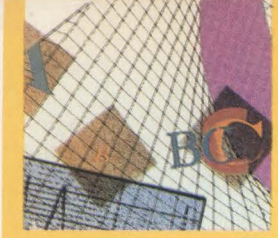

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- Zero Downtime Through Predictive Maintenance
- Dual Sessions: Are Two Terminals Better Than One?

JANUARY ■ 1989

DEC Professional

An Independent Magazine from Professional Press

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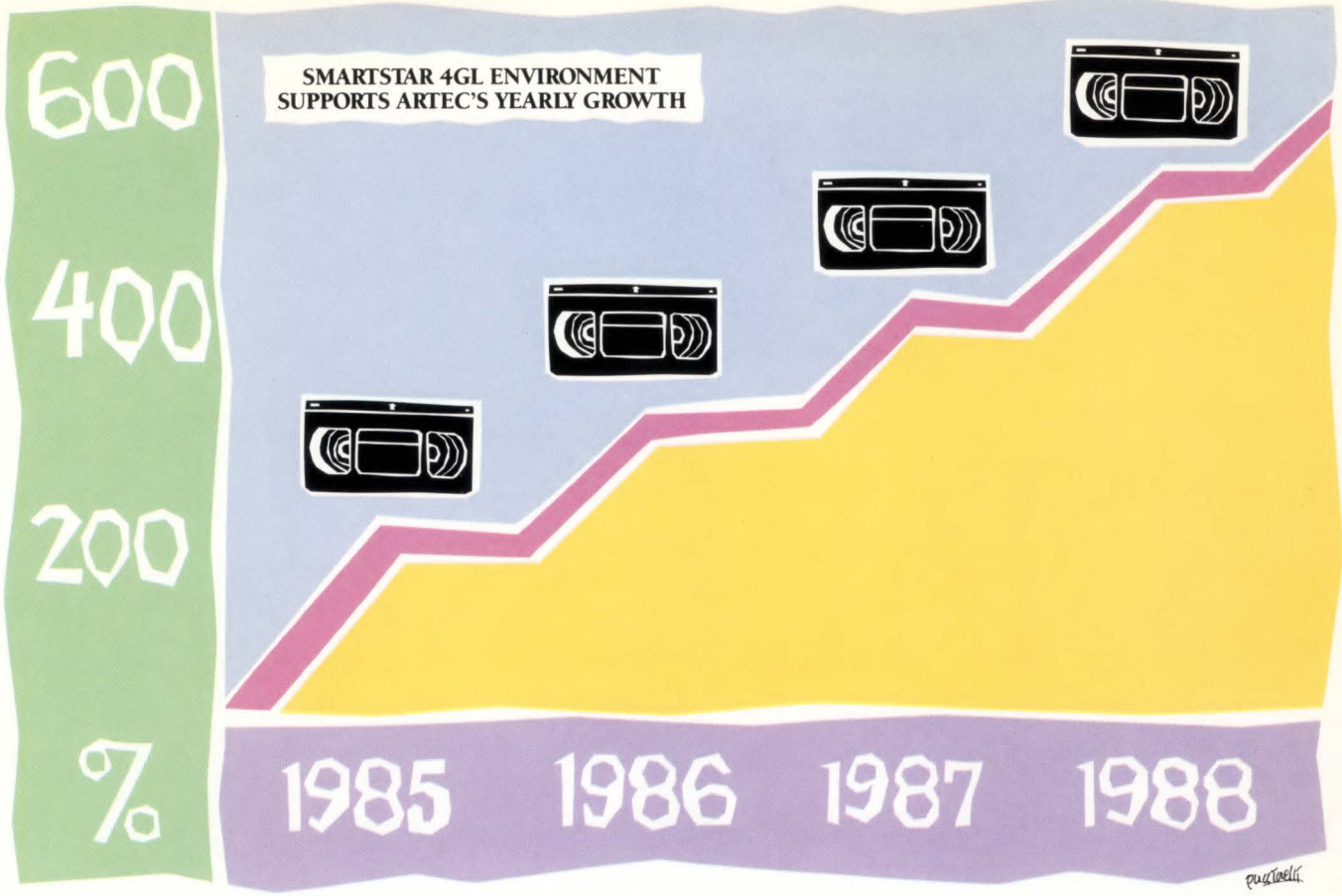
Multivendor Setups



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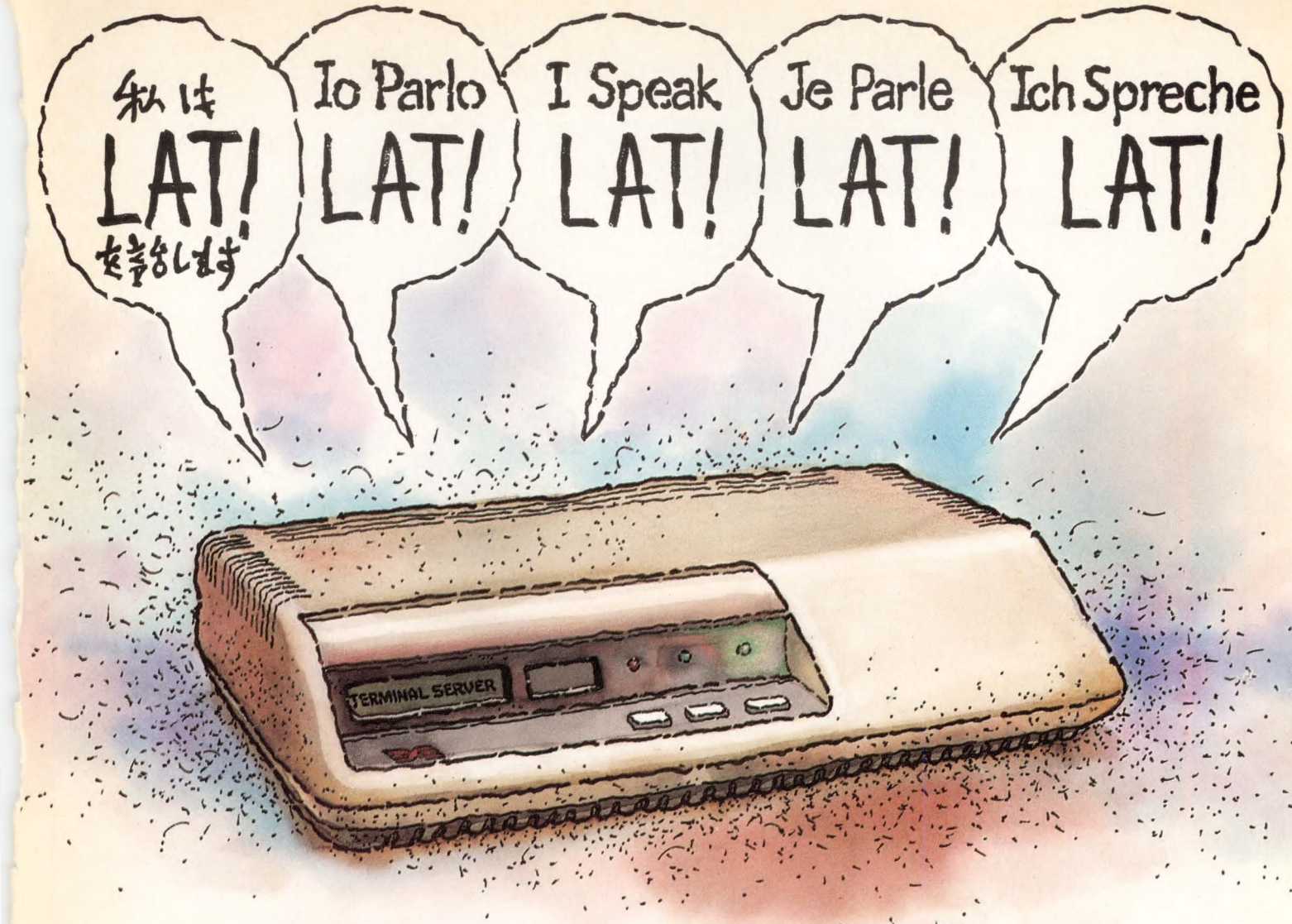

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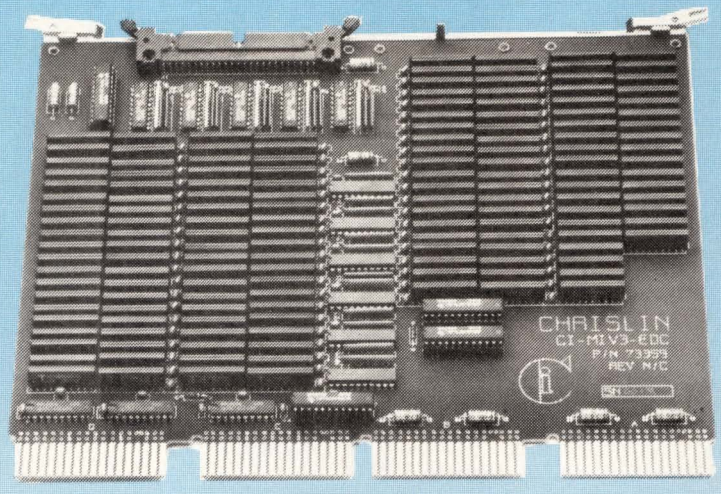

