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MAY ■ 1990

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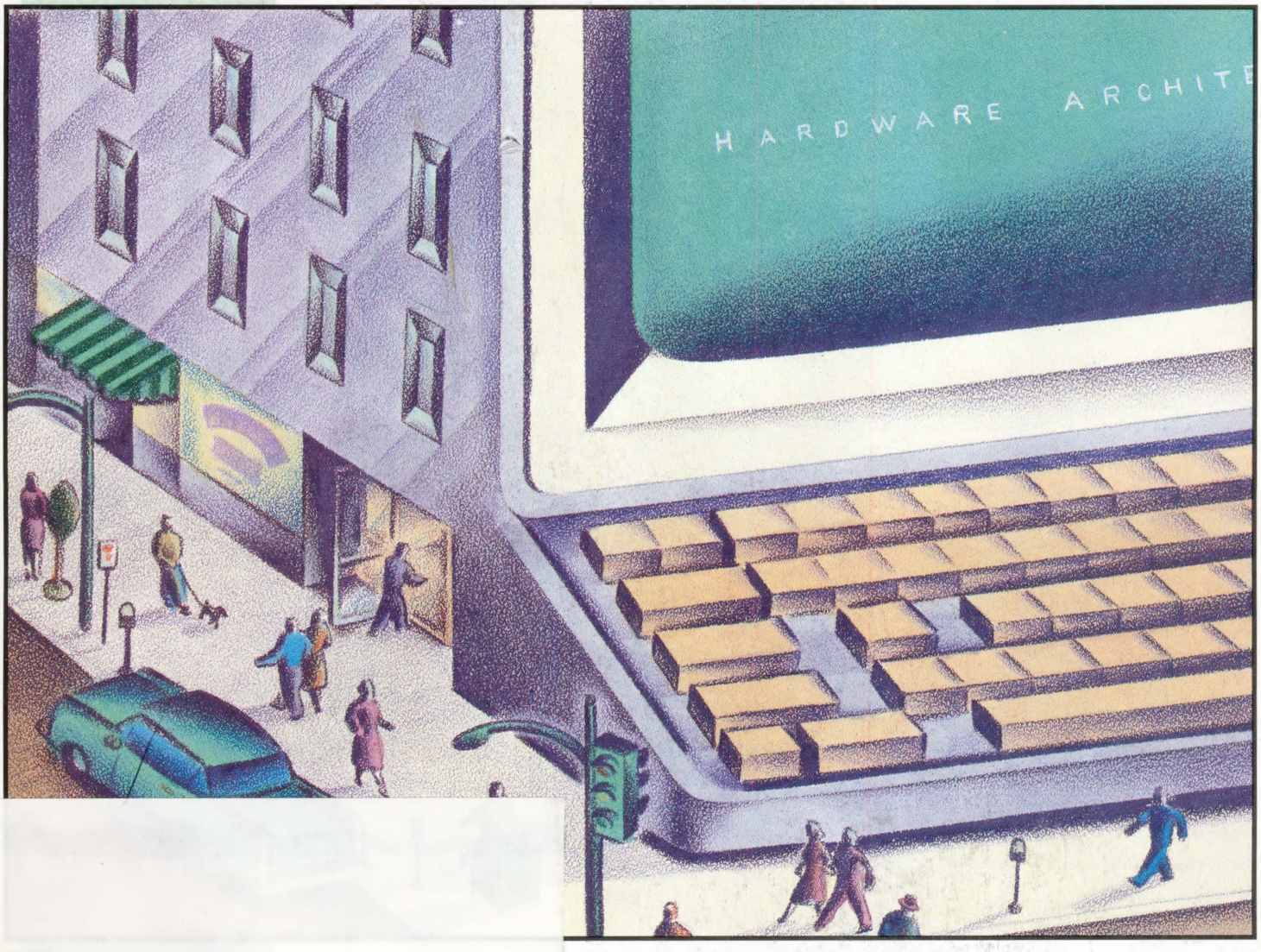

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DEC Professional Magazine
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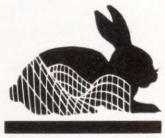

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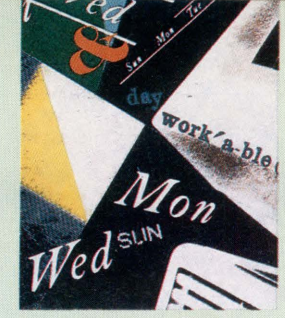

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Illustration by Mark Andresen, Metairie, LA.

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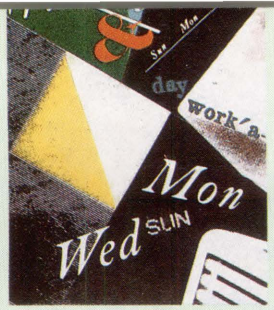

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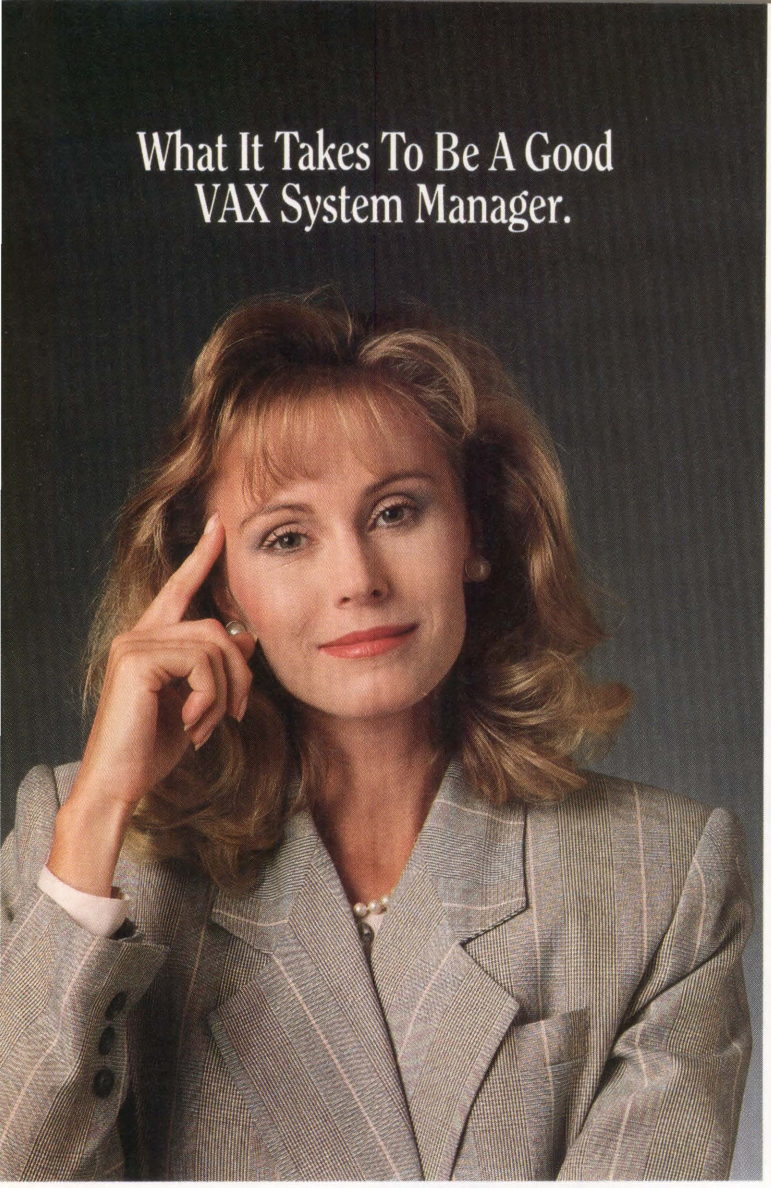

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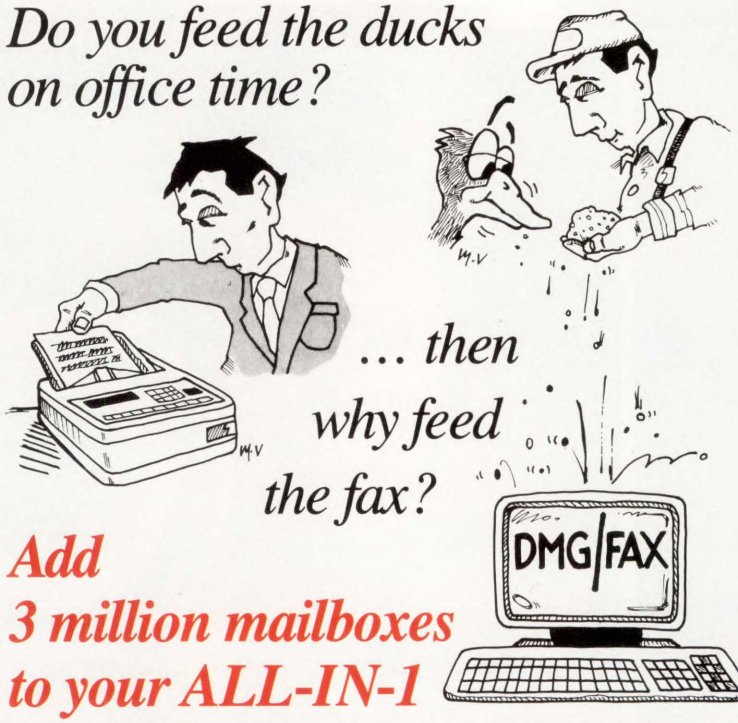

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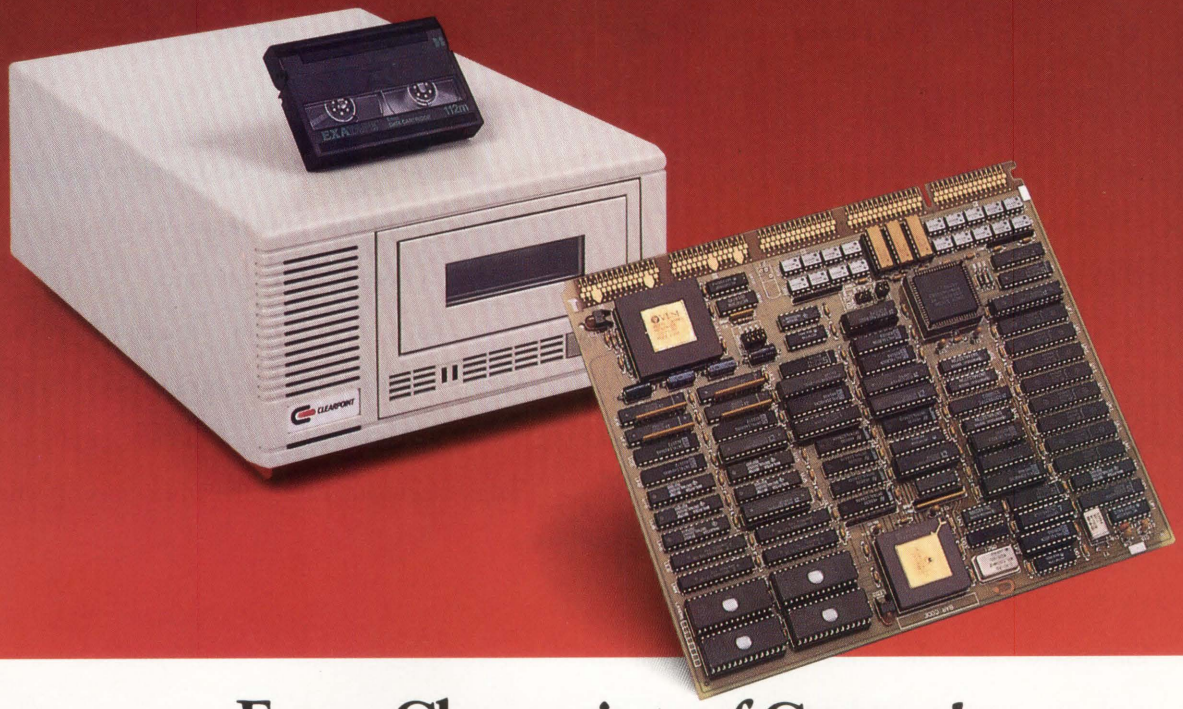

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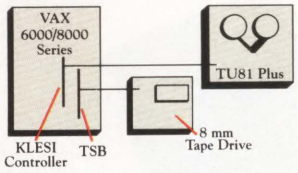

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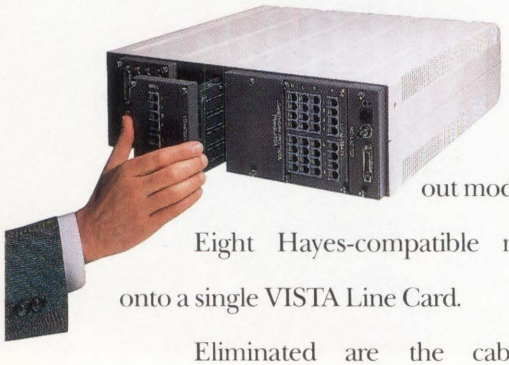

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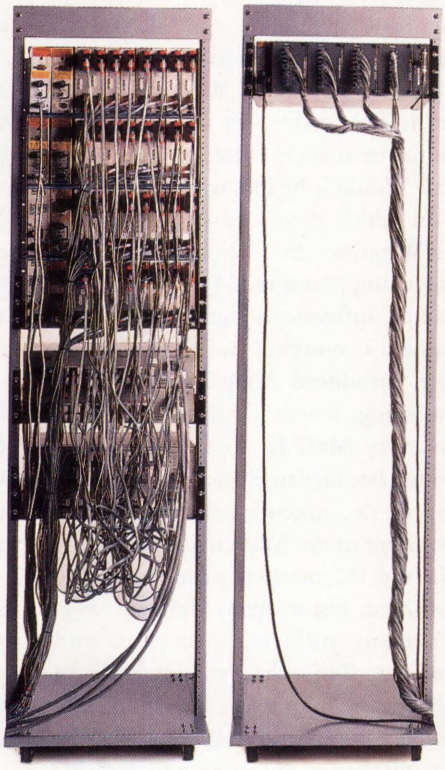

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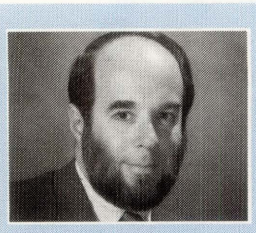

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Do We Have X ... Or Not?

We discovered recently that our DECsystem 3100 ULTRIX RISC machine was missing some important X Window System components. On further inquiry we discovered that they weren't missing at all — they just aren't included with multiuser ULTRIX computers. If we had purchased the single-user workstation variety of this RISC-based system, the X software would have been there.

Standards are just that: standard. Standard features on your car come with the car; optional items don't. Making X an optional layered product is a big mistake.

DEC's computers are well-positioned for the '90s, because they come with standard networking capability. It took most of the '80s to do this, but today most DEC computers exist with the ubiquitous Ethernet and some kind of clustering and networking. It's elegant, as Ken Olsen likes to say, and I think by elegant he means that it's simple. It's simple because it's standard.

PC networks suffer from complexity and confusion, because there are so many networks, protocols and suppliers. Even the complexity of the software is increased, because each networking program must support many different Ethernet (or other network) cards. PCs were saddled with Hercules graphics, CGA graphics, EGA graphics and now VGA graphics — and now there are even more flavors of networking systems. It isn't only confusing, it's hard. DEC, on the other hand, supplies most of what you need to cluster VAXs with simple software and standard hardware.

DECnet and LAVcs are, of course, software upgrades and could be thought of as layered products, since they cost extra to buy and support. However, they're elegant and simple. It takes thought, planning and hard work to keep things easy.

There's good evidence that bundled software is a good idea. What would the Mac be like if the user interface were optional or if there were no Mac standards? Would it be like windows on the PC, in which there's general confusion over Windows 286, Windows 386 and Presentation Manager in OS/2? The Mac attracted software designers and users because it's consistent and simple. When Apple introduced AppleTalk local area networking, it was a standard included with every Mac. As a result, Mac networking became an elegant (and simple) thing to do, making resource sharing transparent in the Mac environment.

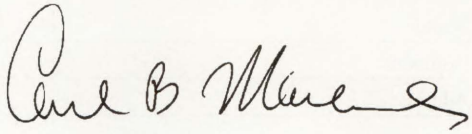
In the PC market, printers can be networked, but in many different ways with many different protocols and networks. This choice adds little in functionality but a lot in the complexity of accomplishing the task. We say that Mac software is intuitive and that PC software isn't. Maybe it's just that Mac software shares a common user look and feel, governed by the standard imposed by the Mac, while the PC lets the software designer have his own look and feel because there are no such standards.

Which comes first, the software or the software environment? Why would I buy the X components for the DECsystem 3100 if there's no software? Why would software companies write software for an environment no one has because there was no reason (software) to buy it? DEC must provide a rich, robust environment for software developers so that, like the Mac, they can have a gaggle of software that runs best on their platforms. If developers write for Open Look, then Motorola wins; if they write for the Mac, then Apple wins; if they write for Presentation Manager, then IBM wins. They won't write for X on DEC systems unless there's a critical mass of systems on which their software will run.

I've seen DECwindows, and I've seen X terminals. They can change the way we think about DEC computing. We have a VAXstation running DECwindows, and you can't really tell that VMS is there. You point and click with a mouse to do almost everything. While it isn't the same as a Mac, you can intuitively do almost anything with VMS you want — all without DCL or knowing that it's VMS. I can't do that with our ULTRIX machine yet, but when I do, I expect it to look and feel just like the VAXstation. VMS and ULTRIX will operate underneath the user interface in such a way that the user won't have to know they're there.

As software becomes available to take advantage of these platforms, each software package could look and feel the same to the user. We can be freed from the idioms of each operating system and concentrate on solving our problems.

The advantage DEC brings to computing for the '90s is a large, loyal installed base, standard networking on almost all its computers, a robust VMS system, and an industry-standard ULTRIX system — all on systems from workstations to mainframes. But to achieve the promise for the future, all this has to work together. That requires a standard platform to work with. The DECwindows interface is no less important to this than DCL is to VMS, and DCL isn't an optional component. DEC has made mistakes before, but none would be more critical than denying its user base the real standard interface it needs.



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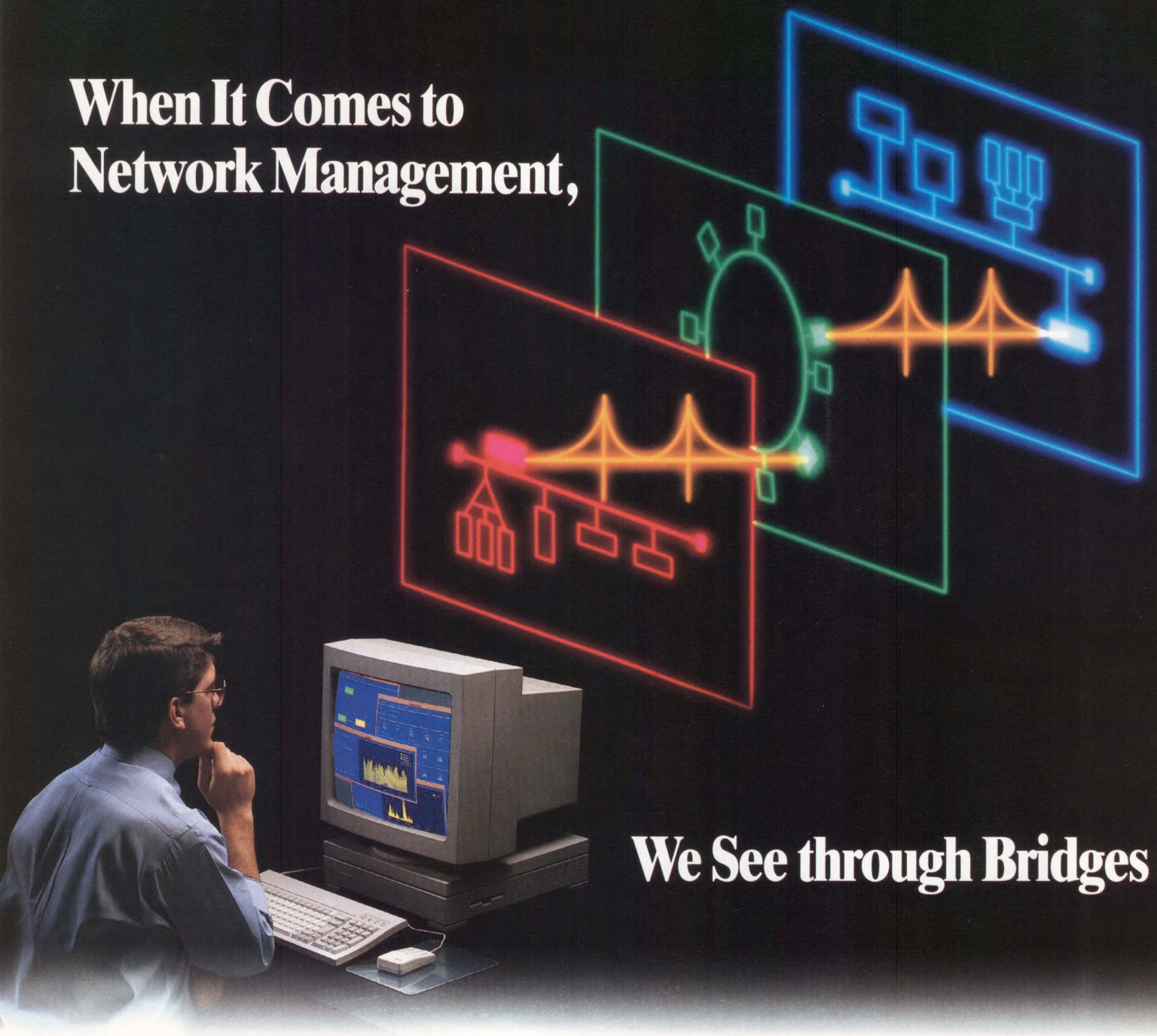

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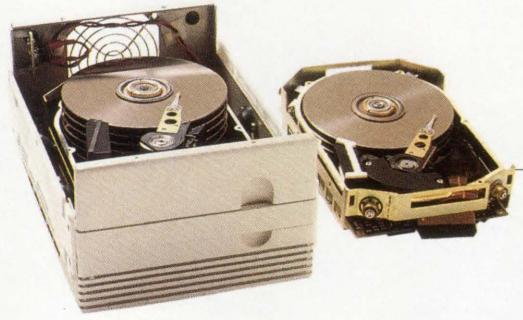

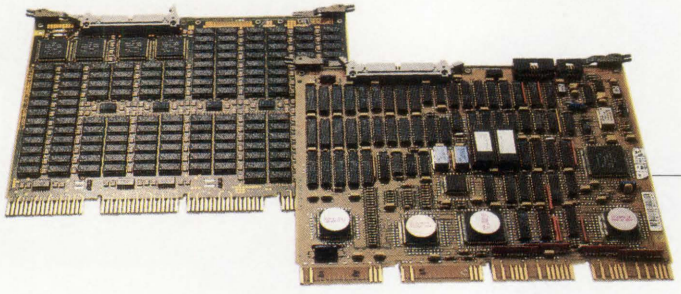

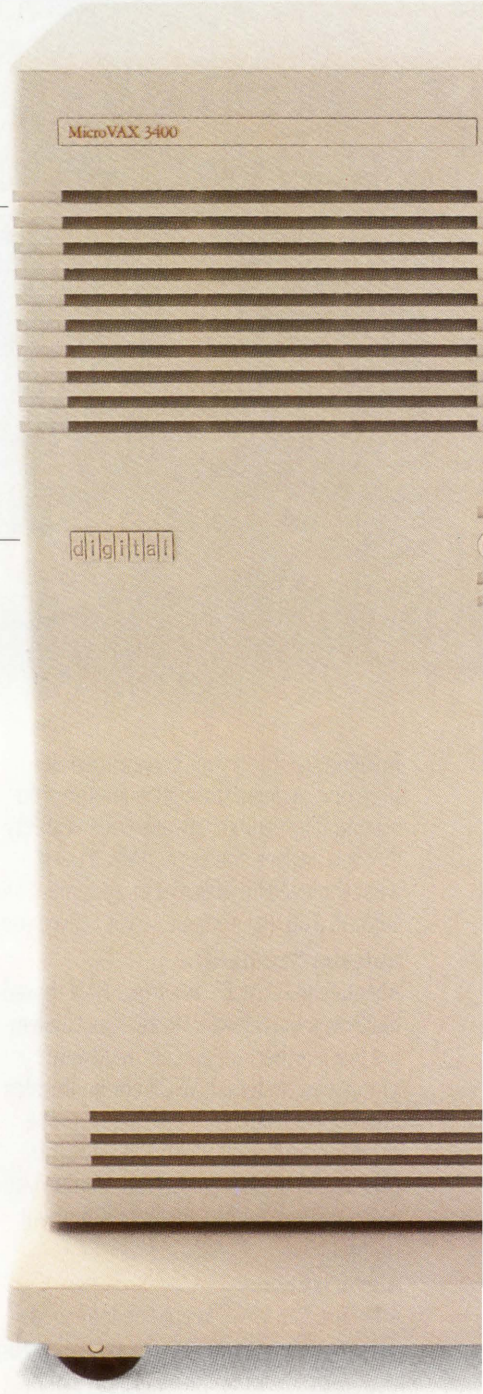

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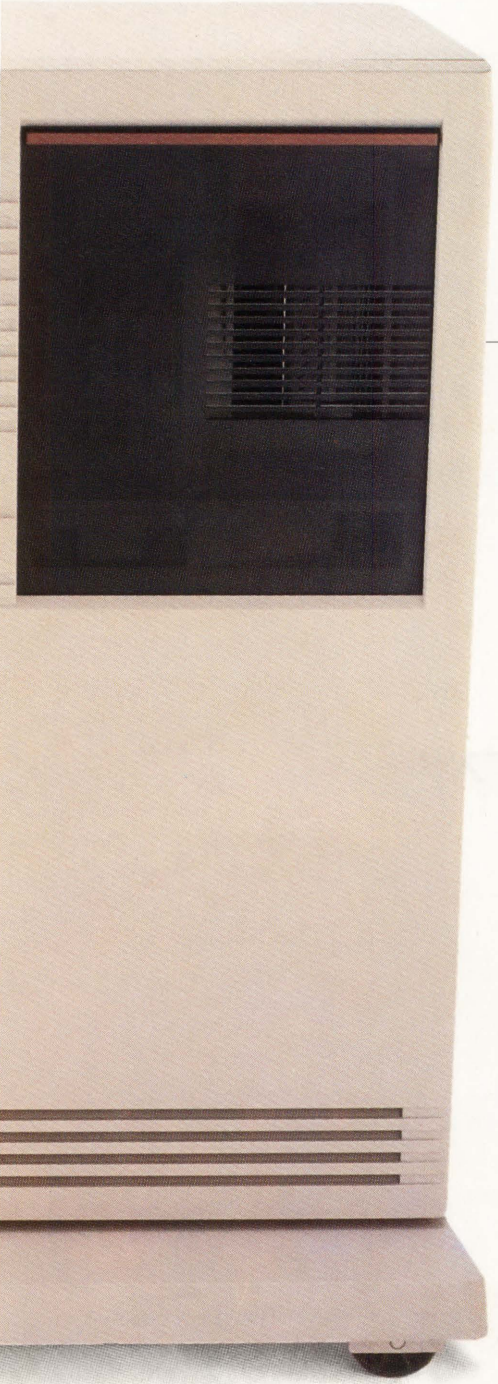

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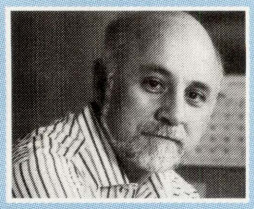


EDITORIAL

Dave Mallery

License To Steal

Here's a little saga that portends the decline and fall of VMS.

I've been on the market trying to buy a large VAX 8000 for Professional Press. Not being a *Fortune* 100 company, we have to watch our hardware and software expenditures very carefully and buy as much bang as our buck can get.

It so happens that a good buyer can pick up 12 mips worth of high-end 8000 machine today for a hundred grand or so. That's all they're worth. (Buy a big one, because if you want to upgrade later, forget it: The VMS license upgrade costs more than the machine!)

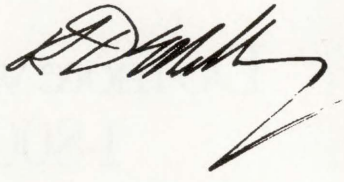
Here's the part about the demise of VMS. We bought a BASIC compiler with our VAX 11/750 about five years ago. This has mutated into a 100 power rating cluster license. An 8820 or 8800 has a power rating of 1,200. The compiler upgrade costs about fourteen grand. I won't have any more programmers the day after the upgrade than I have today, nor will I run the compiler much more often than I do now, but for some reason, I have to shell out all this money for something. There will be no compiling on the 88xx. The VAX BASIC compiler will have to stay on the workstations.

Not only that, but now *all* layered products are permanently out of reach. The hardware prices have fallen, but the software remains untouched.

Once you strip us of our layered products, all that's left is our own code. You can't port layered products to ULTRIX or UNIX, but you sure can port your own code.

Layered products, like field service, are a form of account control. With the current licensing policy, the only account control left will be in the *Fortune* 100.

Short of a life of crime, the only solution would be a per-user license policy. Let the mighty LMF deny access to the first user to go over the 100 power limit. I was told that wasn't in the cards, so I thought I'd make my point here.



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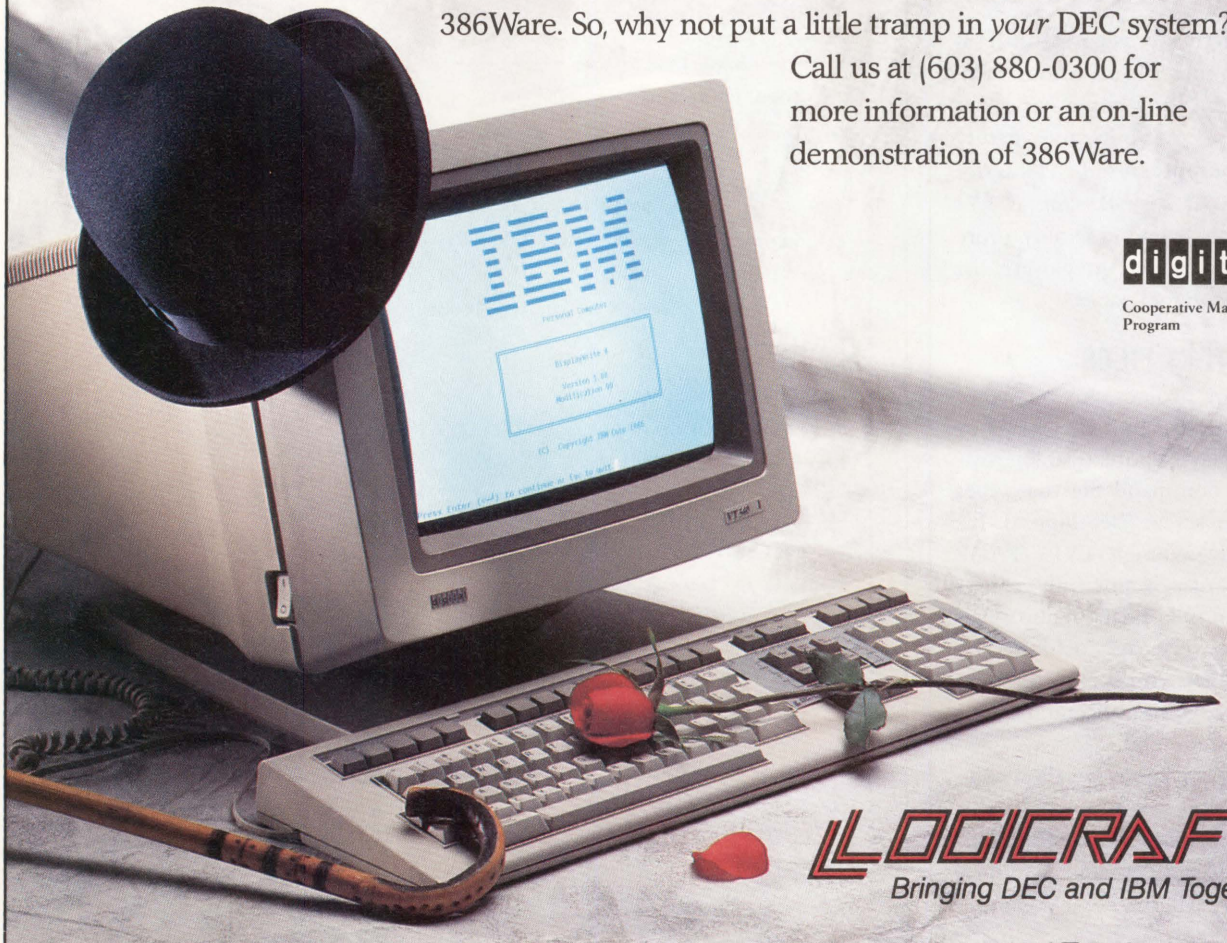

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LETTERS

DIGITAL PAPER CHASE

In Ron Levine's "The Optical Outlook" (January 1990), the author states that digital paper tape costs less than 0.5 cents per megabyte and is cheaper than any storage media in use.

This is incorrect. Commercially available 8mm tapes from Sony and others can be purchased in small quantities for $6 or less per tape. Each tape holds up to 2 GB. This is a cost of 0.3 cents per megabyte. Even assuming that a specific digital storage technique doesn't use the maximum 2-GB capacity of the tape, the storage cost still is comparable to that of digital paper.

Dr. Wes Boudville
Pasadena, California

Ron Levine: The reader is correct if he is referring to commercial-grade 8mm tape. But this isn't true for a computer-grade cartridge. For example, Sony's newly announced computer-grade D8 series costs about $40 at 2.3 GB. This is 1.74 cents per megabyte, considerably more than the 0.5 cents per megabyte for computer-grade digital paper.

ONSCREEN TEXT FILES

On my current project, my manager asked me to "pretty up" the way our application displays reports to the terminal. I wrote a command file that types text files on the screen (see Figure). It's better than the average TYPE/PAGE command, because it not only pauses after each screen full of data, it also clears the screen after every page (delimited by form feeds) and lets you skip to the next page, previous page or a specific page or restart output altogether.

Wildcard specifications are allowed in the command line arguments, so this routine performs many of the functions of the UNIX **more** command. I've used this routine on a MicroVAX 3900, and it performs fairly well, even under a full system load. However, skipping backward can take a while, because it's accomplished by reopening the file and skipping forward to the desired page.

Editor's note: The complete text of the Figure is available in download in ARIS/BB.

Russell L. Morrison II
Fontana, California

THE SABER-C SAGA

Editor's note: The following is in response to a letter published in January 1990 in which a writer questioned the functionality of Saber Software's Saber-C environment. Saber-C was the subject of a Product Watch published in October 1989 (page 22).

Saber-C is a complete programming environment of which error checking is one feature. The Saber-C programming environment offers source-level debugging, an incremental linker/loader and graphical program and data browsers. These features facilitate rapid prototyping, modular programming, better testing and quicker debugging.

The novelty of Saber-C's error detection isn't its ability to catch syntax errors, and we agree that professional programmers don't spend much time on this. The

Figure.

Source Code Follows

```
$ !
$ !     Command File Name:      TYPE.COM
$ !     Version.Edit:           1.0
$ !     Date Written:           15-Nov-89
$ !     By:                     Russell L. Morrison II
$ !
$ !     Description:    This command file types its arguments on the terminal,
$ !                     pausing after 22 lines or a form feed.
$ !
$ !     Syntax:         <TYPE [WIDE] <p1> <p2> ... <p8>
$ !
$ !                     WIDE            optional wide screen (132-column mode)
$ !                                     flag
$ !                     <p1>...         File specifications, wildcards OK.
$ !
$ ESC[0,7] == 27                                    ! Set up symbols for escape
$ FF[0,7] == 12                                     ! and form feed
$
$ print_file:   SUBROUTINE                          ! File printer subroutine
$  on control_y then goto really_done               ! ensures input file is closed
$  if P1 .eqs. "WIDE" then exit                     ! this is the "WIDE" switch
$  LASTFILE = ""                                    ! initialize lastfile marker
$  loop_file:                                       ! print a file:
$   FILE = f$search(P1,1)                           ! get next filespec - allows
$                                                   ! wildcard use
$   if FILE .eqs. "" .or. FILE .eqs. LASTFILE       ! last filespec done?
$   then
$       exit                                        ! exit subroutine
$   endif
$   LASTFILE := 'FILE'                              ! reset lastfile marker
$   open/error=open_error INP 'FILE'                ! open input file
$   COUNT       = 0                                 ! initialize line counter
$   LAST_PAGE   = 1                                 ! initialize previous page no.
$   CUR_PAGE    = 1                                 ! initialize current page no.
$  loop:                                            ! input loop:
$   read/end_of_file=done INP REC                   ! read a record
$   COUNT = COUNT + 1                               ! increment line count
$   if f$extract(0,1,REC) .eqs. "''FF'" -
       .or. COUNT .ge. 22                           ! end of page/end of screen?
$   then
$       gosub end_of_page                           ! do end of page process
$   endif
$   write sys$output REC                            ! display record
$   goto loop                                       ! get next record
$ !
$ ! - End of page routine.
.
.
.
```

TYPE.DOC

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AT & T	Gould	PC MS-DOS	Sun
Convergent	HP	PC SCO Xenix	Unisys
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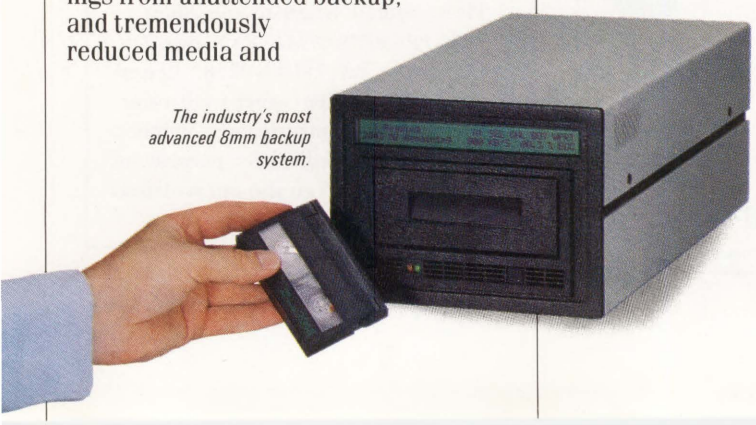

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DEC PROFESSIONAL 1990 Buyers Guide

Survey results indicate that 85 percent of the subscribers to the 1989 edition of the *DEC PROFESSIONAL Buyers Guide* used it for product information, and 16 percent made a purchase during the two months after publication. The 1990 edition will include expanded hardware listings and selected software listings. Information and product update requests have been mailed, so vendors can submit or update their free listings.

For information about free product listings, call Lea Smith at (215) 957-4286. For information about advertising in the Buyers Guide, call Connie Mahon at (215) 957-4216.

novelty of Saber-C is its run-time ability to trap errors before they turn into fatal signals or random behavior. Specifically, the following example describes an error that Saber-C detects that wouldn't be caught with a DEC (or other) standard compiler:

```
int buf[3] = { 11,22,33 };
char *msg = "hello world\n";

main() {
     int i;
     for (i = 0; i <=3; i++) buf[i] = i;
     Print_msg();
}
print_msg() {
     printf("%\n", msg)'
}
```

In this example, the program produces a garbled message (>P^ZAZPPPYPYXu on our VAXstation II), but it won't crash. On a Sun Microsystems machine, a core dump occurs. A breakpoint in printf shows that the variable "msg" contains the value of 3, which isn't much help in finding the problem.

Saber-C detects the real problem, which occurs in the "for" loop within main, when the array index into the buffer "buf" exceeds its declared bounds and corrupts the memory location for the variable "msg." The i <= 3 should be i <3. This checking is novel to Saber-C, because when the program is running, this problem is detected and the source to the function main, with the "for" loop highlighted, is displayed.

The goal of Saber-C isn't high-quality syntax error reporting but a complete programming environment that can detect the greatest number of static and run-time errors (not just hardware faults), providing fast turnaround for interactive code changes through an incremental linker and a graphical user interface to speed debugging and code maintenance tasks.

Stephen Kaufer
Saber Software Inc.
Cambridge, Massachusetts

MULTIPURPOSE MULTITHREADING

There's speculation that DEC will add multithreading (multiple execution streams in a single address space) to VMS to improve the efficiency of TP applications. TP isn't the only area that can benefit from multithreading. DCL is slowed substantially by image activation. If VMS supported multiple action images in the same process, often-used images could be activated and ready to run without activation overhead. This was done years ago in MS-DOS, a supposedly less functional operating system.

An even greater benefactor would be UNIX emulation (or POSIX). Many UNIX commands are insignificant pieces of code that require a process to run. With these images preactivated in one process, VMS could execute shell scripts faster than UNIX.

Lets hope DEC uses a generalized approach that doesn't restrict itself to TP.

Robert S. De Wolf
Fullerton, California ■

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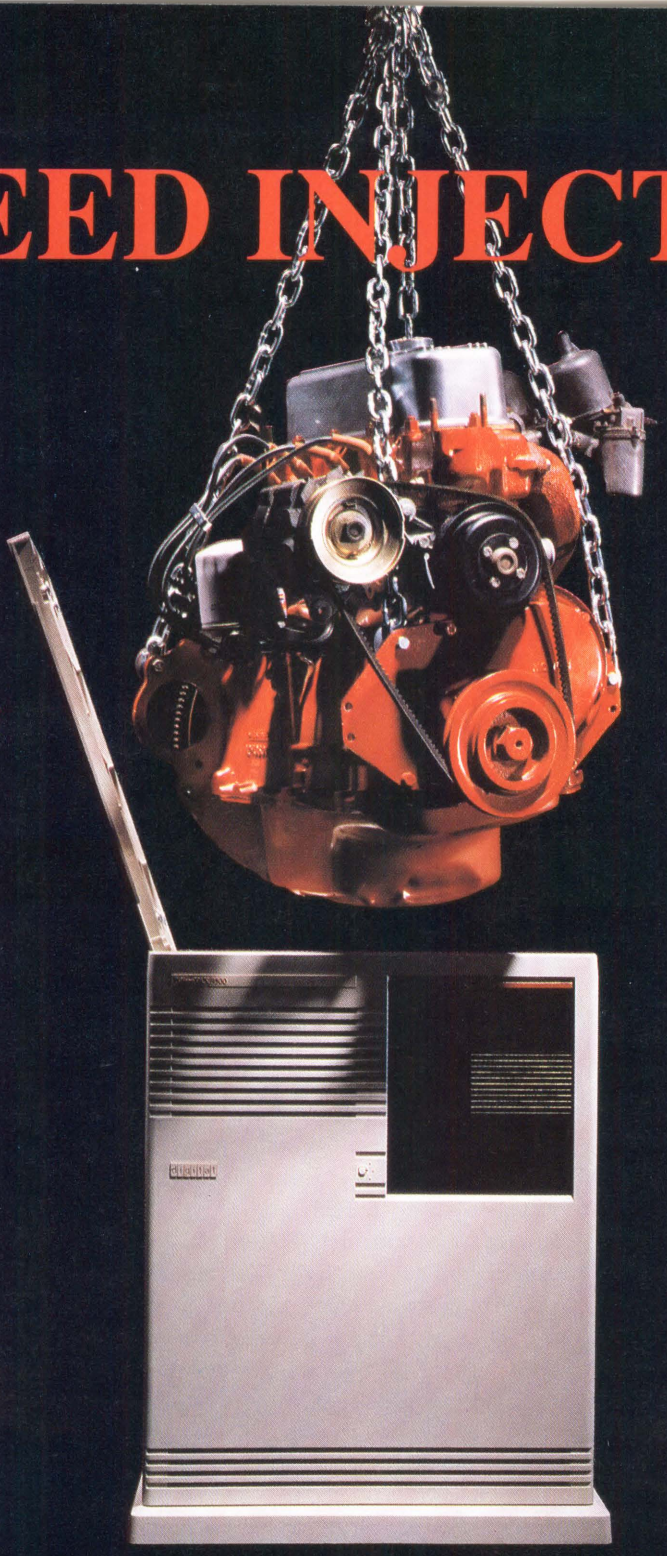

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ARISTALK

CDD.DIC PROTECTION

QUERY:

John P. Flynn *(SIG 37/MESS 1,234)*: My [SYS0.SYSEXE]CDD.DIC file had no world-read access, so I changed the UIC-based protection and the ACL to allow this. It worked, but something keeps changing the protection back to how it was set originally, which is (S:RWED,O,G,W), with an ACL such as:

```
(ID=%X80010005,ACCESS=...)
(ID=[*,*],ACCESS=NONE)
```

After I defined a security alarm on the file, it appears that the changes are done by some batch jobs, which use DATATRIEVE. Not all such batch jobs appear to do it, however, and no interactive jobs appear to do it. The batch jobs don't appear to mess with the protection on any files explicitly.

REPLIES:

John Rice *(SIG 37/MESS 1,235)*: See if the version number of the CDD.DIC file is incrementing. Then look for a batch job calling CDDV doing a VERIFY and COMPRESS. When CDDV compresses the dictionary file, it writes a new version of the file. It's possible that the new file is created with a new protection, very likely PROTECTION/ACLs derived by the protection codes on the directory in which the CDD resides.

John P. Flynn *(SIG 37/MESS 1,239)*: Thanks for the excellent hints. However, no new versions of the CDD.DIC are being created. I'm dealing with my original version of the file, dated three years ago. The problem with resetting protection on CDD.DIC occurs when exiting DATATRIEVE interactively — but only when this is done from the node in my mixed-version cluster running VMS V5.1-1, DTR V4.2 and CDD V4.1. From my other node, running VMS V4.7, DTR V4.1 and CDD V3.4, this problem doesn't occur.

This problem has nothing to do with batch jobs, as I previously thought. It appears to be something in DATATRIEVE V4.2 that, upon exiting, resets the protection on CDD.DIC. Any more hints?

John Rice *(SIG 37/MESS 1243)*: I haven't any ideas other than a possible bug. We're still at V4.7, but in about two weeks we'll start our V5.0 upgrade. I'll look for that problem. We have a number of DATATRIEVE applications running on the cluster.

ESE20-TO-HSC70 CONNECTION

QUERY:

James Meeks *(SIG 22/MESS 277)*: I'm interested in hooking up two ESE20 solid-state drives in a shadow set connected to two different HSC70 controllers. Has anyone done this? What problems could I expect? What configuration problems might I run into? On one HSC70, I'll have only the ESE20s and an SA550 storage array with only RA70s. Shadow copies will be on two other HSC70s that handle two SA550s and one SA650 storage array. All this is being run in a VAXcluster with two VAX 6000 Model 210s and two VAX 6000 Model 410s.

REPLIES:

Marty Johnson *(SIG 22/MESS 278)*: When disk shadowing first came out, I was told that all the disks of a shadow set have to be on the same HSC, as the HSC, not VMS, is doing the shadowing. Is this true? If it is, your second HSC70 could only be used for failover redundancy.

James A. Meeks *(SIG 22/MESS 279)*: The disks in the shadow set can reside on different HSCs, supplying a more efficient failover capability.

Greg P. Schulz *(SIG 22/MESS 281)*: I have one cluster configured with two strings of disks, which are dual-ported and shadowed. Each string has two HSC70s. In one of these strings, two ESE20s have been shadowed and

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

The ARIS/BB symbol appears at the beginning of each article when the program is downloadable. *VAX PROFESSIONAL* programs are available to subscribers of *VAX PROFESSIONAL* only. For subscription information, contact Phyllis Chandler at (215) 957-1500 9 a.m. - 5 p.m. Eastern Time. 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 ARISTALK are:

21 ..... Controllers/Memory
22 ..... Mass Storage
37 ..... VMS
41 ..... Applications
45 ..... Programming Languages/Al

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- LPM line matrix printers
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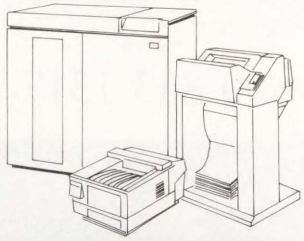
- 30 and 45 PPM Ion Deposition Postscript/Ethernet non-impact printers.



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dual-ported for six months. The big restriction is that your shadow members have to be on the same HSC, but you can certainly dual-port to another HSC for failover. Failover works great, but watch out for shadow copies if you have RA90s. Another tip is to configure your disks and channel cards in the following order:

```
SLOT 9 = LOW SLOT
TA90 = LOWEST SLOTS
RA90 = NEXT
RA82 + ESE20 NEXT
RA70 + RA81 + RA60, ETC.
```

That isn't a typo on the ESE20 behind the RA90. It has to do with transfer rates.

VAXSTATION 3100 SECURITY

QUERY:

Paul S. Buob *(SIG 21/MESS 358)*: I need a product to lock up a workstation so that any input would be disabled without a key or any other verification device. We have our VAXstation 3100s where people could accidentally halt these nodes.

REPLY:

Rob Vugteveen *(SIG 21/MESS 359)*: As long as you don't need to view anything on the console, you can secure a VAXstation running DECwindows from unauthorized input by using the PAUSE feature in the Session Manager. Our VAXstation 3100s aren't running shop-floor operations. If yours are, this PAUSE may be more of a pause than you're willing to accept.

If you're looking for hardware, there are lockable keyboard drawers and covers available from computer supply stores, but then you need to protect the boot switch on the back if that concerns you. If so, check with NEMA for a suitable enclosure.

UIC TRANSLATION

QUERY:

Scot Shaw *(SIG 41/MESS 390)*: I have an application that uses the GETUAI system service call to extract information from UAF. Part of the information extracted is the UIC, which happens to be a longword. How can I translate this longword into the member and group numbers? I recall a RTL routine or another system service call that did this.

REPLIES:

Serge Stein *(SIG 41/MESS 391)*: The routine I believe you're looking for is SYS$FAO. The !%U directive translates a longword UIC to the form [ggg,mmm]. The !%I directive will convert a longword UIC to the form [group_ identifier, member_identifier].

If you need the group and member numbers by themselves, you should be able to get binary word representations from SYS$GETUAI and use the !OW directive of SYS$FAO to get the octal numbers.

Scot Shaw *(SIG 41/MESS 392)*: It worked like a champ. Thanks for the assistance.

RMS $PARSE SEARCH LISTS

QUERY:

Simon Brown *(SIG 45/MESS 516)*: I have a logical, which is a search list, with a lot of varied dev:dir specifications. I'd like to get at the equivalence strings as produced by RMS $PARSE. How do I go about getting at each valid but different dev:[dir] that this logical name points to? I don't want to open files in each directory. I just want to see what the dirs are. I want something similar to what is produced by SHOW LOG/FULL.

REPLY:

Andrew Duggan *(SIG 45/MESS 517)*: If I understand you correctly, SYS$TRNLNM will do what you want. It takes an item_list_3 as one of the arguments. You can call it once to get the maximum number of equivalence names, then build another item list or lists to return all the equivalences at once.

I've never needed to get more than one equivalence back, so I don't know if you can stack multiple LNM$_INDEX requests in a single item list or if you have to use the LNM$_CHAIN to chain a lot of them together. I think the latter is probably correct.

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CIRCLE 239 ON READER CARD

Diminishing Downtime

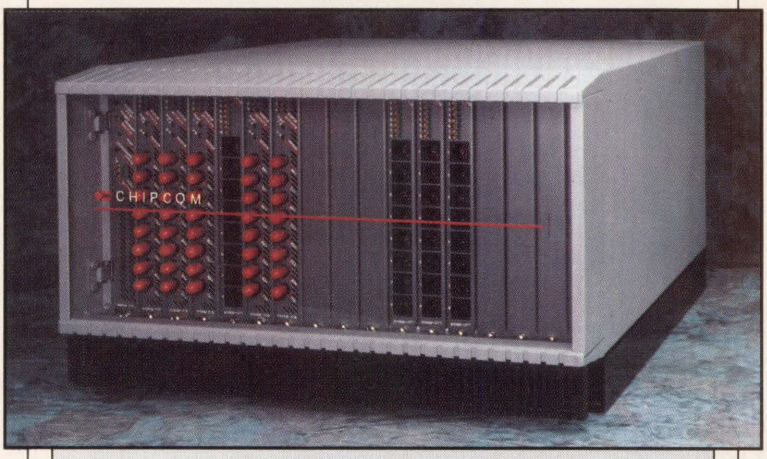
Chipcom Seeks To Eliminate Network Downtime Through Fault-Tolerant Engineering

Network downtime is the bane of a system manager's existence. The typical LAN is down about six percent of the time, resulting in millions of dollars in productivity and revenue losses.

Network managers should sleep better, though, after adding Chipcom's Online System architecture to their networks. Online is a next-generation, multichannel network management and control system, incorporating two key components — the Online System Concentrator and the TriChannel Architecture — that combine to virtually eliminate network downtime.

Featuring 17 front-loading slots, the Online System Concentrator is a modular multichannel network facility platform of various media types and multiple protocols including Ethernet, Token Ring and FDDI. The Concentrator's chief attribute is its ability to support multiple networks from a single concentrator. Chipcom's TriChannel Architecture provides networking flexibility by supporting up to three Ethernet, Token Ring or FDDI networks simultaneously in any combination within a single-system concentrator with integrated bridging and routing.

Chipcom President Rob Held estimates that *Fortune* 500 companies lost an average of $4 million in 1989 because of network downtime, adding, "there's nobody out there who has a system that can't go down."



Online's architecture supports multiple networks from a single concentrator.

"Network managers will be able to configure and reconfigure users on-the-fly among the Online System's three channels — all from a remote console," adds Bob Sheppard, network program manager.

Chipcom relies on its fault-tolerant architecture to allow networks to withstand potential crippling failures. In most cases, switchover to the backup occurs in less than 10 milliseconds. Fault tolerance is achieved in Online by providing redundancy for failure-prone components such as backup power supplies and backbone cable links.

The Online Concentrator boasts a high port density, which allows up to 128 unshielded twisted-pair connections and 64 fiber connections in 8 3/4 inches of standard rack-mount space. Chipcom claims that Online can support the same number of users at a more affordable price per port in one-half the wire closet space of other conventional systems.

Additionally, Online's TriChannel Architecture lets you assign each media module to Ethernet, Token Ring (4 or 16 Mbps) or FDDI, providing flexibility and media mixing capabilities. Each module is configured among channels with an on-board DIP switch or remotely through network management software, permitting flexibility in network design and configuration as users are moved, added or removed.

Future Online developments will include a low-end terminal version and a high-end workstation version, both based on SNMP. Chipcom's workstation version will focus on a software platform that includes the UNIX operating system, the X Window System and a fully integrated SQL database.

The Online System Concentrator (Model 5017C) costs $4,450, while the four-port Online Fiber Module (Model 5104M-FIB) costs $1,800. An additional component, the Fault Tolerant Fiber Transceiver, costs $995.

FOR MORE INFORMATION

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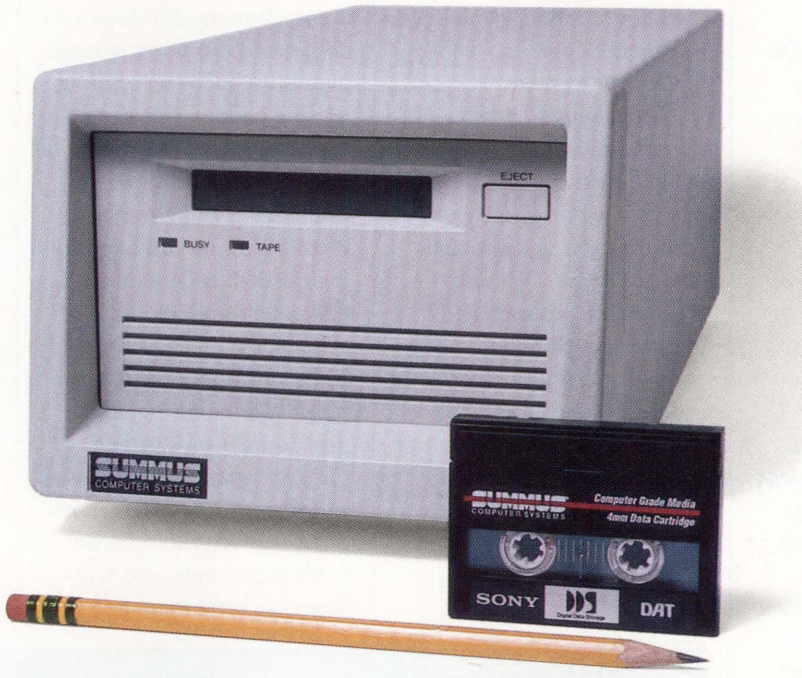

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CIRCLE 161 ON READER CARD

Easing Window Development

Ingres/Windows 4GL Provides A Practical Means Of Creating Sophisticated Window Applications

Workstations, PCs and X terminals provide users with flexible, powerful applications and increase their productivity. Yet developers face complex programming problems that can offset the advantages gained from window interfacing capabilities.

Ingres Corporation's Ingres/Windows 4GL provides help for these programming concerns. It's a complete rapid-development environment for building production-quality applications for graphical user interfaces (GUI). By adopting an integrated architecture featuring visual editing and a full-function, object-oriented 4GL, Ingres provides a practical means of creating sophisticated window applications.

According to Bill Smith, Ingres product marketing manager, Ingres/Windows 4GL is the "first complete development system application specifically oriented for multitask graphical environments."

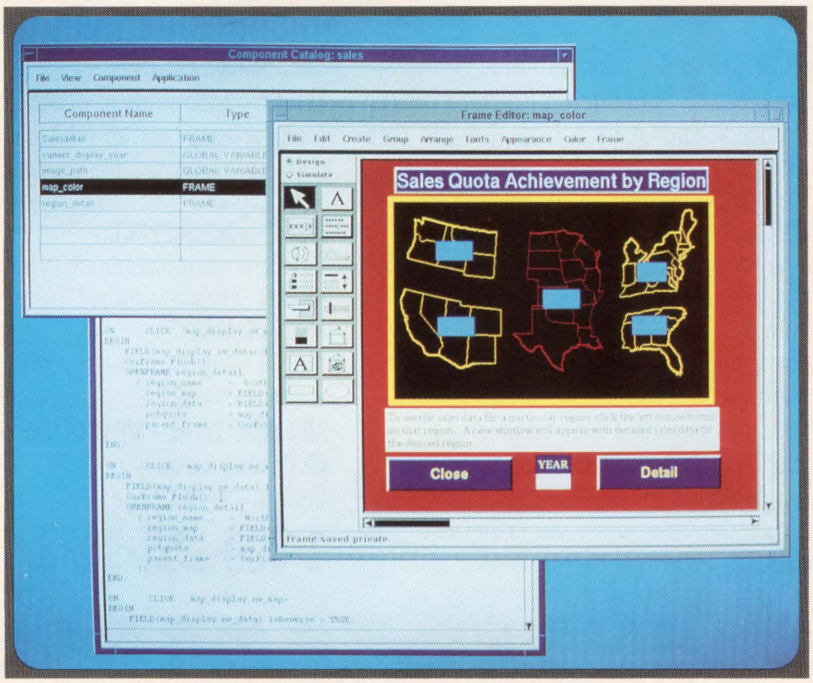
Ingres/Windows 4GL lets you access capabilities that can't be emulated on terminals. You can access advanced workstation facilities, such as common GUI elements and multiwindow applications. One 4GL advancement is its native "window toolkit," which mirrors the look and feel of the user's system.

You can build applications in DECwindows and deploy them on OSF/Motif or other windowing systems without making additional changes. Ingres/Windows 4GL, unlike proprietary toolkits that prohibit cooperation with native toolkits, uses its toolkit to cut and paste between applications.

Here's a snapshot of Ingres/Windows 4GL:

1. It incorporates visual editors to speed development, allowing developers to design and test windows and menus interactively without writing code.
2. Window development provided by 3GL toolkits is simplified. Programs normally requiring thousands of lines of 3GL code require only a few hundred lines of 4GL code.
3. Ingres/Windows 4GL is object-oriented to increase programmer productivity. Object classes can be defined and shared, 4GL code can be encapsulated with window fields and menus, and windows can send messages to other windows.
4. Multiwindow applications increase user flexibility and can increase developer productivity. Windows are active simultaneously, providing ease in switching among tasks. Programmers can create generalized windows that reduce program code.
5. Ingres/Windows 4GL includes a data dictionary to catalog each application element for documentation purposes. It's geared to support prominent windowing systems, including DECwindows, OSF/Motif, Windows/386, Presentation Manager and the Macintosh.

