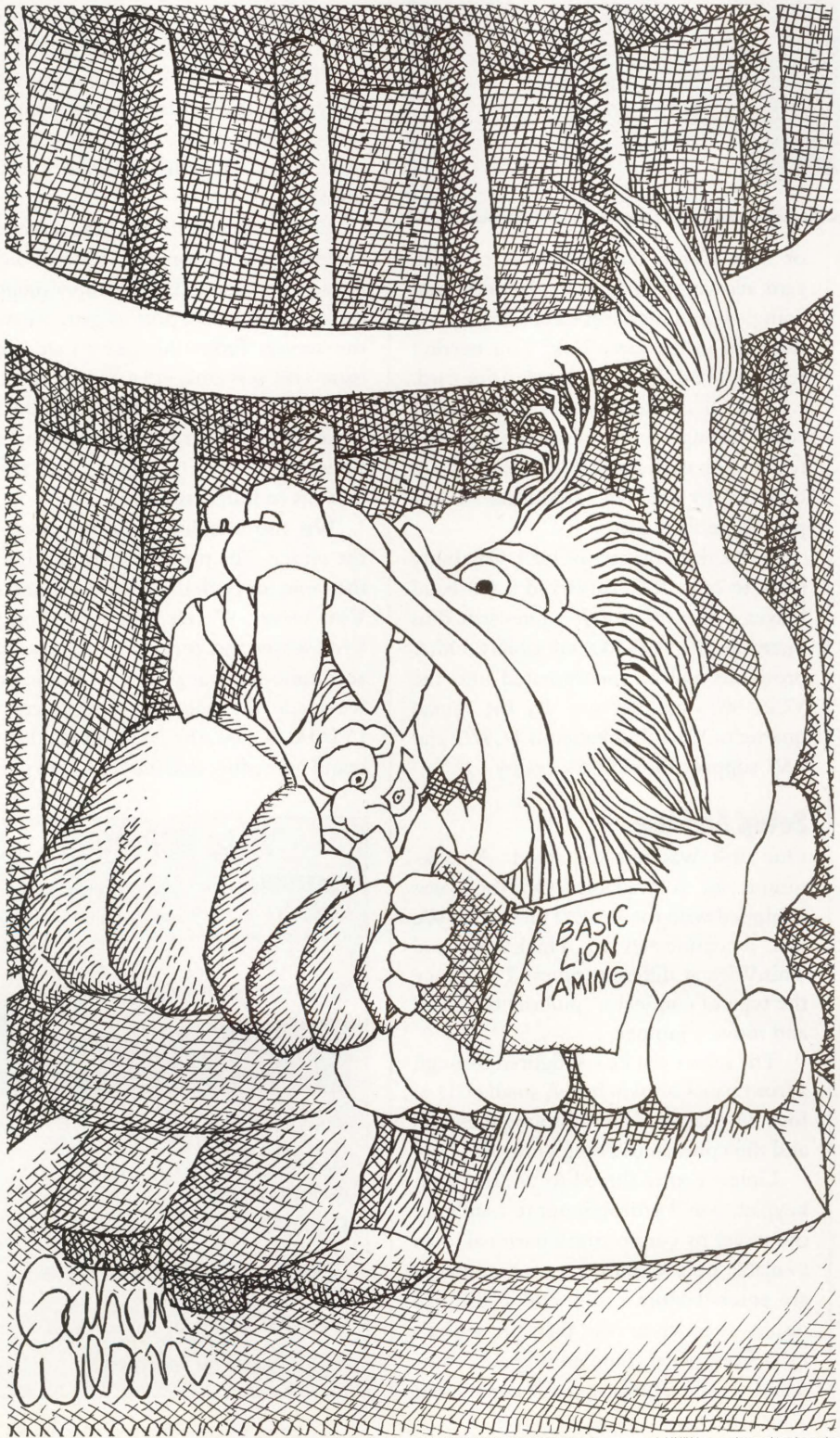
It's likely that terminal servers and LAT have made life easier for you as a system manager. No longer do you need dedicated communications ports and miles of cable to connect users to your system. A terminal server can go anywhere your Ethernet can go, allowing you to distribute printers, terminals and modems throughout your site.

Today's terminal servers offer more than a number of serial connections. Many offer printer ports and other features that let you connect a wide variety of devices to your system without centralizing them in the computer room.

Datability Software Systems Inc. of NewYork offers the Vista VCP-1000 communications server, which goes several steps beyond the capabilities of traditional terminal servers. Its flexible architecture and expandability should help it fit into any environment. It also provides future expansion. In many cases, you won't have to purchase another server to increase the

DAVID B. MILLER

WHEN FACED WITH LEARNING A NEW TEXT EDITOR, YOU CAN PROBABLY THINK OF SOMETHING ELSE YOU'D RATHER DO.



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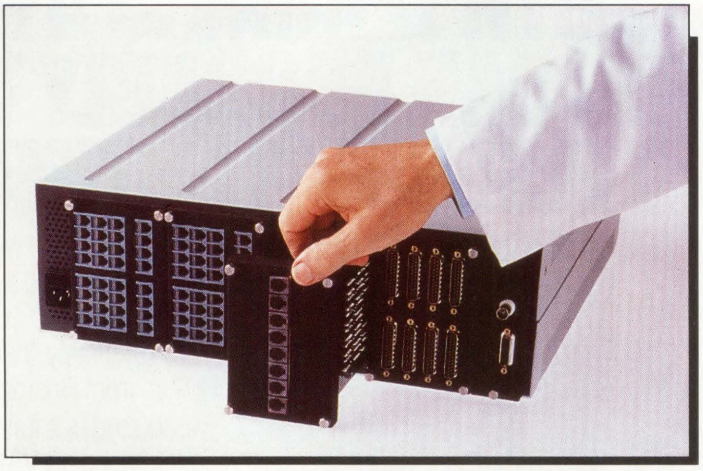

The VCP-1000's backplane lets you mix and match various types of connector line cards in the same box.

number of ports.

We tested the VCP-1000 on our VAXcluster.

The Vista Concept

The VCP-1000 offers a modular approach to communications serving. A single VCP-1000 is about the size of a PC. The basic box contains a five-slot backplane in which you can house a Network Interface Card (NIC) and line cards.

The NIC is a required board. It contains the hardware and software necessary to connect the VCP-1000 to your network. An Intel 82586 coprocessor complements an Intel 80186 processor to drive the unit. All parameters are stored in nonvolatile RAM.

Three flavors of Ethernet connectors are provided: an RJ45 for SynOptics LatticeNet unshielded twisted-pair wire; an 802.3 BNC for ThinNet; and a standard DIX/AUI transceiver for ThickNet. The connectors are jumper-selectable. Although you may not change wiring types often, Datability makes it easy to change the jumpers to select the connector type you need.

The NIC offers 100 percent LAT compatibility. A VCP-1000 can directly replace a DECserver.

Up to four line cards can be installed in the backplane. Line cards contain the connectors for your devices. At the time of this writing, two types of line cards were offered. One provides eight 25-pin RS-232 connectors on each card, offering a maximum of 32 ports per server. The other squeezes either 32 RJ12 connectors or four 50-pin teleconnectors on each card, allowing significant expansion within a single box. Line cards can be mixed and matched in the same box. You needn't reconfigure the NIC to change a line card.

The NIC communicates with the line cards through a shared-memory buffer residing on each line card. Characters are buffered by the NIC, resulting in improved performance.

In the third quarter of 1989, Datability plans to offer X.25 cards and 2,400-baud Hayes-compatible modem line cards, thus increasing the VCP-1000's flexibility. Other protocols will be incorporated into the VCP-1000's architecture. By the fourth quarter of 1989, simultaneous TCP/IP and LAT support should be a reality.

Setup And Use

Our unit was self-contained. A rackmount kit is available. Our box was equipped with the RS-232 line cards. We had it connected to ThickWire and ThinWire at different times. To change the type of connector, pull the NIC card and move a jumper.

The server can be configured through a front panel of switches. A small LCD of four 40-character lines displays messages and the commands being entered.

Unless you're forced to use the front keypad, you'll probably opt to configure the server by connecting a terminal to an available port. Configuration commands are entered more easily, and a terminal display is easier to read than the server's LCD front panel. Line editing and command recall features make it convenient to enter the sometimes lengthy configuration commands through a terminal.

If you've configured DECservers before, the VCP-1000's command set will look familiar. In addition to the SET and DEFINE commands, a CHANGE command updates the permanent and volatile configuration databases, eliminating the need to enter two sets of commands.

The VCP-1000's command compatibility with the DECserver command set makes it easy to set up devices, such as printers and modems, in addition to terminals.

Connecting terminals to the server was a breeze. The factory port settings didn't have to be changed. We simply plugged the terminal into a port to gain access to the server. From the server, we could issue DECserverlike commands to connect to our cluster members and the Lab's MicroVAX II. Up to 10 simultaneous sessions are allowed per port. The server defaults to four sessions.

We also established printer ports on the server. The procedures to do this are the same for both the DECserver and the Vista server. We set up a service on the Vista server and configured two ports to accommodate our printers. On the host, we made the necessary adjustments to LTLOAD.COM, the DEC-supplied command procedure that starts LAT, to define

Vista VCP-1000

PLATFORMS: DEC Ethernet networks, LAT

PRICE: From $3,499 for an eight-port system to $14,996 for a 128-port system

DATABILITY SOFTWARE SYSTEMS INC.

HEADQUARTERS:
322 Eighth Ave.
New York, NY 10001
(800) DIAL-DSS

FOUNDED: 1977

PRODUCT LINE: Communications hardware and software

OWNERSHIP: Private

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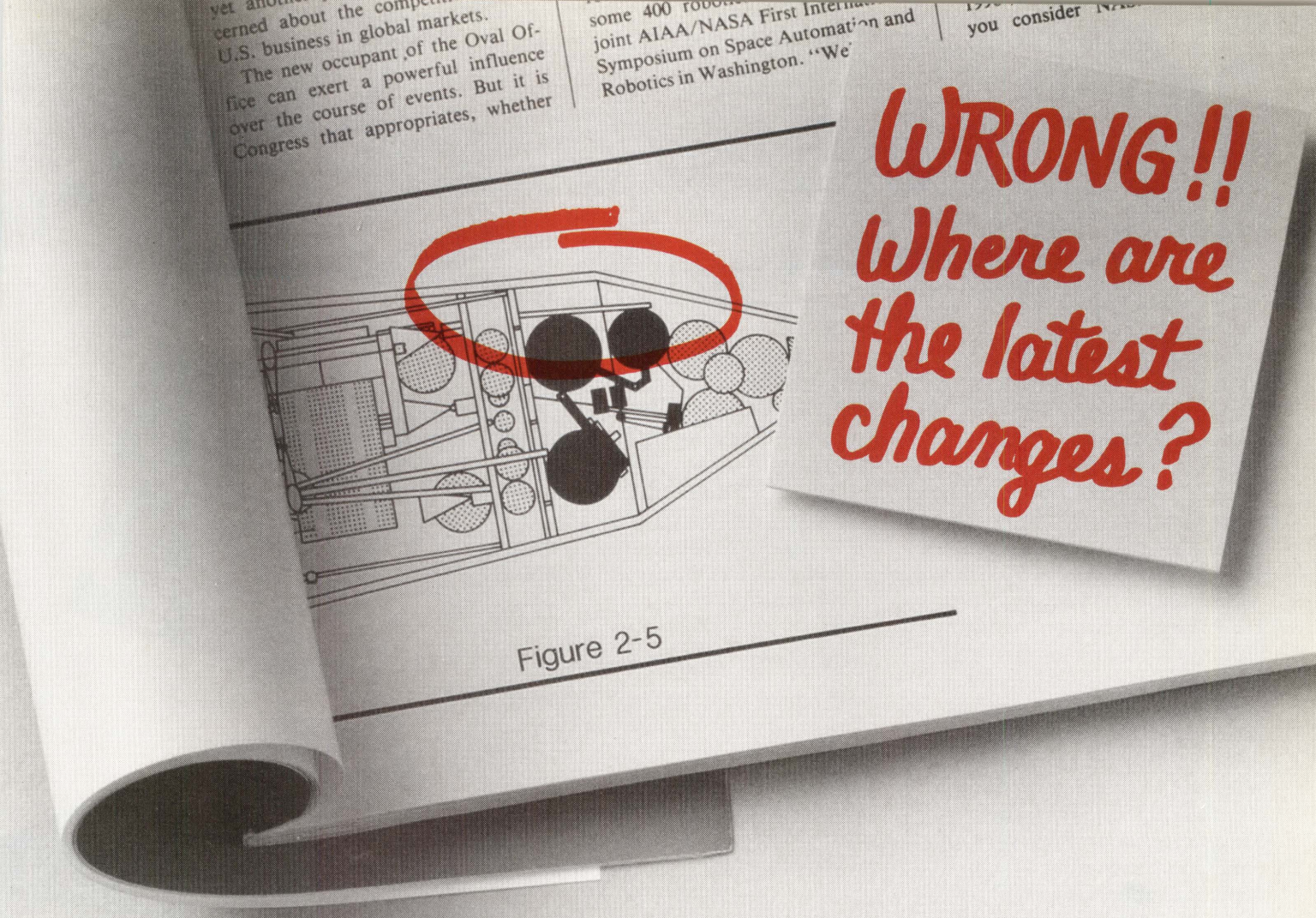

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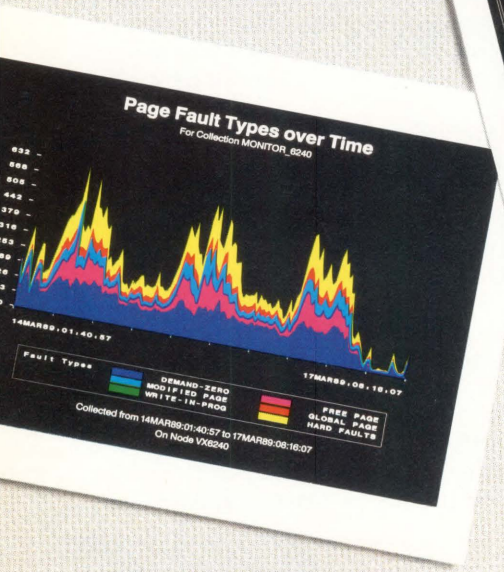

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LTAn: devices for each printer. A separate command file was written to define queues for each printer. The command files were placed into the system startup procedure to ensure that the LTAn: devices and the print queues were established automatically each time the system was booted.

If you aren't familiar with terminal servers and LAT, Section Two of the *Guide to Setting Up a VMS System*, Section Six of the *Guide to Maintaining a VMS System*, the *VMS LAT Control Program (LATCP) Manual* and the *VMS Network Control Program Manual* provide information and examples to help you modify LTLOAD.COM and establish print queues.

Datability's documentation also covers these points. Example setups and command files are displayed in the VCP-1000's documentation.

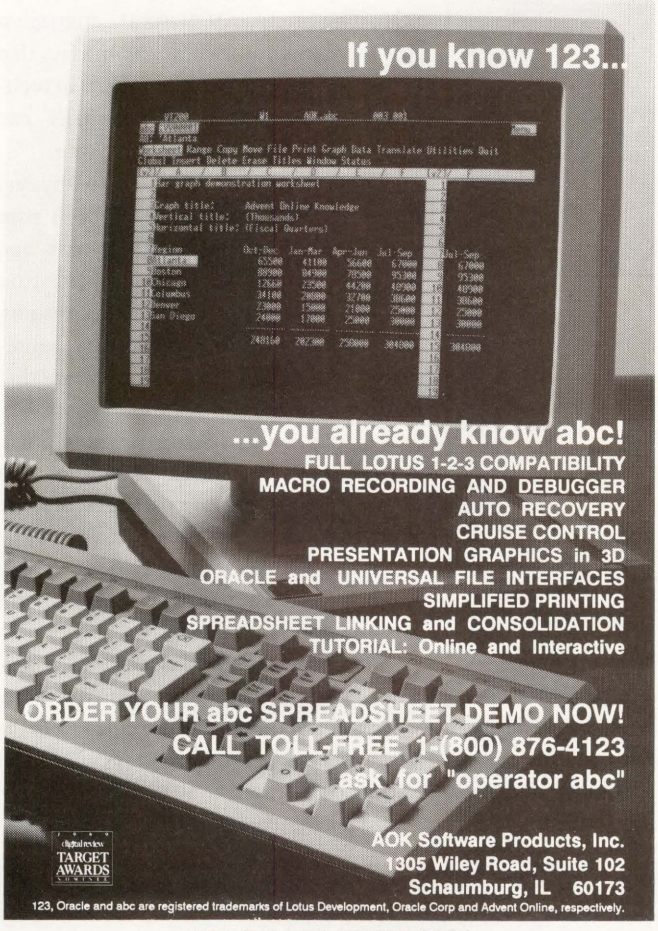
Diagnostics can be run from the front panel. Tests for the keypad, non-volatile RAM, RAM, the line card and the NIC are included.

Documentation

The manual is clear and understandable. It isn't intended to give you detailed information about the workings of LAT, but you can get enough information from the manual to help you set up your VAX and the VCP-1000. If you aren't familiar with terminal servers and LAT, it would be beneficial to consult the appropriate DEC system manager's guides before tackling the VCP-1000's documentation.

Separate chapters describe the VCP-1000's setup and configuration procedures, the command language and VCP-1000 messages. Examples help you set up printers, modems, services and other special features.

THE COMBINATION OF features offered by the VCP-1000 makes it hard to beat. Its command language makes it look like a DECserver. And it's expandable: As your communications needs change, the VCP-1000 will accommodate you. If you need a communications server with a future, one that you can put on your network with a minimum of fuss, take a close look at the VCP-1000.



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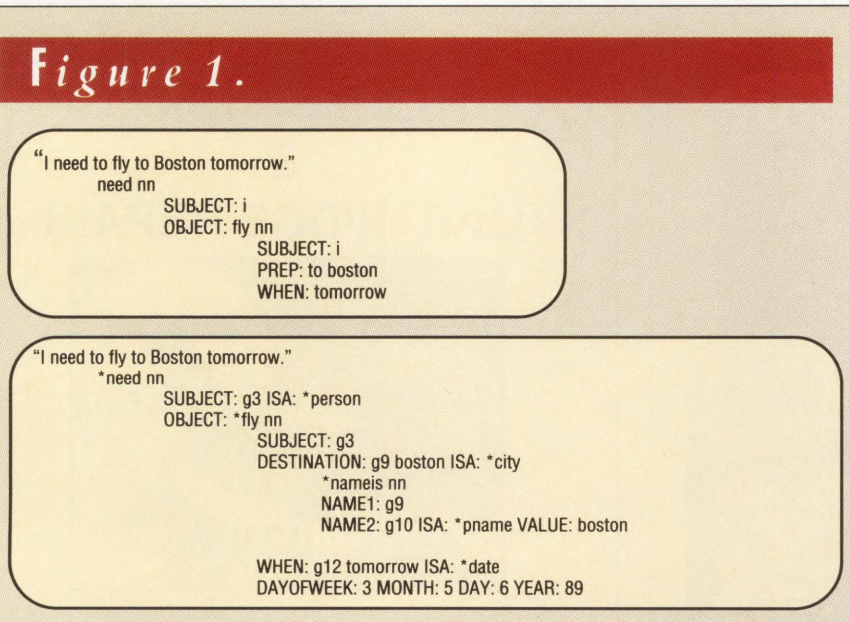
The Natural

Natural Language Inc.'s
Natural Language RDBMS Querying Program
Mixes Expert System And Database Interface Technology.

Figure 1.



Courtesy Natural Language Inc.

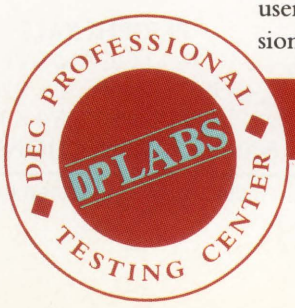
Natural Language parses a sentence into parts of speech and then recompiles the parts to relate to its database and create a response.

Natural Language V3.1, from Natural Language Inc. (NLI) of Berkeley, California, is designed for relational database users who need to make informed decisions based on their existing data but are unfamiliar with and don't have the time to learn database query languages such as SQL. The premise of Natural Language is that it accepts commands and queries that are English questions. Thousands in technical and non-technical industries can benefit from such a software system.

These people might use virtually any major RDBMS. Natural Language runs with Rdb, Ingres, Oracle, Sybase and Informix and across multiple platforms, including the major UNIX workstations. The company has comarketing agreements with many of these software and platform vendors.

On paper this strategy sounds great. Analysts have been anticipating the onset of true English-language packages for some time. But I entered this project with some cynicism. Would this really be everyday English? Could any user truly pick up this product and start to use it?

The answer to both questions is yes. The Natural Language user interface, which implements DECwindows in its latest release, is a major step forward in letting users interact with data. We ran Natural Language on LABDOG::, our Mi-



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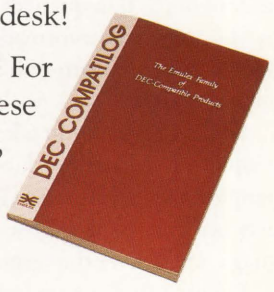

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Figure 2.

:who earned more than their manager

Who earned a higher salary than the employee that managed him?

The employees that earned a higher salary than the employee that managed them are:

first name	last name	salary	manager salary name	manager first name	manager last
janet	jones	$78,000	$49,000	frank	feldman
roger	rebus	55,000	49,000	frank	feldman

:show the query

List the query.

```
select distinct employees.ename1, employees.ename2, employees.salary, t1.salary salary_gl,
t2.ename1_707, t2.ename2 ename2_707, employees.dname
from employees, divisions, employees t1, employees t2
where divisions.dname=employees.dname
        and divisions.manager=t1.eno
        and employees.salary>t1.salary
        and divisions.manager=t2.eno;
```

Courtesy Natural Language Inc.

A typical query of a corporate financials database and the SQL procedure used by Natural Language to generate the response.

croVAX II. The minimum hardware requirement for Natural Language is 15 MB of disk space, 6 MB of RAM and a 1-mip processor. For better performance, however, a 60-MB disk, 8 MB of RAM and a 3-to 4-mip system are recommended.

Understanding English

Natural Language is a shrewd mix of expert system and database interface technology that lets you interact with the database comfortably. Written in C, Natural Language's bread and butter is its ability to interpret questions and respond quickly with specific data from the database. The database interface and the underlying SQL sequences are unnoticed by the user, and information can be retrieved as easily from two segregated databases as one.

For instance, if you ask, "which salespeople sell which products," and salespeople tables are stored in Rdb and products are stored in Ingres, Natural Language will deliver the response smoothly.

Figure 2 shows a typical Natural Language query. The user asks, "who earned more than their manager." The system recognizes that the "who" refers to the salesperson table and that "earned" refers to salary. It also ignores the poor grammar. Notice also that no punctuation is required, including the question mark.

Natural Language responds with a sentence that rephrases what it perceives you to be asking: "Who earned a higher salary than the employee that managed him?" It then delivers a response gleaned from the databases with which it interfaces, displaying only the necessary information.

In this case, Natural Language guessed correctly, although with the complexities of English syntax it doesn't always do so. This example also shows Natural Language's ability to understand English sentences. This question could have been asked in many ways. The next question in Figure 2, "show the query," which brings up Natural Language's SQL sequence, could have been asked, "show the schema," "how did you do that," and so forth. The program recognizes more than 10,000 words and synonyms and understands more than 1,100 concepts.

The Database Interface

The Natural Language database interface architecture is a perfect match with DECnet. Because of the design of the NLI Gateway, a software component that transparently accesses data residing in unlike databases or different vendors' computers, you don't have to worry about which database the system accesses to retrieve information. The DB Interface is the component that directly overlays the different RDBMSs.

Natural Language doesn't use a complex conversion code to transform the English language into SQL. Rather, it's taught by the system manager to understand words that commonly will be used in queries. The component of the software that does this is the Connector. After the Connector relays everything it knows about your database to Natural Language, Natural Language rebuilds the English queries as SQL queries.

After it's installed over the existing database, the Connector develops a set of Y/N questions that it poses to the manager. In Figure 3, the Connector explains why it's asking the questions it poses about the table head "user_def1." The manager responds at the >> prompt.

Natural Language V3.1

PLATFORMS: VAX/VMS, ULTRIX, such UNIX-based workstations as Sun, Apple, HP and PC XENIX, and minisupercomputers

PRICE: From $5,000 on a single-user system (DECstation, VAXstation, MicroVAX) to $55,000 for a VAX 8978 CPU license. The NLI Connector costs from $10,000 to $20,000. The NLI Gateway costs from $2,500 to $30,000. The DB Interface costs from $2,500 to $30,000

NATURAL LANGUAGE INC.

HEADQUARTERS:
2910 Seventh St., 2nd Fl.
Berkeley, CA 94710
(415) 841-3500

FOUNDED: 1984

PRODUCT LINE: Relational database querying and interfacing software

OWNERSHIP: Private

BRANCHES: New York, Chicago, Cambridge, MA, and Arlington, VA

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The purpose of this routine is that the Connector must determine every part of speech, including nouns, verbs and adverbs, that is associated with the headings and data stored in the database. This way, Natural Language gains knowledge about the database from syntax files it shares with the Connector.

You can exit the Connector at any time, and everything will be saved. You also can invoke an editor such as EDT to answer the questions. You may be more comfortable with this, because the explanations of what the Connector is trying to ask are well-written but sometimes long and tedious.

Language Properties

Synonyms are key to Natural Language's flexibility. Significantly, NLI didn't overlay a synonym system over Natural Language. Rather, it built one from scratch. The system can understand subtle distinctions in word usage, e.g., *make* ("How much did salespeople in New York make last year" or "Can you make a list of our New York salespeople"). It also can distinguish *graph* as a noun or verb ("Make a graph of. ..." or "Can you graph this").

Figure 1on page 74 shows how Natural Language first parses sentences based on sentence parts and then compiles them into meaningful categories that relate to tables in the database.

Natural Language has other capabilities. The DECwindows toolkit lets it display its responses in charts or graphs, if you request it. It also provides responses to random questions ("how many feet in a mile") and corrects spelling errors.

A facility called swanmon lets you recall command histories and perform line editing. The window-based menu system for this is called swanwin.

Natural Language has a diminutive 37- page *User Manual*, but that's the point: You really won't need it. The system manager must go through the training, mainly to learn to use the Connector and install the database Gateway. But you may want to refer to examples in the *Manual* before you begin.

AFTER YOU START using the system, you'll see what a confusing language English is, and you'll wonder how we communicate with each other at all. The expert system software engineers who wrote Natural Language and its associated software components understood the frustrating complexities and incongruities of English as well as they understood the underlying database and interface technologies.

The result is a futuristic system that when expanded could have a range of applications, far beyond RDBMS interfaces.

Figure 3.

```
What kind of attribute is "user_def1".
Type 1 if it is a display and 2 if it is a computation
>>2

what is the computation?
>> a16/ (a11 + a14)
a16/ (a11 + a14)
Do you want me to use a different word or phrase than
"user_def1" as a table header?
Type yes or no >> yes
Type the word or phrase you want me to use
        >> efficiency

What does the attribute "user_def1" mean?
Is it
        1. An unique number associated with each salesperson.
        2. The name of the salesperson.
        3. A time duration.
        4. A date or time.
        5. Some kind of pay that the salesperson earns?
        6. A status of the salesperson.
        7. A measurement of the salesperson.
        8. An organization that the salesperson works for?
        9. The location of the salesperson.
        10. A property that can be related to the salesperson by using a preposition.
        11. A property that can be related to the salesperson by using a verb template.
        12. A Boolean value associated with the salesperson.
        13. The quantity of an object not directly in the database.
        14. A property of the salesperson that isn't necessary to reference directly.

Type H followed by the number[s] you want help for.
>>7
If "user_def1" is a measurement, then there is a word that can fill in the blank in
        "How _____is the salesperson?"
so that "user_def1" will be the answer.
For example, "height" is a measurement because it is the answer to question
        "How TALL is the salesperson
What word would you use to fill in the blank? >> efficient
```

Courtesy Natural Language Inc.

Answering questions posed by the Connector customizes Natural Language by teaching it words and equations specific to your database.

Companies Mentioned In This Article

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REWRITABLE LIGHT

LaserDrive Ltd.'s Model 840-114 Optical Subsystem Features Rewritable Capability.

Although Write Once Read Many (WORM) optical disk, with its large storage capacity and cartridge convenience, is a great way to store and read archival data, you can't use it like a "normal" disk. WORM drives lack the abilities of their magnetic cousins to rewrite and truly "erase" data.

Now, "rewritable" optical subsystems are making their appearance. One is the Model 840-114 from LaserDrive Ltd. of Santa Clara, California. We installed a Model 840-114 on our Lab's MicroVAX II running VMS V5.1-1.

Measuring The Model

Our Model 840-114 was a standalone unit in its own cabinet, suitable for standing on the floor. Installation first requires you to configure and install an Emulex UC04/M Intelligent Host Adapter in your Micro-VAX. The disk drive is connected to the adapter via SCSI cables.