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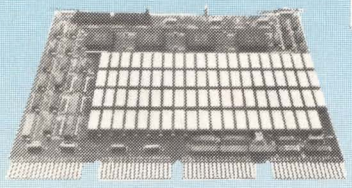
MICROVAX II



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- Control Status Register (CSR) for error logging.
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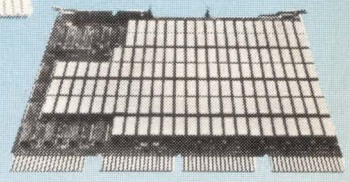
MICROVAX II



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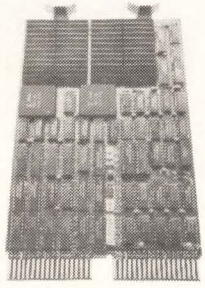

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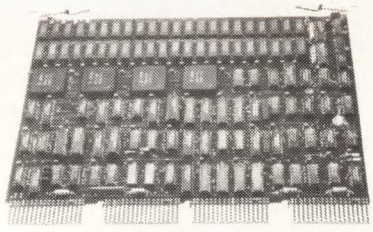

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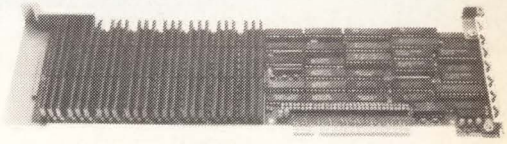

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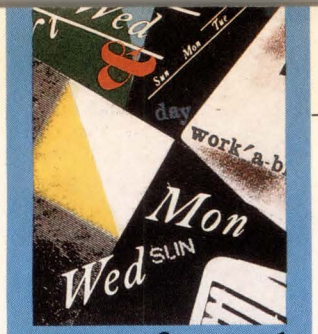

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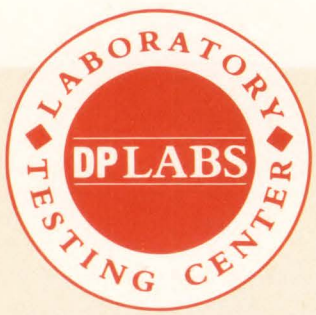

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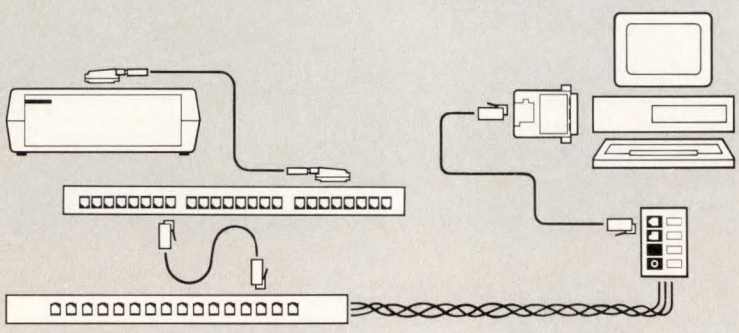

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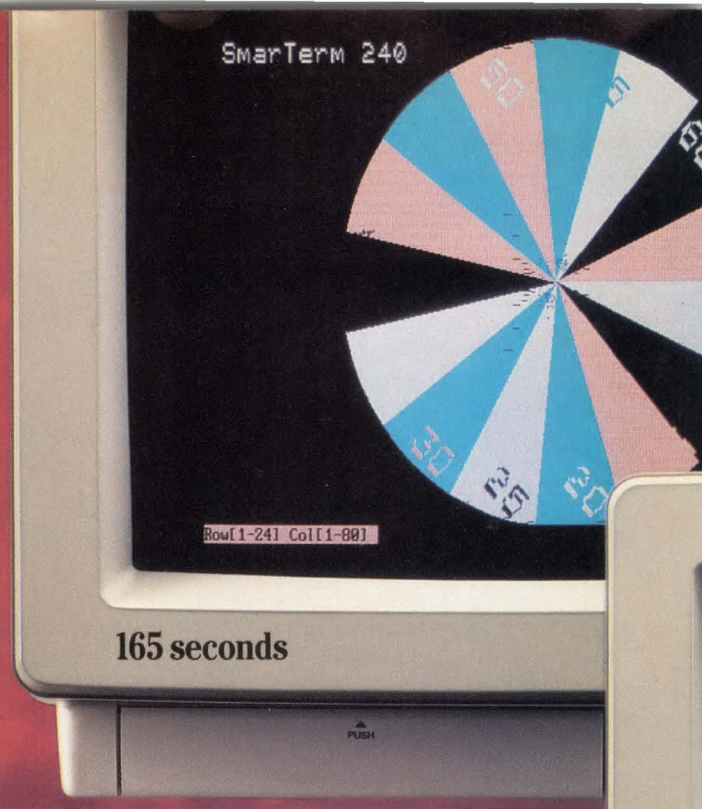

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**Poly-STAR/240 ignores the ReGIS polygon fill command used to color the stopwatch.

Test was run on an IBM AT with an EGA and high-resolution color monitor. Screens were timed locally using one data file. Files photographed are identical, except for product names. Software versions: Reflection 4-3.1; SmarTerm 240-2.0b poly-STAR/240-1.1.

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VT241 Terminal Emulation	Yes	Yes	Yes
VT340 ReGIS Graphics	Yes	no	no
16-Color Display	Yes	no	no
Polygon Fill	Yes	Yes	no
Background Multitasking	Yes	no	no
RAM Used	220K	375K	430K
Complete Keyboard Remapping	Yes	no	Yes
Back up PC Files to VAX	Yes	no	no
Variables in Command Language	Yes	no	no

CIRCLE 143 ON READER CARD

PUBLISHER

Carl B. Marbach

Moving In The Right Direction

When I was learning to fly an airplane solely by reference to instruments, I learned that an instrument needle centered and not moving shows that, although you have it right now, you can't know what's happening. Are things getting better or worse? A better situation is a needle slightly off-center but moving slowly in the right direction. This not only tells you how far off course you are but also how fast things are improving. The mathematicians among us will recognize that it's the first derivative that really gives us the information.

DEC is slightly off-center, but in the beginning of 1989 it's moving in the right direction. Some of this belief comes from hard facts, some from hope and some from history. DEC has made good moves at the right time before.

Facts: The desktop is a major growth area for business computing. DEC's latest moves include a deal with Tandy Corporation (Radio Shack) to private-label DEC IBM-compatible PCs; an alliance with Apple Computer Inc. to connect Macs to VAX networks; the embracing of the X Window System standard as the user and graphical interface; and the recent purchase of a part of Mips Computer Systems Inc., a supplier of RISC workstations. All of these are a plus for DEC, addressing an off-center needle and moving it back where it belongs.

First, it's good to see DEC concentrating on what it does best by not doing what it hasn't done well: produce PCs. By adopting Tandy PCs as its own, DEC ensures compatibility and support while being able to provide an all-DEC solution to those customers who need one, all without having to compete in the cutthroat world of IBM compatibles. In addition, DEC recently signed an agreement with Lotus Development Corporation whereby Lotus will develop and support and DEC will market and sell application software for DEC's VAX/VMS systems, including DECwindows.

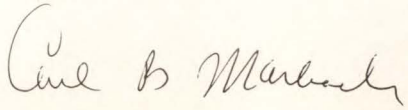
Second, by ensuring connectivity to the desktop with both Macs and IBM PCs, DEC has taken the high ground for the VAX. If you want to tie the enterprise into one coherent network, no other computer connects as well to both the desktop and the corporate mainframe as the VAX.

Third, the Mac has become famous for its user interface and object-oriented programming. Users love it because it's easy to use, and DP staffs love it because it's easy to support. The P-VAX X Window System server might offer a look that could be extremely similar to the now familiar Mac. If that's true, then using a VAX could be as easy (and DEC hopes as popular) as using a Mac. And if that's true, who needs a Mac?

Finally, DEC has realized that putting all of its eggs in the VAX/VMS basket might not be best for itself or its customers. Some of us need a better workstation environment than VMS offers, and because the DEC RISC project obviously didn't pan out, DEC has gone outside to buy the technology. The real trick here is to integrate the RISC workstation into the VAXcluster networking scheme in a truly seamless fashion without adding much more complexity to the mix. This is a challenge, but within the capabilities of the talented DEC engineers.

If all of this comes true, then the face of DEC computing will change dramatically in 1989. Only a strong, aggressive and competitive company could make such a change and take such giant leaps forward, but isn't that what we've come to expect from DEC? DEC always has been a technology-driven company, and 1989 will be no exception. We'll see a lot of new technology, some new hardware, but most of all a profound change in the way we look at the desktop and DEC computing.

Ken Olsen repeatedly has said that DEC wants to own the desktop. And although it appeared for a while that DEC was giving it away, 1989 just might be the year that DEC makes a major move to finally make that come true.



The Fastest, Most Reliable Alternative to the TA79

Why settle for less? Now there's a HSC compatible tape subsystem that runs rings around the DEC TA79—day after day after day. It's the new MA-200 start/stop tape subsystem from Micro Technology.

When it comes to backing up high-capacity disk storage in a VAXcluster, the MA-200 can't be beat. In fact, the MA-200 is 38% faster than the DEC TA79. The MA-200 packs in 6250 bits per inch and records 200 inches per second. When all is said and done, you end up with a data transfer rate of 1.25 MB/sec. And that's a real improvement.