The product will ship in July or August. It will cost about $5,000 for a two- to eight-node network, according to Smith.



Ingres/Windows 4GL is a complete rapid-development environment for building production-quality applications for GUIs.

FOR MORE INFORMATION

Ingres Corp.
1080 Marina Village Pkwy.
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The New Leader

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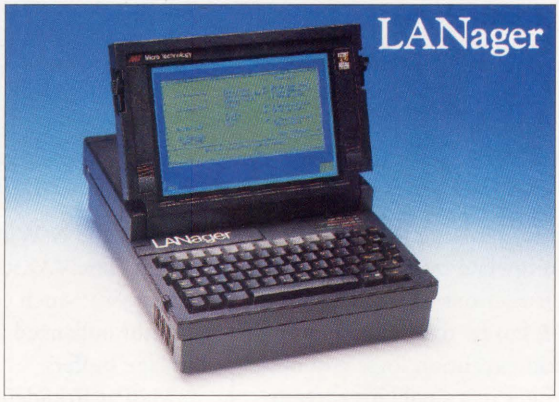

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Parallel Power

MasPar Strives To Make Parallel Computing More Accessible

Information managers seeking to resolve complex problems through high-end computing have been frustrated by barriers in price, performance and programming. But recent advances in parallel processing have provided supercomputer makers with the means to create systems with the price, size and support typical of midrange minicomputers but with supercomputer power.

One such high-end computer manufacturer is MasPar Computer, maker of the MP-1 family of data parallel computers. The MP-1 consists of a Processor Element (PE) Array, an Array Control Unit (ACU), a VAX 3520 subsystem, standard I/O (keyboard, display, Ethernet, disk and cartridge tape) and high-speed I/O. The MP-1 data parallel computers feature a range of 1,024 to 16,384 processor elements in the parallel processing array.

The MP-1 family is available in two series: the MP 1100 and MP 1200. The MP 1100 can accommodate from 1,024 to 4,096 PEs, while the MP 1200 is available in configurations from 1,024 to 16,384 PEs.

FOR MORE INFORMATION

MasPar Computer Corp.
749 N. Mary Ave.
Sunnyvale, CA 94086
(408) 736-3300
Circle 410 on reader card

The MP 1200 Series provides up to 30,000 mips and 1,500 Mflops.

Both are available in two cabinets: a Data Parallel Unit and either a UNIX-based workstation or the VAXstation-based ULTRIX subsystem.

The MP-1 group of supercomputers delivers up to 30,000 mips and 1,500 Mflops and incorporates VLSI chip design technology while using software interface standards to enhance hardware and software upgrade capabilities. The MP-1 family doesn't require special cooling or housing and is designed for installation in office and other moderate-condition computing environments.

The PE Array is the cornerstone of the MP-1 structure, allowing the computer to operate on thousands of instructions in parallel. Each PE has its own data memory and execution logic and operates in a single instruction multidata (SIMD) manner, allowing up to 16,384 processors to work simultaneously on a single problem. The ACU is a RISC-like dedicated control processor specifically designed to control the PE Array and the communication between the PEs and the rest of the system. Containing separate data and instruction memory, the ACU can overlap PE Array control and memory operations.

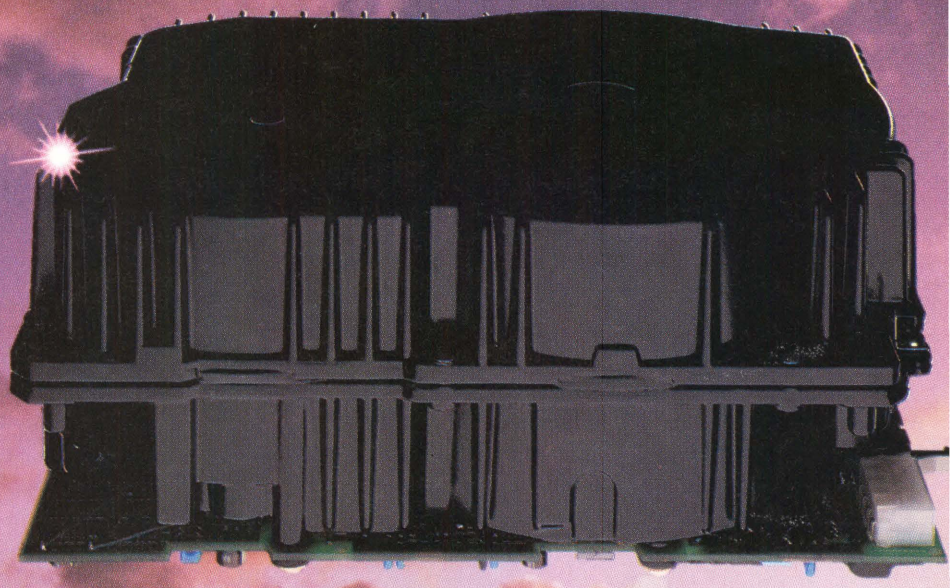
The VAXstation 3520 subsystem boasts up to seven mips of processing power. It includes TCP/IP, NFS and the X Window System. The VAXstation includes a 19-inch color monitor enhanced by eight-bitplane buffers.

MasPar President Jeff Kalb expects a widespread migration of users from high-end systems to massively parallel architectures in scientific and technical markets, most notably in applications such as fluid/solid mechanics, image recognition, signal processing, electronic CAE and computational chemistry.

The MP-1 family is available in eight configurations. Pricing begins at $170,000 for a 1,024-processor system (MP 1101); the 16,384-processor model (MP 1216) is priced at $810,000.

HITACHI'S DK515, 5¼", 780 MB WINCHESTER

From any point of view, this 5¼" disk drive reflects Hitachi's superior technical expertise, high-performance, and quality.



The DK515 features a fast 2.46 MB/sec. data transfer rate, an average access time of 16 ms, and a choice of ESDI, SCSI, or ESMD interfaces.

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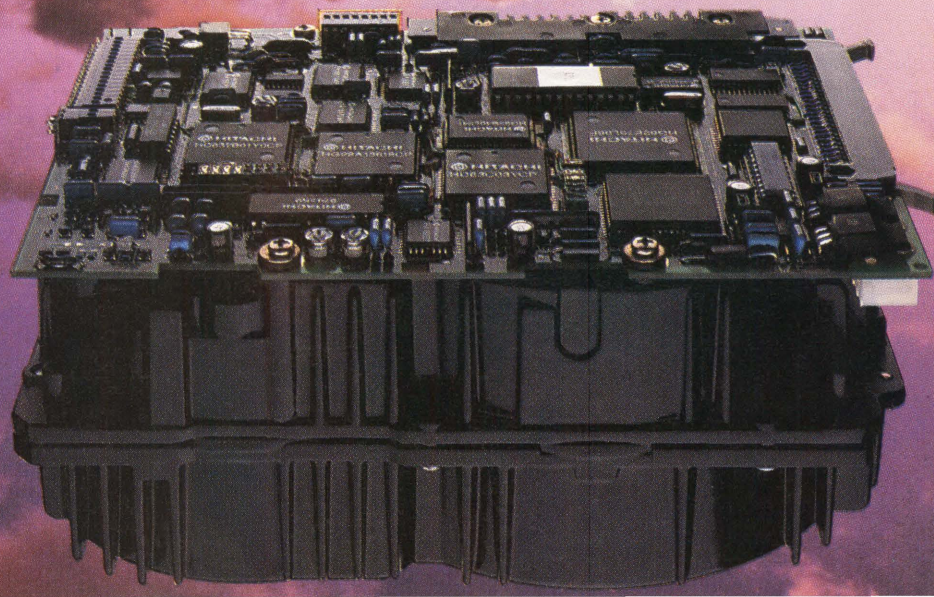

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CIRCLE 312 ON READER CARD

Keeping Tabs On Resources

Braintree's Quantum RS Selectively Reports On System Use Across A Range Of Hierarchies

Many system managers have looked in vain for a system that combines high-volume VAX resource accounting with the flexibility to run on mainframes, minis and workstations. Braintree Technology has accomplished this feat with Quantum RS V5.0.

Quantum RS is a full-function VMS resource management and accounting system that focuses on resource accounting, budgeting, chargeback, project/task accounting, network and cluster accounting and cluster analysis. You can track system resource use and selectively report on use across a range of hierarchies, including node, account, project, task, queue, image and process type.

According to Ed Gavin, vice president, Quantum, "We're not interested in providing users with functionalities they won't need. We prefer to tailor functionalities to specific user needs. Above all, we're striving to provide flexibility without sacrificing ease of use."

The product operates in VAXclusters, VAX networks and single-CPU environments, accounting for computer resources used by individuals, projects, username/projects, tasks and nodes. The system tracks reporting and billing for connect time, CPU time, disk storage, page faults, buffered and direct I/O count, page fault I/O count, peak working set size and paging file usage, symbiont CPU time and up to three user-defined resources. It also provides capacity planning information to identify trends and facilitate purchasing decisions.

The system is menu-driven within a controlled user environment but allows individual programs to be executed from the user's environment. It can be interfaced with DATATRIEVE and other accounting packages.

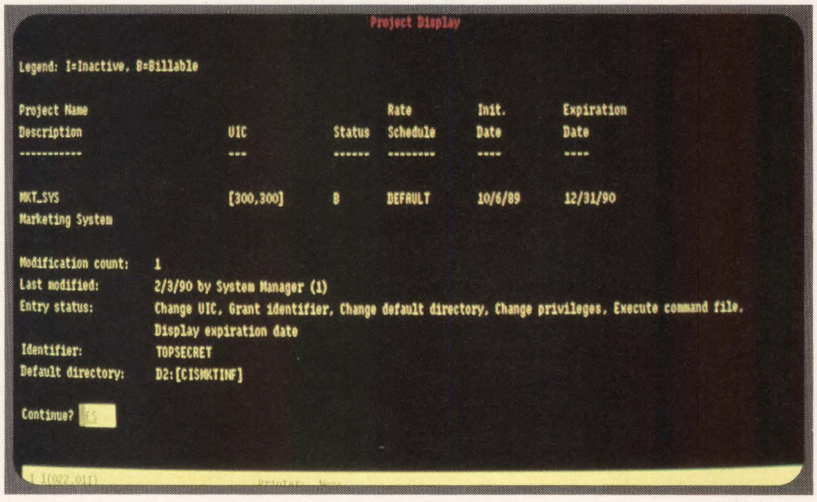
Quantum RS' key element is its project accounting capability, which tracks resource information for individual projects for each username. The system manager can define the project-specific process environment as the user enters a project by designating the UIC, default device/directory, privileges, and a command file to execute on project entry or exit. Users also can switch from one project to another without funneling through the regular VMS log out/log in procedure.

Quantum RS' chargeback capability offers a means of charging costs back to users or projects. The system invoicing option generates fully itemized invoices, indicating income derived from resource use as well as any additional charges. The budgeting feature of Quantum RS allows for the setup of an expense ceiling.

The budget duration and its automatic expiration can be defined and updated each time a user logs out or changes projects. Quantum RS issues warnings and prevents users from logging in when they exceed or threaten to exceed their budget.

Quantum RS monitors data in summary mode and optionally in session mode. Summary data — the resources generated for a username on a given node for each shift — can be compressed automatically into weekly or monthly summary totals, providing reduced storage requirements and online data documentation. The data collection process runs either interactively from the menu or automatically as an independent procedure. Data collection tracks available VMS resources and monitors print symbionts, operator communication services and DECnet network overhead.

Quantum RS is available on hardware platforms running VMS V4.7 and later. It's priced from $3,500 for a MicroVAX II to $25,000 for a VAX 8974.



Quantum RS V5.0 operates in VAXclusters, VAX networks and single-CPU environments.

FOR MORE INFORMATION

Braintree Technology Inc.
600 Cordwainer Dr., Ste. 102
Norwell, MA 02061
(617) 982-0200
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EM320 is a versatile VT320 emulator and communications program. EM320 eliminates the need for a dedicated VT320 terminal.

EM320

VT320 EMULATION

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- *Loadable Character Sets*
- *DOS Hotkey*
- *Modem Dialer*

EM320 includes more productivity features than the competition and runs on most popular PC networks. EM320 is easy to install, is backed by a 30-day no-risk purchase policy, and a Toll Free support number.

Diversified Computer Systems has been providing terminal emulation productivity tools to PC users for seven years.

For more information, contact:

Diversified Computer Systems, Inc.
3775 Iris Ave. Suite 1B, Boulder, Colorado 80301
(303) 447-9251 FAX: (303) 447-1406

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

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CIRCLE 120 ON READER CARD

Performance Edge

Intergraph's 6000 Series Workstations Combine RISC Technology And A Proprietary Graphics Processor

Intergraph has reserved a seat in the workstations arena with its 6000 Series, a new generation of UNIX-based workstations. The series offers a range of configurations and incorporates a RISC architecture to achieve performance levels of 10 and 14 mips.

The 6000 Series features the company's Extensible Display Geometry Engine (EDGE) high-performance graphics processor; Visix's Looking Glass icon-based, menu-driven user interface; and the CLIX operating system, Intergraph's implementation of AT&T's UNIX System V Release 3.1 with Berkeley extensions.

The series offers two levels of EDGE graphics performance. EDGE I supports eight planes plus one highlight plane of double-buffered graphics, achieving a display of 256 colors plus one highlight color from a palette of 16.7 million. Graphics primitives are executed by a digital signal processor operating at a peak performance of 30 Mflops. EDGE II provides 24-bit true color, drawing rates of 400,000 2-D vectors per second and 350,000 3-D vectors per second, and the display of 16.7 million colors from a palette of 16.7 million. It enables realistic rendering with Gourand shading at 25,000 100-pixel shaded triangles per second.

Intergraph's monitors interface with the EDGE I and II graphics subsystems. The 19-inch, 1-megapixel color monitor features a resolution of 1,184 x 884 pixels, and the 27-inch, 2-megapixel color monitor features a resolution of 1,664 x 1,248 pixels.

The series is binary-compatible with other Intergraph RISC workstations, so existing applications run without modification. It supports industry standards in operating systems, software and hardware interfaces, graphics, networking and hardcopy output.

The series supports a system disk drive with up to 670-MB data capacity. The chassis includes a five-slot card cage, 680-watt power supply and a dual-density, 3 1/2-inch, 1.44-MB floppy disk drive. It also includes space for an internal peripheral such as a 5 1/4-inch, 1.2-MB floppy disk drive, 600-MB CD-ROM drive or 150-MB cartridge tape drive.

The Intergraph Network Core lets the workstations communicate with Intergraph workstations, servers and VAXs across a distributed standard or thin Ethernet network. TCP/IP, XNS and DECnet compatibility allow communications with computing devices from other vendors.

The 6000 Series consists of two models, the InterPro and InterAct. While both provide similar features and capabilities, the InterAct devices offer, among other things, dual-screen capabilities and a 12-button, absolute tracking device that controls the cursor and is used for digitizing on dual-screen configurations.

FOR MORE INFORMATION

Intergraph Corp.
Huntsville, AL 35894
(205) 730-2000
Circle 400 on reader card

The 6000 Series is available in more than 100 configurations. For example, the InterPro 6040 includes a 10-mip RISC microprocessor, EDGE I graphics, 16-MB main memory and a 355-MB disk drive for $29,900. It can be expanded to 80 MB main memory and a 2.7-GB disk drive. The InterPro 6280 offers 14 mips performance, EDGE II graphics, 16 MB main memory and a 670-MB disk drive. It costs $45,900 and will be available later this year.

The company also announced 6000 Series servers, including the low-end InterServe 6000; the midrange, multipurpose 6105; the high-performance, multipurpose 6505; and the high-end, fully configured 5200.

The servers are designed for intensive compute, file and plot processing in multitasking production environments. They incorporate a RISC architecture and deliver performance levels of 10, 14 and 20 mips. They cost from $19,000 to $140,000.

The InterPro and dual-screen InterAct 6000 Series provide more than 100 configurations at performance levels up to 14 mips.

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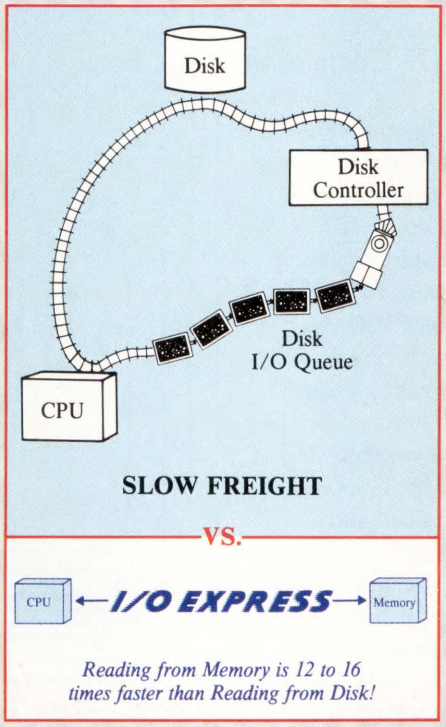

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CIRCLE 126 ON READER CARD

Workstation/ Host Team

Pericom's TeemX Provides A UNIX Connection

If you're looking for a software solution for UNIX workstation-to-host communications, consider Pericom's TeemX. TeemX is a program that lets color or monochrome UNIX-based workstations act as either text or graphics terminals and communicate with host computers — the user interacting with the host via the X Window System.

When run on a standalone workstation, TeemX allows terminal emulation of the Tektronix 4105/4207/4211 and the DEC VT220/240. Existing Tektronix- and DEC-based applications therefore can be run locally or on remote host machines connected over networks. The interaction between the user and the application takes place within a window on the X server (the display). The basic function of TeemX is to accept Tektronix or DEC command sequences from a host application and convert them into equivalent X functions.

TeemX is available for Sun Microsystems' Sun-3 and Sun-4 workstations. Versions for other UNIX platforms also are scheduled to be available, including Apollo, DECstations, IBM systems under AIX, and PCs. TeemX can be invoked multiple times to set up a number of terminal emulation windows in which different host applications can be run simultaneously.

When used in conjunction with a window manager, each window can be repositioned and resized individually. When the text window is resized, the number of rows and columns of text is adjusted to fit within the new window size. When the graphics window is resized, the graphics information can either be scaled to fit into the new window or clipped so a portion of the image is visible.

TeemX has separate alphanumeric and graphic windows. The alphanumeric screen format is 32 lines of 80 or 132 characters per line. It has eight text and 16 graphics colors supporting TrueColor and PseudoColor display types. Virtual resolution is 4,096 x 4,096 (4207 emulation) or 4 billion x 4 billion (4211 emulation). TeemX is ICCC-compliant and has zoom and pan. Segment memory is 2 MB. Addressable points vary according to window size. TeemX also features 157 standard and 32,767 user-definable fill patterns. It supports a wide range of digitizers/tablets.

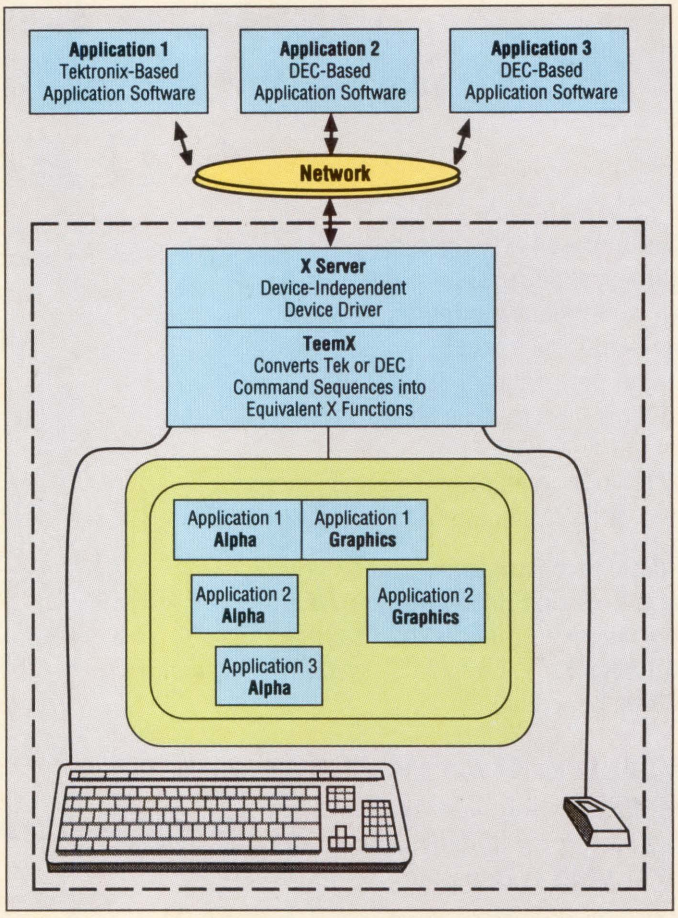
TeemX doesn't support hardcopy devices. Other X clients (Xpr) are available that deal with printing specific windows visible on the display server.

Executive Vice President Anthony Martin says that TeemX will help users migrate quickly and cost-effectively to workstations and get more processing power at the desktop.

"As well as being device-, host- and network-independent — thanks to the power and universality of the X Window System — TeemX will enable users to run their existing applications on their workstations without any modification," he explains.

TeemX is the first in a range of products from Pericom that are compatible with the X Window System. Complementary hardware and software products for TeemX are currently under development.

Pricing for TeemX depends on the number of users per license. For example, a five-user license costs $3,000.



TeemX accepts Tektronix or DEC command sequences from a host application and converts them into equivalent X functions.

FOR MORE INFORMATION

Pericom Inc.
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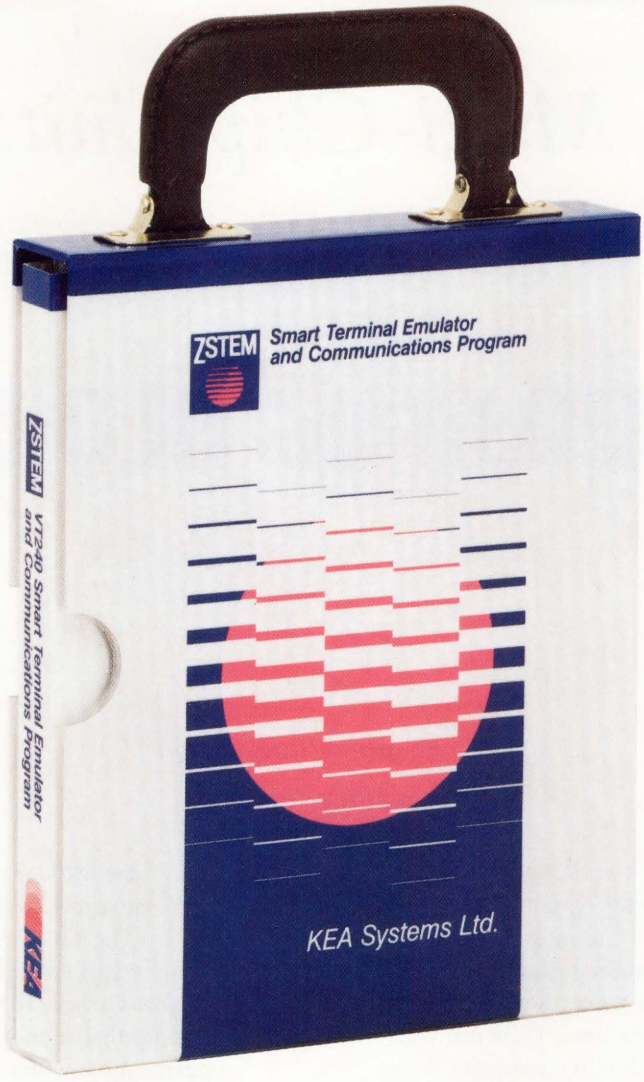

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CIRCLE 313 ON READER CARD

See us at DEXPO South Booth #1007

Multi-Chip Unit:

VAX BUILDING BLOCK

The architecture, design, manufacture and implementation of Digital's innovative MCU.

DON E. MARSHALL

THE DESIGN AND MANUFACTURE OF high-performance computer systems provides challenges to delight the most enthusiastic puzzler, especially at the integrated circuit level. How can you make them fast but keep them cool at the same time? How can you keep signal paths short and of low resistance while retaining reliability and affordability? How can you package them so as to simplify repairability?

These were the challenges Digital confronted in building its high-performance mainframe system, the VAX 9000. The company achieved a long-term solution that provides a base technology for even more powerful systems in the future. The solution is called the Multi-Chip Unit (MCU).

The MCU is leading-edge ECL circuit packaging technology. Proprietary to Digital, it exemplifies its design goals for mainframe systems. These goals are to produce systems that offer higher performance with greater reliability to more customers.

The MCU is the basic building block for VAX high-performance systems (see Figure 1). In the VAX 9000, it's used in the CPU, integrated vector processor and System Control Unit (SCU). As a new solution for housing, interconnecting and cooling integrated circuits, the MCU makes higher density packaging and thus fast cycle times possible.

The MCU has four main components. Very fast integrated circuits are connected via the High-Density Signal Carrier (HDSC). The HDSC is contained within housing that supports the signal connections and power supply. This in turn is linked to a pin fin heat sink to provide cooling.

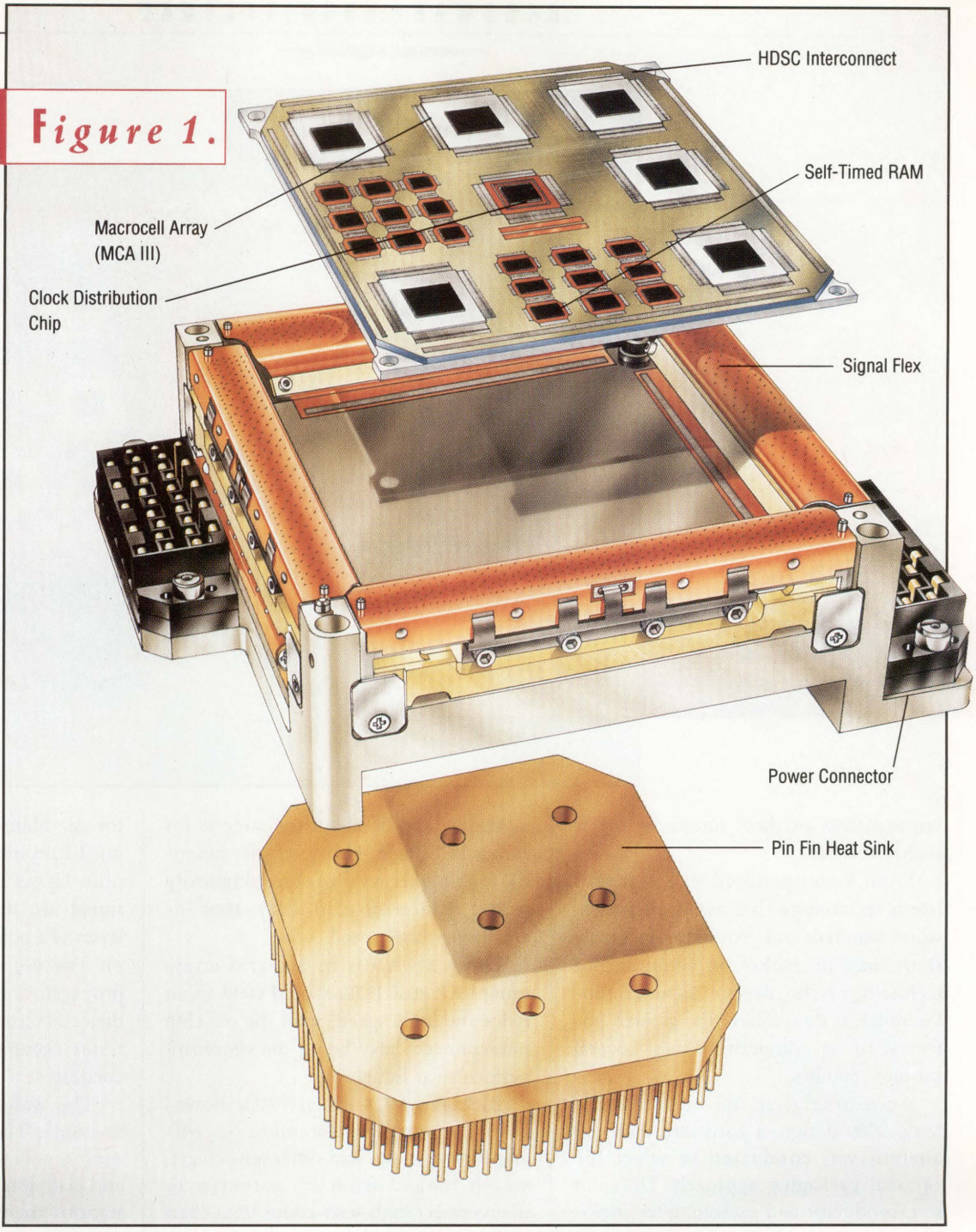
Among the integrated circuits connected via the HDSC are MCA III ECL gate arrays. Designed by Digital and produced by Motorola, the MCA IIIs have a density of 10,000 gates. This is eight times greater than the density of the MCA I gate arrays used in the VAX 8600.

In addition to the MCA IIIs, the MCU houses self-timed RAMs (STRAM), which provide fast access to registers and internal memory, and a clock distribution chip. This performs the clock distribution function through 40 differential outputs and distributes Scan checking lines to the logic chips.

These integrated circuits use advanced processors and very high density to achieve high performance. The use of such dense chips reduces heat output per logic circuit compared to using a larger number of less dense chips. However, denser chips call for a correspondingly greater

The Multi-Chip Unit.

Figure 1.



number of connections per component. This requirement dictates an enhanced interconnect that minimizes connect distances to maintain speed without impacting reliability.

This interconnect has been achieved in the MCU through the HDSC. The HDSC is a wafer-based interconnect using a unique copper polyimide substrate (see Figure 2). It performs similar functions to a printed circuit board (PCB) but is three to five times denser.

The HDSC technology allows for more than 600 signal lines per inch. This dense line spacing cuts propagation delay (see box, "Propagation Delay") and increases the number of connections that can be made efficiently to each component. This makes it possible to use the denser chips. In addition, the HDSC has outstanding thermal properties, making it possible to maintain low temperatures even with dense ECL circuits.

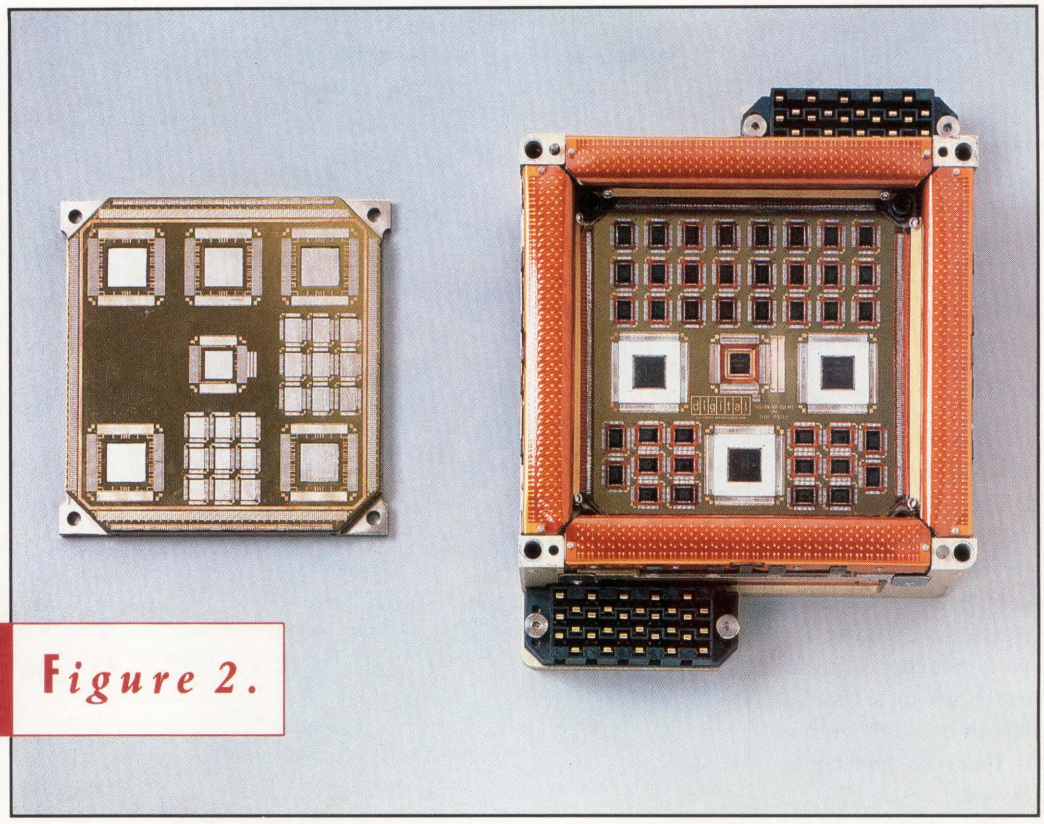
One 4- x 4-inch HDSC can accommodate a clock distribution chip and up to eight MCA III logic chips or an equivalent number of RAM chips at the rate of nine RAMs per MCA III. This quantity of logic previously took up four 15- x 12-inch PCBs, so the HDSC represents a density improvement of 30 times from one generation to the next.

Each HDSC is packaged in a housing that also supports signal and power connections and a heat sink for air cooling. This completed MCU is mounted and interconnected with others on a special board, the Planar Module. Several MCUs, each with a different functional design, are thus integrated into a CPU, vector processor or SCU.

One 25- x 25-inch Planar Module contains 16 MCUs, enabling an entire CPU and vector processor to be contained within one module. The MCU forms the field replaceable unit (FRU) and is located on the Planar Module with the aid of alignment pins and four screws. This minimizes repair time and improves system reliability.

Choosing The MCU

Any choice of packaging and interconnect technology is based on its ability to provide interfaces of four types: signal, power, thermal and physical. The optimum package satisfies the system



The HDSC (left) is a wafer-based interconnect that uses a copper polyimide substrate. MCU is at right.

Figure 2.

requirements of these interfaces and is highly reliable.

From a cost perspective, the vendor needs technology that uses well-understood materials and promises a relatively short time to market. In addition, if a technology is the object of significant investment, it should have the growth potential to be competitive over several product families.

Accordingly, at the outset of the VAX 9000 design, a hardware trade-off analysis was conducted to select the optimal packaging approach. Different semiconductor and packaging technologies were compared by measuring performance over a given logic path in the different technologies. The basis for comparison was VAX 8650 technology, using MCA I gate arrays in pin grid array packages on large PCBs.

The results were clear. Figure 3 shows a summary of results in which the propagation time through a logic path involving such components as the arithmetic logic unit and cache is compared for several technologies. It was projected that chip logic speeds for chilled CMOS in 1989 would be about the same as for earlier ECL logic. However, the potential for a higher level of chip complexity would reduce off-chip delay, thus increasing overall speed.

Using MCA IIIs in pin grid arrays using VAX 8650 PCBs would yield about twice the logic speed, with the off-chip interconnect delay being the dominant performance limitation.

Packaging MCA IIIs on MCUs showed a 50 percent improvement in off-chip delay. It also had other advantages, which ranged from its potential to interconnect high-lead-count VLSI chips with small lead delay, to the fact that it made a practical-sized FRU.

Comparisons of MCA III logic arrays with small-scale gallium arsenide arrays and wafer-scale integration showed little performance advantage for these new technologies. Indeed, they represented a potential risk because of the immaturity of the technology.

Building The MCU

The MCU consists of the HDSC and chips, the pin fin heat sink, the connector assemblies, and housing and mounting hardware. The HDSC is a wafer of nine layers of copper for power and signal use interleaved with insulating layers of a polyimide synthetic (see Figure 4). The use of polyimide helps reduce propagation delay because its very low dielectric constant allows signals to flow faster compared to such materials as ceramic.

The wafer is constructed one layer at a time. The conductive copper is laid onto a polyimide layer using sputtering and plating techniques. Wafer alignment stations then are used to transfer fine geometry patterns from a mask onto the copper layer. These patterns mark out the signal paths, which then are created using copper deposition and etching processes.

The next layer of polyimide then is laid over the copper, and vias are cut into the polyimide. These vias form the connections between signal paths in adjacent layers of copper and are created by masking the polyimide and etching a hole with a plasma etcher. This hole is filled when the next layer of copper is

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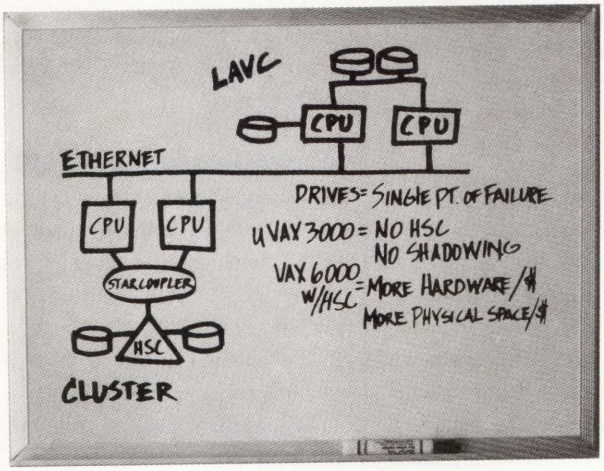
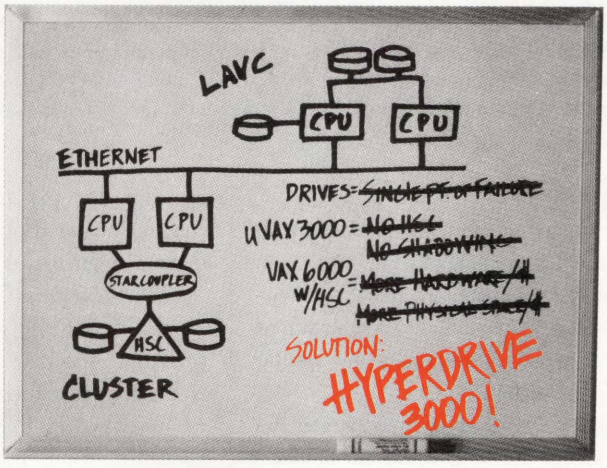


SOLUTION:



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Propagation Delay

Signals propagate at the speed of light divided by the square root of the dielectric constant of the medium in which they travel. In free space, signals can propagate at about one foot every nanosecond (billionth of a second). However, in free space, computer signals would be uncontrollable. Therefore, they must be guided through some type of dielectric material.

On silicon chips, silicon dioxide is the dielectric material. However, studies indicate that on-chip delay accounts for about one-half the nonmemory delay in a given system, while the other half originates with system interconnects. Accordingly, a strategy to increase performance must address both issues.

In MCU technology, the greater density of the MCA IIIs and STRAMs reduces delays among silicon logic circuits, while the HDSC addresses chip-to-chip interconnect delays. By keeping paths short and by using polyimide copper rather than the more traditional ceramic substrate, the HDSC lowers system interconnect delays by more than 30 percent. This is because the polyimide has a much lower dielectric constant of 3.5, as opposed to ceramic's six to 12, depending on the materials used. —*D.E.M.*

deposited.

The signal and power interconnections are made as two separate cores and then bonded together. To make connections, the cores are drilled where required and the connection is created by plating through the holes.

Finally, lasers cut very accurate die sites to accept the semiconductor devices. Tab automated bonding is used to gang bond the signal and power pads to each chip in the HDSC. Chips are bonded through the laser die cuts to the baseplate that serves both as a rigid mounting structure and a heat dissipator for the semiconductors. This bond is made from a diamond-filled epoxy to provide an electrically insulating attachment of low thermal resistance.

By bonding chips directly to the substrate instead of the chip package, the HDSC eliminates one level of interconnect. This improves reliability and performance. Further, the design results in a maximum electrical requirement of 300 watts, contributing to low heat generation and making air cooling practical.

The MCU baseplate assists in cooling. It's made of molybdenum and provides a strong, rigid substrate, a high thermal conductivity and a thermal expansion match to silicon. The baseplate is bolted to the aluminum pin fin heat sink, which contains hundreds of thermally conductive pins. With impingement air cooling, the pin fin heat sink enables temperatures to be maintained at 85 degrees Celsius for optimum reliability.

The design of the MCU housing is significant, because, in addition to providing the key alignment mechanism to ensure proper mating to the next level of interconnect, it provides the structural mounting for all the subassemblies and is a critical part of the signal connector system.

Signals are transferred from the HDSC assembly to the Planar Module by flexible signal connectors (Signal Flex). These are gang bonded to each of the four sides of the HDSC and make contact to the surface of the Planar Module. Each Signal Flex has more than 200 signal paths for an MCU total of more than 800 paths.

The Power Core of the HDSC is fed by separate Power Flex cables bonded on each side of the MCU. These are connected to high-current capacity plugs that engage power bus-bars to deliver power with minimum resistance.

The separation of these flex components prevents signal/power interaction, thus enhancing the reliability of the system.

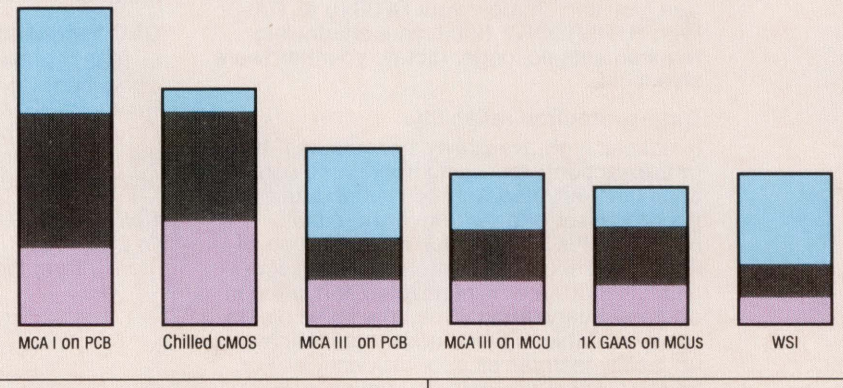
Design And Manufacture

Innovative techniques were developed for the design and manufacture of the MCU, with three goals in mind:

1. To design higher density circuits than ever before.
2. To achieve higher yields from the manufacturing process.
3. To ensure greater reliability of finished components.

Extensive use was made of a suite of integrated CAD/CAM tools to provide error-free design. Specifically, very detailed simulation was used to reduce design faults and to minimize multiple

Figure 3.



Relative delay of various technologies.

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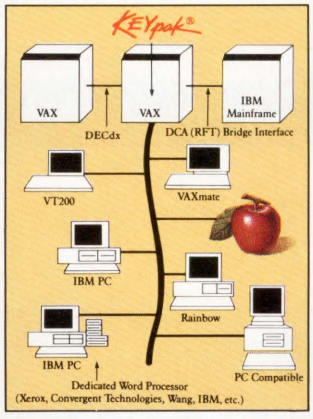

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CIRCLE 297 ON READER CARD

passes for semiconductors during initial manufacturing. A major concern with high-density devices is that signal paths must be sufficiently separated so as not to be affected by "noise" from adjacent paths. The CAD system helped solve this problem by simulating noise to determine the spacing of routed wire.

For the Planar Module, a new set of printed-circuit technologies was developed to satisfy performance, mechanical, electrical and reliability requirements. These technologies have resulted in excellent control of dimensional tolerances over the full area of the module as well as over all the layers of laminate material.

Quality assurance is aided by the ability to conduct several tests at one test station. Other quality safeguards include the use of environmental testing and computer-based inspection systems to verify bonding strength and accuracy. Built-in error analysis and detection circuitry are standard components in the MCU.

> Built-in error analysis and detection circuitry are standard components in the MCU.

Manufacturing support systems on Digital's worldwide network also played a key role in the design and manufacturing process. An integrated database links multiple manufacturing and engineering sites, giving them access to such information as lot history and engineering test data. This helps them identify equipment, process and operator issues that might otherwise reduce yield and productivity.

A Successful Implementation

The MCU has met its goals in three important areas: performance, reliability and cost. From a performance perspective, the MCU has enabled us to meet three key requirements:

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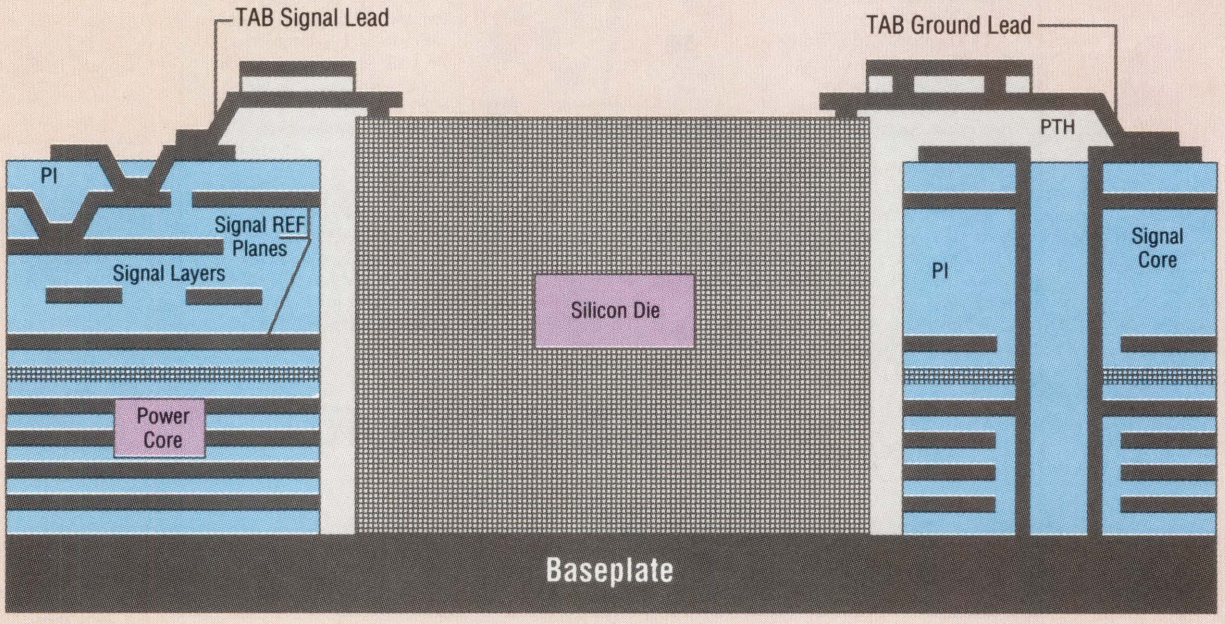
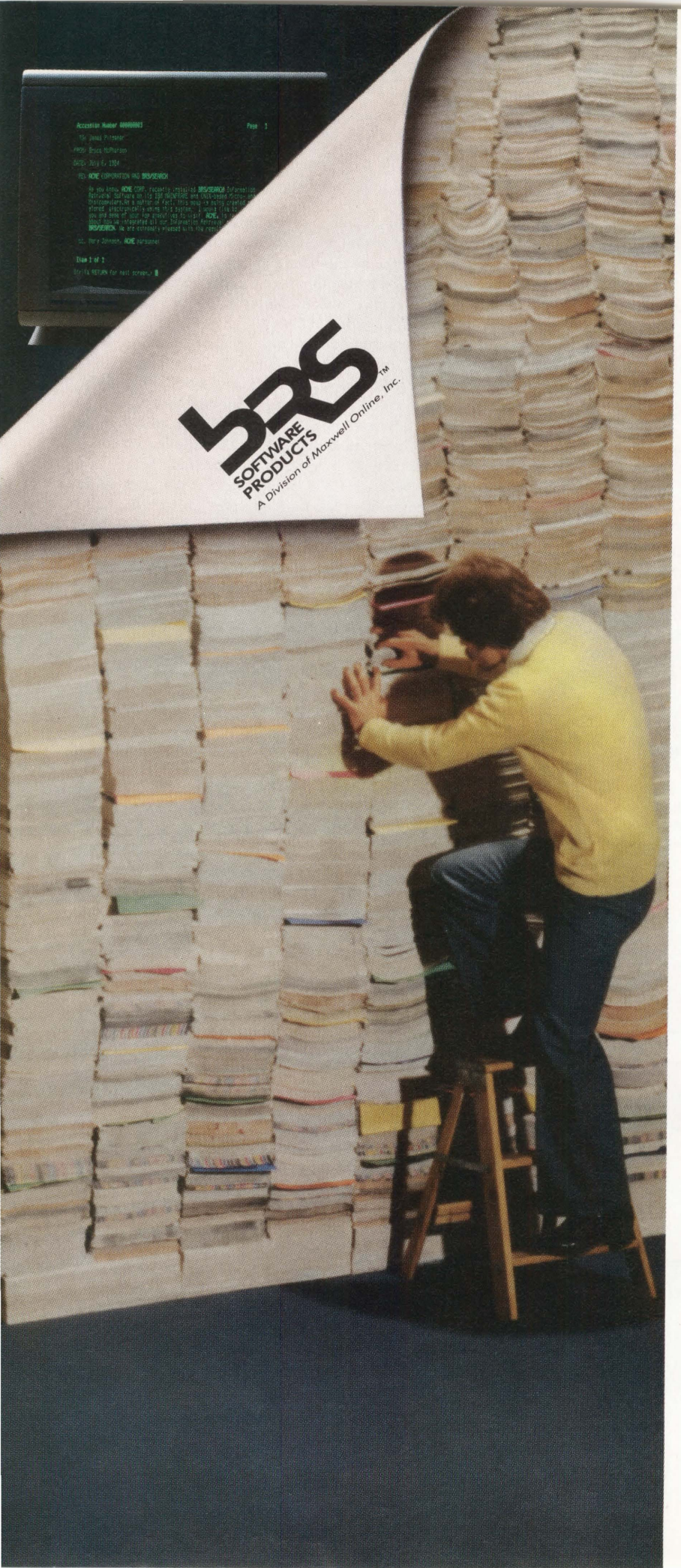
2. The use of a chip interconnect scheme with electrical qualities that enables signals to travel quickly without picking up noise or other interference or losing their integrity between chips.
3. The efficient extraction of heat generated by densely packaged high-performance integrated circuits.

The use of the MCA III integrated circuits takes Digital into new areas of very high-speed chips, and the HDSC enables signals to travel among chips even faster than they can in the chips them-

Figure 4.



High-Density Signal Carrier (HDSC) cross-section (not to scale).



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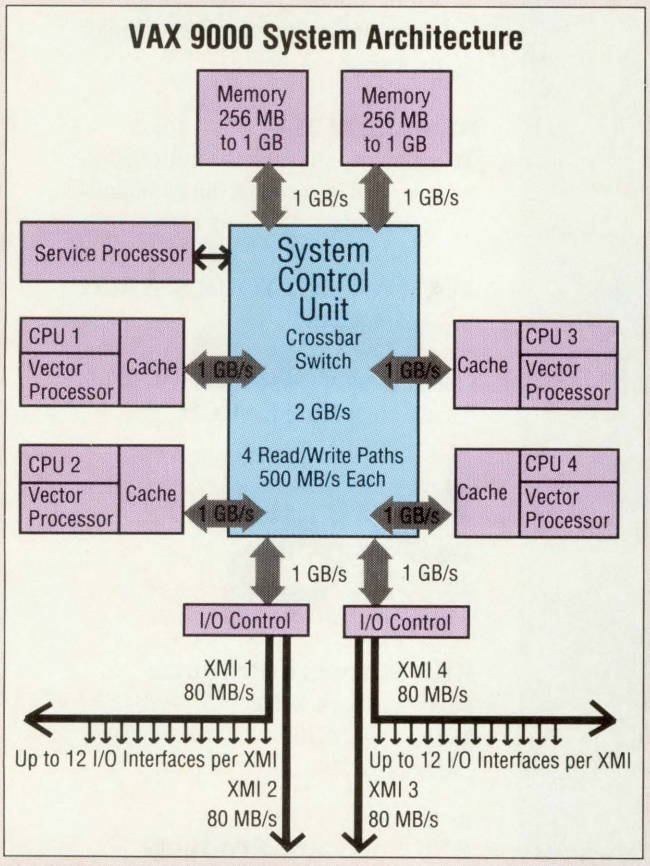
System Control Unit: Key to the 9000

The VAX 9000 mainframe system is a tightly coupled multiprocessor that consists of several components. Connecting these components and keeping them all actively managing resources is the task of the System Control Unit (SCU).

The SCU system module is much more powerful than a bus. Not only does it provide multiple wide data paths, but it acts as an intelligent traffic manager. It incorporates interconnect logic, which enables it to maximize subsystem communication and overall system throughput (see Figure). The SCU also maintains data consistency by monitoring the contents of cache memories and tracking valid data locations.

The SCU logic resides on a Planar Module slightly smaller than the CPU Planar Module. Only four or six MCUs are required for the logic, depending on system configuration, while the remaining space is used to accommodate the many connectors required to carry signals from the SCU to other units.

The SCU provides data paths to connect up to four CPUs with up to two I/O ports, two memory ports and a service processor. The data paths are 64 bits wide, and data is transmitted over them every 16 ns for a total bandwidth of 500 MBps. The SCU is capable of four simultaneous 500-MBps data transfers, enabling it to operate at up to 2 GBps. This bandwidth is sufficient to allow nearly linear performance improvement as new processors are added to the system.



The SCU incorporates interconnect logic to maximize subsystem communication and overall throughput.

With the VAX 9000, memory data is first distributed in caches located within the CPUs and not immediately written into main memory. Accordingly, the data in main memory may not be current. The SCU keeps track of where the most recent data is located and makes sure a memory request, whether from a CPU or an I/O port, results in a valid read or write.

To provide cache consistency, the SCU maintains cache indexes that duplicate those in the CPUs. The duplicate indexes are examined when any port makes a reference to the SCU, and the appropriate action is taken to maintain cache consistency.

Main memory access from the SCU is split between two memory ports. Each memory port has two segments, interleaved on block boundaries. Each block is 64 bytes long and matches the size of a CPU cache block. When a CPU or I/O port makes a memory request, the SCU passes it to the right segment. In fact, the SCU can handle up to four memory references in parallel.

Memory is divided into two main memory units plugged into a backplane, which is separate from but physically close to the SCU. Each main memory unit consists of 1-megabit DRAM chips organized in 32-MB arrays. These arrays are extended by the addition of two smaller 16-MB arrays for an array size of 64 MB.

The SCU's memory ports control the two main memory units and provide dynamic timing signals for the memory arrays. The ports can control up to eight of the extended arrays for a system maximum of 512 MB of memory. When 4-megabit chips become available, the 1-megabit DRAM chips will be upgraded. Therefore, the arrays will hold four times as much memory for a system maximum of 2 GB.

Memory data is stored with error-correcting code (ECC), which is generated and checked in the SCU. The data path into memory is 80 bits wide, allowing 64 bits for data and 16 bits for the ECC. The ECC provides double- and single-bit error detection, and dynamic recovery is provided for single-bit errors.

The SCUs can incorporate up to two I/O ports, each capable of handling up to two XMI buses via 125-MBps links. These links are asynchronous from the I/O ports to each XMI and synchronous from the XMIs to the I/O ports. The XMI buses can be connected to networks, CI VAXcluster systems, storage peripherals and BI buses.

The SCU also connects to the service processor, which provides system, disk/tape and user-interface control. The service processor monitors 20,000 scan points throughout the system to provide reliable operation and fault diagnosis. It also monitors the environment, measuring factors such as power levels, humidity, temperature and air flow.

The SCU is well-protected by error detection and recovery logic as far as possible by providing error detectors wherever a bundle of signals enters a new physical entity such as an MCU or MCA III. In most cases, signals passing between MCA IIIs are accompanied by a parity bit. Wherever possible, the number and positioning of the error checkers in the SCU are such that the minimum number of components is implicated whenever an error is detected.

The SCU is the key to the performance and balance of the VAX 9000. Its resource contention and cache management capabilities and its support of multiple wide data paths provide the throughput capacity needed by high-volume production system tasks. —*Dwight Manley, systems performance engineer, Digital Equipment Corporation, Marlboro, Massachusetts. Manley is one of the system architects responsible for the SCU.*

selves. The interconnects are fewer and shorter than on earlier systems, and the HDSC provides a much cleaner environment than is possible with a typical PCB. This increases reliability and results in faster data transfer, because less time is taken checking for errors.

From the reliability standpoint, the MCU involves only three main types of component — the logic circuits, Signal Flex and HDSC — and thus has fewer parts to fail. Further, the silicon used in the MCA IIIs and STRAMs and the polyimide used in the HDSC are proven materials.

With today's complex systems, the power levels of logic components such as transistors are small and vulnerable to factors that can affect normal operation. The MCU protects against this physically, by offering a mechanically enclosed environment, and through sophisticated built-in fault-avoidance logic. Also, the cooling system further extends the life of the MCU components.

MCU TECHNOLOGY HAS permitted Digital to extend the performance of the VAX family...

Cost has been kept down by superior design, extensive logic integration and inherent manufacturability because of using relatively inexpensive materials. While not directly attributable to only the MCU, the sophisticated manufacturing processes also keep costs down, as does a high-level of reliability.

Digital's MCU technology takes advances in semiconductor technology and uses them to address the limitations that affect PCB design. MCU technology has permitted Digital to extend the performance of the VAX family today and provides a long-term foundation for VAX processors in the future.

The MCU is modular and flexible so that it can be used with higher performance chips when they become available and in configurations not currently envisaged. It's expected to be a part of Digital's future for many years. *—Don E. Marshall is senior consultant, Digital Equipment Corporation, Marlboro, Massachusetts. He was responsible for the initial concept and development of the MCU.*

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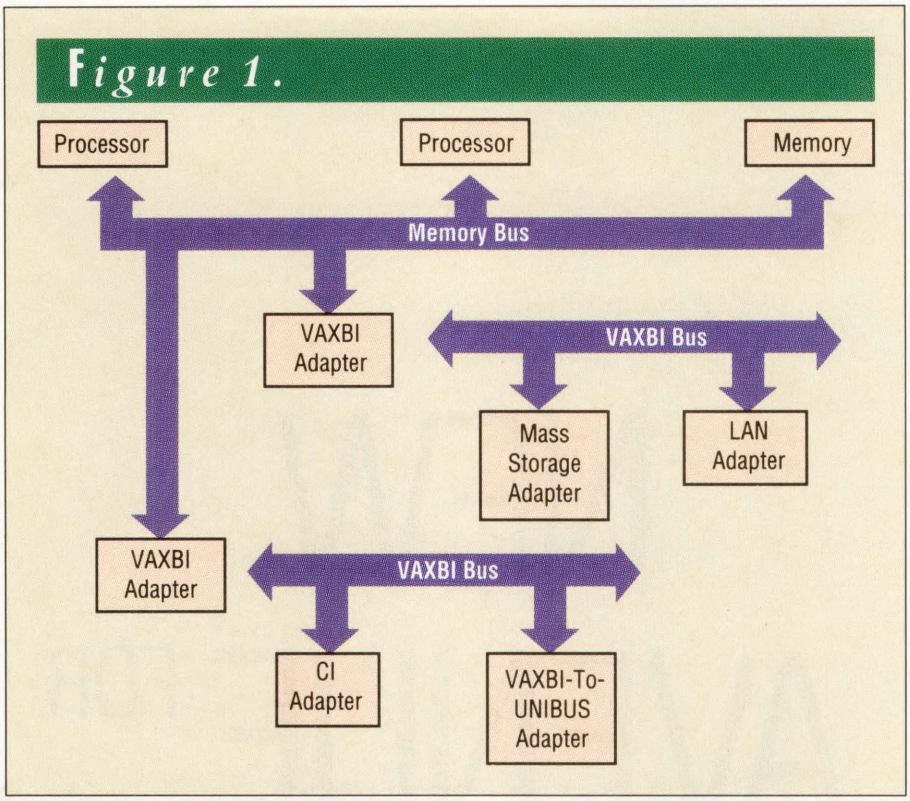
NEW AVENUE FOR THE VAXBI

EVAN BIRKHEAD

ALTHOUGH OFTEN RECOGNIZED as an outstanding bit of engineering, Digital's VAXBI bus achieved more notoriety than popularity. With its fast and wide 10-MBps bandwidth and a maximum data transfer rate of 13.3 MBps for 16-byte transfers, BI-based I/O systems were a welcome advantage at Digital's scientific and technical sites. They also gave the VAX its initial leverage in big-league transaction processing sites. The speeds blew away the 1.1-MBps standard of the UNIBUS and 3.3-MBps rate of the Q-bus.