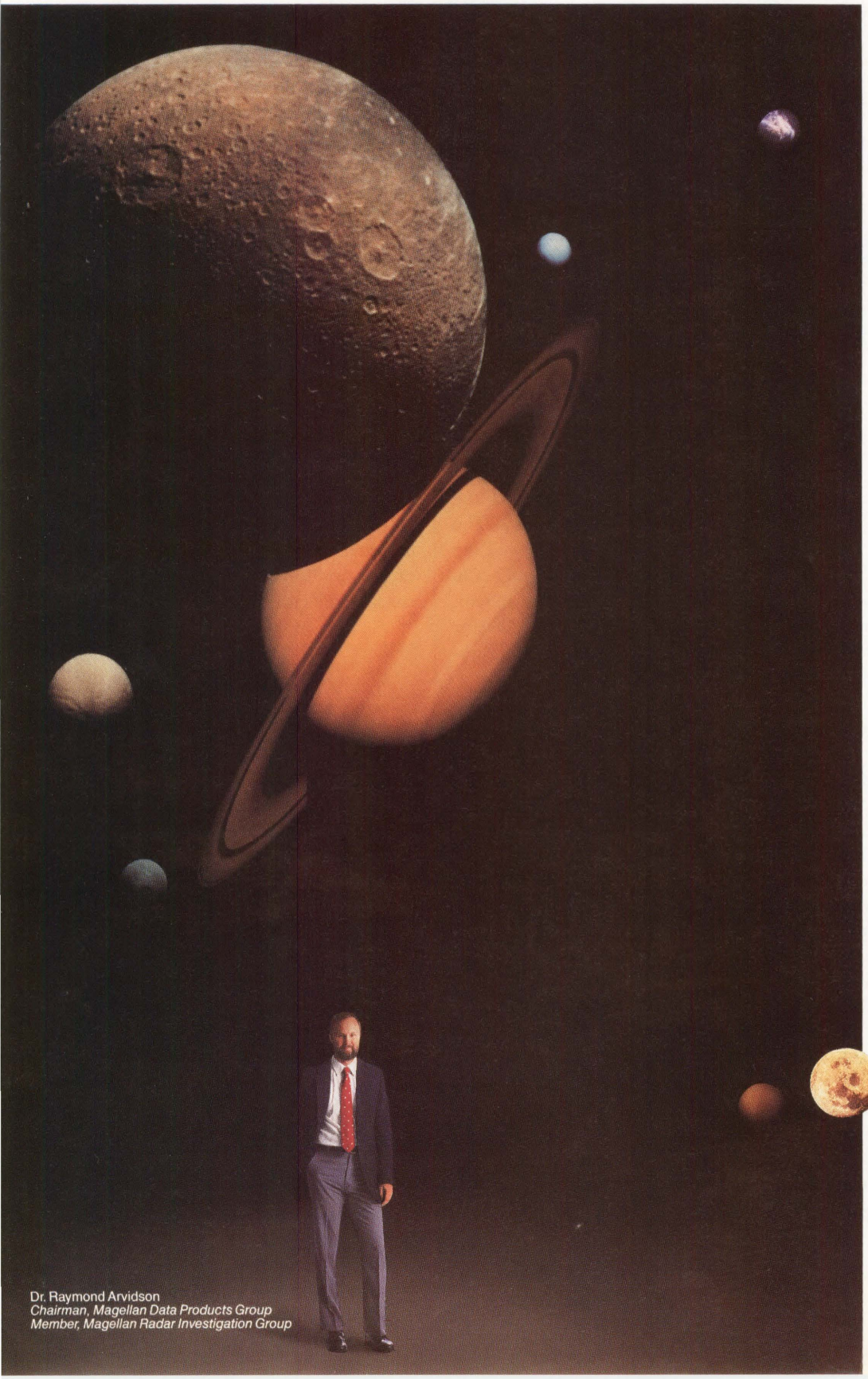
The disk drive documentation explains how to configure the Emulex adapter. You need to set switches for the desired CSR address, establish the adapter's unique SCSI ID and enable 22-bit addressing. For the 22-bit addressing feature, you also need to install an IC supplied with the adapter.

A ribbon cable is routed to a face plate with a SCSI connector. A second cable runs from the face plate connector to the drive. The drive has two SCSI connectors to allow you to daisy-chain multiple SCSI devices. SCSI terminators are provided for the drive if it's the last device. A thumbwheel selector is used to set the

DAVID B. MILLER

DEC PROFESSIONAL DPLABS TESTING CENTER

Before System 1032, 24 years and 1 trillion bits of interplanetary data were lost in space.



Dr. Raymond Arvidson
Chairman, Magellan Data Products Group
Member, Magellan Radar Investigation Group

When the recently launched Magellan space probe reaches Venus in the summer of 1990 to map the planet's surface, it will collect more than 1 trillion bits of data. That's more information than gathered from all the previous planetary probes combined.

According to Dr. Raymond Arvidson of Washington University in St. Louis, the successful use of this new data all gets down to System 1032 from CompuServe Data Technologies.

"Our System 1032 database is the only one in the world that does what it does," said Professor Arvidson.

As Arvidson discovered, System 1032 4GL/RDBMS software readily handles his record-breaking amounts of data at record-breaking speeds. Smoothly. Easily.

Along with the team from the Department of Earth and Planetary Sciences, Arvidson uses System 1032 to catalog and access vast amounts of digital data from past and present missions. Currently, the database includes information about 150,000 images and 500,000 photoproducts.

Before System 1032, 24 years of data weren't cataloged or readily accessible. So trying to find a particular image could not only take weeks, it might not be found at all.

Using System 1032's browse capability, the database can be easily searched and data quickly displayed. For example, a data search that might have taken 40 hours before System 1032, can now be done in just seconds.

If your large, sophisticated RDBMS application leaves you lost in space, here's how to find the answer: Think Big. Think Fast. Think System 1032 from CompuServe Data Technologies.

CIRCLE 153 ON READER CARD

CompuServe®
Data Technologies

1000 Massachusetts Avenue
Cambridge, MA 02138 (617) 661-9440

Think Big. Think Fast.
Think System 1032.

Figure 1.

Copying 7,992 blocks of data		
From	To	Time
DUB0: DUB1: DUC0:	DUB1: DUC0: DUB1:	0 min. 36.09 sec. 1 min. 22.13 sec. 1 min. 11.07 sec.

Results of COPYing files to and from LaserDrive Model 840-114 and the Lab's Wren magnetic disk.

Figure 2.

Deleting 7,992 blocks of data	
From	Time
DUB1: DUC0:	4.96 sec. 15.28 sec.

Results of DELETEing files.

drive's unique SCSI ID.

After the hardware is installed, the Emulex adapter is initialized by a set of commands issued at the system's console prompt (>>>). Next, drive configuration parameters are loaded into the adapter's non-volatile memory.

LaserDrive Ltd. supplies utilities to format cartridges and determine the amount of rewrite space left on the disk. The system must be booted from the utility TK50 (or floppy) to format a cartridge. Therefore, it pays to plan ahead and format several, if you need them.

After a cartridge is formatted, the VMS INITIALIZE command is used to prepare the disk for use. The disk looks like a DU device. It responds to all the usual VMS commands suitable for disk devices. Each cartridge can hold 810 MB of data.

The Model 840-114 appears erasable and rewritable. However, space for "deleted" files isn't recovered. Rewritten data uses new sectors. It's wise to use the LaserDrive utility READCAP.EXE, supplied with the drive, to obtain information regarding the available rewrite space on the cartridge. The VMS command SHOW DEVICES won't report accurate information. READCAP.EXE can be copied from the LaserDrive utility disk or TK50 and INSTALLed for general use.

Figure 3.

Retrieving a 200-block text file with EDT	
From	Time
DUB1: DUC0:	7.78 sec. 9.83 sec.
Saving a 200-block text file with EDT	
From	Time
DUB1: DUC0:	0.86 sec. 1.07 sec.

Results using EDT to retrieve and save data.

Although disk space isn't reused, the drive appears erasable to the host. The drive's emulation firmware allowed the Model 840-114 to take its place as DUC0: next to the magnetic drives on the system. No special drivers had to be added or modifications made to the operating system or application software.

Documentation was supplied for the Emulex adapter and the Model 840-114 drive. The Model 840-114's documentation includes all the instructions for the adapter configuration. You only need the Emulex documentation for detailed information.

Put To The Test

We conducted some informal tests to get a feel for the speed of the Model 840-114 as compared to magnetic media. The first test involved COPYing 7,992 blocks of data to/from DUB1:, an Imprimis Wren drive, to/from DUC0:, the Model 840-114. We also did a COPY of the same files from DUB0: to DUB1:, both Wren drives. Figure 1 shows the results.

We also timed how long it took to DELETE these same files from each type of disk. Figure 2 displays those results.

For the third test, we used EDT to retrieve and save a 200-block text file. The same file was retrieved/saved from DUB1:, the Wren, and from DUC0:, the LaserDrive. The results are shown in Figure 3.

Optical disk can't yet match the performance offered by magnetic media. Our informal tests bear this out. The drive's ability to appear like any other disk device on the system is the important point. As optical technology progresses, expect to see marked performance improvements.

The tests were conducted on the Lab's MicroVAX II with one user and no running batch jobs.

REWRITABLE OPTICAL DISK is on the move. If you're interested in the storage capacity and convenience of optical disk, consider the LaserDrive Model 840-114.

Emulex Corp.
3545 Harbor Blvd.
Costa Mesa, CA 92626
(714) 662-5600
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Imprimis Technology Inc.
12501 Whitewater Dr.
Minnetonka, MN 55343
(612) 936-6271
CIRCLE 578 ON READER CARD

Model 840-114 Optical Subsystem

PLATFORMS: MicroVAX

PRICE: $9,999

LASERDRIVE LTD.

HEADQUARTERS:
1101 Space Park Dr.
Santa Clara, CA 95054
(408) 970-3600

FOUNDED: 1984

PRODUCT LINE: Optical disk drive subsystems for MicroVAX, Mac II and IBM PC/AT and PS/2

OWNERSHIP: Private

BRANCHES: Sales offices in Boston and Orange, CA

CIRCLE 555 ON READER CARD

IF YOU'RE NOT BACKING UP WITH MEGATAPE, YOU'RE MISSING THE BUS.

THE ONLY VAXBI BUS BACKUP DEVICE YOU CAN BUY.

It's sort of ironic that so many big, powerful VAX systems have to get by with little, slow cartridges or reel-to-reel drives for disk backup.

Wouldn't it be great if somebody offered a high-capacity cartridge drive with a direct, high-performance attachment to the VAXBI Bus?

Now, somebody does. Presenting MegaTape's GT-88 VAXBI 8mm cartridge subsystem. A breakthrough that lets high-end VAX users enjoy the enormous capacity of 8mm without bus adapters or other bottlenecks. The result is far greater capacity and convenience than 9-track streamers —at a fraction of the cost.

Each GT-88 cartridge stores up to 2 gigabytes of data, costs around $10, and fits easily into your shirt pocket.

Exabyte-compatible data formatting lets you interchange cartridges with virtually any other 8mm subsystem.

MegaTape's proprietary VAXBI controller is completely TMSCP-compatible, and lets your system zip through backup chores using your standard VMS or Ultrix backup utilities.

NOW: 8MM ON VAXBI BUS.
ANOTHER MEGATAPE EXCLUSIVE!

The GT-88 VAXBI subsystem offers something else that's crucially important, too: support capability built on nearly a decade of advancing the state of the backup art.

So if you'd like your VAX backups to really fly, there's only one place to catch the Bus: MegaTape.

P.S. We also offer the industry's "best buy" QBUS and Unibus subsystems, too!

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MegaTape

THE GREAT LEAP FORWARD IN BACKUP.

CIRCLE 123 ON READER CARD

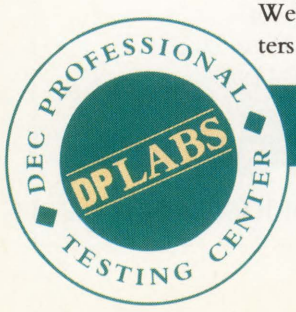
C.Itoh's CIT334 Provides Dual Sessioning In A Mouse- Or Keyboard-Driven VT330-Compatible Terminal.

DRIVING DUAL SESSIONS

Professional Press' Lexington, Massachusetts, office has five users linked to its Spring House, Pennsylvania, LAVc via a leased telephone line that's sandwiched by a pair of 16-way Micom multiplexors. There's no VAX CPU in Lexington: Our six terminals and HP LaserJet are dropped off the Micom. With this configuration, we're true, real-time cluster users. We log in like everyone else. The terminals are connected to wall jacks.

Lexington is a haven for third-party equipment, terminals in particular. Each user has a different brand of terminal, and we have an AST 286 running Data Storm's Procomm. We've become adept at setting parameters and getting terminals on-line quickly.

The process of firing up the CIT334, C.Itoh Electronics' emulation of DEC's VT330 (monochrome), was easier than others. For one thing, it's VT330-compatible. This gives you the option of using



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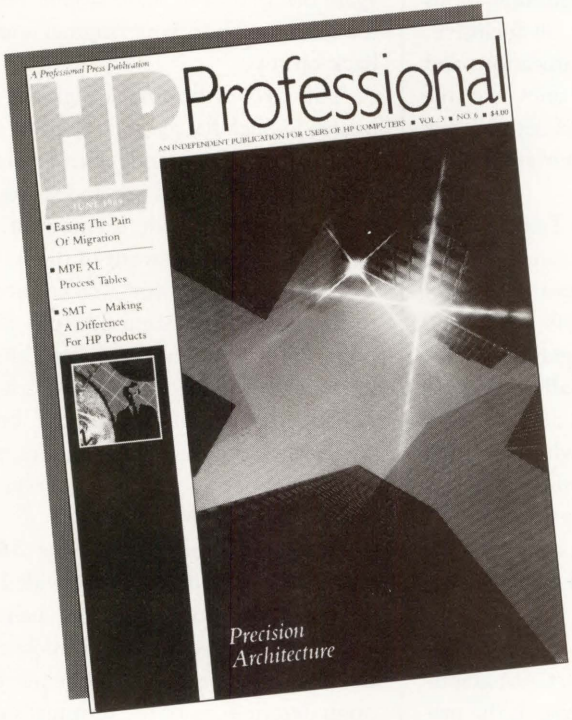

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CIT334

PLATFORMS: Any VAX environment. The CIT334 supports VT52/100/200/330 ASCII-coded ANSI control sequences

PRICE: CIT334, $1,895; CIT344, $2,895

C.ITOH ELECTRONICS INC.

HEADQUARTERS:
2505 McCabe Way
Irvine, CA 92714
(714) 660-1421

FOUNDED: 1973

PRODUCT LINE: Printers and terminals

OWNERSHIP: Public (Japan only)

BRANCHES: Twenty U.S.

CIRCLE 567 ON READER CARD

the keyboard or the mouse throughout setup. Although I'm not a regular mouse user, I found it much faster and easier to use the mouse than the keyboard.

Setup

Setup can be called by either hitting F3 or clicking the mouse on the terminal configuration icon at the far left of the status line. The status line, which forms the lower-screen border, also contains icons for Windowing (which lets you switch to another terminal session), icons for printers and storage devices, a session name that you can create during setup, and x/y axis information on your cursor location.

The setup menus take up a small portion of your screen, so your current application remains intact and visible under it. The main menu, which lists 12 items that can be configured, appears in a small box to the left of your screen. These include Sessions, Display, Communications, Keyboard, Mouse, Configuration, Graphics, Function Keys, Tabs, Local Edit, Color/Shading (the major difference between a CIT334 and CIT344 is color) and Diagnostics.

You select one by highlighting it with the mouse or the up/down arrow keys. Moving the mouse to the right or hitting the right arrow key brings up the corresponding submenus. When you reach the final menu, you select parameter options by either a carriage return or a mouse click. Usually this is narrowed down enough to be either Enable/Disable or Lock/Unlock.

Unique Options

There were some noteworthy decisions to make in setup. I preferred the full control over the display, including manipulation of background and border shadings with mouse-manipulated dials. You even can design your own cursor.

The Local Edit and Communications menus were particularly all-inclusive. Default settings in Communications and Configuration were the ones we required, and these included settings for Transmit=Receive, 9,400 baud and VT300 7- and 8-bit No Parity.

The terminal, based on Texas Instruments' 32-bit TMS34010 graphics processor, also can be set to support Tektronix 4010/4014 and DEC's ReGIS and SIXEL graphics protocols. The graphics have impressive potential, especially when you consider the 16 display colors of the CIT344.

The Sessions menu is where you tell the system whether it's running one session or dual sessions. Your version of VMS must be running DEC's Session Support Utility (SSU) to get the full effect.

Dual Sessioning

Besides the terminal's CAD/CAM graphics capabilities, dual sessioning is the primary reason you'd want a VT330 compatible. It lets you run two terminal sessions at once, using two windows on one screen. When you boot the terminal, you can see the two windows on your screen and label them in the Sessions utility in setup. By clicking on the icon in the lower right corner of each window, you can change the size and shape of your windows.

Hitting F4 (Switch Session) brings the bottom window to the top and makes it the active session. Then hitting CTRL-F4 brings up split-session screens. Both screens are displayed at once, although only one cursor remains active. Hitting it once brings up a vertical split, and hitting it again brings up a horizontal split. Hitting it a third time puts your original window back on top.

The CIT334 features a high-tilt keyboard, 14-inch flat glare-free screen and a rotating monitor stand. The brightness and contrast dials are large and are located under the right side of the monitor. The keyboard input is in front of them.

In the back, the Mod-Tap connection is next to two Communications phone ports. The mouse socket and an Ethernet port are also on the back. The Ethernet interface, which should relieve bottlenecks when downloading graphics, emulates a DECserver terminal server and executes DEC's LAT protocol.

A two-volume *Programming Manual* and a *User's Manual* are provided. All functions and parameters are painstakingly laid out. Don't let the thickness of the manuals scare you. They're just thorough descriptions of the terminal's capabilities, many of which you'll never need to worry about.

Companies Mentioned In This Article

AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333
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Data Storm Technologies Inc.
P.O. Box 1471
Columbia, MO 65205
(314) 443-3282
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Micom Systems Inc.
4100 Los Angeles Ave.
Simi Valley, CA 93063
(805) 583-8600
CIRCLE 570 ON READER CARD

Mod-Tap System
P.O. Box 706
Harvard, MA 01451
(508) 772-5630
CIRCLE 571 ON READER CARD

Tektronix Inc.
P.O. Box 1000
Wilsonville, OR 97070
(503) 685-3180
CIRCLE 415 ON READER CARD

Texas Instruments Inc.
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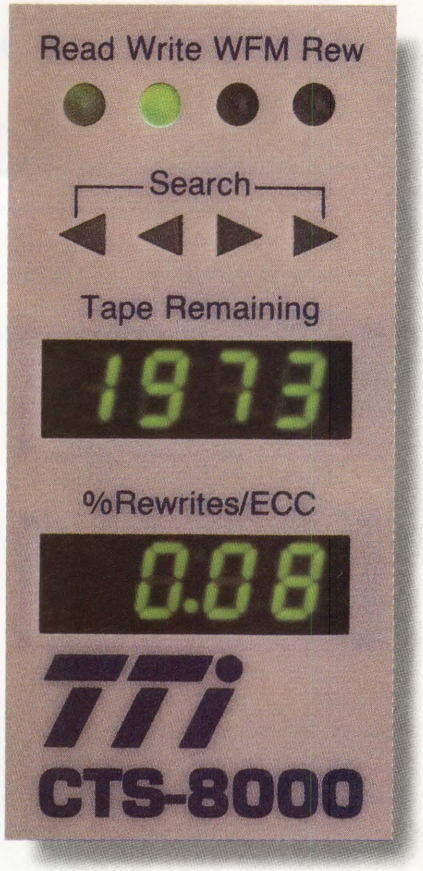
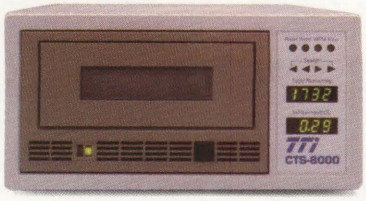
Plano, TX 75086
(214) 575-4404
CIRCLE 548 ON READER CARD

Ask about our new HSC System.



The idea behind our 8mm tape backup system's display panel.



The whole reason for putting instrumentation in cars is to help you avoid unpleasant surprises.

Well, that's exactly why we gave the new CTS-8000 8mm tape backup system a built-in status display. It lets you catch problems before they happen—not after.

A digital readout tells you how many megabytes of unused storage remain on a tape. When you put in a cartridge, you'll know for sure that you've got enough tape to finish the job.

The CTS-8000 also tells you the ECC error correction rate. By watching it for a minute or two, you can determine if the tape is in good enough condition to properly record your data. If the tape is unacceptable, you'll know before you leave at night—not when you return in the morning.

Still another first on the CTS-8000 is multi-host capability. It can back up data from as many as three hosts.

It's also TMSCP compatible and works with all your applications without any modifications.

And thanks to TTI's long line option, you can place the CTS-8000 up to 80 feet away from the host.

Don't settle for unattended backup with less than full instrumentation. For complete information on the CTS-8000, call (714) 744-1030. Or write Transitional Technology, Inc., 1411 N. Batavia, Suite 203, Orange, CA 92667.

TTi
TRANSITIONAL TECHNOLOGY, INC.

In Europe, call 0865 741345. Or write Transitional Technology, Suite 2, Kennett House, 108/110 London Road, Headington, Oxford OX3 9AW.

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CIRCLE 261 ON READER CARD

DIGITAL WATCH

Evan Birkhead

VAX And RISC: The Odd Couple

Digital has set its strategy for the 1990s in stone. It involves two dissimilar processor architectures: VAX CISC and Mips Computer Systems RISC. President Ken Olsen has let us know unequivocally that Digital will stick with the two-platform strategy, despite criticism from industry analysts and confusion among customers.

Like it or not, Digital is now a two-headed monster with one head running VAX/VMS and the other running RISC/UNIX. Businesswise, Olsen's logic is indisputable: Digital's largest customers have asked for both UNIX and VMS, so DEC is delivering each on its optimal platform. Technically, rest assured that Digital is pursuing several avenues that will allow the two to coexist, and Olsen insists that "they complement each other."

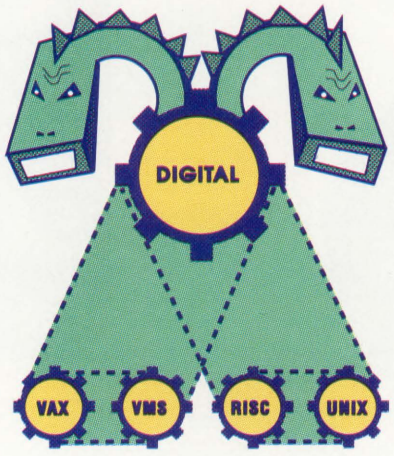
Digital, which still would prefer you buy VMS (look at the price difference), advises you to make your CPU purchasing decision based on the software applications available. VMS has hundreds more than ULTRIX. But the company also admits that RISC/ULTRIX is the fastest architecture for many applications and that many environments require the standards-based openness that ULTRIX provides.

Olsen maintains that the platform selection "will be obvious" at most costumer sites. He says UNIX is an easier-to-use, undisciplined system without the features and extensive documentation of VMS. He suggests that UNIX fits best in small businesses that have systems managers with little computer expertise, and VMS in larger commercial applications with greater system requirements.

"For 20 years, we've sold more UNIX software, services and machines than anyone else," Olsen claims. "We've lived well within UNIX and VAX."

Serious RISC

Because Digital is shipping midrange RISC machines and calling them ULTRIX servers, the distinction between the roles of RISC and VAX machines is beginning



to blur. The new DECsystem 5400 and 5800 marked the company's first foray into the RISC/UNIX midrange computer market and silenced those who said the company wasn't serious about RISC processing.

Now Digital has begun serious development on a RISC-based VAX. As with the Odd Couple, the question becomes, Can two grown platforms share a computer cabinet without driving each other crazy?

The technological ramifications of VAX/RISC are disconcerting and further the argument that the VAX will be phased out slowly during the 1990s. Currently, the state of the 12-year-old VAX architecture is stronger than it has ever been.

Of the computers debuted at Digital's July 11 product launch, four have been groomed to play starring sales roles in the 1990s. Two are VAX-based and two are RISC-based:

1. The VAX 6000 — If we're to learn from Digital's history of success at the midrange, its most significant weapon in the current arsenal will be the dramatically improved VAX 6000 series. The 6000 Model 400 is the highest-performance VAX system in history (see Figure 1).

The single-processor Model 410 has 85 percent more performance than existing VAX 6000 Model 310s, and prices start at $204,700. It also boasts 16 percent better performance than the defunct 8800 series, and the price is 60 percent lower. The entire series can be expanded by adding processors. The high-end six-processor Model 460, with 36 times the performance of a VAX 11/780, is priced from $752,000.

The entry-level system for the 6000 series is the Model 210, which can be CPU-upgraded to more powerful systems. The 210 is priced at $129,000 for the VMS version, about half that of last year's 6240 (renamed, like the others, the VAX 6000 Model 240). The entire pricing structure of the existing 6000 series has been realigned, making it price/performance-competitive across four families of IBM midrange computers: the AS/400, 9370, 4381 and many models of the 3090.

2. The MicroVAX 3100 — This entry-level MicroVAX features three times the performance of a MicroVAX 2000 (see Figure 2). It's priced at less than $8,500. The corresponding VAXserver 3100, Digital's low-end software and network server, is priced from $6,680. For single units, that's less than IBM's base AS/400 and PS/2 Model 80.

3. The DECsystem 5400 and 5800 — These computers are general-purpose ULTRIX servers that weave the RISC architecture into the Q-bus and BI/XMI bus architectures (see Figure 3). The models include the MicroVAXlike DECsystem 5400 (from $49,900) and the VAX

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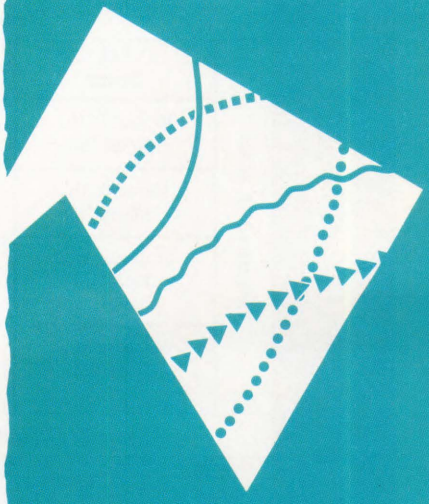

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6000-like DECsystem 5810 (from $121,500). They were developed by separate development teams chosen from the MicroVAX and VAX 6000 groups, respectively.

The 5800 is also available in a dual-processing version, the 5820, which is capable of 36 mips.

4. The DECstation 2100 — The smallest in DEC's series of workstations based on the Mips R2000 processor, it's expected to surpass the VAX-based VAXstation 2000 and become Digital's number one workstation warrior.

The DECstation is rated at 10.4 mips and is priced at $7,950 monochrome, $11,450 color. That's about $1,000 less than the comparable (12 mips) SPARC-

FIGURES 1-3.

VAX 6000 Series

VAX System	CISC Proc.	VAXBI Channels	CPU (VUPS) Performance	Max. I/O Bandwidth	Max. Local Storage	VMS Memory	ULTRIX Memory	Pricing
Model 210	1	1 to 6	2.8	60 MB/sec.	58.2 GB	32-256 MB	32-256 MB	$129,000 (VMS) $101,600 (ULTRIX)
Model 310	1	2 to 6	3.8	60 MB/sec.	58.2 GB	32-256 MB	32-256 MB	$184,100 (VMS) $155,200 (ULTRIX)
Model 410	1	2 to 6	7	60 MB/sec.	58.2 GB	32-256 MB	32-256 MB	$239,000 (VMS) $204,700 (ULTRIX)
Model 420	2	2 to 6	Up to 13	60 MB/sec.	58.2 GB	64-256 MB	32-256 MB	$399,000 (VMS) $376,000 (ULTRIX)
Model 430	3	2 to 6	Up to 19	60 MB/sec.	58.2 GB	64-256 MB	n/a	$489,000 (VMS)
Model 440	4	2 to 6	Up to 25	60 MB/sec.	58.2 GB	128-256 MB	n/a	$627,000 (VMS)
Model 450	5	2 to 4	Up to 31	40 MB/sec.	38.8 GB	128-192 MB	n/a	$700,000 (VMS)
Model 460	6	2 to 4	Up to 36	40 MB/sec.	38.8 GB	128-192 MB	n/a	$752,000 (VMS)

Each VAX 6000 system features:
■ One to four Ethernet controllers ■ One VAXcluster adapter ■ Maximum disk storage of 2.2 GB in-cabinet ■ More than 800 GB of HSC storage

Figure 1: The VAX 6000 series is the most significant weapon in Digital's arsenal.

VAXsystem 3100 Series

VAX System	Number Users	Minimum Memory	Disk	Tape	CPU Performance	Pricing
MicroVAX 3100 (Model 10)	5	4 MB (16 MB options)	104 MB, 3.5-inch floppy	95 MB (option)	2.4 VUPS	$8,480
MicroVAX 3100 (Model 20)	10	8 MB (16 MB options)	Two 104-MB drives	95 MB	2.4 VUPS	$22,965
VAXserver 3100 (Model 10)	up to 4 async lines	4 MB (3.5-inch floppy optional)	104 MB (option)	95 MB	2.4 VUPS	$6,680
VAXserver 3100 (Model 20)	up to 12 async lines, 1 sync	4 MB (3.5-inch floppy optional)	104 MB (option)	95 MB	2.4 VUPS	$8,180

Figure 2: Digital's entry-level MicroVAX 3100 features three times the performance of a MicroVAX 2000.