But perhaps the biggest improvement the MA-200 has to offer is its uncompromising performance. Its reliability. After all, what good is speed without reliability? And that's exactly the point.

CIRCLE 124 ON READER CARD

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So check the MTBF rates and see for yourself where the latest improvements have been. Then treat your VAXcluster to the MA-200. The only start/stop tape subsystem that knows how to store your data, quickly, carefully and reliably.

For more information on the fastest, most reliable alternative to the TA79 tape subsystem, call Micro Technology, 800-999-9MTI.

Micro Technology, Inc. designs, manufactures, sells, and supports enhancement products for the VAX end user.

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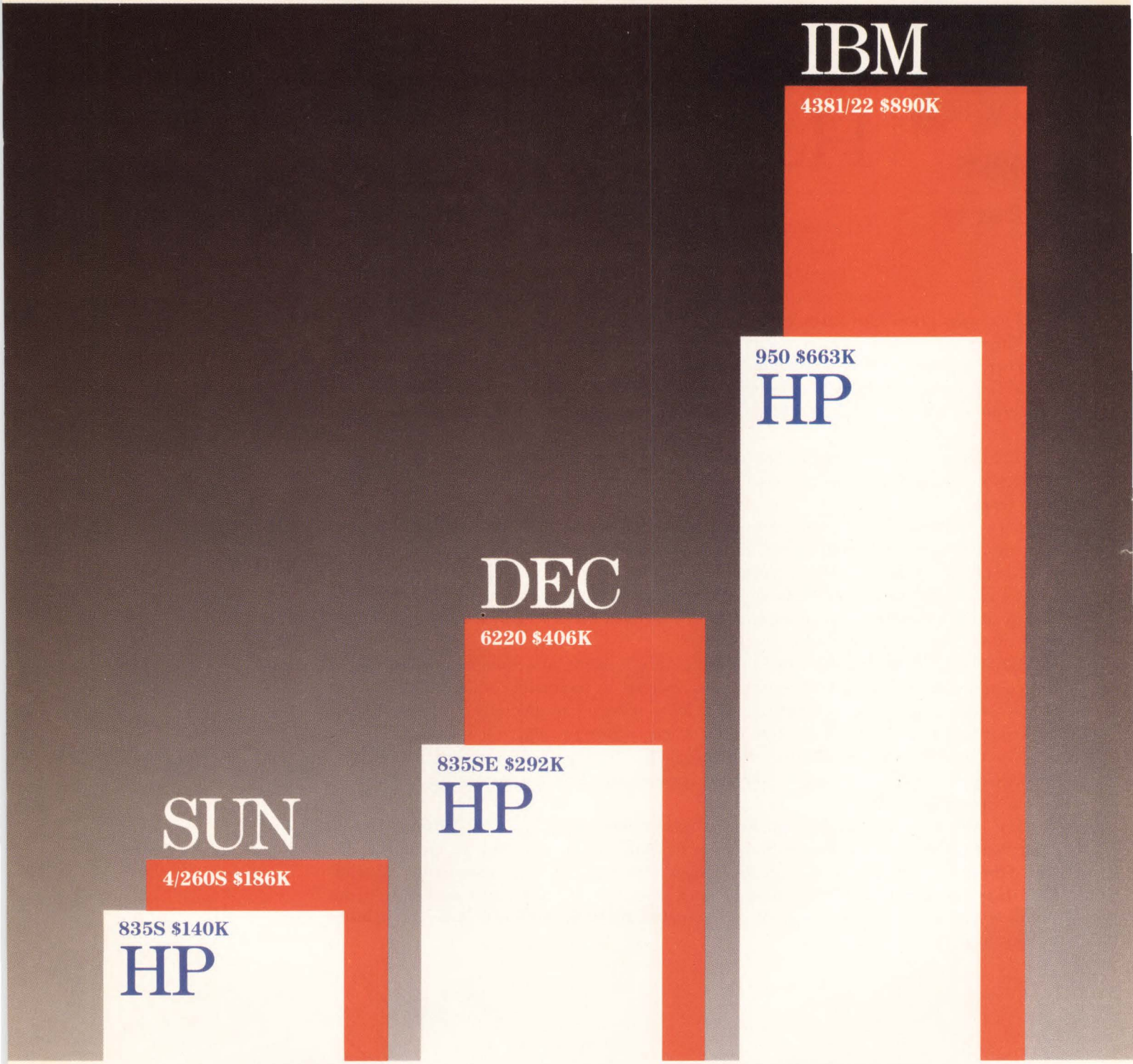
With Precision Architecture, we've both simplified and speeded up the computer. We use fewer instructions,



fewer parts. So you get more power in a smaller box for less money. You can even upgrade most systems just by exchanging a few boards.

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HEWLETT PACKARD

Note: The cost-of-ownership figures reflect the initial purchase price and 5-year hardware and software support costs for servers configured with operating systems, memory, mass storage and terminal connections. Prices as of October 1, 1988.

*Based on averaging six categories: Maintenance Effectiveness, Maintenance Responsiveness, Troubleshooting, Documentation, Education and Software Support.

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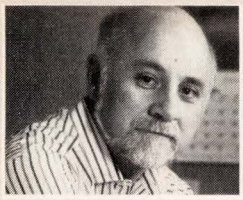


EDITORIAL

Dave Mallery

Economic Colonization: Here And Now

Some thoughts on Inauguration Day:

Much has been written about the so-called dynamic random access memory (DRAM) crisis: how the Japanese have created a cartel and now control almost the entire supply of dynamic RAM chips, and, therefore, their price. That's true enough.

The tragedy of the situation is that setting up manufacturing processes to produce these chips is so expensive and time consuming that it falls outside the philosophical limits of most quarterly report-driven American businesses. We can't get back into the DRAM business because our corporate ethic won't allow substantive investment with payoffs that are more than a year away. Thus, we lose.

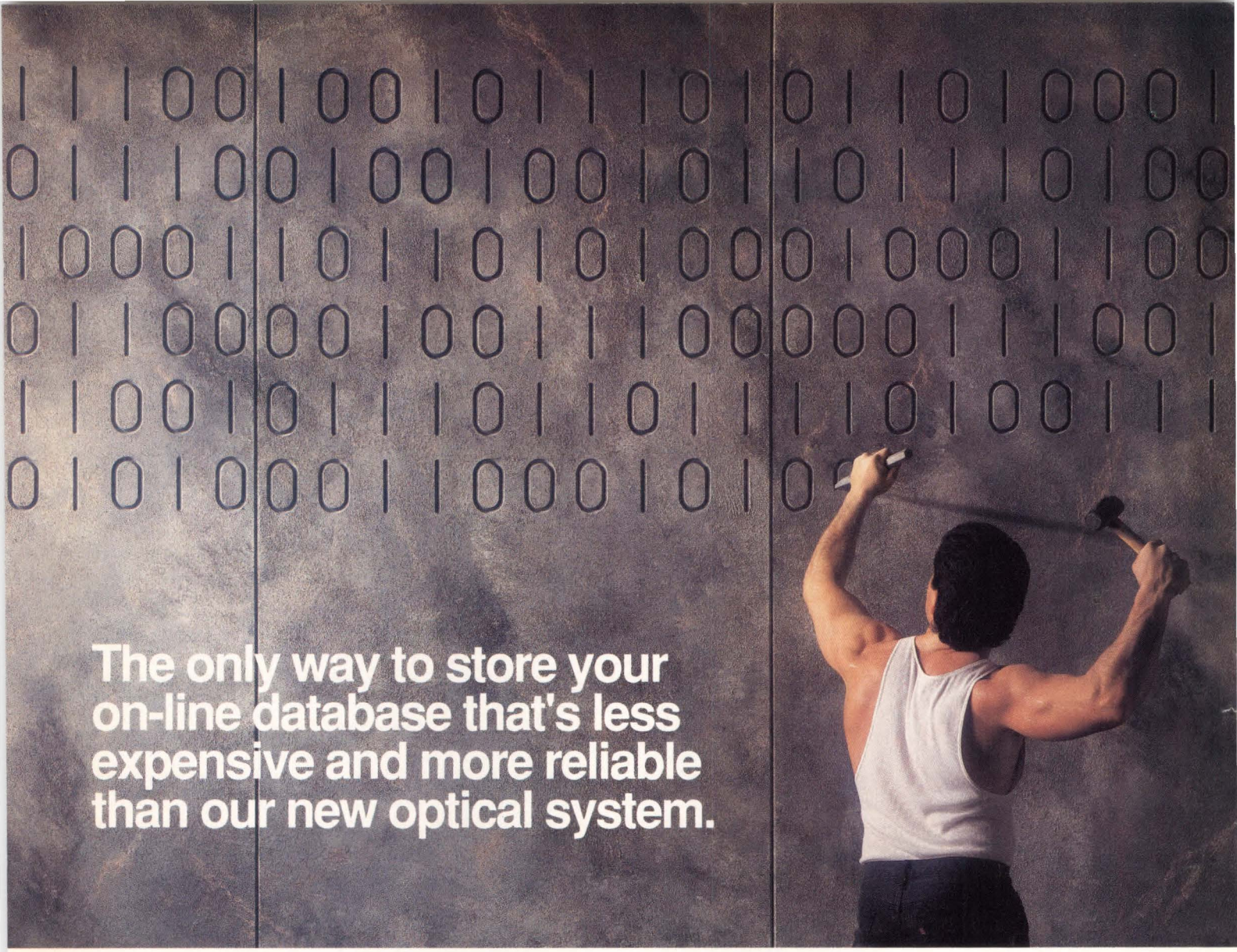
The impression I get from the electronics trade press is that most U.S. manufacturers are waiting for Washington to bail them out. Others seem to be lining up to license process technology from Japan.