But the new technology sounded a controversial sour note as well. Because Digital closed the specifications to the bus architecture and patented portions of the interconnect technology, third-party storage and networking devices were shut out, limiting customers to expansion products produced by Digital. Many felt that the added I/O throughput of the BI channel was rendered useless without the extended capabilities available from outside peripherals manufacturers.

While customers complained bitterly and the media blasted the move as competitively unconstitutional, the third-party competitors dissected every millimeter of the Bus Interface Interconnect Chip (BIIC) searching for legal and technical loopholes. EMC, Emulex and System Indus-



When the BI was introduced, its ability to support several processors was unique among I/O channels.

tries reportedly broke the code, but none had the capital in the legal department to risk customer shipments. Digital had covered its tracks nicely.

The search continued until Clearpoint began shipping a small family of products, including its DCMS-TSB 8mm subsystems and DCMS-DSB disk subsystems, which feature controllers that are host adapters for VAXBI to SCSI. With these controllers, one slot supports seven tape devices. By this time, however, better than four years had passed since the first BI computers had shipped, and BI-based systems were no longer fast-moving commodities. Clearpoint had to be satisfied with supplying upgrades to the current installed base of VAX 6000s and 8000s.

The BI Technology

The BI technology was the foundation of VAX computing for a good portion of the 1980s. In 1985, at the time of its introduction, it was considered a state-of-the-art I/O channel, though it was outperformed by other technologies, including the VMEbus.

On the BI bus, the BIIC is responsible for all bus transactions, including interrupts, multiprocessing commands, error checking and distributed arbitration, a scheme that ensures fair access for all nodes and peripherals connected to the bus. There are three types of nodes that can be attached to a BI: CPUs, memories and adapters.

Adapters include mass storage, communications and bus adapters. For example, Digital designed a UNIBUS adapter for the BI that lets BI users connect to UNIBUS devices and peripherals. When the BI was introduced, this ability to support several processors was unique among I/O channels, although it requires the entire bandwidth (see Figure 1). One of the most important features of the BI bus is that it maximizes the use of the multiple processors. Of the 13 VAXBI transactions, nine fully support multiprocessing.

To date, there have been four generations of VAXBI bus-based systems available from Digital, each with a slight variation on the previous theme. On the VAX 8000, the first machine to deploy the BI bus, it was used as a CPU bus. But on subsequent systems it was eventually more efficiently implemented as a peripheral bus.

The first incarnation of the VAXBI bus was on VAX 8200/8250/8300/8350-series computers. These 12- and 24-slot systems featured the CPU, memory and peripheral device controllers contained on one backplane. To maintain customers' investments in older VAXs while providing them with access to the wider bandwidth, Digital introduced the UNIBUS adapter. Without these adapters, customers buying this generation of CPU from Digital would have been left behind by the company's eventual strategies.

The second generation of VAXBI systems was available on VAX 8500/8700/8800-series computers and subsequent machines with improved CPUs, such as the VAX 8530/8550. With this series, Digital made the BI bus a separate entity from the CPU and designated it for controlling peripherals. On these computers, the BI used a memory bus called the Nautilus Memory Interconnect (NMI). The BI supported Ethernet connections, HSC and CI connections and tape and disk (i.e., KDB50) controllers.

Then came the VAX 6000 series and the advent of the powerful XMI bus, with a peak data rate of up to 80 MBps. With eight custom chips and one gate array, the XMI is, like the VAXBI, pretty tightly closed. With the XMI bus residing on a backplane with the CPU and memory, the BI bus once again was relegated to supporting a card cage for peripheral controllers. The eight initial 6000 models consisted of one to six peripheral I/O channels for a maximum bandwidth of 60 MBps.

The fourth and most recent incarnation of the VAXBI bus is on the symmetric multiprocessing-oriented VAX 9000 mainframe. The 9000 uses a high-speed switch rather than a classic bus architecture for internal throughput. Apparently, Digital was prepared to use the XMI as the sole peripheral bus on the VAX 9000

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and may do so in subsequent editions. However, Digital didn't have the XMI interface completed at the time of the VAX 9000 announcement and decided to stick with the BI. Additionally, the BI was provided with an improved Ethernet adapter.

Open For Business

In February 1990, Digital announced to its customers that it would broaden its policy on the VAXBI in the near term. The company said this policy reflected its new open-bus strategy, which now also includes support for the VMEbus and Futurebus+. The VMEbus is considered to be a migration path to the Futurebus+, which is a family of buses (3 GBps in the maximum configuration) that the IEEE is developing as an industry-standard bus technology. Unisys also is committed to the standard, and Hewlett-Packard and others are reported to be giving it serious consideration.

"What you see happening with the BI [opening up]," says Jim Duvall, Digital's Futurebus+ program manager, "goes right in line with our strategy for future generations of buses." According to Duvall, Digital is spending significant time and effort on the IEEE committee and is proposing an I/O bus standard for Futurebus+ called Profile B. The proposal is for a midrange form factor, but the bus will be used at the VAX workstation level to support peripheral cabinets and at the VAX 9000 level to support, for example, CIs. "You'll see it on both DECstations and VAXstations and extending from the top to the bottom of our product line," says Duvall.

The open strategy doesn't currently encompass all Digital buses, however. The proprietary buses that carry the bulk of the workload in the architectures of the top-selling VAX 6000 and 9000, specifically the XMI memory interconnect and CI disk clustering interconnects, remain closed and show no signs of opening.

A Lower Profile

Though no dates officially were given for delivering specifications, it's evident that the opening of the BI bus was orchestrated to coincide roughly with three events:

1. The end of production of the VAX 8000 series, which used a BI bus as both a CPU and peripheral bus.
2. The advent of a new generation of midrange machines and MicroVAXs from Digital, which will be available later this summer and will feature a more limited role for the BI.
3. The beginning of shipments of the VAX 9000 mainframe, which also features a lower profile BI.

For the most part, third-party storage device manufacturers greeted the news with a lukewarm reception. Though no longer in production, the VAX 8000 series represents a base of 20,000 to 30,000 computers, according to most estimates. The aftermarket for the earliest machines is now five years old. Most 8000 customers will be migrating to the 6000 if they haven't already, and most 6000 system managers are expected to add peripherals through cluster channels, such as the CI, rather than the BI.

Spokespersons from EMC, Micro Technology and System Industries were low-key. "This [opening the BI] puts a new twist on things," says Jim Fitzgerald, group product manager for VAXs at EMC. "There is a large installed base that's not going to go away overnight, but things that are happening with the XMI, CI and the rest of the clustering technologies are more exciting."

Most of these existing third parties hadn't planned on investing in the VAXBI and currently don't have any way to attach to it. Even with the specs or a BIIC interface chip sold by Digital, Fitzgerald estimates that it would take at least six months to prepare a BI storage device, for example. Many companies will find this

COULD ALL OF THIS PRODUCT support for the XMI be another indicator of the inevitable demise of the BI?

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Figure 2.

VAX 9000 Model	210	410	420	430	440
I/O Bus Capacity					
Max. I/O Throughput	80 MBps	160 MBps	160 MBps	320 MBps	320 MBps
XMI Channels	1	2	2	4	4
XMI Slots	12	12	24	48	48
Max. VAXBI Channels	4	8	8	14	14
Max. VAXBI Slots	20	40	40	70	70
Memory					
Max. Memory Supported	512 MB	512 MB	512 MB	512 MB	512 MB
Min. Memory Supported	256 MB	256 MB	256 MB	512 MB	512 MB
Architectural Max. Memory Limit	2 GB	2 GB	2 GB	2 GB	2 GB
Max. Memory Bandwidth	2 GBps	2 GBps	2 GBps	2 GBps	2 GBps
Memory Type	ECC	ECC	ECC	ECC	ECC
Mass-Storage Capacity					
Max. Local Disk Capacity	48 GB	105 GB	105 GB	220 GB	220 GB
Max. VAXcluster I/O Servers (HSCs)	150	150	150	150	150

On the VAX 9000, the channel architecture is expandable to up to four XMI I/O channels and up to 14 VAXBI I/O channels.

potential market irresistible, however, and some began product innovation immediately. When asked if he thought there was a large enough base of VAX 8000s to support a solid-state disk product, Imperial Technology's product manager John Anderson said yes. When asked if he thought there was justification for such a product on VAX 6000-based BIs, he again said yes. Imperial is planning to enter the market as soon as possible, as is System Industries, while EMC and others will evaluate the potential of the market before taking action.

It appears likely that the BI will retain its role as a Digital I/O bus in the 1990s, although its role will be limited to controlling certain types of peripherals. Then again, the role Digital is outlining for the Futurebus+ overlaps quite a bit with the current role specified for the BI. If both the BI and the Futurebus+ are to be open I/O buses, isn't it logical to expect Digital to go with the higher throughput bus?

At 80 MBps, the XMI bus currently is Digital's leading performance CPU bus. Reports from Digital and industry analysts suggest that the next generation of VAX midrange systems, due later this summer, again will implement the VAXBI channel, albeit in slightly different, more advanced ways.

The XMI Strategy

On the 9000, the resulting channel architecture is expandable to up to four XMI I/O channels and up to 14 VAXBI I/O channels (see Figure 2). The XMIs are used for I/O to and from storage interfaces, networks and VAXclusters. And the XMI is receiving the window dressing that goes with being the state-of-the-art bus:

- Disk striping, which improves throughput speeds, is used most efficiently on the XMI.
- A new KDM70 disk and tape controller was introduced for the XMI along with the 9000. The KDM70 can access the XMI with up to 700 I/O requests per second.
- The XMI was fitted with the LANcontroller 400 adapter, which lets systems connect multiple Ethernet controllers to the XMI. This adapter allows XMI-based systems to operate as the boot node in LAVcs.
- The 9000's new CIXCD intelligent interface for CI-based VAXclusters was based on a single module that fits into an XMI slot.

With its superhigh bandwidth, the XMI acts as a data path between the VAX 9000's 2-GBps internal System Control Unit (SCU) crossbar switch and mass storage and external I/O devices. The 9000's use of four XMI buses constitutes a maximum transfer rate of 320 MBps, ideal for transaction processing-style I/O requirements.

Could all of this product support for the XMI be another indicator of the inevitable demise of the BI? More likely it indicates a new positioning of the BI channel within the new processor I/O blueprint. Even if Digital didn't include a BI bus on the next generation of the VAX midrange systems, the new computers inevitably will require a BI expansion cabinet to support all of the BI devices that Digital and a select few third-party peripherals manufacturers currently are producing.

"IN THE NEXT GENERATION of VAX 6000s," maintains Tony Prigmore, manager of the Digital product line at Clearpoint, "I've got to believe there will be a continued implementation of the VAXBI."

Digital officials won't comment yet on the bus architecture or any other facet of the anticipated VAX 6000 Model 500. Reportedly, however, the controller for the KDB50, the fundamental VAXBI disk storage device, is being redesigned, further evidence that Digital won't totally abandon the BI bus any time soon.

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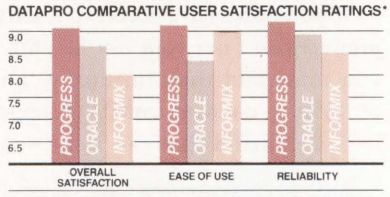

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Techniques for detecting and eliminating I/O bottlenecks.

DAN ESBENSEN

DURING THE PAST 15 YEARS, VAX processing speeds have increased from one to 30 mips, a 30-to-one speed increase. During the same time, disk seek times have been reduced from 28 to 14ms, only a two-to-one speed increase. This imbalance causes almost all VAX/VMS systems to become I/O-bound. Processing is constrained by the relatively slow disk subsystems attached to the new, fast VAX processors. I/O bottlenecks abound.

How do you know when you're I/O-bound? The easiest way to find out is to use the Digital-provided MONITOR DISK utility as follows:

```
$ MONITOR DISK/ITEM=QUEUE
```

This DCL command displays the I/O queue depth for each disk device. A depth of two means that, on the average, two users are waiting for the disk at all times. A depth of six means that six users are waiting for the disk. In this case, disk I/O response time is three times slower than when you access a disk with an I/O queue depth of two (see Figure 1).

Once you've determined that you have an I/O bottleneck (average disk I/O queue depth greater than one), these steps should be taken to eliminate the bottleneck:

1. Determine which files are "hot."
2. Take actions that reduce the I/O bottlenecks caused by hot files.

Hot files are those with high I/O counts. On most systems, 95 percent of the I/Os are caused by less than 5 percent of the files. One-third of those files are VMS internal files (pagefiles, installed images, JBSYSQUE.DAT, and so on).

The easiest way to locate your hot files is to use a software package that locates them for you. Digital's VPA utility provides a list of hot files. Third-party software such as I/O Plus (designed by the author) also provides hot file reports and file "lock mastering" information (see Figure 2).

If you don't have access to a software product that finds your hot files for you, you must find them manually. Digital provides an undocumented/ unsupported DCL command that can assist you:

```
$ SET WATCH/CLASS=MAJOR FILE
$ ! "none" turns off the feature
$ SET WATCH/CLASS=none  FILE
```

However, for a nonprivileged user to

use this command, the SYS$SYSTEM:SETWATCH.EXE image must be installed with CMEXEC privileges, as follows:

```
$ INSTALL:==$INSTALL/COMMAND
$ INSTALL ADD SYS$SYSTEM:
    SETWATCH/PRIV=CMEXEC
```

The SET WATCH command prints to SYS$OUTPUT the name of each file opened by an image. When the file is closed, it prints the number of physical reads and writes that occurred. To monitor the physical I/Os used when you execute VMS mail, for example, see Figure 3.

From this you can see that SYSUAF.DAT (file ID=28,4,0) had eight reads and no writes, while VMSMAIL_PROFILE.DATA (file ID= 84,12,0) had seven reads and two writes. By using the SET WATCH command and then running a typical I/O-intensive application, you can determine which files seem to have the highest I/O counts. Multiplying this by the number of users on your system can give you a reasonably accurate list of hot files.

Reducing File I/O Bottlenecks

Two major actions can be taken to reduce I/O bottlenecks caused by files with high I/O counts:

1. Speed the I/O operations.
2. Eliminate the I/O operations.

You can speed a file's I/O operations by moving the file to a faster or less busy device or by moving the file across multiple spindles (as in a shadow set). You can speed both read and write operations using this method.

You can eliminate file I/O operations in a number of ways, for example:

1. Host-based data caching speeds file reads.
2. RMS file converts speed reads and writes.
3. RMS global buffering speeds file reads.
4. RMS local buffering speeds reads and writes.
5. Disk defragmentation speeds reads and writes.
6. File defragmentation speeds reads and writes.

You can request both RMS local and global buffering for a file.

Host-Based Data Caching

Host-based data caching uses free memory for high-speed data caching. I/O requests to the file are intercepted by the caching system. If the I/O request is a write operation, the data is passed to the disk device. No speed increase occurs. If a read I/O request is intercepted and the requested data is already in the memory data cache, the request is satisfied with a very fast memory move. No I/O to the disk occurs. Host-based data caching systems are available from a number of commercial software vendors.

RMS File Conversion

As you write to RMS-based files, they become internally fragmented and disorganized. Over time, read and write operations cause extra physical I/O operations to the RMS file. You can use the Digital-provided CONVERT utility to defragment and reorganize RMS files. To convert the file MYFILE.DAT, at the DCL prompt enter:

```
$ CONVERT myfile.dat  myfile.new
$ RENAME  myfile.new  myfile.dat;
    (note the trailing ";")
```

This two-step process safely converts and reorganizes an RMS file.

If the CONVERT fails, *don't do the rename.* This ensures the integrity of your original unconverted file.

RMS Buffering

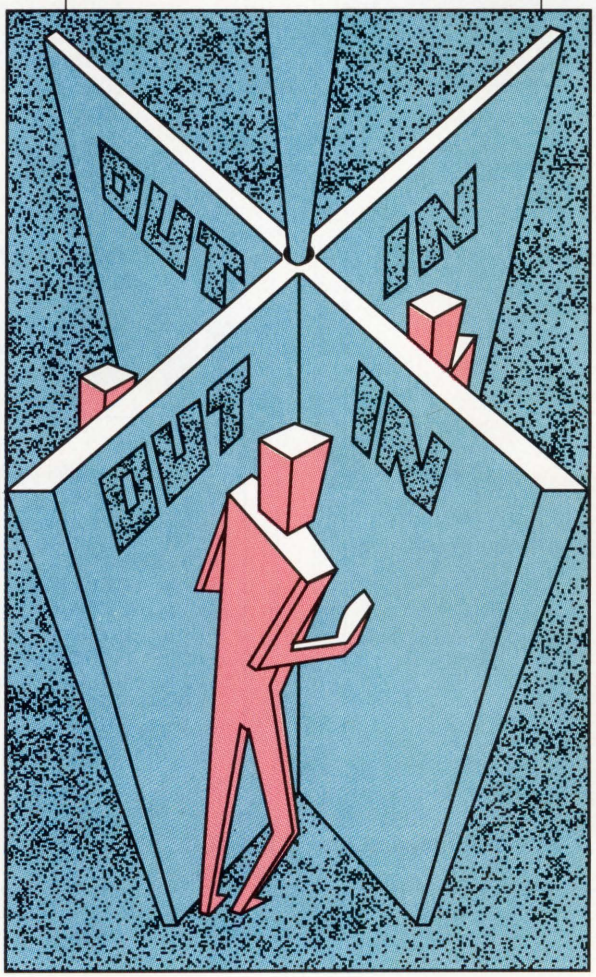
RMS moves data from the disk into memory buffers. From the buffers, data is moved into the application program. Whenever the requested data can't be found in a data buffer, RMS must access the disk to find the data. Accessing the disk is much slower than getting information from a data buffer.

RMS provides two types of file data buffers: local and global. Local data buffers aren't shared among processes. They only can be accessed by the process for which they were created. When RMS opens an indexed file, by default it creates two local data buffers.

Global data buffers, on the other hand, are shared among processes. They can be accessed by all processes that have the file open. By default, RMS doesn't create global data buffers.

File I/Os can be reduced using either or both of these buffering methods. However, increased buffering requires additional system resources. To avoid running out of system resources, both SYSGEN and AUTHORIZATION (SYSUAF) parameter changes are needed.

RMS Local Buffering — RMS indexed files with high file I/O counts can benefit from increased local buffering. As the number of local buffers is increased, more I/O requests can be satisfied from the local buffer cache. In some cases, even write requests can be



speeded using local buffering (for deferred write operations).

The number of local buffers used by RMS indexed files can be set per process or systemwide. In either case, the SET RMS command is used to specify the number of local buffers.

For example, to set the number of local buffers used for indexed files for all users on the system to eight, the following DCL command is used:

```
$ SET RMS/SYSTEM/INDEX/BUFFER=8
```

To set the number of local buffers used for indexed files for just one process to 10, the following DCL command is used:

```
$ SET RMS/INDEX/BUFFER=10
```

RMS Global Buffering — RMS-based files with high read I/O percentages (75 percent or greater) can benefit

Figure 1.

VAX/VMS Monitor Utility
DISK I/O STATISTICS on node TTI
25-JAN-1990 13:11:35

I/O Request	Queue Length	CUR	AVE	MIN	MAX
1DIA0:	TTIVMSRL5	1.20	2.20	0.10	2.50
1DUB3:	USER	3.65	6.15	0.65	8.65

The Digital-provided MONITOR DISK utility displays the I/O queue depth for each disk device. A depth of two means that, on the average, two users are waiting for the disk at all times.

Figure 2.

December 1, 1989 I/O PLUS Page 1
I/OPLUS Hot File Analysis (High I/O Counts)
Node MINI sampled on December 1, 1989 at 06:14 PM by SMITH

Lock Master	File Name	Total I/Os	Read I/Os	Write I/Os	Read %
(L) MINI	SALES_MSTR.DAT;1	206	206	0	100.00
	MENU.INT_IMG;52	121	121	0	100.00
	PAYROLL_RUN.EXE;4	60	60	0	100.00
	DECW$SERVER.EXE;1	51	51	0	100.00
	DECW$SRV_DX.EXE;1	24	24	0	100.00
	ACCOUNTNG.DAT;1	10	1	9	10.00
	Node Totals:	472	463	9	98.09
(R) TTI	PAYROLL.EXE;400	62	62	0	100.00
	OPCOM.EXE;1	47	47	0	100.00
	NETACP.EXE;5	27	27	0	100.00
	SMISERVER.EXE;2	12	12	0	100.00
	CONFIGURE.EXE;6	11	11	0	100.00
	JOBCTL.EXE;4	11	11	0	100.00
	Node Totals:	170	170	0	100.00
	Grand Totals:	642	633	9	98.60

Sample hot file reports and file "lock mastering" information.

Figure 3.

```
$ SET WATCH/CLASS=MAJOR FILE
$ MAIL
   .
   .
   .
Access SYSUAF.DAT;2 (28,4,0)
Access VMSMAIL_PROFILE.DATA;1 (84,12,0)
You have 2 new messages.

MAIL> SEND/NOEDIT
To:    SYSTEM
CC:
Subj:  new system
Enter your message below. Press CTRL/Z when complete, or CTRL/C
to quit:
Create ..... (9881,58,0)
How are plans for buying the new 9000 going??  Sure be nice to get
rid of this 11/750!!
<CTRL/Z>
Deaccess (9881,58,0) Reads: 0, Writes: 2

MAIL> EXIT
Deaccess (28,4,0) Reads: 8, Writes: 0
Deaccess (84,12,0) Reads: 7, Writes: 2
$ SET WATCH/CLASS=NONE FILE
```

The SET WATCH command can be used to monitor the physical I/Os used when you execute VMS mail.

Figure 4.

VAX/VMS Monitor Utility
RMS CACHE STATISTICS on node TTI
1-DEC-1989 21:52:11

(Index) SALES_MASTER.DAT;1

Active Streams: 2	CUR	AVE	MIN	MAX
Local Cache Hit Percent	37.00	36.65	0.00	40.00
Local Cache Attempt Rate	51.16	5.53	0.00	51.16
Global Cache Hit Percent	57.00	57.02	0.00	100.00
Global Cache Attempt Rate	31.89	3.50	0.00	31.89
Global Buf Read I/O Rate	13.95	1.48	0.00	13.95
Global Buf Write I/O Rate	0.00	0.00	0.00	0.00
Local Buf Read I/O Rate	0.00	0.02	0.00	0.33
Local Buf Write I/O Rate	0.00	0.00	0.00	0.00

The MONITOR RMS utility provides local and global buffer caching information.

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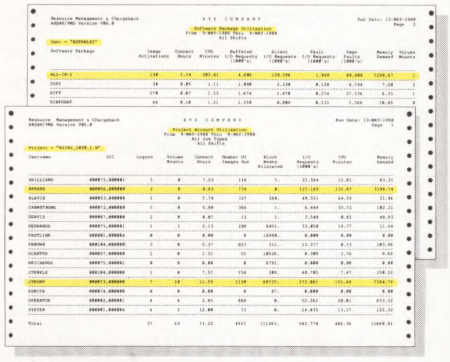

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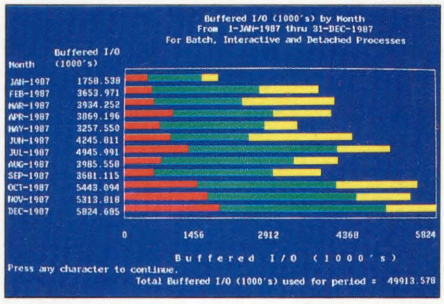

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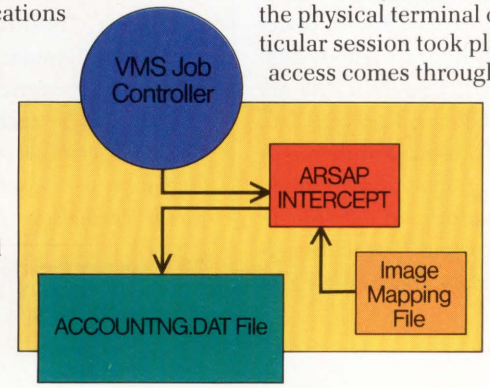

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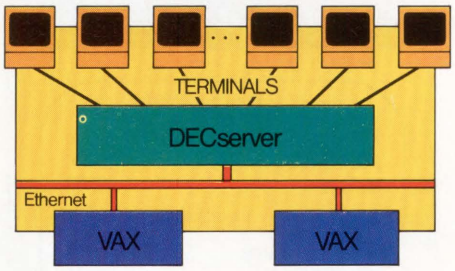

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from increased global buffering. As the number of global buffers is increased, more read I/O requests can be satisfied from the global buffer cache. Write requests are written directly to the disk and aren't speeded by global buffering.

To specify the number of global buffers to be used on a file, the file must be closed. To set the number of global buffers on file MYFILE.DAT to 30, the following DCL command is used:

```
$ SET FILE myfile.dat/GLOBAL=30
```

Monitoring RMS Cache Hits — VMS V5.0 and later provides a utility for monitoring RMS buffer caching activity. To perform RMS monitoring, the file to be monitored must first have the statistics option set.

To SET the statistics option on a file, the file must be closed. To set statistics on the file MYFILE.DAT, the following DCL command is used:

```
$ SET FILE myfile.dat/STATISTICS
```

After the statistics option has been set on the file, the following MONITOR command is used:

```
$ MONITOR RMS/FILE=myfile.dat/ITEM=CAC
```

The Digital-provided MONITOR RMS utility provides both local and global buffer caching information. The higher the cache hit percent shown in the display, the better the I/O performance of the file (see Figure 4).

Authorization Parameter Changes — RMS local and global buffering require increased address space and additional VMS synchronization information. The minimum authorization parameter values recommended when either local or global buffering is specified are shown at the top of Figure 5.

SYSGEN Parameter Changes — RMS global buffering requires increased use of VMS global pages and global sections. In addition, some RMS-related SYSGEN parameters must be changed. The minimum SYSGEN parameter values recommended when global buffering is specified are shown in the middle of Figure 5.

RMS local and global buffering both require increased use of VMS locking and synchronization resources. The minimum SYSGEN parameter values recommended when either local or global buffering is specified are shown at the bottom of Figure 5.

Figure 5.

SYSUAF

Parameter name	Minimum value
PGFLQUO	35000
BYTLM	35000

SYSGEN

Parameter name	Minimum value
GBLPAGFIL	8192
GBLPAGES	25000
GBLSECTIONS	800
RMS_GBLBUFQUO	8192

SYSGEN

Parameter name	Minimum value
IRPCOUNT	500
LOCKIDTBL	4000
LOCKIDTBL_MAX	16000
PQL_MENQL	600
RESHASHTBL	2500
SRPCOUNT	4500
VIRTUALPAGECNT	35000

At the top are the minimum authorization parameter values and at bottom are the minimum SYSGEN parameter values recommended when either local or global buffering is specified. In the middle are the minimum SYSGEN parameter values recommended when global buffering is specified.

Disk And File Defragmentation

Disk defragmentation causes files to become physically contiguous. Contiguous files can be accessed with fewer I/O operations than noncontiguous files. The two ways to defragment a disk are to do a full BACKUP and RESTORE to the target disk or to use a commercially available disk defragmentation product.

If you don't have time to defragment all of your disks, you can instead defragment your most badly fragmented files one at a time.

Figure 6.

```
FILE
        best_try_contiguous     yes
        ALLOCATION              nnn
        ORGANIZATION            xxx
        .
        .
        .
```

Customizing a .FDL file.

VMS provides a way to defragment individual files. There are three steps:

1. Create a .FDL for the file.
2. Customize the .FDL file as needed.
3. Convert and rename the file.

A .FDL is a file definition language file. It can be used with the Digital-provided CONVERT utility to defragment a file. To create a .FDL for the file MYFILE.DAT, use the following DCL command:

```
$ ANALYZE/RMS/FDL MYFILE.DAT
```

The ANALYZE command creates a file called MYFILE.FDL. The .FDL is a text file that contains a description of MYFILE.DAT.

To customize the .FDL file, use the text editor of your choice to edit the .FDL file and insert the text "best_try_contiguous yes" (see Figure 6).

Finally, the CONVERT utility can be used to defragment and reorganize your files using a .FDL. To convert and defragment the file MYFILE.DAT, at the DCL prompt enter:

```
$ CONVERT/FDL=myfile.fdl
    myfile.dat  myfile.new
$ ! (note the trailing ";")
$ RENAME  myfile.new  myfile.dat;
```

If the CONVERT fails, *don't do the rename*. This ensures the integrity of your original unconverted file.

Using these techniques to eliminate file I/O operations can help improve performance. — *Dan Esbensen is president of Touch Technologies Inc., San Diego.*

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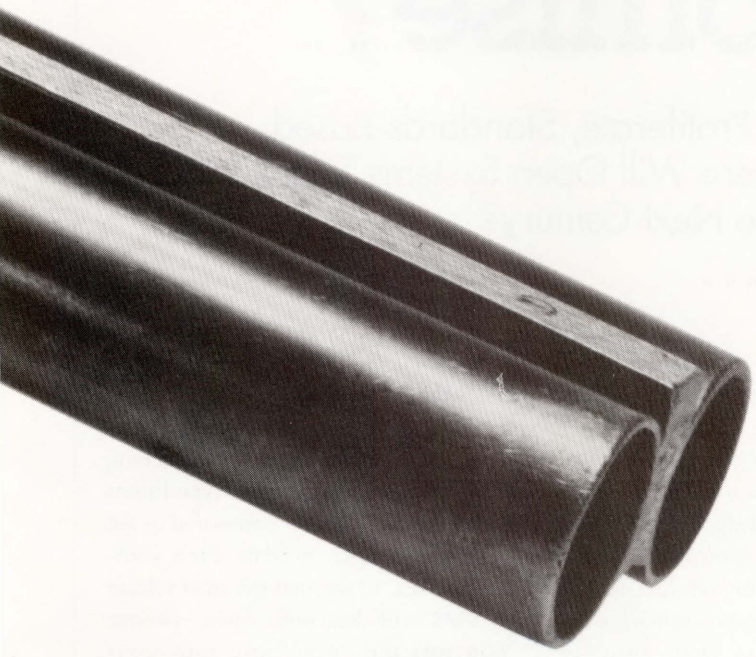

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ROUNDTABLE

Open Systems: Will They Fulfill The Promise?

As Multivendor Environments Proliferate, Standards-Based Computing Takes Center Stage. Where Will Open Systems Take Us As We Approach The Next Century?

Editor's note: In February, DEC PROFESSIONAL *technical editors gathered for their first roundtable discussion of the '90s to debate open systems, a theme that likely will define DEC computing in the '90s. Voicing their opinions were DCL Editor Kevin G. Barkes; ULTRIX Editor Philip E. Bourne, Ph.D.; Macintosh Editor Al Cini; Networking Editor Bradford T. Harrison; Editorial Director Dave Mallery and Technology Editor Philip A. Naecker. The discussion was moderated by Managing Editor Lou Pilla.*

Pilla: Open systems can be defined as a multivendor networked environment that allows easy, robust sharing of system resources no matter what the platform or the operating system. With that in mind, how does the VAX/VMS community view open systems?

Naecker: With respect to the networking aspect, there isn't a lot of noise about open systems from the VMS community, for a couple of reasons.

One is that VMS is already a pretty well-connected platform. There are a number of DEC and third-party products for TCP connection and NFS file serving. Other major vendors in the open systems arena have network connectivity products that emulate DECnet. VMS already has a lot of connectivity with open systems.

Another reason is that DEC has told its customers that in the future it will provide a higher plateau of connectivity and openness and that VMS allows that to happen relatively painlessly. Customers are taking a "let's see" approach to that statement. When greater openness comes, customers will complain if it isn't what they want. But for now, they're willing to wait for DEC.

Barkes: You can divide the VMS community into two types of managers. There's the proactive type who's getting HP-Apollo and Sun workstations, pushing the envelope and seeing what he can do. The other type listens to DEC and doesn't feel pressured to get involved in open systems. He's waiting for DEC to say that the next release of VMS will deal with open systems: You just put something into your startup file and pay your monthly support charge for VMS.

The proactive people are watching the marketplace and how open systems are developing. They'll be in a better position to deal with open systems when they come. And they certainly will come. By 1995, open systems and interconnectivity will be functional.

Starting At The Bottom

Mallery: Can we define level 1 of open systems connectivity? VMS V5.3

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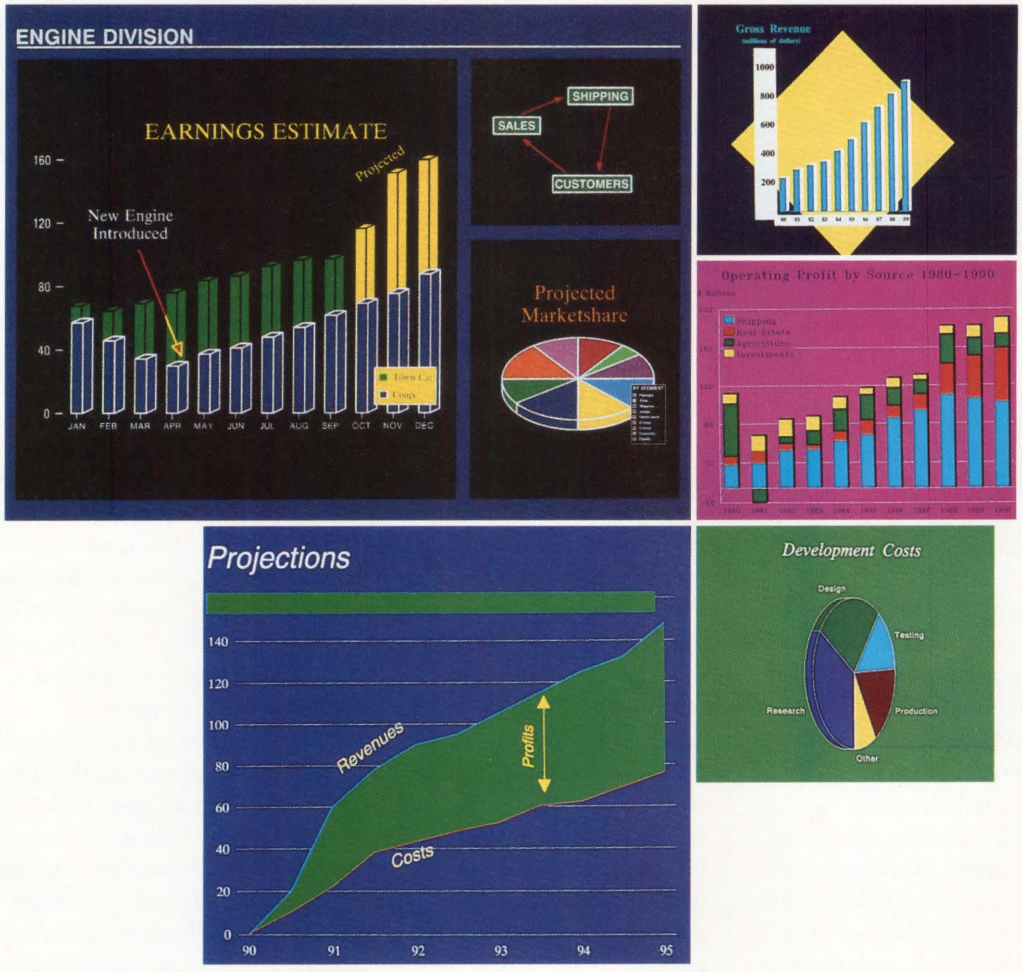

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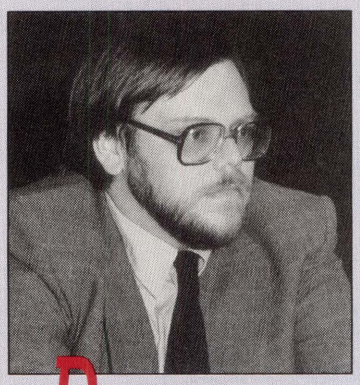

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has TCP support for DECwindows so that you can run X from an HP-Apollo or Motif-supported workstation with your VMS system as a server. That's all well and good, but other than the clock and calendar, there isn't a lot of software to run in that mode.

Barkes: That's starting to change. More commercial developers are porting to UNIX, and it looks like Motif will be the platform of choice. Initially, we'll be dealing with communications issues, getting mail back and forth between systems, and client/server-type relationships. By 1994 or 1995, we'll get into remote procedure calls [RPC] and architecture-neutral distribution formats.

As far as vendors that are doing things now, I believe HP-Apollo has network computing services. DEC is working with HP-Apollo to add WAN support. And I think Netwise is being supported by Sun.

Harrison: Sun has pretty much abandoned its own RPC compiler, RPCGEN, in favor of the Netwise product called RPC Tool. AT&T is supportive of that effort, and it looks like there will be a major battle soon between the NCS compiler Network Interface Definition Language [NIDL], which OSF seems to favor, and the Sun-AT&T-Netwise compiler.

Mallery: Within the next few months, there will be a divorce settlement — but we'll have to call it a marriage settlement — between OSF and UNIX International.

Harrison: Exactly. And there's also the user interface issue. Sun is fully behind Open Look. It will have to coexist with Motif.

Driving Forward

Pilla: Aren't we asking a lot of the computer industry in getting these standards to coexist? In automobiles, we have Ford, GM and others, and everybody can drive the cars equally well though they come from different manufacturers. Are we asking too much of the computer industry to get standards together?

Mallery: We want to be able to drive the car.

Naecker: I don't think we want just to be able to drive the car. I think we're already past level 1 and probably level 2 of interconnectivity. File transfer has been here for a long time, and a minimum level of TCP-type interoperability has been here for a few years. We're trying to get to the next level, and that's more than just driving the car. We want to use the carburetor from our Chevy in our Jaguar. That's the level of interoperability people are pushing the industry toward.

Bourne: That's at least partially true. A lot of vendors already support the same chip set on different platforms, the Mips Computer Systems chip in particular. But we'll never be in a situation in which one operating system works on all types of hardware, for the simple reason that each vendor has its own specific devices. We'll have a degree of interoperability, but it will be at a somewhat higher level.

Mallery: In the 1990s, four or five architectures will survive. The Mips architecture, the Motorola 88000 architecture, perhaps the HP PA architecture, and maybe the VAX architecture. To interoperate, those architectures will require standards at the networking, database and procedure call levels. Those architectures are a reality for the next five years, because there's so much force behind them.

Bourne: And massively parallel architectures will come into being by 1995 if not before.

Barkes: But don't open systems represent a least-common-denominator approach to computing? Open systems establish a base line of expected performance from systems — certain things all systems should be able to do. Then every vendor adds value by adding bells and whistles.

No one during this discussion is asking if open systems will be accepted. It's as if it will be accepted, and the question is, When do you get the invoice in the mail?

I see more and more large computer companies working together to develop an open architecture. It doesn't have a lot to do with computing, but rather with the financial marketplace. Apollo was purchased by HP. There have been rumors that DEC might be vulnerable to purchase. Maintaining a proprietary operating system can be a real cash cow if you have control of the market. The problem is that the market is no longer controlled solely by buyers of computer equipment. For example, pension funds demand a return on their investment in DEC stock. Those are the nontechnical issues that make open systems a question of when rather than if.

The UNIX Question

Pilla: Is DEC making the right moves now toward open systems? Is it putting the pieces in place for the future?

Harrison: You have to distinguish

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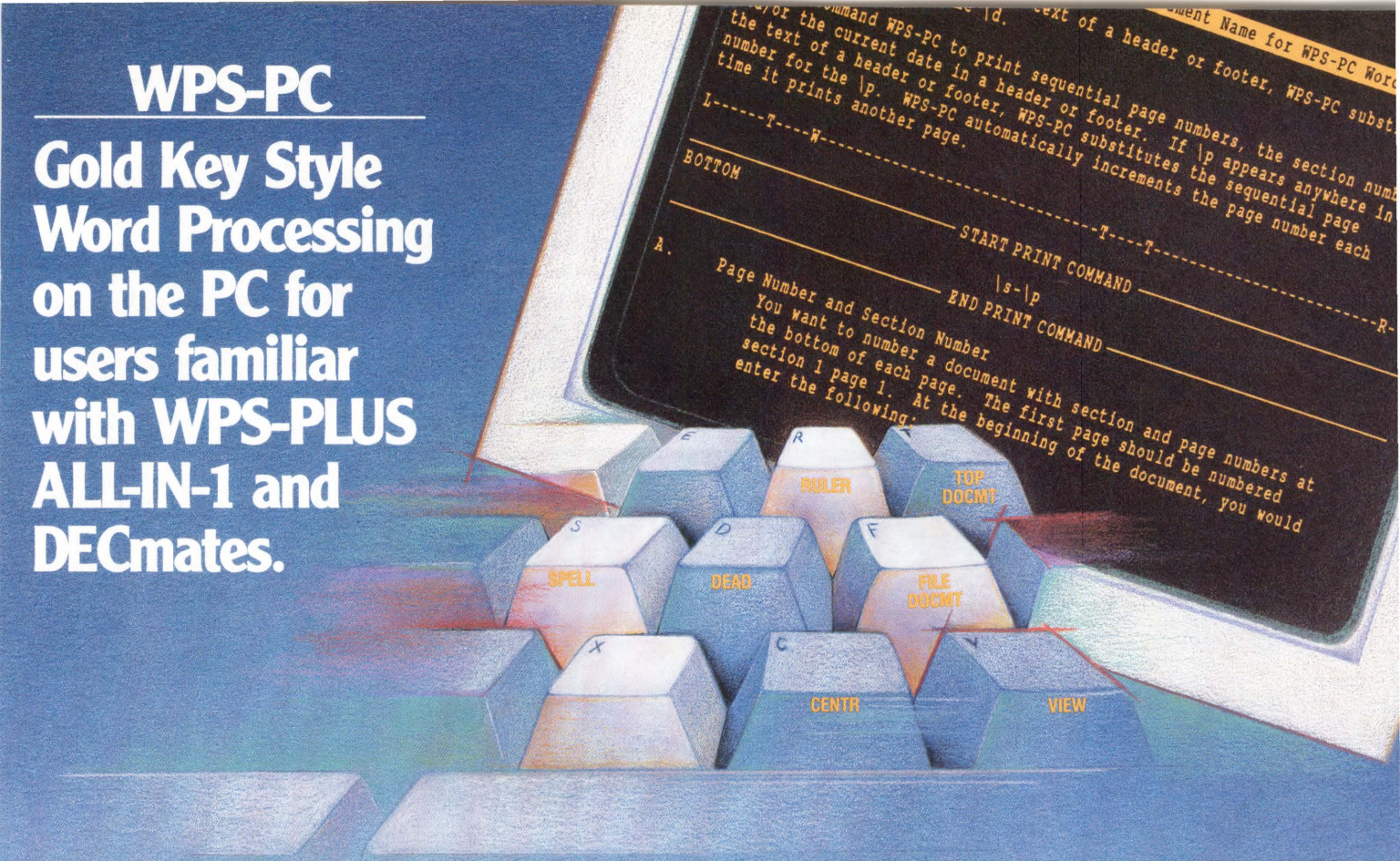

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between open systems that are open because they're basically the same systems and you can move software and so on between them and openness in which each environment retains its integrity but connects with other environments according to standards. People seem to interpret open systems not as a single architecture across the whole industry but as different environments that can connect with some degree of interoperability. The question is, What's that degree and how great must that degree be? DEC is attempting to achieve as high a degree of interoperability with other systems as is technically feasible while retaining the integrity of its own environment.

Bourne: I concur. NFS in VMS is a classic example of that approach. It's the melding of two distinctly different approaches to managing files. And yet you essentially can have VMS as an NFS server to a UNIX system. That's a very positive step.

Naecker: What's more, it doesn't just give you NFS serving on a VMS system, it also gives you other features of VMS. It happens in symmetric multiprocessing. It works with HSC, it works in clusters, it fails over, and so on. DEC took the best parts of VMS and made them available to "foreign" systems.

Barkes: At many sites, users don't know where their data is. When they run an application on a Sun workstation, they're actually accessing data stored on a VAX over the network. Those sites have reached the degree of interoperability they want, at least for now.

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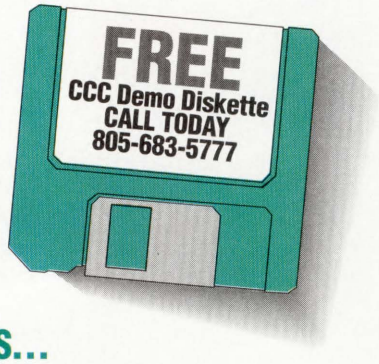

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But when we're talking about open systems, we're talking about UNIX. We're talking about the functionality that exists in UNIX establishing standards for what you want to get from the operating system.

Naecker: I disagree completely. We're talking about interoperability, not necessarily using the same platform or the same operating system. RPCs are an excellent example of that. There are a variety of interprocess and intermachine communication mechanisms available in a variety of UNIX operating systems. But they aren't very widely accepted or highly interoperable, and that's why everyone's pushing toward a common RPC, for example. The way they'll do it won't exclude anyone. It will be an open standard similar to X and implementable on any system, including PCs and VAXs running VMS. The open system discussion doesn't have much to do with UNIX.

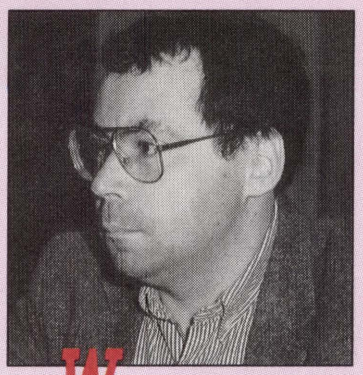
Pilla: But it seems that UNIX and open systems go hand in hand. Is this a misconception?

Barkes: When you say open systems to the person who signs the checks, he's thinking UNIX. The push for open systems comes from the UNIX community.

Naecker: But few of the people who sign the checks know UNIX or VMS. They just want to know how they can get the data from their health system into the data in their marketing system and vice versa. They want to know whether, if they buy a 55-mip server, the guys in the lab can get to it to do compute-intensive tasks.

Barkes: But we're splitting hairs. VMS and other proprietary operating systems are starting to look more like UNIX, not the other way around.

Cini: On the one hand, we have proprietary solutions that gain market share and allow companies to compete effectively against other companies because they have positions that are



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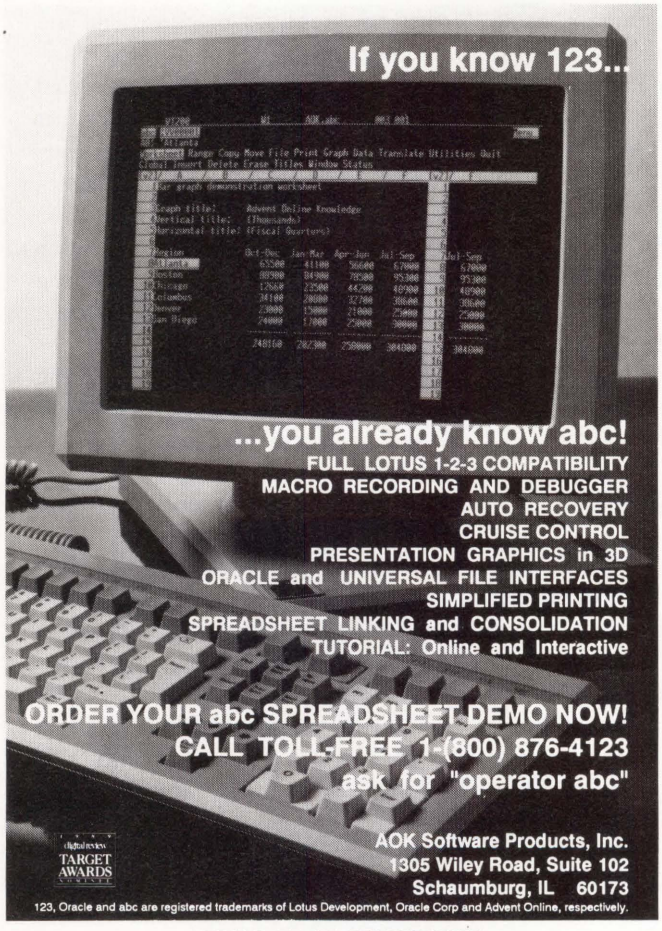

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Is DEC doing as good a job of presenting its own direction for the future as it is in advocating everybody else's direction for the future?

discernible and definable. On the other hand, we have the issues of interconnectivity, which are largely academic and argumentative and don't necessarily gain anybody market share. Is DEC doing as good a job of presenting its own direction for the future as it is in advocating everybody else's direction for the future? Is DEC in a position of winning the argument and losing the marketplace?

Naecker: DEC intends to own the network, and it's making a big push in that direction. Many vendors have good networking capability. But across a wide range of networks and from the desktop up, DEC is in a good position to take ownership of networks. That's one thing that will keep DEC from driving itself out of business.

Cini: But what product should I buy from DEC?

Naecker: DEC slapped together a handful of products into the beginnings of a NetView competitor and put a quick and dirty DECwindows cover on top of it. DEC calls it version 1 and will work like heck on version 2. It's called the Management Control Center, and you can buy it now.

Cini: My point is that if DEC wins its open argument and crystallizes the standards it's proposing and then someone else puts together something that does the same thing at a lower price, who wins?

Harrison: All the companies are trying to make money by saying that they have the most open system. Sun has its SunNet architecture, which is completely ambiguous. DEC has the EMA network management system and Network Application Support [NAS], which are still being defined. HP has AdvanceNet and Open View, and IBM has NetView. NetView is the only well-defined product, but for the most part it works only with IBM systems. They're all trying to sell strategies, but no one is sure what the strategies are.

Naecker: You don't want to buy open systems anyway. You want to buy something that solves your problem today and that will still work next year and five years from now. If that's an open systems approach, then fine.

Cini: And that's my point. Do I worry about this from the bottom up, or do I worry about this from the top down? A lot of the open systems issues we're discussing are nothing but rearranging the deck chairs on the Titanic from the marketplace point view.

Naecker: I don't think so. The discussion is very meaningful, because depending on how your company does business, on what your centralization and data storage models are, and on what standards you want to buy into, the question may indeed come back to which vendor you purchase from.

Watching Out

Pilla: What should VAX managers keep their eye on: the network, DECnet, OSI, the operating system, or something else?

Harrison: Start from the bottom up. Start at your LAN and use the well-defined standards there. Since you're buying into something a lot of people have, you can be sure you'll be given a migration path as you move up. Don't start from the top down, because there's nothing at the top to buy into at this point.

Cini: MIS directors have to concentrate on service delivery to their users. They have to start with what their users need while reconciling those needs with what they know will be stable platforms in the future.

Naecker: But don't take those comments out of context. I've worked with companies to design an open architecture. An architecture isn't a cast-in-concrete set of standards, and it's constantly changing, but it's a good place to start your acquisition plans.

If those companies find they weren't quite right as far as what they want for wide area networking, they refine it. If they didn't choose the right media, they refine it. The architecture includes everything that comes through MIS, from the user interface to the connectors on the terminals. If they have a purchasing choice between products that are architecture-consistent and products that aren't, it's an easy decision. Say your architecture has settled on X for the GUI. If a vendor says that it's based on a non-X product, they say, "That's interesting, but we've decided that our GUIs will be X-based, so come back when you have one that's X-based." It's a matter of throwing away alternatives that are inconsistent with your long-range view.

Pilla: But that doesn't sound like the way the real world works. The real world patches things together and goes on from there.

Bourne: We have a host of different systems at my site. Everything is application-driven. I have something running on VAX/VMS, but if the associated software becomes available on a RISC box, then that becomes attractive. I don't care about open systems. I'll patch together what it takes to make one system talk to the other. If I listen to what's going to happen and what it's going to cost, it's worrisome. I don't want to address that until I have

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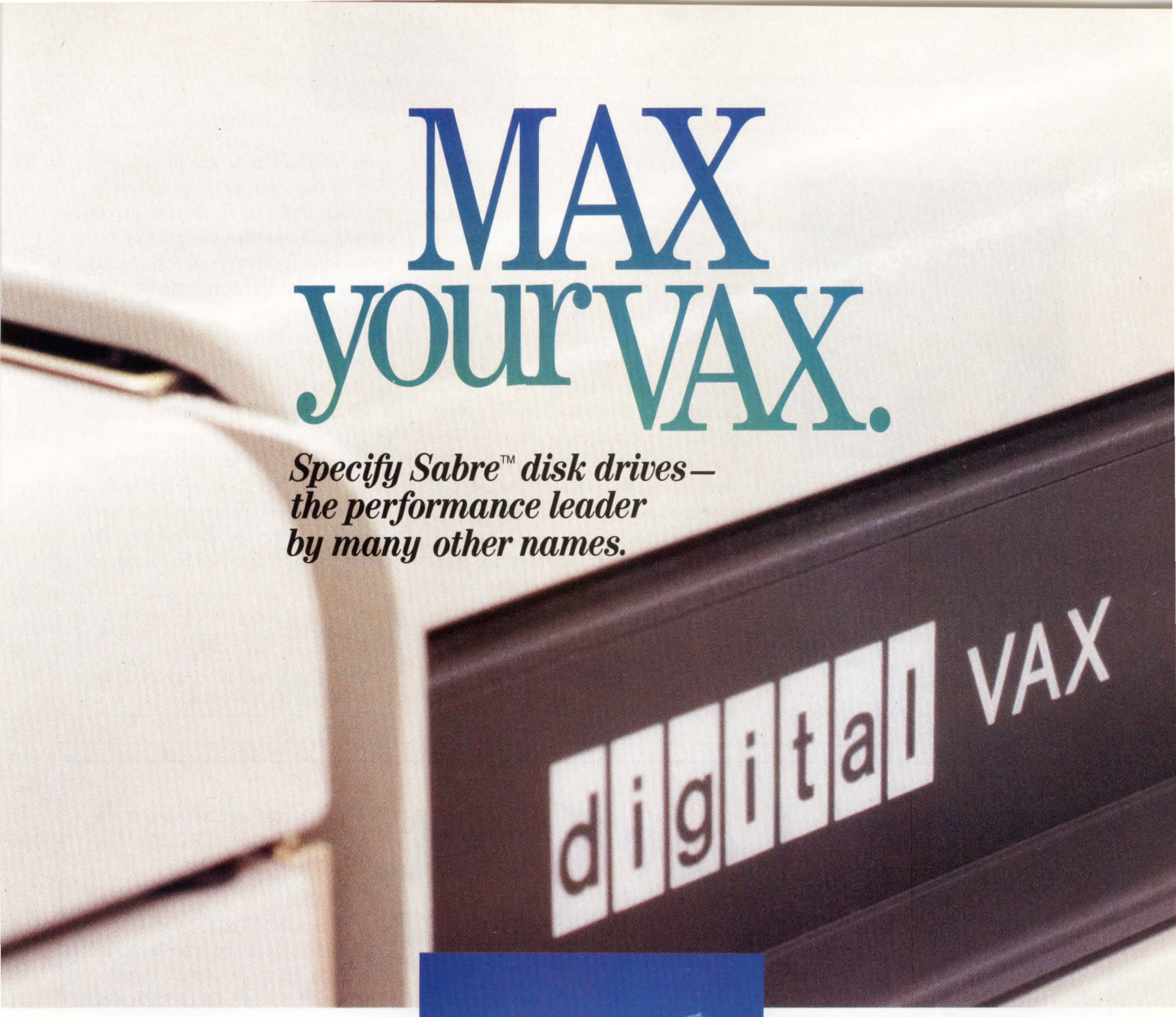

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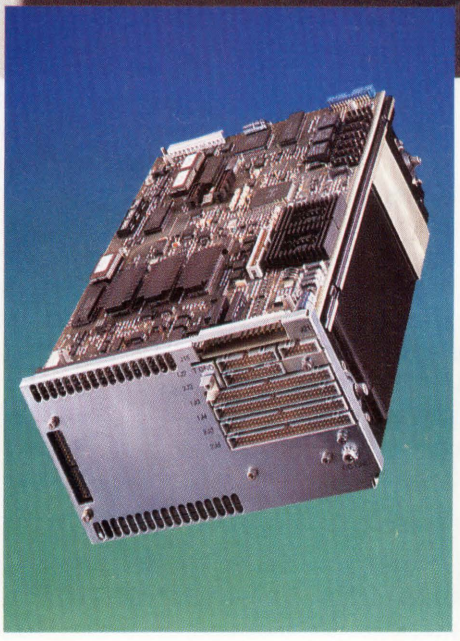

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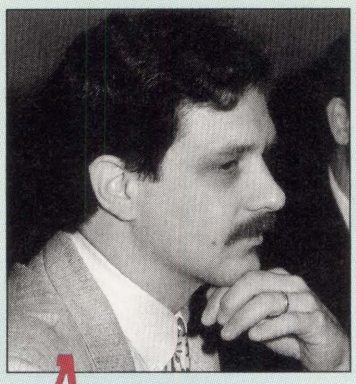

Across a wide range of networks and from the desktop up, DEC is in a good position to take ownership of networks.

to. That may be short-sighted, but it's the way a lot of people operate.

Pilla: What do members of the group advise readers to do in planning for open systems in the near term and further into the '90s?

Harrison: If you buy what works and what most reliable vendors support, you can't go wrong. You'll be given the appropriate migration paths when you move on to something else.

Barkes: Find something that offers the most capability but that doesn't paint you into a corner.

Bourne: Don't suffer from non-VMS phobia — the fear of hardware or software that doesn't begin with VAX/VMS. Use whatever does the job best now and worry about bandaging it together later.

Naecker: Certainly there are bandages in any organization. But to begin the acquisition process by saying, "Just buy whatever is available today and get it all to work together later" isn't a recommendation I'd take to my company president. Despite the criticisms made about American managers, most of them can see beyond this application and this fiscal year. If you can make a case that it would be better to look further ahead and get that case accepted by management, that's what I'd propose.

Cini: You do have to take a long-range view. But for a company such as DEC to regain a leadership position, it will have to invent something unique to DEC and not just promote open architectures that are like everybody else's. DEC has to come up with a product that people want to buy even though it might cost more than competing products from other companies.

Appearing in photos: page 64, Kevin G. Barkes, DCL Editor; page 67, Philip E. Bourne, Ph.D., ULTRIX Editor; page 68, Al Cini, Macintosh Editor; page 70, Philip A. Naecker, Technology Editor.

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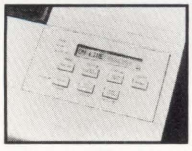

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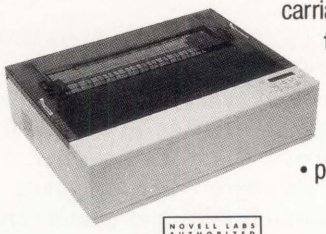

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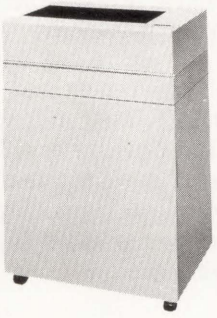

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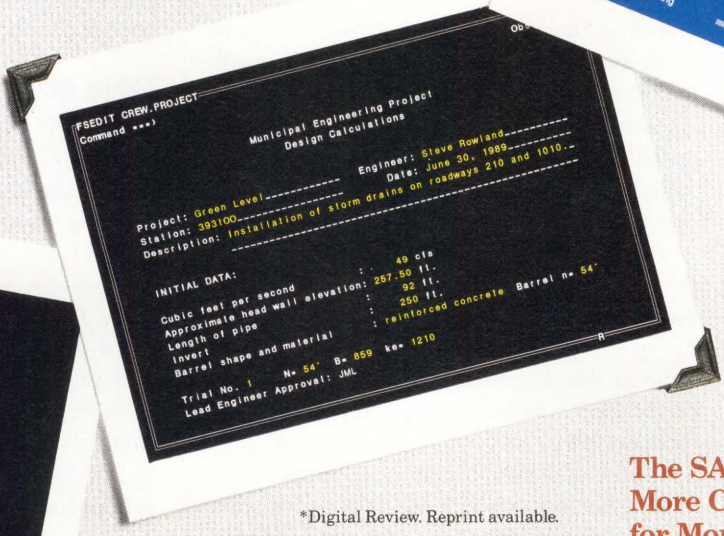

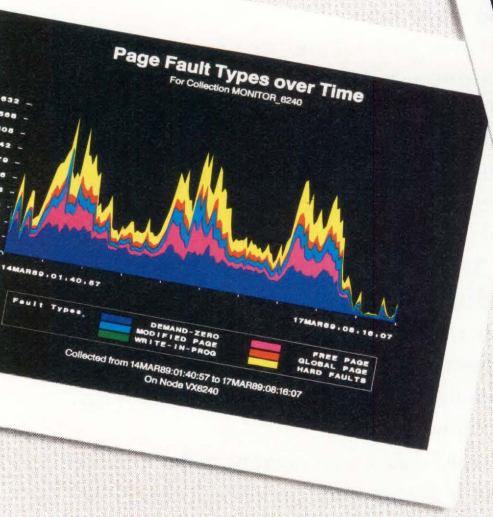

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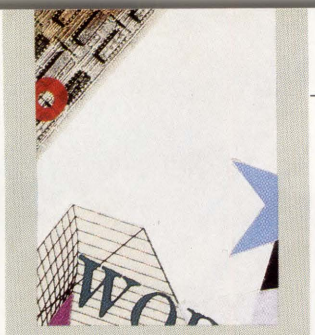

DATABASES

Rdb/VMS: A Tunable Feast

Andy Mahler

Digital's Rdb/VMS Provides A Comprehensive Set Of Utilities That Let You Monitor And Tune Your Database With Ease.