RISC System	CPU/FPU	Clock Speed	Mips Rating	Max. I/O	Max. Disk	Max. Memory	Peripherals	Pricing
DECstation 2100	R2000/ R2010	12.5 MHz	10.4	4.0 MB/sec.	1.2 GB	24 MB	4 SCSI	$7,950 (monochr) $11,450 (color)
DECsystem 5400	R3000/ R3010	20 MHz	16.6	8.0 MB/sec.	9.7 GB	64 MB	Q-bus, DSSI, SDI	$49,900
DECsystem 5810	R3000/ R3010	25 MHz	18.7	50 MB/sec.	58 GB (local)	256 MB	VAXBI, SDI	$99,900 (kernel) $121,500 (base)
DECsystem 5820	Two R3000s/R3010	25 MHz	36.0	50 MB/sec.	58 GB (local)	256 MB	VAXBI, SDI	$174,900 (kernel) $196,500 (base)

Figure 3: These general-purpose ULTRIX servers weave the RISC architecture into the Q-bus and BI/XMI bus architectures.

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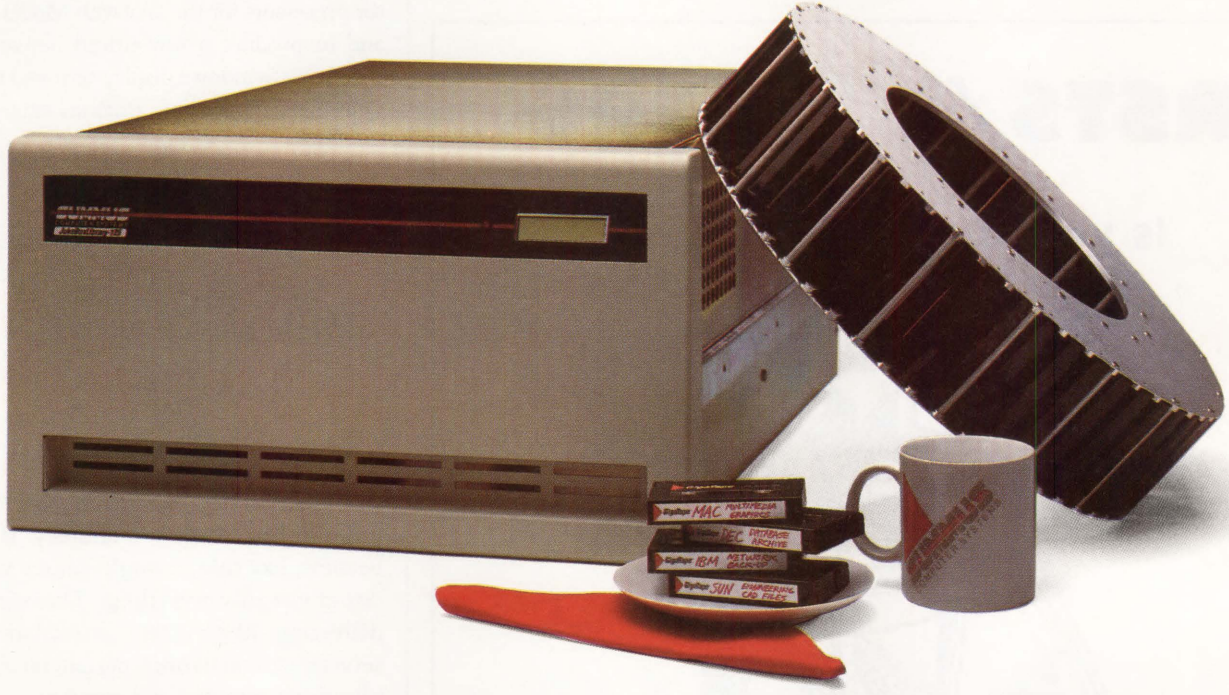

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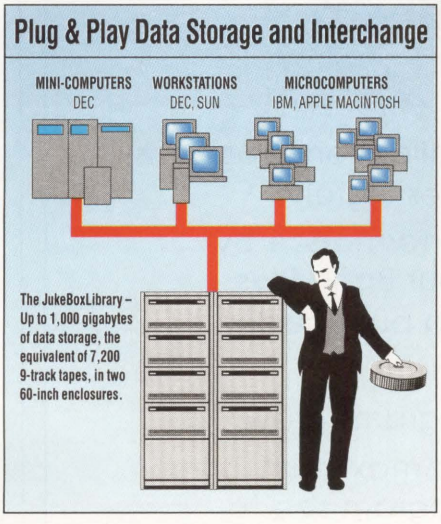

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station 1 from Sun.

A new VAXstation line was conspicuously absent from the product blitz.

The multiarchitecture nature of the July 11 introductions didn't stop with the CPUs. Digital stepped up its Network Application Support (NAS) services by adding facilities that help integrate various network databases into desktop applications. Digital also announced that several new vendors will support this service. NAS is DEC's program for tying multivendor computers and applications into DECnet/Ethernet.

The NAS facilities include Conversion Services that support sharing of text, graphics and images using VMS and ULTRIX workstations, PCs and Macs. Another service, the long-awaited VAX/SQL, is a way for users to access DEC or IBM databases transparently, regardless of their applications. A significant new application, VIDA For DB2, is a client/server system that lets Rdb access the IBM mainframe database.

To top it off, Digital announced its intention to design and manufacture vector processors for the VAX 6000 Model 400 and to produce a low-priced network-based DECwindows display terminal that will run X applications. Both are expected to premiere late this fall.

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The only missing piece in the computer-wars puzzle is a machine to battle IBM's high-end 3090 mainframes. But a mainframelike VAX (internally code-named Aquarius) that will run VMS and ULTRIX should complete the picture within the next few months. Coupled with NAS and clustering, this will make DEC a force to be reckoned with at the high end as well. ■

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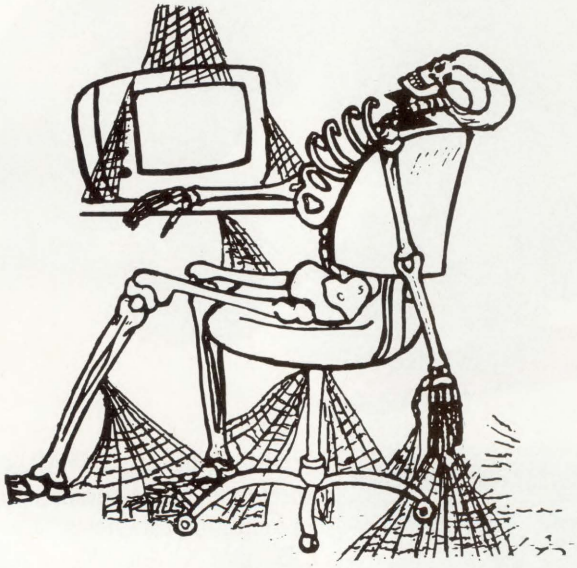

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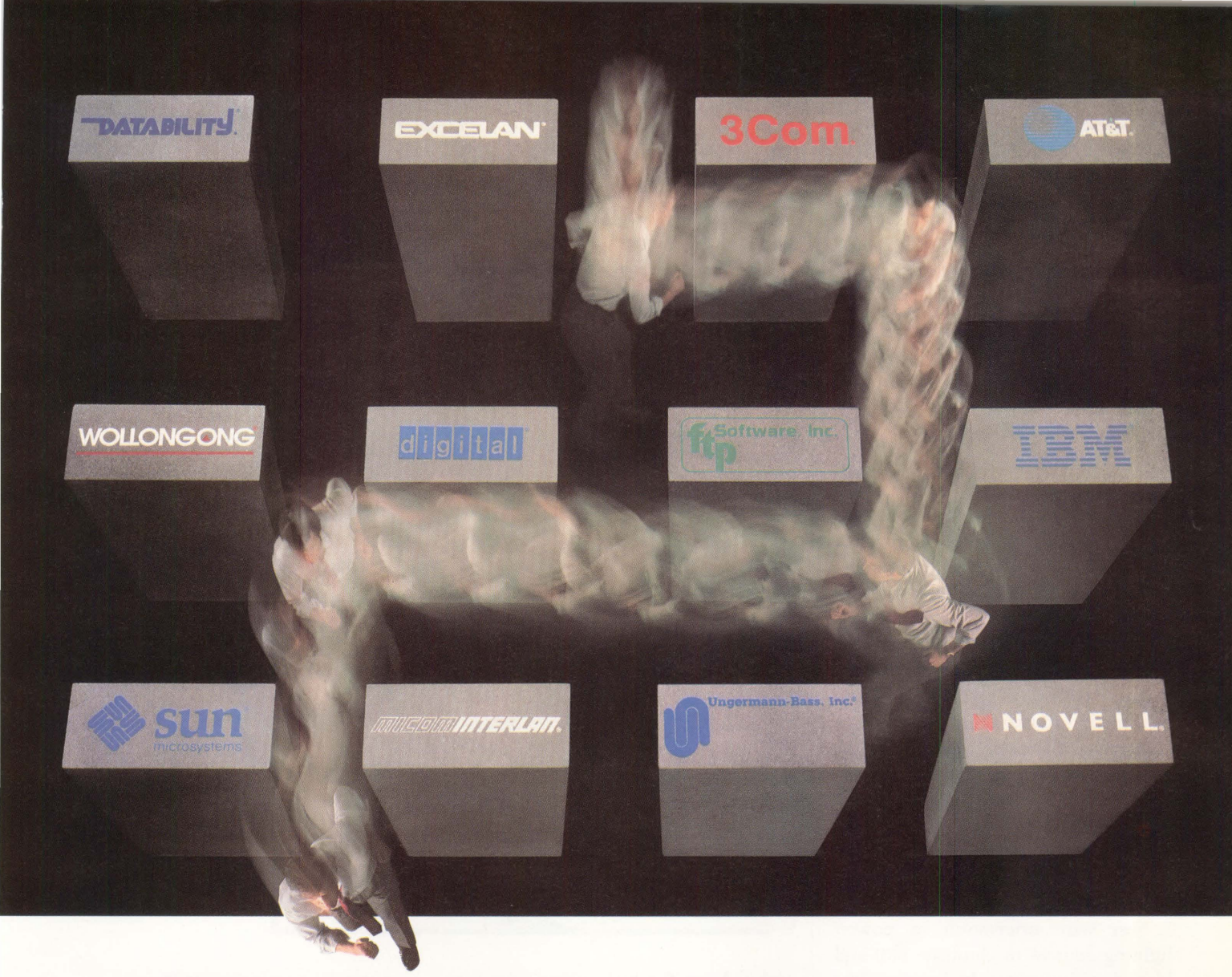

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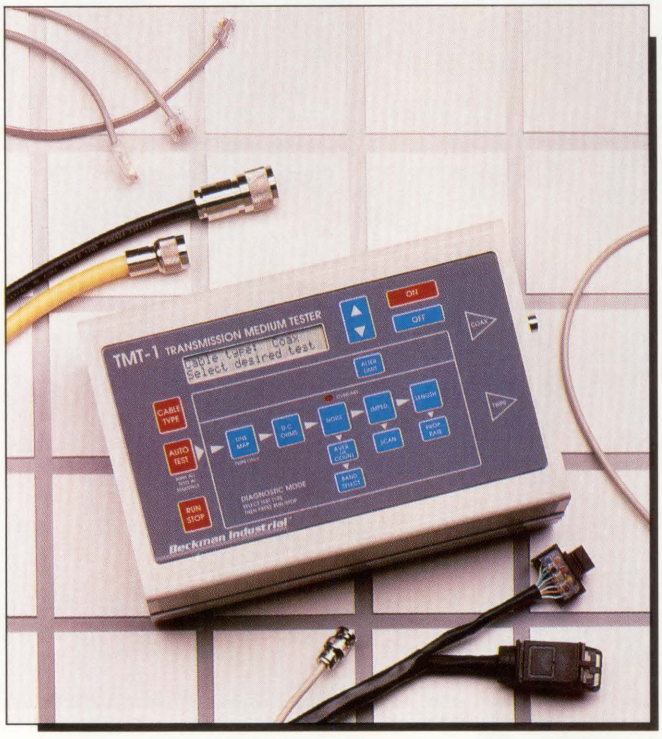
FIELD SERVICE

Ron Levine

The Network's Physical Exam

Until now, tracing LAN problems in a network's wiring and connectors (known as the physical or data-link layer) was a tedious and difficult job. It involved specialized tools and considerable interpretive analysis. But a newly developed test instrument called the TMT-1 Transmission Medium Tester verifies, at the push of a button, the capability of an installed LAN to conduct high-reliability information traffic. The TMT-1, from Beckman Industrial of La Habra, California, accurately tests coax or twisted-pair cabling. It lets you:

1. Certify LAN wiring pulled by a subcontractor prior to system installation.
2. Trace unidentified cable ends in the wiring closet to their terminations in individual offices.
3. Test wire orientation to power/lighting sources to eliminate EMI and identify noise sources by location, frequency and level.
4. Find shorts, opens and bad connections in a network, pinpointing the location on the cable to within a foot of the fault.
5. Assess existing wiring, especially telephone twisted pair, to see whether or not it can support a digital network.
6. Detect security problems such as wiretaps.



Beckman Industrial's TMT-1 Transmission Medium Tester verifies the capability of a LAN to conduct high-reliability information traffic.

Trade Center Test

This automated LAN wiring tester first was used on a system installation project taking place at the World Trade Center in New York City. The subcontractor for the telephone utility was installing the AT&T Premises physical layer and had just finished pulling wire for 160 offices on two floors. This AT&T type of network installation employs eight-conductor twisted-pair wiring. In this popular star network configuration, one cable is pulled through to the wiring closet from a wall jack in each office. The installation team is confronted with a bewildering clump of unidentified cable ends (with RJ45 plugs) that hang from the ceiling in the wiring closet. The challenge is to identify the unlabeled cable ends in the wiring closet and certify all wiring and connections.

If you used the standard method, examining the LAN would require at least two FEs equipped with walkie-talkies, a shorting bar, an ohmmeter (or digital multimeter), a noise meter and an expensive tool called a time domain reflectometer (TDR). At least one of the FEs would need in-depth training in interpreting TDR scope waveforms.

In this scenario, one FE is stationed in the wiring closet, and the other roams from office to office as each network branch is examined. The FEs communicate by walkie-talkie as the roaming FE uses the shorting bar to short the cable ends in an office, and the other FE tests each set of leads in the closet with the ohmmeter, looking for the short. After the short is found, the cable ends in the closet can be tagged with a preassigned office number. By process of elimination, all cable ends in the wiring closet are identified.

So far, however, this procedure doesn't get at potential wiring problems. For example, if there's an open somewhere, you won't find it until you've eliminated all other possibilities. When inspecting the ohmmeter, the open

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looks like an unidentified office. (Imagine the confusion when there are several open cables.)

After each office is identified, the lines to it must be verified and tested for signal-handling quality. Using the noise meter and the TDR, the line must be inspected for noise and signal attenuation. The noise meter gives clues to sources of noise, such as induction from nearby lighting or power circuits, motor hum or switching spikes from equipment such as air conditioning units or copiers. TDR waveforms indicate opens and shorts. Again, diagnosing these problems involves skill in interpreting the scope displays. The two FEs, if they're experienced, will need about two full days to examine all 160 offices.

Using The TMT-1

With the TMT-1 LAN tester, the same situation required one FE, the TMT-1, and a set of terminators and connectors. The time required was a little more than five hours. There was no need for the TDR and an FE with sophisticated waveform-analysis skills.

In this twisted-pair star network, the TMT-1 identified the offices by sensing unique resistance values in special terminators attached to the wall jacks in each office. The terminators fit standard six-conductor RJ11 (Rolm), six-conductor DECconnect (MMJ) or eight-conductor RJ45 (StarNet) jacks and plugs.

The TMT-1 comes with eight terminators, because in twisted-pair configurations, lines in the wiring closet typically are grouped eight per concentrator. The terminators have dialable settings that correspond to office numbers. Each office number sets the terminator to a different resistance value, sensed by the TMT-1. Upon arriving at the site, the FE attached the terminators in each of eight offices and proceeded to the wiring closet. All tests then were performed with the TMT-1 from the wiring closet.

In coax networks, which typically use bus or ring topologies, a single cable runs down hallways or through common walls. Offices are connected to this main cable through taps or T-connectors. In these cases, there's no need to trace lines from a wiring closet to individual offices, and there are no concentrators. You simply connect the backbone to a network transceiver. However, the characteristic impedance, length, DC ohms (resistance) and noise still must be verified as in twisted-pair configurations.

Test Types

For twisted-pair and coax networks, physical/data-link layer verification can be performed with the TMT-1 either as an automated sequence of tests or as individual tests. In the Auto Test mode, the TMT-1 steps through a predefined sequence of five tests to provide a thorough examination of each line or cable on the network. After the cable type is selected, a full sequence of tests is performed at the touch of a button. In Auto Test mode, preset high/low limits are checked for all tests, providing a quick Go or No-Go determination for each line or cable. These preset parameters can be changed either temporarily or permanently so that nontechnical personnel can run the tests in the field.

When operating in the Auto Test mode, you must be concerned with only two buttons: Cable Type, for selecting coax or twisted-pair wiring; and Auto Test, to initiate testing. Operator prompts and test results are displayed on the unit's two-line, 20-character LCD. The line being tested is connected to the TMT-1 via the built-in BNC coax connector or through the twisted-pair modular jack. The tester operates with an AC adapter, with internal (supplied) rechargeable batteries or temporarily with four standard C-size dry cells.

The Auto Test sequence will be interrupted from time to time with operator prompts giving instructions to attach appropriate cables and terminations if they haven't been connected previously.

Individual tests are run in the Diagnostic mode. When operating in this mode, the TMT-1 performs any test in any sequence. A major purpose of selective testing is to home in on a particular problem identified in the Auto Test sequence.

Other modes alter and reset test limits (AltLim mode) or calibrate the tester (CAL mode). However, a field operator normally isn't concerned with these modes.

The TMT-1 features touch-sensitive membrane-type panel buttons. For quick identification, Auto Test buttons are red and Diagnostic buttons are blue. The test functions performed by the TMT-1 are:

1. Line Mapping — This is for twisted-pair wiring only. It's automatically disabled when coax is selected. This test verifies the pin-to-pin wiring pattern and reports, by office number, which line is connected to it.

2. DC Resistance — This detects shorts and opens. The loop resistance of the shorted cable is measured to 0.1 ohm. In the Auto Test mode, default high limits are applied to test for open circuit or poor connections. The default

TMT-1

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high limit for coax is 10 ohms; for twisted pair it's 16.8 ohms. The DC Ohms test also can be used for office identification, in which terminator resistances of 200 to 444 ohms are used in verifying LAN routing. Higher resistances also can be used to flag office terminations in coax networks.

3. Noise — This aids in tracing sources of noise by location, frequency and level. In Auto Test mode, the tester looks at noise impulses. The default threshold is 70 mV, and the high limit count is 2 impulses. In Diagnostic mode, you can select either measurement of noise impulses greater than a preset threshold (count per 100 seconds) or time-averaged noise amplitude (RMS) for any of three bandwidths (the frequency of any noise is a strong clue to its source).

4. Impedance — This measures characteristic impedance of coax or twisted-pair lines over the range of 45 to 175 ohms. The test also automatically matches line impedance at the source. The unit reports both impedance and the distance to the terminator.

In the Diagnostic mode, you can measure impedance along increments of distance or scan the line to determine distance measurements to each impedance overlimit point. (The development of the capability to measure true impedance down-line and compare the measurement to a value in default proved a challenge to the Beckman design team. The result is copyrighted software and a patented technique that lets you measure true impedance from 10 to 600 meters and pinpoint the locations to within 0.3 meters.)

5. Length — This reports the length of

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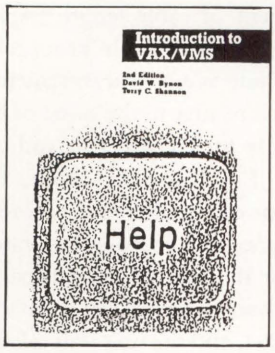

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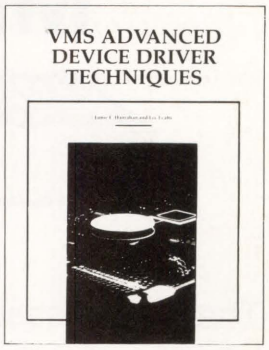

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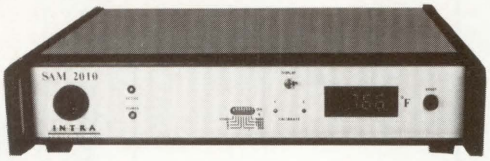

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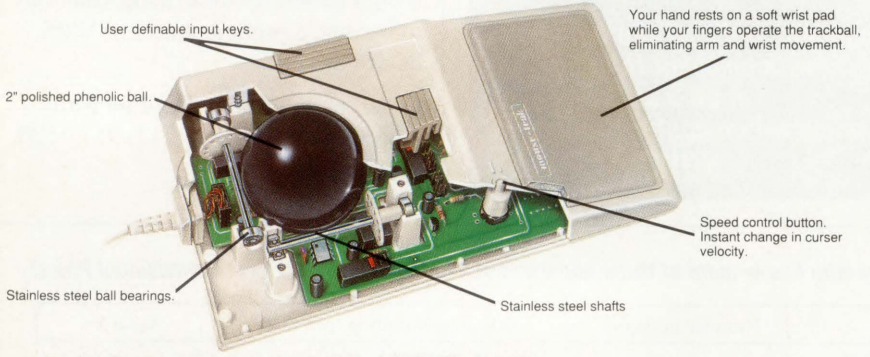

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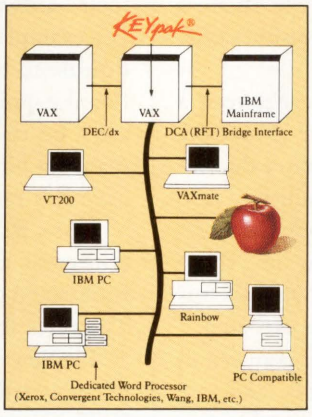

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LET'S C NOW

Rex Jaeschke

Floating-Point And Modern C

Historically, C's strengths have been primarily in the area of systems programming, an application that requires little if any floating-point support. However, with the boom in C's popularity, an increasing number of scientific and engineering programmers have taken more than a little interest in it as a production language.

In some quarters, C is being investigated as a possible alternative to FORTRAN. More than a few FORTRAN programmers are being dragged kicking and screaming into the world of pointers, weird operators and punctuators.

This month we'll look at C's weaknesses in the area of floating point, what ANSI C has done to help and what's still needed. We'll also see why FORTRAN is losing ground to C.

float: The Poor Cousin

Like **char** and **short**, the **float** type is a narrow type. In most cases of expressions having a **float** type, the expression's type was promoted to the wide type **double**.

On many modern machines, the difference between a **float** and a **double** representing the same value is that the **double** has more mantissa bits. Converting a **float** to a **double** on such machines is simply a matter of adding a bunch of zero bits (32 in the case of DEC's double-precision type). Converting a **double** to a **float** is simply a matter of truncating those low-order bits. Even though these systems could do this cheaply, conversions instructions still had to be executed.

On systems in which the **float/double/float** conversion wasn't trivial, the cost was proportionally higher, and as a result, if floating-point operations were necessary, the programmer used type **double** to avoid the constant widening and narrowing of operands. This usually resulted in a larger data space requirement, because **double** objects usually occupy more memory than **float**s. On many systems, the **sizeof(double)** is exactly twice that of **sizeof(float)**.

The idea of widening and narrowing was seen as wasteful by some compiler vendors, because their underlying hardware supported single-precision instructions, such as Add Float and Compare Float, directly. As a result, they provided compiler options to indicate that **float** operations were to be performed in **float** precision rather than in **double**.

ANSI C's New Types

The ANSI C Standard defines **float** as a "real" type, because it can behave like a wide type in almost all places in the language, as we'll see. And recognizing that an increasing number of floating-point processors had more than two different representations, it also added a third floating-point type, **long double**.

According to the Standard, "The set of values of the type **float** is a subset of the set of values of the type **double**. The set of values of the type **double** is a subset of the set of values of type **long double**." This means that **float** and **double** can be the same (as they are on Cray's supercomputers), and **double** and **long double** can be the same (as they are on most compilers supporting the **long double** type).

A compiler doesn't have to support three different floating-point representations, just the three types. Therefore, compilers running on systems with fewer than three representations always map at least two of the types to the same thing. And compilers that want to be ANSI-conforming with little effort also can map two types to be the same, even though their hardware may support more than two representations. For example, DEC's VAX C will likely map **double** and **long double** to be the same even though the VAX has a "larger" floating-point type than **double**, the H-float type. G-float can't be used to map **long double**, because it has fewer mantissa bits (but a larger exponent) and **long double** can't have less range or precision than **double**.

As a result of ANSI's changes and additions, floating-point arithmetic can be done in any precision if the same answer is obtained as that required by the standard promotion rules. The rules for arithmetic conversions are:

1. If either operand has type **long double**, the other operand is converted to **long double**.
2. If either operand has type **double**, the other operand is converted to **double**.
3. If either operand has type **float**, the other operand is converted to **float**.
4. Otherwise, the integral promotions are performed on both operands. These promotion rules won't be discussed here.

Passing floats To Functions

With the adoption of function prototypes from C++, ANSI C provides a way to describe the arguments a function expects. As such, a prototype can contain narrow types such as **char**, **short** and **float**.

Prior to ANSI C, whenever a narrow type expression was passed to a function, it was widened first. Other results now

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are possible. Consider the following:

```
void g()
{
    void g2();
    void g3(double);
    void g4(float);
    void g5(int, ...);

    float f = 1.2;

    g1(f);
    g2(f);
    g3(f);
    g4(f);
    g5(100, f);
}
```

When **g1** is called, **f** is widened to **double** as it always was. It's the same when **g2** is called, because no argument list information is provided to indicate otherwise. In the case of **g3**, the prototype contains **double** (a wide type). Therefore, **f** is widened before being passed.

The prototype for **g4**, however, contains a narrow type, and in this case (and those having **char** and/or **short** arguments) it's implementation-defined whether or not the argument is passed without widening. The compiler writer can choose to leave it narrow or widen it. So if you use narrow types, always specify the prototype as such to take advantage of more efficient passing if it's supported.

In the case of **g5**, the second argument corresponds to the ellipses in the prototype and is widened. Not only does this make sense in the absence of a narrow type in the prototype, but it also is a necessary decision required by **printf**. **printf** has no **float** masks, because it relies on **float**s being widened to **double**.

ANSI C added a new way to declare and define a function and made the "old styles" obsolescent, the first step necessary to get them removed from future versions of the language standard. While most combinations of old- and new-style function declarations and definitions can coexist, those involving narrow types can't. For example:

```
/* file a.c */

void fun(float);

void g()
{
    float f = 1.23;

    fun(f);
}
```

```
/* file b.c */

void fun(arg)
float arg;
{
    /* ... */
}
```

Consider an implementation that passes **float**s without widening in the presence of a prototype containing **float**, as does DEC's VAX C. In that case, **fun** would be called with a **float** value being passed, which might be, for example, 4 bytes. However, in b.c, **fun** expects a **double** (possibly 8 bytes long), despite the fact that **arg** is declared as **float**. When the compiler generated code for the definition of **fun**, it took a **double** off the stack (or wherever function arguments are located) and converted it to a **float** before using it. The only way to have the correct code generated is to define the function using the new style, i.e., as:

```
/* file b.c */

void fun(float arg)
{
    /* ... */
}
```

The correct behavior always will result whether or not the compiler widens **f** before calling **fun**, because the rules it follows for the call are the same as those it uses for the definition.

New Constant Types

To round out language support for **float** and **double**, new floating-point constant types were invented by ANSI C. An unsuffixed floating constant continues to have type **double**. If suffixed by the letter **f** or **F**, it has type **float**. If suffixed by the letter **l** or **L**, it has type **long double**. Because **l** can look like a **1**, it's suggested you use **L** instead.

New printf/scanf Family Support

As stated above, any narrow argument that matches an ellipses in a prototype continues to be widened before passing. Therefore, **printf** needs no adjustment for **float**'s new status. However, it needs additions to handle **long double**.

The floating-point masks are **%e**, **%f** and **%g**. However, it was implementation-defined whether the exponent in **%e** and **%g** contained an uppercase or lowercase E. That has been changed by the addition of the masks **%E** and **%G**. Now, the uppercase masks generate an uppercase E, while the lower-

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case masks generate a lowercase e.

To accommodate **long double**, the modifier **L** was added, specifying that a following **e**, **E**, **f**, **g** or **G** conversion specifier applies to a **long double** argument.

Another addition is the use of * in a field width or precision. This has been implemented in libraries for years but wasn't universal. If a * occurred in a width or precision specifier, the next argument was assumed to be an **int** that contained the value to be used in its place. For example:

```
#include <stdio.h>

main()
{
    printf("|%8.*f|, |%*.4f|, |%*.*f|\n",
    4, 1.234567,
    8, 1.234567,
    8, 4, 1.234567);
}

|  1.2346|, |  1.2346|, |  1.2346|
```

The * isn't limited for use with floating-point edit masks.

scanf always has been somewhat asymmetric to **printf**, because **scanf** expects pointers to objects, and widening doesn't apply to narrow types passed by address. As before, **scanf** continues to support **e**, **f** and **g** as pointer to **float** and **le**, **lf** and **lg** as pointer to **double**. It now supports **Le**, **Lf** and **Lg** as pointer to **long double**.