If I were a maker of UNIX workstations, I'd be shaking in my boots. Would anyone like to bet how long it will be until Japan Inc. produces nice little 15-mips toasters that sell for the price of an IBM PC AT? The Open Software Foundation will make it trivially easy by liberating UNIX and making it universal. Because Japan controls memory prices (which now exceed the sum of all other workstation components), Japan's memory cartel actually controls the finished price of *all* U.S.-made workstation competition!

Little by little, the heart and soul of our industry is falling to a foreign onslaught. We've lost complete control of DRAMs, a commodity industry as important to the national interest as basic steel, which we lost many years ago. We're shifting vast amounts of money to these foreign interests, just as we transferred much of our wealth to OPEC a few years ago.

You can see the flip side of this by watching who's buying whom with our devalued and exported dollars. America is being re-colonized economically. And you thought taxation without representation was bad!

Has anyone been for a ride in the Korean Space Shuttle? How about the Japanese Seventh Fleet? Maybe the Taiwanese Stealth Bomber or the Saudi Superconducting Supercollider? The rest of the world is riding on our coattails. Perhaps if we didn't spend so much money "defending" these countries, they wouldn't have so much excess cash to protect their markets from our products, subsidize their commercial R&D and purchase the heart and soul of American industry at bargain prices.



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If you've been banging your head against the wall trying to find a low-cost, reliable way to store your large on-line database, EMC has the solution.

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All this, for a fraction of the cost of magnetic disk storage.

The end result is simple: if you want a low-cost, reliable way to store your valuable on-line database, buy EMC's Archeion Database System.

Or get your chisel ready.

For more information on EMC's Archeion family of optical subsystems, call

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CIRCLE 157 ON READER CARD

LETTERS

Address letters to the editor to *DEC PROFESSIONAL* magazine, P.O. Box 503, Spring House, PA 19477-0503. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

SHARED EDITING

In "Shared Editing With WPS-PLUS" (September 1988), authors Isaac Rosen, Ph.D., and Faith Einerson don't appear to discuss shared editing as it's usually understood, although true shared editing also has its drawbacks.

They say, "In WPS-PLUS, users identify documents by both folder name and document name, neither of which must be unique as long as the combination is." In fact, it's possible for two (or more) documents to have the same folder name and document name.

I've created documents with the same folder name and document name. They can be distinguished only by number, which is assigned consecutively by the software.

Even more significant is their statement that control characters are lost when the document is transmitted by MAIL. This isn't true if the document is "Sent" from the Word Processing Menu or if it's an "Attachment" to a message. It's true only if Gold-Get Document is used to incorporate the document into the body of the message, not as an attachment.

It took a lot of experimenting to determine how to recover the document, with its formatting, when you're the recipient. The only way I've found that consistently works is to create a new document in Word Processing, then use Gold-Get Document to get the Read document from ELECTRONIC MAIL. The Read folder is just as accessible as any other while you're in word processing.

This brings the message header, the message itself and the attached document, complete with its formatting, into the document. Then, "Cut" the header and the message body, and you have the document in its original form.

W.A. Leatherock
Oklahoma City, Oklahoma

Isaac Rosen, Ph.D.: In stating that documents must have a unique combination of folder name and title, we oversimplified our discussion of the operation of WPS-PLUS. WPS-PLUS does permit multiple documents with the same folder name and title. In this case, documents are distinguished only by document number, and the document with the highest number is retrieved when selecting by folder name and title.

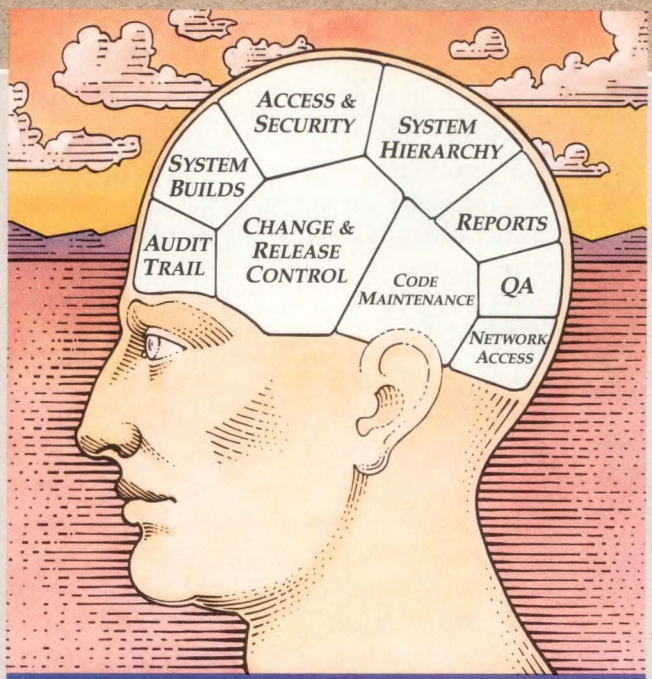
Because documents generally are selected by folder name and title, documents tend to get lost when non-unique combinations of folder name and title are used. We consider this a flaw in WPS-PLUS operation rather than an intended feature, and our policy is to use unique folder and document name combinations.

One advantage of ALL-IN-1 is that it permits significant interaction between different VMS products such as MAIL and WPS-PLUS. Without ALL-IN-1, transfer of WPS-PLUS files that contain all the control characteristics can't be accomplished using only the MAIL and WPS-PLUS utilities. Sites with ALL-IN-1 can use the simpler technique described above.

GRAPHICS OUTPUT SOLUTIONS

I enjoy your magazine and find the articles well-written and informative. However, David B. Miller's "Datability's RAF Print Server" (October 1988) helped us more than any previous article.

We had problems in achieving proper graphics output using our Hewlett-Packard LaserJet Series II printers under VAX/VMS Services for MS/DOS. The command file that showed the queue definition and terminal setup used by the RAF Print Server held the key. Comparing your setup to our queue setup, I noticed two qualifiers in ours that



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Automate the critical task of Configuration Management with easy to use and highly flexible tools from POLYTRON. You will discover why thousands of programmers and managers at the leading software, aerospace, manufacturing and service companies use the POLYTRON Version Control System (PVCS™) and PolyMake™ to control the revisions and versions of source code and automate the rebuilding process with unequalled power and precision. PVCS and PolyMake can be used independently or together.

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PC Tech Journal

Unmatched Capabilities

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Automatically rebuild and maintain simple or highly complex projects consisting of thousands of modules, multiple directories & disks, and geographically dispersed development locations.

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If your projects are developed in a multiple operating system environment, or will be ported to run on another OS in the future, PVCS and PolyMake will make your job easier. The PVCS archive files (logfiles) and the command interfaces are exactly the same across operating systems. The same PolyMake makefiles can run unchanged on the different operating systems.

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PVCS maintains individual archives of all project components in your system — source code modules, data files, documentation and even object code. The "source documents" can be written in any language or multiple languages. PolyMake is also language independent.

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MS-DOS OS/2 Macintosh

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PVCS uses "reverse delta storage" which saves disk space and speeds retrieval of the latest versions of any module or an entire system. A delta is the set of differences between any revision and the previous revision. Differences are automatically detected and stored when programmers "check in" a file.

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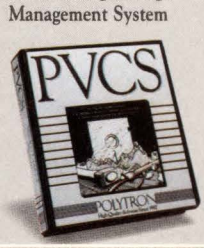
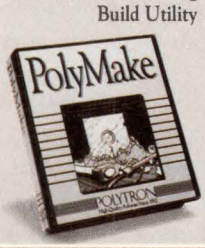
While important for single-programmer projects, PVCS is absolutely essential for multiple-programmer projects and LAN-based development efforts. In a LAN environment, source code modules are simply too easy to change. Because any change to any module can have major ramifications, coordinating and keeping a record of changes is critical. Project leaders can determine on a module-by-module basis, which programmers can access or modify source files, libraries, object code or other files. Levels of security can be tailored to meet the needs of nearly every project. PVCS works on all major LANs and networks, including networks with multiple computer types.

The Leading Change Management System



The World's Best Selling Build Utility



PolyMake Works With PVCS

PolyMake understands the structure of PVCS logfiles and is able to correctly determine the time and date of any module revision. This prevents unnecessary operations that occur when the date and time of the revision archive file itself is used as with other Make utilities.

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POLYTRON products are priced on a "Per User" basis. The price per user decreases as you add users. ■ ***MS-DOS, Macintosh MPW:*** **Personal PVCS** (for single programmer projects) $149 for single user. **Corporate PVCS** (has features for larger, more complex projects including unlimited levels of "branching") $395 for single user. **Network PVCS** (includes file locking and security features for LAN use) $1,284 for 5 users. **PolyMake** $149. **Network PolyMake** $484 for 5 users. ■ *PVCS and PolyMake are packaged together on OS/2, SunOS and VAX/VMS.* ■ ***OS/2:*** $695 single user, $2,259 for 5 users. ■ ***SunOS:*** $795 single user. $2,584 for 5 users. ■ ***VAX/VMS*** any model: $995 single user. $3,233 for 5 users. ■ Call for price quotes.