After you have designed a logical database, an equally challenging task is to design a physical database. Once the database is loaded and in production, you need to monitor the activity and tune the database for optimal performance. Relational databases offer much flexibility in making physical design changes, but to make the correct adjustments to the database, you need the appropriate utilities. With the following utilities, you can monitor the database and make the correct choices with greater efficiency than by using trial and error.

Just as the logical design requires a lot of work to associate the data with how it will look to the user, initial physical design also requires considerable effort. A good physical design, which is needed for good performance, mandates how the data is to be stored and accessed from physical devices. Logical design work is independent of hardware and operating systems, but the physical database design isn't. Physical design requires a knowledge of the system before it can be implemented. Because of this dependency, designing the physical database is difficult unless you prototype the database within the system environment.

Data modeling can help in certain circumstances, but it too is difficult. If the parameters used for the modeling are imprecise, simulation will yield unreliable results. Although it provides some form of prediction, the results of data modeling are never certain until the full application is run with the actual data and workload.

The tools available for monitoring the system can assist with the physical database design. However, monitoring the system is often difficult because of processing loads and other factors outside the database environment. These factors can produce results that show system performance problems and might point to the database as the culprit. To perform physical design and tune the database, you need database-specific monitoring tools.

Experience with your specific relational database product can aid with the initial physical design. However, this experience doesn't provide enough knowledge to make the necessary judgments in designing for performance. As the complexity of the logical design grows, the physical design grows, as well. This can lead to poor decisions and poor performance.

Table Manners

To perform physical database design, you must understand the data, application and database. You should also follow some basic design practices and avoid others.

For faster retrieval and to avoid sequential searches through the database, implement indexes. Hashed indexing should be implemented when there's a need for speed in exact match retrievals (e.g., employee with badge number = 56789). However, avoid hash indexes for range retrievals (e.g., employees between the ages of 20 and 40). It's acceptable to define multiple indexes, but since these must be updated, too many indexes can hinder update and insert performance. Don't use indexes in which there are a minimal amount of unique values (e.g., sex of employee).

To avoid data fragmentation, make sure the page size is greater than the record size. However, don't make the page size too big, or it could cause wasted space. Large pages provide

You already know about all the risks to your VAX systems. From viruses to worms, trojan horses to accidental user errors, the nightmare of security exposures is growing and you are in the middle of it. You know what has to be done to close security loopholes; you need to identify guessable passwords, eliminate unnecessary privileges, disable unused accounts, locate misowned files and more. You may think the only way to achieve maximum security is through *your* hard labor.

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CIRCLE 118 ON READER CARD

more data to be transferred per I/O, so fewer I/Os are needed. Small pages can save CPU time when searching pages and areas and also can provide better buffering.

For reductions in I/O, use multifile database storage areas if possible. Splitting the database into multiple storage areas helps reduce the chance of a file becoming an I/O bottleneck. In certain situations, individual tables and indexes also can be split among several storage devices to avoid I/O bottlenecks on those devices. Within each storage area, it might be advantageous to cluster table rows together, depending on transaction access patterns. For example, you could place the EMPLOYEE table data with the corresponding JOB_HISTORY table data.

Performance improvements also can be gained by making better use of disks. Shadowing disks can help speed read performance and add resiliency to storage media. Smaller, faster disks can increase the performance of high-speed, highly concurrent transactions because they allow more disk heads to access the data faster. However, larger, slower drives are the correct medium for storage of historical data.

These practices should be evaluated before any database monitoring or tuning is performed. Many of these practices depend greatly on the complexity and size of the database. For example, a sequential search on a small database performs better than a sequential search on a multigigabyte database.

Tuning Utensils

After the initial design, monitoring and tuning are required for optimum performance. Rdb/VMS offers utilities that provide a rich monitoring and tuning environment. The utilities provide physical information about the database and data structures, row and index storage information, dynamic database statistics, and cost and access strategies used by the optimizer. VMS utilities also are available to monitor the database and the system environment.

RMU/DUMP — The RMU/DUMP utility can provide physical database information regarding the size (both page and area) and placement of the database storage files. When an area becomes full, Rdb/VMS dynamically extends the storage area. The database doesn't need to be taken offline as it grows. RMU/DUMP also provides information on the number of times Rdb/VMS has dynamically extended the storage area.

If the storage area has extended a number of times, then the initial storage area size was underestimated. If the storage area has extended, there's potential for fragmentation (records stored across multiple pages), which can hinder performance. If you encounter this performance problem, you can resize the storage area and perform an unload/reload of the storage area at a convenient time. A properly sized storage area can efficiently accommodate data storage and allow for growth without the risk of fragmentation or more area extensions.

RMU/ANALYZE — Information about

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CIRCLE 304 ON READER CARD

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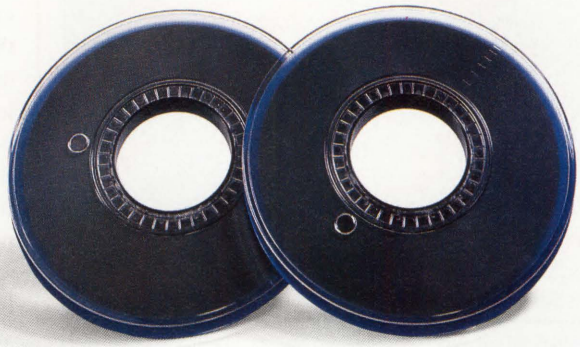

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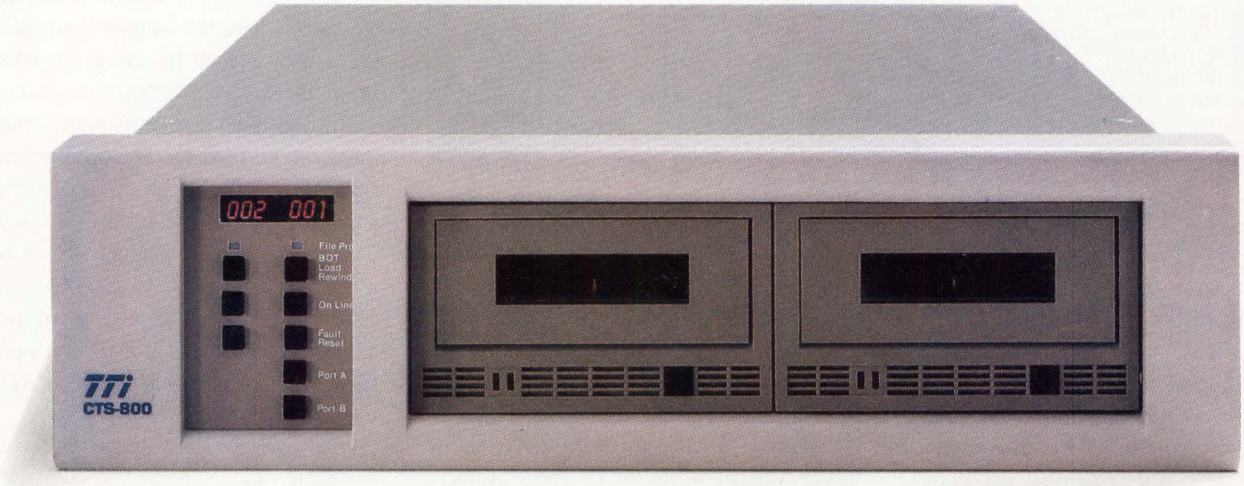
Or real fast.



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CIRCLE 169 ON READER CARD

FIGURE.

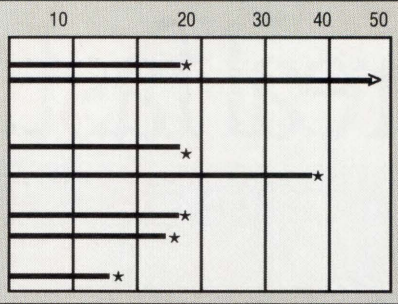
Node: MAHLER Rdb/VMS V3.1-0 Performance Monitor 15-FEB-1990 09:42:16
Summary IO Statistics
For Database: DBCG:[MAHLER.RDB]NDC1.RDB;1

statistic..... name.....	rate.per.second..... max.	cur.	total... avg...	average.. count...	per.trans
transactions	24	19	21.3	11971	1.0
verb successes	231	195	189.0	106167	8.9
verb failures	0	0	0.0	0	0.0
data file reads	39	19	22.8	12791	1.1
data file writes	46	37	32.1	18027	1.5
RUJ file reads	0	0	0.0	0	0.0
RUJ file writes	23	19	16.6	9300	0.8
AIJ file writes	18	18	12.8	7192	0.6
root file reads	0	0	0.1	40	0.0
root file writes	15	14	10.0	5646	0.5

Display_menu Exit Graph Help Options Reset Set_rate Time_plot Write_screen

Node: MAHLER Rdb/VMS V3.1-0 Performance Monitor 15-FEB-1990 09:42:16
Summary IO Statistics
For Database: DBCG:[MAHLER.RDB]NDC1.RDB;1

statistic..... name.....	max. rate	cur. rate
transactions	24	19
verb successes	231	195
verb failures	0	0
data file reads	39	19
data file writes	46	37
RUJ file reads	0	0
RUJ file writes	23	19
AIJ file writes	18	18
root file reads	0	0
root file writes	15	14



Display_menu Exit Help Numbers Options Reset Set_rate Time_plot Write_screen

Example of two displays provided by RMU/SHOW STATISTICS. These screens show a summary of I/O information in numbers or histogram format.

row and index storage is provided through RMU/ANALYZE. This utility gives detailed row analysis about fragmentation, compression, average size and percentage breakout of free space, space used by data and overhead (in bytes). RMU/ANALYZE can be used to gather index information regarding type (sorted or hash), corresponding relation, whether duplicates are allowed, the number of levels within a tree and space use. It also provides analysis and histograms on data placement, minimum and maximum I/Os needed to traverse buffers and data pages to retrieve the row.

Analysis of RMU/ANALYZE data can reveal the amount of fragmentation or wasted space in the database. If there's too much fragmentation or wasted space (assuming no more cumulative growth), the storage area might need to be resized. Knowing the number of index levels within the sorted tree is also valuable. Depending on the application, the index levels can be adjusted to yield either a wide tree for fewer I/Os or a deep tree for fewer lock conflicts.

RMU/SHOW STATISTICS — This utility collects dynamic database statistics, which can be viewed online and/or collected and replayed later. The statistics include a summary of database I/Os (see Figure), a breakdown of the I/Os-per-storage-area file and information about the amount of stall time per I/O. The utility also monitors both sorted and hashed indexes and provides information on retrieval, insertion and removal of nodes and hash keys. Statistics are available on the number of locks requested, promoted, demoted and released on a summary or per lock type basis. Other important statistics include buffer pool and database process stall activity.

By monitoring the output from the RMU/SHOW STATISTICS displays, you can get help in determining how to size the database buffers. It also can help locate hot spots within the database where locking conflicts might be hindering the performance of the database. Much I/O data can be collected that will help determine optimal placement of files and partitioning of tables and indexes across disks. Analyzing the statistics regularly helps to monitor the database performance and indicates potential problems.

**RDMS$DEBUG_FLAGS —** Rdb/VMS allows you to display the cost and access strategy used by the query optimizer through the use of the RDMS$DEBUG_FLAGS logical name. Because it's a logical name, it can be dynamically turned on and off. Also available is the ability to direct where the output from the logical will be placed by using the RDMS$DEBUG_FLAGS_OUTPUT logical.

Information gathered from RDMS$DEBUG_FLAGS can be used to determine the methods the optimizer is using to perform queries. This will show if the data was retrieved sequentially or by an index and will provide the index name. Analysis of this data will determine if a table needs an index where one isn't defined or if extra indexes are defined where they aren't needed.

DECtrace and RdbExpert are optional products that monitor the database and application and make specific physical database design recommendations (see "Elegance For Rdb," March 1990). Other Digital products that can help when tuning a database by monitoring the system environment are VAX SPM, VAX VPA and the VMS MONITOR utility. —*Andy Mahler is a database consultant at Digital Equipment Corporation Database Systems Engineering in Nashua, New Hampshire.*

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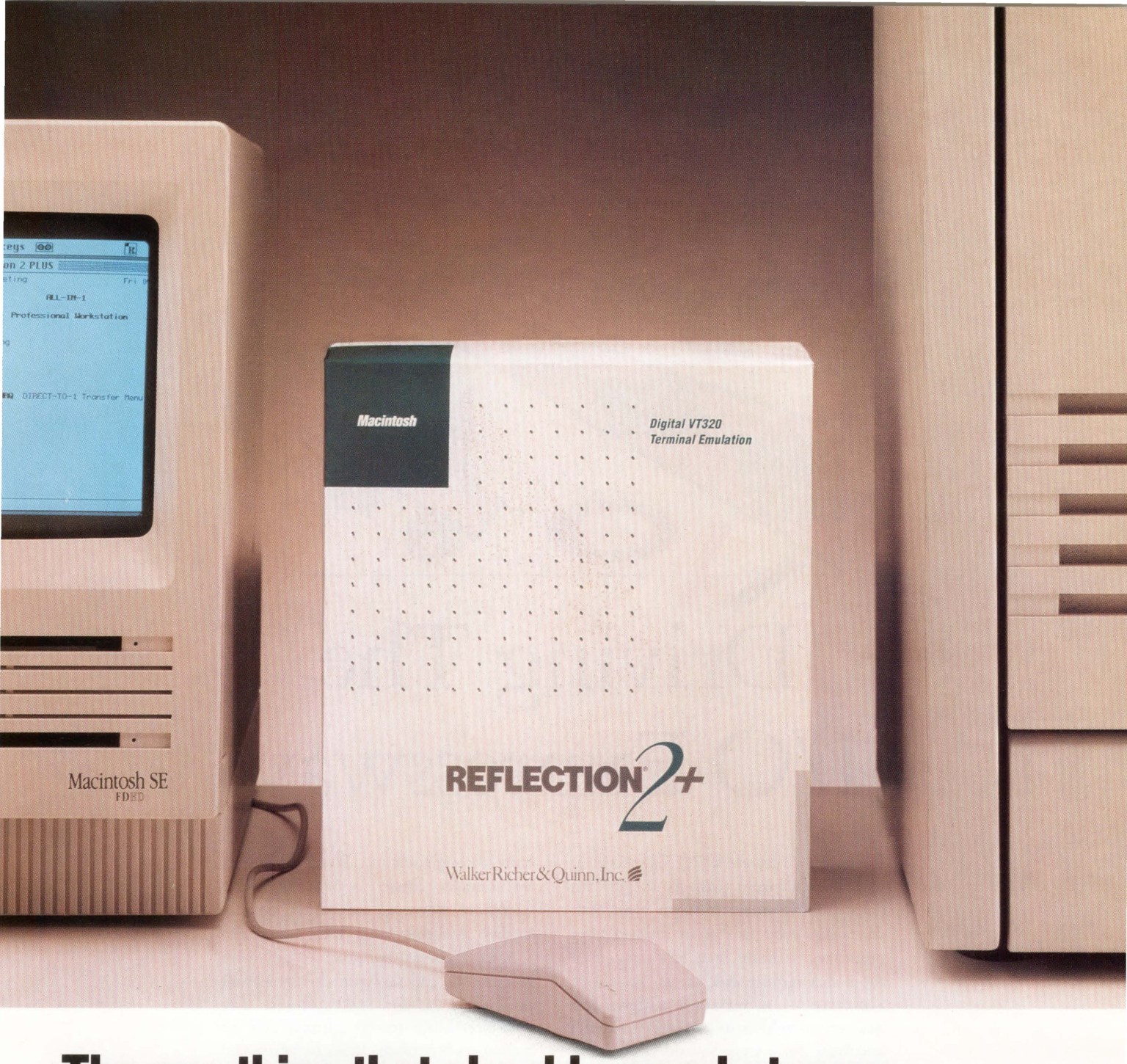

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CIRCLE 172 ON READER CARD

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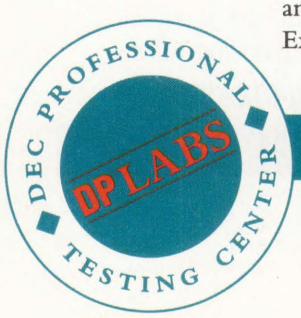
Memory is allocated and deallocated dynamically. When memory is plentiful, I/O Express takes advantage of it. During times of heavy memory use, I/O Express trims its cache to allow memory to be devoted to other processes. There's no need for system managers to identify and maintain a list of "hot" files. I/O Express's caching is automatic.

The caching mechanism employs a write-through scheme. Read operations are normally accessed from cache. Write operations, however, are written directly to disk, ensuring your data's integrity.

I/O Express supports standalone systems, NI- and CI-based clusters as well as single-CPU and SMP systems. Any disk accessible to the cluster can be cached on any node. Disks to be cached are chosen automatically by I/O Express. There's no need to specify this information manually.

I/O Express requires 1,200 free disk blocks for the software and 256 pages of physical memory as a minimum cache size. VAX/VMS V4.6 through V5.3 are supported. One restriction is that disks served by VMS Distributed File Services (DFS) can't be cached across cluster boundaries.



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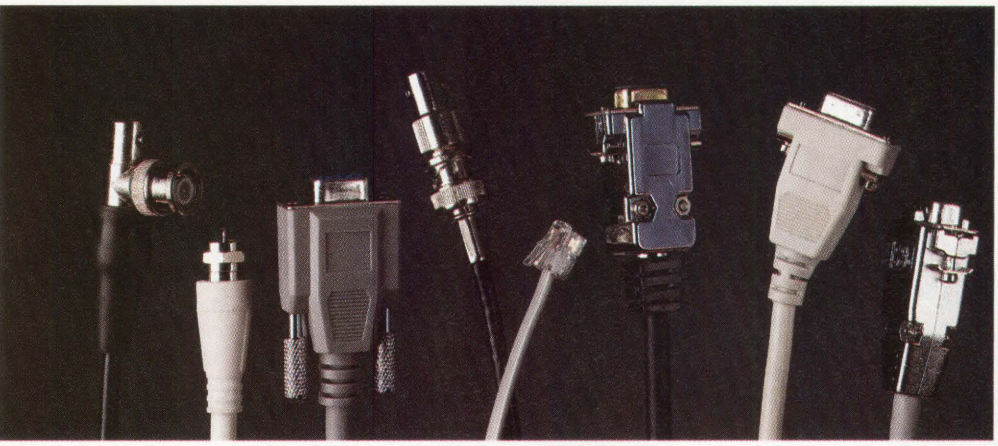

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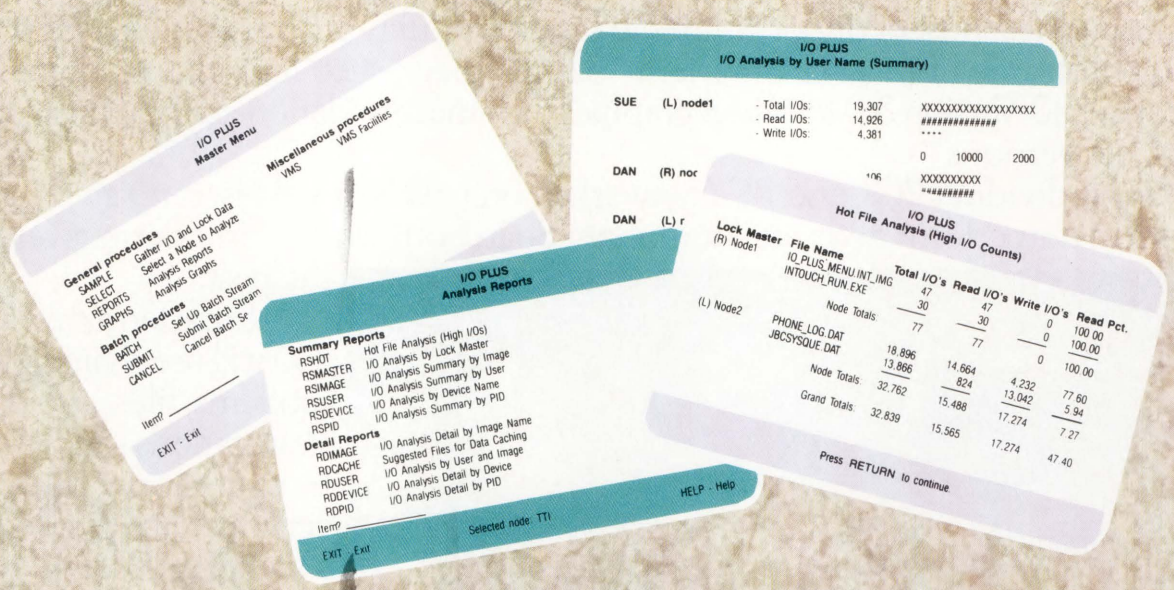

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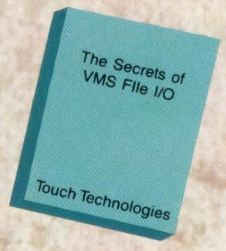

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CIRCLE 168 ON READER CARD

We ran I/O Express V1.0I on LABDOG::, which is the Lab's MicroVAX II, and on our VAXcluster.

Setting Out

I/O Express is easy to install using VMSINSTAL. It requires some nonpaged memory for its internal data structures. The installation process automatically expands nonpaged memory to accommodate these structures, if necessary.

A command procedure is run automatically to determine if the SYSGEN parameter NPAGEVIR is large enough. Suggestions are made if it's determined that I/O Express will run better if that parameter is changed. No other SYSGEN parameter is affected.

If you're running a cluster, I/O Express must be started on every node before caching will start. A device driver needs to be started and a pseudodevice, SPIDCA0:, must be created on each node.

The only other installation procedure is to include the package's startup command in your system startup command file. There are also utility programs for which you might want to define symbols.

In normal daily operations, you won't know that I/O Express is running except if you notice better I/O subsystem performance. To see what's going on and to control its operation, I/O Express includes a few utilities.

Normally, the program IOX_MONITOR determines which drives should be cached. If you stop IOX_MONITOR, you can specify with the IOX_DEVICE utility which drives should be cached.

You can use IOX_INIT to modify I/O Express' control parameters. These parameters include maximum and minimum cache sizes, maximum number of disks to cache, how much memory must be on your free list to allow caching to operate and how cache trimming is to occur.

You can view statistics with the IOX_STATS utility. A discussion of some of these statistics follows.

Cache System Statistics indicate how I/O Express is using system resources (see Figure 1). For example, the statistics Cache Max Possible Pages, Pages Currently in Cache and Pages Cache May Hold tell you the maximum size of I/O Express' cache, how many pages I/O Express currently is using and the

I/O Express V1.0I

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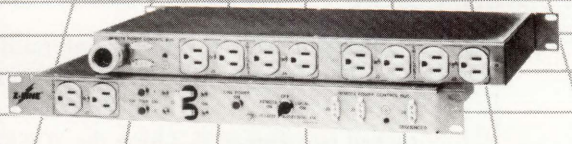

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CIRCLE 151 ON READER CARD

Figure 1.

```
IOX_STATS V1.0i Copyright 1989 Executive Software International All Rights Reserved.
                Cache System Statistics 22-FEB-1990 16:19:31.58

DCDRIVER Version Number  :      V1.0i   Nonpaged Pool Bytes Used  :     554096
Cache Max Possible Pages :     12288   Min Pool Before Use       :      90086
Pages Currently in Cache :      8217   Nonpaged Pool Extension   :     327680
Free List Crisis Level   :      1945   Pages Held in Reserve     :          0
Min Free List Before Use :      2201   Pages Cache May Hold      :        256
Desired Free List Size   :      2457   Free Page Reservoir Size  :        256
Max I/O Size for Caching :        32   Free List Pages Reclaimed :          0
#New CCDs to Allocate    :       128   Cache Trim Count          :          0
Hit Delay Time (msec)    :         0   #Disks Being Cached       :          2
#Nodes in Cluster        :         1   #Clusters in Cache        :       8217
#Clusters Left to Purge  :         0   #Nodes w/ DCDRIVER Loaded :          1
Time since Cache Init    : 0 00:58:56  Time since Cluster Trn     : 0 00:48:51
Time since Cache Re-Init : 0 00:58:56  # Mismatch Version Msgs    :          0

Control Flags = INITED:

The following Disks are being cached:
        DUB0
```

System resources used for caching are displayed in the Cache System Statistics report.

Figure 2.

```
Totals for Disks Cached Locally     22-FEB-1990 16:19:31.58

Total Read  I/Os         :    151826   % Read I/Os Hit          :     94.39
Total Write I/Os         :       787   % Reads to Total I/Os    :     99.48
Total I/Os (Rds + Wrts)  :    152613   % Total I/Os Hit         :     93.90
Total Read Hit I/Os      :    143316   Fractional Read Count    :         0
Mean Blks per Read       :         1   Inhibit Count            :         0
Mean Blks per Write      :         1   Mode Blks per Read       :         1
Mode Blks per Write      :         1

#Nodes Caching Disk      :         1

********************************************************************************
** For a disk with an average access time of 40 milliseconds (RD54 class),
** you would have reduced the average READ access time to 2.24 milliseconds

** For a disk with an average access time of 25 milliseconds (RA81 class),
** you would have reduced the average READ access time to 1.40 milliseconds
********************************************************************************
The following is a list of all nodes currently caching this Disk:
```

Part of the caching report is this summary of caching effectiveness on all cached disks.

minimum number of pages I/O Express will retain in its cache, even if memory has to be returned to the operating system.

Free list statistics show you how I/O Express looks at the free list size. Min Free List Before Use, Free List Crisis Level and Desired Free List Size determine how large the free list must be before I/O Express will start caching, how small the free list must get before I/O Express returns memory to the system and the minimum free list size that must be achieved after returning memory to the system. The nonpaged pool statistics display the required nonpaged dynamic memory settings for proper I/O Express operation.

Pages Held in Reserve and Free Page Reservoir Size are used to anticipate future I/O Express use. If memory has to be returned to the operating system, it will come from here first before blocks containing actual data.

The #Clusters in Cache and #Clusters Left to Purge represent data blocks contained in one I/O request that either are in cache or are marked to be purged but haven't been released from cache yet. Max I/O Size for Caching determines the largest read request that will be cached. Any request bigger than this won't be cached.

The number of times I/O Express has returned memory to the operating system and how many pages have been returned are indicated by the Cache Trim Count and Free List Pages Reclaimed statistics.

The summary of disk caching statistics that follows the Cache System Statistics display is for all disks being cached (see Figure 2). Using the /DISKS qualifier displays statistics on a per-disk basis.

The cache effectiveness statistics display shows you the count of I/O operations and the performance gain you're achieving with I/O Express running.

All I/Os are tallied and totaled in the Total Read I/Os, Total Write I/Os and Total I/Os statistics.

Probably the most interesting statistics are Total Read Hit I/Os, % Read I/Os

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Hit and % Total I/Os Hit. These figures indicate how the cache is being used. Higher numbers indicate more I/O requests being satisfied from the cache rather than from disk.

Other statistics display the average and most frequent number of blocks in each request packet for reading and writing operations. Using the /DISKS qualifier, the per-disk caching reports display the percentage of reads that were less than or equal to the previously mentioned cluster size. If this percentage is too low, you probably need to adjust (through IOX_INIT) the setting for the maximum I/O size.

Below the statistics, notes show how I/O Express reduces the read access times for disks belonging to the RD54 and RA81 device classes respectively. The figure is based on the percentage of read I/Os hit and the rated speed of the device. It can help you put your disk performance into perspective.

Two IOX_STATS qualifiers are available in addition to /DISKS. The /MAP qualifier can be used for clustered systems to display a 2-D graph of the disks cached by each node on the cluster. The /OUTPUT qualifier lets you send reports to disk.

Express Tests

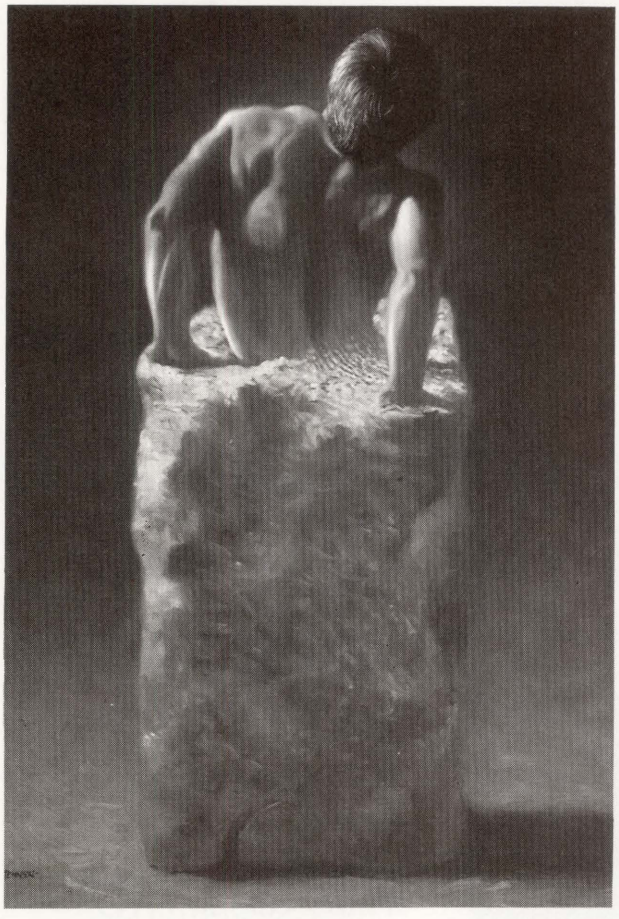
To test I/O Express, we ran two programs on LABDOG:: to force heavy read I/O. Our hardware setup included a Seagate Technology Wren V user disk where the files were located. Our controller was an Andromeda Systems ESDC caching controller, so some caching already was being done by the hardware. We also ran I/O Express after turning off the controller cache.

Both programs ran in a continuous loop. Each program located a record in a relative file. One program had a subloop that iterated 10,000 times, reading records that were up to 50 records forward from the original. It then randomly chose a new baseline record and repeated the subloop. The companion program behaved similarly. Its subloop iterated 1,000 times, locating records that were up to 100 records forward from the original. The goal of running these programs was to make our user disk very busy to see how I/O Express behaved over time.

I/O Express didn't go great guns immediately. By observing the numbers with the IOX_STATS utility, you can watch the % Read I/Os Hit increase slowly but surely. After letting I/O Express run for an hour, the % Read I/Os Hit rose from just below 11 to above 60 percent. If you have faith in disk-drive-busy indicator lights, your confidence in I/O Express will be bolstered as you observe them flickering a lot less while your applications scream along.

When we turned off controller caching, I/O Express soared. It cached both our system and user disks. On the user disk, cache percent hit rates rose to near 95 percent and stayed consistently high.

I/O Express proved to be effective in reducing the I/O load our heavy jobs were placing on our production systems. It's easy to install and its operation is transparent. ■



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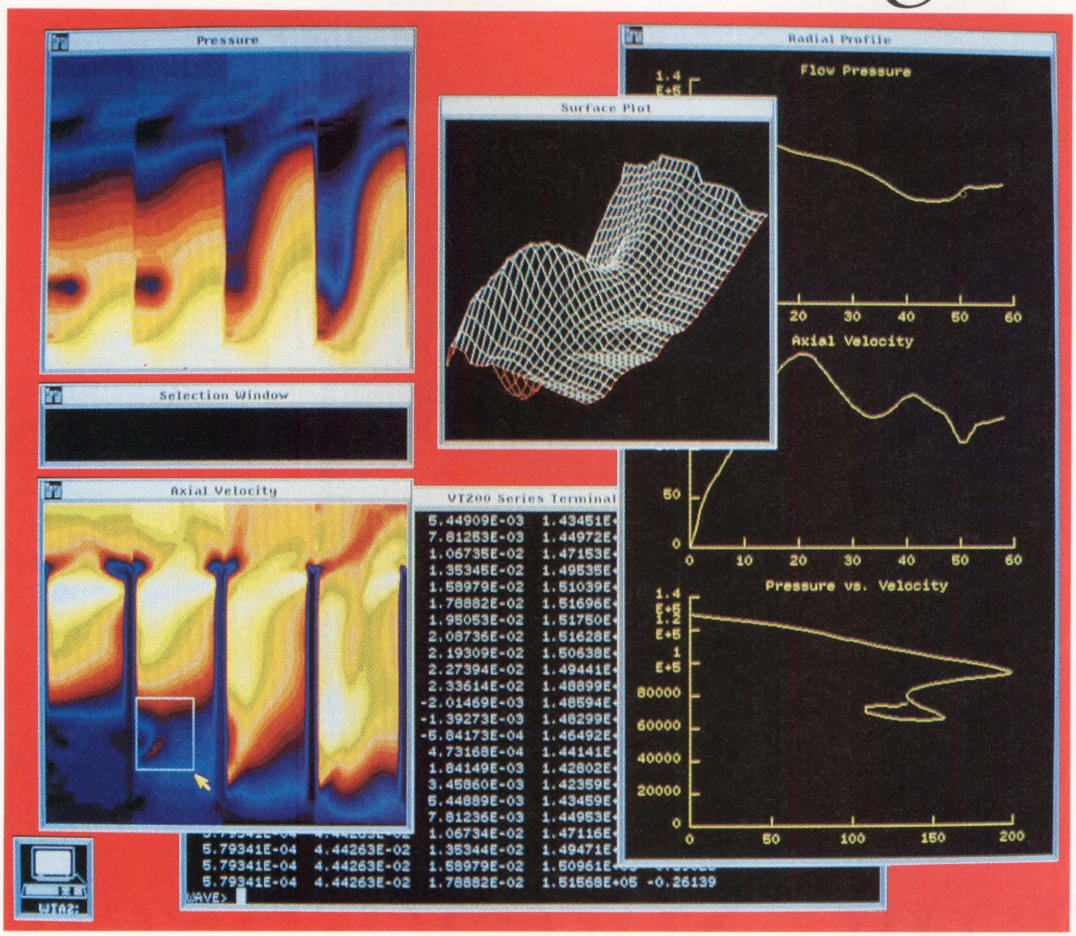

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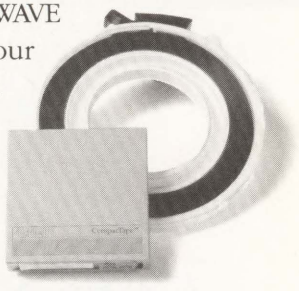

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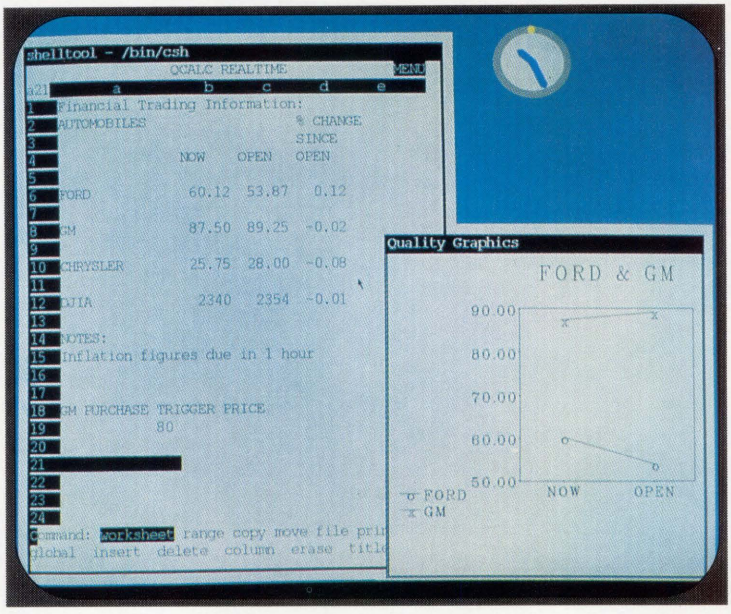
UniPress Software's Q-Calc RealTime Spreadsheet Is A Data-Fed, Dynamic Decision Support Tool.



Dynamic Spreadsheets

UniPress Software's Q-Calc Standard and Q-Calc RealTime spreadsheets run in the UNIX environment and are compatible with Lotus 1-2-3 release 2.01. Q-Calc Standard provides a MACRO language, database capabilities and a 94-member function library. The optional graphics package lets you create bar, pie, line, XY and commodity graphs on many graphics devices and printers.

Q-Calc RealTime is a modified version of Q-Calc Standard. In addition to accepting data input from a keyboard, it accepts data from another program running simultaneously on the same computer or network. You also can share .wk1 files with PCs running Lotus 1-2-3.

In the trader's market, RealTime serves as a decision support tool. You can monitor price changes regularly from a market feed and then display the updated prices within cells on your spreadsheet. Alert messages can be made to appear at the top of the screen if a previously specified condition occurs.

We installed RealTime with graphics V1.0(R8) on the Lab's DECsystem 3100. The media was supplied on a TK-50 tape.

Installation took less than 30 minutes. To install RealTime, log in as root and then **cd** to **/**. Next, type **tar xf device /tmp** using the correct device for your system. UniPress supplies device names in the installation and setup section. We

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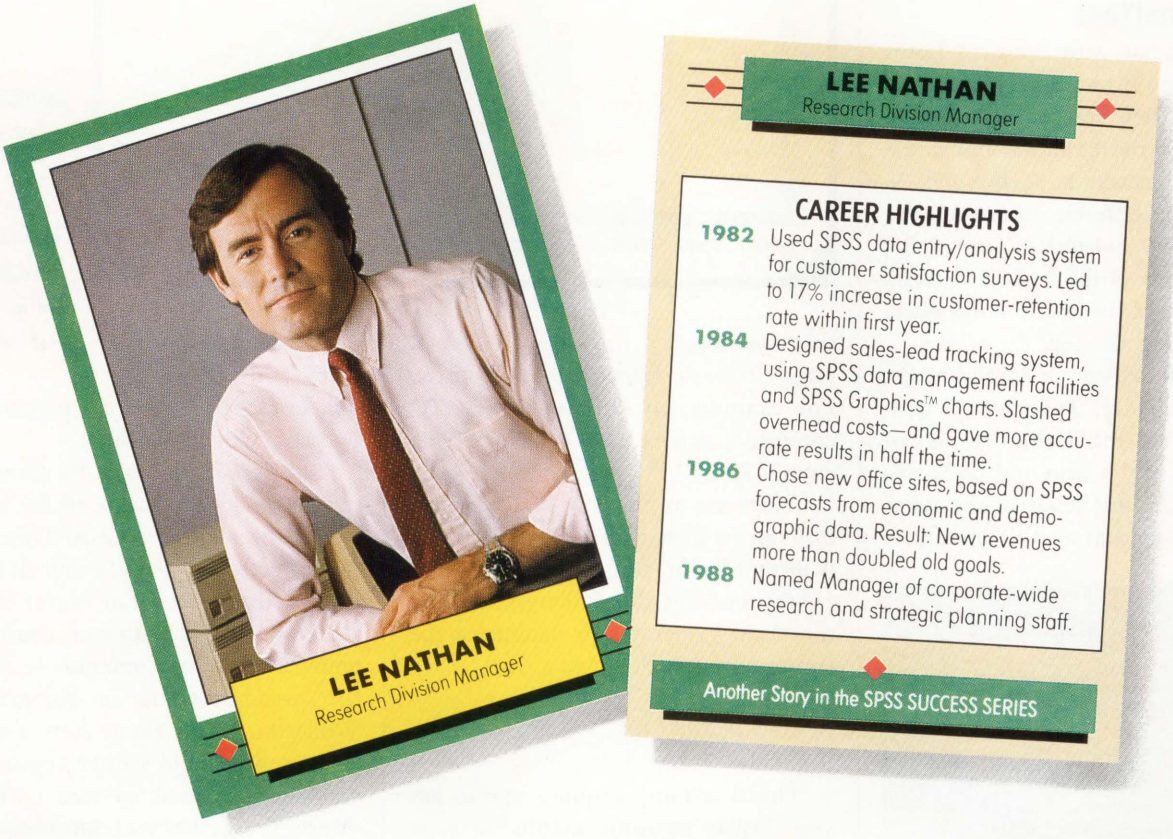

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entered **tar xvf /dev/rmt0h**, which reads the installation script from the media. When **tar** finishes, execute the installation script by typing **/tmp/qspexec**.

The installation script lets you choose the location of the executable program qcalc and various utilities. Typically, the executable is placed in the **/usr/bin** directory and the utilities in the **/usr/qsp** directory. To start RealTime, enter qcalc.

Running RealTime

If you're familiar with Lotus or Lotus lookalikes, you'll be comfortable with RealTime. When you start RealTime, you'll see lettered columns and numbered rows. It contains 8,192 rows and 256 columns. One difference between the RealTime setup and that of Lotus 1-2-3 is the placement of the horizontal menu on the bottom of the screen. Lotus places the menu along the top.

To place RealTime in MENU mode, type / (see Figure). To select an item from the menu, move the highlighted bar cursor over the item and press Enter or press the first letter of the item.

RealTime contains a set of commands that are invoked through a CTRL-X escape sequence followed by a keystroke. For example, to execute the GOTO command, enter CTRL-XG. For HELP, enter CTRL-X?.

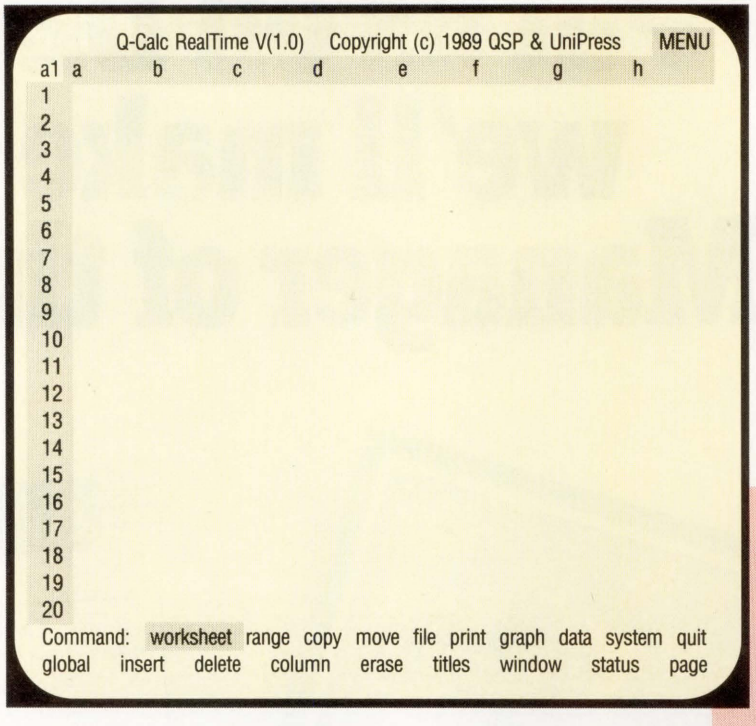

Figure: The Q-Calc RealTime spreadsheet with MENU.

A rich set of functions and operators that can be used within expressions also is included. For example, the following expression uses the @if function and the #and# operator to determine the contents of cell e18:

```
e18=@if(+GM<a19#and#GM>1,
      "BUY GM", "")
```

The RealTime graphics option lets you display dynamic graphs on your screen or a hardcopy device based on the information in your spreadsheet. Graphs are created and then redrawn automatically to reflect the changing data being fed into the spreadsheet.

RealTime comes with a directory containing demo files. The program dataemit.c is a C program that emits data at regular intervals. It was written to work with qcalcrt.wk1, a sample spreadsheet also included in the demo file.

The two work together to show how RealTime reads in data values from a running prog ram. When you retrieve the qcalcrt.wk1 spreadsheet and execute the dataemit.c program, you will see cells in the spreadsheet being continually updated with new values.

The screen on page 86 shows the result of such an update. Cells b6, b8, b10 and b12 and the % CHANGE SINCE OPEN cells d6, d8, d10 and d12 have been updated. You can display spreadsheet and graphics on one windowing terminal or use two terminals — one for the spreadsheet and one for graphics. While this screen shows how a spreadsheet and graphic would appear on a windowing terminal, we used a VT320 to display the qcalcrt.wk1 spreadsheet and an AST Premium 286 PC to display the RealTime graphics. The PC was running Walker Richer & Quinn's Reflection and emulating a Tektronix 4014 terminal.

When the dataemit.c program was run, cells within the spreadsheet were updated with new values. The changing data also was reflected on the PC in the form of changing graphs. Graph types available are bar, stacked bar, line, multiline, XY, pie and commodity graphs.

Interfacing To UNIX

RealTime contains several commands that allow you to step into and work

Q-Calc RealTime

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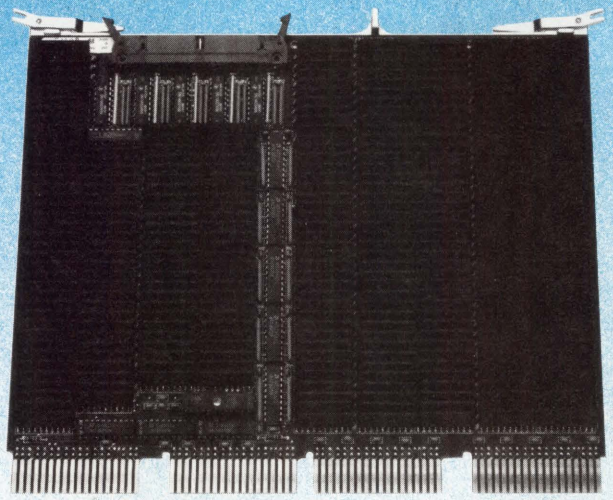

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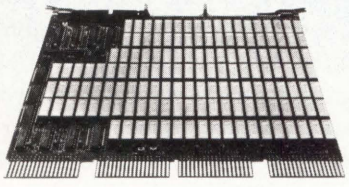

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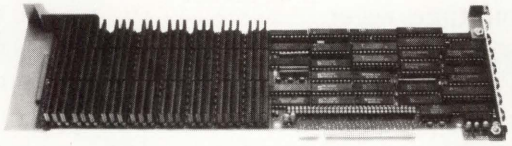

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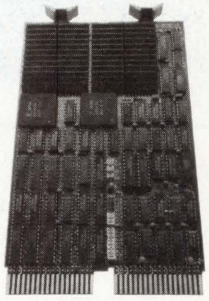

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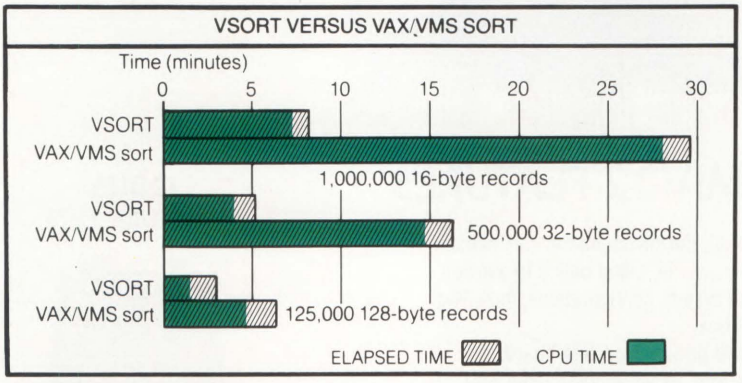

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within UNIX from your spreadsheet.

When you invoke **/ system push**, you create a shell from your spreadsheet to UNIX. Here, you can issue any UNIX command as you would from your original log in shell. When you want to exit the shell and return to your spreadsheet, type CRTL-D.

RealTime's **/ system import** command lets you run a shell command. When the command is executed, the resulting output is parsed either as text or numbers.

The **/ system filter** command provides a powerful interface between RealTime and UNIX. It lets you send data from your worksheet to another UNIX program running on your computer or network. The program can be written in any language. The data can be processed by this program and the results fed back to the same place on your worksheet.

The RealTime manual contains installation instructions, a reference section describing the capabilities of RealTime and its command set and a quick reference guide. A tutorial for the novice spreadsheet user also is included.

The Q-Calc RealTime spreadsheet is as easy to use as Lotus 1-2-3 and provides the user with a powerful decision-making tool. ■

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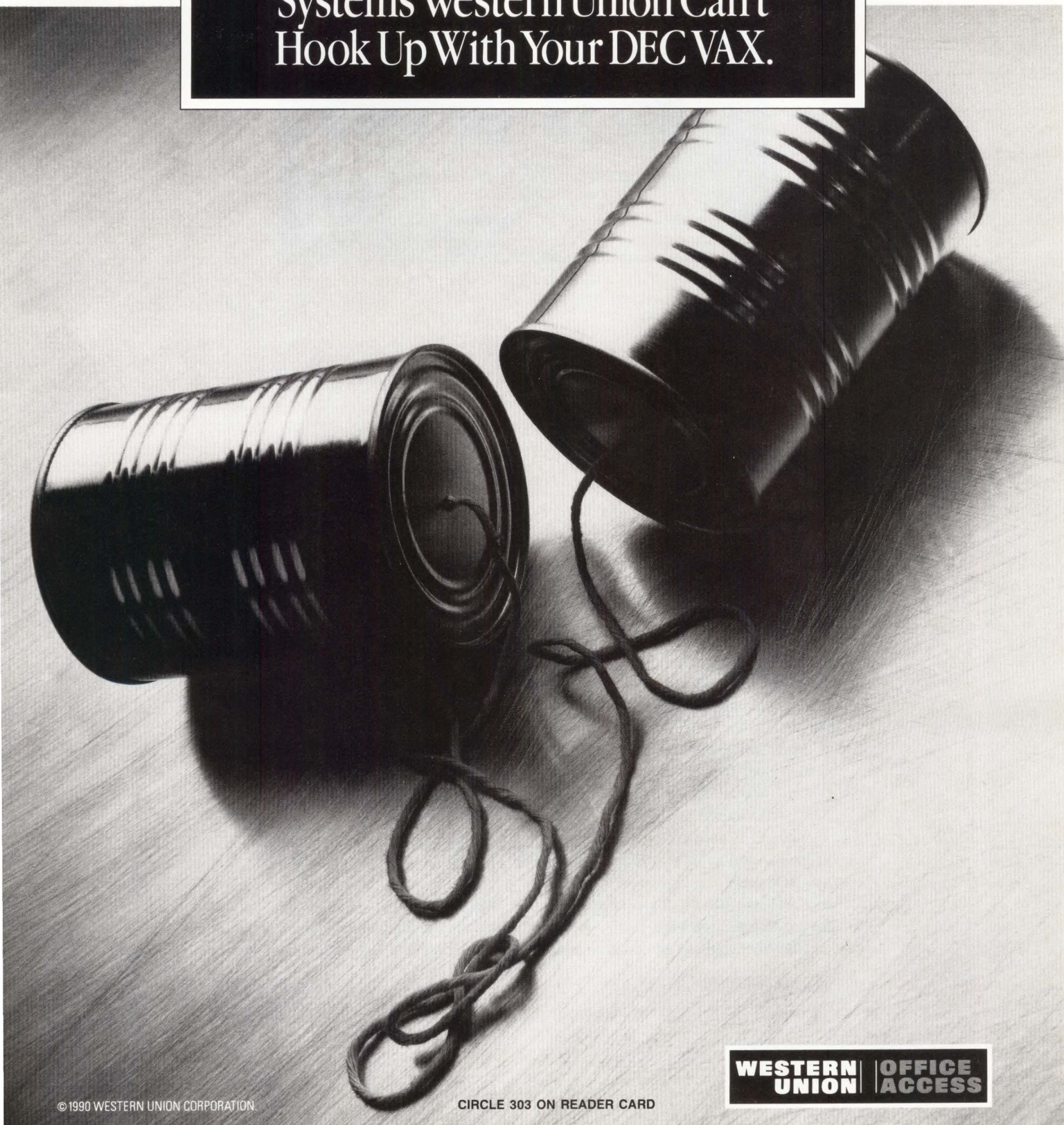

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386Ware Gold And The LC-16 Network Servers Bring Together The Worlds Of ULTRIX And MS-DOS.

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LOGICRAFT HAS added two members to its fleet of MS-DOS servers for the DEC environment. The LC-16 and 386Ware Gold network servers help bridge the gap between MS-DOS V3.3 and ULTRIX. Both let you create a PC window and run MS-DOS applications such as Lotus 1-2-3, Ashton-Tate's dBase III and WordPerfect from your DEC RISC workstation.

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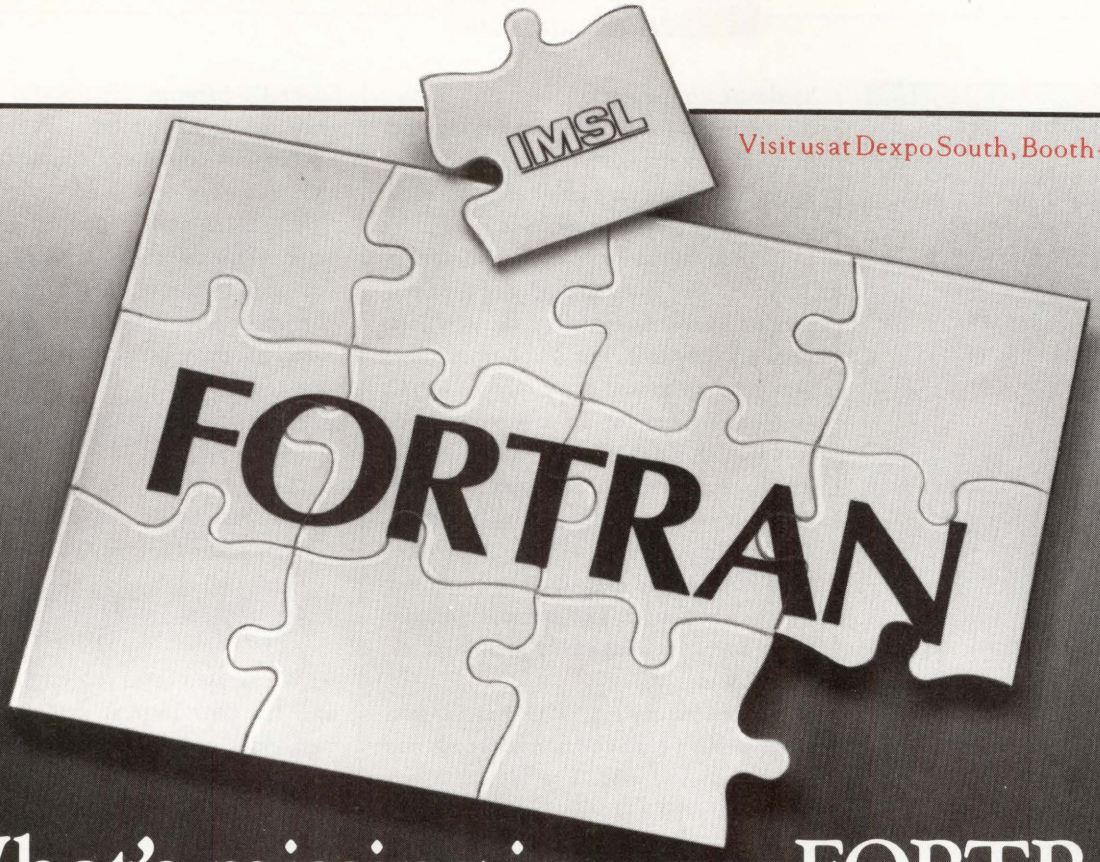

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CIRCLE 299 ON READER CARD

386Ware Gold

PLATFORMS: 386Ware Gold is available for VMS and ULTRIX systems. The LC-16 is available for the DECstation 2100/3100 and the DECsystem 3100/5400/5800

PRICE: 386Ware Gold starts at $8,995 for a one-processor system and 1 MB of RAM. The LC-16 starts at $11,995

LOGICRAFT INC.

HEADQUARTERS:
22 Cotton Rd.
Nashua, NH 03063
(603) 880-0300

PRODUCT LINE: MS-DOS servers for the DEC environment

FOUNDED: 1975

OWNERSHIP: Private

CIRCLE 439 ON READER CARD

MR-9000C ThinWire Multiport Repeater. The Lab's DECsystem 3100, running ULTRIX V3.0, served as the host.

A standard serial terminal or printer can be attached to the server to display initialization and run-time errors. This connection is made to one of the serial ports on the back of the server. We connected a VT220 to display the initialization messages.

In addition to the floppy drive, the 386Ware Gold server comes with a 5 1/4-inch bootable floppy disk. You boot the server by placing the boot disk in the drive and turning on the server.

The server first sequences through about 35 ROM-based diagnostics, testing various components of the 80286-based I/O processor board. The name of each test is displayed on the serial terminal attached to the back of the server and on a status display located on the front of the server. Upon completion of the diagnostics, the system boots from the floppy disk and displays a message on the 386Ware Gold system console, asking if you want to change 386Ware system configuration.

If you answer yes, a menu containing configuration items appears. Options include displaying the current system hardware configuration, setting the system date and time and modifying the network interface and floppy-drive configuration. The user's guide explains each menu item and its function.

When you've completed configuring 386Ware Gold, the remainder of the boot process loads and initializes the 386Ware network interface. For a first-time boot, you'll be prompted to supply a TCP/IP Internet address for your server.

On the host side, you'll need to extract and install the software from the distribution media supplied by Logicraft. Our media was supplied on a TK-50 tape. You need to be logged in as superuser for the installation. The entire installation procedure is explained in detail in the user's guide.

Before running a DOS session, you must create a configuration script file and assign a logical disk. The logical disk is really an ULTRIX file that appears to 386Ware Gold as a hard disk. You can have up to six DOS drive assignments: C: through H:.

You can create the configuration script file with a text editor such as vi or with the 386config utility. This utility is menu-driven and is invoked by typing 386config at the ULTRIX prompt. We found it convenient to create our script file with the 386config utility.

Here's a script file that we named dos1:

```
csh> 386Ware d386c -slab386
```

It communicates two pieces of information to the system. The entry d386c is the name of the logical disk that contains the DOS file COMMAND.COM. The name of the 386Ware Gold server hardware to communicate with follows the -s option. The name of our server is lab386.

A DOS Session

Once the server has been configured properly, you initiate a DOS session by typing in the script file at the ULTRIX prompt. To execute the above script file, type dos1.

After a brief sign-on message, the ULTRIX prompt disappears, and the standard DOS prompt C:\> appears. You're now communicating with an MS-DOS machine.

The 5 1/4-inch floppy drive is designated A: for the 386Ware Gold server. If you want to read in files from this drive, you must first attach the drive. You attach the drive by issuing the command:

```
C:\>ATTACH FLOPPY
```

If you want to see the names of the logical disks you assigned during the configuration process, type:

```
C:\>SHOW DISKS
```

We created three logical disks: C:, D: and E:. Our logical disk D:, named library.dos, contained various PC application software packages. The data for these software packages was held on logical disk E:, data1.

386WARE GOLD ALSO SUPPORTS DECwindows. To run DECwindows, you need ULTRIX V3.0-1 or later, 386Ware V3.62 and a VAXstation or DECstation with a mouse.

386Ware Gold offers you the opportunity to back up and retrieve your PC files from your 5 1/4-inch floppy disk or the VAX. You also can share data among other PC users. Your PC files are subject to the same file security as any file stored on a VAX, and DEC peripherals are accessible through 386Ware Gold.