The * notation has been used to indicate conversion suppression in **scanf** so that field width and precision values can't be supplied as run-time arguments as in **printf**. I'm not aware of a version of **scanf** that provides notation for achieving this.

Rearranging Grouping Parentheses

K&R (first edition) states that grouping parentheses in expressions that were associative and commutative could be rearranged arbitrarily by the compiler. For example:

```
a + (b + c)
(x * y) * z
```

could be rearranged as:

```
(a + b) + c
x * (y * z)
```

or as:

```
b + (a + c)
(x * z) * y
```


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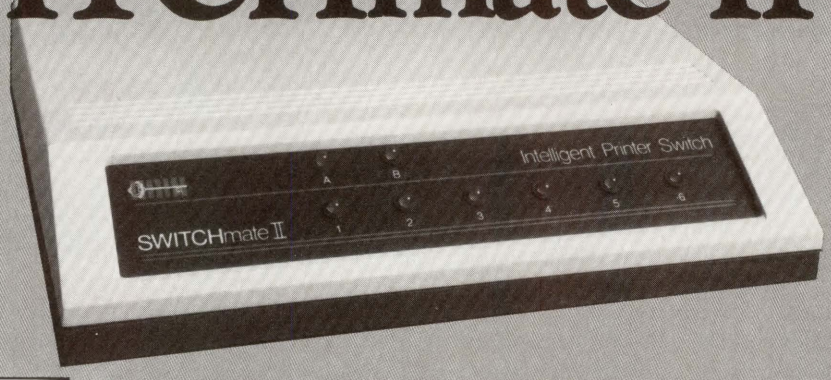

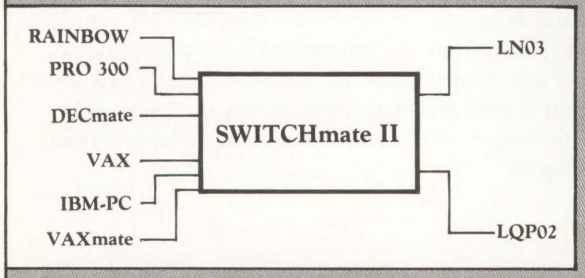

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In integer arithmetic on machines with no overflow interrupt capability, the correct result always was obtained. This isn't so with floating-point operands. Either a numerical programmer avoided such expressions, or the implementer always honored such grouping parentheses.

After at least two failed attempts within ANSI to force an implementation to always honor such parentheses, this was achieved because of France's insistence that this be "fixed" in the ISO C Standard. Because ANSI and ISO C committees want both standards to be identical, grouping now must be honored in all cases in an ANSI-conforming implementation.

Floating-Point Properties

Numerical programmers feel that it's necessary to be able to determine certain aspects of the floating-point properties of the underlying hardware.

For example, what's the exponent range of **float**, and how many significant digits can a **long double** represent? These and many more properties have been provided by ANSI as macros in the header **float.h**. Only one of these macros (**FLT_RADIX**) is required to be a compile-time integer constant expression suitable for use with the **#if** directives. All others are permitted to expand to function calls, such as global variables, because on some systems the values may not be constants. The complete set of macros in **float.h** is described in your compiler library manual and won't be detailed here.

An equivalent set of macros for integer types also exists in ANSI C and is called **limits.h**.

Math Library

An ANSI-conforming library only needs double versions of the **math.h** functions. However, the names of all **math.h** functions suffixed with **f** or **l** are reserved for **float** and **long double** versions, respectively, should an implementation wish to provide them. For example:

```
float sqrtf(float);
double sqrt(double);
long double sqrtl(long double);
```

Historically, **errno** was declared in **math.h** with various macros of the form **E***. This is no longer true. A new header called **errno.h** has been invented as a home for **errno** and related macro values. And while a given implementation may have many different values to represent errors in **errno**, ANSI C contains only two: **EDOM** for domain errors and **ERANGE** for range errors. Further, the widely implemented use of a default function **matherr**, which the user could override, isn't permitted by ANSI C.

The macro **HUGE**, used by some math functions, now is called **HUGE_VAL**, and an alternative to **atof** has been provided. **strtod** does the same as **atof**, but it provides error handling.

Many commonly provided math functions and names aren't permitted in ANSI-mode. They include the Bessel functions and the **complex typedef**.

ALL LIBRARY ROUTINES that recognized or produced values containing a radix point used a decimal point. In non-English cultures it's common to use other characters, e.g., the comma.

Many cultural "hooks," in addition to numeric formatting, are provided in ANSI C via the notion of a locale. If something in the standard library is locale-specific, its behavior "depends on local conventions of nationality, culture and language that each implementation shall document."

The only locale a standard implementation must provide is **"C"**, which causes the traditional behavior we've come to expect. A locale has at least five subparts designated by the macros **LC_COLLATE**, **LC_CTYPE**, **LC_MONETARY**, **LC_NUMERIC** and **LC_TIME**. The function **setlocale** can be used to change all or part of a locale at run time, and the **localeconv** function fills in a structure with locale information, including a description of currency formatting.

When a conforming program begins execution, it must start in the **"C"** locale.

With the addition of the **#pragma** preprocessing directive, it's possible for an implementation to provide interesting extensions for floating-point support and other areas. Because the syntax and semantics for a pragma directive are up to the implementer, the range of possibilities is as big as his imagination. He could, for example, provide a pragma that could be used to specify particular floating-point registers to be used. Or, he could permit in-line access to floating-point and other specialized instructions.

Beyond ANSI C

The ANSI C Standard provides better support for numerical programming but doesn't go far enough. One of the main reasons it falls short is because there's little "prior art" in this area, and the standard was mostly devoted to consolidating existing practice and forming a detailed specification of what we already had.

Let's look at why numerical people are interested in C. While the ANSI FORTRAN committee is extending F77 in various ways, many non-C programmers see thousands of C disciples graduate, while few new programmers learn FORTRAN. There's a high demand for C-related skills, and having them is attractive on your resume. C is popular, and portable C code can be written (with the appropriate care). However, these aren't sufficient reasons to discard FORTRAN, particularly if your shop has man-years of code already written in FORTRAN. In its present shape, C can't compete with F77 in such areas as variable-dimensioned arrays and complex arithmetic.

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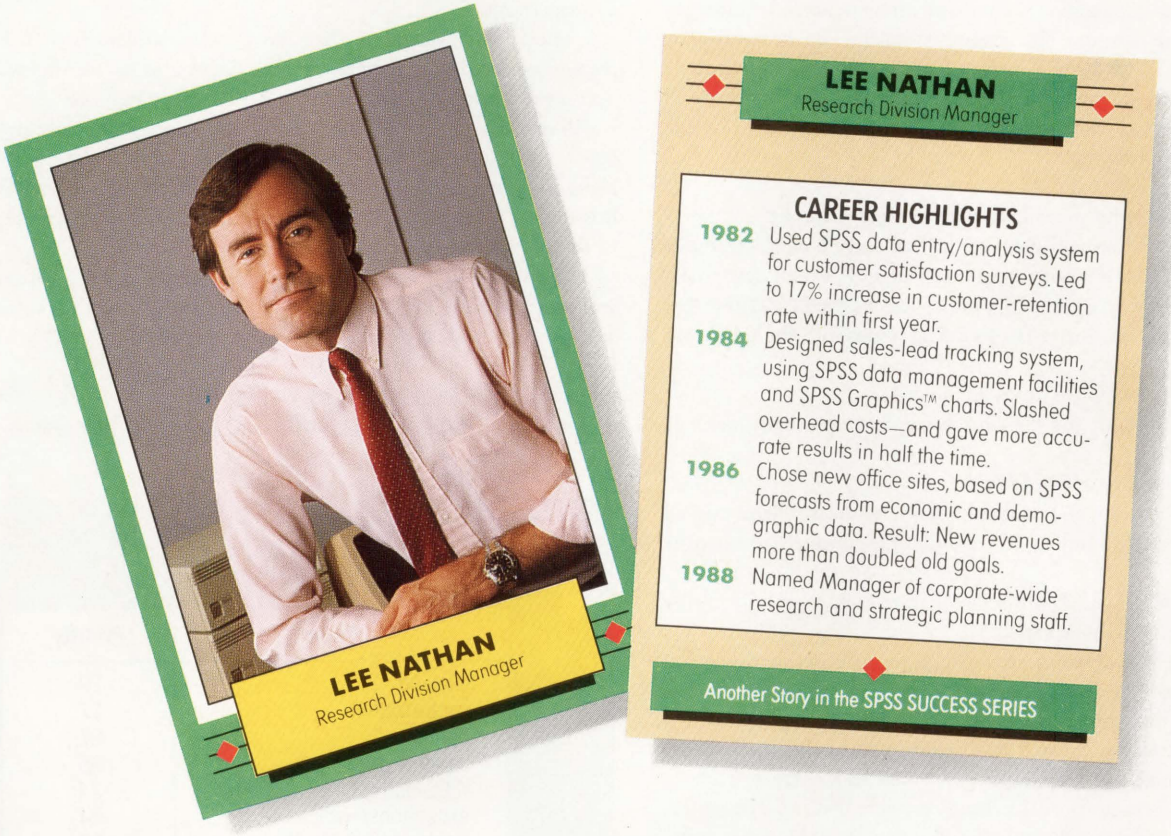

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moving to supercomputers. Machines such as those from Cray, Convex, FPS Computing, Stellar and Thinking Machines are examples. Almost all such hardware companies build hardware only. They rely on off-the-shelf operating systems and development tools to make their hardware do useful work. Most run a variant of UNIX, and because C is the native language of UNIX, it usually becomes the dominant if not the only language they provide and support. Therefore, people who want to exploit these systems often are forced to program in C.

Numerical C Extensions Group

Because of my involvement in X3J11, my writing and teaching interests and starting *The Journal of C Language Translation*, a quarterly publication aimed at C language implementers, I've formed an extensions group. The group is called The Numerical C Extensions Group (NCEG), and its broad purpose is to standardize extensions to the preprocessor, language and/or library as appropriate to satisfy the increasing interest in C shown by the numerical community.

Initially, NCEG should:

1. Identify existing prior hardware and software art.
2. Identify existing and pending formal and de facto standards and establish a liaison with them (X/Open, OSF, POSIX, X3J11, GKS and ISO immediately come to mind — maybe even FORTRAN 8X).
3. Identify and prioritize the technical issues into the following categories:
   - Must have now or as soon as possible.
   - Can live without for the time being but eventually need or would like.
   - Wishful thinking. (Wouldn't that be nice?)
4. Recognize, accept and rationally deal with the problems created when competing vendors and conflicting commercial interests arise.
5. Immediately identify those areas that such a group can't or chooses not to standardize.

When I conceived of an ad hoc group to define numerical extensions to C, I didn't know what the reaction would be. The evidence is that this is worthwhile. More than 90 people asked to be added to the contact database, and 30 of them attended a one-and-a-half-day meeting at Cray Research, May 10-11.

The backgrounds of the attendees were diverse. The supercomputing industry was represented as was the IEEE community. The digital signal processing industry and the user community also were represented. Organizations represented included Digital, Hewlett-Packard, Control Data and IBM. Dennis Ritchie from AT&T also participated.

There was no real sentiment that we deliberately go against the direction established by ANSI C — quite the contrary. However, it was recognized that some of ANSI C's constraints may impede our activities, resulting in possible conflicts. The issue of **errno** and formatted I/O of NaNs and infinity are examples.

The main purpose of the meeting was to identify and prioritize the principal technical issues. The group voted on each topic, indicating high or medium (or no) priority. High-priority votes were weighted twice as much as medium-priority votes. The resulting list is shown in the Figure. The topic "Arrays as first class objects" had high priority (21), but after considerable debate it was dropped from the list, because its addition probably would confuse existing C programmers.

There was consensus that we become affiliated with a recognized standards organization. The final proposal was that we become a working group within X3J11. If we follow that route, it will result in our publishing a Technical Report, a non-binding report on our findings and recommendations. Getting our extensions adopted as a standard is also possible in the long term. At this stage, I plan to ask for agenda time at the next X3J11 meeting to discuss admitting us as a workgroup.

The next two meetings are scheduled in the same location and week as those of ANSI C's X3J11. These NCEG meeting dates are September 19-20 in Salt Lake City and March 7-8, 1990, in New York.

Editor's note: Portions of this report initially appeared in the June 1989 edition of Rex Jaeschke's The Journal of C Language Translation.

FIGURE.

Topic	Priority
aliasing	29
vectorization	27
complex	27
variably dim arrays	25
IEEE issues	24
exceptions/errno	24
float/long double library	23
parallelization	22
ANSI	21
array syntax	19
extra math functions	17
aggregate initializers	15
interlanguage issues	15
wide accumulators	10
math function precision	9
non-zero-based arrays	8
numerical representation	6
new data types	4
new operators	4
function overloading	4

Main numerical issues.

Teaching dyed-in-the-wool FORTRAN programmers that arrays in C start at zero instead of one and what a pointer is can be non-trivial and catastrophic. C can provide a lot of power, but you also get the responsibility of that power, and you have that power whether or not you need it. For example, you could write a program that never directly uses pointer notation, yet through some subtle coding errors generates a stray pointer that may take hours or days to locate. You can cause many overt and covert problems just by calling standard library routines incorrectly.

C isn't a cheap language in which to develop, and I hate to see it used for any environment for which it's not yet equipped. I'm not saying that you shouldn't use C for numerical applications. But C, like most languages, isn't the greatest language for all applications. Other languages may be more suited to a given approach. The investment you have in skills and already-developed software should weigh heavily on your decision.

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. international representative for ISO, as well as editor of* The Journal of C Language Translation*, a quarterly publication aimed at C implementers.*

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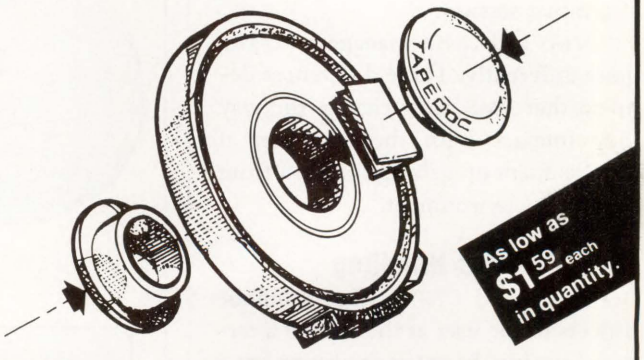

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Process Handling And Input/Output

ULTRIX

Philip E. Bourne, Ph.D.

In the last column (July 1989), we marveled at the elegance and simplicity of the UNIX file system. In this installment we continue the themes of elegance and simplicity with a discussion of UNIX process and I/O handling.

VMS commands are interpreted by the DCL Command Language Interpreter (CLI); UNIX commands are interpreted by the shell. The shell, like the VMS CLI, is the outermost layer of software making up the operating system (see Figure 1). The shell may call commands and utilities or interface directly to the system service routines, which, in turn, interface with the kernel — the center of this nutty environment. One function of the kernel is to create and manage the processes you need during a terminal session.

VMS and UNIX manage processes quite differently. These differences demand that VMS users change the way they interact with the computer if they're intent on getting the most from the UNIX environment.

UNIX Process Handling

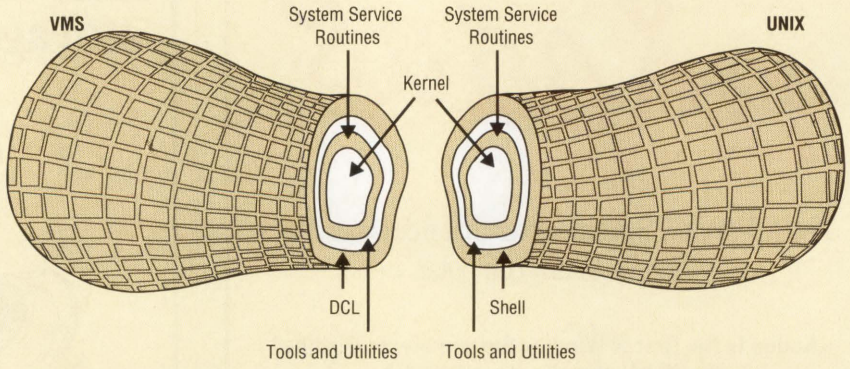
Both VMS and UNIX assign a unique process to the user at the start of a terminal session. Every such process has a unique process identification number. In UNIX, the purpose of this process is to run the shell program. The difference in the way in which VMS and UNIX use processes becomes apparent when a command is issued. Figure 2 uses the UNIX **ps** and the VMS SHOW PROCESS commands to illustrate this difference.

The VMS user has a single process. The UNIX user has two processes: the shell process (**csh**) and the process running the **ps** command. The **STAT** field (state of the process) indicates that the shell process has been stopped for a short period of time (**S**) and that the **ps** command is running (**R**). UNIX forked (compare VMS SPAWN) a separate process to run the **ps** command. This has important implications, but first let's see in more detail what's happening when the **ps** command is issued.

The shell program parses the command line and determines that it isn't a built-in shell command, which would be executed by the parent shell process. The shell then sends a fork system call to the kernel, which generates a child process with the same characteristics as the parent shell process to execute the **ps** command. Following command execution, the child process sends an exit system call to the kernel, which terminates the child process and returns control to the parent. Figure 3 shows one advantage that the use of a separate process to execute a command has over the single process used by VMS.

After compiling a large program

FIGURE 1.



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VMS and UNIX operating-system topology.

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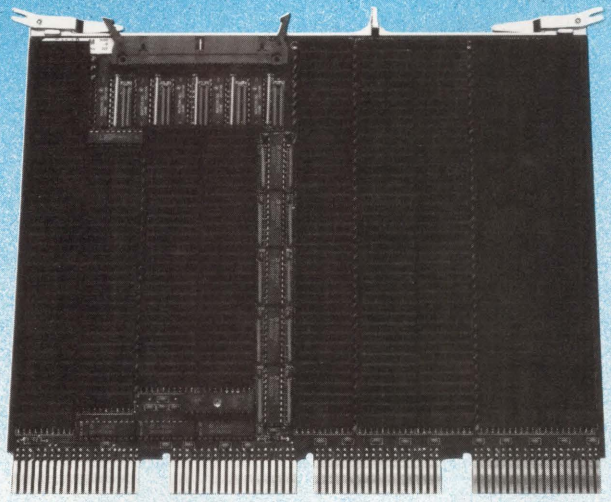

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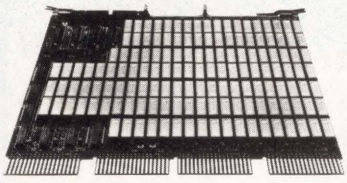

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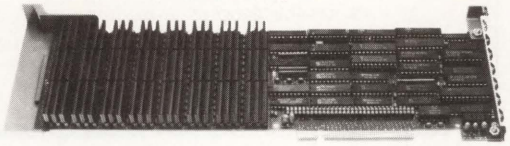

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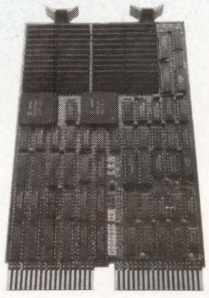

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for several minutes, suddenly you aren't sure that the correct source code is being compiled. So as not to waste the CPU time already spent if it's the correct source code, you stop, rather than terminate, the compilation and examine the source code file.

UNIX — While compiling the FORTRAN program **myfile.f** with the UNIX command **f77** (compare the VMS FORTRAN command), the child process running the compilation is stopped with CTRL-Z. Control returns to the parent process, which forks another process to execute the **cat** command (compare the VMS TYPE command). At the conclusion (or interruption) of file display, the child process running the **cat** command dies, and control returns to the parent process. The UNIX user, having determined that the correct source code is being compiled, issues the command **fg** (foreground), which restarts the stopped child process responsible for the compilation. The **fg** command is executed by the parent shell process; no new child process is generated. Such commands are built into the shell and are therefore specific to the shell — in this case the C shell.

VMS — Analogously, the VMS user stops the parent process, spawns a subprocess to display the source-code file and then reattaches to the parent process to continue the compilation.

Both look much the same, so where's the UNIX advantage? The advantage is that the UNIX user, rather than stopping the parent process, could have left it running while displaying the source code. VMS is more restrictive in regard to similar multitasking activity. When VMS spawns a subprocess, the parent process almost always hibernates until control is returned to the parent process. Only one process is active at any time.

The exception is the VMS command RUN/PROCESS, which simultaneously runs an executable image while the parent process performs other tasks. The UNIX user simultaneously can run any number and types of tasks. Although only one task receives input from the terminal, any number can generate output. Each task is referred to as a job. At any given instant, one foreground job is receiving input from the terminal and any number of background jobs are generating output. Output is, by default, sent to the terminal. This can be confusing if several tasks are simultaneously producing output.

A VMS user requiring extensive multitasking either uses batch queues or, if a workstation is available, opens multiple windows, one for each task. Most versions of UNIX, ULTRIX included, don't support batch queues. This could be a disadvantage if the system's resources are limited, because UNIX foreground and background processes don't give the system manager the control over resource allocation that's possible with VMS batch queues.

In UNIX, CPU-intensive background jobs begin running at the same priority as foreground jobs. A job that runs longer than a period defined by the system manager, say five minutes, is "niced," that is, its priority is reduced

FIGURE 2.

```
        VMS
example: $ SHOW PROCESS
        24-APR-1989 11:45:17.67   TWA5:              User: SYSTEM
        Pid: 00000035   Proc. name: SYSTEM_TWA5      UIC: [SYSTEM]
        Priority:   4   Default file spec: SYS$SYSROOT:[SYSMGR]

        Devices allocated: TWA5:

        UNIX
example: % ps
         PID  TT  STAT    TIME COMMAND
        12964 p5  S       0:00 -csh[system]
        13136 p5  R       0:00 ps
```

Examining processes.

FIGURE 3.

```
        VMS                                                    UNIX
example: $ FORTRAN MYFILE.FOR                                  % f77 myfile.f
        <CTRL>Y                                                <ctrl>z
                                                               stopped

        $ SPAWN
        %DCL-S-SPAWNED, process PROCESS_1 spawned
        %DCL-S-ATTACHED, terminal now attached
                  to process PROCESS_1
        $ TYPE MYFILE.FOR                                      % cat myfile.f
        .....                                                  .....
        $ ATTACH PROCESS
        DCL-S-RETURNED, control returned to process PROCESS
        $ CONTINUE                                             % fg
                                                               f77 myfile.f
```

Multiprocess handling.

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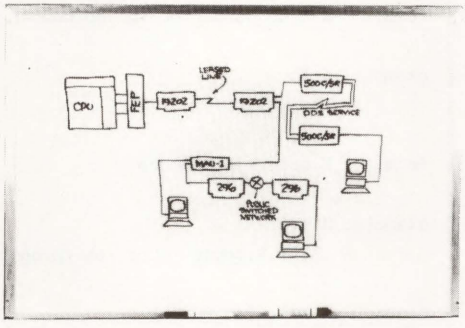

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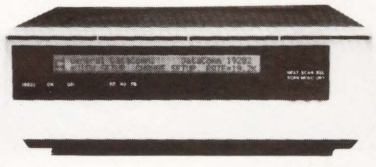

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so that it doesn't compete with short-term interactive tasks. Although moderately effective, this reduction in priority offers no mechanism to restrict jobs to a certain level of memory usage, CPU time limit and the like, as VMS batch queues do.

On the positive side, if sufficient system resources are available, a UNIX user can be very productive by simultaneously manipulating a number of interactive tasks.

Process Manipulation

Figure 4 illustrates a typical situation: a UNIX C shell user with five tasks to accomplish.

The C shell command **jobs** returns your tasks and the status of those tasks. The first field of the display, a number in square brackets, specifies the job number assigned to each task. The second field, + or -, indicates the current task and the next-to-current task, respectively. When you create a new task or change an existing task in some way, that task becomes the current task. Likewise, the task that was current before the creation or change becomes the next-to-current task. It's important to know which is the current task, because this is the one changed by default if a job number isn't specified.

The third field of the **jobs** display indicates the status of each task. For job [5], the display is **Stopped (tty output)**, indicating that this task is stopped and waiting to display output. If the task was awaiting input from a file or the keyboard, **Stopped (tty input)** would appear. The last field of the **jobs** display contains the command string defining the task.

The remaining examples show how these tasks might be manipulated. When referring to a job number, the number is preceded by a percent sign: **%2 &** changes the state of job 2 from stopped to running; **%5** (or **fg 5**) brings job 5 from the background to the foreground; **stop %3** changes the background job 3 from running to stopped; and **kill %4** deletes background job 4. Note that **fg** (without a job number) would bring the current job to the foreground, in this example, job 2.

What happens to these tasks when you log out? First, if there are stopped jobs, the message "There are stopped jobs" appears and you aren't logged out (a disconcerting message seen frequently by a novice UNIX user familiar with VMS). Finding yourself stuck while issuing UNIX commands, you're likely to strike the CTRL-Z keys. To your relief, the shell prompt will be returned, but unbeknown to you, a stopped task has been generated in the same way we purposely stopped the compilation in an earlier example so that we could examine the source code. At log out time, you either attend to this stopped background task or immediately type the **logout** command again, whereupon any stopped jobs are removed.

Second, running tasks will continue

FIGURE 4.

```
        UNIX
example: % jobs
         [1]  -  Running                 find / -name myfile -print > find.out
         [2]  +  Stopped                 grep "hello again" /usr/file1 > grep.out
         [3]     Running                 cc /usr/progs/calc.c >& errlog
         [4]     Stopped                 vi users.lis
         [5]     Stopped (tty output)    more test.f

form:    % %job_number &

example: % %2 &
         [2]  grep "hello again" /usr/file1 > grep.out

form:    % %job_number or fg job_number

example: % %5
         more test.f

form:    % stop %job_number

example: % stop %3
         [3] + Stopped    cc /usr/progs/calc.c >& errlog

form:    % kill job_number

example: % kill %4
         [4]  Terminated   vi users.lis
```

Further multiprocess handling.

FIGURE 5.

```
                  VMS                                UNIX
form:                                        % command1 | command2 | command3
example:  $ SHOW USERS/OUTPUT=A.TMP          % who | sort | lpr
          $ SORT/KEY=(POSITION:40,SIZE:6) -
            A.TMP SYS$PRINT
```

Example of piping.

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to run when you log out. This isn't true of all versions of UNIX, but it's true of ULTRIX. However, if you log back into the system, any running processes won't be seen with the C shell **jobs** command, because such processes aren't children of the current parent process. However, they will appear in the **ps** listing and can be changed with any UNIX commands that affect processes.

UNIX Pipes

So far, we've seen how the UNIX user can manage a number of independent tasks. Another powerful feature of UNIX process management is the ability to synchronize a number of dependent processes in a pipe. Pipes permit complex and powerful command constructs from a number of seemingly simple and trivial UNIX commands.

Each command in the pipe is separated by a vertical bar (|). Upon parsing the command line, the shell uses the wait system call so that the kernel synchronizes each of the commands in the pipe. The output from the first command, rather than being sent to standard output (**stdout**), the terminal by default (compare the VMS logical name SYS$OUTPUT), is used as standard input (**stdin** — compare VMS SYS$INPUT) to the next command in the pipe. This sequence of events is illustrated in Figure 5.

The kernel starts three child processes simultaneously. However, **sort** (compare the VMS command SORT) must wait for input, namely, the output of the **who** command (compare the VMS command SHOW USERS). Similarly, **lpr** (compare the VMS command PRINT) must await output from the **sort** command.

When all output from the **who** command has been passed to **sort**, the child process responsible for running the **who** command dies. By default, **sort** uses the first field (delimited by a blank) as the sort key. Because the first field output by the **who** command is the log in name, records are sorted alphabetically by log in name. The **lpr** command then accepts as input the output from the **sort** command, and the child process responsible for **sort** dies. After printing the output of **sort** on the default printer, the child process responsible for **lpr** dies, and control passes back to the parent shell process. The result of the pipeline is a printed listing of all users on the system in alphabetical order.

A comparable sequence in VMS requires the creation of an intermediate file. The VMS example in Figure 5 creates a printed listing sorted by terminal device name. The output of the SHOW USERS command is saved in the file A.TMP. The contents of the file then is sorted on the device key, which is six characters long and commences in column 40. The output is sent to the default line printer.

The VMS user may regard the output of some UNIX commands as terse and uninformative. For example, the VMS DIRECTORY command begins with the directory and device name, lists the files in the directory and ends with the total number of files. The comparable UNIX command, **ls**, merely lists the files, because that file list is very useful for passing to another command in a pipe. In the simplest case, **ls|wc -l**, the output of **ls** is piped to the command **wc -l** (word count), which returns the number of lines in the input. The output of **ls**, when piped, is one file per line. So, what's displayed by **ls|wc -l** is the number of files in the directory.

That's the information that VMS provides anyway, but what if you want to mail the directory listing to user fred? The command **ls | mail fred** does it with fewer keystrokes than it takes in VMS. Similarly, **ls | lpr** (compare the VMS command DIRECTORY/OUTPUT=SYS$PRINT) would send the directory listing to the default printer.