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VAX/VMS SunOS

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Jonathan Richey
Director of Product Development
Novell

Adopt PVCS & PolyMake On Existing Projects

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High Quality Software Since 1982

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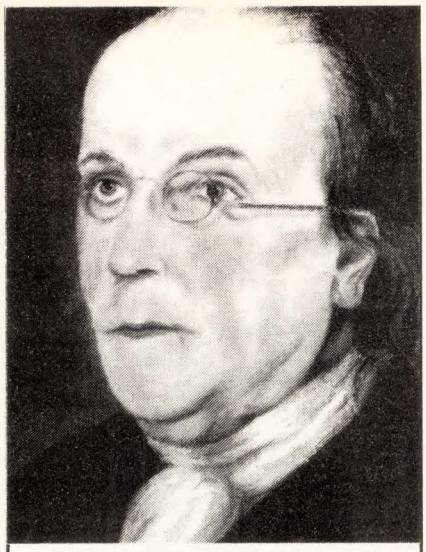

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weren't on your queue characteristics. These qualifiers, along with two terminal qualifier changes, provided the answer that had escaped us for the past year.

Scott A. Youlden
Boston, Massachusetts

ANOTHER DISK FILE I/O OPTION

I enjoyed Darylene Colbert's "Block I/O And Record I/O" (September 1988). The biggest problem with VMS often is determining which solution is the best in a given situation.

In addition to block and record I/O, creating and mapping a disk file section is an I/O option. It allows an entire file, or contiguous portion, to be mapped into the virtual address space of a process with one call to RMS and another to the System Service $CRMPSC. Thereafter, no further I/O statements are required to read from and/or write to the file. I/O is performed implicitly for you by the system via page faults rather than by explicit I/O calls.

This method has its drawbacks, such as the ability to map an entire file into the virtual address space of a process. Technically, VMS allows a 2-GB process virtual address space. But the actual limit is system dependent and can be as small as several megabytes. You could map portions of a large file, then unmap and map in other portions as they're needed, but you're probably better off using more traditional forms of I/O.

The call to $CRMPSC returns starting and ending virtual addresses to you. This is a minor inconvenience in languages such as FORTRAN, requiring you to pass the address of the section to a subroutine using the /VAL built-in function to refer to addresses in the section.

Other languages might allow you to use addresses directly. As with block I/O, files requiring any of the features provided by RMS, such as variable-length records or indexes, are poor candidates for mapping as sections.

So when should you use section mapping for disk I/O? Applications such as signal and image processing, in which the files are a reasonable size and can be treated as one or more fixed-length records, are suited to section mapping. Because of record length limitations in file systems such as RMS, N × N image files often are treated as files containing N fixed-length records, each of length N bytes (or words, longwords and so on), and therefore are read and written with N I/O operations. Mapping allows you to treat the entire image as a single entity as far as I/O is concerned.

We deal with computed tomography images that have a fixed-length header record followed by the image itself. The header record can be mapped first. One of the fields in the header contains the size of the image that follows. This information then can be used to map the image itself.

Bob Heath
Edmonton, Alberta

ONE MORE TWIST

As President of the Accent R User Group, I was surprised that Evan Birkhead's "New Twists For the RDBMS" (October 1988) failed to mention Accent R, which is a complete 4GL in its own right and has interfaces to several 4GLs mentioned in the article.

Although it's understandable that emphasis is given to some of the better-known 4GLs, it would serve readers to mention products that have features comparable, at the least, with those examined in an otherwise informative article.

Winston Tellis
Fairfield, Connecticut

Editor's note: For information on the Accent R 4GL, contact:
NIS Inc.
1190 Saratoga Ave.
San Jose, CA 95129
(408) 985-7100

CIRCLE 503 ON READER CARD ■

MEET THE GUYS WHO CHEATED DIGITAL EQUIPMENT CORPORATION OUT OF $60,000,000.

With their software, you can do everything a $1000 DEC terminal does — on your PC — for a mere $245.

The suave and debonair gentlemen bandits who sit before you virtually invented DEC terminal emulation for the IBM personal computer.

To the uninitiated, what that means is this.

With their software, you can do everything a $1,000 DEC terminal can do — right on your own PC — for the paltry sum of only $245.

Has business been good for our heroes?

You bet: to the tune of 60,000 users, who would otherwise have blithely gone out and bought DEC terminals.

Does this make DEC happy? What do you think.

Heavy DEC Experience + Heavy IBM Experience = Perfect Emulation.

The product these wizards invented is VTERM/220. And the reason it's so good, frankly, is that nobody has more experience than they do in DEC emulation on a PC.

With VTERM/220, you can emulate DEC's VT220, VT102, VT101, VT100, and VT52 terminals.

Of course, there's emulation and then there's EMULATION. This is *TRUE EMULATION*. Complete! Comprehensive! Thorough! Fast! Accurate!

Installation's a snap. Setup is a simple full-screen operation. You can toggle between DOS and the terminal screen and put mainframe data directly into PC spreadsheet and data base products such as Lotus 1-2-3™, dBase™, and Multiplan™. And for file transfer, there's XMODEM, ASCII, Kermit or VTRANS, our own high-speed, error-correcting protocol.

One last word from the Robin Hoods of software.

Are there other terminal emulators?

Of course there are.

But, we invented DEC terminal emulation at Coefficient. We know the subtleties, the little features (and the big ones) that make an emulator a joy to use. And we've incorporated them all into VTERM/220.

Just ask any of our 60,000 users.

They paid us the highest compliment of all.

They chose our software over the real thing.

CIRCLE 105 ON READER CARD

A free working copy of their software. *Free?* Yes, free.

There's only one way to experience the speed, power, and simplicity of VTERM/220. Try it.

- ❑ Send me a free, time-limited, full-blown working copy of VTERM/220, which is mine to keep.
- ❑ Send me a free, time-limited full-blown working copy of your new ❑VTERM/4105 or ❑VTERM/4208 Tektronix graphics terminal emulators.

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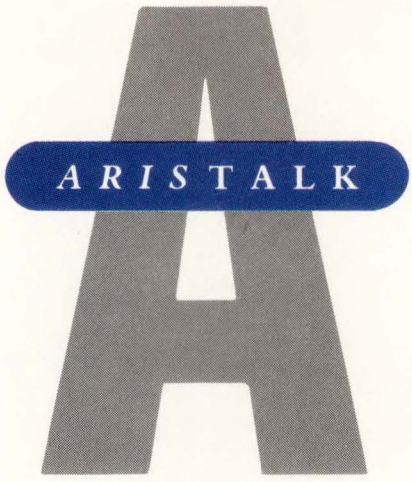

MASS-11 PRINTING TO HP LASERJET

QUERY:

Scott E. Kensinger *(SIG 47/MESS 93):* We're experiencing problems printing from Mass-11 to an HP LaserJet II. Our queue stops in SYS$PRINT, and when started manually, it prints. Can anyone give me a hint on what to do?

REPLY:

Bonnie Auclair *(SIG 47/MESS 94):* We use both Mass-11 and a LaserJet. I'm confused about why your queue stops. Here's how we init ours:

```
SET TERM/PERM/UNKNOWN/CRFILL=0/LFFILL=0/INTERACTIVE/SCOPE
 /NOTYPE_AHEAD/NOECHO/TAB/FORM/TTSYNC/NOWRAP/PAGE=0
 /NOBROADCAST/EIGHTBIT/NOMODEM/NOHANGUP [device]

SET DEV/SPOOLED [device]

INITIALIZE/QUEUE/LIBRARY=HPDEVCTL/SEP=(RESET=HP_RESET)
 /DEFAULT=(FORM=JET)/CHAR=0/START/NOGENERIC
 /ON=[device] que_name
```

The form is defined:

```
DEFINE/FORM/LENGTH=66/MARGIN=(TOP=2,BOTTOM=4)/STOCK=DEFAULT
 WIDTH=255  [form] [form #]
```

The margins are 2 and 4, because the LaserJet has a half-inch non-printing boundary on all sides that I've been unable to overcome. Keep this in mind in your Mass-11 first/last lines to print and page size.

HP_RESET in the device control library includes only Esc-E, which is invoked after each job. The Mass-11 printer table does the same thing.

If you don't want jobs to print immediately because, for example, you need to change stationery, when you print your Mass-11 document send it with a different characteristic or form. When the right paper is loaded, set the queue with the appropriate char/form, and the document will print.

How To Use ARIS

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

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

- (215) 542-9458 - Pennsylvania
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As a *DEC PROFESSIONAL* subscriber, you can download any of the programs marked with an ARIS symbol in *DEC PROFESSIONAL*. *VAX PROFESSIONAL* programs are available only to subscribers of *VAX PROFESSIONAL*. For subscription information, contact Karol Hughes at (215) 542-7008.

XMODEM is available.
KERMIT is available.

SIG Identification

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

11 .....Clustering/Networking
41 .....Applications
46 .....Utilities
47 .....Word Processing
101 .....Miscellaneous

DESCENDING KEYS

QUERY:

Mike Humphreys *(SIG 41/MESS 270):* Help! FDL allows me to create a file with descending primary keys, but I can't identify VAX COBOL syntax that allows me to open such a file.