If you're in the market for an MS-DOS server for your ULTRIX- or VMS-based system, 386Ware Gold enables any terminal or workstation on your VAX network to run PC software packages. ■

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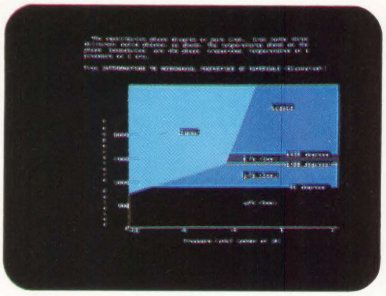
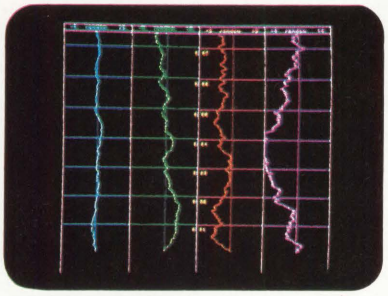
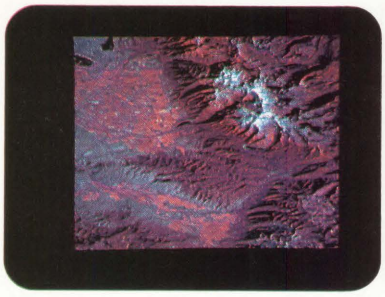
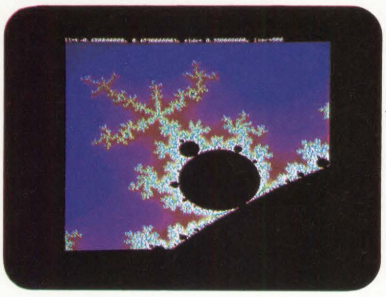
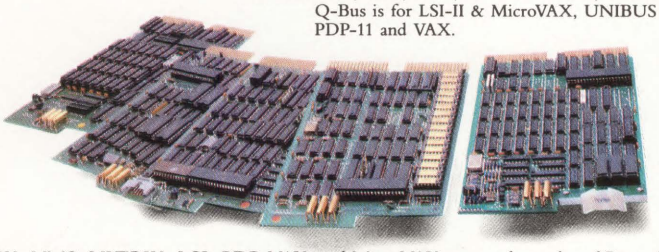





	MODEL	BUS & SIZE	FEATURES AND OPTIONS	PIXEL GRAPHICS PRIMARY	PIXEL GRAPHICS OVERLAY (S)	ALPHA-NUMERICS
COLOR/GRAY SCALE	VCL	Q QUAD	68030,68882 32-BIT RAM, ACRTC, DMA 2 DUART, PAN ZOOM, SCSI	1024 x 1024 x 8	1024 x 1024 x 4 HARDWARE CURSOR	
	VCM	Q DUAL	ACRTC, PAN ZOOM, DUART	1024 x 1024 x 8	1024 x 1024 x 4 HARDWARE CURSOR	
	VCW	Q DUAL	ACRTC, PAN, 2 CHANNELS	640 x 480 x 8	HARDWARE CURSORS	50 x 80 x 6
	VCT (avail. 1/90)	Q QUAD	34020, PAN ZOOM, SCSI, 2 DUART	1024 x 1024 x 24	1024 x 1024 x 8 HARDWARE CURSOR	
	VCX	Q & U QUAD	EXTERNAL SYNC INPUT	512 x 512 x 24		50 x 80 x 6
MONOCHROME	VRH	Q DUAL		1024 x 1024		64 x 128
	VRS	Q DUAL		512 x 512		50 x 80
	VRA	Q DUAL				24 x 80

NOTES: VCK, VRC, VCH, etc. also available, contact factory. Q-Bus is for LSI-II & MicroVAX, UNIBUS is for PDP-11 and VAX.



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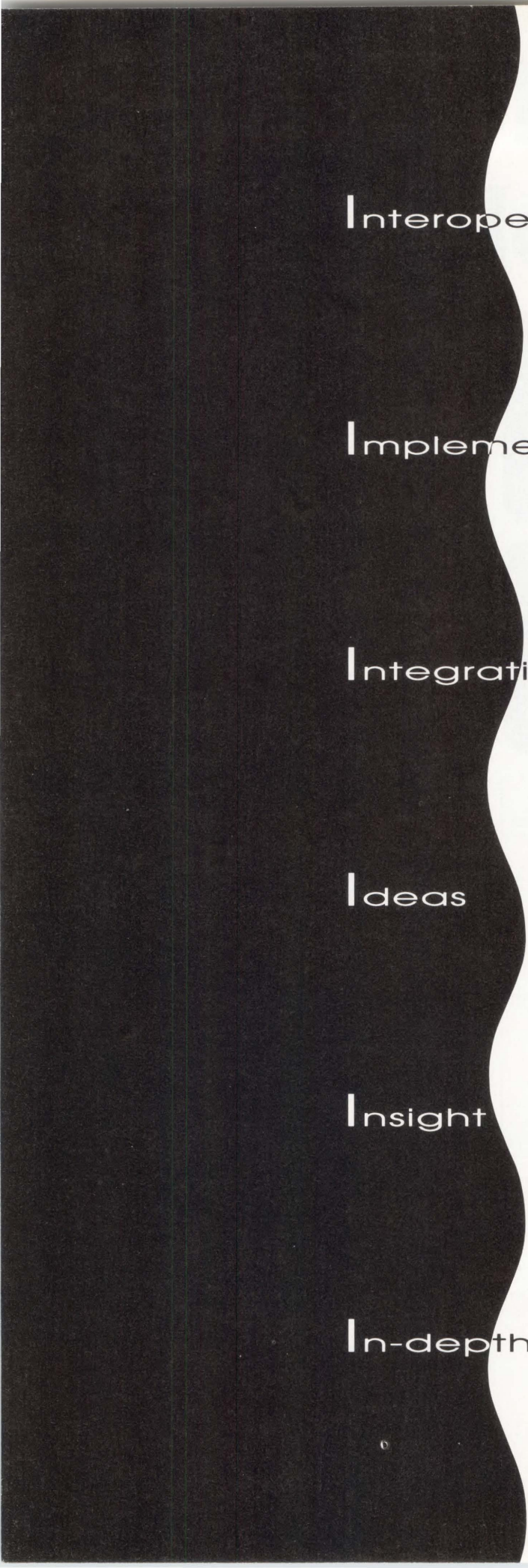
CIRCLE 185 ON READER CARD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Hancock Software's Filemaster Uses Multiwindow Displays And Point-And-Shoot Menus To Ease VAX File Management.

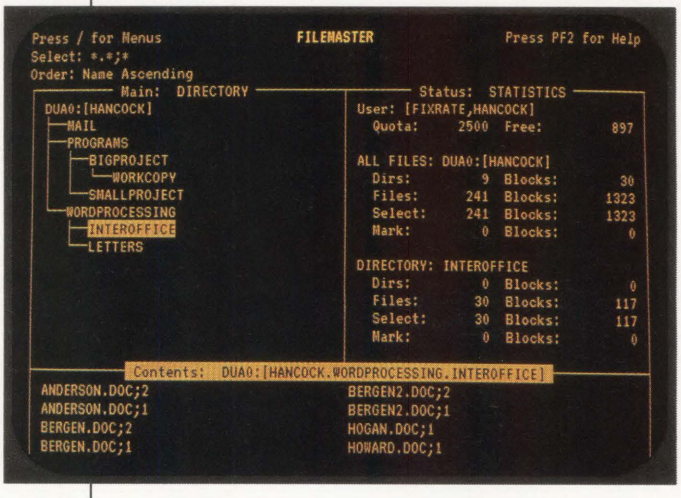
MASTERING FILE MANAGEMENT

If you've seen the file and directory management utilities available for PCs and wished for something similar for your VAX, Hancock Software's Filemaster may be for you. Filemaster's multiwindow displays and point-and-shoot menus can ease file management on the VAX.

No matter how much you try to control them, files and directories propagate like rabbits. But, as with other tasks, it's easier to deal with things that you can visualize. Filemaster displays a graphic directory tree and does its work by having you select a branch on the tree.

We installed V1.1-01 on our Lab's MicroVAX II. Command procedures are supplied to assign necessary logicals at system startup and to INSTALL the Filemaster image with the Open, Header-Resident and Shared attributes. FLM is defined as a foreign command to run the program. The installation uses VMSINSTAL. The instructions provided in the *System Manager's Guide* should ensure that the program will be set up correctly.

To start Filemaster, type FLM. If you want to go through a short but thorough tutorial, type FLM/TUT. Filemaster features uniform file access across networks. It runs under VMS and supports



Opening screen of Filemaster in DIRECTORY mode.

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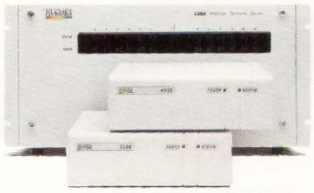

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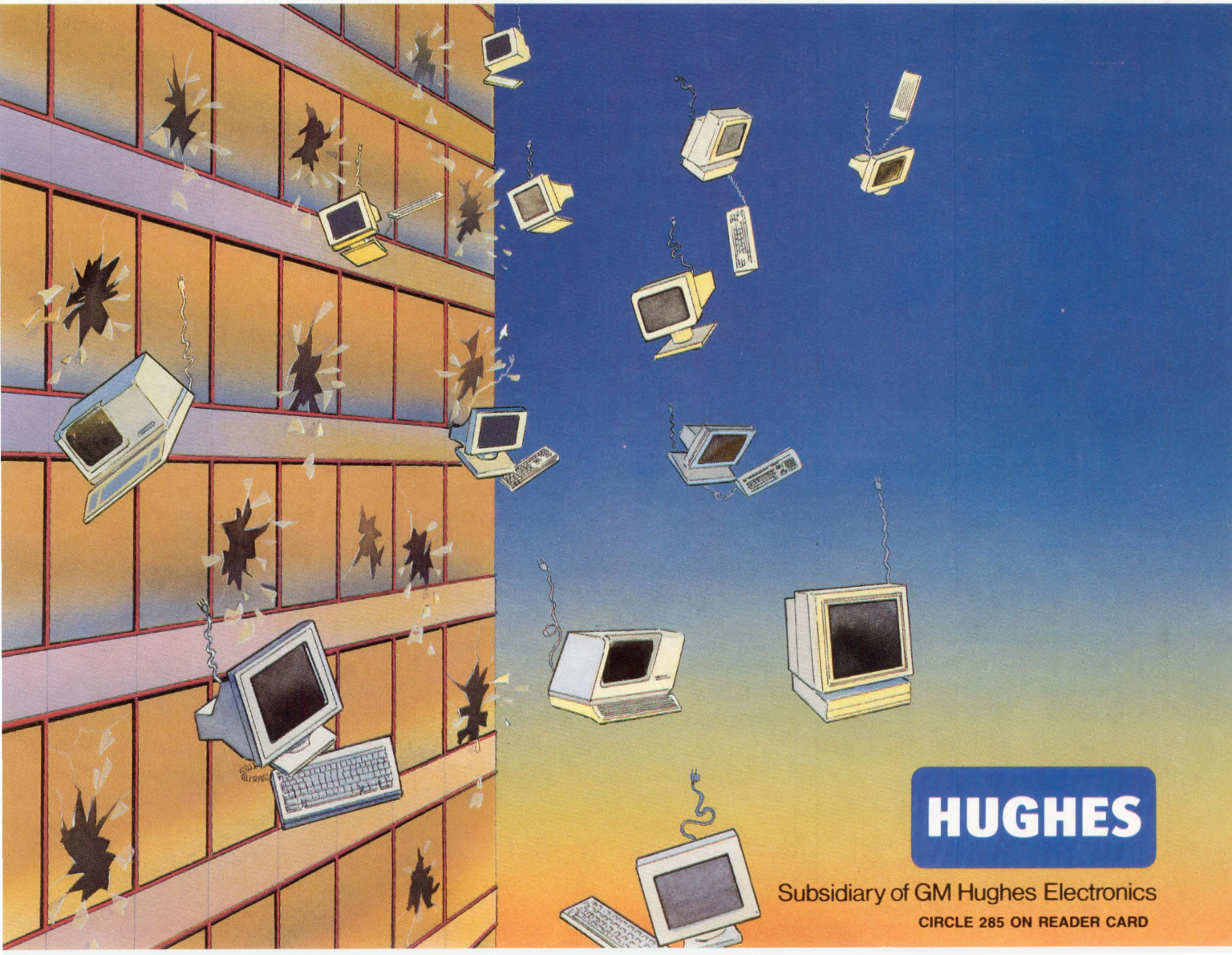

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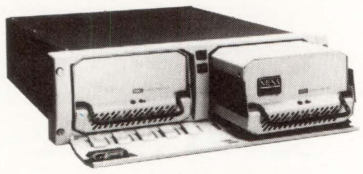

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CIRCLE 260 ON READER CARD

DEC and DEC-compatible terminals.

One interesting feature is a "soft-delete" directory. This is done as a default option during the Filemaster install. If you accept this option, files deleted with Filemaster will be moved to a special directory rather than purged from the disk. This lets you use the Undelete option in Filemaster in case the deletion is accidental or if you change your mind. Using the command files provided, FLM_ LIB:FLM_LOGIN.COM and FLM_LIB: FLM_LOGIN2.COM, a soft-delete directory is created for each user.

Filemaster operates in four modes. In DIRECTORY mode, you can visually move through the directory tree. FILES mode lets you examine and perform operations on files in your current directory. ALLFILES mode gives you access to all files in the directory tree. In UNDELETE mode, you can recover files "soft-deleted" by Filemaster.

We Do Windows

Following the Hancock Software initial screen, you'll get a display with three windows and a three-line Control Panel across the top of your screen (see screen on page 98). The Control Panel displays menus, prompts and current Filemaster options you've chosen. The Main Window in the upper left of the screen displays a list of files or a directory tree. When you enter Filemaster, you're in DIRECTORY Mode, as indicated at the top of that window. A directory tree is displayed. The root of the tree is your SYS$LOGIN directory.

Before the display comes up, Filemaster lets you know what files it's reading by displaying them in a window across the middle of the screen. That's OK if you have an average-sized directory, but what if you have a lot of files? Version 1.1 provides several options for faster startup.

If you start Filemaster with the INITIALREAD parameter as follows:

```
$ FLM /INITIALREAD=DIRECTORIES
```


Filemaster V1.1-01

PLATFORMS: Any VAX running VMS

PRICE: For single-CPU, from $495 to $7,950, depending on VAX

HANCOCK SOFTWARE INC.

HEADQUARTERS:
115 Watertown St.
Watertown, MA 02172
(800) 829-6468

PRODUCT LINE: VAX/VMS system utility software

FOUNDED: 1988

OWNERSHIP: Private

CIRCLE 437 ON READER CARD

Filemaster reads only the directory "backbone" and thus starts much faster. However, as you subsequently use Filemaster to operate on the files, the operations take longer. The above command can be abbreviated as:

```
$ FLM /INITIALREAD=D
```

The system manager can set the above option as a systemwide or an individual user's default by creating a FILEMASTER.ENV file with the following Filemaster command line:

```
$ SET INITIALREAD DIRECTORIES
```

Filemaster looks for .ENV files during its startup procedure for SET commands. If you place the file in FLM_LIB directory (defined at startup), the default is systemwide. If you place the file in the user's SYS$LOGIN directory, it only affects that user. To override this startup default, type the following when you start Filemaster:

```
$ FLM /I=F
```

Using .ENV, Environment and Filemaster Command Initialization Files (having the suffix .INI), the user and

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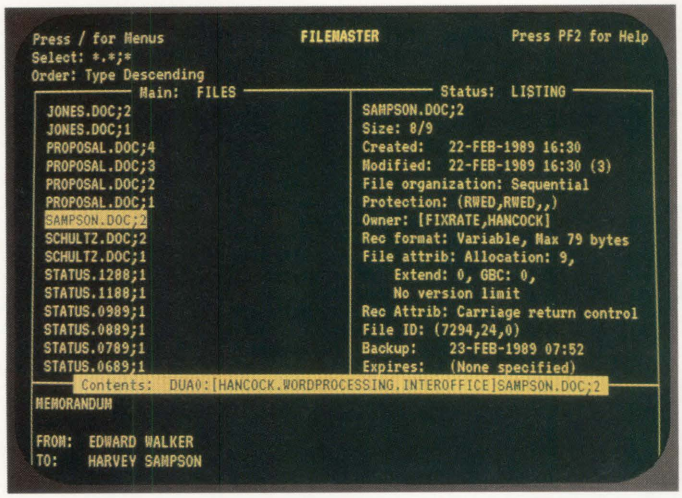

Figure 1: Filemaster in FILES mode with Status Window showing a Listing display.

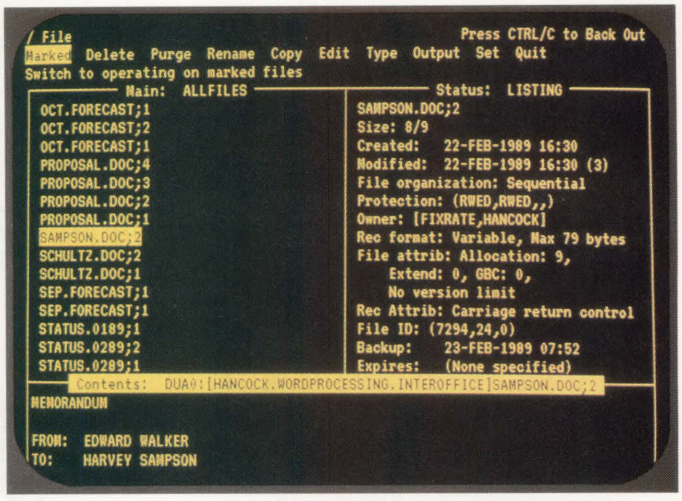

Figure 2: ALLFILES mode provides access to all the files across your system.

system manager have a great deal of flexibility in setting up Filemaster.

For the system manager or someone with BYPASS and READALL or SYSPRV or a system UIC, there's another way to jump start Filemaster. Use the /ROOT command qualifier to read an entire disk up to 10 times faster than the vanilla startup. Our user disk has 773 files in 228,363 blocks. Using this qualifier, it took Filemaster less than 25 seconds to read all the file and directory information and present its multiwindow display.

To start Filemaster this way, type:

```
$ FLM /ROOT=DUB1:[000000]
```

In using this option, Filemaster reads the disk's INDEXF file instead of using QIO and RMS system calls to read the directory information. This assumes that the default hasn't been set to INITIALREAD=DIRECTORIES or reading of the index file hasn't been disabled.

The Status Window in the upper right of the screen displays statistics on the current directory or file, such as size in blocks and, for directory files, number of files and blocks in that directory. It also provides disk quota information.

The Contents Window across the bottom of the screen displays the first few lines in the selected file or, if a directory, it displays a list of the first few files in the directory.

Typing / calls the Main Menu, which appears as two rows of commands across the top of the screen. You select them either by using arrow keys or by typing the first letter of the command.

Fully Functional

Filemaster makes good use of DEC function keys. It predefines VT100/200 function keys and Gold Key (PF1) sequences for moving around the Main and Contents Windows. There are function-key shortcuts for frequently used menu commands. Hitting PF3 or the DO key lets you enter Filemaster commands to move around quickly in the Filemaster environment, much like the EVE interface to VAXTPU.

To illustrate Filemaster's capabilites, let's delete and recover a file. The down arrow key lets you traverse the directory shown in the Main Window when you start Filemaster. To select where you want to be, hit Return. The Main Window title changes from DIRECTORY to FILES, and a list of files in that directory appears, with the first file on the list highlighted. The Status and Contents Windows displays also change.

You can change the display in the Status Window from showing file statistics to display a listing that shows the file's VMS (and RMS) attributes similar to the DCL DIR/FULL command (see Figure 1). To get a better look at your selected (highlighted) file, expand the Contents Window to show more of the file.

Type / to call up the Main Menu. Select F, File. This brings up the file submenu. You want D, Delete. Filemaster then asks:

```
Soft-delete file MYFILE.DOC;1 [NO]?
```

Answer Y, and the file disappears from the displayed list.

You can select a group of files that match a certain spec. Filemaster accepts DCL wildcards. If you enter / SF, Select Filespec, you're prompted to:

```
Select files with names that match:
```

You enter your file spec, followed by Return. On the second line of the Control Panel, you'll see Select: followed by your input spec. All files except those that match your spec disappear from the window.

If you want to perform an action on a group of files, you must first mark them by typing /M, Mark. You have the option to mark one file, all files in our window or all files in the directory tree. If you choose D, Directory, all the files in your current directory that you previously selected are marked with asterisks. We then can /FD, File Delete (or PF1-Remove) all the marked files in one operation.

To undelete files, change the mode of the Main Window. We select / WU, Window Undelete (or PF1-2). A list

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of the soft-deleted files appears in the Main Window. /FU, Files Undelete, followed by Return gets them back.

Let's change to ALLFILES mode (/WA or PF1-1). We need to do a /SR, Select Reset (or PF1-Select) to see all our files (see Figure 2). Because of our previous operation, only the undeleted files are listed in the Main Window.

We then can /O, Order, the files by any criteria we choose. For example, /OSAD, Order Size Allocated Descending, orders the files listed by allocated size in blocks in descending order.

Helping You Manage

It's easy to recognize the potential of Filemaster to control file propagation by users. You can get a handle on which files are on your system by first looking at the files in ALLFILES mode. If you then order the files with the largest file first, you can identify the culprit, because the full directory spec is listed at the heading of the Contents window.

This doesn't stop with your local node, if you manage files across DECnet. Because Filemaster accepts VMS logical names, you can DEFINE one to a list of, say, the three user disks on different nodes:

```
$ DEFINE STOOGES SYS$LOGIN,
    NODE2::DUA1:[CURLY],
    NODE3::DUA3:[LARRY]
```

Then you can start Filemaster as follows to access all the files:

```
$ FLM /ROOT=STOOGES
```

Filemaster must be installed on the remote nodes, and the command file FLM_LIB:FLM_NCP.COM must be invoked on the remote nodes.

The File Set and Directory Set menus offer ease and power when you're trying to keep track of what's happening on your system. Not only can you reset the end-of-file mark and change the extend quantity of a file, but you also have full access to changing the ownership and protection and establishing, changing and deleting ACLs for all files and directories.

Filemaster comes with a user's guide, which provides an introduction to VMS file structure for novices, and a reference manual that's a complete command and help reference.

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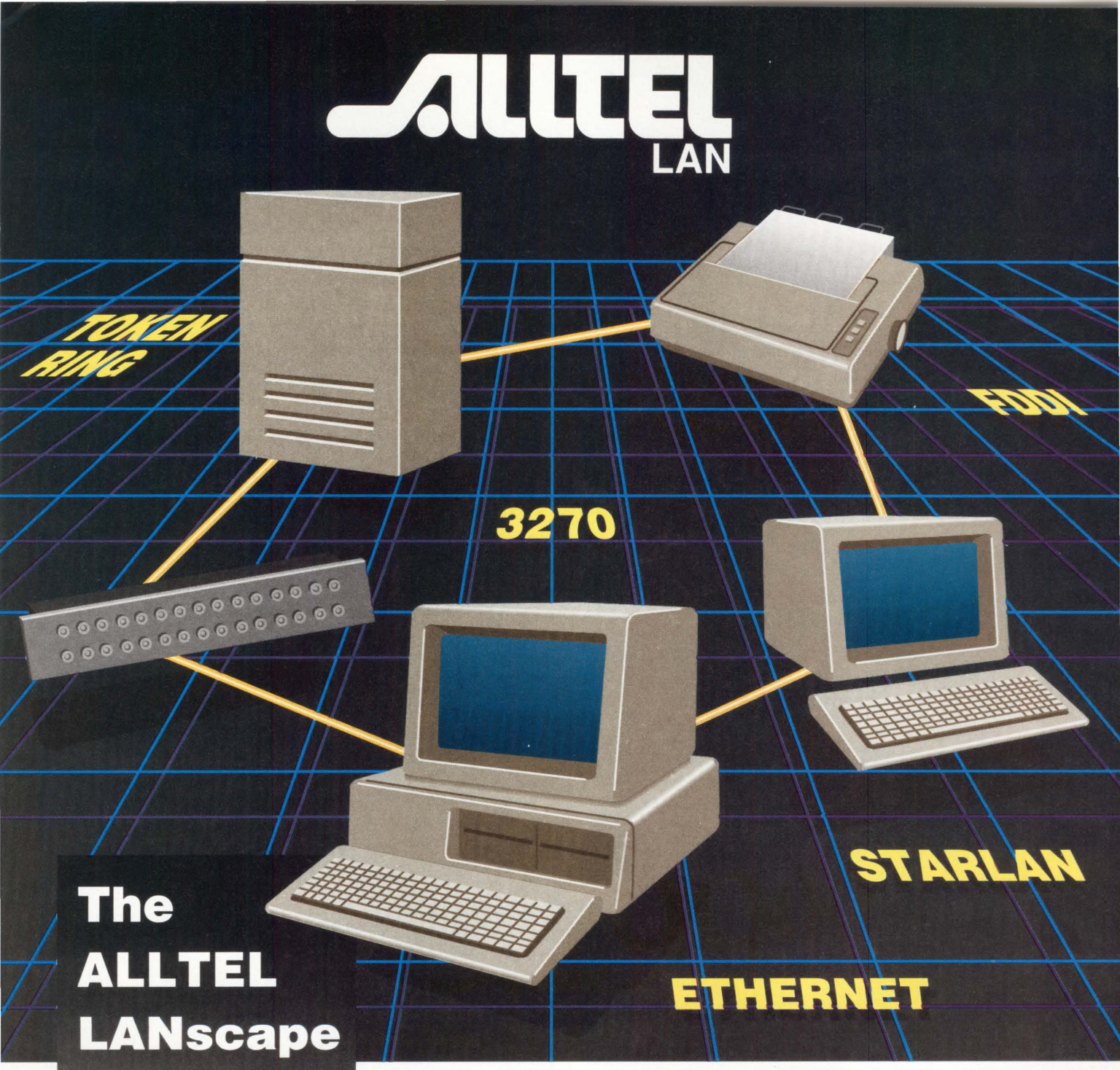

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BOOKSHELF

REAL DCL, REAL PROGRAMMING ADVICE

You have to wonder if Paul C. Anagnostopoulos' *VAX/VMS: Writing Real Programs in DCL* wasn't deliberately titled to stir up some good-natured bickering in the VMS community. I overheard a few conversations concerning the book following its debut at the DECUS Symposium in Atlanta last spring. Generally, technical tomes such as this don't create much controversy, and it wasn't the content of Anagnostopoulos' work that was the subject of the debate. Rather, it was the "real programs" in the title.

The purists maintained that DCL isn't a true programming language and that people who write serious applications in DCL are misguided zealots. These folks viewed the title as an oxymoron.

DCL enthusiasts were puzzled by the use of the adjective "real." Writing real programs in DCL — as opposed to what? Is there a metaphysical DCL interpreter that generates unreal code which functions only in another dimension? The DCL crowd felt the title was somewhat condescending in tone.

Title controversies notwithstanding, *Real Programs* is a must-have book for people responsible for writing reliable, robust DCL command files. It successfully fills a void in the official DEC documentation, providing insight and direction lacking in DEC's *DCL Concepts* manual, the only other readily available source of DCL programming instruction. Unlike the *Concepts* documentation, *Real Programs* can be used as a textbook for teaching DCL to the neophyte.

VAX/VMS: Writing Real Programs in DCL
Paul C. Anagnostopoulos
450 pages
paperback, $29.95

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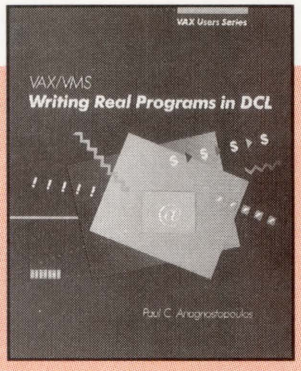

Paul C. Anagnostopoulos' "VAX/VMS: Writing Real Programs in DCL" addresses the basic elements of DCL and command procedure design.

Even expert DCL users should consider *Real Programs* required reading. Anagnostopoulos liberally sprinkles the text with programming gems and obscure information that can enhance your DCL coding efforts significantly.

Anagnostopoulos was the original author of VMSINSTAL.COM, the official VMS software installation utility and arguably one of the most complex command procedures ever written. Tackling such a large job in DCL forced the author, as he notes in the book's preface, to "develop stylistic and organizational guidelines for programming in DCL."

Judging from the layout, Anagnostopoulos' organizational skills were well-honed by his VMSINSTAL design efforts. Covering a wide-ranging subject such as DCL is no easy task, yet the author has created a highly structured approach.

After a brief but comprehensive review of core VMS concepts, the book addresses the basic elements and components of DCL and command procedure design. Anagnostopoulos methodically tackles control flow, symbol manipulation, user interfaces and I/O, leading the reader through a logical progression of more complex subject matter. At the end of the book, a sample DCL application for managing VMS mail distribution lists is provided that uses many of DCL's most versatile features. A "library" of subroutines also is provided to enable the reader to write highly structured, consistent DCL code.

Anagnostopoulos assumes that readers are using VMS V5.x but also covers DCL behavior under prior versions of the operating system.

Real Programs is an instructional work, not a reference book. You won't be able to throw away your *DCL Dictionary*. It doesn't provide a glossary of all DCL commands, and it omits comprehensive descriptions of all the commands it references. Aside from eliminating the need for frequent revisions to accommodate the continuing evolution of VMS, the lack of excess detail makes the book flow smoothly.

On the other hand, Anagnostopoulos reveals quirks of DCL that aren't clearly stated in the DEC documentation. I found myself writing notes in my battered, annotated *DCL Dictionary*, referencing items in *Real Programs*. Fortunately, the book features a good index that makes looking up subject matter simple and straightforward.

The experienced DCL user may be a bit put off by Anagnostopoulos' approach to command procedure design. In the preface, the author says he remains overwhelmed by the lack of style and organization of most of the DCL code he sees and addresses this problem by espousing "structured" DCL. He suggests using his supplied subprocedures for handling various routine operations and using status codes with all EXIT commands. He also makes other recommendations that would appear to force a layer of questionable complexity on application design and perhaps negatively affect procedure execution time and performance.

But even people who feel Anagnostopoulos' approach borders on overkill will have to admit that implementing his suggestions will provide the closest thing to bulletproof DCL. That makes *Real Programs* truly live up to its title. *—Reviewed by Kevin G. Barkes, DCL Editor.*

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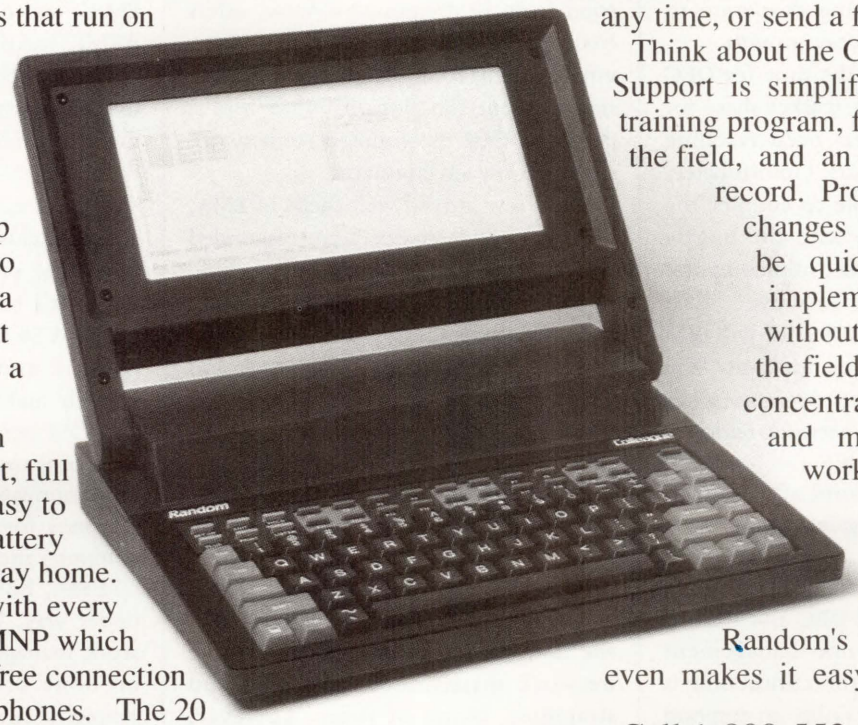

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NETWORKING

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EMA And SNMP Challenge NetView

With its Enterprise Management Architecture (EMA), DEC is delivering a clear winner in the race to bring a workable network management framework to the multivendor corporate networking environment.

But could DEC have done otherwise? The time is perfect for DEC to step in and take control. The combination of the company's large size ($13 billion and growing) and a long, productive history in multivendor distributed computing has placed it in the ideal position to respond quickly at a time when network managers are becoming desperate to control sprawling network growth.

This also could be the time for DEC to grab from IBM the market share for which it anxiously has been reaching during the past few years. Unfortunately for DEC, IBM was able to counter the VAXcluster challenge with the hugely successful AS/400-scalable minicomputer product line, after, however, first striking out with the 9370. But will IBM be able to do the same against EMA? Will NetView, IBM's already somewhat entrenched enterprise network management product, evolve fast enough and receive the right kind of support to compete successfully against EMA?

Corporate Colors

The struggle between DEC and IBM to bring the right network management products to market at this critical time is delineating corporate ability to respond to urgent customer needs and is demonstrating the overwhelming momentum that company product history has on new product philosophy.

DEC's history has positioned it to respond quickly and comprehensively, and DEC is presenting the industry with the right *distributed* network management products that will allow the varied computers and network interconnect devices on corporate networks to interoperate on a *peer-to-peer* basis. This contrasts sharply with the longstanding IBM philosophy that has favored IBM equipment and a centralized, hierarchical approach based exclusively on that equipment.

"Openness" in this environment involves a series of IBM technical publications defining Application Programmer Interfaces (API) that let customers and vendors access the network management data and commands. The design, though solid from IBM's point of view, offers little opportunity for other vendor environments to integrate their network management functionality with IBM's, demoting these environments to network management satellite status.

NetView arrived well ahead of EMA, but network managers have responded poorly to it, and IBM has shown little intent or ability to change NetView in any meaningful way to appropriately support a wide range of vendors and computer networks. NetView is an important piece of IBM's System Application Architecture (SAA), so NetView functionality places IBM's propietary technology at the heart of network management control.

If NetView isn't the answer, does that leave only EMA? The answer is, no. All the dominant computer vendors have network management products and strategies. None of these, however, accommodates the multivendor environment with as comprehensive a solution as EMA nor are they as well-defined, architected or supported. Network management strategies from DEC represent a natural product evolution. Competing network management products represent more of a marketing strategy than any kind of similar natural evolution.

Hewlett-Packard has Open View, which represents an approach that in many ways is similar to EMA. However, HP lacks critical experience with large distributed systems and extensive multivendor networks to be able to provide large accounts with the right enterprise-wide products, support and direction.

Sun Microsystems has SunNet Manager, which is a major component of its SunNet family of products. But SunNet Manager is designed for managing workgroups and LANs as opposed to EMA's larger focus. Also, Sun's mentor, AT&T, has the Unified Network Management Architecture (UNMA), of which the Accumaster Integrator component is the most widely implemented.

But AT&T has found its success in the computer network management arena almost exclusively as a result of its overwhelming presence in telecommunications. It's still too early, however, to gauge AT&T's relative strength in the network management arena. The company is making network management and OSI compatibility a priority, and the company's size and experience in telecommunications could yield big surprises for DEC and the rest of the computer industry.

EMA, however, is also just getting under way. For the moment, the network management product spotlight is on none of the above products and strategies. Instead, it's on an unassuming Internet standard that has found overnight success and shows no sign of slowing.

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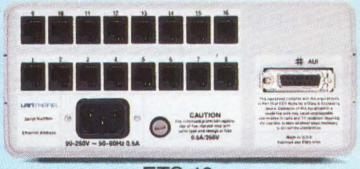
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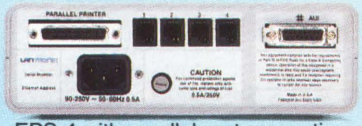
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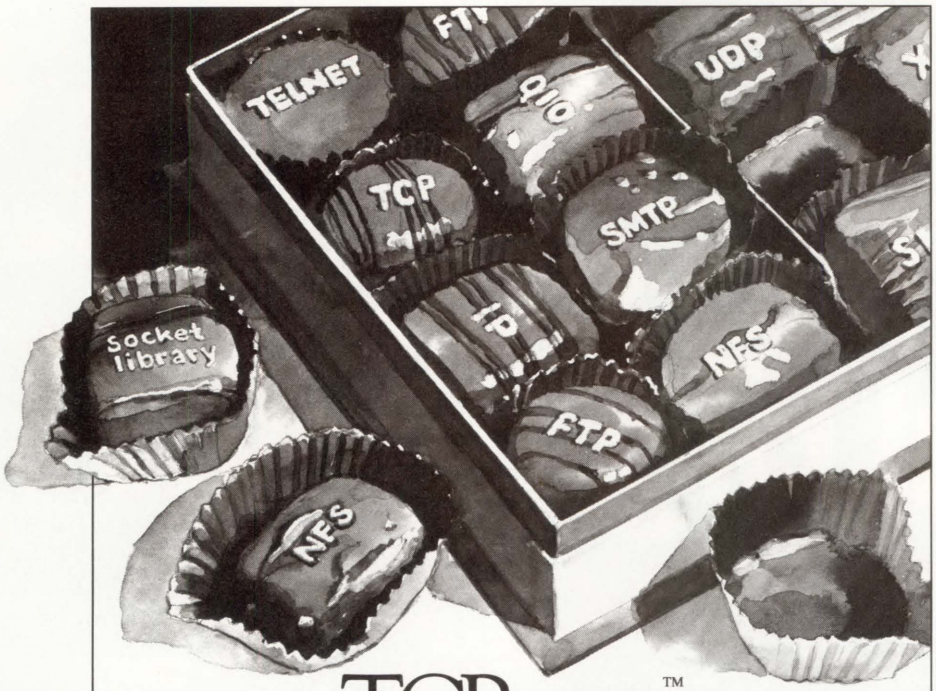

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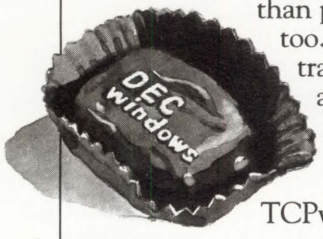

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products and support this dark horse is finding aren't simple. Nor are the reasons for its success entirely obvious, but they involve the critical need network managers have for workable network management products. The problems are appearing locally, at the LAN level, and SNMP is providing solid, successful, functional solutions to them.

SNMP was designed by four academics and is defined by the Internet Activities Board (IAB). It was designed to overcome the deficiencies of the earlier Internet-standard Simple Gateway Monitoring Protocol (SGMP). After receiving a huge boost at Interop '89 in San Jose, California, where about a dozen vendors demonstrated SNMP functionality by creating a large multivendor network fully managed by the protocol, SNMP has gone on to spawn many products and almost compulsory inclusion by network interconnect product manufacturers in their bridges, routers and gateways.

SNMP also is fully supported by EMA, SunNet Manager and Open View. SNMP is a grass-roots movement that will last for at least several more years, allowing network managers to bring badly needed network management functions onto their LANs and WANs. The most likely scenario is that managers and system administrators later will move to more comprehensive solutions — primarily the ISO's Common Management Information Protocol (CMIP) and Common Management Information Services (CMIS).

On TCP/IP networks, this will occur via the CMIP Over TCP/IP (CMOT) standard as defined by the IAB and implemented by such companies as NetLabs. On other networks, the transition will be facilitated by the predominant vendor — DEC, HP, IBM or Sun. The ISO has gone to great lengths to specify CMIP/CMIS, and though the standard isn't fully defined yet, it's almost universally acknowledged to provide the protocols and services of choice by all vendors, featuring nearly every conceivable network management function.

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structured EMA in such a way that the transition from SNMP (or any other network management protocol, including its own DECnet Phase IV NICE) to CMIP/CMIS will be painless. The solution goes hand-in-hand with DEC's support of OSI in DECnet Phase V. In fact, the way EMA has been architected, DEC will be able to move onto any network at any level and provide an open-ended, incremental approach to bringing its management scheme online networkwide. Network management products from other vendors feature flexible architectures, but EMA has been defined to cover a network of any size with machines of any size and network protocols and services. DEC already has designed a NetView interface and is targeting traditional IBM environments right off the bat.

EMA/SNMP Clients And Agents

Common to all network management protocols is the concept of clients and agents. These two fundamental components communicate according to the protocol in the network management scheme. Agents collect information about managed "objects" that provide a service or function within a network, such as an individual computer, software application, modem or bridge. This information is stored in a data structure yielding a database of some size regarding the object. In SNMP, it's called the Management Information Base (MIB). The MIB contains a variety of information about the managed object, its "attributes" and, possibly, surrounding activity. The SNMP MIB was designed to be upwardly compatible with the OSI MIB in CMIP/CMIS.

Clients collect information from the agents via polling to get a coherent view of network activity. They store this information in their own databases. This information can be manipulated in some way, displayed or used to make a decision such as rerouting traffic because of congestion. AI and expert systems technology soon is expected to handle much of the decision-making involved in the client's use of information.

Agents also have the ability to raise alarms. For example, if there's a disk failure on a system or if a router detects a lot of lost packets, the agent can raise an alarm to which the client will respond and take action. Alarms also can be used for routine notification of change in object status so that the client won't need to look for this information at a predefined polling interval. This reduces activity on the network, which in some cases can compete with daily traffic.

In SNMP, the MIB information has been defined in RFC specification 1066, and work now is being done to specify an upwardly compatible MIB-2. Further, SNMP allows vendors to add extensions to the information their products track about themselves, which then can be passed on to the client if the client has polled the device to learn about possible extensions and supports use of them.

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Another important component of an SNMP network is the use of proxies. These programs run on an agent device and collect information about an object that isn't SNMP MIB-compliant yet can provide information about itself. These are usually older or less sophisticated network interconnect devices. Specialized companies such as Epilogue Technology focus on bringing these products into the network management scheme. A partial MIB is built describing their attributes, and the client polls for information provided by the agent in the same way as for a standard object.

Bottom Up

EMA builds on the basic concept of clients and agents to create a large and sophisticated distributed network management system. In the EMA world, clients are called Directors and an Entity is defined as consisting of an agent and its managed object. Interactions between Directors and Entities can be as simple as in SNMP or much more complex, including management capabilities that involve directing an object, via its agent, to take an action such as logging off a user or shutting itself down in an orderly manner.

EMA also includes a superentity called the Executive, which is built into every Director and allows for Director-to-Director communications. The Directors maintain a very large and flexible database of information about managed objects called the Management Information Repository (MIR). This database supports whatever information various environments can provide about themselves and makes no demands on the environment to conform to predefined data requirements.

Also, networks can be divided into user-defined domains with a Director responsible for a single domain. There are even domains within domains, resulting in nested Directors. Complex hierarchies of Directors can be built, or the strictly distributed architecture can be retained, presenting local managers with complete autonomy.

For managers with immediate needs, SNMP provides a wonderful entry point into network management and provides a solid growth path to EMA. Currently, the client side of SNMP is finding its strongest support on Sun workstations because of their graphics capabilities and presence on virtually all TCP/IP networks. Client management station software for Sun workstations is available from Advanced Computer Communications, PSI/NYSERNet, SNMP Research, Wellfleet and The Wollongong Group, and most manufacturers of network interconnect products are including agent support for SNMP.

PSI/NYSERNet, SNMP Research and The Wollongong Group are working on SNMP implementations for the VAX under VMS and ULTRIX. DEC has licensed its SNMP implementation from PSI/NYSERNet, but currently most

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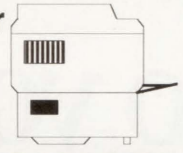

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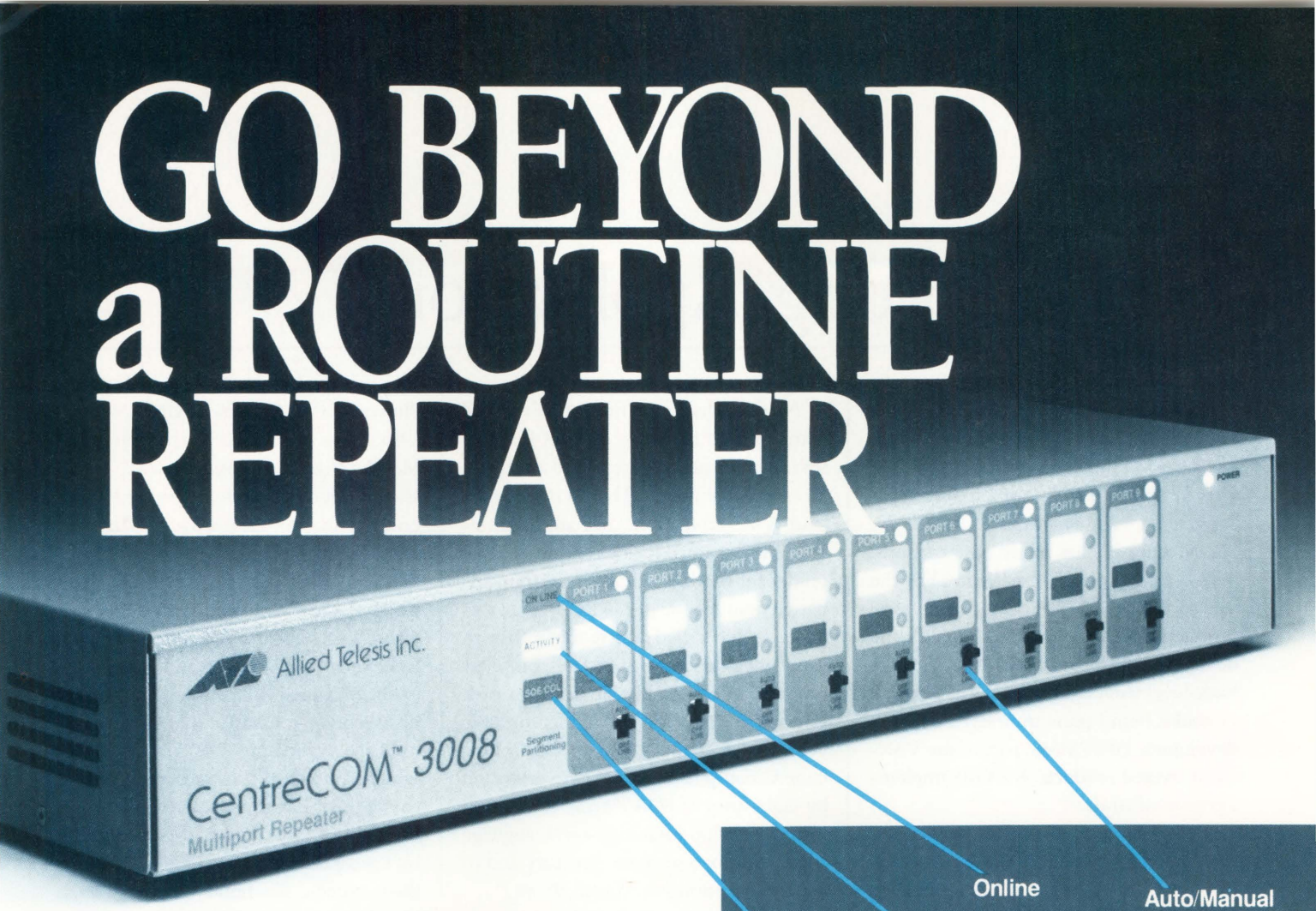

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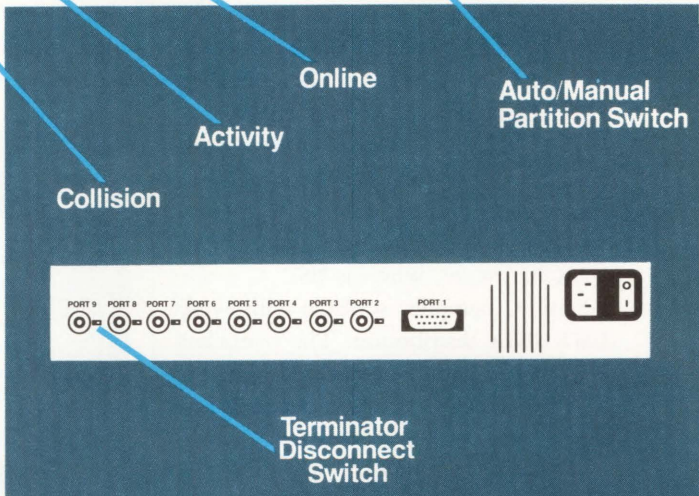

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ULTRIX

Porting Applications

Philip E. Bourne, Ph.D.

Editor's note: We continue our introduction to UNIX for VMS users by porting a high-level language application to a UNIX environment.

"Making it" has many connotations. To a UNIX connoisseur, it implies the use of the **make** utility — a powerful productivity tool most often used in the development and maintenance of large, high-level language programs. The value of **make** hasn't gone unnoticed by VMS developers. DEC/MMS, part of the VAX-set of layered products, is a VMS implementation of **make**.

Before we discuss **make**, we need to understand something of the UNIX compilers and loader (linker in VMS parlance). ULTRIX contains the compilers VAX C, BSD C, BSD FORTRAN, BSD Pascal, BSD Franz Lisp and BSD Modula-2 as part of every distribution. VAX C is a port of the VMS C compiler and is specific to VAX hardware, whereas BSD C is the generic C compiler available with every BSD UNIX distribution. The compilers are invoked with the commands **vcc**, **cc**, **f77**, **pc**, **liszt** and **mod**, respectively.

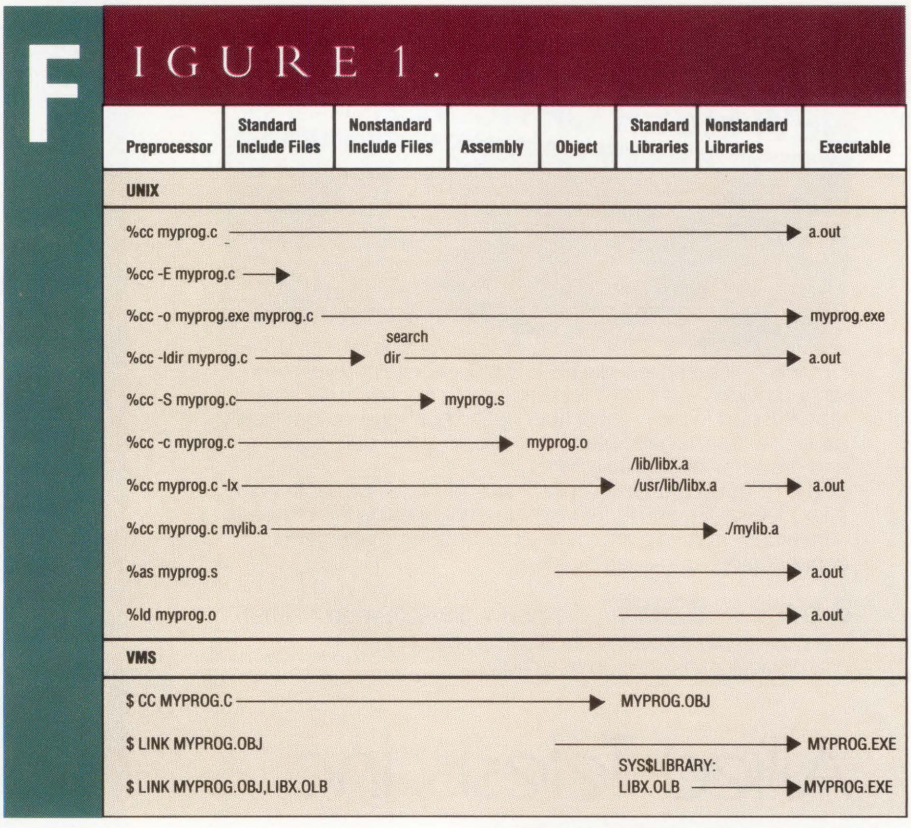
Standard Options

As compilers have been modified to meet the needs of alternative hardware types, new and hardware-specific options have appeared. Nonetheless, a subset of options is standard. For example, the **oname** option implies that an executable file called **name** will be produced when used with any of the compilers. Some standard options are illustrated in Figure 1, which compares the steps in producing an executable image under VMS and UNIX. Commands are given for the BSD C compiler (**cc**), but the same steps are involved in any UNIX high-level language compilation.

Notice that without options, the command **cc myprog.c** passes through several intermediate steps and produces an executable image. There's no separate load (VMS LINK) step, nor are intermediate files produced. The result — a contender for the most arcane and unimaginative component of UNIX — is an executable file called **a.out** that's sure to cause the VMS user grief. All compilers produce an executable file named **a.out**. Because UNIX doesn't support multiple versions, the result of a 10,000-line source code C compilation is easily overwritten by eight lines of FORTRAN! It's a good idea to develop each high-level language application in a separate directory and to use the **o** option introduced above.

The remaining examples in Figure 1 illustrate other features of UNIX compilation. The commands **as** (compare VMS MACRO) and **ld** (compare VMS LINK) assemble and load code, respectively. The command **cc myprog.c -lmylib** searches for the library in the system libraries **/lib/libmylib.a**, **/usr/lib/libmylib.a** and **/usr/local/lib/libmylib.a** to resolve external references. This is the only UNIX command I could think of that assumes a file extension. That is, **cc myprog** returns a "file not found" message, unlike the VMS command CC, which assumes .C if it isn't specified. On the other hand, **- lmylib** assumes **libmylib.a**, but, unlike VMS, **-lmylib.a** isn't acceptable, because the UNIX loader then expects the library **libmylib.a.a**.

FIGURE 1.



UNIX versus VMS program compilation.

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FIGURE 2.

```
example:   % fsplit protin.f
           protin.f already exists, put in zzz000.f
           residu.f
           distns.f
           planes.f
           ...

           % mv zzz000.f protin.f      # replace complete program with main
```

***Using UNIX** fsplit.*

FIGURE 3.

```
example:  % cat makefile
          # Macro Definitions:
          FILES = /usr/fred

          # Target definitions:
          Print: list.out
                  lpr list.out

          # Second level dependency:
          list.out: $(FILES)
                  ls -l $(FILES) > list.out

          % make -n
          ls -l /usr/fred > list.out
          lpr list.out

          % make
          ls -l /usr/fred > list.out
          lpr list.out

          % make
          lpr list.out
```

***A simple example of** make.*

You can maintain your own libraries. You could use the command **cc myprog.c -lfoo** to search for references in the local object library **libfoo.a**.

Having mastered these inconsistencies, how do you deal with a large program that you've just copied from a VMS system? This time, take a FORTRAN program, using the following steps:

1. Split the source code into smaller independent parts using the UNIX command **fsplit**.
2. Write a **makefile** to manage the programs.
3. Run **make** to create a current executable image.
4. Run the program. Figure 2 shows the result of running **fsplit** on a FORTRAN program **protin.f**, which consists of a number of subroutines and functions. Each subroutine and function is copied to a separate file with the name of the subroutine or function and the file extension **.f**.

The main calling program begins with the statement PROGRAM PROTIN. Thus, **fsplit** attempts to name the main calling program **protin.f**. However, this is the name of the file that contains the overall program. Fortunately, rather than overwrite the complete program, the main calling program is named **zzz000.f.** When the split is complete, the main calling program is renamed with the **mv** command, overwriting the complete source code. If the statement PROGRAM PROTIN hadn't been present, the main calling program would have been named **main000.f.**

Making It

With the program broken down into its constituent subroutines and functions, you're in a position to "make it." Let's begin with a simple example of how **make** exploits the dependencies that

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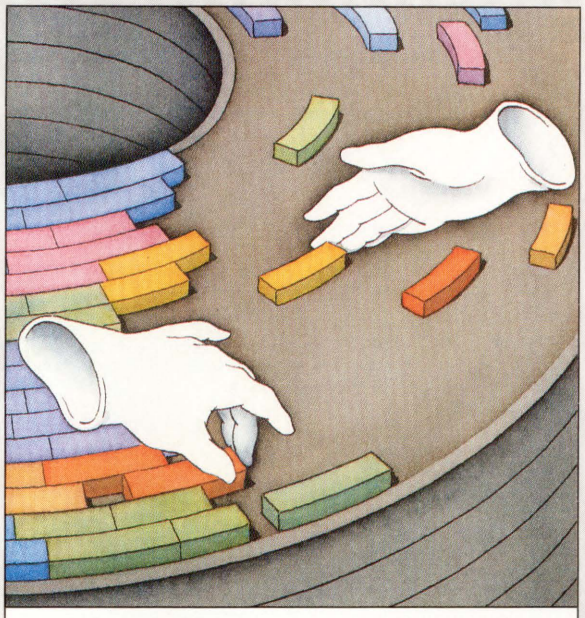

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FIGURE 4.

```
example:    % cat Makefile
            # definitions:
            #   # is a comment until a newline is reached
            #   \ is a continuation line
            #   : is a dependency
            #   $? is the list of prerequisites out of date
            #   $@ is the full target name
            #   .SYMBOL: is a predefined symbol
            # macro definitions
            FSOURCE = protin.f residu.f distns.f planes.f pairs.f \
            chiral.f det3.f vdwaal.f torshn.f tangle.f \
            ellips.f shrink.f

            OBJECTS = protin.o residu.o distns.o planes.o pairs.o \
            chiral.o det3.o vdwaal.o torshn.o tangle.o \
            ellips.o shrink.o

            FFLAGS  = -c -w     # -w suppresses warning messages

            # target definitions:
            prog.out: $(OBJECTS)
                  f77 -o $@ $(OBJECTS)
            clean: $(OBJECTS)
                  rm -f $(OBJECTS)
            touch: $(FSOURCE)
                  touch $(FSOURCE)

            # second level dependencies
            .f.o: $(FSOURCE)
                  f77 $(FFLAGS) $?

            #definitions
            .SUFFIXES: .out .o .f
            .PRECIOUS: prog.out
```

***A more complex example of** make.*

FIGURE 5.

```
example:  % make
          f77 -c -w protin.f
          f77 -c -w residu.f
          ...
          f77 -o prog.out protin.o residu.o distns.o planes.o pairs.o \
          chiral.o det3.o vdwaal.o torshn.o tangle.o \
          ellips.o shrink.o

          % ex residu.f
          : ...
          : wq

example:  % make
          f77 -c -w residu.f
          f77 -o prog.out protin.o residu.o distns.o planes.o pairs.o \
          chiral.o det3.o vdwaal.o torshn.o tangle.o \
          ellips.o shrink.o

example:  % make clean
          rm -f protin.o residu.o ...

example:  % make touch
          touch protin.f residu.f ...

example:  % chmod 755 prog.out
          % prog.out
```

***Invoking the more complex** makefile.*

exist between files.

Instructions to **make** are stored in what's called a **makefile**. If no file argument is specified, using the **f** option, **make** searches for **makefile**s with the names **makefile** or **Makefile** in that order (compare VMS MMS DESCRIP.MMS). Figure 3 illustrates a simple **makefile** to print a long directory listing (**ls -l**) of the files contained in the directory **/usr/fred**. The listing is contained in the file **list.out**; **list.out** is recreated only if the contents of the directory have changed since **list.out** was last created.

FILES = /usr/fred defines a macro that's used in what's called a second-level dependency. A first-level dependency is first dependent on a second-level dependency; that is, we have nested dependencies. **ls -l $(FILES) > list.out**, the second-level dependency, substitutes the value for the macro. Note that the parentheses are obligatory. Compare this to a C shell substitution, in which **$FILES** would be valid. Note also that the **ls** command line is indented by a tab, because it follows a dependency.

The dependency (**list.out: ($FILES)**) implies that the listing is dependent on the value associated with the macro. Similarly, the target **Print** is dependent on **list.out** (**Print: list.out**).