Input/Output Redirection

We indicated that input, output and error data streams can be redirected either in a pipe or to and from files. UNIX accomplishes this with the use of characters (called metacharacters) that have a special meaning to the shell. The vertical bar used in a pipe is one example of a metacharacter. Figure 6 sum-

FIGURE 6.

Character	Meaning
>	Redirect standard output
>!	Redirect standard output, disregarding noclobber
>>	Redirect and append standard output
>>!	Redirect and append standard output, suppressing error and opening a new file if output file does not exist
<	Redirect standard input
<<xxx	Read input up to a line identical with xxx*
>&	Redirect standard output and standard error
>&!	Redirect standard output and standard error, disregarding noclobber
>>&	Redirect and append standard output and standard error
>>&!	Redirect and append standard output and standard error, suppressing error and opening a new file if output file does not exist
|	Redirect standard output to another command
| tee	Direct standard output to another command and a file
|&	Redirect standard output and standard error to another command

* Unique to the C shell

UNIX special characters used in redirection.

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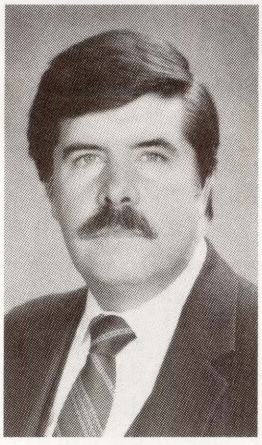

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FIGURE 7.

```
VMS                              UNIX
example:
$ ASSIGN/USER SYS$OUTPUT A.LIS
$ ASSIGN/USER INPUT.DAT FOR005
$ RUN MYPROG                     % myprog < input.dat > a.lis
```

Example of I/O redirection.

FIGURE 8.

```
          UNIX
example: % echo "please call me" | mail fred
example: % ls -l | grep "^d"
example: % head -1 * >> index ; lpr index &
example: % file * | grep ascii | lpr -Plaser
```

Further examples of piping and I/O redirection.

marizes these metacharacters.

Thus, > indicates output to a file; <, input from a file; >>, append to a file; >&, output and errors to a file; and so on. Redirection is possible because, as we saw in July, UNIX files have no structure. Hence, input sent from a file is interpreted by UNIX in the same way as what you type at the terminal. The VMS user uses the ASSIGN command to redirect SYS$INPUT, SYS$OUTPUT and SYS$ERROR. Figure 7 shows an example of UNIX redirection to and from a file.

myprog < input.dat > a.lis causes the executable program **myprog** to read input (<) from the file **input.dat** and send output (>) to **a.lis**. Note that:

1. UNIX redirection is in effect only for the command line in which it is used (compare VMS ASSIGN/USER_MODE).
2. Error messages haven't been redirected and would appear at the terminal.
3. If the file **a.lis** existed prior to program execution, VMS would create a new version of the file with a higher version number. By default, UNIX overwrites any existing file with the name **a.lis**. Overwriting of a file through redirection is aptly called clobbering. C shell users may prevent clobbering with the built-in shell command **set noclobber**. It warns you that the proposed output file already exists and the command won't be executed.

Let's conclude with several examples that illustrate process and I/O handling. The important point for the VMS user is the departure from a sequential mode of thinking — first issue one command, then issue a second command based on the result of the first, and so on. The UNIX user gets as much done on a single command line as possible and has any number of command lines running simultaneously (see Figure 8).

The command **echo "please call me" | mail fred** is a one-liner for sending a mail message to user fred. The C shell command **echo** (compare the VMS command WRITE SYS$OUTPUT) echoes a text string to standard output. Here, however, the string is piped to the **mail** utility and sent to user fred.

The command **ls -l | grep " ^d"** introduces the use of a regular expression — the use of a metacharacter in a string definition. **ls -l** produces a long listing, one file per line, of files in the current directory (compare the VMS command DIRECTORY/FULL). The first character of each line describes the type of file. **d** indicates that the file is a directory pointer. **grep " ^d"** (compare the VMS command SEARCH) searches and displays those lines that have **d** as the first character. The result is a listing of all pointers to subdirectories. **head -1 * >> index ; lpr index &** creates a file called **index**, which contains the first line (**head -1**) of all files in the current directory.

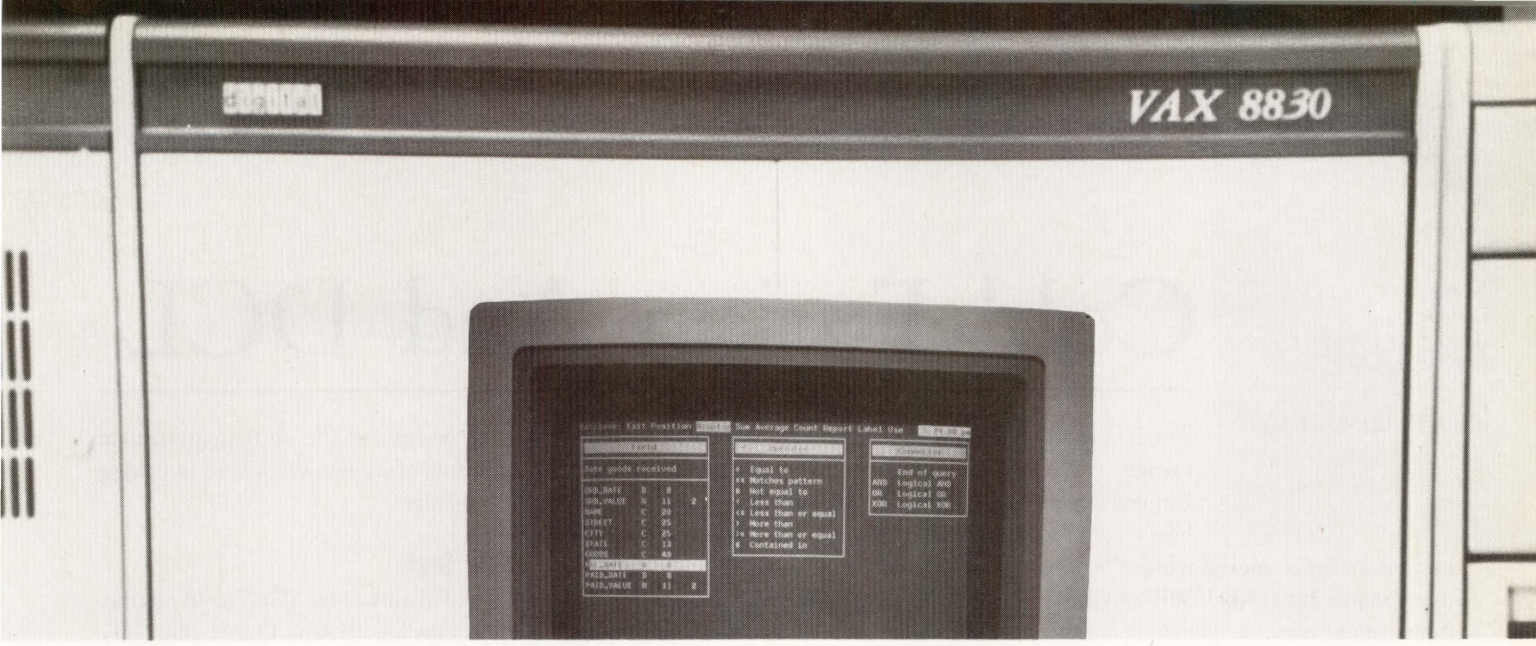
Note that >> causes each entry to be appended to the file **index**. If > were used, each new entry would overwrite the previous entry. Hence, **index** would contain only the first line of the last file in the directory. After the file **index** has been created, control passes to the **lpr** command, which prints the file on the default printer (compare the VMS command PRINT). We aren't piping output but are executing two separate commands in sequence (indicated by the **;**). Terminating the command line with an ampersand (**&**) causes execution to begin in background. The shell prompt is returned and a new command may be issued while the previous command continues to execute in the background.

Finally, **file * | grep ascii | lpr -Plaser** creates a printed listing on the print queue **laser** of all ASCII files in a directory. The command **file** reads part of each file in the current directory and makes a guess as to the type of information read. The listing produced by **file** contains the name of each file and the type of file contents found. This information is piped to **grep**, which searches for the string **ascii**, passing any records found to the **lpr** command for printing.

Issuing VMS commands to complete a complex application and then moving to a UNIX processor to achieve the same result is akin to moving from the top floor of a five-story walk-up to a penthouse apartment on the 20th floor of a building with an express elevator. Not only is the result better, but the method of getting there consumes less time and energy.

Hints or kinks useful to VMS users grappling with UNIX will be received gratefully. Send information via e-mail to SYSTEM@CUMBG.BITNET or pbourne@cunixc.cc.columbia.edu.

—Philip E. Bourne, Ph.D., is senior associate at the Howard Hughes Medical Institute at Columbia University and the author of UNIX for VMS Users, *published by Digital Press.*



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CIRCLE 328 ON READER CARD

DCL DIALOGUE

Kevin G. Barkes

Cold Fusion And DCL

The late entertainer Will Rogers is perhaps best-known for his immortal words, "I never met a man I didn't like." Will obviously never ran into a prospect-starved salesperson on the last day of a DEXPO.

Another of his famous lines is, "It's not what we don't know that hurts, it's what we know that ain't so." I call this The Will Rogers Syndrome — accepting as fact the utterings of an individual in a position of influence without verifying the accuracy of the statement.

Certain groups are less prone to this weakness than others. Physicists are a particularly stubborn lot, as the recent business over cold fusion proves. Physicists will look askance at any claim that hasn't been independently duplicated and verified.

On the other hand, VMS users, especially newcomers to the community, have a tendency to believe everything they read in the press and hear in DECUS sessions.

Fortunately, there are (to borrow a Jimmy Carterism) moral-equivalent physicists who are also VMS users.

A Good Question

At the May DECUS Symposium in Atlanta, I mentioned in passing during my session that the efficiency of DCL command procedures could be increased by "pre-tokenizing" the code prior to execution.

This observation was based on an experiment I conducted that was prompted by a letter from a reader. While wandering through the microfiche, the reader had discovered a routine within DCL called "DCL_DIET". Intended to improve the interpreter's efficiency, the routine collapsed all excess spaces in command lines, shortened commands to their smallest unique form, discarded comments and did other things to speed subsequent execution of the same lines of code.

To test this routine, I quickly created a command file that looked something like this:

```
$ COUNT = 0
$ GOTO BOTTOM
$ TOP:
$!
.
. 10,000 comment lines
.
$ BOTTOM:
$ COUNT = COUNT + 1
$ WRITE SYS$OUTPUT "At bottom - count ''COUNT'"
$ IF COUNT .EQ. 2 THEN EXIT
$ GOTO TOP
```

When executed, it took DCL quite a while to chug through the comment lines before it printed, "At bottom - count 1". However, "At bottom—count 2" appeared almost instantly, proving that DCL indeed had blown away the superfluous comment lines.

After I told this story at DECUS, someone said that he had run benchmarks on a 250-line command file and had observed virtually no difference in elapsed CPU time. Another recounted how his site had appeared to have cut the execution of a procedure in half by shortening commands to the smallest acceptable length. He later discovered the improvement was the result of a reduction in I/O caused by the file allocation size shrinking from six to three blocks.

This was serious stuff. When I returned from DECUS, I performed my own benchmarks using a more realistic-sized command file so that inordinate amounts of useless I/O would not skew the results.

The Test

I decided to use the Tic-Tac-Toe game, TTT.COM (see "Don't Quote Me," July 1989, and TICTACTOE.DOC in ARIS/BB download). It seemed a good choice, because it contains code executed only once (during initialization), as well as subroutines repeatedly called throughout the procedure.

TTT1.COM was identical to the original procedure; TTT2.COM had the "pre-tokenizing" lines commented out.

I played each version of the game 100 times, using the same play pattern (user moves 1, 2, 7, 6, 8 and "N" for play again.) The Figure shows the averaged results. Aside from showing that a VAXstation 3100 is about 3½ times faster than a 750, what can we conclude from these numbers?

The differences in I/O and page faulting can be attributed to a number of factors beyond the immediate control of the user, such as system load and bus configurations. I've seen varying figures for these parameters when conducting my test informally on different machines. The elapsed CPU time, however, remained consistent in each test, regardless of processor.

On the 750, the "pre-compiled" procedure ran .18 seconds, or 2.2 percent, faster. The 3100 test showed the optimized TTT1.COM ran .11 seconds, or 4.8 percent, faster.

Why the variation? Could it be differences in VMS versions? Software-emulated microcode in the VAXstation CPU? Sunspots?

I performed another set of tests in which I answered "Yes" to the "Play

FIGURE.

	TTT1.COM	TTT2.COM
VMS 4.7 / VAX 11/750		
Elapsed CPU:	7.99	8.17
Page faults:	36	36
I/O:	134	131
VMS 5.1-B/ VAXstation 3100		
Elapsed CPU:	2.19	2.30
Page faults:	37	37
I/O:	103	105

Comparison of DCL execution times.

again?" question, then played 99 additional standard games. In each case, there was no difference in execution time among the procedures.

The reason for this result is obvious: You can optimize DCL only once. After the first pass through the procedure, DCL has performed all the optimization it can. So our 2.2 and 4.8 percent advantages dwindle on subsequent executions. After 100 passes using the "Play again?" option, the difference is only 1/100th of the original value.

Does this mean the "pre-compile" step is worthless? Maybe, depending on the size, structure and execution pattern of the command file. If TTT.COM were an important procedure that couldn't be converted into a program written in a compilable language and were executed 10 times daily by 10 users, we'd save 18 seconds of CPU time per day on the 750 and 11 seconds on the 3100. If, on the other hand, TTT.COM were a captive command file in which the users operated, only the first pass through would result in any CPU savings, and a small one at that.

Is it worth it? Only you can decide, based on your own analysis of command-file usage. Note that TTT.COM already was optimized when it was written, using the shortest legal command abbreviations available as well as extremely brief symbol and label names. The savings could have been greater if the original file had contained lots of comments, expanded commands and verbose symbols and labels. Testing of this hypothesis is, as they say in textbooks, left as an exercise for the reader.

As for me, I'm looking for heavy water, palladium rods and an old car battery.

FOR YOUR VERY OWN "I Love DCL" sticker and/or a listing of all FidoNet public bulletin board systems in the U.S. featuring message areas with DEC-related topics (VAX, PDP-11 and RAINBOW), send a self-addressed, stamped envelope to: BBS List and/or DCL Sticker, Kevin G. Barkes Consulting Services, 4107 Overlook St., Library, Pennsylvania 15129.

The list is also available on-line from my SYS$OUTPUT bulletin board system: (412) 854-0511, 1,200/2,400 baud, 8 bits, 1 stop bit, no parity. If you're active on FidoNet, ask your local sysop to file request DECBBS.LST from 1:129/38.

—Kevin G. Barkes is an independent consultant in VAX systems software, management, tuning and training based in Library, Pennsylvania.

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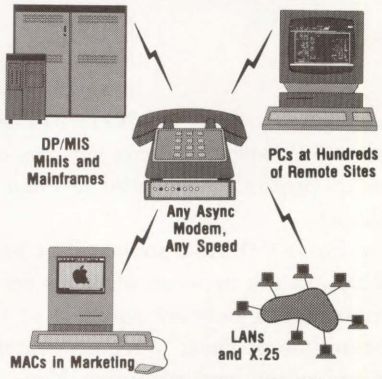

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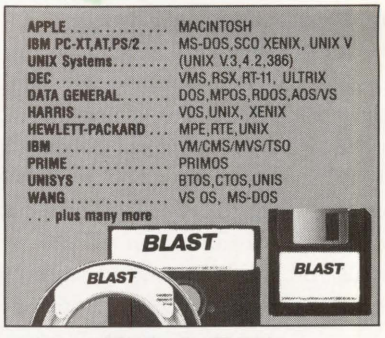

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NETWORKING

Bill Hancock

Phase V Migration: Method Or Madness?

Editor's note: In Part 1 of a two-part series, Networking Editor Bill Hancock explores steps you can take to prepare for migration to Phase V DECnet.

Phase V DECnet soon will be here. What can the network manager do to get ready? A network upgrade of the magnitude of Phase V requires careful consideration and planning. You can take several steps to prepare now.

Phase V DECnet still is called DECnet and looks like DECnet to the user. But under the skin, DECnet gets a lobotomy and becomes Open Systems Interconnect (OSI) compliant. This is good and bad.

On the positive side, there's the benefit of interconnectivity to other OSI-compliant network software and hardware packages. This means that gateways may become a thing of the past as the evolution of OSI to most vendors progresses. Another good point is that OSI is OSI is OSI. More specifically, there's a need to learn about multiple packages and protocols. With OSI, you learn the protocols and procedures for a protocol stack, much of which applies to all OSI-compliant packages.

On the negative side, if you need to evolve or modify protocols or algorithms because of congenital flaws or other problems, changing OSI isn't like complaining to Digital about a DDCMP problem and getting relief via a patch or recode. Modification of OSI standards involves committee meetings, studies and politics that are out of the control of any one company or organization. Running and getting support with a network product in the OSI environment isn't like running a proprietary vendor network product. The vendor may be responsive on the implementation, but there are items that still will require committee intervention. This is sometimes out of the vendor's hands.

Further, not all OSI implementations will perform in a way that's satisfactory in all system environments. OSI protocols aren't necessarily efficient for all system architectures. In OSI, certain areas of the requisite protocols contain options. Options allow for incompatible implementations of OSI among vendors, because some vendors may implement options and others may not. Features that exist in current product sets may have to be "emulated" under OSI, because there may not be a place in the standard in which the previous incarnation of a protocol suite is available.

Standards are "tuned" in many ways. There are as many political reasons as there are technical reasons for changes. As a result, sometimes standards get "politic'd," and this may cause unexpected results when the standard is implemented. Although the standards body involved may realize that there's a problem with the standard, the rectification may take time, because everyone must agree on the changes and avoid causing other problems as a result of the fix.

In short, Phase V has desirable features but requires re-education of expectations on the part of network users. Digital and others that are members of the committees that provide OSI protocols and services are subject to the standards as they evolve. Users of products developed by these vendors must adjust the way they expect the changes to occur and the product to evolve.

Phase V DECnet eventually is expected to provide a complete OSI implementation set that will allow OSI products from various vendors to interoperate with each other. This means that a Phase V node will be able to route packets for other OSI nodes, transparently move files between systems, provide for virtual terminal support and program communications, and provide other services from vendor to vendor.

Phase V Features

Phase V offers a number of new features. There probably will be more as OSI evolves.

1. Support for High-Level Data Link Control (HDLC) with LAPB for synchronous lines and other communications technologies. (Digital will continue to support DDCMP.)
2. Support for IEEE 802.3/802.2 packet formats (ISO 8802/3).
3. Support for Common Management Information Protocol (CMIP), a draft section of the Common Management Information Services (CMIS) for OSI network management and control. The initial implementation of this feature is provided by the new Network Command Language (NCL) utility. NCL is incompatible with NCP, so for networks in which there will be Phase IV and Phase V nodes, the network manager will need to use both utilities.
4. Allowance for more than one hardware link on an end node. This means that end nodes in Phase V may have more than one hardware connection to the network at a time. Routing among the hardware links isn't supported in an end node (end nodes may use all links but not route traffic among them) but is supported on routing nodes.
5. Support for OSI applications such as File Transfer, Access and Management (FTAM), X.400 Message Handling Stan-

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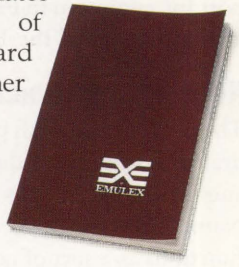

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dard (MHS, also known as electronic mail handling), and others as they evolve.

6. Support for connectionless (CLNS) and connection-oriented (CONS) routing facilities.

7. Support for OSI transport protocols for connection to other OSI nodes.

8. Use of the Distributed Name Service (DNS) to store names and provide/store protocol selection information. DNS also provides such services as address translation and replaces the DECnet Phase IV node database.

9. Continued support for Phase IV by Phase V through backward-compatibility features.

10. Support for OSI addressing, which allows very large networks and network addressing (literally billions of nodes on a network).

The following Phase IV products won't be supported directly by Phase V. They'll still be supported through Phase IV compatibility by Phase V nodes with compatible Phase IV addresses:

1. DEQNA Ethernet controller for Q-bus systems.

2. DECSA communications router (when configured as a DECnet router).

3. PDP-11 systems and operating systems.

4. DMR-11/DMV-11 for DECnet/VAX (VMS).

5. DECsystem 10/20.

Digital's recommendations for communications controllers for the Phase V environment for sites that will support Phase V on their operating systems are shown at the top of the Figure. The products Digital will support for migration to Phase V are shown at the bottom of the Figure.

Networkwide Naming

The new feature with perhaps the most dramatic impact on the network management and setup is the Distributed Name Service. DNS, simply defined, functions as a sort of network directory or database of what resource exists where. DNS provides consistent networkwide naming information on resources or objects. Such items include mailboxes, nodes, queues, objects (and their attributes), addresses and translations, and protocol information.

Within DNS, names and information are stored in structures called DNS directories. The concept is analogous to VMS disk directories. There's a root from which other levels of directories are created. Each directory structure is stored in a networkwide hierarchy called a namespace. The namespace is managed and maintained dynamically by the server and is modified, if required, by the network manager.

DNS provides facilities that allow a Phase V environment with some interesting capabilities:

1. You can choose how the network is managed. The namespace of the DNS units throughout the network can be managed in a distributed or centralized way, depending on how the network will be controlled.

2. Security (access to namespace information) can be controlled on an individual or group basis.

3. Namespaces can be scaled to provide proper sizing for the network or subsection being controlled. Further, the namespace can be replicated on other systems and synchronously updated automatically, without user assistance.

4. Commonly referenced information can be cached. This speeds access to frequently referenced namespace information.

5. A location-independent naming capability lets resources be moved transparently to applications and user access. Physical location of a resource becomes irrelevant and the resource can be moved without disturbing access by applications.

DNS works on a common network technique called the client/server model. Client applications communicate with one or more servers and request information from them. On each Phase V node, a clerk interfaces between the client and one or more of the distributed

FIGURE.

Ethernet/802.3 Controllers	
DELUA, DEUNA	UNIBUS systems
DELQA, DESQA	Q-bus systems
DEBNA	BI systems
DESVA	MicroVAX 2000, VAXstation 2000, DECstation 3100
Synchronous Controllers	
DMF32	UNIBUS systems
DMR11	UNIBUS DECnet/ULTRIX systems only (not VMS)
DMV11	Q-bus DECnet/ULTRIX systems only (not VMS)
DSV11	Q-bus systems
DMB32	BI systems
DST32	MicroVAX 2000 systems
DSH32	MicroVAX 2000 (Multicontroller 581)
DSB32	BI systems (WANController 220)
Asynchronous Controllers	
DMF32	UNIBUS systems
CXY08	Q-bus systems
DHQ11	Q-bus systems
DHV11	Q-bus systems
DHB32	BI systems
DMB32	BI systems
DHT32	MicroVAX 2000 systems
DSH32	MicroVAX 2000 systems

Digital recommends these communications controllers for the Phase V environment for sites that will support Phase V on their operating systems.

DECnet/VAX (VMS)	DECrouter products (except the DECSA)	VAX FTAM
DECnet/ULTRIX	DECnet-DOS	VAX OSAK
	VAX PSI and PSI Access	VAX MRX

Digital will support these products for migration to Phase V.

name servers on the network. A program requesting access (client) to the network passes information to the clerk for assistance in connection to the remote system. The clerk passes information to either a local or remote DNS. The DNS returns information about remote node addresses, protocols available and other things. The initiating node uses this information to make the connection and then stores it.

Within DNS are concepts new to the Phase V DECnet user and manager. First, there's the namespace. There's usually only one namespace per network (there could be more, but it would complicate management of the namespaces), because each namespace in the Phase V environment is a separate and distinct namespace entity.

Items in the namespace can be referred to by different names or aliases, because DNS allows soft links. Soft links allow the manager to set pointers among items or various references to an item in the namespace so that an item can be seen in various ways by different entities in the namespace.

Each namespace has a unique identifier called the Namespace Unique Identifier (NSUID) that's usually set up as a nickname on a particular node. This nickname usually appears as a logical name and can be used as such. For example, a namespace called PHASEV might have a subdirectory in it called SUB_DIR_1 and have files in the subdirectory such as MY_FILE. This would be represented to a user as:

```
PHASEV:SUB_DIR_1.MY_FILE
```

There may be many situations in which there's an entity called MY_FILE. But there's only one situation in which MY_FILE is subordinate to the entity SUB_DIR_1.

Names in DNS are case-sensitive. If there's a period or a space in a name, it must be contained in double quotes, or DNS won't find it properly. This means that care must be taken when identifying items to the namespace. Some pro-

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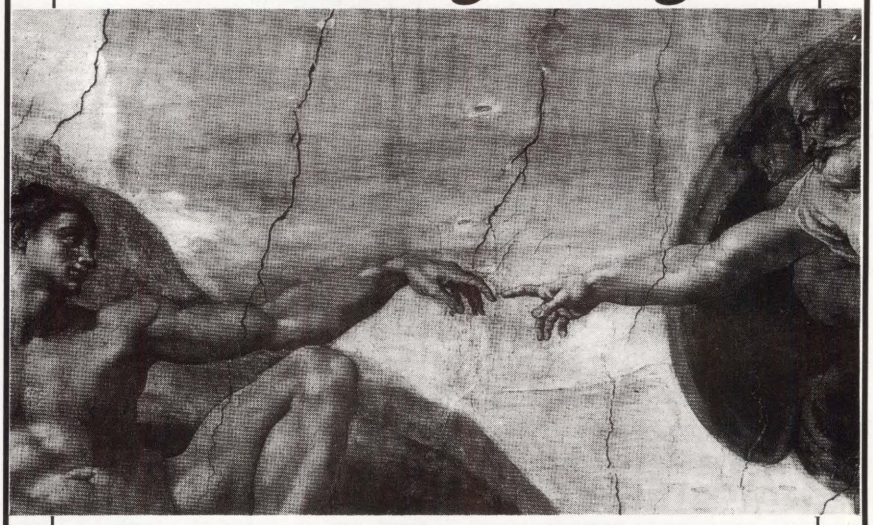

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CIRCLE 152 ON READER CARD

gramming languages are notable for using periods in variable names (BASIC for one), and interesting things can happen if care isn't exercised.

Every item in the namespace has a series of attributes specific to the entity (objects, directories, subdirectories, soft links) and a set of attributes specific to a class of entity (such as all objects). Because of this attribute-setting capability, the network manager can set access class restrictions, authorization entities and other items that may help user access and security.

The namespace can be split up as different directories on different servers and can be replicated on various servers. A function called the clearinghouse helps manage access to these entities. It consists of a particular set of directories located on a nameserver. The clearinghouse must be active to provide name service and service client requests. On a particular server there may be various clearinghouses, so partial sections of the namespace may or may not be able to service client requests based on the state of the clearinghouses.

Skulking Around

To help keep a Phase V namespace in an active state, replicas of various sections of the namespace can be kept on various servers. Thus, some clearinghouses have duplicate information, which is desirable in case of a server failure. By establishing duplicate entries in the namespace, another server in the namespace can pick up clearinghouse activities in case of a server failure. To accomplish this, entities in the namespace can be duplicated in a master/secondary relationship. If an entry in the namespace is duplicated, there's one master and at least one secondary location. Both can be updated, but the master retains certain network overhead functions required for access to the namespace and clearinghouse.

Because DNS acts as a type of distributed database, there's the problem of concurrency of updates to the namespace entities. If there's more than one occurrence of an entity entry in the namespace, the problem of concurrency appears. This means it's probable that the entry information in two or more clearinghouses for the same entity may not be the same. DNS doesn't guarantee the accuracy of the results that may be produced, because changes must be sent around the network and this may take time on large networks. DNS eventually will converge any changes to the entities in various nameservers on the network so that all will reflect the same information, but this can't be guaranteed.

To provide the concurrency function between replicated entities, a process called the skulker is provided. The skulker runs at either regular, scheduled intervals or on demand by a client. How often the skulker is set to run is directly dependent on the criticality of updates on the network. Running in the background, the skulker first creates a virtual "ring" where each directory has a pointer to one other replica in the namespace. When connected, all replicas form a ring. After the ring has been closed, the initiating skulk node goes to every master and secondary node and gathers all updates that have been made since the last skulk operation. These updates are added to the local clearinghouse and propagated to all replicas. The skulk begin time then is updated on all replicas.

The main purpose of the skulk process is to provide total concurrency of the various clearinghouse entity values. A secondary but still critical purpose is to provide background updates that aren't time-critical. For instances in which an update is required immediately, a separate module in DNS, called the update module, provides immediate update services. For example, if a new clearinghouse is established, all servers in the namespace would need to know about it immediately, because it affects how data is searched and accessed.