REPLIES:

Robert G. Schaffrath *(SIG 41/MESS 272):* Descending keys in RMS was added in VAX/VMS version 4.4. Not all languages have added support for it. In fact, VAX BASIC version 3.3, which was just released for VMS version 5.0, now supports descending keys, two years after the release of VMS V4.4. Support probably will appear in a VMS V5.0-compatible release of COBOL.

Kitty George *(SIG 41/MESS 277):* I don't know if you can access records in ascending order with COBOL, but if you can do the ascending access, read on.

The following applies to other languages as well. I know it works with FORTRAN and PASCAL, I can't see why COBOL shouldn't follow suit.

If you define a file as having records with descending keys, you can access them using the GE or GT qualifiers on the Read statements. For example, in FORTRAN, you might have records with

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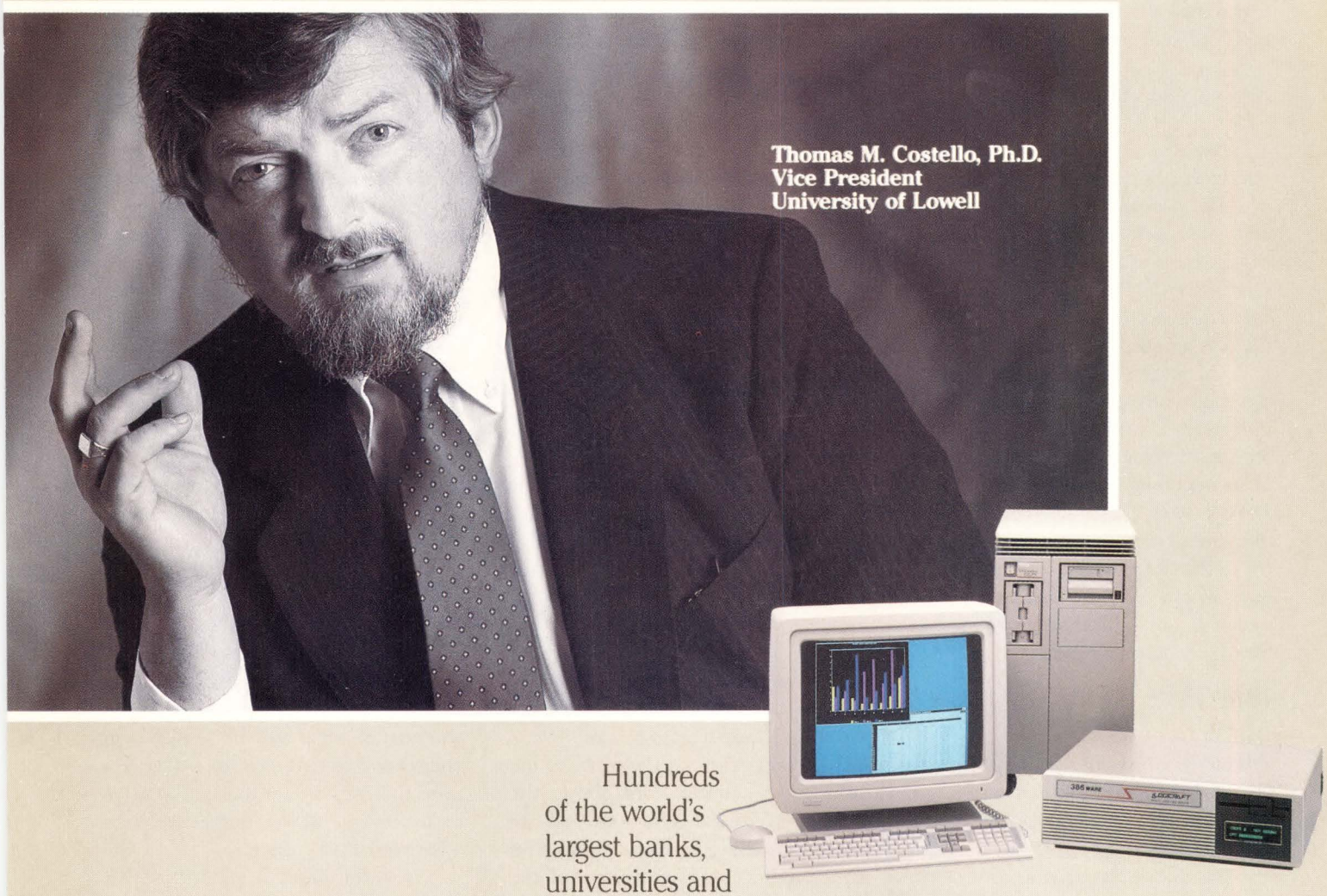

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CIRCLE 156 ON READER CARD

keys with the following values: record one, key is C; record two, key is B; record three, key is A. If you want the first record after the one with key = C, the Read statement looks like this:

```
READ (unit=nn, keygt = 'C', .....) var1, var2, var3
```

And the actual record read is the one with key = B.

The compiler might not have the keywords (KEYLE, K EYLT) that you'd expect to use to access the records in descending order. You still can process the file in descending order if that's how the file was designed using the FDL editor.

This doesn't mean that, if you design a file with descending keys, you can process the records in descending order with Read verbs like KEYLE and KEYLT, or in ascending order with KEYGE and KEYGT. RMS traverses the index in only one direction, from first index entry to the last index entry. Thus, if you have an old compiler that hasn't been updated, you still can use it to process files with descending keys.

IBM TAPE READ

QUERY:

Rodney W. Struhssig *(SIG 46/MESS 302):* We need a program, preferably free, that will read IBM standard labeled tapes, either binary or EBCDIC-written Variable Block Spanned Record (VBS), on a VAX.

REPLIES:

George Winkler *(SIG 46/MESS 303):* There's a program on several of the recent DECUS VAX tapes that handles IBM tapes. Are you a member of DECUS? If not, join. There's no cost, and you get a lot of benefits.

Mike Mongeau *(SIG 46/MESS 307):* There's a program in SYS$SYSTEM called TAPECOPY.EXE. I recently used it to read an unlabeled ASCII tape written on an IBM machine. I'm not sure, but it might only read fixed-length records. To use it, first MOUNT/FOREIGN MUA1: (or whatever your drive name is). Then, ASSIGN MUA1: TAPE. The program uses the logical TAPE to access the drive. Next, RUN SYS$SYSTEM:TAPECOPY.

The program will ask a few questions, such as what length the records are and the name of a file to copy to.

WHY CLUSTER?

QUERY:

John Lappetito *(SIG 11/MESS 297):* After reading about the inability to use TK50 tape drives on a cluster, I'm wondering what the advantages of clustering are. My company is planning to set up an LAVc. Right now, I say that an LAVc will give us the same environment that our customers have (we're a software house) and allow us to better understand the problems our customers report. But I have not come up with real advantages for us.

We have two MicroVAX IIs (one with an RA82) and eight VAXstation IIs, plus a couple VAXstation 2000s. There are two laser printers, one off each MicroVAX. All the CPUs are strung together via E-net (coax).

REPLIES:

Bill Jamison *(SIG 11/MESS 301):* One reason to consider going to an LAVc is shared disks. You can serve any of the disks to the cluster. This allows the VAXstations to access the RA82 and can prevent installing the same product on many different systems, because all the systems would have access to the product on a served disk.

Another reason is a central queue facility. There's a systemwide queue setup in a cluster. This makes it easier to manage queues and lets users access printers on other systems without any hassle.

Easier backups also are an advantage. If you have a nine-track tape drive on the MicroVAX II, you can back up all the disks in the cluster to that tape drive. That way, you don't have to run backups on each of the systems individually. Doing backups over the network is very intensive, though. You also can do all of the backups to a TK50. You can't serve the TK50, so the process running the backup must be on the system where the TK50 is installed.

Now for the drawback. There's overhead for each system in the cluster. I've heard that you can lose up to 20 percent of the CPU in cluster overhead because of serving disk, lock management and so on.

I like the LAVc benefits. I manage an 11/750 and two MicroVAX IIs and will be installing an LAVc shortly.

Jared Hecker *(SIG 11/MESS 310):* For my money, an LAVc "by the book" is of limited value. It provides those VAXstations access to a disk farm, but little more. As an alternative, you might consider the Clustor 3 controller from System Industries and some of its disks. The Clustor 3 attaches to your MicroVAX by a DMA channel, effectively allowing you to set up an almost-CI cluster, comparable to CI clusters in terms of performance. To remain LAVc-compatible, they send the distributed locks via the Ethernet.

RUMORS

Dr. R *(SIG 101/MESS 426):* Here are a few juicy details on a forthcoming DEC workstation, the much-vaunted Firefox.

Firefox is a CVAX-based SMP workstation that will be available in your choice of two- and four-CPU versions that will deliver five and 10 VUPS of processing power, respectively, to VMS *and* ULTRIX users.

Does this mean that ULTRIX SMP is right around the corner? You bet, because DEC's hot new midrange workstation is due to hit the streets early this year, mayhap hard on the heels of the PMAX (RISC workstation using technology from Mips Computer Systems Inc.), which tentatively is scheduled to debut during the second week of January.