The first-level dependency is followed by the command **lpr** (indented by a tab), which prints the directory listing on the default printer. The command **make -n** provides a safeguard, because it displays the commands that will be executed by **make** without executing them (**n** option). Seeing that **make** will function as planned, the first invocation of **make** creates the file **list.out**, a long listing of the files in the directory **/usr/fred**, and sends it to the default printer. The second invocation illustrates the power of **make**; **make** determines that the contents of the directory **/usr/fred** haven't changed since the previous listing file was made and therefore merely prints the listing without re-creating the file **list.out**.

It should now be apparent how this dependency between files can be exploited in the case of source and object code. Let's return to the FORTRAN program, which we separated into its component subroutines and functions. Figure 4 illustrates a **makefile** that can be used in maintaining this program.

On the first pass, the **makefile** will attempt to compile and load all the FORTRAN source code files into an executable image, prog.out. If compilation errors are found, affected routines are modified by the user and **make** is in-

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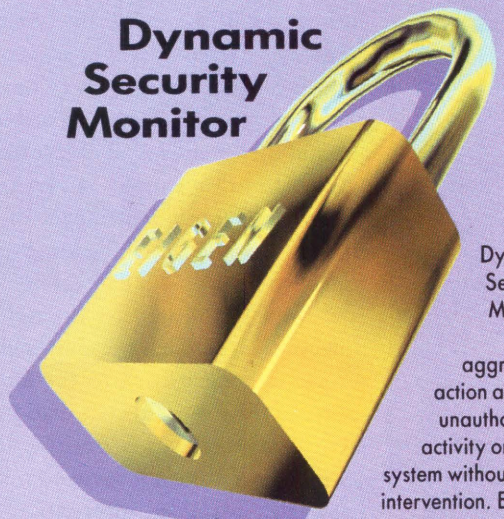

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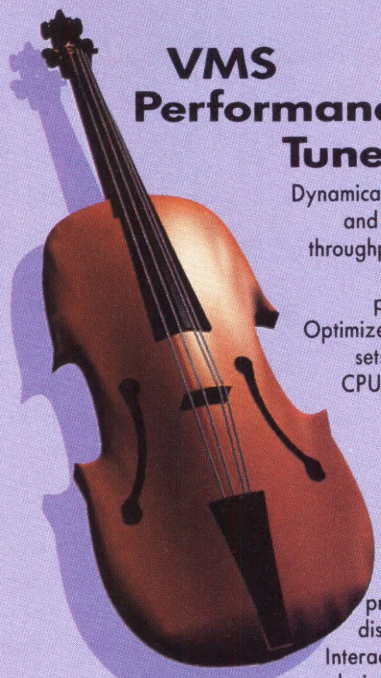

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Additional Reading

Feldman, S.I. *Make: A Program for Maintaining Computer Programs.* ULTRIX V2.0 Documentation Set.

Talbott, Steve. *Managing Projects with Make.* Sebastopol, California: O'Reilly & Associates, Inc., 1987.

Peters, J.F. *UNIX Programming, Methods and Tools.* San Diego: Harcourt Brace Jovanovich, Inc., 1988.—*P.E.B.*

voked again. On the second pass, only the subroutines and functions that have been modified are recompiled. If successful, all files are loaded into an executable image. This represents a significant saving in CPU time and wall-clock time over maintaining a single, large source code file that's completely recompiled each time a change is made.

Syntactical Concepts

It should be apparent from Figure 4 that understanding the concepts and syntax of **make** requires some effort. Only a few salient features are introduced in this example, but it may be a useful template for the occasional **make** user. For a complete discussion of **make**, refer to the box, "Additional Reading."

A predefined symbol is a concept introduced in Figure 4. Predefined symbols begin with a period, appear in uppercase and end with a colon. In Figure 4, .PRECIOUS: prevents the target from being deleted if **make** is interrupted; .SUFFIXES: lists the filename suffixes that have defined prerequisites in **make**, for example, .c, .f, .s, .o and .out.

Figure 5 illustrates the result of invoking this **makefile** with different arguments. The first example, **make** without arguments, compiles each of the source code files and creates an executable image, **prog.out**.

The second example invokes **make** after one of the source code files (**residu.f**) has been modified using the **ex** editor. Only **residu.f** is recompiled, and all object files are loaded to create a new executable image file.

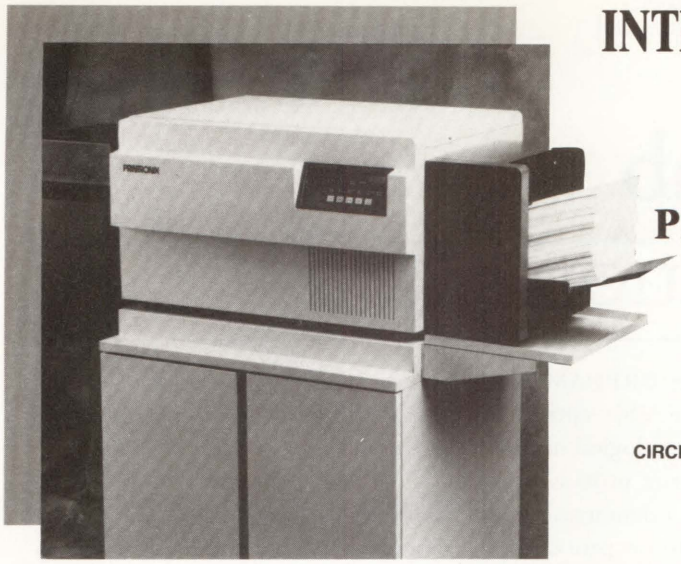
The third example, **make clean**, illustrates the concept of an alternative entry point. If the executable image file is current, it removes any object (.o) files; if the executable image isn't current, it first generates a current executable image and then removes all object files.

The fourth example, **make touch**, illustrates an important aspect of using **make** — forcing compilation even if a source file is up-to-date. The UNIX command **touch** updates the modification date of the file by reading a character and writing it back to the file. The source is then more recent than the object. Therefore, **make** recompiles the source. Here **touch** is invoked from the **makefile** using an alternative entry point. However, all the source files in this directory could have been touched just as easily with the shell command **touch *.f**.

The last example runs the program. First the file is made executable with the **chmod** command. Unlike VMS, there's no RUN command — the name of the file is enough. The shell searches the directory paths specified by the shell variable path for references to the filename. If found, a process is forked by the shell and the file executed.

At this point, you're either in the pleasant position of having code that runs and gives the correct answers or, if you're like me, in desperate need of a debugger. Both situations will be addressed in the next column with a look at the profiling tools — the UNIX equivalent to the VMS Performance and Coverage Analyser (PCA) for optimizing code and **dbx**, the UNIX source level debugger equivalent to VMS DEBUG.

Information regarding hints and kinks useful to VMS users grappling with UNIX will be gratefully received. Send it via e-mail to SYSTEM@CUMBG.BITNET or pbourne@cuhhca.hhmi.columbia.edu. — *Philip E. Bourne, Ph.D., is a senior associate of the Howard Hughes Medical Institute and author of* UNIX for VMS Users, *published by Digital Press.*



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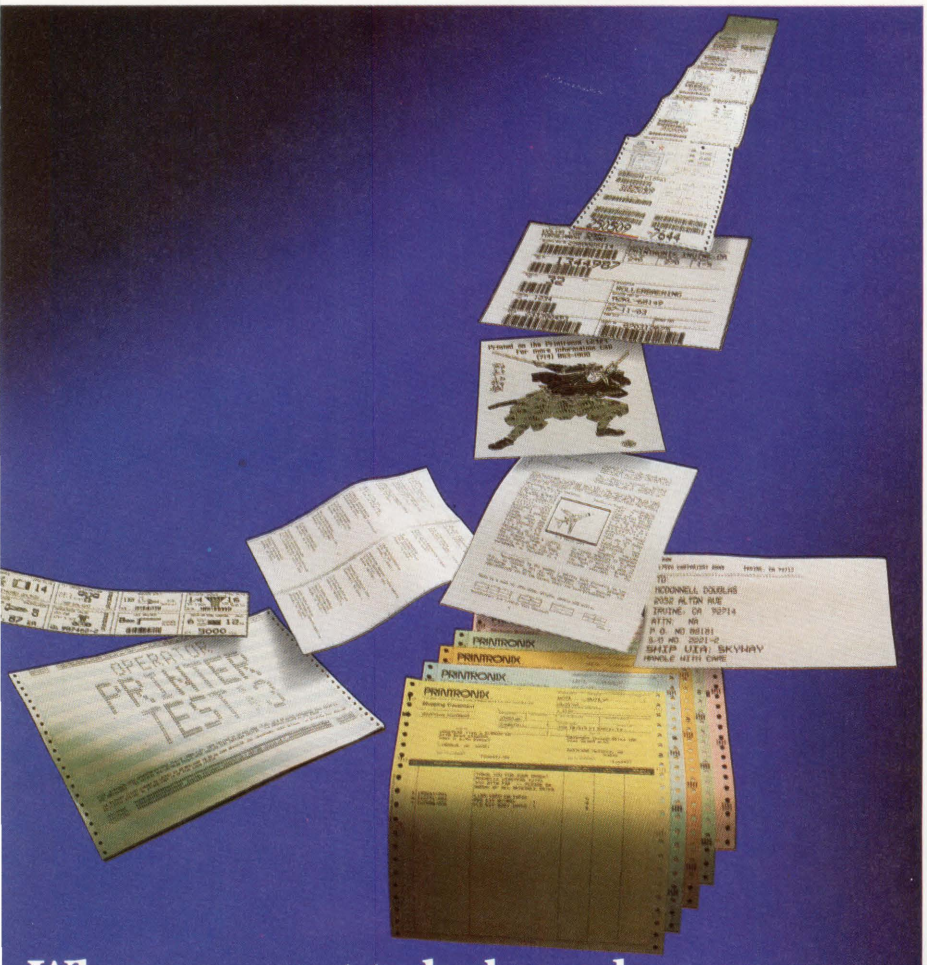

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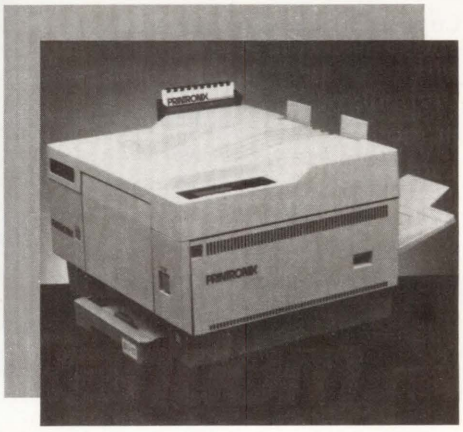

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SYNC.DOC

DCL DIALOGUE

Bread Crumb Synchronization

Kevin G. Barkes

One of DCL's glaring omissions is a mechanism for interprocess communication and/or synchronization. Programs written in high-level languages use mailboxes, asynchronous system traps (AST) or other VMS facilities to coordinate activities between processes. DCL-based applications must resort to less elegant methods.

To anthropomorphize a bit, high-level languages permit the creation of programs that let processes talk to one another. DCL command procedures can leave bread crumbs that serve as rudimentary signals, provided other processes know to look for them.

Not Much Help

DCL has one command, SYNCHRONIZE, that can place a process in a wait state until a specified batch job is completed. However, the command is a pain to use in everyday operations. You must perform all sorts of unpleasant contortions to obtain the necessary queue and entry information dynamically. The F$GETQUI lexical function available in VMS V5.n makes the chore less onerous, but SYNCHRONIZE is still too restricted in scope and complex in invocation to be of real value.

Logical names provide a viable method of interprocess communication. One process reads entries made by another in the system logical name table or in a group name table and alters its operation based on the values placed in the tables.

Of course, the process making the logical name assignments must have elevated privileges (either GRPNAM or SYSNAM) to make the table entries. Entries made in the system logical name table can be read by any process on the system. Group table assignments can be accessed only by those processes having the same group UIC as the creating process.

There are a few drawbacks to using logical names in this way. A system crash will wipe out the assignments. If the process creating the logical name is killed or improperly exits for some reason, the logical won't be deleted, causing the processes that check for the assignments to lock up. Malicious or meddling users with sufficient privileges can change the values of the logicals, which also will result in improper operation.

Using Sync Files

Another alternative is to use sync files to coordinate procedure execution. This method isn't infallible, but it's somewhat more reliable.

Here's our scenario: We have two command procedures that shouldn't be executed simultaneously because of potential file access conflicts or other unpleasant side effects. We arbitrarily give one of the procedures execution preference; let's call it SYNC_MASTER (see Figure 1). The other procedure, which

FIGURE 1.

```
$! SYNC_MASTER
$!
.
. Initialization code goes here
.
.
$! Create our syncfile before executing:
$!
$  GOSUB DO_SYNCHRONIZE
$!
$! Do whatever it is we're supposed to do:
$ DO_WORK:
.
.
.
$! We're done, so get rid of the syncfile.
$       CLOSE SYNCFILE
$       DELETE SYNCDIR:SYNCFILE.DAT;1
$       EXIT
$!
$! This is the subprocedure which creates the syncfile.
$ DO_SYNCHRONIZE:
$!
$! If there's a syncfile left over from a previous
$! execution, get rid of it:
$       IF F$SEARCH("SYNCDIR:SYNCFILE.DAT;1") .NES. "" -
        THEN DELETE SYNCDIR:SYNCFILE.DAT;1
$!
$! If we can't delete the syncfile, then it would appear
$! this procedure is already being run by another process,
$! so abort.
$!
$       IF .NOT. $STATUS THEN EXIT
$! $! Otherwise, open a new syncfile and return:
$       OPEN/WRITE SYNCFILE SYNCDIR:SYNCFILE.DAT;1 $
        RETURN
```

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CIRCLE 190 ON READER CARD

mustn't run when SYNC_MASTER is executing, is called SYNC_SLAVE (see Figure 2).

We create a special directory and assign it the system logical SYNCDIR. This is where our sync files will be placed. Ideally, the directory will have its protection set so that only the SYNC procedures can access them.

Let's fire up SYNC_MASTER. After performing some initialization functions, SYNC_MASTER calls the subroutine DO_SYNCHRONIZE.

The subroutine first checks to see if there are any spurious sync files left over from previous executions of the procedure. Note that the sync file must have an explicit version number.

If the subroutine finds an old sync file, it attempts to delete it. If the delete fails, we assume it's because another process is executing the same procedure and has a sync file open and locked, so we exit. There are other reasons why the delete could bomb out, such as disk off line, improper file protection, and so on, but we're assuming we've covered these eventualities.

> ***"Logical names provide a viable method of interprocess communication."***

If all goes well, SYNC_MASTER opens its sync file and RETURNs to the portion of the procedure that does its real work. When completed, it closes the sync file and deletes it before exiting.

SYNC_SLAVE, the subordinate procedure, waits for a minute after executing its initialization code. This provides a "safety zone" to permit SYNC_MASTER to get up and running.

The symbol TESTSYNC is used as a flag to determine whether or not SYNC_MASTER has a sync file open. We set the flag and go on to test for the existence of the file with the CHECKSYNC subroutine.

If SYNC_SLAVE can't find the sync file, then SYNC_MASTER isn't running. It returns to the main body of the procedure, checks TESTSYNC and continues.

Should SYNC_SLAVE discover that there's a sync file, it tries to delete it, because it could be merely the residue of an aborted SYNC_MASTER execution. If SYNC_SLAVE can't delete the file, then SYNC_MASTER is executing and has it locked. SYNC_SLAVE sets the value of TESTSYNC to fail and returns to the main procedure. When TESTSYNC bombs out, the procedure loops back to BEGIN and waits for a minute before attempting to continue operation.

If SYNC_SLAVE can erase the file, it still sets TESTSYNC to failure before returning, causing the procedure to wait a minute before attempting to continue. The existence of a spurious sync file indicates that something possibly went

FIGURE 2.

```
$! SYNC_SLAVE
.
. Initialization code goes here.
.
$ BEGIN:
$!
$! Our procedure waits a minute to make certain
$! our "master" process is up and running and
$! has had time to open its syncfile:
$!
$       WAIT 00:01:00
$! We set the value of the symbol TESTSYNC to 1.
$! This symbol is used to test whether a syncfile
$! exists:
$!
$       TESTSYNC = 1
$!
$! Before executing, our procedure checks to see
$! if a syncfile exists:
$!
$ GOSUB CHECKSYNC
$!
$! If the CHECKSYNC subroutine resets the value of
$! TESTSYNC, it means that a syncfile exists; loop
$! back to the beginning and wait to do another test.
$!
$       IF .NOT. TESTSYNC THEN GOTO BEGIN
$!
$! Do whatever we're supposed to do:
.
.
.
$       EXIT
$!
$! Subroutine to check for the existence of a checkfile:
$!
$ CHECKSYNC:
$!
$! If there's no syncfile, return and proceed with
$! our normal processing.
$!
$     IF F$SEARCH("SYNCDIR:SYNCFILE.DAT;1") .EQS. "" THEN RETURN
$!
$! If there is a syncfile, make certain it isn't just left
$! over from a previous aborted execution:
$!
$       DELETE SYNCDIR:SYNCFILE.DAT;1
$!
$! If we can't delete the file, (assuming protections are
$! properly set), then set the value of TESTSYNC and return:
$!
$       TESTSYNC = 0
$ RETURN
```

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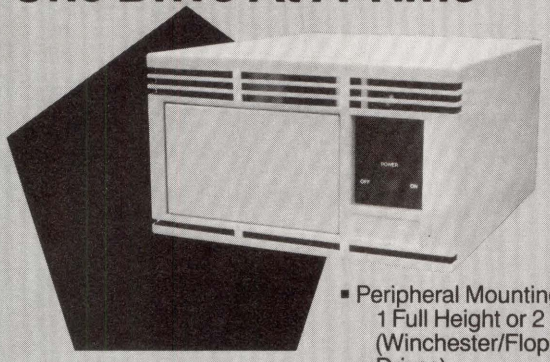

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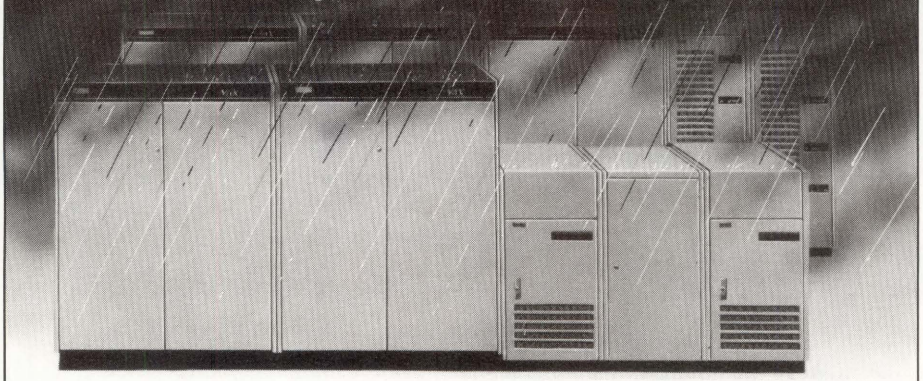

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wrong with the SYNC_MASTER procedure and the pause allows recovery operations to take place.

For added safety, SYNC_SLAVE can call CHECKSYNC repeatedly during its operation to make sure SYNC_MASTER

> ***"...SYNC_SLAVE can call CHECKSYNC repeatedly..."***

hasn't started up unexpectedly. SYNC_SLAVE also could create its own sync file that SYNC_MASTER would check.

THE VETERAN DCL HACKER who showed me this method a few years ago was exceedingly proud of his discovery. "It's foolproof," he said. "Even someone with bypass privilege can't delete the sync file."

I logged into the SYSTEM account, enabled BYPASS privilege and entered:

```
$ RENAME SYNCDIR:SYNCFILE.DAT;1
SYNCDIR:FOOLPROOF.DAT;1
```

You could hear his scream a block away.

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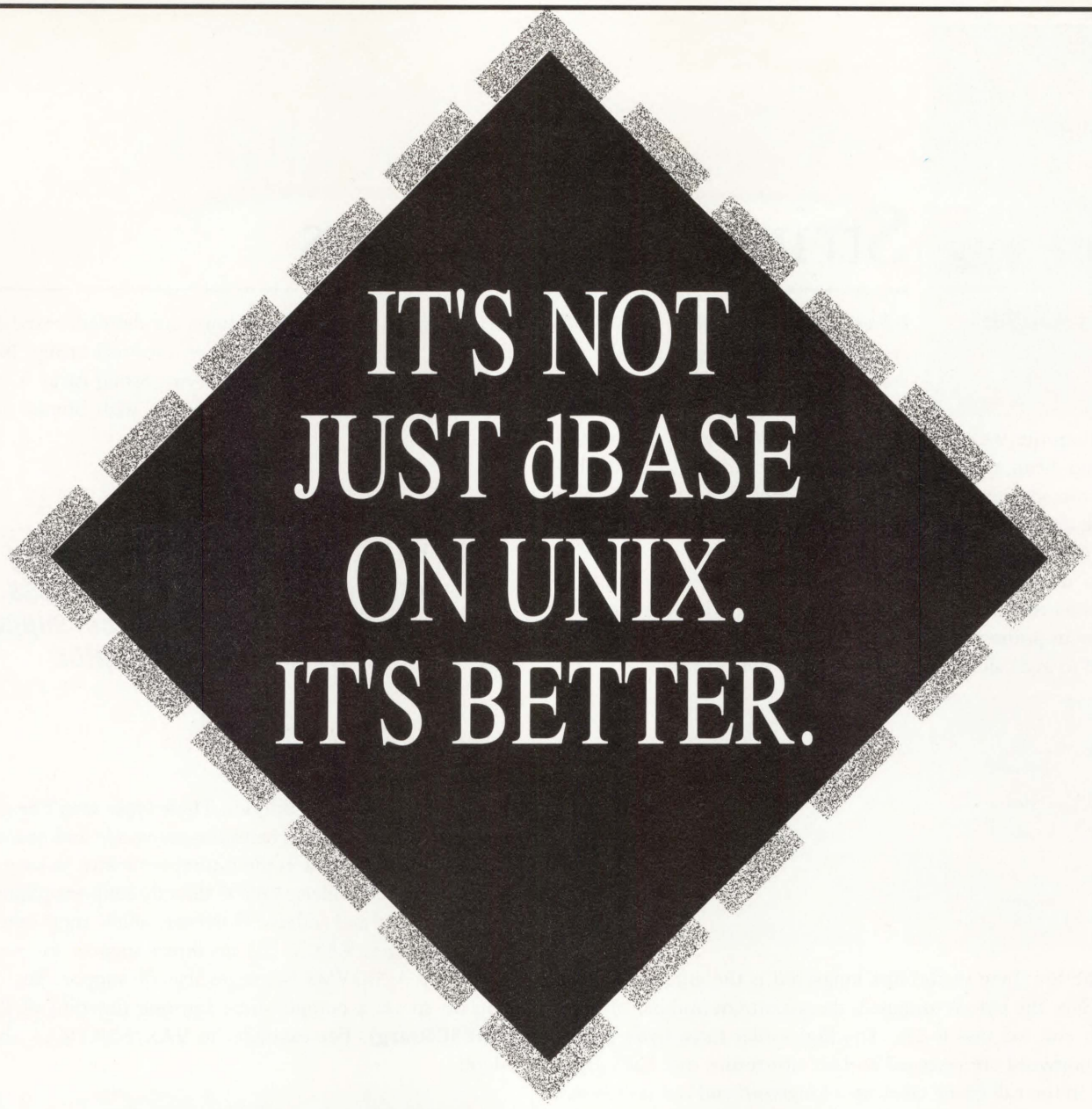
The list is also available online from my SYS$OUTPUT bulletin board system: (412) 854-0511, 1,200/2,400 baud, 8 bits, 1 stop bit, no parity. If you're active on FidoNet, ask your local sysop to file request DECBBS.LST from 1:129/38.

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



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LET'S C NOW

Rex Jaeschke

String Descriptors

Editor's note: When calling VAX/VMS system services, you must deal with string descriptors. This month, Rex Jaeschke tells us how to do this from VAX C.

When the VAX hardware and VAX/VMS were designed in the mid-1970s, the VAX-11 Hardware Procedure CALL Mechanism was specified. This method provided three ways in which an argument could be passed to a procedure: by value, reference (often called by address) and descriptor.

To understand this, let's look at how procedure linkage works on the VAX. When control is passed to a subroutine, the argument pointer (AP) register points to a data block, often referred to as a call frame, having the following form:

```
-------------------------
|        0        | n   |
-------------------------
|      argument 1       |
-------------------------
|      argument 2       |
-------------------------
|      argument 3       |
-------------------------
          ...
-------------------------
|      argument n       |
-------------------------
```

The low byte in the first longword is the argument count (*n*). Since the byte is unsigned, the maximum number of arguments you can pass is 255. The high-order three bytes in that first longword are reserved by DEC for future use. Each argument in the call frame takes up a longword and can represent a value, the address of an object or procedure, or the address of a descriptor.

In C, strings usually are stored as null-terminated arrays of characters. Unfortunately for VAX C programmers, VAX/VMS doesn't represent strings this way. Instead, it uses a string descriptor, a data structure having the following form:

```
---------------------------------
| type | class |      length      |
---------------------------------
|        address of string        |
---------------------------------
```

The address of the string is stored in the address field, which is a longword. The length of the string is stored in the length field, which is a word. The text of the string is stored outside this structure. The type and class bytes are flags that indicate the type of this descriptor. Besides supporting string descriptors, the following descriptor types are defined: Fixed-Length, Dynamic String, Array, Procedure, Decimal String, Noncontiguous Array, Varying String, Varying String Array, Unaligned Bit String, Unaligned Bit Array, String with Bounds and Unaligned Bit String with Bounds. These types won't be discussed here. The descriptor mechanism is extensible and new descriptor types can be added in the future, each with its own format.

VAX C directly supports passing arguments by value and address. However, VAX C has no direct support for passing by descriptor.

Like all C compilers, VAX C directly supports passing arguments by value and address. However, unlike most other VAX/VMS languages, VAX C has no direct support for passing by descriptor. VAX/VMS languages that do support this convention do so via a compile-time intrinsic function of the form **%DESCR(arg)**. For example, in VAX FORTRAN the statement:

```
CALL SUB (%DESCR(A))
```

calls the procedure **SUB**, passing in the argument **A** by descriptor. VAX C doesn't support this intrinsic. Instead, you're provided with the primitives to construct a descriptor yourself. Of course, this places the burden of writing extra code and debugging it on the programmer. It's a situation that I hope will be rectified in future compiler releases. Meanwhile, you have to "roll your own." It's no good complaining; the VAX C developers are aware of the situation.

Taking A Test Drive

In order to demonstrate the construction of a string descriptor, I've picked the simplest system service routine I could find, which required a string argument to be passed by descriptor. That service is SYS$SETPRN, a nonprivileged routine that can be called to change one's process name. It's not a very exciting

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routine, but it demonstrates the technique adequately:

```
/* setprn.c */

#include <stdio.h>
#include <descrip.h>
#include <ssdef.h>

$DESCRIPTOR(my_desc, "Rex");

main()
{
        unsigned int status;

        status = sys$setprn(&my_desc);

        if (status == SS$_NORMAL)
                printf("Call was sucessful\n");
        else if (status == SS$_ACCVIO)
                printf("Access violation\n");
        else if (status == SS$_DUPLNAM)
                printf("A process by this name already exists\n");
        else if (status == SS$_IVLOGNAM)
                printf("Name must be 1-15 characters long\n");
        else
                printf("Undocumented error code %u\n", status);
}
```

The header **descrip.h** is included to get various bits of descriptor information. The details will be discussed later. Since SYS$SETPRN is a system service, the header **ssdef.h** is included to get the macro definitions **SS$_*** for the possible return values. The source line:

```
$DESCRIPTOR(my_desc, "Rex");
```

uses the macro **$DESCRIPTOR**, defined in **descrip.h**, to allocate memory for a string-descriptor object called **my_desc**. The descriptor is initialized to point to the string **"Rex"**. And since the macro is called outside any function, the storage class of **my_desc** is global. The statement:

```
status = sys$setprn(&my_desc);
```

calls SYS$SETPRN passing in the descriptor's address. You must use the address-of operator **&**. If you don't, the descriptor, which is really a structure, will be passed by value, causing undefined behavior — probably an access violation or error value being returned. Note that **ssdef.h** does *not* contain a function prototype for SYS$SETPRN. Therefore, if you get the argument list wrong, the compiler won't know.

This is a major problem. It's hard enough to work out how to call some of the system library routines without having to debug invalid argument lists. I strongly urge that you invent prototypes for system library routines you need to call. The problem with this is that if you misunderstand how to call a given routine, you still won't get a compiler warning, because your bad prototype presumably will match your bad argument list.

The system services manual defines the possible return values for each system routine. Since this example caters to all the defined return codes, the final **else** clause isn't necessary unless you have some stray pointers elsewhere in your program that

have caused memory to be trashed.

To test the program, use the following DCL commands:

```
SHOW PROCESS
RUN SETPRN
SHOW PROCESS
```

Your process name now should be "Rex" or whatever you initialized the descriptor to.

Peeking Inside DESCRIP.H

The header **descrip.h** contains two kinds of entries: structure templates for each descriptor type and macros to help initialize a descriptor. The template for a string descriptor is:

```
struct dsc$descriptor_s
{
        unsigned short dsc$w_length;
        unsigned char  dsc$b_dtype;
        unsigned char  dsc$b_class;
        char           *dsc$a_pointer;
};
```

The other relevant parts of this header are the following three macros:

```
#define DSC$K_DTYPE_T   14
#define DSC$K_CLASS_S   1

#define $DESCRIPTOR(name, string)    \
  struct dsc$descriptor_s name =     \
  {sizeof(string)-1, DSC$K_DTYPE_T, \
  DSC$K_CLASS_S, string}
```

Using this information, we can see that our macro call:

```
$DESCRIPTOR(my_desc, "Rex");
```

expands to the following declaration:

```
struct dsc$descriptor_s my_desc =
        {sizeof("Rex")-1, 14, 1, "Rex"};
```

The descriptor type and class flag bytes are set to the macro values shown in the definition of **$DESCRIPTOR** and are constant for a given descriptor type. They won't be discussed further here.

Note how the string length field is initialized. The **sizeof("Rex")** is 4, but the system service does *not* want to know about the trailing null character — that's only there for C's purposes. So 1 is subtracted. If the null character were included, the name of the process would include the null, something you wouldn't want.

Constructing A Descriptor At Run Time

The machinery provided in **descrip.h** is OK if you know the descriptor's value at compile time. However, usually you find it out at run time, based on user input, data from a file or in a message sent from another program. How then can we handle such a situation, considering the header only contains the one macro **$DESCRIPTOR** to help?

Since we know the names of the structure members, they

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DEC Professional

can be accessed directly, as follows:

```
...
main()
{
        unsigned int status;
        char buffer[50];

        $DESCRIPTOR(new_desc, "");

        printf("Please enter new process name: ");
        scanf("%49s", buffer);
/*1*/ new_desc.dsc$w_length = strlen(buffer);
/*2*/ new_desc.dsc$a_pointer = buffer;

        status = sys$setprn(&new_desc);
        ...
}
```

The problem is that we have to "mess up" our code by referencing these members explicitly each time we need to construct or pull apart a descriptor. A better way must exist.

What's Missing From DESCRIP.H?

The solution involves the definition of a few more macros, so you can hide the gory details from view. The more logical you make an interface, the easier it is to read and the less chance of introducing errors each time it's used. The following are the macros I've invented to solve the problem.

$DESCALLOC allocates a descriptor with an initial length and address of zero. **$DESCINIT** lets you initialize an existing descriptor with a given string, array name or char pointer. Some system routines initialize a descriptor whose address you've passed in. To help break down the fields, the macros **$DESCGETATTR** and **$DESCUNPACK** were defined.

This program doesn't call a system service. It simply creates and initializes some descriptors and breaks them down again into null-terminated strings that C can handle more easily.

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

#define $DESCALLOC(name) struct dsc$descriptor_s \
        (name) = {0, DSC$K_DTYPE_T, DSC$K_CLASS_S, 0}

#define $DESCINIT(name, string)                  \
        ((void)((name).dsc$a_pointer = (string), \
        (name).dsc$w_length = strlen(string)))

#define $DESCGETATTR(name, addr, length)         \
        ((void)((addr) = (name).dsc$a_pointer,   \
        (length) = (name).dsc$w_length))

#define $DESCUNPACK(name, string)                          \
        ((void)(strncpy(string, (name).dsc$a_pointer,  \
        (name).dsc$w_length),                              \
        string[(name).dsc$w_length] = '\0'))

main()
{
        char name[20];
        char buffer1[20];
        char buffer2[30];
        char *ptr;
        unsigned length;

/*1*/   $DESCRIPTOR(desc1, "");

/*2*/   static $DESCALLOC(desc2);

/*3*/   $DESCINIT(desc2, "text");
        strcpy(name, "somename");
        $DESCINIT(desc2, name);

/*4*/   $DESCGETATTR(desc2, ptr, length);
        strncpy(buffer1, ptr, length);
```

Continued on page 138.

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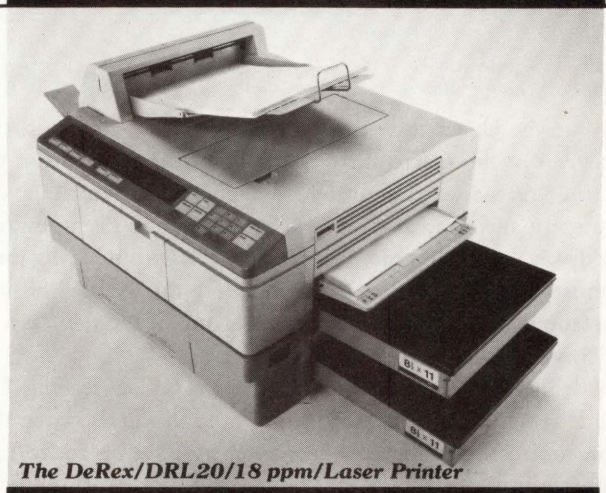

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Continued from page 137.

```
        buffer1[length] = '\0';
        printf("buffer1 = >%s<\n", buffer1);

/*5*/   $DESCUNPACK(desc2, buffer2);
        printf("buffer2 = >%s<\n", buffer2);
}

buffer1 = >somename<
buffer2 = >somename<
```

Note the clever use of the comma operator and **void** cast in several of the macro definitions. Their use lets each of the last three macros expand into **void** expressions so that they can be used in any context where such an expression is permitted. Strictly speaking, the **void** casts are unnecessary but having them eliminates any attempt to accidentally use the "value" of such expressions in a larger context. This is one of the few cases in which **void** casts can be justified.

I deliberately have spelled my macros with a leading **$**, a practice reserved by DEC for its use. I did this in the hope that these macros, or something like them, would be added to a future version of **descrip.h.** The macro source was submitted to the VAX C development group with this suggestion. Since this hasn't happened yet, it's up to you how you spell them in your code if you adopt this approach.

A More Useful Example

Many system services and VAX/VMS library routines require arguments to be passed by descriptor. One of them is SYS$FILESCAN, a routine that accepts a string supposedly containing a file specification, which it breaks into components such as node name, device, directory, and so forth.

SYS$FILESCAN does some elementary validation on the string to make sure that it contains valid characters in the right places. However, it's not foolproof. For example, it doesn't check the length of each component to see if it's too long. Read the routine's description in the VAX/VMS manual set for complete details.

```
#include <ssdef.h>
#include <descrip.h>
#include <fscndef.h>
#include <stdio.h>
#include <string.h>

#define $DESCALLOC(name) struct dsc$descriptor_s (name) = \
        { 0, DSC$K_DTYPE_T, DSC$K_CLASS_S, 0 }

#define $DESCINIT(name, string) ((name).dsc$a_pointer = (string)  \
                        (name).dsc$w_length = strlen(string))

#define PRVALUE(name, index) {                                    \
        char filespec[80];                                        \
        if (valuelist[index].fscn$w_length > 0) {                 \
                strncpy(filespec,valuelist[index].fscn$l_addr,    \
                        valuelist[index].fscn$w_length);          \
                filespec[valuelist[index].fscn$w_length] = '\0';  \
                printf("%s = %s\n", name, filespec);              \
        }                                                         \
        else                                                      \
                printf("%s was not found in string\n", name);     \
}

main()
{
        char buffer[51];
        unsigned long status;
        unsigned long flags;

        $DESCALLOC(descriptor);

        struct fscndef valuelist[] = {
                {0, FSCN$_FILESPEC,  0},
                {0, FSCN$_NODE,      0},
                {0, FSCN$_DEVICE,    0},
                {0, FSCN$_ROOT,      0},
                {0, FSCN$_DIRECTORY, 0},
                {0, FSCN$_NAME,      0},
                {0, FSCN$_TYPE,      0},
                {0, FSCN$_VERSION,   0},
                {0, 0,               0},/* list terminator */
};

while (1) {
        printf("\nEnter text with filespec (50 chars max): ");
        if (scanf(" %50[^\t\n\f\v]", buffer) == EOF)
                break;

        $DESCINIT(descriptor, buffer);
        status = sys$filescan(&descriptor, &valuelist[0], &flags);

        printf("flags = %X\n", flags);

        switch (status) {

        case SS$_NORMAL:
                PRVALUE("FILESPEC ",0);
                PRVALUE("NODE     ",1);
                PRVALUE("DEVICE   ",2);
                PRVALUE("ROOT     ",3);
                PRVALUE("DIRECTORY",4);
                PRVALUE("NAME     ",5);
                PRVALUE("TYPE     ",6);
                PRVALUE("VERSION  ",7);
                break;
        case SS$_ACCVIO:
                puts("scan failed with ACCVIO");
                break;
        case SS$_BADPARAM:
                puts("scan failed with BADPARAM");
                break;
        }
    }
}
```

The macro **PRVALUE**'s definition is large but serves its purpose, which is to hide lots of messy stuff well. Like many service routines, SYS$FILESCAN has its own header provided, namely **fscndef.h**. This header defines several structure templates and several sets of macros.

The first argument to the routine is the address of the descriptor describing the file specification string. The second is the address of the first entry in a value list. Each entry in the list is a structure of type **fscndef**, declared in the header, so the list is really an array of structures of type **struct fscndef**. The structure template is defined as follows:

```
struct fscndef {
        unsigned short int fscn$w_length;
        unsigned short int fscn$w_item_code;
        unsigned  long int fscn$l_addr;
} ;
```

Note that the member **fscn$l_addr** should have type **char ***, *not* **unsigned long int**. As defined, you get a warning if you use CC /STANDARD=PORTABLE when you assign this member to another pointer.

You create this list with as many entries as you need, initializing the second member of each using one of the **FSCN$_*** macros. These macros indicate which component of the file specification you want to extract. If that component is found, the address and length members in that entry will be initialized by SYS$FILESCAN to indicate that component was found or to zero to indicate it wasn't found. The routine doesn't make a

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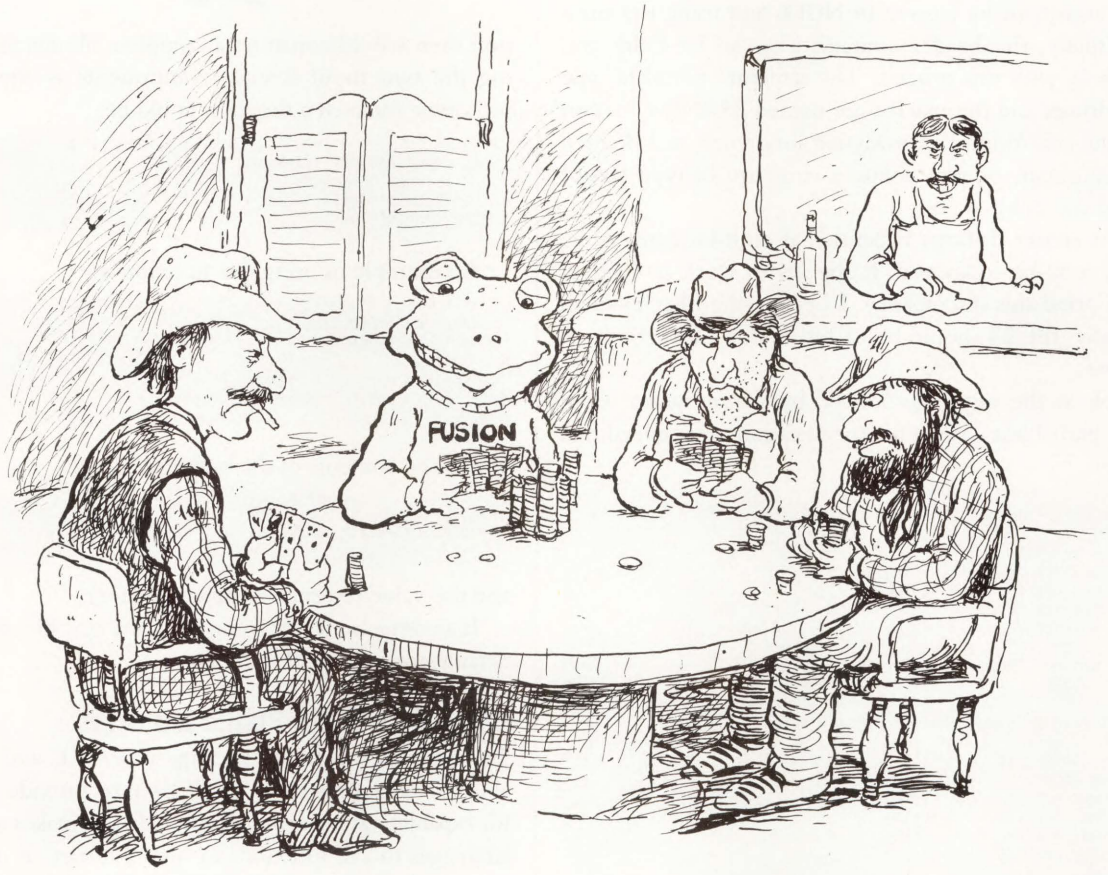

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copy of the filename string but simply returns back to you pointers into the first argument string you passed in.

The value list must be terminated with a longword containing all zero bits, and the easiest way to do this is to have two such longwords in the guise of a dummy structure.

The third argument, &flags, is optional and is an unsigned longword passed by address. It indicates which components are found in the input string and can be used independently of the value list. For example, if you only want to see which components are specified but not get the text for each, you could omit the second argument by passing in **NULL** and using the third instead. Actually, the header contains a set of bit-fields and macros to help with this process. The structure template type is **struct fldflags** and the macros are named **FSCN$M_***. You either use the macros and an unsigned longword, as I defined the third argument, or you define a structure of type **struct fldflags** and use its bit-fields.

Note that **struct fldflags** is defined as an 8-bit byte, while it should be a 32-bit longword. It appears to work as defined, but I've reported this discrepancy. I believe the filler bit-field named **fscn$v_fill_23** should be 25 bits. I don't know why it has this name.

Let's look at the output produced by this program when given some partial but correct file specifications and several that are incorrect:

```
Enter text with filespec (50 chars max): xyz;345
flags = 50
FILESPEC  = xyz;345
NODE      was not found in string
DEVICE    was not found in string
ROOT      was not found in string
DIRECTORY was not found in string
NAME      = xyz
TYPE      was not found in string
VERSION   = ;345

Enter text with filespec (50 chars max): node::.;2
flags = 71
FILESPEC  = node::.;2
NODE      = node::
DEVICE    was not found in string
ROOT      was not found in string
DIRECTORY was not found in string
NAME      was not found in string
TYPE      = .
VERSION   = ;2

Enter text with filespec (50 chars max): dev:[dir
flags = 2
FILESPEC  = dev:
NODE      was not found in string
DEVICE    = dev:
ROOT      was not found in string
DIRECTORY was not found in string
NAME      was not found in string
TYPE      was not found in string
VERSION   was not found in string
```

If an invalid character is seen, such as a space, or a component is incomplete, the scan terminates.

It's Your Turn

My example program isn't meant to do anything particularly useful except show how to set up the data structures and call such a routine. However, you easily can take this information and construct useful routines of your own. For example, you might want to pass a (valid) file specification to a function along with a set of default values for missing components. The function then would construct a complete file specification, merging the two input strings' components as appropriate. The prototype for such a function could be:

Many system services and VAX/VMS library routines require arguments to be passed by descriptor.

```
unsigned add_def_filespec(
const char *userspec,
const char *defaultspec,
char *destinspec);
```

An example of using this function is:

```
char buffer[100];
unsigned length;

length = add_def_filespec("DBA0:test",
        "DU1:[dir]temp.dat", buffer);
```

where the contents of the buffer become:

```
"DBA0:[dir]test.dat"
```

and the value returned is **strlen(buffer)**.

If a component is missing from the first file specification the default one is taken if it exists.

Using C To Write Public Libraries

To implement a library package in VAX C and make it available to other languages, you'll have to provide string descriptor capability as necessary. And while this makes it easy for other languages to call functions in such a library, it does mean that C programs doing so also must go through the motions of setting up descriptors even though they could communicate with C library routines in a more simple and efficient manner. The problem is that you hardly can justify having two versions of every library routine — one dealing with null-terminated strings, the other via string descriptors.

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

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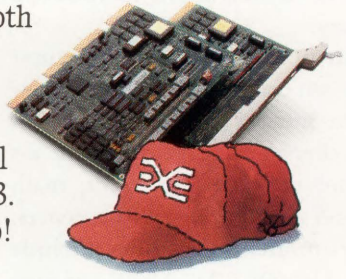

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DIGITAL WATCH

Evan Birkhead

OS/2, DEC And The Desktop

I learned an important lesson about capitalism and American entrepreneurship in high school. Two of my best friends worked at the local fried chicken joint. The first enjoyed working with the customers and piled extra french fries onto everyone's order. The second was a more reserved, professional type who saved pennies for the franchise by filling the french fry baskets half-way and stuffing the soft drink cups with crushed ice.

While you might think the first was better for business because he made customers want to return, it was the second, whose short-term fiscal strategies impressed the ownership, who was promoted to assistant manager. So much for giving people what they want.

DEC is learning a similar lesson. It's giving its desktop customers what they want and need in abundance in terms of processing and networking (see Figure 1). But the buying public currently is disinterested. DEC has the answers for integrating the desktop, including a major new suite of connectivity products featuring PCSA for OS/2, and a less expensive, feature-filled line of Tandy-manufactured Ethernet/DECwindows PCs, all of which were introduced in February.

At this point, no other computer company can claim to let unlike operating systems interact so completely. PCSA includes client and server software for transparent network file, print, mail, security and system management services. The environments it unifies include MS-DOS, Mac/OS, VMS, UNIX and now OS/2. Yet on the day these desktop products were introduced, DEC stock sank to 79.

The PCSA Strategy

OS/2, which finally is materializing as a market presence, becomes the fourth operating system in DEC's arsenal. PCSA, which is a layer built on DECnet, was designed to let PC users achieve a higher level of network integration (see Figure 2). The top layer, Network Application Support (NAS), is DEC's set of software programs for integrating operating systems from diverse vendors across a distributed environment. It has Application Programming Interfaces for four types of services:

1. Application access.
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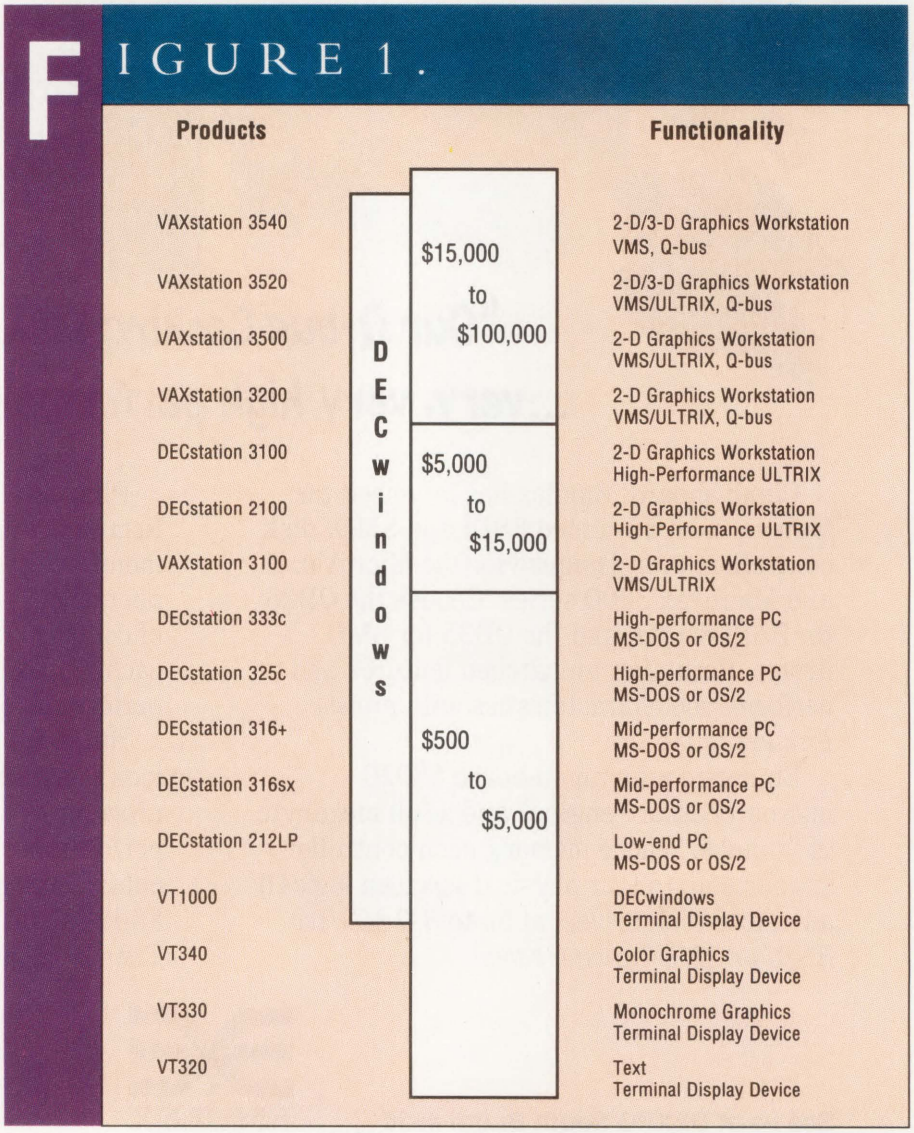
3. Resource sharing services.

FIGURE 1.



DEC's desktop lineup of workstations, PCs and terminals.

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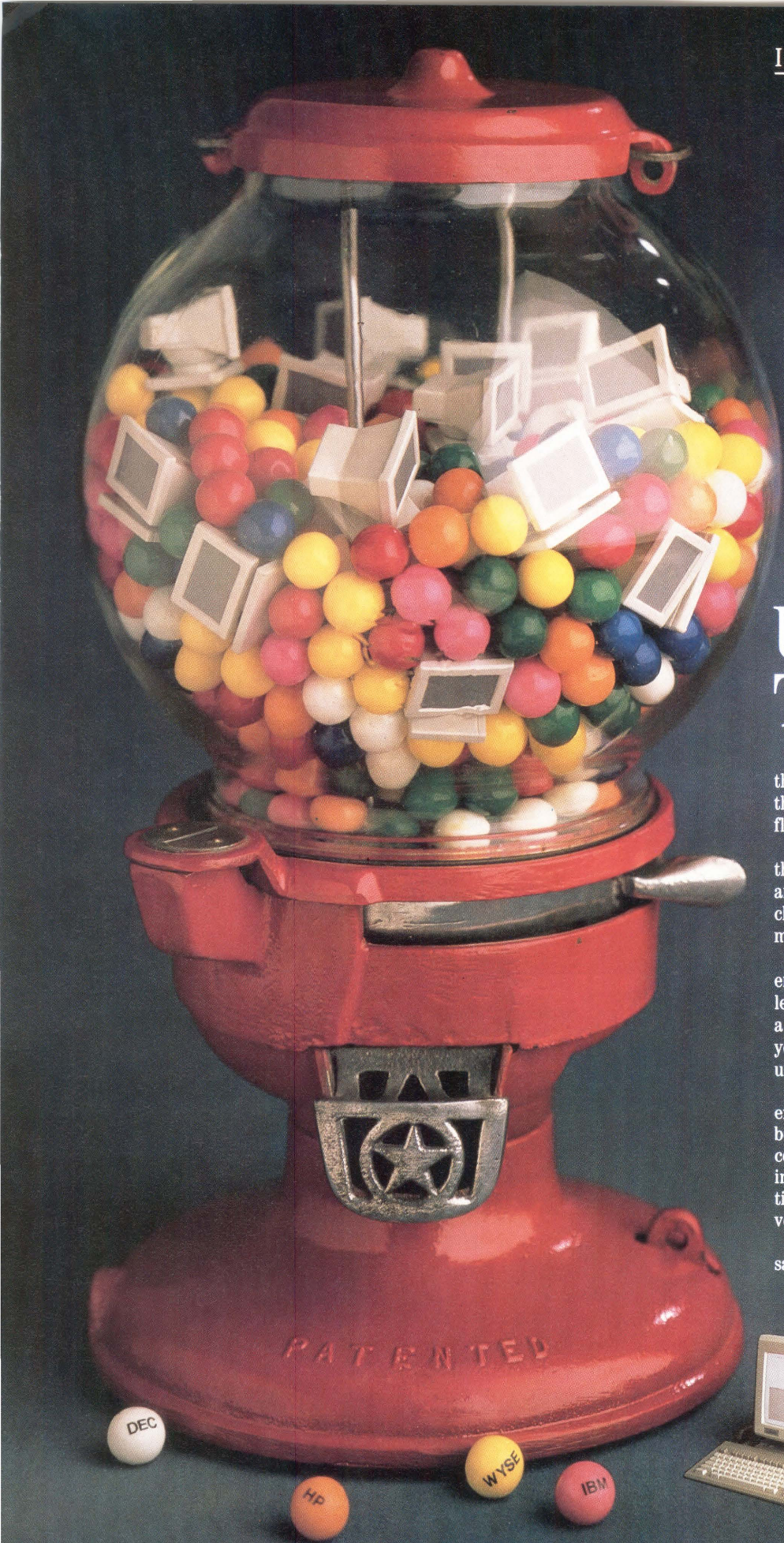

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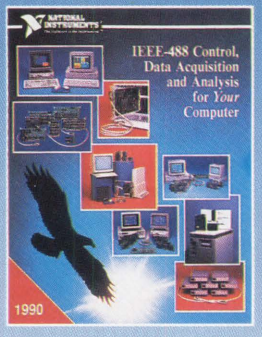

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FIGURE 2.

Product	Description	Pricing Schedule
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PCLAN/Server 316	PCSA server based on DECstation 316+, with 8 to 16 MB of system memory, DEPCA 8-bit Ethernet adapter for PC/XT and PC/AT and a 170-MB disk drive. Includes OS/2 V1.1 and PCSA for OS/2 software and documentation.	$10,215
PCLAN/Server 333	PCSA server based on the DECstation 333c. Same configuration as PCLAN/Server 316 available, but with 33-MHz clock.	$12,360
PCLAN/Server 3100	MicroVAX-based PCLAN/Server with VMS Services for PC V3.0 and DECnet PCSA Client for DOS V3.0, which supports DECnet. Features extendable memory (8 to 32 MB), VT320 console, TZ30 tape backup and improved file server performance.	With 104-MB disk: $12,500 With 312-MB disk: $15,500
DEMCA	Digital Ethernet Microchannel Adapter, a 16-bit Ethernet controller card that supports the Microchannel (IBM PS/2 and compatibles). The NDIS-compatible DEMCA comes with device drivers for use with DECnet for OS/2, DECnet PCSA Client for DOS and PCSA for OS/2.	$495

DEC's new PC integration products.

FIGURE 3.

DECstation Model	Processor	Speed	Operating System	Total XT/AT Expansion Slots	Base Price/ Preconfigured Price*
212LP	Intel 286	12 MHz	MS-DOS	3	$1,110 / $3,040
316sx	Intel 386sx	16 MHz	MS-DOS	3	$1,575 / $3,915
316+	Intel 386	16 MHz	MS-DOS	6	$2,095 / $5,005
325c	Intel 386	25 MHz	MS-DOS or OS/2	6	$3,570 / $9,515
333c	Intel 386	33 MHz	OS/2	6	$4,240 / $11,100

*Preconfigured price includes IDE or SCSI hard disk, up to 8 MB memory expansion and 101-key keyboard.

DEC's new line of Tandy-manufactured PCs.

4. Operating system services.

Although much of NAS is yet undefined, it uses toolkits, libraries and other products based on industry-standard software. DEC explains that OS/2 will eventually fit into the NAS scheme with services such as access to remote relational databases using SQL and the exchange of X.400 e-mail systems.

PCSA for OS/2 takes DECnet integration one step further than DECnet for OS/2, which was introduced at the end of 1989. Using the Microsoft LAN Manager (MS-Net) platform and designed with help from Microsoft, PCSA for OS/2 enables OS/2 systems to be used as clients or servers on the DECnet. The client allows transparent access to disk, file and print services over DECnet, while

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- Optional graphics board. Tektronix 4010/4014 compatible.
- Optional data comm. board. RS422/RS423 board (VS-230E). DEC423 board (VS-230E). RS232C board (VS-320). 20mA current loop.
- VS 230E standard is RS232C.
- VS 320 standard is RS422/RS423.

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1-2-3 Meets VAX

DEC And Lotus Team Up — There are two schools of thought regarding Lotus Development's recent announcement of a VAX/VMS version of its renowned 1-2-3 spreadsheet. Some industry gurus contend that Lotus is crashing the nonpersonal computer spreadsheet market needlessly, while others predict the alliance will provide a boost to an otherwise overlooked segment of the spreadsheet market.

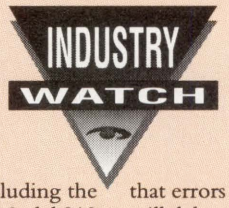
The announcement was a bit of a spectacle, telecast from Boston in March to 177 sites worldwide. What viewers saw was the result of a joint two-year development and marketing project between Lotus and DEC that will provide a version of 1-2-3 for VAX/VMS and version of 1-2-3 for ALL-IN-1.

Based on Lotus 1-2-3 V3.0, both releases incorporate 3-D worksheets, external data access, file sharing, file linking, enhanced graphics and on-sheet relational database capabilities. Lotus 1-2-3 for VAX/VMS lets VT and VAXstation users access 1- 2-3 and offers PC users access to VAX services. It also fully supports DEC's Network Application Support (NAS) services by taking advantage of VAX/VMS to offer cross-platform file and data sharing, enhanced security and access to corporate data.

Some new wrinkles include Lotus' DataLens technology, which lets you integrate data through VAX/SQL Services for Rdb, and built-in support for multiple languages, including French, German and Italian.

Lotus 1-2-3 for VAX/VMS doesn't run on ULTRIX, nor are there plans to connect Lotus users to Access Technology's 20/20 spreadsheet, the current leading VAX/VMS spreadsheet on the market.

Vive la DEC! — DEC's choice of Paris as the setting to announce the addition of fault-tolerant technology to the VAX product line may be more than mildly interesting. Apparently, DEC has decided to crack open the '90s with a determined marketing effort overseas, in part to capitalize on recent political developments in Europe. According to DEC spokesperson Mark Steinkrauss, more than 55 percent of the company's business during the last quarter was done overseas, with European sales a "major contributor" to DEC's coffers.



As for the announcement, DEC released the first industrywide fault-tolerant system that runs a mainstream operating environment, VMS. The VAX 3000ft is also the first fault-tolerant system in which every component, including the backplane, is mirrored. In addition, DEC announced the Model 310 Entry System and the Model 310 Expanded System disk storage options and the TF70 tape drive.

New developments in transaction processing also were announced in Paris. VMS now contains DECdtm software, enabling data management and transaction processing systems to update multiple databases. DECdtm software is embedded in a new version of VMS, V5.4, and is supported by new releases of DEC's Rdb/VMS, DBMS and RMS. DEC's two DECtp monitors, DECintact and VAX ACMS, also have been upgraded. Both monitors now support VAX Rdb/VMS.

Care For A MicroVAX, Comrade? — DEC has wasted no time leaping into the fray in Eastern Europe. A joint-venture company formed in April establishes DEC as an early U.S. entrant in the East European high-tech sweepstakes in Hungary. DEC initially will seek to market its highly successful MicroVAX family of computers and will bide its time while the long-term financial restructuring of the fragile Hungarian economy gets under way. Joining DEC overseas are two Hungarian engineering outfits, KFKI and Smalzak. Each will share 24.5 percent of the venture's ownership, while DEC will hold 51 percent as majority owner.

ESS Expands Repair Services — Electronic Service Specialists (ESS), known primarily for its maintenance, servicing and repair of DEC-manufactured systems, announced that it will provide similar maintenance to selected models of AT&T, Fujitsu and Sun equipment. ESS will offer repair services for the Sun 350 and 360 desktop workstations, used primarily for computer-aided drafting and design applications. The company also will offer servicing for the AT&T 3B20 Model II and the Fujitsu Eagle M2351A and Super Eagle M2361A hard-disk drives.

DEC Forges X Alliance — Brooktree and DEC have agreed to develop a family of IC components that support the X standard. The Brooktree/DEC team will work to improve X workstation performance in displaying multiple applications requiring different visual models. The hardware architecture developed by the two companies will provide low- and high-end graphics products, offer direct hardware support for X, reduce required software implementation and generate an increase in graphics performance.

VAX Woes — DEC's inability to correct technical problems on the VAX 9000 may stall initial deliveries. DEC maintains that the technical snafus are easily corrected and won't affect early shipping, but industry sources say that errors in the entry-level Model 210's vector processing addition will delay deliveries. Though the Model 210s were scheduled to ship in April, the larger models are targeted for release in July to coincide with the start of DEC's 1991 fiscal year.

—Brian O'Connell, East Coast Editor

the server runs on any OS/2-based machine. All told, these programs allow OS/2 systems to communicate with:

1. A VMS server running VMS Services for PCs.
2. Other OS/2 systems running PCSA for OS/2.
3. MS-DOS clients running DECnet PCSA Client for DOS.

DEC also introduced packaged LAN servers based on Tandy PCs and MicroVAXs configured with the OS/2 software and license. The newest series of Tandy systems were repriced and optimized for networked workgroups running OS/2 applications (see Figure 3). A $495 DEMCA Ethernet controller adapter card for the PS/2's Microchannel accompanied a price slash on DOS clients from $250 to $195. DEC also published its current library of PC options and PC networking options and accessories, which has grown into a fairly impressive list.

Desktop Futures

Surprisingly, DEC allotted time during the announcement to outline its desktop networking plans for the rest of the year. In a nutshell, you can expect a further expansion of the existing client/server solutions involving DEC's PC user base, which desktop manager John Rose said now encompasses more than 300,000 integrated PCs. The company is currently developing:

1. PCSA for ULTRIX on VAX and RISC platforms.
2. TCP/IP connectivity for its DOS and OS/2 machines.
3. PCSA support for the EISA and Intel 486 processor standards.
4. Support for an emerging standard developed by 3Com and Microsoft, called

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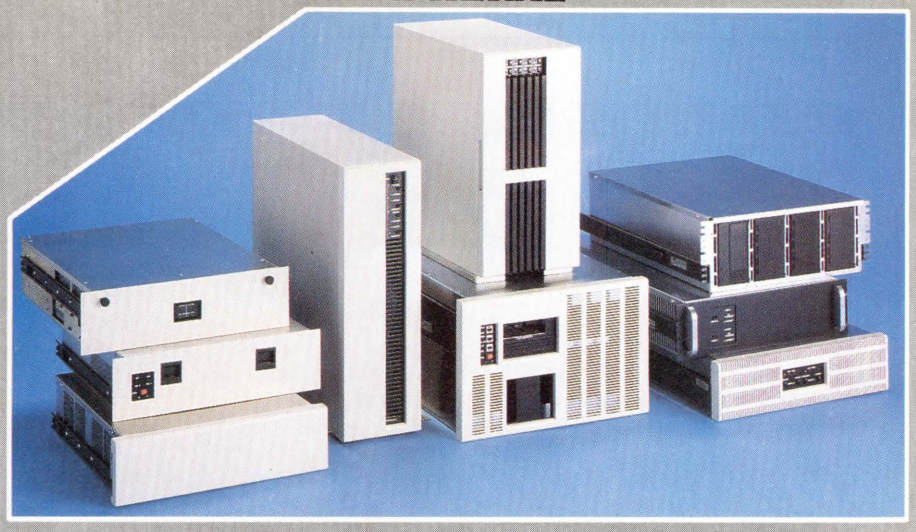

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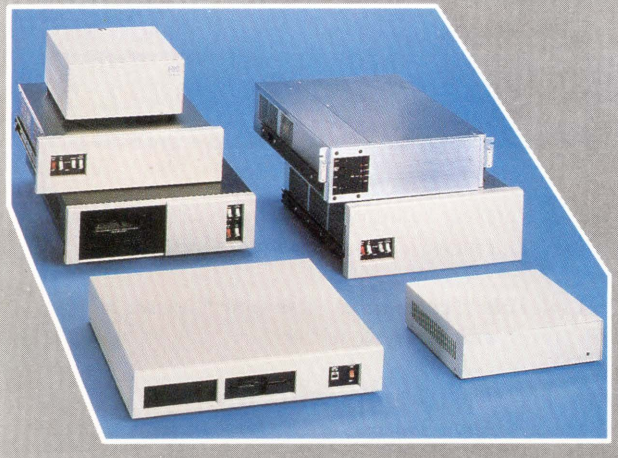

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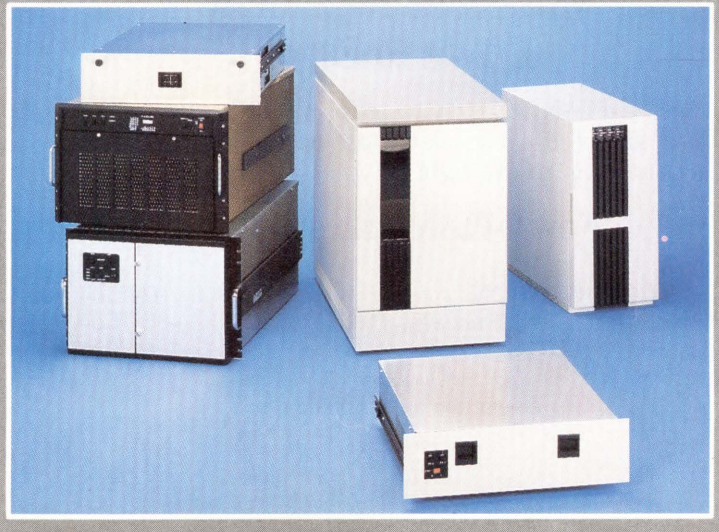

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National Data Interchange Standard (NDIS), across all of its PC clients.

5. Extensions to the PCSA base.

6. Client/server software for Mac integration. This includes networking connectivity (AppleTalk for VMS and an AppleTalk-to-DECnet gateway), file sharing services, CDA and DDIF converters, print services, database access, VT emulation, a Mac-based X server, e-mail and ALL-IN-1 client software.

DEC's distributors were uncharacteristically enthusiastic. James Sommer, president of Trilogic, said, "With DEC's strengths in networking and its commitment to PC integration, it has begun to leapfrog the competition." Roy Vallee, president of Hamilton/Avnet Computer, said, "The network architecture along with the new desktop products position DEC as the preferred enterprisewide computer supplier."

DEC's positioning itself as a PC-to-Ethernet networking vendor rather than a PC vendor is a good idea. "You have to supply users on the desk with what they want," said DEC president Ken Olsen. "Some only need a terminal. Others need more." In this case, DEC should keep the french fries coming. ■

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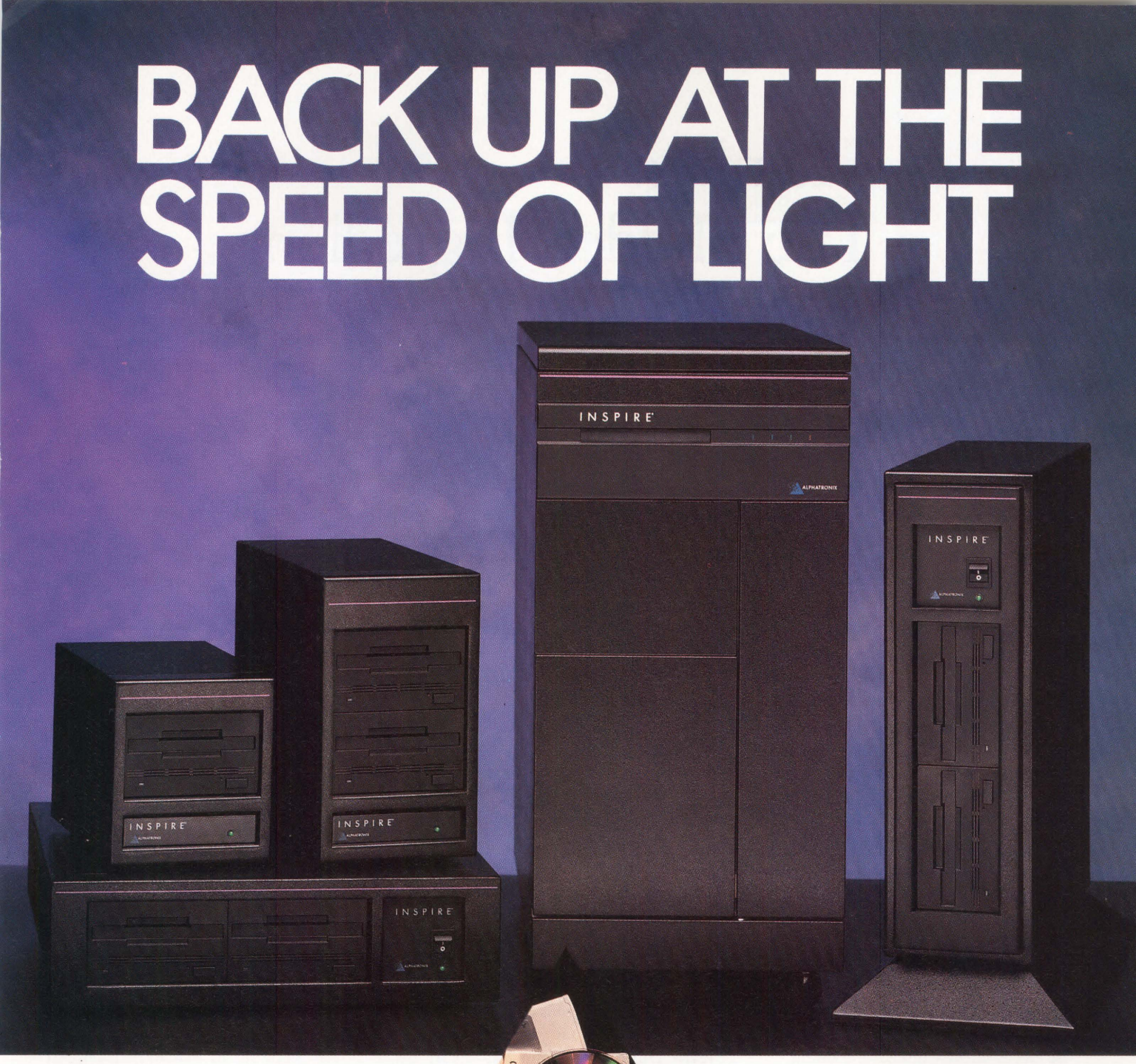

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FIELD SERVICE

Ron Levine

Training: The Hidden Ingredient

The success of a field service program, whether obtained from an outside vendor or in-house, is directly related to how well the FEs are trained. Computer hardware quickly becomes obsolete and is replaced constantly with newer, more complex units. Software is continually upgraded. Add data communications and networks connecting unlike components from an array of manufacturers, and just keeping up with the technology can become a full-time job.

What users expect from their field service providers has changed from mere "fix-it" capabilities to complete support. Applications solutions, consulting on equipment purchases and overall system support may play as big a part in the service picture as the maintenance and repair of hardware. The role of field service has been redefined. And comprehensive training on a continual basis is the hidden ingredient necessary to establish a first-rate service organization.

FEs require top-notch training to meet customers' expectations. Service quality plays a vital role in the user's rating of system performance, and service quality is directly linked to training.

Teaching The FEs

The bigger service companies train their FEs through in-house schools, some of which are very large and operate in universitylike settings. Most have fully equipped laboratories, large libraries and experienced staff. Their curriculum includes all the technical courses an FE requires to service the company's products. Nontechnical courses may be offered to teach writing skills, sales and marketing techniques, public relations and other business-oriented subjects.

But what if you're a smaller service company or self-maintainer needing outside help to train your FEs? Where do you go for the advanced training required by your senior people? And if you're building a field service force for the first time, where do you go to get introductory courses for those new to the business?

Community colleges, private technical schools and computer industry schools are the main sources for obtaining competent training at various levels. These sources can be augmented by workshops and seminars offered by universities, computer manufacturers and industry consultants.

College Bound

For the novice FE, many two-year colleges offer associate degrees in computer maintenance and repair. These programs usually teach basic electronics the first year and then go on to cover computer servicing. Most emphasize microcomputer and minicomputer maintenance, including peripherals. A few also cover mainframes and nontechnical aspects of the service business.

Students get hands-on experience as well as classroom instruction. They may learn troubleshooting and repair by maintaining the college's computer laboratory equipment. Troubleshooting is at the unit and module levels in some institutions and at the chip and component levels at others. Students learn to operate such standard test tools as the oscilloscope, logic analyzer, multimeter, disk-drive tester/exerciser and breakout box. Instruction includes using and interpreting diagnostics.

Private Schools

For those interested in learning the basics of computer theory and operation and the essentials of maintenance and repair in less time, a private technical school may be ideal. These institutes teach general electronic theory, how to read and interpret logic prints, basic programming and general computer systems maintenance. Usually, they don't teach nontechnical and business-oriented subjects.

At these private schools, you can receive a good education in the basics. This can serve as an entry-level platform in the service profession or as a background for an in-house school. Some technical schools have many training locations and are easily accessible if you're near a major city.

Industrial Education

There are two types of computer industry schools: in-house company training centers open to selected outside students; and schools set up specifically for offering computer training to the industry in general.

If you have a background in electronics and computer system maintenance and programming, the training offered at either type of facility is ideal for learning DEC systems service. Those with DEC systems experience will find advanced courses to improve their skills.

An example of the first is Digital Equipment Training Centers. DEC's in-house company schools are open to selected customers and self-maintainers who want instruction in field service and other kinds of support. Here, outside FEs receive the same training as, and sit side by side with, DEC's FEs.

The second type is exemplified by independents that offer training to anyone. Recently, I visited TRW's Technical Training Center in Fredericksburg, Virginia, and Electronic Service Specialists Ltd.'s (ESS) Training Center in

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Menomonee Falls, Wisconsin. Both specialize in DEC hardware and software training.

Computer industry schools offer a pleasant classroom atmosphere and hands-on laboratories with later models of the hardware and software found in the field. The courses are compact, increasing student motivation and making it easier to attain goals. The tools and test equipment are the same as those at field sites.

Classroom and lab time are equally divided, with excellent student-instructor and student-equipment ratios. Most of the instructors I met are ex-FEs who can describe their experiences to the students.

TRW's training center was built from the ground up as a training center. Courses are aimed at users who maintain their own DEC computers and DEC-related peripherals and at FEs working for independent service vendors. There are also software courses for systems managers and others who need in-depth technical knowledge.

The facility includes 11 classrooms, two computer laboratories and two terminal laboratories. The training curriculum comprises 28 hardware and 15 software courses, with most courses running three to 10 days. Class size is held to a maximum of 16 students for software courses and usually four to eight students for hardware courses. Hardware class size is course-dependent, with a maximum of three students per CPU. Instructors have an average of 10 or more years of instruction and field service experience. In 1989, more than 1,000 students attended TRW's training center.

ESS has major training facilities in Menomonee Falls, Wisconsin, and Camarillo, California. The curriculum covers almost all of DEC's computer families, including the PDP series, the VAX 6000 and 8000 series, and the MicroVAX series. Sun and UNIX courses are under development. The courses are aimed at third-party maintenance providers and users who maintain their own DEC computers and related peripherals.

The Menomonee Falls facility includes five classrooms and two fully equipped computer laboratories. The Camarillo site has four classrooms and one computer laboratory. Most courses range between five and 10 days. Class size is held to a maximum of six. A ratio of three students per machine or one student per terminal is maintained. Instructors have an average of eight or more years of experience in the computer industry. In 1989, more than 500 students attended ESS training centers.

THERE ARE MANY OTHER sources of technical training, such as seminars and workshops offered by universities, private training firms, user groups, technical organizations, consultants, and hardware and software manufacturers. These usually run from one to three days and are offered at various locations nationwide. It may be advantageous to put your company on the mailing lists of these training providers.

Others provide self-paced instruction via video and computer-aided instruction media. These too are offered nationwide.

And don't forget the training available from DEC. DEC provides classroom and lab training at its training centers or on-site. Seminars are given in selected cities across the U.S. Self-paced computer-, video- or text-based courses are also available. ■

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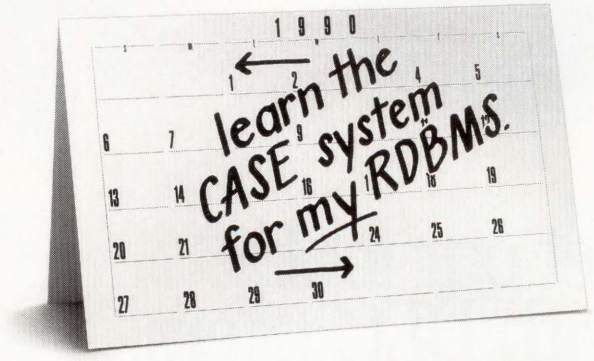

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WORKSTATIONS

David W. Bynon

UNIX, The Desktop Contender

The best workstation for an application isn't always the one with the highest mips rating, as many vendors would have us believe. Power is important, but more often than not the direct value of a workstation is its ability to get a job done effectively. The best workstation is one that can accomplish the work to a satisfactory level for the least amount of money. If you subscribe to this theory, you know that finding a best-fit solution requires variety.

In January, I attended UniForum in Washington, D.C. After two days of looking at UNIX and open-systems products, I wondered if there's a future for VAX workstations and VMS on the desktop. Virtually every major computer manufacturer and software development firm had a booth at this show and were showing what they could do with their hardware or software under UNIX.

DEC's booth was one of the largest, with more than 20 demonstration systems. Not one of them was running VMS. This leads me to ask, what role do VAXstations and VMS play? Is there a technical advantage to VMS? If not, why are customers buying VAXstations?

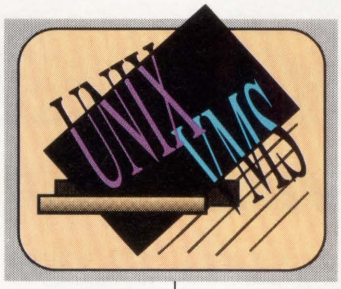
Who Buys VAXstations?

VAXstations sell to customers with VAX/VMS systems in place. Most VAXstations are networked or clustered, not standalone. This is part of the lure. If you have an existing VAX system acting as a server, you literally can take a VAXstation from its box, put it on a desktop and have it running in 15 minutes. This is a technical advantage, but UNIX file servers with TCP/IP and NFS provide a similar service for UNIX workstations. Most UNIX workstations are plug-and-play compatible.

Using DEC's VMS/ULTRIX Connection product, VAX/VMS systems can communicate with and file serve UNIX workstations. Other VMS network add-ons, such as Fusion by Network Research and WIN/TCP by The Wollongong Group, provide TCP/IP and NFS support with additional functionality. With these products, you can have the best of both worlds. NFS and TCP/IP permit resource sharing, networking and file access among VMS servers and UNIX clients.

The technical advantages the VAXstation has in the connectivity arena are the ability to remote boot, operate as a diskless system and share CPU resources through batch queues. For the UNIX workstation user, these capabilities have little significance. The X Window System lets you take advantage of other CPUs in the network, and a diskless workstation isn't worth having.

Do VAXstations have a performance advantage? Even within DEC's own family of workstations, it doesn't take a statistician to see that the 3.8-mip VAXstation 3100 Model 38 is outgunned by the 10-mip DECstation 2100 for the same price. The only way you're likely to see a price/performance advantage with a VAXstation is if DEC replaces the VAXstation 3100 CVAX CPU with the newer CVAX-II CPU and doesn't raise the price. This would result in a VAXstation with eight to 10 mips. The CPU should change, but I doubt the price will remain.



The shame is that DEC has a potent VAXstation CPU now. The VAXstation 3540, a 10-mip, 4-CVAX-processor, Q-bus workstation, is a nice system for 3-D CAD/CAM applications. But, the $48,000 price tag, before adding memory, disks or tapes, is difficult to justify.

Worth Of A VAX Mip

One VMS technical advantage we shouldn't overlook is the VMS user interface and VMS software. It's long been said that a VAX mip is worth more than other CPU mips because VMS is so much better than other operating systems. No doubt, DCL and the VMS utilities are superior to their UNIX shell and utilities counterparts. Consistency, ease of use and good documentation are the biggest factors.

Still, most UNIX programmers and power users will argue that the UNIX shell (Bourne or C) is superior to DCL. The UNIX shell has the ability to redirect standard input and output easily, whereas DCL is limited in this respect. This ability was fundamentally necessary for UNIX because of its initial application as a text processing system. Often, more than one program must be run to prepare a document's final output. The ability to pipe the output of one program to the input of another is very useful in this environment.

Unfortunately, the strengths of UNIX often are overshadowed by a single weakness. For most users, UNIX commands are terse and wildly named. For instance, what does **cat** (the UNIX equivalent of APPEND and TYPE) have to do with files, and how do you relate a command such as **nohup** (the UNIX equivalent of SUBMIT) with batch jobs? DCL commands, on the other hand, are English-

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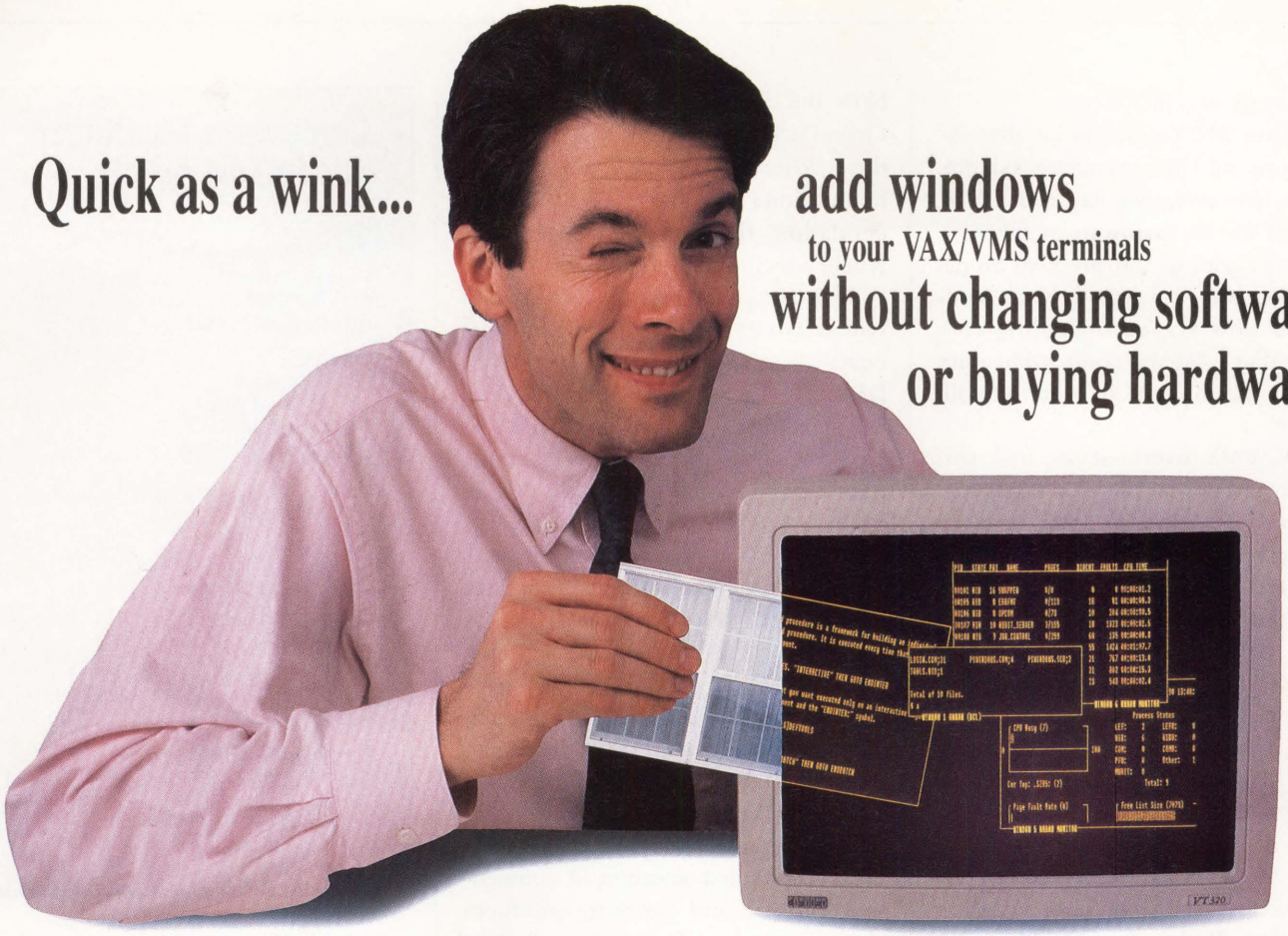

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like and easy to remember.

Another UNIX problem involves the variations of the operating system. Vendors have their own flavors of UNIX, modified for the hardware it supports. The worst part of this problem comes when you want to upgrade your hardware. Unless you're upgrading to a system that's binary-compatible with your old system, you can write off your software.

VAX/VMS users never had this problem and never will. You know that when you buy any VAXstation, your software will run without modification.

Other VMS advantages are less clear. With the emphasis on X Window System graphical user interfaces (GUI), there are few complaints about the usability of UNIX. The advantages of UNIX, such as the cost and availability of UNIX workstations and software, are beginning to show.

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If you break the price of a VAXstation system into its components, the software costs about $3,000. You get VMS, DECnet, VAXcluster software and DECwindows. When compared to SCO's Open Desktop, the VMS user is paying twice as much and doesn't get an RDBMS. DEC needs to cut about $1,500 from its VAXstation prices and throw in Rdb. This might be a reason to continue buying VAXstations.

In the face of its workstation competition, VMS is having a hard time competing. The number of computer manufacturers and software developers (including DEC) standing behind UNIX and open-system standards is overwhelming. This kind of support for a system brings the widest selection of competitive software and hardware products. You need look no further than MS-DOS and PC-compatible systems to see that this is true.

VMS users and advocates may not be ready to accept UNIX as their operating system. It's like settling for second best. But, consider this: If your user interface is OSF/Motif, and you have access to all of your favorite VAX applications through windows, does it really matter if your workstation is running UNIX? What really matters is that you apply the most effective solution to your application. ■

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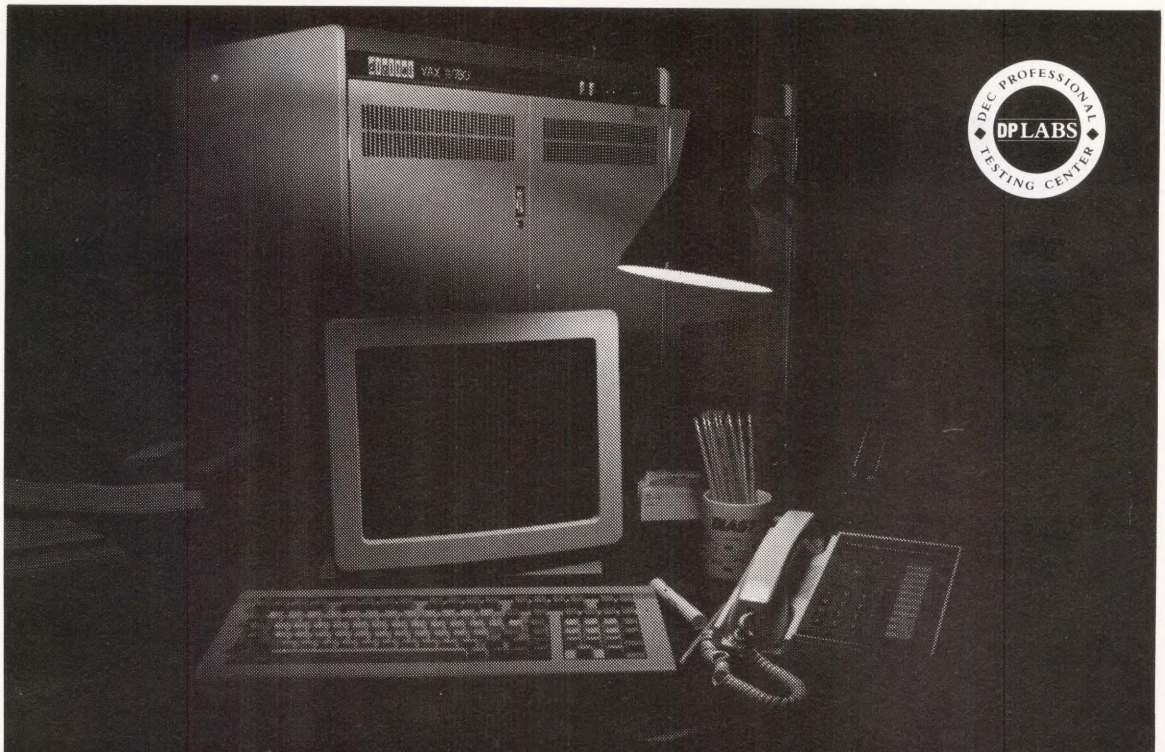

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THE MAC CONNECTION

Al Cini

DECwindows On The Mac

Not long ago, DEC's idea of user friendliness was the ubiquitous $ prompt that welcomed interactive VMS workers at dumb VTxxx terminals into DCL. During the last few years, various influences in the computer industry, including the commercial success of the Mac's Graphical User Interface (GUI), have changed this. These days, in VMS circles, user-friendly is spelled DECwindows.

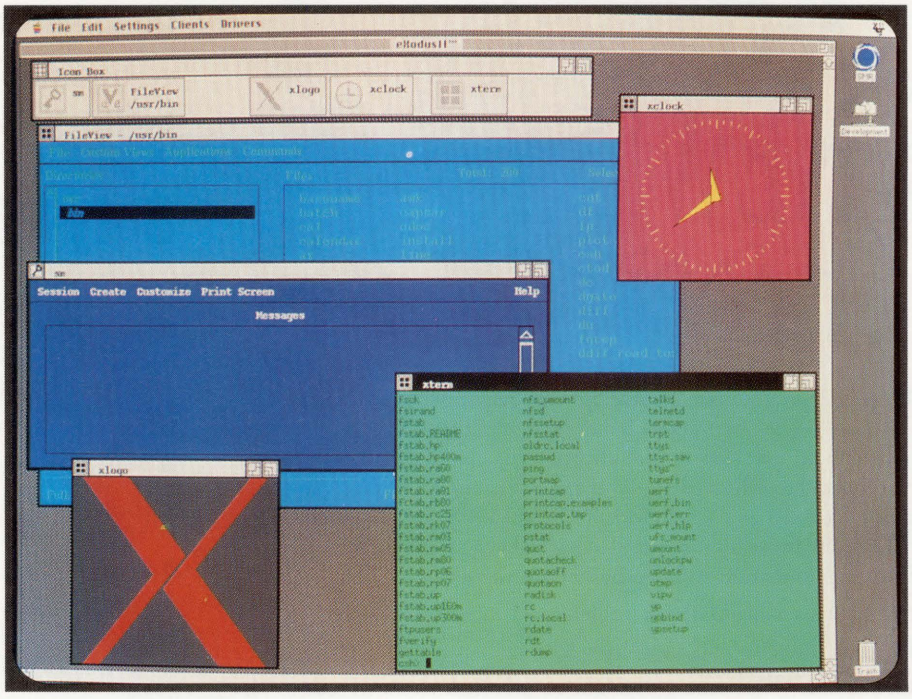
White Pine Software's eXodus is a Mac-based software product that lets a Mac user work with DECwindows software running on a host VAX/VMS system. Let's set the stage for a survey of eXodus V2.0's functional characteristics by reviewing DECwindows' basic architecture.

DECwindows Background

As with the Mac's user interface, DECwindows is a GUI that greatly simplifies the use of VAX/VMS computer software. DECwindows-based application programs display their output through logical "windows" mapped onto a bitmapped screen. As on the Mac, a DECwindows user resizes and moves windows around on the screen and controls his corresponding programs by pointing to displayed symbols (icons) and menus with a mouse.

DECwindows transcends the Mac's window experience by letting you display and manipulate windows on one computer while their corresponding application programs run on a host computer elsewhere in a network. The DECwindows software running on the display computer is referred to as a DECwindows server, and the applications running on the host computer are called DECwindows clients.

Based on MIT's X Window System V11.0 display system, DECwindows adds a stylized look and feel, which makes X easier and more consistent to use. Because DECwindows is a functional superset of X, X clients usually can be used through DECwindows servers, but DECwindows clients usually don't work very well through ordinary X display servers.



eXodus' server window.

eXodus is a DECwindows server that runs on a Mac under the Mac Operating System. It can access either DECwindows clients on VMS systems or X clients running on UNIX hosts. An eXodus server can communicate with its client using DECnet, TCP/IP or LAT protocols (see Figure 1).

Windows In Windows

When a Mac user launches the eXodus application, an empty eXodus server window appears. Later, as DECwindows client applications activated on host VMS systems connect with the Mac running the eXodus server over the network, their representative DECwindows appear within eXodus' server window. As with most Mac applications, the eXodus server window is fully scrollable and resizable. The eXodus server is compatible with Apple's Multifinder and will operate in Multifinder background mode. The latest release of eXodus, V2.0, even allows its DECwindows server window to be stretched across multiple Mac monitors.

To resolve the functional difference between the single-button Mac mouse and the three-button mouse used in X and DECwindows environments, eXodus lets you define keyboard equivalents. The Mac mouse button used alone might map to DECwindows mouse button 1, for example, while pressing the mouse button and holding down the Mac

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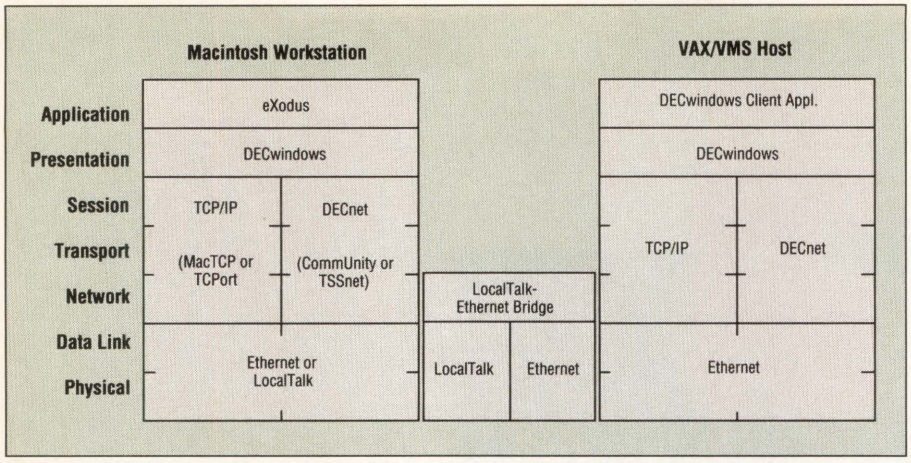

Figure 1: Network integram for eXodus. eXodus can connect to a DECwindows or X host system using either TCP/IP or DECnet protocols. For a small extra cost, White Pine Software will supply the necessary Mac communications drivers. eXodus V2.0 also supports LAT protocols, but only through an Ethernet interface on the Mac. The intermediate Bridge step in the diagram is required only for Mac systems connected via Apple's LocalTalk LAN.

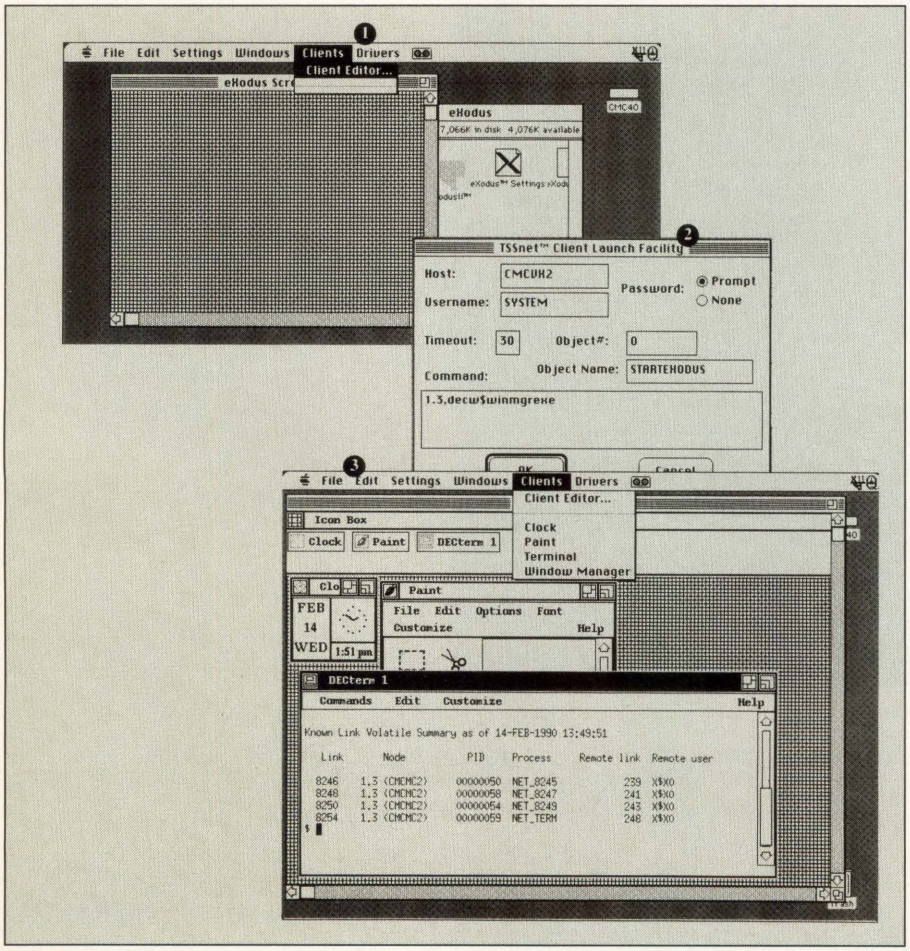

Figure 2: eXodus' client launch facility. A blank eXodus server window (1) is populated with DECwindows by first teaching it how to activate clients on a host VAX system (2), then selecting DECwindows client applications from the Clients menu (3).

keyboard's Command or Option keys might correspond to DEC mouse buttons 2 and 3. Any Mac key — used with the mouse button or alone — can be substituted for any of the three DEC mouse buttons as long as it doesn't conflict with keys needed in any of the windows applications.

A VMS-knowledgeable user can activate DECwindows client applications by logging into the host VAX using a VT terminal emulator, $DEFINing the logical name DECW$DISPLAY to translate to the DECnet address of his Mac and $RUNning a DECwindows program such as DECW$PAINT or DECW$PUZZLE.

Alternatively, an eXodus user can take advantage of the product's much simpler Client Launch capability, which starts the client applications by connecting with a supplied launch-server command procedure located on the VMS host (see Figure 2).

Version 2.0 of eXodus supports color and grayscale Mac monitors (see Screen on page 160) and provides onscreen diagnostics to help resolve client connection problems. The new release also offers integration between the Mac clipboard and X/DECwindows internal Cut Buffers, allowing you to copy and paste data between DECwindows and Mac applications.

Making The Connection

To connect with its clients, eXodus V2.0 on the Mac can use the DECnet subroutine libraries included with TSSnet (engineered by Thursby Systems and distributed by Alisa Systems), Technology Concepts' Community Mac, the TCP/IP libraries provided with Novell's TCPort, Apple's MacTCP or its recently announced LAT software for the Mac Communications Toolbox. Potential eXodus customers lacking these products can purchase the libraries from White Pine.

While the documentation states that eXodus can run on a 1-MB Mac, opening just a few DECwindows easily can require more memory. Two megabytes is a more realistic minimum-memory configuration, and any serious user will

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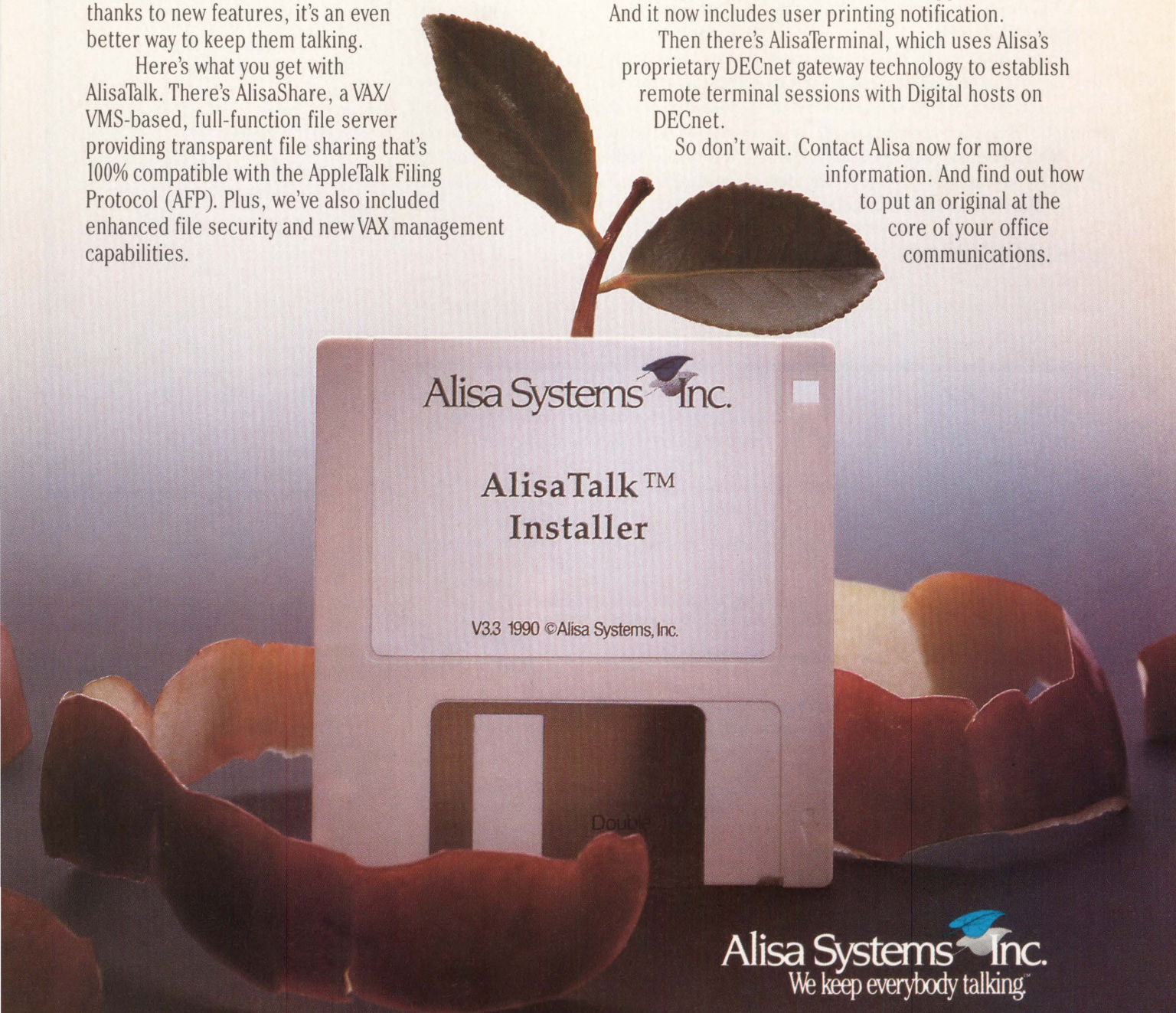

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want at least 4 MB in his eXodus-equipped Mac, especially if he intends to use it under Multifinder.

Mac systems can connect to TCP/IP networks through a direct Ethernet interface or indirectly from within an Apple LocalTalk LAN with the help of a bridge, such as Kinetics FastPath (now owned by Novell) or Cayman Systems' GatorBox. Once the TCP/IP connection is made, eXodus can serve up X from X clients on UNIX hosts in the network or DECwindows clients on TCP/IP-equipped VMS hosts.

To use Apple's LAT toolbox interface or CommUnity Mac's DECnet transport services with eXodus, the server Mac must be Ethernet-connected. With a Kinetics FastPath configured as a DECnet router, you can use TSSnet's DECnet library over LocalTalk and Ethernet.

eXodus Performance

As with most network-capable software, DECwindows performance is affected by several factors. Because the client application and server windows are running on the same machine, DECwindows on a standalone VAXstation responds almost immediately to mouse events. When DECwindows clients are started on remotely networked host systems, however, window responsiveness suffers because of networking overhead, host computer workload and network transmission speeds.

Keeping this in mind, eXodus' window server performance compares very favorably to that of a DECwindows VAXstation running clients on remote host systems but is considerably slower than that of a standalone VAXstation. Just as DECwindows users who frequently rely on applications such as DECwrite and DECpaint probably will prefer to run them locally on a VAXstation rather than from a host VAX elsewhere in their network, Mac users probably will opt to use Mac-based software such as MacWrite and MacPaint rather than DECwrite and DECpaint through eXodus.

Several eXodus V2.0 code paths have been written in assembler to improve server performance, and the product package includes a version of eXodus further optimized for advanced 68020/30 Macs. The final release of eXodus V2.0, which was scheduled for April 1990, also will include support for performance optimizations included in X Window System, Version 11, rev. 4.

The DECwindows and X cultures are different from the Mac's and will take getting used to, as will running applications on remote machines through a local windows server. Nonetheless, Mac users who want to tune into the future promised by X and DECwindows can start now with eXodus. ■

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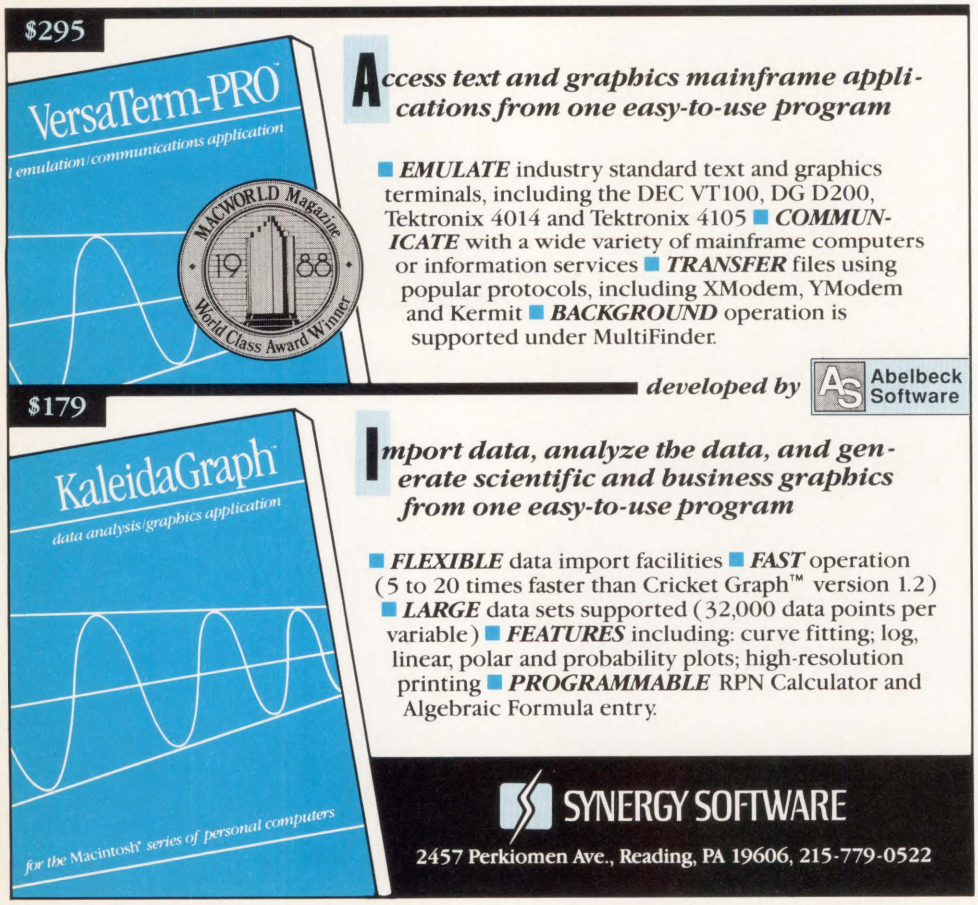

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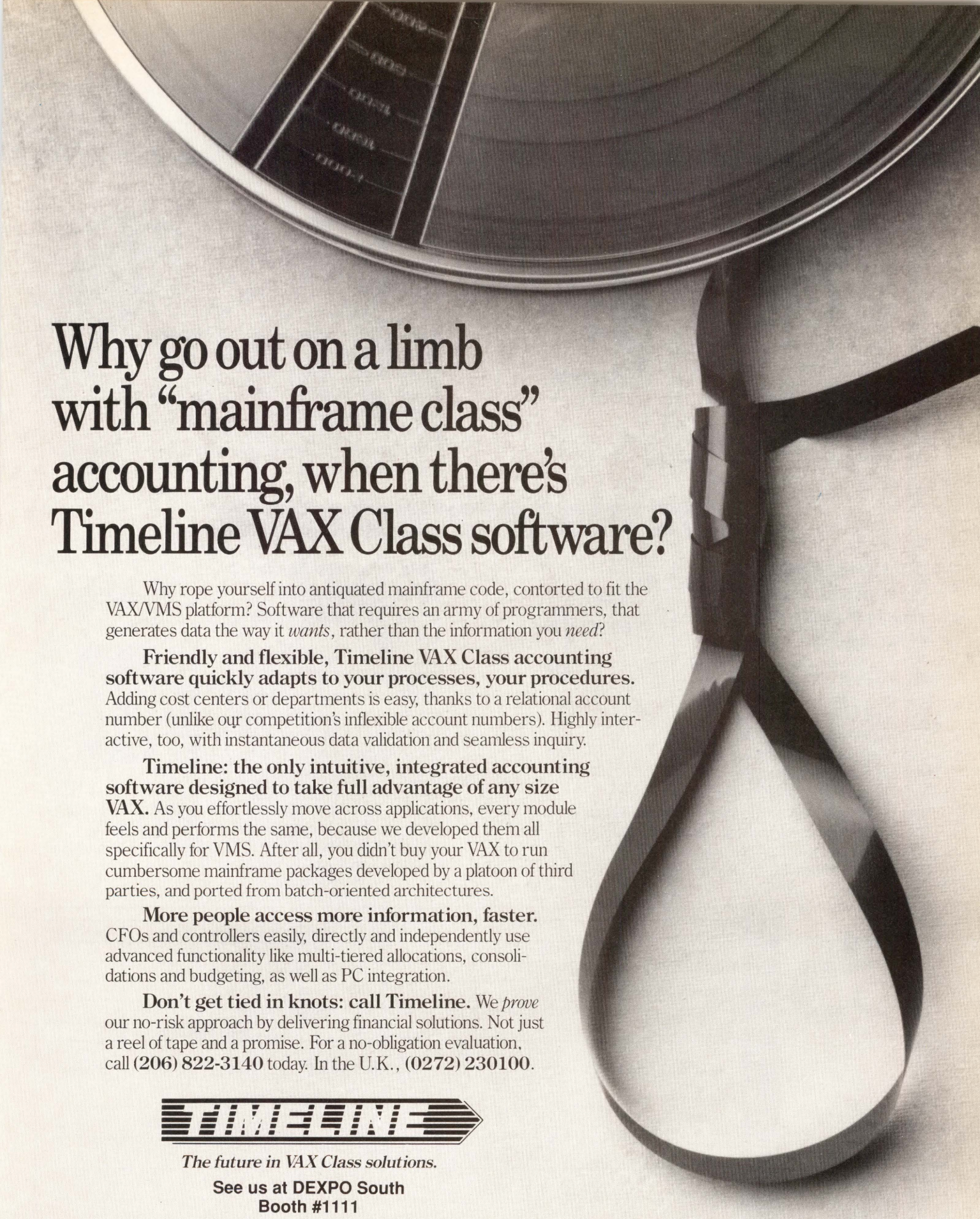

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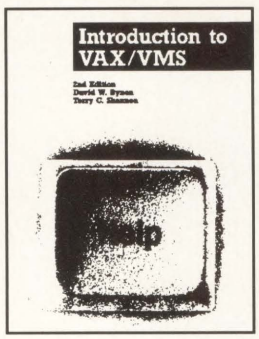
Increase Your Computing Skills With Books From Professional Press

Introduction to VAX/VMS, 2nd Edition

by David W. Bynon and Terry C. Shannon



The perfect "get started" book for computing professionals new to VAX/VMS. It covers the basics of the operating system, DCL, Files & Directories, the EDT Text Editor and much more. With easy to understand, step-by-step examples, Introduction to VAX/VMS is also a great desk reference for experienced users. Softcover, 239 pages, $29.95.

Mastering VMS

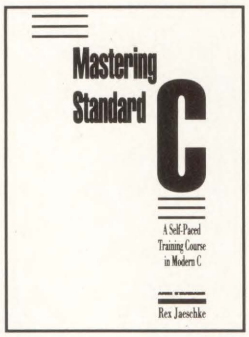
by David W. Bynon

The perfect tool for teaching intermediate-level VMS skills and a valuable desk reference for any system manager, programmer or operator who works in VMS. Includes chapters on the VAX, DECnet, VAXclusters, Utilities and Commands, Command Procedures, VMS Operational Management, System Performance Management, DECwindows and much more. Order this valuable reference now. Softcover, 465 pages, $39.95.

To order, just follow the instructions below.

Mastering Standard C — A Self-Paced Training Course in Modern C

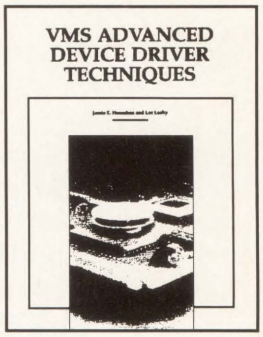
by Rex Jaeschke



World-renowned C expert Rex Jaeschke's ANSI-compliant tutorial teaches C novices and experienced users alike the latest innovations in C language. Provides detailed explanations and teaching examples on topics ranging from Arrays, Functions and Pointers to the C Preprocessor, Standard Library I/O Routines and C's Typing Mechanism. Learn Modern C the quick and easy way — with Mastering Standard C. Softcover, 366 pages, $39.95.

VMS Advanced Device Driver Techniques

by Jamie E. Hanrahan and Lee Leahy



The book for hands-on VAX/VMS pros who want to design, implement and debug device drivers. Explains simple VMS device drivers, full duplex and state machine-based drivers, VAX BI drivers, user-written ACPs and debugging techniques. Become proficient in device driver techniques from low-level building blocks to high-level design issues. Order VMS Advanced Device Driver Techniques. Softcover, 347 pages, $59.95.

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PRODUCTS

Double-Up 380 Designed For MicroVAX II, III

CMS Enhancements Inc. announced Double-Up 380, a 3 1/2-inch, 380-MB SCSI hard disk subsystem for MicroVAX II and III computers and DEC and Sun workstations.

While the standard chassis for these DEC systems accommodates only one 5 1/4-inch hard disk, the form factor of the Double-Up 380 lets you install two subsystems, thus doubling the storage capacity of your system. When used for storage of sensitive data, the subsystem can be removed from its cabinet for added security. It can be configured to be installed internally or externally.

The product is priced at $5,500.

For more information, contact Agha Mahmood, CMS Enhancements Inc., 1372 Valencia Ave., Tustin, CA 92680; (714) 259-5903.

Circle 435 on reader card

Pipeline Develops PS View For The Mac

Pipeline Associates Inc. announced its PS View PostScript previewer for the Mac. PS View is a full implementation of the PostScript language that lets you display a PostScript image on the screen or save it as a file.

As a previewer, up to six editing windows can be open at once to test, edit and debug PostScript code. The full image can fit on the screen with a single keystroke. Or, a large image can be scrolled within a smaller window. Resolution is selectable at startup. Run as a memory device, it can create bitmaps as output files. These output files can be saved as raw bitmaps or in PICT or TIFF format to be incorporated into other documents. The program comes with a LaserWriter-compatible font set.

Prices start at $495.

For more information, contact Jordan Glogau, Pipeline Associates Inc., 239 Main St., W. Orange, NJ 07052; (201) 731-7860.

Circle 431 on reader card

TSX-32 Combines Supermini And DOS Capabilities

S&H Computer Systems Inc. announced TSX-32 V2.0, a multiuser, multitasking, real-time operating system with networking capabilities. It's a supermini-quality operating system in the tradition of VMS, RSX, RT-11 and S&H's TSX-Plus. It offers high-performance execution in 32-bit protected mode and 16-bit virtual 8086 mode of the Intel 80386 and i486 processors.

TSX-32's user interface features English keyword commands and DOS-compatible file management. Text editors familiar to users of DEC, DOS and UNIX systems are available. S&H's EDIT-32 text editor, which offers gold key-style editing to users of EDT, KED and EVE, is bundled with all systems. Lotus 1-2-3, WordPerfect and dBase run efficiently and transparently with the product. The basic network server and MessageNet e-mail system are included.

A development system costs $1,450.

For more information, contact Richard Dohrmann, S&H Computer Systems Inc., 1027 17th Ave. S., Nashville, TN 37212; (615) 327-3670.

Circle 418 on reader card

Fiber Module Provides Fault-Tolerance Capabilities

Chipcom Corporation announced the LAN-to-LAN Fiber Module, a fiber module designed with 3Com for the Chipcom LAN-to-LAN MultiMedia Hub and the 3Com MultiConnect Repeater. The MultiConnect Repeater is an open platform modular multiport repeater.

The Fiber Module is compatible with Chipcom's ORnet fiber optic Ethernet products and provides fault tolerance capabilities for connection to fiber backbones. It lets network diameters extend to more than 2.5km, with up to 2km between any two Hubs or MultiConnect Repeaters. It uses ORnet repeaterless technology, thus avoiding the limitations of the four-repeater rule. Used with the ORnet Star Coupler, hundreds of Hubs or MultiConnect Repeaters can be installed on a fiber backbone. It provides cable plant redundancy and full backbone fault tolerance.

The product costs $1,095.

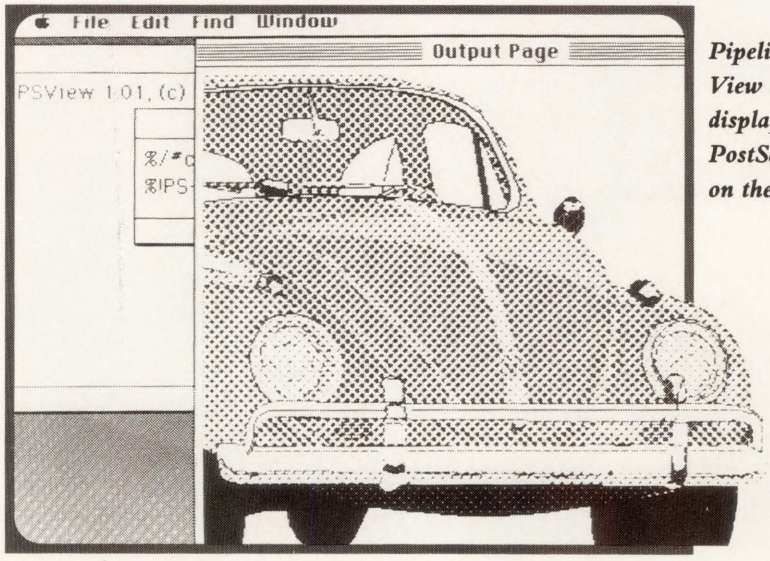
For more information, contact Pamela Herbert, Chipcom Corp., 195 Bear Hill Rd., Waltham, MA 02154; (617) 890-6844.

Circle 411 on reader card

GQL Provides Graphical Interface For Mac Users

Andyne Computing Ltd. announced Graphical Query Language (GQL) V2.0. It provides Mac users with a complete graphical interface for accessing host database information.

With GQL V2.0, Mac users can invoke the power of SQL through graphical interaction without seeing an SQL statement. Query and attribute windows have been consolidated and increased functionality has been added, including new pop-up menus for



Pipeline's PS View lets you display a PostScript image on the screen.

functions and operators, user-defined operators, and qualification diagram. User-defined buttons can be added to the data model window to allow stored queries to be issued automatically and the results sent to the results window, the clipboard or a file. The product can send stored SQL scripts. Further, the SQL for a query can be edited and saved, allowing full access to SQL features for users familiar with SQL. Each object can be colored individually, and object types can be assigned a default color. The product works with most SQL databases, including VAX Rdb and VAX RMS.

GQL costs from $295 to $1,995.

For more information, contact A. Cameron Thompson, Andyne Computing Ltd., 544 Princess St., Ste. 202, Kingston, ON K7L 1C7; (613) 548-4355.

Circle 421 on reader card

ACS Series 4000 Performs True Bridging, Routing

Advanced Computer Communications announced internetworking bridge/router software. The ACS Series 4000 hardware links remote Ethernet LANs and TCP/IP networks over high-speed point-to-point and X.25 ports. For LAN connections that require bridging and routing, it combines these functions simultaneously over the same physical link on the ACS 4100 or ACS 4400 Multiport Hardware Platform.

Unlike hybrid brouters, the Series 4000 bridge/router performs true bridging and routing services and therefore isn't restricted to proprietary protocols. It supports the full features of MAC Layer bridging and IP routing on a single platform using such industry standards as 802.1 Spanning Tree Protocol and SNMP. The hardware platform changes functionality when you invoke bridge, router or combined bridge/router application software.

The multiprotocol bridge/router and ACS 4100 Hardware Platform cost $7,500. The ACS 4400 Multiport Hardware Platform costs from $8,500 to $20,500.

For more information, contact Advanced Computer Communications, 720 Santa Barbara St., Santa Barbara, CA 93101; (805) 963-9431.

Circle 419 on reader card

XL/superCASE Links superCASE With Excelerator/RTS

Advanced Technology International Inc. (ATI) announced XL/superCASE, an interface between Index Technology's Excelerator/RTS and ATI's superCASE.

XL/superCASE provides an integrated CASE software development environment and links Excelerator/RTS, a CASE product for the analysis and design of real-time systems, and superCASE, a tool for real-time development and maintenance, including reverse engineering. Software engineers can use the PC or VAXstation environment for analysis and preliminary design using Excelerator/RTS. They can then use a smooth incremental interface to continue development from detailed design through maintenance on the VAX via superCASE. The interface generates superCASE templates and code in Ada, C, Fortran, JOVIAL, PL/1 and PLM directly from Excelerator/RTS graphs. Revisions to graphs become incremental updates in the superCASE templates and code. XL/superCASE also provides full requirements traceability from analysis to implementation and maintenance.

XL/superCASE is an option to superCASE and costs $8,500.

For more information, contact David Woods, Advanced Technology Int'l Inc., 1501 Broadway, Ste. 1314, New York, NY 10036; (212) 354-8280.

Circle 420 on reader card

LANtern Monitors Network Statistics

Novell Inc. announced LANtern, a remote network monitor that uses SNMP. Designed for Ethernet networks, it's available for OEMs that will add a user interface to let LANtern-generated network data appear on network management consoles.

LANtern hardware and software continuously monitors network statistics. LANtern acts as a network characterization tool, tracking use and traffic patterns on the network. Attached directly to a network segment, it feeds information to a network management console, tracking network activity and alerting network administrators to cabling malfunctions, network problems and changes in network statistics. SNMP compatibility lets you choose management consoles now that will support network management systems in the future. System software can be updated, ensuring compatibility with evolving SNMP specifications. The product can be integrated into large networks without conflicting with standards-based gateways and routers.

LANtern costs $4,495.

For more information, contact Donna Keel-

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ing, Novell Inc., 122 E. 1700 S., Provo, UT 84606; (801) 379-5900.

Circle 459 on reader card

FOR_STRUCT Reconditions Spaghetti FORTRAN Code

Cobalt Blue announced FOR_STRUCT V1.0, a comprehensive structuring utility that transforms spaghetti FORTRAN-IV and FORTRAN-77 into fully structured code, with or without VAX and FORTRAN-8X extensions.

FOR_STRUCT replaces goto and if-goto combinations with if-then-else, do-while and do-enddos and offers style control switches to allow visual customization of the structured code. Original programming logic is left intact, dead code segments can be removed optionally during structuring, and there's no duplication of original code. Three levels of structuring are offered: to FORTRAN-77; to FORTRAN-77 with VAX do while and do endo extensions; and to VAX FORTRAN-77 with FORTRAN-8X extensions. It's available for MS-DOS, XENIX/UNIX/386, Sun-3 and Sun-4.