In Part 2, we'll look at network management, addressing, end nodes and other noteworthy issues. ■

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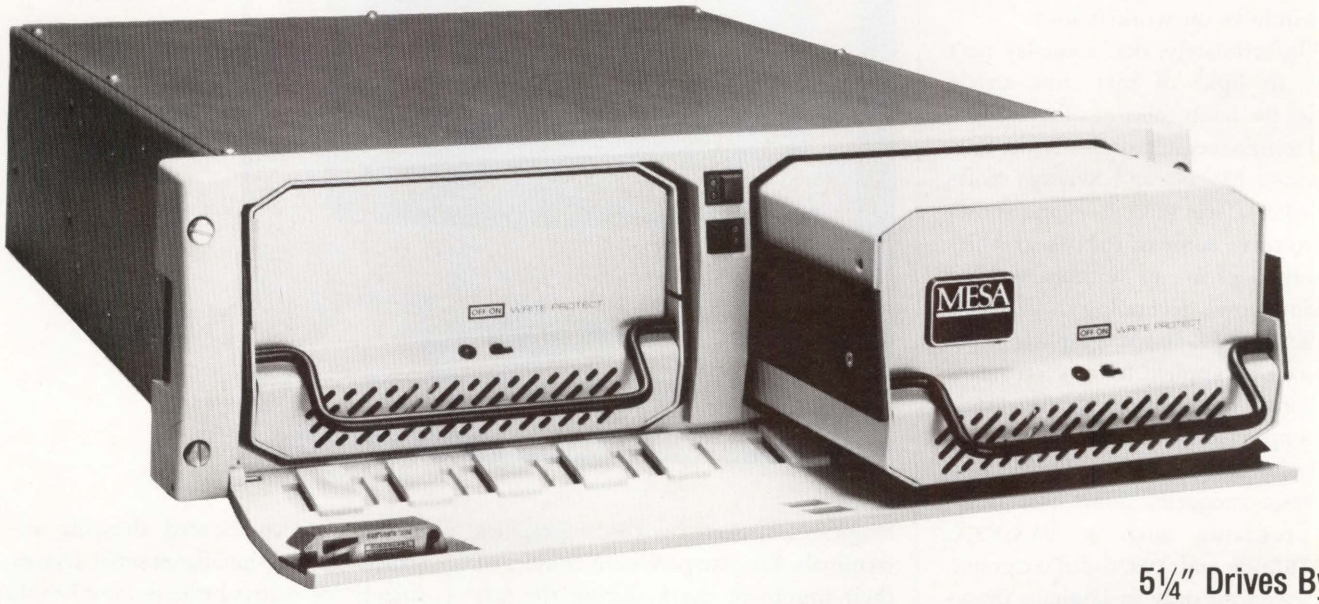

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THE MAC CONNECTION

Al Cini

Windows While You Wait

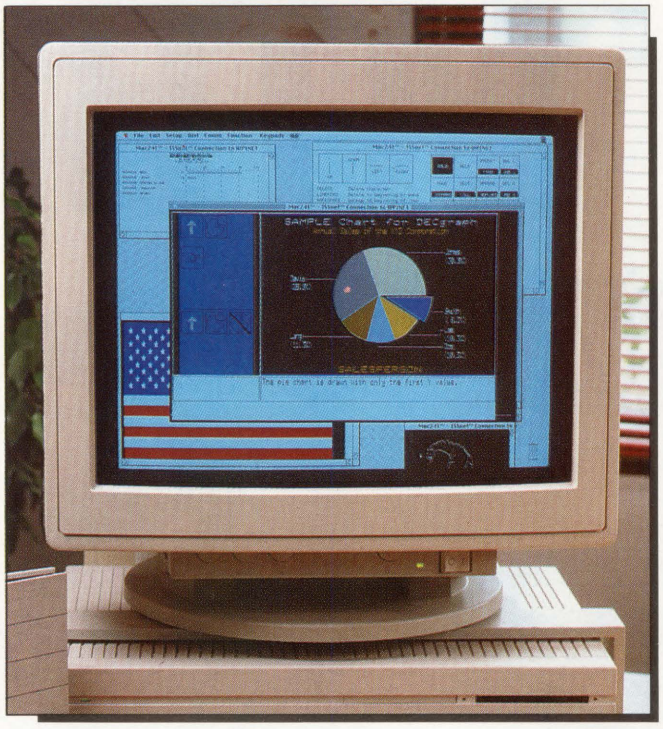
Someday, DEC customers will be calling up full-color, high-resolution pictures of people, places and things from vast relational databases, delivered automatically via DECnet/OSI and displayed through DECwindows on workstations.

Unfortunately, that someday isn't today. In light of that, this article reviews the latest releases of two Mac-based terminal emulators — White Pine Software's Mac241 and Synergy Software's VersaTerm PRO V3 — and shows how to solve some of today's graphics integration problems without waiting for tomorrow's technology.

While VAX-based graphics software can be applied to a spectrum of problems ranging from executive decision support to mechanical engineering to interior design, it generally falls into two basic categories. Some host drawing programs, such as VAX/VTX, DATATRIEVE and DECslide/DECgraph, are conversant only in Digital's drawing formats (ReGIS and SIXEL, as supported by VT24x and VT34x terminals), while other drawing software can be told to draw pictures in a variety of display formats (Tektronix, HPGL, PostScript, and so on, found in various third-party terminals, printers and plotters). The trick to knowing which graphics terminal emulator to use is to understand the display capabilities of the software you run on your VAX.

The Old Guard

Digital's graphics display formats, ReGIS and SIXEL, have been around for a long time and are the native picture languages spoken by DEC's graphics terminals. Despite persistent rumors of their imminent death during the last several years, DEC terminal products likely will continue to support them for some time.



Mac241 supports ReGIS and SIXEL color instructions on a Mac with a color monitor.

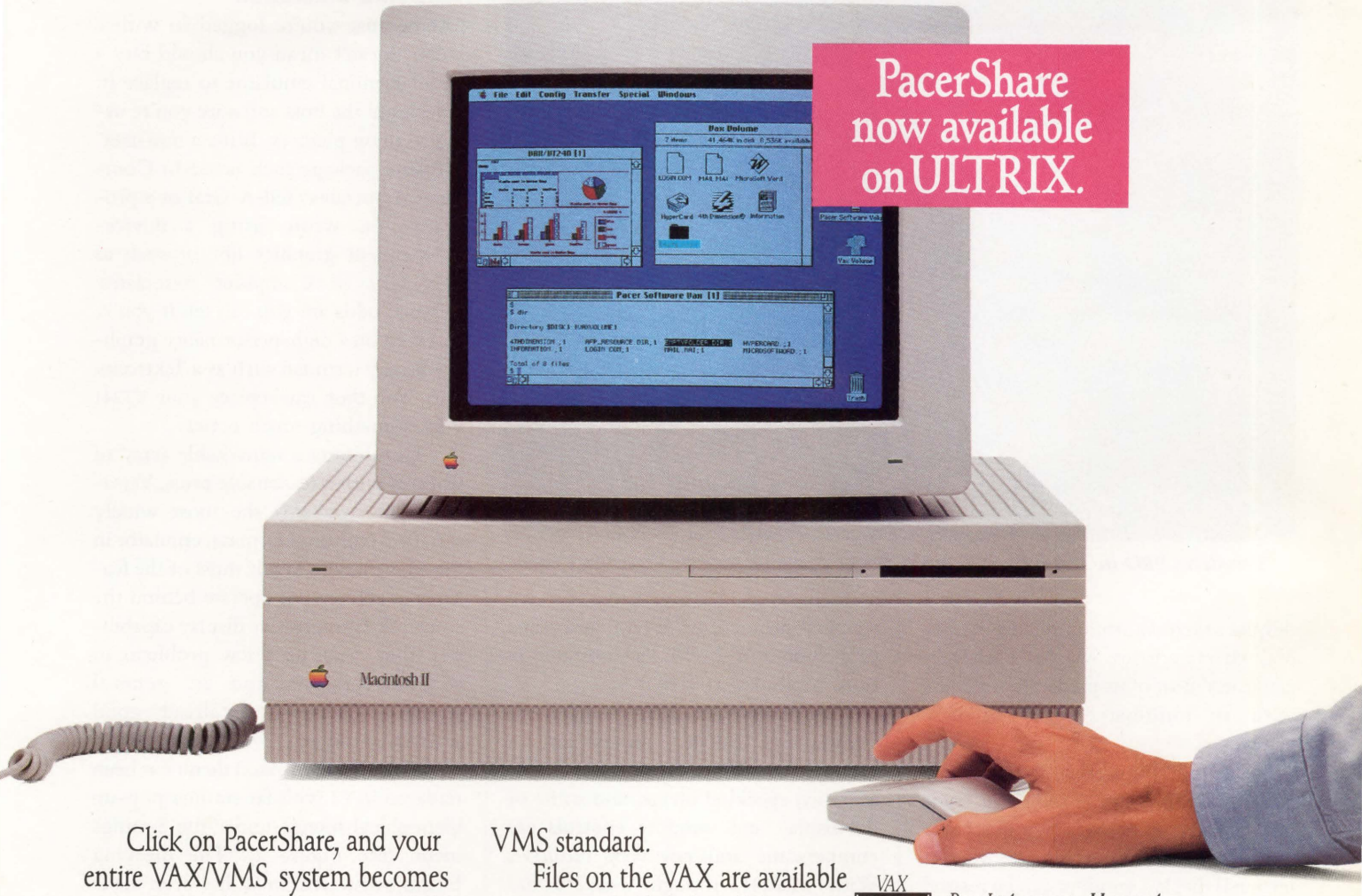
ReGIS, the Remote Graphics Instruction Set, is an "object-oriented" geometric picture language, which means that the ReGIS instructions for drawing a circle, for example, describe the circle's centerpoint location, radius and color rather than each pixel in the circle. SIXEL (each pixel is described as a six-bit value) instructions, on the other hand, describe the same circle in terms of each of its constituent bits, serially painting them either on or off from upper left to lower right.

By nature, ReGIS is suited to the capabilities of graphics display devices such as the VT241, which can accept and execute object-oriented drawing instructions. Less-intelligent serial devices, such as dot-matrix printers, must be told in much greater detail how to construct an image. SIXEL is DEC's drawing language for them. As anyone who has used an LA50 in conjunction with a VT241 knows, the VT241 screen image, initially drawn to the tune of ReGIS instructions from a host computer, must be converted to a SIXEL bitmap before it can be printed.

Enter Mac241

Initially released in 1986 as the first ReGIS/SIXEL graphics terminal emulator for the Mac, Mac240 surprisingly remained the only entry in this field until recently. Consequently, Mac240 sold briskly to an enthusiastic customer base,

Click on VAX power.



Click on PacerShare, and your entire VAX/VMS system becomes an immense AppleShare-compatible file server. Mac users gain tremendous speed, system-wide connectivity and VMS back-up procedures without ever leaving their icons!

Yet PacerShare complies totally with VMS security. A Mac user has the same access – no more and no less – to VMS files as a VT terminal.

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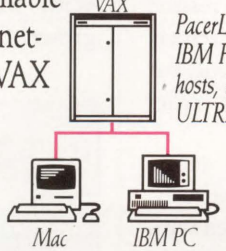
By simply clicking on the PacerShare volume icon, Mac users gain complete transparent access to VAX files and power.

Files on the VAX are available to users on both sides of the network. Mac users can access VAX files shown as icons (directories as folders), while VAX users gain transparent access to VAX-resident Mac files. PacerShare is a powerful extension of PacerLink, our core communications package that integrates terminal emulation, file transfer, virtual disk and print services in one product.



PacerLink connects Macs and IBM PCs (and compatibles) to many hosts, including DEC VAX (VMS & ULTRIX) and several UNIX systems.

PacerLink connects IBM PCs (and compatibles) as well as Macs to VAX (VMS and ULTRIX) and many UNIX systems†.

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Pacer Europe S.A., Valbonne, France, (33) 93 653 008, FAX: (33) 93 653 100 †Physical connection between the Mac/IBM PC and host can be RS-232, Ethernet (EtherTalk or TCP/IP) or Apple LocalTalk bridged to Ethernet using Kinetics FastPath or Cayman GatorBox. All product names subject to trademark claims.

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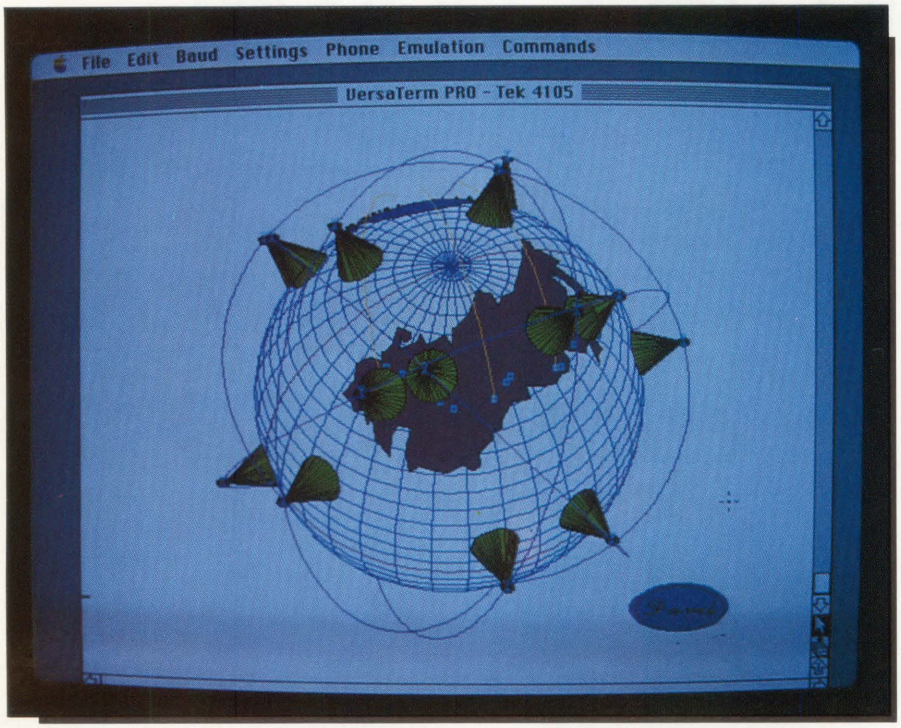

Versaterm PRO in Tektronix 4105 mode. Image downloaded from Precision Visuals.

despite severe shortcomings in its display characteristics. Mac241 decisively eradicates most of its predecessor's faults with an impressive array of new features.

Starting with the flashy stuff, Mac241 supports ReGIS and SIXEL color instructions on a Mac with a color monitor. More important, the Mac241 terminal display window can be resized to take advantage of a large Mac screen. It offers an optional vertical scroll bar that lets you recall text received earlier from the host.

You can use Mac241 to create several host sessions simultaneously, each mapped into a separate screen window (see Figure 1). For most people, this means using two asynchronous cables from the Mac's two serial ports to the host VAX or terminal server. But this feature is most valuable when used in conjunction with a network session package, such as Alisa's AlisaTerminal. Future releases probably will support LAT, now that Apple has licensed this terminal protocol from DEC and plans to include it in the Mac's communications toolbox software.

The approach Mac241 takes to simulating ReGIS colors on a monochrome Mac screen can result in a grainy, speckled image, and some of its display and window controls are cumbersome and not very intuitive. With Mac241, though, Mac240 has grown from the only ReGIS beast in town to a true thing of beauty, well worth a buyer's respect.

Tektronix Emulation

Just because you're logged in with a VT241 doesn't mean you should buy a VT241 terminal emulator to replace it. Check out the host software you're using to draw pictures. If it's a non-DEC software package such as SAS or Computer Associates' Tell-A-Graf or a program you wrote using a device-independent graphics library such as VAX Gks or Computer Associates' Disspla, odds are you can tell it you're working on a high-performance graphics display terminal such as a Tektronix 4105. You then can replace your VT241 with something much better.

Combining a remarkable array of features with a reasonable price, VersaTerm PRO remains the most widely installed Tektronix terminal emulator in the Mac market. While most of the features of its new V3 operate behind the scenes of its impressive display capabilities, they clean up a few problems in earlier versions and in general strengthen and refine an already good software product.

The awkward Baud menu has been replaced in V3 with far simpler pop-up hierarchical menus under the Settings menu (see Figure 2). The dizzying Extras menu item in V2 has been made simpler and far more usable in V3. New

Companies Mentioned In This Article

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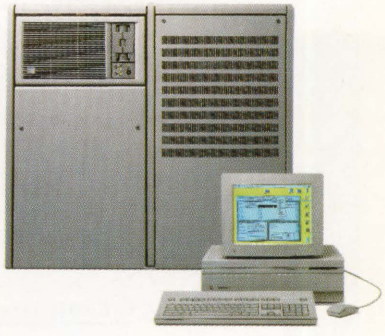

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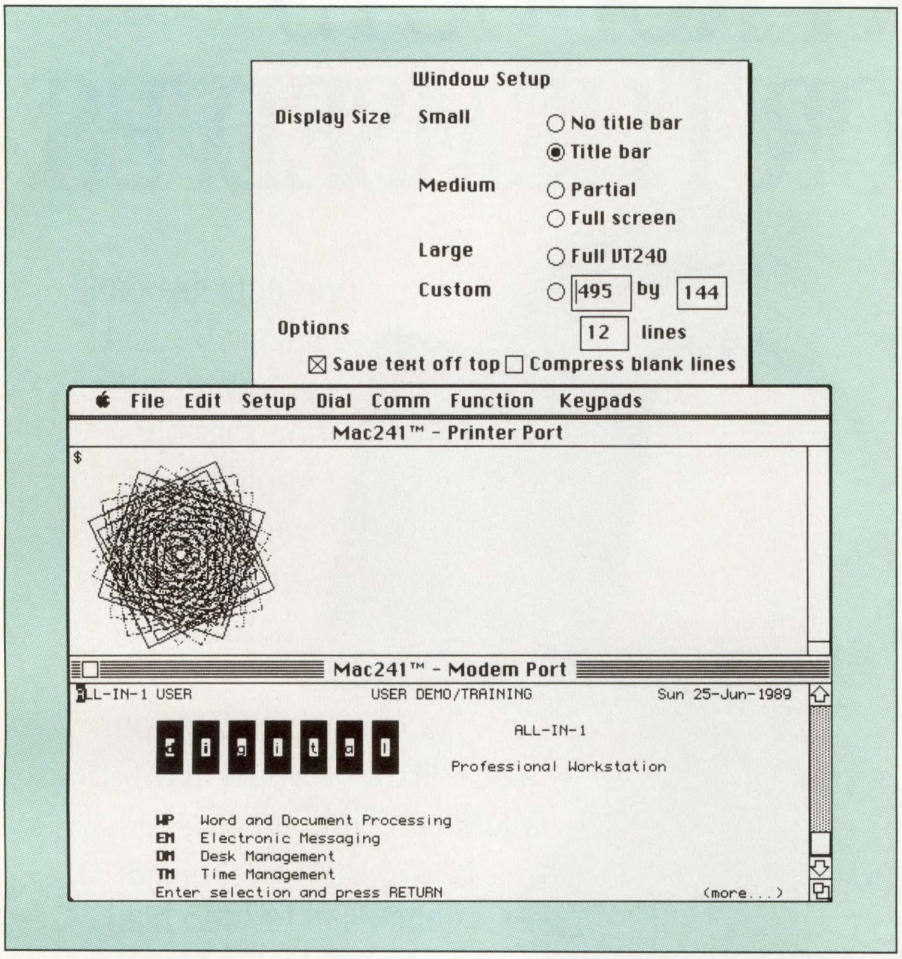

Figure 1: New features in Mac241 include multiple concurrent sessions, resizable and movable display windows and an optional vertical "save-text-off-top" scrolling bar.

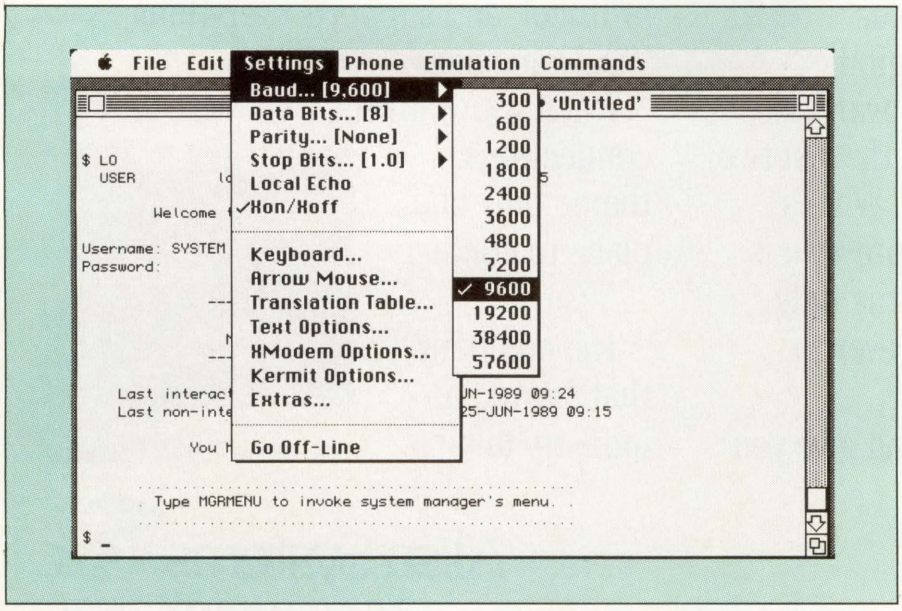

Figure 2: VersaTerm PRO's user interface uses hierarchical pop-up menus.

> ***". . . concern yourself with the quality and fidelity of the display . . ."***

features include a handy, built-in text editor and a KERMIT server file-transfer capability.

Which Should You Buy?

In selecting a Mac-based graphics terminal emulator, concern yourself with the quality and fidelity of the display you'll see on the screen. Also be attentive to what is often more important, the product's ability to export its display into other Mac drawing and page-layout applications.

Like its predecessor, Mac241 represents its ReGIS or SIXEL image as a Mac screen bitmap at the screen's resolution of about 72 dpi. Because this upper limit of resolution is as good as the Mac's screen gets, this approach is generally fine (unless you're approximating colors on a monochrome monitor) as you view the picture on the screen. When you copy the image to the clipboard, however, you get a relatively low-resolution bitmap which, when printed on a 300-dpi Apple LaserWriter, appears grainy and irregular.

VersaTerm PRO, on the other hand, stores its Tektronix image in an internal buffer before displaying it through its graphics window on the Mac screen. As a result, even though you're limited to 72 dpi by the monitor, you can zoom and pan the image to inspect minute picture details more closely. Unlike Mac241's bitmapped approach, VersaTerm PRO copies its images to the Mac's clipboard in object-oriented (pict) form, which can be manipulated in Mac draw-

ing programs such as MacDraw and printed in high resolution. On the down side, VersaTerm PRO image copy/paste operations can take several seconds or even minutes, and its approach to text substitution may require some manual MacDraw-style touch up.

If you're using host software that speaks only ReGIS/SIXEL, then Mac241 is the obvious choice. With its welcome improvements over Mac240, you don't have to buy it grudgingly.

Users of host software that can draw either ReGIS or Tektronix pictures face a more complicated choice. If you use the host software through a Mac monitor but rarely or never include what you see in desktop publishing documents, or if you prefer your printed documents to look as they do on screen, then choose Mac241. If you're an engineer or draftsman and need a precise hardcopy rendering of a host graphic image, then you'll probably prefer VersaTerm PRO. Just be prepared to clean up your host images in MacDraw before printing.

Mac241

REQUIREMENTS: Color monitor, memory to support color graphics

PRICE: $299. Site licenses available

WHITE PINE SOFTWARE

HEADQUARTERS:
94 Rt. 101A
Amherst, NH 03031
(603) 886-9050

FOUNDED: 1984

PRODUCT LINE: Mac-to-DEC connectivity, file transfer, terminal emulator and X products

OWNERSHIP: Private

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Versaterm PRO V3

REQUIREMENTS: Mac Plus or above

PRICE: $295

SYNERGY SOFTWARE

HEADQUARTERS:
2457 Perkiomen Ave.
Reading, PA 19606
(215) 779-0522

FOUNDED: 1985

PRODUCT LINE: Mac terminal emulation, data analysis, graphics and communications applications

OWNERSHIP: Private

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PRODUCTS

Deskpro 386/33 Features 33-MHz Processor

Compaq Computer Corporation announced an expandable desktop PC, the 33-MHz Compaq Deskpro 386/33. The Deskpro 386/33 Models 84, 320 and 650 are designed for such applications as computer-aided design, financial modeling and software development and for use as a file server or multiuser host system.

The Deskpro 386/33 uses the Compaq Flex Architecture, which combines Intel's 33-MHz 386 processor with 64 KB of cache memory to deliver a 35 percent performance improvement in processor-intensive applications over 25-MHz 386 cache-based PCs. It also features an ergonomic system unit design that provides eight expansion slots and room for five storage devices for a maximum of 1.3 GB of internal mass storage. A video graphics controller and standard peripheral interfaces are integrated into the system board to leave six expansion slots for add-in boards.

Prices for the Deskpro 386/33 Models 84, 320 and 650 are $10,499, $14,999 and $17,999, respectively.

For more information, contact Compaq Computer Corp., 20555 FM 149, P.O. Box 692000, Houston, TX 77269; (713) 370-0670.

Circle 492 on reader card

AOK.abc Produces Graphs On PostScript Device

AOK Software Products Inc. announced the AOK.abc Spreadsheet release 2.4.1. It can generate any of eight business-quality presentation graphs on a PostScript device, including the LN03R. AOK.abc's graphs are constructed and spooled from within the AOK.abc spreadsheet, a fully integrated spreadsheet analysis and presentation graphics tool.

Release 2.4.1 features ReGIS color graphics in 16 colors on VT340 and compatible terminals and emulators. Default colors are user-selectable. You also can specify the FILL option, which will draw bar and pie charts with specified graphic fill types. The Universal File Interface is a standard feature, and Limited User Licenses are available. AOK.abc is a fully Lotus-compatible spreadsheet for VAX/VMS that uses 1-2-3's commands and macros and performs two-way translation of Lotus .WKS and .WK1 files, keeping macros intact.

Prices for MicroVAX II two- and five-user licenses are $1,400 and $2,500, respectively.

For more information, contact AOK Software Products Inc., 1305 Wiley Rd., Ste. 102, Schaumburg, IL 60173; (312) 884-7097.

Circle 490 on reader card

SCSI Subsystems For VAXstation 3100

Computer Systems Technology announced a line of 3½-inch internal and 5¼-inch external SCSI subsystems for the VAXstation 3100.

The 3½-inch disk drives feature capacities of up to 172 MB formatted and an average access time of 15 ms. The 5¼-inch external disk modules feature capacities of up to 780 MB and access times as low as 10.5 ms. They feature an asynchronous transfer rate of up to 2.4 MB per second and a synchronous transfer rate of more than 4 MB per second.

In addition to the disk drive line, the company provides an 8 mm 2.3-GB backup tape drive and memory upgrades for the DECstation 3100. A 4-MB memory upgrade is priced at $2,400.

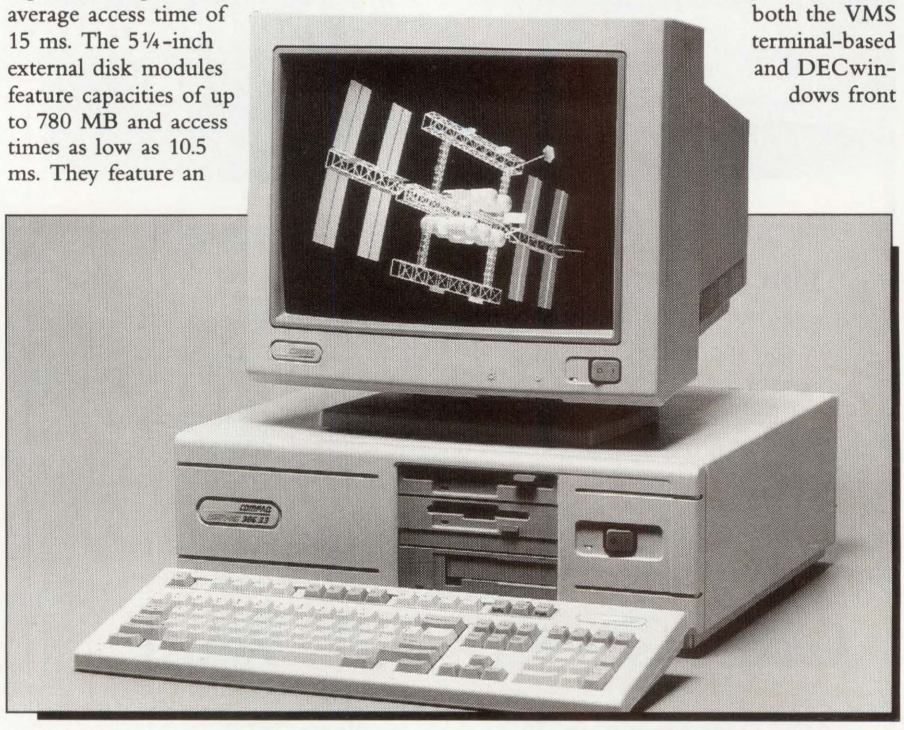
For more information, contact Yosef Taitz, Computer Systems Technology, 22932 El Toro Rd., Ste. 2, El Toro, CA 92360; (714) 458-8567.

Circle 493 on reader card

MaxNotes Participates In VAX Notes Conferences

Alisa Systems Inc. announced its first Mac application product, MaxNotes. MaxNotes is a Mac front-end application for VAX Notes. It uses Alisa's TSSnet Macintosh DECnet package to connect to remote VAX Notes conferencing servers via DECnet.