Gotta run. An old pal who specializes in unannounced processors has dropped by to explain the difference between the 4-mips 60-nanosecond CVAX II CPU, which will form the heart of the VAX 6300 series, and the 7-mips 40-nanosecond CVAX successor, known to insiders as RIGEL. ■

THE SOFTWARE NEWS

Total VAX/VMS Disk Solutions

RABBIT-11 Disk Caching

New!

RABBIT-11's automatic caching keeps frequently accessed files in memory. System performance improves greatly because I/O to physical disks is minimized.

RABBIT-4 Disk Management

New!

"Whatdayamean, we're out of disk space? I just spent $17,000 on a new RA82!!!"

Maybe you think you're out of disk space, but you're really not. RABBIT-4 lets you free disk space for productive use. RABBIT-4 collects data on each disk or an entire disk farm, then arms you with the information you need to make the most of your disk hardware investment.

RABBIT-5 High Speed Disk Backup

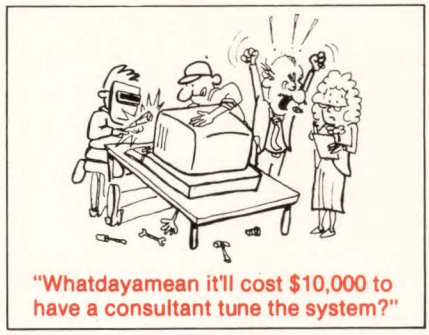
"Whatdayamean you spent 24 hours backing up the system and then overwrote the tape?"

Backups are done quickly and safely with RABBIT-5. The tape librarian enforces tape labeling so there's no room for accidental overwrites. Disk to tape backup is often 3 to 5 times faster than VMS Backup in elapsed time and 90% faster in cpu time.

RABBIT-9 VAX Acceleration Software Technology

Patent Pending

RABBIT-9 works all the time and prices start at only $1,000. Improve system performance up to 100% and more using only a few seconds of cpu daily. Continuous tuning means your system feels quick and performs great. All the time!



"Whatdayamean it'll cost $10,000 to have a consultant tune the system?"

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CIRCLE 190 ON READER CARD

PRODUCT WATCH

Riding The Giga-Go-Round

Summus Extends GigaTape Technology With GigaTape 125 JBL

Summus Computer Systems of Houston, Texas, manufacturer of GigaTape storage systems, now offers a unit that autoloads a number of cartridges. The GigaTape 125 Jukebox Library (JBL) provides storage and access for up to 54 8mm tape cartridges. At 2.33 GB of data per tape, total storage capacity for one unit is more than 125 GB of data.

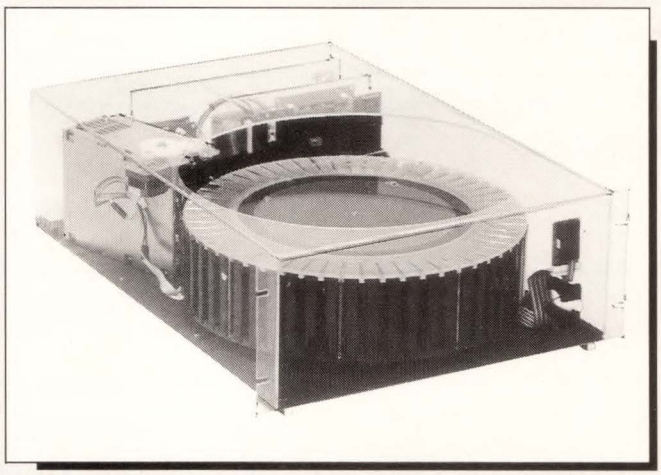
"Our system is 100 times more reliable than any other auto-library system on the market, because it is mechanically simple but driven by very intelligent electronics," comments Dave Meitzen, vice president of sales for Summus. "It is not a mechanical monster, moving media in a multiaxis platform."

Tapes are arranged in a carousel that fits in a standard 10½-inch NEMA 19-inch rack-mount cabinet. The unit comes with all robotics necessary to access the data on any cartridge.

Peak transfer is rated at 1.5 MB per second with a sustained rate of 246 KB per second. A 256 KB buffer helps the 125 JBL achieve its high performance. Effective tape-to-head speed is 150 ips. Searching for files is done at 10 times normal speed.

The 125 JBL is built to be reliable. Summus claims a 1 in 10^{15} Write and a 1 in 10^{13} Read non-recoverable error rate. Mean Time Between Failures comes in at 20,000 hours.

The 125 JBL can be used on many models of DEC computers, including PDPs, VAXs and MicroVAXs. Host adapters compatible with the UNIBUS, Q-bus and BI-bus are available. VMS, VAXELN and ULTRIX operating systems can support the 125 JBL. An Ethernet adapter is being developed to support network server applications under DECnet and TCP/IP.



Summus Computer Systems' 125 JBL can store more than 125 GB of data.

To extend your storage capacity further, eight 125 JBLs can be configured to form the GigaTape 1000 JBL, providing access to up to one terabyte of data. A 2-MB data cache is available to speed performance.

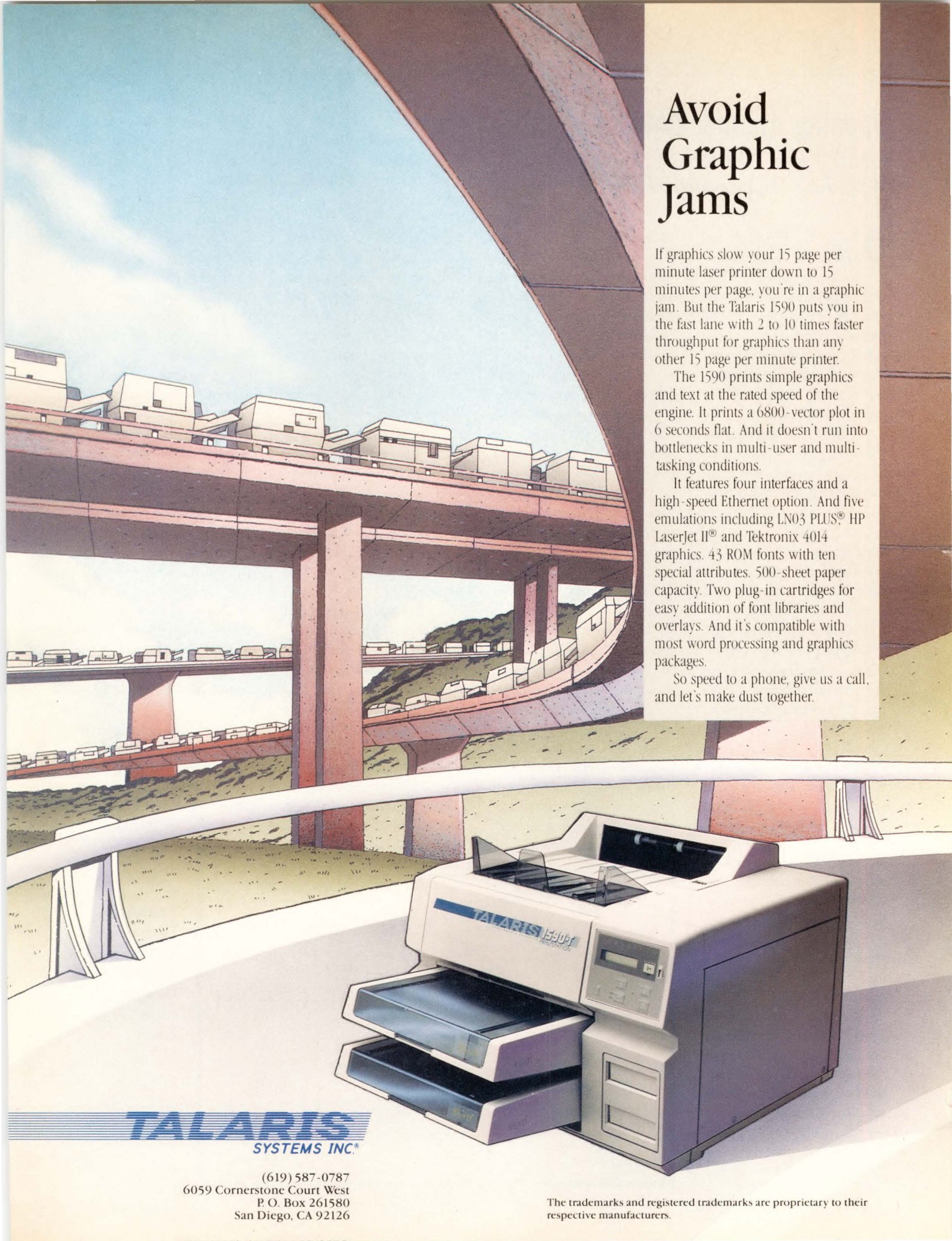
Data backup and interchange is made possible with Summus' GigaSAFE Backup and Data Interchange Utility software. GigaSAFE is menu driven and supplies options for ANSI-standard or Summus proprietary file formatting. It also provides user-defined image or file-by-file backup and multiple save-set capabilities, as well as file directory and backup status reporting.

Prices for the GigaTape JBL subsystems range from $44,000 to $194,000, depending on configuration and computer type.

For more information, contact Summus Computer Systems, P.O. Box 219270, Houston, TX 77218; (713) 492-6611.