The Sun-3 and Sun-4 versions cost $1,350, the XENIX/UNIX/386 version costs $1,150 and the MS-DOS version costs $825. For more information, contact Beverley Lightfoot, Cobalt Blue, 2940 Union Ave., Ste. C, San Jose, CA 95124; (408) 723-0474.

Circle 436 on reader card

CAPE Enhances QuickReader Data Collection

Compsee Inc. announced a new feature for its QuickReader bar code wedge that enhances data collection. Customer Application Programmable Edit (CAPE) lets you qualify the raw data record passing through the unit and define the output format of the data record.

CAPE is menu-programmable. When used for data qualification, it can specify the port from which the data record can be received, specify symbology by which the data record must be represented, specify the length of the data record and match data in the record to specific ASCII codes. For data output definition, CAPE can add data and function codes to the output record and delete data from the output record or repeat or rearrange data in the output record. It also allows for the definition of a code that when read will signal for the transmission of a secondary output format on the next input record, even if different in format than the primary output record. QuickReader is compatible with DEC, IBM and other terminals.

For more information, contact Compsee Inc., 1501 Robert J. Conlan Blvd. N.E., Ste. 280, Palm Bay, FL 32905; (407) 724-4321.

Circle 422 on reader card

Creative Consultants Offers Easymig In U.S.

Creative Consultants Ltd. announced that its Easymig software migration service is now available in the U.S.

Easymig is a service that provides automatic conversion of applications running on IBM System 36 or System 38. These applications are fully converted to VAX/VMS COBOL. Easymig provides automated conversion for RPG II, RPG III and COBOL programs as well as for screens, logical files, physical files and procedures. Under terms of

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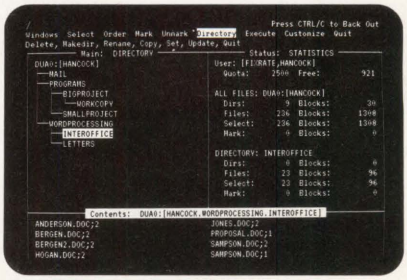

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the service, you provide a tape of the IBM application, and the company performs the conversion and produces a tape of the converted application. The company also provides a program to convert your database into one suitable for the VMS environment. The conversion is performed onsite.

Typical conversion takes from two to five months and costs from $100,000 to $500,000, depending on number of programs, screens, files and procedures.

For more information, contact Yoram Zahavi, Creative Consultants Ltd., 211 Broadway, Ste. 400, New York, NY 10004; (212) 837-7860.

Circle 423 on reader card

VAX-Alert Monitors Devices And Queues

Data Center Software announced VAX-Alert V2.0. VAX-Alert is a VAX system monitoring utility that monitors devices and queues for status values and automatically notifies specified users when these events occur. DCL commands or command files can be linked to each event monitored. The product also can terminate idle processes selectively.

V2.0 monitors the existence of predefined processes that should be running. If a specified process isn't running, the product automatically notifies specified users. The product also can exclude users from automatic log out by UIC or group.

VAX-Alert V2.0 costs from $495 to $995. For more information, contact Data Center Software, 70 Herrick St., Beverly, MA 01915; (508) 922-5500.

Circle 424 on reader card

Da Vinci Graphics Launches RasterPro 720 Plotter

Da Vinci Graphics Inc. announced the RasterPro 720 color graphics plotter. This penless plotter produces A (8 1/2 x 11 inches) and B (11 x 17 inches) size plots and is positioned as a replacement for conventional pen plotters supporting HPGL.

The plotter uses proprietary image processing technology to convert vector-based plotting specifications into an optimized raster format. Because it uses no pens, it doesn't skip, clog or smear during the plotting process. With an optional sheet feeder, it provides independent operation. It features an addressable graphics resolution of 720 dpi and a margin of error of 0.0mm. It provides four selectable line widths from 0.2mm to 1.3mm and a palette of 15 colors. It offers 180- or 360-dpi draft mode in color or monochrome. It can replot in resolution mode with a single command and no CPU involvement.

The RasterPro 720 is priced at $3,495. For more information, contact Scott Cochran, Da Vinci Graphics Inc., 870 Hermosa Dr., Sunnyvale, CA 94086; (408) 737-8800.

Circle 425 on reader card

Epoch Systems Adds Jukebox To InfiniteStorage Servers

Epoch Systems Inc. announced an erasable optical disk library unit to its family of high-capacity Epoch-1 InfiniteStorage servers. It provides online backup service, which automates backups and eliminates backup tapes, and online backing store to the server's Winchester disk drives so that magnetic disk space is always available.

The unit, manufactured for Epoch by Hitachi Ltd., handles up to 48 5 1/4-inch optical cartridges for a total capacity of 30.9 GB. The unit can be added to any existing

Epoch-1 system, including those using 5 1/4- or 12-inch WORM optical disk library units. Epoch-1 is an NFS- and TCP/IP-compatible file storage server system.

Servers incorporating the unit cost from $158,500 for the 31.7-GB Model 31B with a 30.9-GB erasable optical disk library unit and 760-MB high-speed magnetic disk drive. Additional magnetic disks ($8,000) and erasable optical library units ($65,000) can be added. The library unit comes with one drive and can be expanded to four drives at $14,000 per drive.

For more information, contact Jay Woodruff, Epoch Systems Inc., 8 Technology Dr., Westborough, MA 01581; (508) 481-3717.

Circle 426 on reader card

Fusion V3.3.7 Features Network Security Package

Network Research Corporation announced Fusion Network Software V3.3.7. It supports the TCP/IP protocol suite under VAX/VMS and SMP systems.

The release features Net-Secure, a network security utility package. It can reject TCP/IP connections from remote (network-connected) users based on network number, subnet number, host number and application (TCP, Telnet or SMTP). Access granted is based on an easily configured database. When a remote connection is attempted from the network, Net-Secure scans the security database for a matching address and determines if the connection is to be accepted or rejected. Fusion 3.3.7 uses the VMS loginout feature for network connection requests, ensuring that a remote user has a valid log in and password before providing service.

Prices range from $750 to $15,000, depending on the VAX/VMS model and system.

For more information, contact Gary Gerwin, Network Research Corp., 2380 N. Rose Ave., Oxnard, CA 93030; (805) 485-2700.

Circle 430 on reader card

Interactive Announces CASE Environment For ULTRIX

Interactive Development Environments Inc. announced Software through Pictures V4.2 for ULTRIX workstations, including the DECstation and VAXstation.

Software through Pictures is an integrated, multiuser CASE environment. Built on an open architecture, it can be extended, customized and integrated with other tools. The product includes user-modifiable configuration files, message files and templates. V4.2 uses DECwindows and provides user-extensible applications built on template-driven tools. It includes new applications such as Automatic Documentation, DoD-STD-2167 and 2167A support, and Data Dictionary Analysis. A template-driven Document Preparation System lets you generate documents on laser printers supporting PostScript and Device Independent Troff.

Single licenses cost from $5,000 to $21,000, depending on configuration.

For more information, contact Nobby Akiha, Interactive Development Environments Inc., 595 Market St., 10th Fl., San Francisco, CA 94105; (415) 543-0900.

Circle 427 on reader card

JSB MultiView DeskTop Offers ANSI Terminal Emulation

JSB Computer Systems Ltd., of Macclesfield, U.K., announced an upgraded version of its DOS/UNIX interface software, JSB Mul-

sible return from your IBM® and DEC computer investment – – but how?

The Mitek OpenConnect Systems℠ Solution

For years, Mitek OpenConnect Systems has pioneered connectivity solutions for a wide range of diverse operating environments and platforms. And now, Mitek OpenConnect Systems has a new cost-effective way to help make your AS/400, System 3X and DEC/VAX™ systems part of a full connectivity and network management solution.

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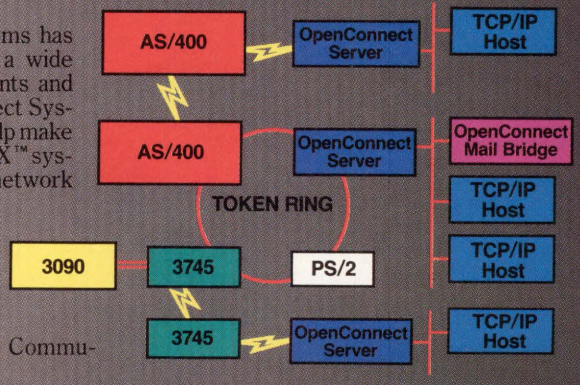

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CIRCLE 311 ON READER CARD

tiView DeskTop V1.2.

New features include X/Open ANSI terminal emulation, PC terminal scan code support, extended local area networking to include TCP/IP, and cooperation with distributed file systems via the Locus PC Interface (PCI). ANSI terminal emulation lets OEMs provide an X/Open-compliant terminal emulator for PC internetworking as defined in the X/Open Portability Guide for Networking Services. With PCI, you can reference a file system on a remote host as if it were resident on the PC. You also can execute tasks concurrently on the remote system over the PCI transport layer.

The company also announced JSB MultiView Tekterm, a support package designed to bring Tektronix terminal emulation to Microsoft Windows environments. Used in conjunction with JSB MultiView DeskTop, it supports any software product on a remote host that requires a Tektronix 4207.

For more information, contact Dorothy Goldberg, ITEM Communications, P.O. Box 124, Montclair, NJ 07042; (201) 783-1675.

Circle 428 on reader card

JAM And JAM/DBi Support VAX SQL/Services

Jyacc Inc. announced that its front-end tools, JAM and JAM/DBi, are available for VAX SQL/Services.

Using DECnet and DECnet-DOS, a JAM and JAM/DBi application running on a PC can transparently retrieve or store data residing on a VAX. The products can use all features of PCSA. JAM can exist as a PC file on the VAX and perform better than if it were residing on the PC's hard disk. Applications developed with JAM are portable across 100 hardware platforms and 10 operating systems. Its screens, control logic and data structures are used directly in applications without modification. JAM/DBi, a database interface that runs with JAM and is sold separately, links JAM's front-end development tools to the database. It accesses the JAM database through SQL and can extend the SQL capabilities by automatically mapping query results into screen fields.

The JAM and JAM/DBi development kit costs $990 on PCs running MS-DOS.

For more information, contact Andrea L. Bowers, Jyacc Inc., 116 John St., New York, NY 10038; (212) 267-7722.

Circle 429 on reader card

Accell/SQL For Informix Uses High-Performance 4GL

Unify Corporation announced Accell/SQL for Informix, an application development system designed to expand the flexibility of Informix DBMS users. Unify's Accell family of unbundled open systems-standard 4GL toolsets also supports Oracle, SCO Integra and the Unify 2000 RDBMS, with Sybase scheduled for release this year.

Access/SQL for Informix integrates a high-performance 4GL and an applications generator. The generator offers a fill-in-the-blanks approach to field and form definition, allowing you to prototype applications quickly. The product is designed to interface easily with existing Informix applications and provide programmers direct access to the Informix DBMS engine. System managers can simultaneously support character-based interfaces such as Microsoft Windows and such GUIs as Open Look and OSF/Motif.

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For more information, contact Anu Shukla, Unify Corp., 3870 Rosin Ct., Sacramento, CA 95834; (916) 920-9092.

Circle 432 on reader card

Vista In Software Converts PCs To Terminal Servers

Datability Software Systems Inc. announced a software product that turns IBM-compatible PCs into terminal servers. Vista in Software lets you use existing 80386, 80286 and 8088 PCs as terminal servers.

Using the software that runs in the company's Vista terminal server hardware, the product has been converted to run in PCs. It features all the characteristics of the Vista, so users familiar with Vista or DEC servers will find it an identical environment. It features a network protocol translation capability that lets DEC LAT terminal servers speak to TCP/IP UNIX systems and vice versa. It loads from a single floppy, so no hard disk is required on the PC. It supports standard communications ports and parallel ports on the PC. You can hang printers off the PC to attain network-based printers.

The product will be priced at about $600 for eight users. It will be available in June.

For more information, contact Leslie Schinto, Datability Software Systems Inc., 322 8th Ave., 11th Fl., New York, NY 10001; (212) 807-7800.

Circle 524 on reader card

Alantec Adds T1 Interface To Multilan Switch

Alantec announced a T1 interface module for its Multilan Switch (MLS) that links up to eight LANs to a T1 WAN connection. The T1 Interface Module (T1IM) supports standard and fractional T1 connections. The MLS, with a 50-Mbps sustained packet forwarding rate, is suited for T1 transmission speed.

MLS doesn't require a separate DSU/CSU. Fractional T1 connections let you purchase only the transmission capacity you need for LAN traffic. T1IM software controls the number of active T1 transmission channels up to a maximum of 24. The MLS supports any multiple of those channels up to the 1.544-Mbps T1 bandwidth. Additional T1IM modules can be installed in the MLS to support multiple T1 links. The interface provides the data framing required for T1 transmission. The MLS takes the data from the LAN and converts it to the transmission format for wide-area transmission of the T1 link, connecting directly to a CSU. A CSU provides the interface between the T1 medium and the MLS.

The T1IM costs $3,300. The MLS costs from $8,800.

For more information, contact Laurie Schuler, Alantec, 101 Hammond Ave., Fremont, CA 94539; (415) 770-1050.

Circle 455 on reader card

B&B Combines Graphics And Data Gathering Software

B&B Consultants Inc. announced the Integrated Supervisory Process Control software package. It combines graphics software and hardware technology with robust process data

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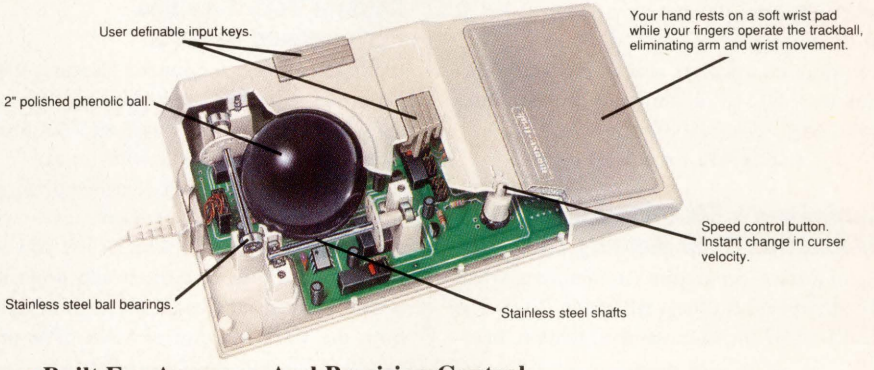

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gathering and control software.

The product consists of three integrated components: proprietary process control software, VI Corporation's DataViews graphics software, and Calcomp's CGS-4600 graphics display subsystem. Graphics interface features include 1,280 x 1,024 display resolution and a palette of up to 256 colors. It features such standard display input techniques as menus, sliders and numeric/text. It features such standard display output techniques as single or multiline trends, bar charts, tabular trends, indicator dials, digits and color and drawing dynamics. It offers a structured software design and modular coding and is portable to other platforms. It runs on the MicroVAX II or III running MicroVMS V4.7.

For more information, contact B&B Consultants Inc., 302 S. Washington St., N. Attleboro, MA 02760; (508) 695-1074.

Circle 438 on reader card

Camintonn's CMX-411D Increases VAXstation 3100 Memory To 8 MB

Camintonn Corporation announced a 4-MB daughterboard for the VAXstation 3100. The CMX-411D increases standard systems memory to 8 MB. By combining the CMX-411D with the 24-MB CMX-2411, you can achieve the the maximum 32 MB of memory on the MicroVAX 3100.

The CMX-411D is designed to mate with the entire line of Camintonn VAXstation memory products. The company offers 8-, 12-, 16- and 24-MB memory boards for the VAXstation 3100, VAXserver 3100 and MicroVAX 3100.

For more information, contact Geneva Zagarnaga, Camintonn Corp., 2332 McGaw Ave., Irvine, CA 92714; (714) 553-0247.

Circle 472 on reader card

Capture/VMS Provides Performance Reports

BGS Systems Inc. announced Capture/VMS performance and capacity planning software for VAX/VMS. It can analyze all VAX processors, including the VAX 9000 series.

Capture/VMS provides detailed performance reporting of VAX hardware use as well as user response time analysis. It lets you answer questions about current and projected system performance based on measurements from the VMS Monitor or VAX SPM performance monitor. It reads and analyzes VMS performance data and generates reports that show clusterwide and node-by-node use of hardware devices for VAXs and VAXclusters. It lets you define workloads and transactions and provides reports showing calculated throughput and response times for VAX users. It also creates a performance model to show how workloads use system components.

Pricing for VAX installations is typically from $20,000 to $40,000.

For more information, contact BGS Systems Inc., 128 Technology Cntr., Waltham, MA 02254; (617) 891-0000.

Circle 471 on reader card

Cappcomm Enhances Mail Call Electronic Messaging Software

Cappcomm Software Inc. announced Snap-In Modules to enhance the electronic messaging capabilities of its Mail Call software. Mail Call is PC software that extends ALL-IN-1 by letting PC users create, edit, address and manage their mail using the processing power of their PCs rather than that of the VAX.

The Mail-Anything module lets you send

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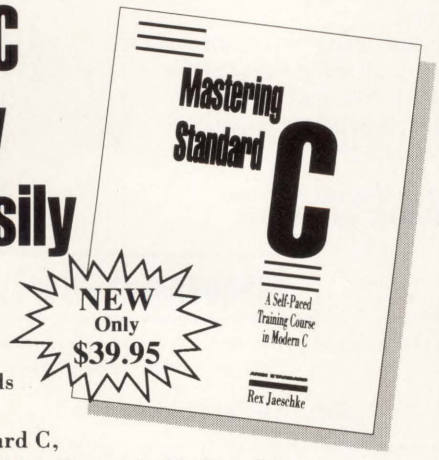

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The New Wyse WY-185. It's what you wanted from DEC.

Our new WY-185 is fully compatible with DEC's VT320. But it also gives you everything that you wanted in the VT320—and didn't get.

For example, we give you a 15 x 12 character cell for full VT320 compatibility. But Wyse also has a second mode, a 10 x 20 cell, which they don't. Amazingly, that gives the WY-185 from Wyse better resolution and better soft font compatibility with DEC's VT220 than their own VT320.

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CIRCLE 226 ON READER CARD

graphics, spreadsheets, programs and special word processor files. This transparent binary file transfer system uses the KERMIT protocol. Mail-Backgrounder provides mail exchange in the background while you do other things on your PC in the foreground. Mail-Ed is a full-function message creator. Mail-Finder lets you search, analyze or process your mail. Mail-411 provides address directory assistance from the host. It loads and validates personal addresses in batches. Mail-Housekeeper eliminates redundancy and waste in mail resources on ALL-IN-1 and your PC.
For more information, contact Cappcomm Software Inc., 26 Journal Square, Ste. 1003, Jersey City, NJ 07306; (201) 795-1500.

Circle 473 on reader card

Saiga Systems' VDM V4.0 Speeds Data Collection

Saiga Systems announced VDM V4.0. VDM is a VAX/VMS disk monitor utility that helps system managers free disk space by monitoring and flagging users who show an increase in block use.

VDM now features a flexible and faster data collection procedure. You can omit directory information collection to speed data collection and reduce the amount of disk storage required for VDM data files. Data files have been redesigned so that directory-based and UIC-based data is stored in separate files. The product also features new reports. The Capacity by Directory report lets you project disk growth by directory. The File Size report shows the allocated and used blocks for the50 largest files on each drive and summarizes the number of files and blocks by file size.

A single-CPU license costs $695; a site license costs $895.
For more information, contact Saiga Systems, 801 6th St. S.W., Ste. 215, Calgary, AB T2P 3V8; (403) 263-1151.

Circle 481 on reader card

Eigen Unveils Tuner, Defragmenter And Monitor

Eigen Corporation announced a dynamic VMS performance tuner, disk optimizer/defragmenter and security monitor.

The performance tuner changes SYSGEN parameters to optimal values and reallocates CPU and memory resources as needs change. It enhances memory by dynamically adjusting processes working sets; by dynamically adjusting VMS page caches to use free memory; and by freeing memory by purging working sets of inactive processes.

The disk optimizer/defragmenter places the oldest modified files at the end of the disk. Frequently accessed files are placed together to minimize seek areas and disk movement. The product provides online defragmentation of files to eliminate window turns and disk movement. If a file is accessed while being made contiguous, the defragmenter's activity is terminated.

The security monitor reads VMS audit alarms and performs actions defined by the security manager. It prevents users from deleting marked files and prevents access to files even to users with BYPASS privilege. It allows access to objects only if the user is granted the associated ACL and restricts access to declared data files to an executable image.
For more information, contact Eigen Corp., 82 Wall St., Ste. 1105, New York, NY 10005; (212) 749-7513.

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CIRCLE 247 ON READER CARD

Multi Soft Extends Infront Async Support

Multi Soft Inc. announced extended async communications support for its Infront cooperative processing products. Infront provides async support for peer-to-peer processing and for its software distribution and change management functions.

New capabilities extend async support to let Infront provide SAA/CUA interfaces for any existing applications that use VT220 or 3101 terminals or emulation. These front-end programs can be built with no changes to the host applications. Because Infront applications are independent of the communications path, applications can support async and 3270-based links with no changes in the PC code. With extended async support, users can communicate to hosts through VAXs, IBM Series 1 machines and Information Network, and any packet-switched networks. The support is provided through a HLLAPI/async interface that also provides access to the DEC terminal server, VT220 emulation through the IBM 3708 and 3101 emulation via packet-switched networks.

For more information, contact Ray Ingram, Multi Soft Inc., 123 Franklin Corner Rd., Ste. 207, Lawrenceville, NJ 08648; (609) 896-4100.

Circle 458 on reader card

Teamwork/RqT Tracks Project Progress

Cadre Technologies Inc. announced Teamwork/RqT, a new member of the workstation-based Teamwork product family. It's a comprehensive project-tracking system for large systems engineering efforts.

Tightly integrated with Cadre's CASE environment for systems analysis, software design and code generation, Teamwork/RqT tracks project progress and completeness through requirements traceability by showing relationships between project requirements and project deliverables at specific times in the development life cycle. It works with other Teamwork modeling and coding tools on networked, graphics workstations, enabling project teams to operate from common information databases and track requirements from analysis and design to test and integration. It satisfies DoD-STD-2167 and -2167(A) standards and runs on VAX/VMS and Sun workstations.

For more information, contact Joanne Dawson, Cadre Technologies Inc., 222 Richmond St., Providence, RI 02903; (401) 351-5950.

Circle 434 on reader card

Maxdata Introduces MD-1200 DAT Backup/Archival System

Maxdata announced the MD-1200, the first in a series of 4mm DAT backup/archival systems. The company offers complete solutions for the MD-1200 to run within Apple, MS-DOS, OS/2, Sun, UNIX and VAX/VMS environments.

The MD-1200 is available in DDS and Data/Dat formats. It offers an 20-second average random access seek time, 1.2 to 2.4 GB of unattended backup storage capacity and an industry-standard SCSI interface.

For more information, contact Ira Tator, Maxdata, 100 Leek Cir., Unit 9, Richmond Hill, ON L4B 3E6; (416) 882-0600.

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BPA MEDIA INTELLIGENCE

Esprit's 400 display terminal provides a true application window.

Esprit 400 And 400G Connect To Hosts And View Applications

Esprit Systems Inc. announced the Esprit 400 and 400G multipersonality ASCII/ANSI/PC display terminals. They let you connect to hosts and view applications simultaneously through windows or a 52-line display.

The 400 offers an application-independent WindowFrame feature that uses custom ASIC video technology to provide a true application window. It can be framed to any size anywhere on the screen to run and view existing and future programs with no software modification required. It can combine 80- and 132-character data on the same line and create a virtual terminal in a bounded window. It supports two independent host programs, each with its own memory display using a split-screen 52-line format or the windowing feature. The 400G offers the same features as the 400 plus Tektronix 4010/4014 and Hercules graphics compatibility and eight pages of memory.

The Esprit 400 costs $599.

For more information, contact Esprit Systems Inc., 100 Marcus Dr., Melville, NY 11747; (516) 293-5600.

Circle 476 on reader card

ARSAP Accounting Software Features Open Architecture

Gejac Inc. announced ARSAP V7.0. This DEC system accounting software includes a rewritten documentation set and up to a 70 percent improvement in system accounting performance. It also offers project accounting and user chargeback on ULTRIX and UNIX platforms.

ARSAP's open architecture lets it accept system accounting data from "foreign systems" along with Intergraph, VMS, UNIX and ULTRIX data. System accounting data from other systems can be presented to ARSAP in a defined format. ARSAP processes and incorporates the foreign data into its database as another network node and reports the system accounting data independent of its machine or operating system origin. A User-Defined Accounting feature lets you automatically write custom accounting records into the VMS accounting file. This feature is used to track in-house applications, monitor use of special devices and account for application use in transaction processing environments.

For more information, contact Gejac Inc., 8643 Cherry Ln., Laurel, MD 20707; (301) 725-2500.

Circle 457 on reader card

The 2400XF Combines Modem And Fax Capabilities

Micro Electronic Technologies Inc. announced the 2400XF fax/modem. It uses menu-driven software to fax to any Group III fax machine. It can be programmed to send documents, text or graphics at predefined times to multiple fax numbers.

The product incorporates all features of a Hayes-compatible 2,400-baud modem and send fax capabilities into one external unit. It features the Pass-Thru, which lets PC users connect a serial device to the computer through one serial port without disconnecting the modem. The 2400XF is compatible with all communications software and communicates at 2,400, 1,200 or 300 baud, automatically adjusting to match the speed of the modem to which it's linked. The modem portion meets CCITT V.22 bis, V.22, V.21, Bell 212A and Bell 103 standards and works with all microcomputers through a standard serial interface.

The product costs $239.

For more information, contact Paul Laskow, Micro Electronic Technologies Inc., 35 South St., Hopkinton, MA 01748; (508) 435-9057.

Circle 479 on reader card

TGraf-X Combines X And Non-X-Compliant Environments

Grafpoint announced a line of terminal emulation software for the X environment. With TGraf-X, non-X-compliant software that supports Tektronix terminals can run as an X client on any color X terminal.

TGraf-X supports DECwindows extensions and runs on the DECstation 3100 (ULTRIX) and VAXstation (ULTRIX and VMS). It lets you mix X-compliant and non-X-compliant software with traditional graphics support devices and X graphics support devices to let you migrate at your own pace. The product comes with a menu-driven user interface that simplifies the user's task of setup and application use.

For more information, contact Olin Reams, Grafpoint, 1485 Saratoga Ave., San Jose, CA 95129; (408) 446-1919.

Circle 477 on reader card

CMD Enhances SCSI Disk And Tape Host Adapters For DAT

CMD Technology Inc. announced DAT enhancements for its SCSI disk and tape host adapters. CQD and CDU host adapters let you interface 4mm DAT drives to any Q-bus or UNIBUS computer with no special drivers or software. The company also announced DAT versions of its SCSIwatch tape monitor utility.

SCSIwatch for DAT gives system mangers an onscreen display of up to seven tape devices on the VAX. You can create a historical VMS file, called LOGon, that keeps a record of backup procedures. The screen program can be used with front panel displays on 4mm DAT subsystems or alone for tracking backup transactions. SCSI host adapters are available in configurations that support up to 14 disk and tape devices on a Q-bus board or up to seven devices on a UNIBUS board. Features include asynchronous or synchronous transfers and single-ended or differential SCSI capabilities.

The Q-bus CQD-200/T series costs $1,350. The UNIBUS CDU-700/T series costs $1,750. SCSIwatch is available for 4mm or 8mm and costs $250.

For more information, contact Bob Rudy, CMD Technology Inc., 3851 S. Main St., Santa Ana, CA 92707; (714) 549-4422.

Circle 474 on reader card

MAX VAX® BACKUP

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CIRCLE 274 ON READER CARD

Reliability Ratings Provides Statistics For DEC Market

Reliability Ratings announced the formulation of its corporation and a charter membership for its rating information service. The company provides objective statistical information concerning DEC-manufactured and DEC third-party peripherals.

Reliability Ratings is published quarterly and lists statistical information for the reliability of memory boards, disk and tape drives, printers and DEC CPUs, from MicroVAXs to the VAX 9000. The status report contains uptime statistics, field service response times and an overall reliability rating.

Reliability Ratings is available to all DEC users for a charter price of $149 per year.

For more information, contact Linda Johnson, Reliability Ratings, 888 Worcester St., Wellesley, MA 02181; (617) 235-3553.

Circle 480 on reader card

Saber Software Enhances Saber-C Environment

Saber Software Inc. announced Saber-C V3.0. Saber-C is a C language programming environment that lets programmers develop and maintain large software projects. V3.0 features enhanced debugging capabilities and includes a new error browser.

With object code debugging, Saber-C's debugger has been extended to let programmers debug any portion of their application, such as code handled by the interpreter, object code produced by the system compiler or libraries. Thus, you can develop, debug and test C programs without leaving the Saber-C environment. The error browser lets you quickly "batch load" all files for processing through Saber-C's error checkers. It automatically finds the source code location of an error.

The product costs $2,495. Saber-C Software Support customers will receive V3.0 free of charge.

For more information, contact Saber Software Inc., 185 Alewife Brook Pkwy., Cambridge, MA 02138; (617) 876-7636.

Circle 461 on reader card

Controlex CM331 Delivers 10 ms Access Time

Controlex Corporation announced the CM331, a RAMdisk with an ANSI-standard SMD interface. It appears to the controller as a true SMD device, indistinguishable from its rotating counterpart.

The Controlex CM331 is based on a memory mapping state machine. The formatter section receives the SMD address — cylinder, head and sector — and maps it onto RAM address space in rows, columns and blocks. Memory mapping is implemented in hardware rather than with a microprocessor under software control. The result is that the mapped SMD address is available to the RAM array within the propagation times of several layers of TTL logic plus PROM access times. The design delivers an access time of 10 ms. By placing the state maps in PROM, CM331 characteristics can be altered to make it appear as a variety of SMD rotating disks, with differing numbers of cylinders, heads and sectors per track.

For more information, contact Controlex Corp., 16005 Sherman Way, Van Nuys, CA 91406; (818) 780-8877.

Circle 456 on reader card

The Small Computer Company Enhances filePro Plus V4.0

The Small Computer Company Inc. announced enhancements to its filePro Plus V4.0 DBMS.

The product now incorporates a transaction handling capability through its browse pop-up window feature. It lets filePro provide developers a more flexible way to develop point-of-sale, order entry and other transaction-oriented applications. Another new feature, Fuzzy Search, lets you search for data without the preciseness required by other search methods. The feature is a patented algorithm licensed from Proximity Technologies.

The product costs from $990 to $40,000. It runs in LANs and on DOS, OS/2, VMS and UNIX flavors such as AIX, Sun OS, ULTRIX and XENIX.

For more information, contact Barbara Kelly, The Small Computer Co. Inc., 41 Saw Mill River Rd., Hawthorne, NY 10532; (914) 769-3160.

Circle 482 on reader card

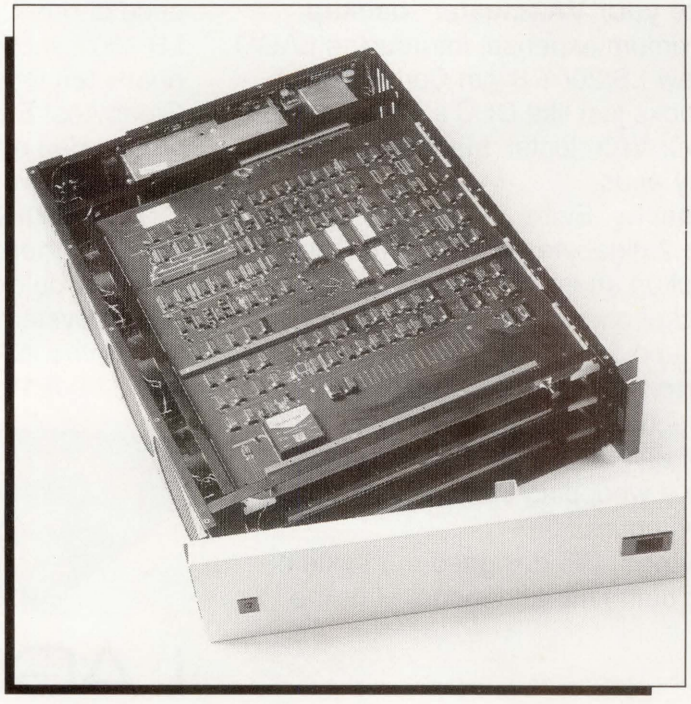
StorageStak Houses Various Storage Peripherals

Specialized Systems Technology announced StorageStak, a modular packaging system suited for VAXstations and servers that houses disk, tape and optical storage peripherals.

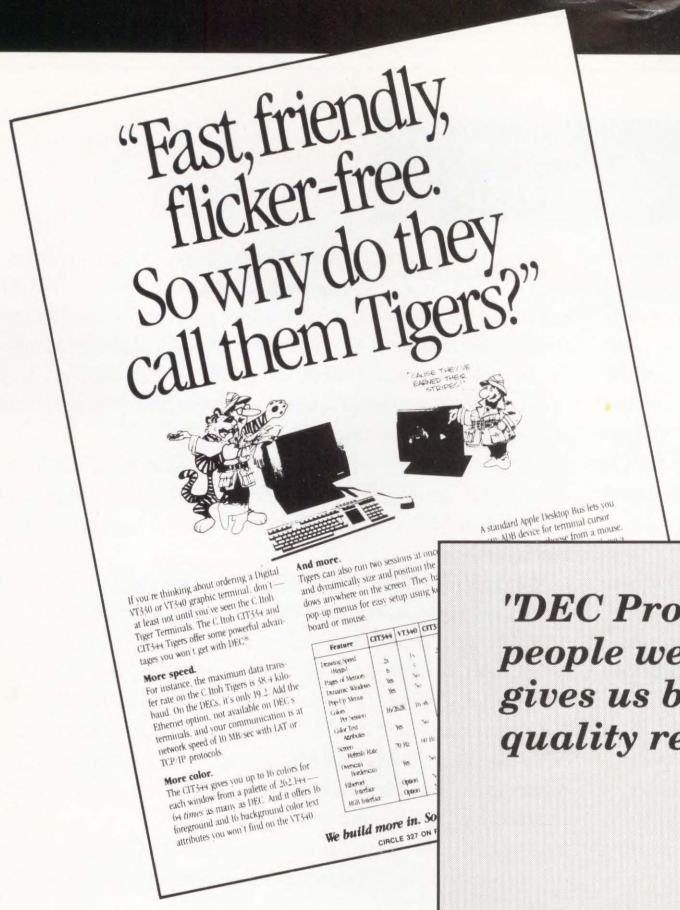
StorageStak modules feature a built-in asynchronous SCSI bus that can transfer data to and from host memory at 1.5 MBps. The product lets you customize a peripheral subsystem to your needs. Each subsystem can contain up to seven peripheral modules, which can include any combination of disk, tape and optical storage peripherals. The modules snap together and are self-contained and plug-compatible with StorageStak's internal bus. The subsystem is self-configuring and transparent to the user.

For more information, contact Specialized Systems Technology, 3628 Westchase Dr., Houston, TX 77042; (713) 781-8893.

Circle 483 on reader card



Controlex's CM331 RAM disk features an ANSI-standard SMD interface.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> **C. Itoh Electronics, Inc.**

For C. Itoh, DEC Professional Means Soaring Sales

C. Itoh Electronics, Inc. is one of the largest manufacturers and suppliers of hardware peripherals products in the U.S., serving not just the DEC community, but also the IBM midrange and PC marketplaces with a complete line of impact, nonimpact and terminal products.

Does DEC Professional's targeting of Fortune 1000 buyers pay off for C. Itoh?

"Most definitely so," says Marc Liebesman. "We don't judge leads just by the number we get, we judge them on the quality and type of audience we reach. DEC Professional targets the right audience."

And the editorial environment?

Marc Liebesman tells us, "DEC Professional's editorial coverage has helped our sales efforts immensely."

"One of DEC Professional's most important pluses is its 'From the Lab' product reviews," he continues. "People in the DEC marketplace feel that DEC Professional's evaluations are very accurate and nonpartisan. We believe they are an important factor when purchase decisions are being made. They lend a high degree of credibility to the magazine and we want to be associated with credible, influential organizations."

According to Liebesman, C. Itoh benefits in a more general way.

"We have an excellent working relationship with our DEC Professional sales rep. She doesn't just sell advertising space. She's been very, very helpful in organizing and putting all their marketing services together for us so we can take optimum advantage of the various opportunities."

"It isn't just one thing that makes our relationship with DEC Professional operate in a positive framework. They work with us on all levels to see that we're taking maximum advantage of what they have to offer."

DEC Professional

DIGITAL PRODUCTS

■ DEC announced the VRE01, a 19-inch Flat Panel Monitor for use with DEC workstations and windowing terminals.

Based on electroluminescent (EL) technology, the product was developed by DEC and Planar Systems. EL technology was chosen for its durability, highly readable image, low power consumption and quick response. The VRE01 has a footprint of 51 inches and weighs 18 pounds. Screen resolution is 1,024 x 864 pixels (75 dpi), with a vertical refresh of 60 Hz. It's available as an option for DEC's desktop workstations, including VAXstation 3100s, DECstation 2100/3100s and windowing terminals.

The product costs $11,995.

■ DEC will provide VMSbus and Futurebus+ on workstations, deskside and computer-room systems.

Futurebus+ standard was developed by the IEEE 896 committee. DEC is a contributor to the effort to develop the standard and profiles of Futurebus+ in cooperation with other system and component companies.

VMEbus will be available as an optional I/O bus on several desktop, deskside and computer-room systems. This will provide access to devices developed for VMEbus as well as a migration path to Futurebus+. Drivers will be portable across system families running the same operating systems — both VMS and ULTRIX.

■ The DECserver 510 terminal server and the MUXserver 310 remote terminal server provide entry-level solutions for local and remote multivendor terminal access.

The DECserver 510 provides IBM 3270 terminal connectivity and interoperability to VAX applications. It provides VT220 emulation to IBM 3270 CUT displays and passthrough access to an IBM environment via a hotkey sequence. While accessing VAX applications anywhere in a DECnet networking environment, the product maintains the IBM session, allowing you to switch between the two environments.

The MUXserver 310 connects up to 16 asynchronous devices over a leased line. By communicating with DEC's DECmux 300 remote terminal server, it lets remote users access an Ethernet LAN. It provides remote data communications, a high-speed phone link for clusters of remote users, and reliable data transfer. It provides the dual functionality of a terminal server and statistical multiplexer at the local Ethernet site.

■ The Technology Migration Option Leasing program provides MicroVAX leasing flexibility. After leasing the computer for one year, you have the option to purchase it or trade it in for a larger MicroVAX.

MicroVAX 3300/3400/3800/3900s are eligible for the program. Sixty days notice is required before purchase or upgrade.

DEC also announced MicroVAX and VAXserver 3300/3400 conversion kits that provide the processing power of a MicroVAX or VAXserver 3800. You can convert VAXserver 3300/3400s to a VAXserver or MicroVAX 3800, and you can convert MicroVAX 3300/3400s to a MicroVAX 3800. The conversion boosts CPU power by about 60 percent, from 2.4 to 3.8 VUPs. The kits are installed by DEC's customer services.

■ As part of its Desktop Service Solutions, DEC announced an agreement to service and support 3Com networking hardware and software.

DEC will provide installation, onsite maintenance, toll-free telephone advisory software support and integration services for 3Com products. 3Com will provide training, documentation and backup support for DEC engineers. Desktop Service Solutions include startup, direct access advisory, maintenance and integration services to support customers' multivendor desktop computing needs. DEC provides single-source hardware, software and PC LAN support for all phases of the product life cycle.

For more information, contact your local DEC sales office or call (800) DIGITAL.

ezBridge CASE Tools Aid LU6.2 Application Development

Systems Strategies Inc. announced ezBridge LU6.2 CASE tools. These productivity aids simplify the development of multivendor LU6.2 applications.

The toolkits let LU6.2 applications be developed and applied faster and make LU6.2 easier to use, support and debug. They also provide identical LU6.2 calls on both the IBM and DEC sides. The first release is available for IBM's LU6.2 on the AS/400 and System Strategies' ezBridge Peer-to-Peer, a LU6.2/PU2.1 software solution for building real-time applications between VAX and IBM mainframe or midrange systems. Additional toolkits, such as LU6.2 application development for communications between AS/400, VAXs, the IBM RS/6000 and the IBM AIX PS/2, will be available later this year.

For more information, contact Lynn Tusa, Systems Strategies Inc., 225 W. 34th St., New York, NY 10001; (212) 279-8400.

Circle 484 on reader card

3Station/2ED Functions As PC And DEC Graphics Terminal

3Com Corporation announced 3Station/2ED, a version of its network workstation that provides direct access to applications and data residing on DEC computers through the LAT protocol. The 80286-based Ethernet product functions as a network PC and a DEC high-resolution graphics terminal.

The 3Station/2ED offers local processing power for such PC applications as spreadsheet, e-mail, word processing and database management in a client/server system. In DEC terminal-to-host applications, it emulates the ReGIS graphics capability of DEC color graphics terminals and provides a resolution of 800 x 600 pixels. Direct Ethernet connectivity to DEC hosts eliminates the need for terminal servers and RS-232 wiring. For PC applications, it offers IBM compatibility and network connectivity for client/server applications. Files can be transferred between the two environments, allowing DEC computer-based data to be manipulated with PC productivity tools.

The product costs $2,595 with a keyboard.

For more information, contact Nicholas Parham, 3Com Corp., 3165 Kifer Rd., Santa Clara, CA 95052; (408) 562-6871.

Circle 486 on reader card

Millennium Creates UNIX Image Processing Systems

Ramtek Corporation announced Millennium, an imaging system that makes a UNIX-based workstation an image processing system suited for remote sensing, geophysical, medical and other imaging-oriented applications.

The Millennium subsystem is designed to accelerate the processing and visual display of technical and scientific data. It connects to a UNIX workstation via a VME bus or SCSI link, offloading image processing and visualization functions from the workstation. Its architecture performs floating-point calculations at a rate of 80 Mflops and provides up to 16 MB of local memory and 30-Mbps local buses.

A standalone seven-slot chassis with SCSI interface costs $25,995. A three-board set that plugs into a VME backplane costs $20,995. Both configurations include a TMS34020-based graphics board, a TMS34082/TMS34020-based imaging board, a 20-bit memory video board and a software license. For more information, contact Michael Tyler, Ramtek Corp., 1525 Atteberry Ln., San Jose, CA 95131; (408) 954-2700.

Circle 460 on reader card

Image-X Stores And Displays CALS-Compliant Images

Vykor Technology Inc. announced the Image-X file server. It stores and displays CALS-compliant images for IBM PC and compatibles networked over Ethernet using the TCP/IP protocol.

Image-X is based on Motorola's 88000 RISC microprocessor. It's rated at 17 mips and comes network-ready for connecting to IBM PC and compatibles. The Image-X network kit provides an Ethernet card and software for TCP/IP and NFS support. Using the file server and network kit, you can create a PC network that allows use of Image-X as a file server, providing sharing of disk drives and printers. In addition, it allows display of scanned document images that are stored on the optical drive attached to the file server. It thus lets you view CALS-compliant images on your PC. The images can be printed on laser printers attached to the network.

For more information, contact Vykor Technology Inc., 5879 Hollister Ave., Santa Barbara, CA 93117; (805) 964-3535.

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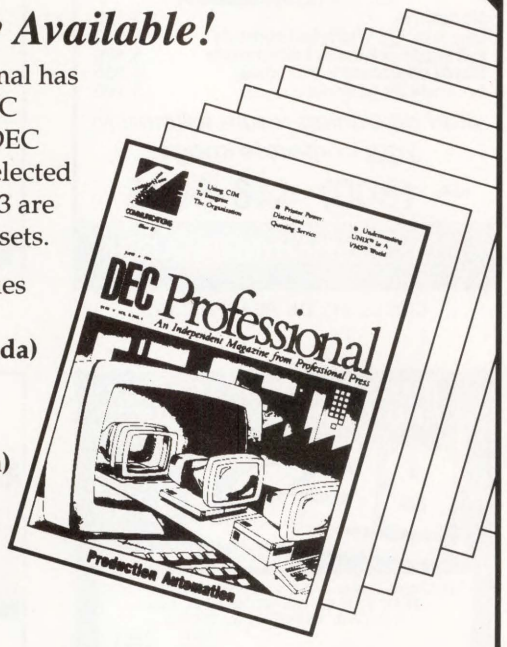

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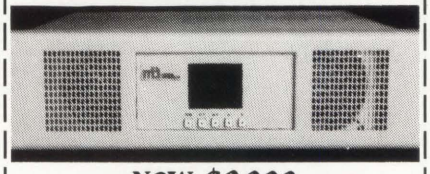

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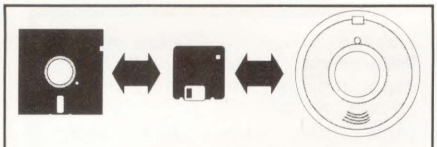

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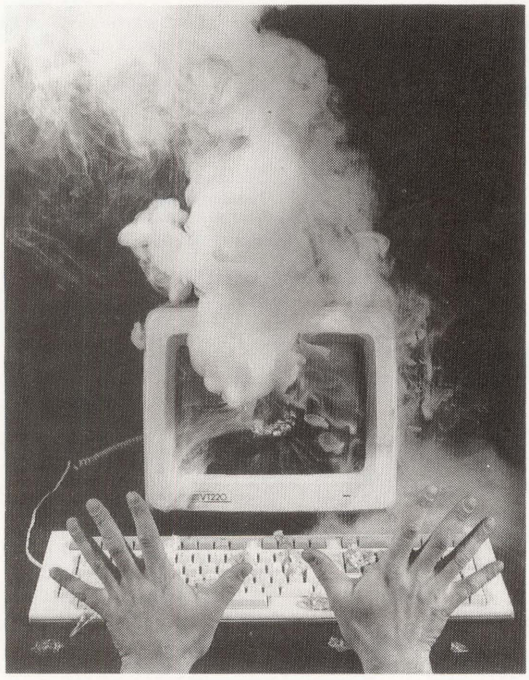

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BACK END

John C. Dvorak

Mind Your Own Business

I'm a watch collector. I've noticed something interesting about current cheap watches shipped from Asia: They all have the same band size. If a band breaks, you can buy a cheap replacement without worrying about the width. Today, the oddball size is the exception, not the rule. Years ago, I struggled to find an odd-sized replacement band for an old Movado and wondered what they had discussed in company engineering meetings.

"I see the new band is 2mm wider than our last model's band. What are we doing here, Jenkins?"

"This new band will require that customers buy bands from us. It seems that Piaget makes a watch band that matches our old band size. People are buying bands from them for our watches."

"But are we in the watch business, or are we in the band business?"

"We're in the watch business, and the band is part of the watch. Besides, it means our dealers will have to inventory more things from us. It will prove that they're sincere in supporting the company."

Now let's jump to computers and have the same meeting in the boardroom of Compaq, Zenith or any laptop maker.

"I see that we've developed a new battery pack for the LUG-386. What are we doing here, Jenkins? Are we in the computer business, or are we in the battery business?"

With standard-sized cells available, you'd think that laptop makers would find a way to use them and get out of the battery business.

The boss asks, "Why aren't we using standard-sized cells from a battery maker?"

An engineer tears open a battery pack and reveals standard cells crammed within the plastic covering — a ruse. The only reason these manufacturers are in the battery business is that a bean counter figured that it could be a profit center. Some battery packs cost far more than equivalent standard cells. Nobody is giving these packs away. Expect to pay $100 and up for many battery packs. This means that a $5 cell is remarketed for about $25. And because nobody inventories these odd batteries, the customer is out of luck if he needs an emergency battery.

The fact is that the watch company isn't in the watchband business and the computer company isn't in the battery business. Computer companies aren't in the floppy-disk business or the printer business, either. These efforts run counter to the age of specialization.

The Grass Is Greener

Computer companies that nickel-and-dime customers with proprietary battery packs or branded overpriced diskettes are part of a bigger problem endemic to American business. These companies don't know what business they're in.

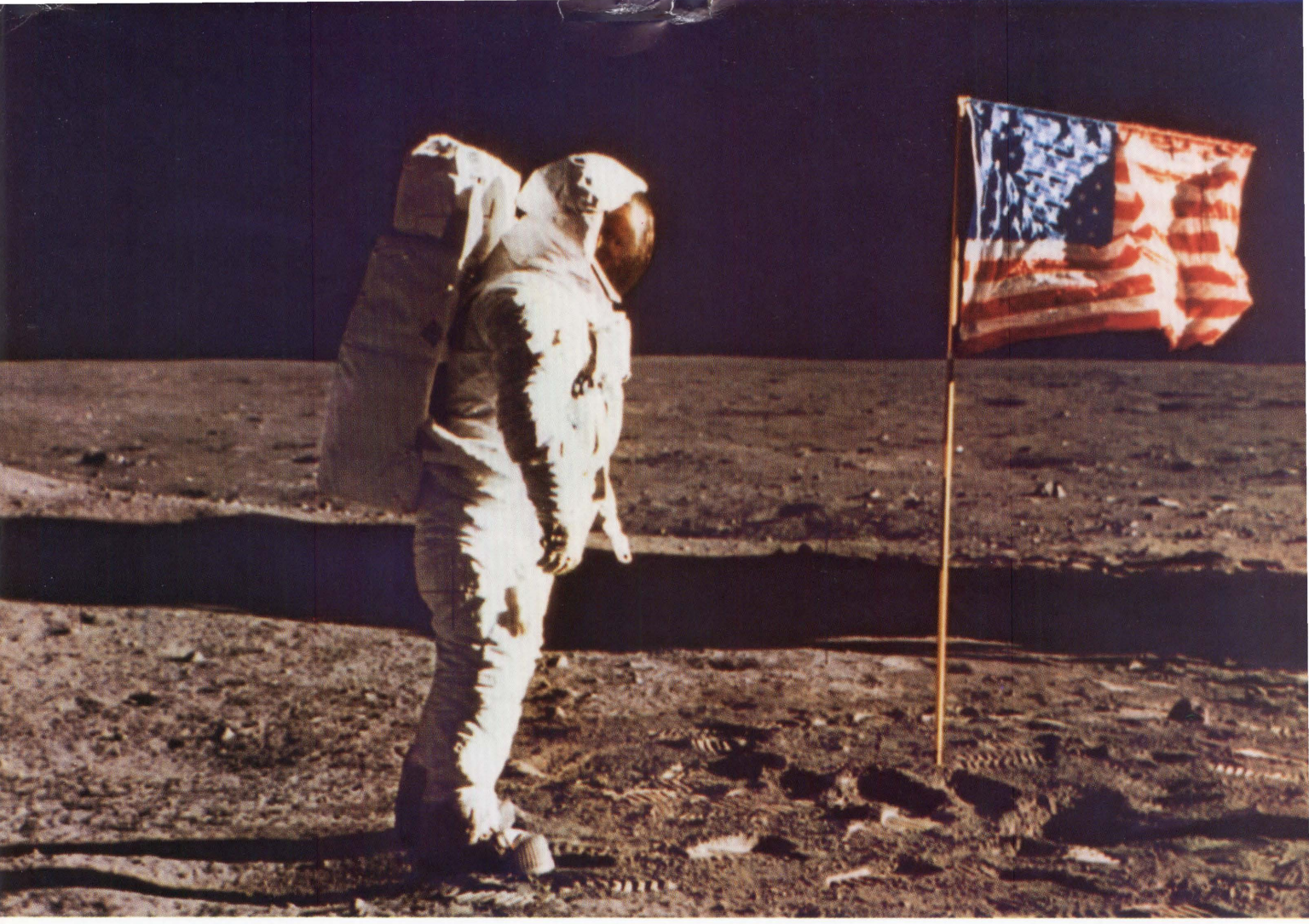
The best example of this problem is the little shop in which a guy repairs toasters, rents mailboxes, sharpens knives, sells moose heads, has a junk jewelry consignment business and does gardening and hauling on the side. What business is this guy in? I admire ambition, but this is ridiculous. His lack of focus makes me wonder if he can do any of these things properly.

Much of the inability to focus on a business stems from "the grass is greener" philosophy. Corporations see another company doing better than they're doing — in some other field — and decide that they want to do *that* too. For example, Intel saw Compaq growing faster than Intel by doing no more than piecing together systems from parts. So Intel figured it could make systems. It's now in the systems business making the AT&T machine and OEMing to anyone interested. Instead of just making semiconductors for others to put onto their cards, Intel now makes the cards, much to the annoyance of its chip customers with whom it now competes. By playing the me-too game, it risks its core business for the sake of short-term profit.

Chasing the pot of gold never works. The chaser loses his focus and soon the core business goes to pot from neglect, distractions or skewed decision-making. The skewed decision-making is what hurts the core business most. For example, suddenly a ton of income comes from an ancillary business such as Intel's systems business. Now a hot shot in that part of the company brags that he's supporting the other parts of the company and should have more "say" in big decisions. Money talks, and suddenly an interloper is calling the shots. Decisions from a guy like this will be self-serving and thus destructive to the core business.

It doesn't have to be something super successful that results in flawed decision-making. Do you remember DEC's decision to sell its now defunct Rainbow computer without a format program so that people could only buy preformatted diskettes from DEC? The decision was made to sell diskettes — a business DEC shouldn't have been in. The result was customer dissatisfaction and lost income for its primary business — selling computers.

DEC's pot of gold is computers. Intel's pot of gold is chips, not easy-money systems. Compaq's pot of gold is systems, not proprietary batteries. These companies must learn what business they're in, or they won't have a business at all. ■



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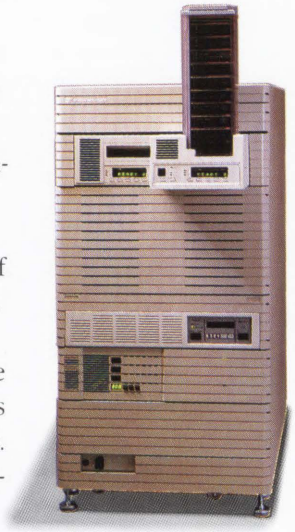

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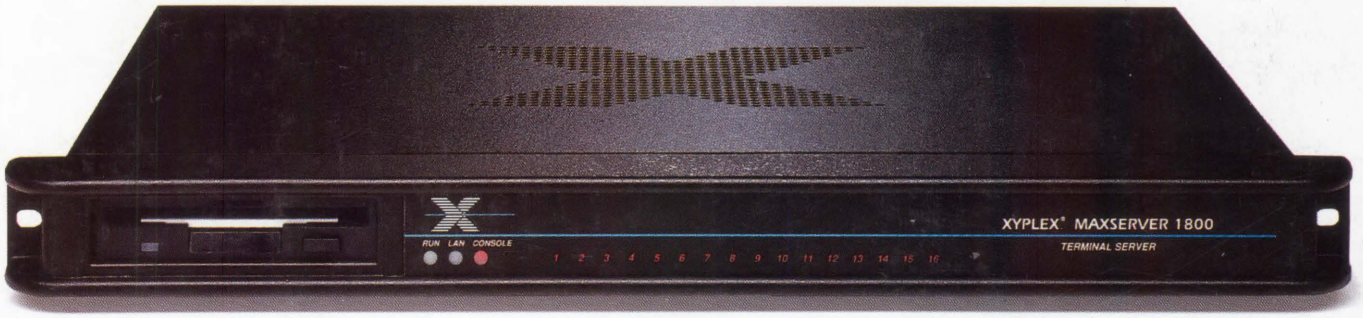

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