MaxNotes lets Mac users participate in VAX Notes electronic conferences. It makes full use of the Mac graphical point-and-click interface, eliminating the need for arcane commands and function keys. Features of both the VMS terminal-based and DECwindows front



Compaq Computer Corp.'s Deskpro 386/33 personal computer.

ends for VAX Notes are supported, with use of the Mac interface. MaxNotes' multiwindow interface allows browsing of several topics at once, each with its own threading context. A single search can specify one or more keywords and a text phrase. The matching notes are listed for selection, then collected into a set for browsing, printing or archiving into a local Mac file.

The product is priced at $295.
For more information, contact Suzanne Young, Alisa Systems Inc., 221 E. Walnut St., Pasadena, CA 91101; (818) 792-9474.

Circle 400 on reader card

InFoCen V8.2 Handles Variable-Length Text

3CI Inc. announced the InFoCen information management system V8.2. Features include improved variable-length text handling, an improved menu system, expanded Macro module capabilities and enhanced virtual view processing.

Optimized features include Add, Change, Select, Retrieve, Sort, Tally, Reverse, Virtual and Lock Server. V8.2 incorporates new internal structures for efficient storage and retrieval of variable-length text data. Variable-length items can be created with Signature Indices for fast Search retrievals. You also can build keyword index tables for variable-length items so that Search can respond immediately to single-word queries.

InFoCen V8.2 costs from $10,000 to $120,000, depending on machine class.
For more information, contact John Hoxmeier, 3CI Inc., 2057 Vermont Dr., Fort Collins, CO 80525; (303) 223-2722.

Circle 527 on reader card

DNS/2000 Connects XA2000 With DECnet

Stratus Computer Inc. announced support of DECnet-compatible communications, enabling Stratus XA2000 Continuous Processing Systems to communicate with VAXs. DNS/2000 communications software lets users with DECnet LANs maintain their standard networking methods while taking advantage of Stratus' fault-tolerant XA2000 Systems for critical, on-line applications.

DNS/2000 software lets Stratus XA2000 Systems participate as end nodes on an Ethernet LAN running DECnet Phase IV. It supports logical link support, task-to-task or program-to-program communication, network file access, file transfer and network management functions for monitoring network attributes specific to the XA2000. DNS/2000 runs under VOS, Stratus' operating system. To connect to the Ethernet cable, XA2000 Systems require a Stratus Programmable Ethernet Adapter.

DNS/2000 prices range from $17,500 on XA2000 Models 50 and 70 to $45,000 on Models 150 and 160.
For more information, contact David Hayward, Stratus Computer Inc., 55 Fairbanks Blvd., Marlboro, MA 01752; (508) 460-2796.

Circle 556 on reader card

TSX-32 Provides 32-Bit Virtual Memory

S&H Computer Systems Inc. announced TSX-32, a multiuser, multitasking and real-time operating system for computers using the Intel 80386 and i486 processors. TSX-32 is a full-featured, production-quality operating system that provides a 32-bit virtual memory environment with demand paging. Users, integrators and VARs of DEC systems and PC/MS-DOS systems can use the 32-bit power of the 386 and 486 without the cost of adapting to a dissimilar operating system.

TSX-32 running on a 25-MHz 80386 provides five times the CPU power of a MicroVAX II and six times the power of a PDP-11/83. TSX-32 supports more than 50 users on computers built around the Intel 80386 CPU, such as the PS/2.

A TSX-32 development system costs $1,450; a run-time system costs $950.
For more information, contact Rebecca Henderson, S&H Computer Systems Inc., 1027 17th Ave. S., Nashville, TN 37212; (615) 327-3670.

Circle 554 on reader card

Braintree Expands Graphics Capabilities

Braintree Technology Inc. announced presentation-quality graphics in its VAX/VMS system management tools, Quantum PM and Quantum PT. A new version of the Graphics Facility includes exact and trend line graphs, stacked bar graphs and pie charts as well as tabular reporting capabilities. These features provide a pictorial representation of data generated by Report and Display functions and is accessible from these functions and a Data Representation Manager function. The extended graphics functions are available in the VAX performance monitor Quantum PM V4.0 and VAX dynamic systems tuner Quantum PT V3.0.

Quantum PM lets you collect and report on VAX system data to analyze, optimize and troubleshoot the VAX. The Graphics Facility can access and perform processing and formatting operations on data produced by any type of Quantum software report. It reads and processes report and display data stored in an ASCII text file. Quantum PT provides a real-time dynamic display and hourly

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Avail - to be of use, worth, benefit or advantage; effective use or help.

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CIRCLE 369 ON READER CARD

statistical reporting capability to analyze the state of the VAX/VMS system.

For more information, contact R. Stephen Lilly, Braintree Technology Inc., 600 Cordwainer Dr., Norwell, MA 02061; (617) 982-0200.

Circle 525 on reader card

Editor's note: A July 1989 announcement (p. 137) indicated that Quantum PM V2.0 is available from Computer Information Systems Inc. However, Quantum PM is now in V4.0 and is available from Braintree Technology Inc. We regret the error.

Commix 32 Interconnects PCs And DEC Host

Infotron Systems Corporation's LAN Systems Division announced the DEC LAT protocol on the Commix 32 communications server. The Commix 32 allows a group of users to interconnect their PCs and to access a DEC host via a single network connection.

PCs, terminals and peripherals can communicate with one another through Commix 32, which supplies direct access to DEC hosts via the LAT protocol using either thin or thick Ethernet. Through Commix's WAN links (64 Kbps and X.25), you have a natural migration path to Infotron's line of wide-area networking products, including StreamLine 45 T3 multiplexers, Infostream NX Network Exchanges, 990NP Network Processors and StreamLine 25 packet/circuit switches. Commix 32 includes PC networking capabilities. The LAT protocol coexists with the Commix TOPS/OSI protocol stack on the Ethernet module.

A 16-port Commix 32 in a LAT configuration costs $6,490.

For more information, contact Ed DiMingo, Infotron Systems Corp., LAN Systems Div., 130 Gaither Dr., Bldg. 116, Mt. Laurel, NJ 08054; (609) 722-5575.

Circle 495 on reader card

Micro Technology Inc. Redesigns Intercept

Micro Technology Inc. announced the redesign of its Intercept removable Winchester device for the OEM. Originally designed for the military and defense contractor markets, Intercept features security and reliability. It supports SCSI differential, SMD and pure ESDI interfaces. It also supports 2.5-MB-per-second, 780-MB, 5¼-inch drives.

Intercept houses up to two removable canisters for 1,240 MB of on-line storage. It uses standard ESDI 5¼-inch drives or can convert the ESDI interface into a SCSI differential or SMD interface. Users who need all three types of interface can reformat the same canister packs. Intercept features a mailbox architecture. The chassis slot determines the unit select number, so the canister can be moved to another chassis for easy system reconfiguration. The canisters have four radial load shock mounts to protect the disk drive against impacts of up to 60 Gs.

Intercept is priced at $5,000 for a two-canister model.

For more information, contact Tom Raimondi, Micro Technology Inc., 5065 E. Hunter Ave., Anaheim, CA 92807; (800) 999-9MTI.

Circle 496 on reader card

Minitab 7.1 Features Program Enhancements

Minitab Inc. announced a release of Minitab Statistical Software designed to meet the needs of scientists, engineers and business analysts. Minitab 7.1 features program enhancements including statistical process

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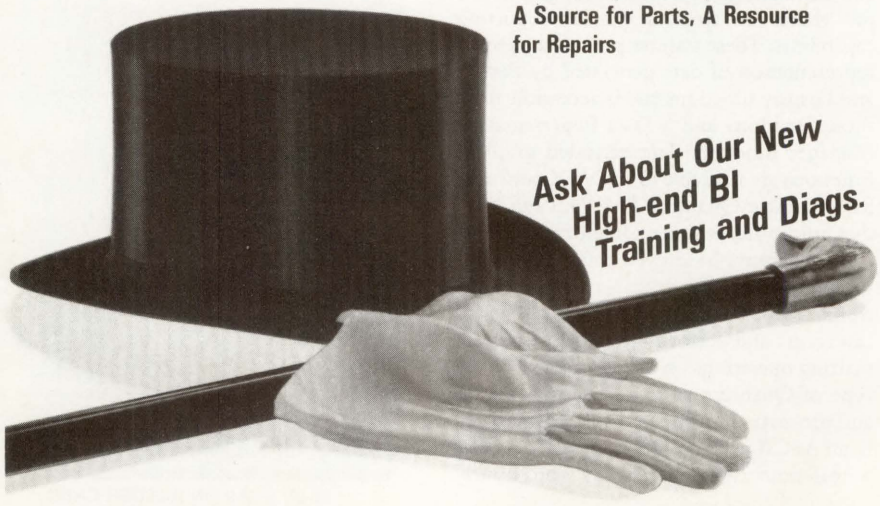

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CIRCLE 294 ON READER CARD

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QUANTUM PT for VAX Dynamic System Tuning

Improve VAX response time with Quantum PT, the dynamic system tuner that will get the most throughput from your memory or CPU constrained system. With an adjustable control program, you're able to tailor the tuner to your site specific needs. Real-time displays and statistical reporting allow you to validate that your system resources are being used efficiently.

QUANTUM PM for VAX Performance Monitoring and Capacity Planning

Improve your system's efficiency with Quantum PM. Capable of collecting and reporting on configuration, CPU, I/O, and memory statistics, Quantum PM is a powerful tool for demonstrating system usage patterns, troubleshooting and capacity planning. Flexible data collections can run for multiple nodes from a central control point.

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CIRCLE 361 ON READER CARD

control (SPC) capabilities and a new command for the analysis of general linear models (GLM).

Minitab 7.1 offers 11 new SPC charts that measure, monitor, control and improve process quality. These Shewhart-type control charts include X-bar (sample means), R (sample ranges) and P (proportion of nonconformities) charts. The new GLM command fits the GLM to perform analysis of variance and covariance for unbalanced designs. This enables scientists and engineers to analyze experimental results in which the number of observation varies by factor level.

License fees for mainframe/minicomputer version range in price from $1,700 to $3,300.

For more information, contact Mary Montminy, Minitab Inc., 3081 Enterprise Dr., State College, PA 16801; (814) 238-3280.

Circle 497 on reader card

Fujitsu DL4400 Provides Paper-Handling Features

Fujitsu America Inc. announced the DL4400, a 24-wire dot-matrix printer targeted at the midrange, office automation and industrial markets. Including paper-handling features such as bottom feed and paper parking, as well as a rugged design, the DL4400 is tailored for applications in which reliability and minimal downtime are required.

Fujitsu America Inc.'s DL4400 24-wire dot-matrix printer is targeted at the midrange, office automation and industrial markets.

Two automatic adjustment features — friction-to-tractor feed switching and paper-thickness adjustments for multipart forms — are optional. You can select either bottom or front paper feed. Up to three optional sheet-feeding bins are available. The DL4400 can print five-part forms, labels and envelopes and features 8,000-hour MTBF. It also features a print speed of up to 220 cps, a 48-character LCD operator panel and 360- x 360-dpi graphics. The DL4400 emulates the IBM Proprinter XL24, Fujitsu DPL24C

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Plus, Epson LQ-2500 and Diablo 630. Dual Centronics and RS-232C interfaces are provided.

The product is priced at $1,199.
For more information, contact Holly Bourne, Fujitsu America Inc., 3055 Orchard Dr., San Jose, CA 95134; (408) 432-1300.

Circle 494 on reader card

CPI 12300 Connects DEC And IBM

Simpact Associates Inc. announced the CPI 12300 interface, which allows Q-bus systems to communicate on a peer-to-peer basis with IBM mainframes and minicomputers over SNA. The SNA interface takes advantage of Simpact's second-generation ICP, which offloads communications and applications processing up to the presentation layer of the OSI reference model.

The CPI 12300 provides MicroVAX II and 3000 users with an interface to IBM LU6.2, the protocol for IBM's APPC. Advanced features of APPC are supported by IBM physical units Type 2.1 (PU2.1), which establish peer-to-peer relationships with other PU2.1 nodes on an SNA network without mainframe intervention.

The CPI 12300 interface costs $12,000.
For more information, contact Steve L. Adams, Simpact Assoc. Inc., 9210 Sky Park Ct., San Diego, CA 92123; (619) 565-1865.

Circle 503 on reader card

RGB/View 2000 Integrates Live Video

RGB Technology announced a system for the integration of live video in a workstation display. The RGB/View 2000 display controller integrates text, data and graphics with real-time video on any high-resolution workstation display. Either NTSC (or PAL) composite video or RGB component signals can be input. The real-time video is displayed as a window on the computer screen. The position of the window is user-controllable and can be expanded from 1/16th to full screen size.

The RGB/View 2000 can be connected to any camera, tape recorder or interactive video disk as well as computer-generated video sources. Two composite signals and one RGB component signal can be connected simultaneously and switched manually or under software control. The product is a tabletop or rack-mountable unit with all window functions controlled by front panel switches or via an RS-232 port. The display output can be directed to a computer system's high-resolution RGB monitor or to a high-scan-rate video projector.
For more information, contact Carol Fogel, RGB Technology, 2550 Ninth St., Berkeley, CA 94710; (415) 848-0180.

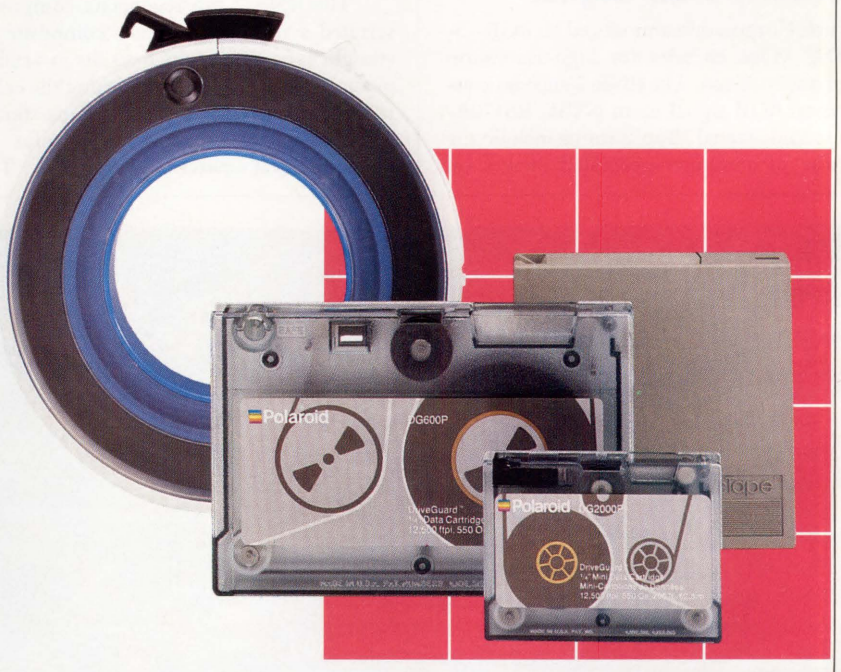
Circle 501 on reader card

Avalon's AP/30 Speeds VAX Performance

Avalon Computer Systems Inc. announced the Vaccelerator AP/30, a 15- to 20-mip application accelerator for VAXs and MicroVAXs that requires no user reprogramming. It uses RISC technology to perform 15 to 20 times faster than the MicroVAX II on compute-intensive applications, exceeding the performance of the VAX 8800 by more than a factor of two.

The AP/30 is supported by global optimizing FORTRAN, PASCAL and C com-

Polaroid tape duplication services



Polaroid Software Duplication Services has added tape duplication to its complete line of diskette duplication and software packaging services. Polaroid duplicates a wide range of 1/4" and 1/2" cartridge formats including TK50 cartridges and reel to reel formats.

Whatever your duplication or software packaging needs, you can depend on Polaroid for fast, high quality service. For more information call the duplication center in your region.

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CIRCLE 362 ON READER CARD

pilers developed by Green Hills Software. These compilers support virtually all VMS FORTRAN and C extensions for recompilation of applications. Avalon's proprietary Central Interface Program transparency software makes the interaction between the AP/30 and the host VAX invisible to the application. Unlike array processors, which require applications program modification, the AP/30 requires no source-code changes.

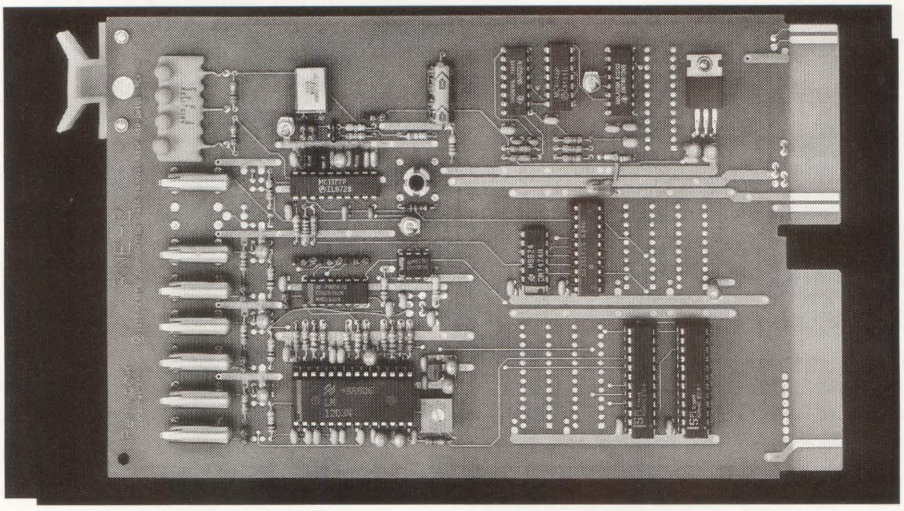
The AP/30, configured with 4 MB of memory, is priced at $15,900. FORTRAN, PASCAL and C compilers are priced at $1,490 each.

For more information, contact Bob Krysko, Avalon Computer Systems Inc., 425 E. Colorado St., Ste. 710, Glendale, CA 91205; (818) 247-2216.

Circle 491 on reader card

The RNE-2 Encoder Converts RGB Signal

Peritek Corporation announced an RGB-to-NTSC video encoder for high-resolution computer displays. The RNE-2 encoder converts an RGB signal to an NTSC RS170A-compatible signal. Applications include the display of computer-generated images on standard TV monitors and the recording of these images directly onto videotape.



Peritek Corp.'s RNE-2 RGB-to-NTSC video encoder.

The RNE-2 can regenerate composite serrated sync from ordinary composite or straight sync input, which results in a stable picture. It also provides for locking the color subcarrier reference to the incoming signal. This minimizes problems with color by reducing beat pattern interference. The RNE-2 has been designed with jumper-selectable options and adjustments for input and output levels. Although it has a Q-bus half-height form factor, it can be used as a standalone with external power or plugged into a Q-bus backplane. It's compatible with any RGB color graphics controller that outputs NTSC frequency.

The RNE-2 is priced at $400.

Allied Telesis adds more functionality in the DECnet environment.

Allied Telesis is a specialist in Ethernet building blocks, adding more modular plug-in functionality and allowing more configuration options. Allied Telesis AT-5000 is the only Multimedia Concentrator offering IEEE 802.3 Ethernet based repeaters, transceivers, and a MAC Layer bridge in a coax, fiber optics, repeater and transceiver modules can be mixed with in the same chassis. ATI also offers single, dual, and multiport transceivers and repeaters.

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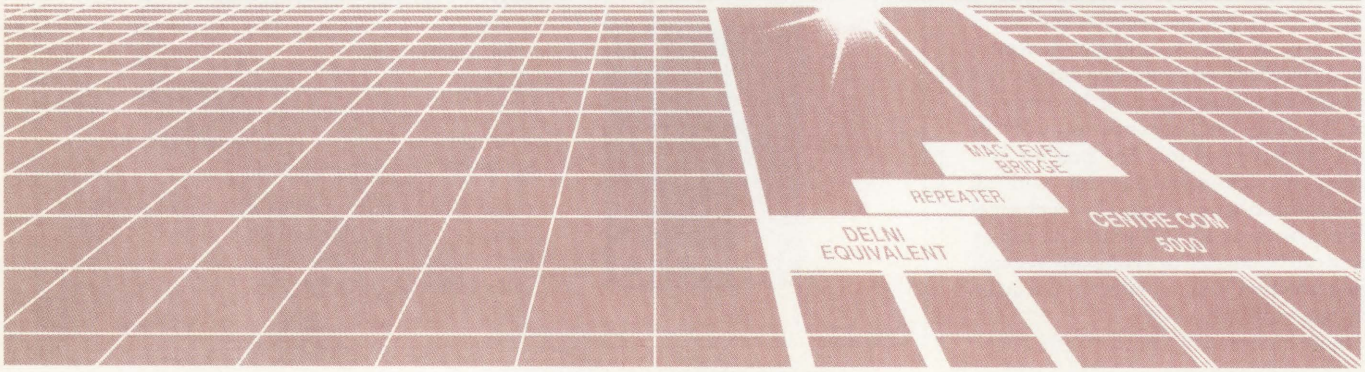

CIRCLE 358 ON READER CARD

For more information, contact Jill M. Collins, Peritek Corp., 5550 Redwood Rd., Oakland, CA 94619; (415) 531-6500.

Circle 500 on reader card

Calendar Manager Maintains Schedules

Russell Information Sciences Inc. announced Calendar Manager V3.3. V3.3 includes enhancements to further automate scheduling. Conference facilities, van pools, pipeline stations, Lear jets and traditional meetings are among the schedules managed.

A user interface allows data-free entry. Cursor movements select meeting details. Schedules of attendees, resources and facilities are searched and conflicts automatically are resolved. If a facility or resource is unavailable, Calendar Manager finds an alternate automatically. You can view a pop-up menu of commands with a single keystroke. Proxy mode allows scheduling by designated administrators and lets you view up to 21 Proxy accounts simultaneously. Log in and Tickler notices keep you updated on schedule information. Yearly, monthly and weekly summaries can be viewed, printed or sent to a report file. DECnet, cluster environments and username aliases are supported. Calendar Manager is available in VMS standalone, ALL-IN-1 and A- to-Z integrated versions. For more information, contact William George, Russell Information Sciences Inc., 25201 Paseo de Alicia, Ste. 111, Laguna Hills, CA 92653; (714) 768-5000.

Circle 553 on reader card

Camintonn Subsystems Optimize Performance

Camintonn Corporation announced RAM disk UNIBUS and Q-bus expansion boards with MSCP protocol. RAM disk subsystems are for I/O-intensive applications. With no moving parts, they're valuable in hostile environments that diminish the reliability and performance of conventional disk drives. Data is stored on 1-MB DRAM chips that operate on low power at close-to-CPU speeds.

The UNIBUS controller board (CRD-UC) interfaces up to 128 MB of RAM disk memory for all UNIBUS computers, with a combination of 16- (CRD-U16) and 32-MB (CRD-U32) expansion memory boards. It runs under VMS, ULTRIX, RSTS and other DEC operating systems. The Q-bus controller board (CRD-16C) with 16-MB of RAM is compatible with conventional disk drives that use MSCP protocol. The 32-MB expansion board (CRD-32) can be combined with the CRD-16C for Q-bus or CRD-UC for UNIBUS.

The Q-bus controller board costs $12,000, and the 32-MB memory expansion board costs $18,000. The UNIBUS controller board costs $1,800, and the 16- and 32-MB expansion boards cost $10,000 and $18,000, respectively.

For more information, contact Geneva Zagarnaga, Camintonn Corp., 2332 McGaw Ave., Irvine, CA 92714; (714) 553-0247.

Circle 558 on reader card

PC/QT Features 80286 Processors

PCQT AB announced the Personal Computer/Quality Technology (PC/QT). This computer combines technical solutions that meet rigorous operational dependability requirements.

PC/QT can stand temperatures up to

WHY THE 1990 CENSUS IS COUNTING ON VIKING DATA ENTRY

When the U.S. Census is taken in 1990, data will be key-entered with Viking software. About 106 million households will be asked as many as 60 questions per person. Viking Data Entry (VDE) system will be used to record responses.

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CIRCLE 300 ON READER CARD

104 F without external air intake. Its built-in warning system continuously monitors temperature, displays warnings on screen or automatically shuts down. PC/QT's main power source is an AC/DC converter that's externally mounted, thus reducing internal cooling requirements. PC/QT runs on two built-in batteries. Its external power converter is a battery charger: In the event of power loss, the computer continues running for 20 minutes. It also resists current surges and voltage and phase fluctuations. PC/QT has 80286 processors, 16 MHz clock frequency, space for two diskettes or tape drives, and two 40-, 100- or 350-MB hard disks.

For more information, contact Claes Israelsson, PCQT AB, Box 42, Skalholtsgatan 2, S-164 93 KISTA, Sweden; +46 8 752 90 90.

Circle 499 on reader card

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Systems are available for DEC VAX™ and MicroVAX™, the IBM PC/XT/AT™ and compatibles as well as 386 machines. A Novell LAN compatible system is also available. And Digi-Data's product line includes 1600 and 6250 bpi 9-track tape drives and systems.

Digi-Data is an organization with a 27 year history of manufacturing quality tape drives.

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CIRCLE 199 ON READER CARD

Mips Offers Lower-Cost M/2000 RISComputers

Mips Computer Systems Inc. announced lower-cost models of its M/2000 family of 20-mip RISComputers, as well as new tape backups.

The new M/2000s offer disks based on the SCSI interface standard. The 328- and 663-MB models provide prices as low as $12 per megabyte. Prices begin at $83,000. A typically configured M/2000 with a 328-MB SCSI disk and the new Model 6015 tape backup costs $106,500. A version with two 663-MB disks and tape backup costs $117,500.

The Model 6015 tape backup uses the industry-standard SCSI interface and provides 2 GB of storage capacity in a single 8mm tape cartridge. It's configured in the M/2000 with front access and fits into a standard 5¼-inch full-height peripheral space. A 2-GB tape drive costs $6,500 and is available for new and installed systems.

For more information, contact Beverly Jerman, Mips Computer Systems Inc., 928 Arques Ave., Sunnyvale, CA 94086; (408) 991-7736.

Circle 508 on reader card

MT8-MIM Connects To Ethernet LANs

Cabletron Systems Inc. announced the MT8-MIM Multiport Transceiver Module, which provides flexibility in connecting servers and other devices to twisted pair, fiber optic and coaxial cable Ethernet LANs.

Designed to be used with Cabletron's Multi Media Access Center (MMAC) hub, the MT8-MIM includes eight manageable 802.3-compatible medium attachment unit (MAU) ports. These ports provide a direct connection into twisted pair, fiber optic and coaxial networks, eliminating the need for external transceivers and saving wiring closet space. The MT8-MIM is for applications in which remote servers and other network elements, such as bridges, routers and gateways, must be tied into a hub. It provides full IEEE 802.3 repeater functions. It retimes data packets, generates preambles and automatically partitions problem segments.

The product is priced at $1,295.

For more information, contact Robert Monaco, Cabletron Systems Inc., 10 Main St., Box 6257, Rochester, NH 03867; (603) 332-9400.

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Clyde Digital Offers Windowing Environment

Clyde Digital Systems announced a new version of Window software that provides the windowing environment to VAX/VMS users with VT terminals.

With Window, you can create sessions on demand for as many applications as you want. Each window acts like a separate terminal, allowing you to work with multiple independent processes. By pressing a key you can switch from window to window. Window keeps track of the activity for each session running in background. When you switch to a different session, the screen is refreshed to the current display for that job. Window can save screen images in different formats, such as for an LN03 printer. Screens can be captured from several programs, then collected, combined and edited in one place. Window also has macro capabilities. You can shrink long, complex or multiple command sequences to a keystroke. Window software works no matter how a terminal is connected to the system — by direct link, over DECnet or through the DECserver.

For more information, contact Richard Bos, Clyde Digital Systems, 371 E. 800 S., Orem, UT 84058; (801) 224-5306.

Circle 572 on reader card

Focman 4.0 Features Context-Sensitive Help

Information Builders Inc. announced Focman release 4.0. In release 4.0, on-line, context-sensitive help is available for all input fields, allowing you to request on-line assistance specific to your field.

Screens and reports have been reformatted to uppercase and lowercase. They use color and highlighting attributes. Resource tracking is enhanced with matrices displaying seven resources per screen and search facilities for utilized resources. You can display the description of each activity on the timesheet. Multiproject timesheets display daily, weekly and to-date totals and can be revised and updated from a single screen. In multiproject analysis, you can calculate the values of activities through a common critical path as part of one project or as separate projects. Focman runs under IBM's VM/CMS and MVS/TSO and under VAX/VMS.

Prices begin at $6,000 and depend on machine size and configuration.

For more information, contact Verne Sheidler, Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433.

Circle 559 on reader card

Netron/CAP Allows VAX/VMS Debugging

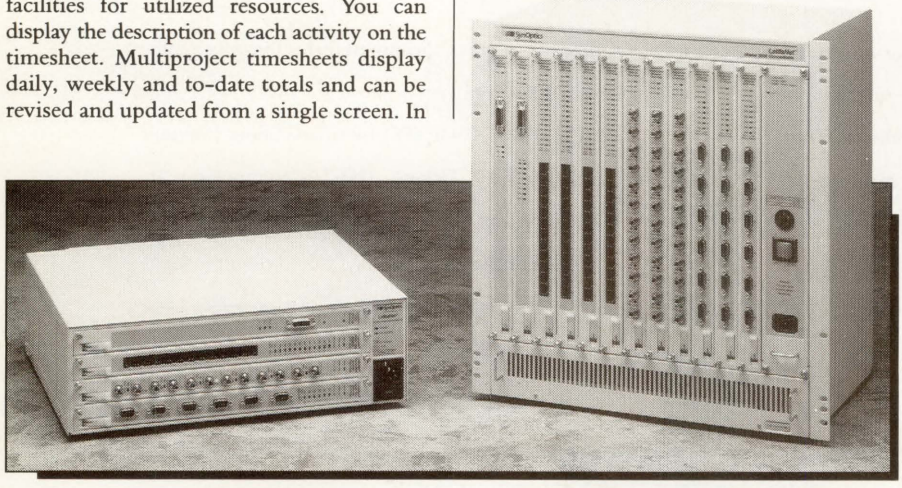
Netron Inc. announced V2.04 of its Netron/CAP software engineering system. The upgrade provides flexibility for PC-based mainframe applications developers and enhancements to Netron/CAP's target platforms for portable COBOL applications. V2.04 is for native and portable COBOL applications development on VAXs, Wang VS minis and IBM PCs, PS/2s and MVS and VM/CMS mainframes.

The Netron/CAP CFMP Linker allows VAX users to statically link VAX-developed CICS mainframe programs to CFMP to speed testing. It also allows greater access to VAX/VMS debugging features. Enhancements include an optimized frame implementation of Micro Focus COBOL/2; the addition of the IVM Test Facility for PC-based mainframe developers; and a re-engineering of the standard library of CAPframes and generated screen and report CAPframes to improve code readability and uniformity.

Netron/CAP is priced according to development/target environments and number of terminals. Licenses cost from about $50,000 to more than $600,000.

For more information, contact Bill Daverne, Netron Inc., 99 St. Regis Crescent N., Toronto, Canada M3J 1Y9; (416) 636-4847.

Circle 498 on reader card



SynOptics Communications Inc.'s LattisNet System 3000 family.

System 3000 Serves Networking Environments

SynOptics Communications Inc. announced a line of connectivity products designed to meet the demands of widespread networking environments. The LattisNet System 3000 complements the existing LattisNet family of connectivity products and provides a sophisticated backplane designed to support multiple access methods such as Token Ring and Ethernet for meeting current and future networking needs.

The System 3000 family includes concentrators and a variety of host and retiming modules. It's targeted at customers with complex networking requirements. The system's expanded networking capabilities include high port and module density, integrated bridging and network management functions.

The LattisNet System 3000 is priced from $350 to $500 per port, depending on transceiver options used in the network, and comes with a one-year warranty.

For more information, contact Beverly Barnett Ristow, SynOptics Communications Inc., 501 E. Middlefield Rd., Mountain View, CA 94043; (415) 960-1100.

Circle 504 on reader card

Series 2000 Connects AppleTalk Devices

Network Resources Corporation announced the NRC Series 2000 family of AppleTalk-compatible routers for broadband, Ethernet and fiber optic networks. The broadband and fiber optic models operate at 2 Mbps per channel. The Ethernet models support speeds of 10 Mbps.

The products let you build large, geographically dispersed networks of Macs and peripherals using existing backbone networks and software. They include the AT2000 series for connecting one AppleTalk device and the AT2002 series for connecting up to two AppleTalk devices to the backbone network, as well as the LT2000 series for connecting a number of devices on a LocalTalk or PhoneNet LAN to the backbone. The NRC Series 2000 family supports all AppleTalk protocol functions and expands Apple's networking capability.

The AT2000 series costs $999, the AT2002 series, $1,295, and the LT2000 series, $1,995.

For more information, contact Bill Steele, Network Resources Corp., 2450 Autumnvale Dr., San Jose, CA 95131; (408) 263-8100.

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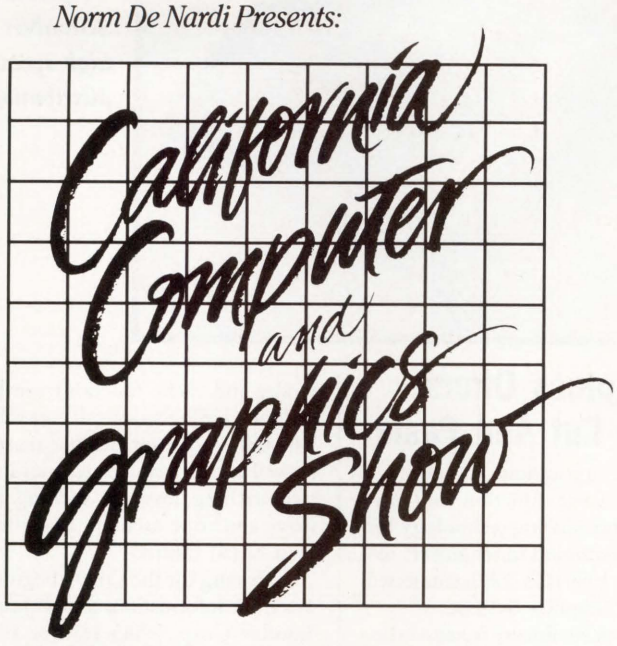

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PlanTRAC II Integrates Interfaces For All Users

Computerline Inc. announced PlanTRAC II project management software. PlanTRAC II integrates interfaces for all levels of users into a single database-driven system.

The EasyPLAN graphic planner provides an interactive graphic interface for PlanTRAC II. The mouse interface provides point-and-shoot simplicity. The Guide Mode provides an on-screen user guide to walk you through PlanTRAC II. As each menu is highlighted, a note explains the meaning and the application of that menu item. The Guide Mode offers the full range of PlanTRAC II features through a simplified main menu and nested options. The Direct Mode features a no-frills full-option menu. PlanTRAC II is available in English, French or Swedish on a wide range of PCs and minicomputers. PlanTRAC/PC is a single-user system for PCs running MS-DOS or a multiuser system for networked PCs. PlanTRAC/VMS is a multiuser system for VAXs and MicroVAXs. PlanTRAC/UNX is a multiuser system for Sun and Apollo workstations.

For more information, contact Computerline Inc., P.O. Box 308, Pembroke, MA 02359; (617) 294-1111.

Circle 523 on reader card

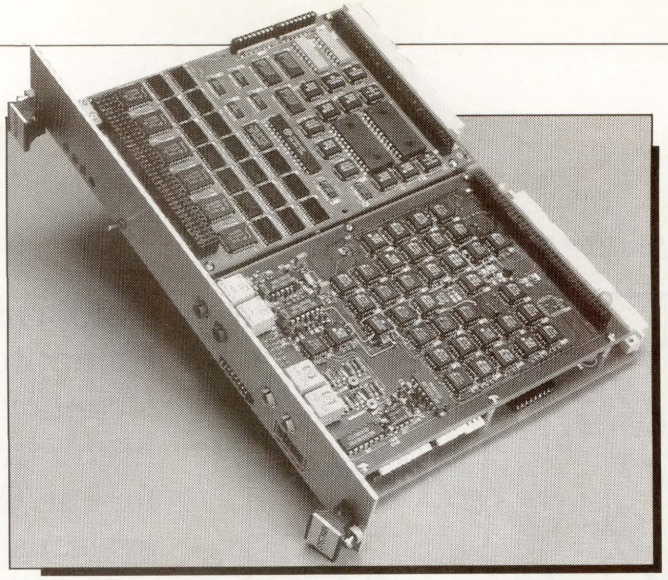
Reflection 3.4 Supports SIXEL Graphics

Walker Richer & Quinn Inc. announced V3.4 of its Reflection terminal emulation software, which includes API. Reflection API lets programmers write DOS applications that access existing host programs. Libraries for C, Turbo PASCAL and Microsoft Quick BASIC are included in a programmer's toolkit in Reflection Plus.

Through embedded API functions, DOS applications can access a range of Reflection features, including command language and file transfer. As a result, anything you can do manually on the terminal emulator can be simulated through API commands such as typing on a keyboard, issuing host commands or filling in data-entry screens. Additionally, V3.4 of Reflection 4 and 4 Plus supports all three levels of DEC's SIXEL graphics language and SIXEL printers. This allows a greater range of graphics printer support. An improved display of ReGIS images and 132 columns are also included.

For more information, contact Carolyn Bakamis, Walker Richer & Quinn Inc., 2825 Eastlake Ave. E., Seattle, WA 98102; (206) 324-0350.

Circle 530 on reader card



Systran Corporation's ScramNet offers high-speed data distribution.

Spectragraphics Offers VAXstation Cut And Paste

Spectragraphics Corporation announced a graphics cut-and-paste function and implementation of anti-aliasing technology for increased image resolution for engineers using the CommSet 1080 (CS 1080) connected to a VAXstation Graphics System.

The cut-and-paste feature is keystroke-activated, allowing you to define a rubber-banded window and select an area on the monitor to cut (copy) and store in a file on the VAXstation. The bit-mapped image, stored in a binary file retaining the original color of the drawing, can be pasted into a window on the VAXstation using DECwindows or transferred to another workstation via a LAN. Using the standard 1,024 x 864 VAXstation monitor, anti-aliasing provides an effective resolution greater than 2k x 2k within the CS 1080 window. The higher resolution aids in surface design and decreases the need to perform extensive line analysis.

For more information, contact Gary Clark, Spectragraphics Corp., 9125 Rehco Rd., San Diego, CA 92121; (619) 450-0611.

Circle 574 on reader card

QD35 Supports MicroVAX II Systems

Emulex Corporation announced a new model of its high-performance QD35 SMD-E disk controller with 1 MB of cache memory. It supports MicroVAX IIs. With the QD35 and the QD35-III, the MicroVAX II through 3900 are supported.

The QD35 offers the full range of Emulex's controller features, including MSCP implementation, rotational position sensing and zero latency read, with the added capability of cache memory for such applications as imaging and graphics. Because the QD35 uses the 68020 microprocessor, controller and cache functions can be handled without adding to overall controller latency. The 68K processor handles these functions as well as the performance monitor. It offers two caching features, caching per logical drive and zone caching, and offers a sector read-ahead feature.

Pricing for the QD35 begins at $2,895. For more information, contact Jean Ratajczak, Emulex Corp., 3545 Harbor Blvd., Costa Mesa, CA (714) 662-5600.

Circle 405 on reader card

ScramNet Features Reflective Memory

Systran Corporation announced ScramNet, a real-time, shared-memory ring network offering high-speed data distribution, software-free intercomputer communications and error detection/recovery.

Using ECL circuits, dual fiber optic transmission and shared-memory technology in a ring network, ScramNet maps memories rather than just passing messages. ScramNet uses reflective memory, i.e., each memory node has its own 2 MB of memory, and memory copies are updated over a high-speed serial-ring network. ScramNet hardware handles all network communications and requires no real-time communication software. To communicate on the ring, you simply make a high-level language assignment statement. Each computer on the network, regardless of operating system, has a network card containing additional computer-addressable memory. Whenever you write a word to the shared-memory area on one computer, ScramNet transmits it around the ring to all other shared memories. ScramNet operates on Q-bus and VMEbus-based machines.

For more information, contact Susan M. Chicoine, Systran Corp., 4126 Linden Ave., Dayton, OH 45432; (513) 252-5601.

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CIRCLE 353 ON READER CARD

LQD11 Supports High-Speed Printers

Peripheral Solutions Inc. announced the LQD11, a DMA printer/plotter controller for the MicroVAX. The LQD11 is a dual-height board for all MicroVAX and MicroPDP Q-bus computers. High-speed printers and plotters from multiple vendors are supported without degrading system performance.

The Q-bus DMA design eliminates the host overhead associated with LPV11 character style printer controllers. High-speed printer throughput is achieved by an optimized on-board microprocessor, support logic and an 8,192-byte buffer. Data transfers to the printer occur without host intervention. Throughput is sufficient to provide continuous printing on any standard printer such as ion, band, drum, matrix, laser or plotter at speeds exceeding 90 ppm or 5,940 lpm. The LQD11 is compatible with standard software and all common printer interfaces. The controller emulates a DHV11 using the standard VMS YF driver. Cabinet kits and options are available to support high-speed printers 30 to 2,000 feet from the MicroVAX host.

For more information, contact John Panunto, Peripheral Solutions Inc, 5964 Ladyburn Crescent, Mississauga, ON L5M 4V5; (416) 542-0461.

Circle 573 on reader card

SmartStar Supports Oracle Connection

Signal Technology Inc. announced an interface to Oracle. The interface provides SmartStar users with a consistent user interface to Oracle and other database types and provides Oracle users with new applications development capabilities on a DEC platform.

SmartStar protects Oracle users' investments in VAX/VMS by allowing them to run their applications under the foundation RMS and Rdb file structures. SmartStar provides the tools to migrate data and data definitions from one database to another, without syntax or coding, from its 4GL facilities. No recompilation of the application is required as it's migrated across database types. Rapid prototyping of Oracle-based applications is possible because of SmartStar's ANSI-SQL RMS interface. An application can be designed for RMS files and then migrated to the Oracle database type by setting a software switch. The same application can be moved from one database type to another with minimal changes. SmartStar also supports Oracle's heterogeneous interconnects to major hardware platforms. This allows SmartStar applications to access Oracle databases throughout the entire enterprise.

For more information, contact David Baum, Signal Technology Inc., 5951 Encina Rd., Goleta, CA 93117; (805) 683-3771.

Circle 502 on reader card

SuperMAX Yields Up To 1.2 Gflops

FPS Computing announced the SuperMAX second-generation matrix algebra accelerator module. It features 152 Mflops per accelerator. Up to eight SuperMAXs can be added to an FPS M64/60 attached processor, yielding a supercomputer with peak computer power of 1.2 Gflops.

The SuperMAX accelerator is the second generation of FPS' parallel processing Matrix Algebra Accelerator (MAA) technology. SuperMAX is targeted at users with very large matrix applications for analysis of structures, electromagnetic wave behavior and fluid flow. Applications software for the original MAX will run on SuperMAX without recompiling or relinking. FPS' subroutine library for SuperMAX automatically checks the processing and storage resources available and divides the work among them. Each SuperMAX module contains four processors, each based on high-density ECL and ULSI gate arrays, reimplementing the original MAX technology from CMOS.

The product costs $130,000.

For more information, contact Jeff Wilson, FPS Computing, 3601 S.W. Murray Blvd., Beaverton, OR 97005; (503) 641-3151.

Circle 524 on reader card

AT&T Enhances C++ Language System

AT&T announced a supported and enhanced implementation of the object-oriented C++ programming language, the C++ Language System release 2.0.

AT&T has expanded the documentation and created a product-support program. C++ adds an object-oriented programming paradigm to C. It supports C's traditional procedural approach to programming, but lets programmers add object-oriented features. A new feature, multiple inheritance, lets a child object inherit the properties of more than one parent. Other features include typesafe linkage, default memberwise assignment and initialization of classes, overloaded -> operator, and the ability of each class to define its own new and delete operators. Refinements include separation of specialized task and complex libraries; enhancement and re-engineering of the task library; re-implementation of the stream I/O portion of libC.a; and re-engineering of the parsing of C++. The C++ Language System release

2.0 is available in source-code format.
For more information, contact AT&T, 550 Madison Ave., New York, NY 10022; (212) 605-5500.

Circle 513 on reader card

TES Connects NetWare LANs To Ethernet LANs

InterConnections Inc. announced Terminal Emulation Services (TES), client/server software that allows PC workstations on Novell NetWare LANs to communicate with VAX/VMS systems on Ethernet LANs. InterConnections, codeveloper of NetWare for VMS with Novell, is unbundling TES from NetWare for VMS and marketing it separately for those who don't need NetWare file service on one or more of their VAXs.

TES lets NetWare PC and PS/2 workstations emulate interactive terminals (including VT220/240/320 and Tektronix), log into VAX/VMS and run standard VMS applications. TES supports many PC-based terminal emulation programs, including those that let you hot key between DEC terminal emulation and PC applications that access NetWare file servers.

For more information, contact Kent Barnard, InterConnections Inc. 14711 N.E. 29th Pl., Ste. 100, Bellevue, WA 98007; (206) 881-5773.

Circle 526 on reader card ■

DIGITAL PRODUCTS

■ DEC expanded its line of PC and desktop products and services. Products and programs include:

1. The PCLAN/Server 3100, a packaged hardware and software system optimized for a workgroup of up to 48 PCs in a LAN or WAN. Pricing begins at $12,500 for a base unit with a 104-MB disk.
2. An internationalized PC line based initially on the DECstation 316 and 320 and adhering to international standards for Europe and the Pacific region.
3. The DECstation 212, a 12-MHz Intel 286-based industry-standard MS-DOS system for worldwide customers.
4. Options for the DECstation 210, 316 and 320, including a choice of a 101-key U.S. keyboard or DEC's keyboard, available in multinational character sets; a 16-bit VGA graphics adapter; and 20-MB IDE hard disk drives and an IDE controller.
5. An agreement with Toshiba Corporation of Tokyo, Japan. Selected Toshiba laptops will be certified by DEC as compatible with the Network Application Support program.

■ DEC's VAX ACMS V3.1, one of the monitor products within the DECtp environment, supports DECforms. It includes a commercial implementation of the ANSI/ISO FIMS standard.

DECforms' functionality allows forms processing on local and remote CPUs, field-level control without returning to the application program, management of simultaneous panels, storage of forms context between exchanges, additional field-level validation via escape units, and conversion tools to facilitate migration from VAX TDMS to DECforms. Minimum requirements are VAX/VMS V5.0 and CDD/Plus V4.1.

Pricing is processor-dependent; base prices are $22,000 for a development license, $11,000 for a run-time license and $5,500 for a remote-access license.

■ DEC announced VAX Software Performance Monitor (SPM) V3.3 and the DEC Capacity Planner (DECcp) performance and planning products based on VAX/VMS. The products are designed to help data processing managers maintain system performance.

These products provide an accurate measure of system use while identifying performance bottlenecks. With VAX SPM serving as a comprehensive performance management facility, you can pinpoint ways to gain system performance. In concert with VAX SPM, DECcp reduces the time and effort required to perform capacity planning studies while simultaneously generating information used to predict system performance based on projected workload.

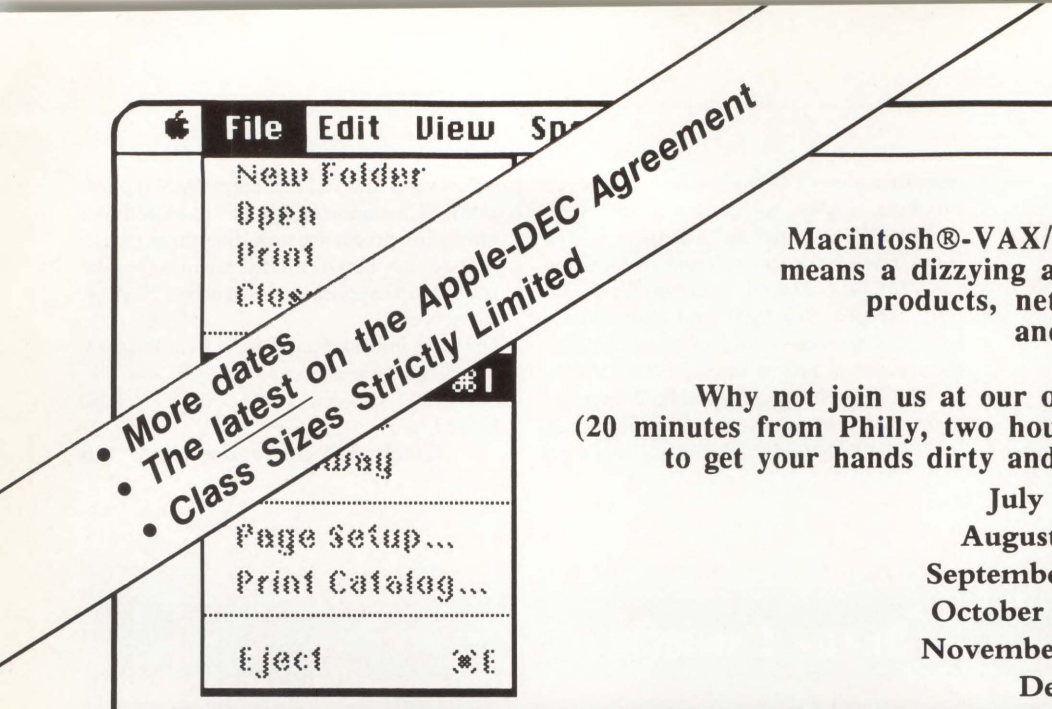
■ DEC announced a new version of ULTRIX that boosts the kernel performance of its RISC-based computers in timesharing, server and I/O-intensive environments. Many RISC-based kernel operations now run from 12 to 30 percent faster.

ULTRIX-32 V3.1 and ULTRIX Worksystem Software (UWS) V2.1 offer new device support, increased reliability and faster processing for many RISC-based applications. The new versions can be installed as a patch to ULTRIX-32 V3.0 and UWS V2.0. ULTRIX-32 V3.1 supports MicroVAX 3300/3400s, including a variety of related disk options, disk controllers, communications boards and Ethernet devices. In addition, V3.1 increases the feature-for-feature compatibility between VAX and RISC-based processors running ULTRIX.

■ DEC announced new versions of CASE products for the aerospace market:

1. The XD Ada MC68020 cross-development environment is a joint effort between SD-Scicon and the VAX Ada compiler and environment teams. Based on the VAX Ada compiler and SD-Scicon's code-generation technology, it provides a highly optimized code generator and support for the Motorola MC68020.
2. VAX Ada V2 adds the Ada Compiler Validation Capability (ACVC) V1.10 test suite, generic code sharing and Program Library Manager capabilities. It supports VMS V5 and the License Management Facility.
3. VAXELN Ada V2 is the development environment integrated with VAX Ada V2 for VAXELN real-time target systems. It's validated with ACVC V1.10. It allows access to VAXELN V3.1 and V3.2 system services and utilities and uses VAX Ada program libraries to develop applications for VMS or VAXELN.
4. VAX LISP V3 includes a DECwindows-based programming environment. Multiwindowed tools let programmers edit and debug code and exchange information with other DECwindows-based applications.
5. VAX DOCUMENT V1.2 includes support for DOD-STD-2167A, a DOD standard that specifies the process for the development and documentation of mission-critical software systems. Two doctypes specifically for DOD documents have been added.

For more information, contact your local DEC sales office or call (800) DIGITAL.



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CIRCLE 106 ON READER CARD

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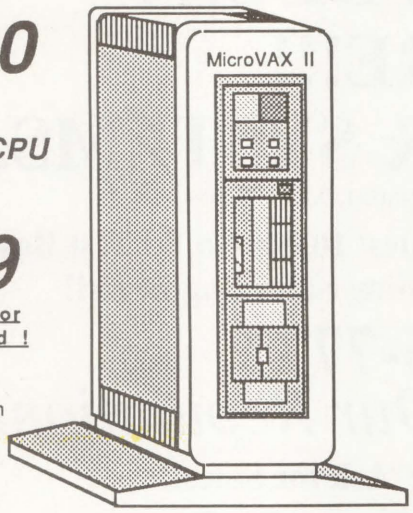

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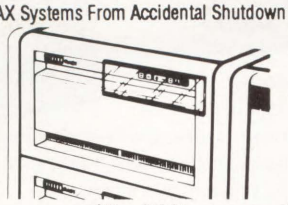

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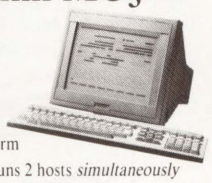

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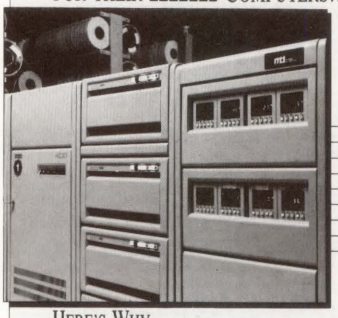

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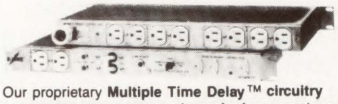

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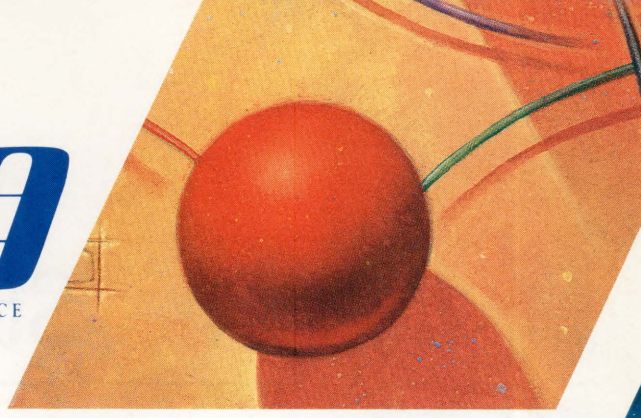

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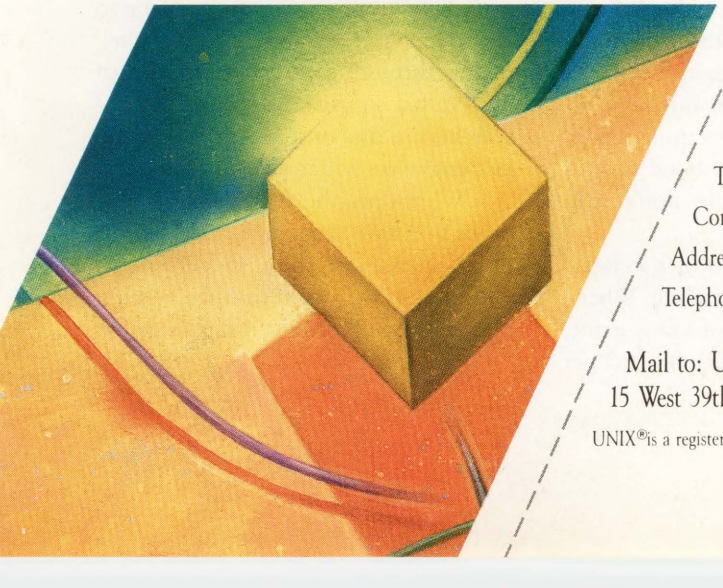

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BACK END

John C. Dvorak

The Stupidity Factor

Two articles that I recently read distressed me. One was in a computer-trade weekly in which a columnist commented that Windows wasn't "as big a dud as TopView," implying that Windows is going nowhere fast. Microsoft, however, claims that oodles of copies are being sold.

The other article, in another publication, was about research on the topic of stupidity being done by Jon Miller of the Public Opinion Laboratory at Northern Illinois University. He discovered that 36 percent of the American public believes that boiling radioactive milk makes it safe to drink.

The more we study stupidity, the more we realize that the technological society toward which we're headed must protect itself from its own inability to keep up with things because of its own stupidity. The public will be overloaded with bad information and will be unable to distinguish hokum from fact.

People involved in the PC revolution aren't any smarter. Like the general public, they suffer from an overall incompetence that stems from lack of initiative, fear of the unknown, and plain old sloth.

Watching Microsoft Windows try to turn the corner on its quest for popularity reflects this. As easy as Microsoft Windows is to use, it's too hard to use. You must own and install a mouse (too much work). You must clear memory from the machine and make space available on the hard disk (too hard to do). You must install Windows (time-consuming and not much fun). You must read the manual to understand the program's capability (forget it). You must create .PIF files and test software for compatibility (ha!).

The attitude seems to be that if the machine booted Windows automatically and if a lot of extra work wasn't needed, people might like it. Currently, it's too much trouble. The biggest fear is that you'll go through a lot of effort only to be disappointed with the results: The package won't work as advertised, or run your favorite program, or it crashes.

> ***"People don't read documentation. This is part of a national trend toward stupidity, because people don't read anything!"***

The only computer that has overcome this sloth factor is the Macintosh, with its logical interface. Steve Jobs realized that many people don't read. He put the documentation in pamphlet form. Plenty of information was omitted, but who cares? Most people never use all the features anyway. It's better not to promote features — instead, let them be discovered by the user. This is only true if the machine is functional without using all the whiz-bang features. Windows is a far cry from the Mac operating system in this regard.

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My 12-year-old stepson is a classic example. He's bored by reading. Whenever I get a review copy of a new game, he wants to play it. Usually, he can't get the game installed or started. "Did you read the instructions?" I ask. "Yes," he answers. "Read them again," I say. A few minutes later I hear the same complaint. I go to the computer, look at the manual and walk him through it.

Is he different from anyone else who refuses to read documentation — the majority of today's users? In the past, it was easy to condemn documentation writers for their mediocre and hard-to-understand prose. But much documentation now is well-organized, simple and easy to follow. Still, nobody reads it. Even sophisticated users — the ones who used to read documentation — have joined the forces of the illiterate. They argue that life is too short and that a good program doesn't need documentation.

What do we end up with? The market demands bulletproof software that's extremely intuitive. Can software be so intuitive that it communicates its commands through some nether world of non-verbal signals? We can expect researchers to find out. Meanwhile, interface engineers will make a lot of money.

What does the future hold? Windows will have to change drastically to be popular, and soon 50 percent of Americans will believe that boiling radioactive milk makes it safe to drink.

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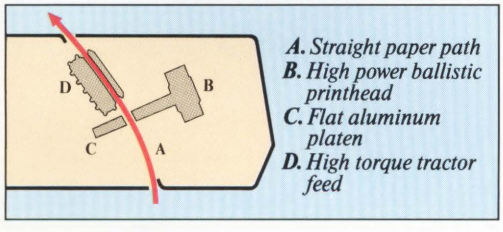

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