Circle 578 on reader card

—David B. Miller



Avoid Graphic Jams

If graphics slow your 15 page per minute laser printer down to 15 minutes per page, you're in a graphic jam. But the Talaris 1590 puts you in the fast lane with 2 to 10 times faster throughput for graphics than any other 15 page per minute printer.

The 1590 prints simple graphics and text at the rated speed of the engine. It prints a 6800-vector plot in 6 seconds flat. And it doesn't run into bottlenecks in multi-user and multi-tasking conditions.

It features four interfaces and a high-speed Ethernet option. And five emulations including LN03 PLUS,® HP LaserJet II® and Tektronix 4014 graphics. 43 ROM fonts with ten special attributes. 500-sheet paper capacity. Two plug-in cartridges for easy addition of font libraries and overlays. And it's compatible with most word processing and graphics packages.

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Opening Another CASE

Oracle Enters The CASE Market With Tools And A Methodology

Oracle Corporation of Belmont, California, marked its entrance into the CASE market by announcing a family of tools designed to help software engineers design better systems. In addition to the tools, Oracle also is promoting a system development methodology.

CASE*Designer provides the graphical interface to Oracle's CASE environment. Using X Window System software and pop-up menus, system designers can produce and modify entity relationship diagrams, function hierarchy charts and matrix diagrams. Textual information and other non-graphical detail also can be entered. Diagrams can be checked for consistency and reports can be generated to make sure that diagrams are complete.

Diagrams can be plotted on Hewlett-Packard and compatible plotters. Screens can be printed on many makes of laser printers.

As diagrams are drawn, the contents of Oracle's CASE*Dictionary are updated dynamically. By using pop-up windows, non-graphical data can be entered directly into the data dictionary.

Currently available on Sun workstations, versions of CASE*Designer for other workstations, including VAX workstations, will be available soon. It also will be ported to the IBM PS/2 family upon the general availability of OS/2's Presentation Manager.

CASE*Method, the non-software portion of Oracle's CASE strategy, is Oracle's proprietary development methodology. It's derived from Oracle's SQL*Development Method (SDM). Oracle now is promoting it as the design methodology of choice after years of experience in using it to develop its own applications.

It's a top-down approach to system development. Oracle has taken a three-model approach that encompasses:

1. The objectives of a business.
2. The tasks it undertakes in pursuit of those objectives.
3. The information required to support those objectives.

In addition to cut-and-dry systems development rules, CASE*Method emphasizes effective communication between analysts and end users through interviewing, feedback sessions and presentation techniques, as well as rigorous diagrams.

The heart of Oracle's CASE family is CASE*Dictionary, a data dictionary developed from Oracle's SQL*Design Dictionary. Every item in a project is stored in the central database. Data is entered via CASE*Designer, through menus and forms-based interfaces or by direct entry from a terminal.

By using Oracle's distributed database, project information can be shared easily and split among the members of the design team. Users sharing the data are informed of changes to the database by fellow analysts. By using Oracle's SQL*Net, data can be shared across a network.

More than 80 predefined reports can be run to check the integrity of a system. Use of the Oracle database means that built-in checks and balances regarding a project's data are already a part of the system.

CASE*Dictionary is available on a variety of platforms, including VAX, IBM VM and MVS, a number of UNIX platforms, and on proprietary operating systems from Prime and Data General.

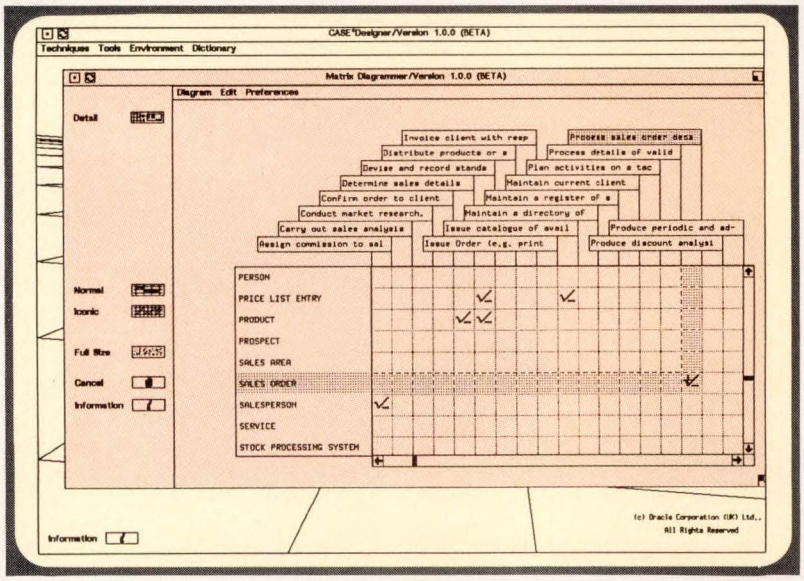
Oracle's CASE products originally were designed in the United Kingdom. When the products were announced in Europe in June, Geoff Squire, managing director of Oracle U.K. and chief executive of Oracle Europe, commented, "Industry analysts have proclaimed a 'software crisis' which, if left unchecked, will see commerce and industry crippled by poor quality, unreliable computer systems, and a whole generation of our workforce being recruited into the ranks of programmers, just to meet the demand for new systems.

"Our CASE products are designed to help avert this crisis by ensuring that from now on software can be designed 'right first time' in a fraction of the time it takes today."

For more information, contact Oracle Corp., 20 Davis Dr., Belmont, CA 94002; (415) 598-8000.

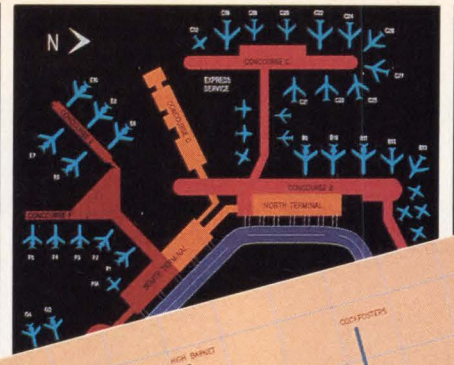
Circle 409 on reader card

—David B. Miller



The Matrix Diagrammer is one example of CASE* Designer's system design tools.

This freehand drawing was created using DRAW's tablet mode.



This airport terminal layout illustrates the placement of user-defined symbols with object-snapping.

Grid-snapping was used to create this map of the London subway system.

DRAW's extrusion feature allows the user to generate complex graphs and drawings.

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With DRAW you can export picture metafiles to other CGM–compatible systems so you can incorporate line drawings with charts or any other graphics. You can also use DRAW to route images through PostScript, HPGL, and other publishing formats to merge illustrations with text output.

DRAW provides user control over every attribute with a feature set that includes color table support, layering, mirroring, 3D extruding, variable line width, 48 hatch patterns and publication – quality text fonts. And because DRAW operates on all VAX/ VMS systems with Tektronix graphics or VT-240, VT-340 terminals and all popular hardcopy devices you are not tied to the hardware.

To qualify for a free evaluation copy and to receive complete technical information, call Chris Logan at 303/530–9000.

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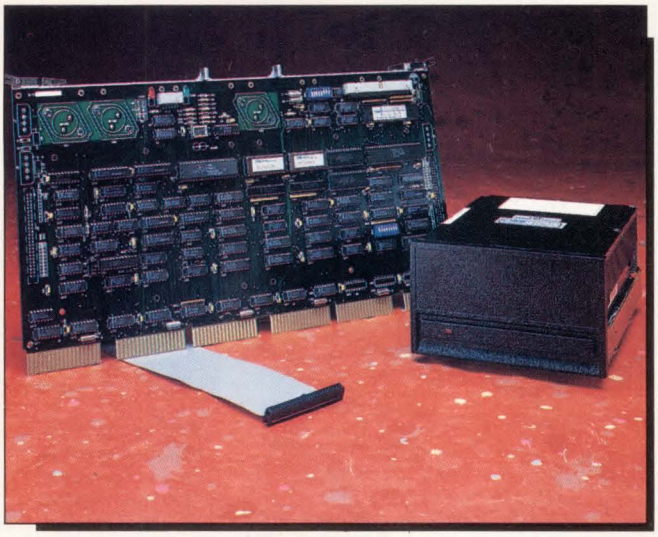
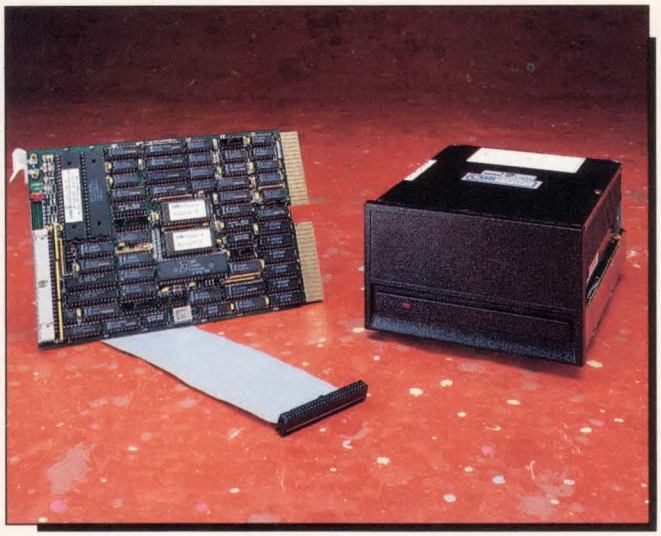
CIRCLE 172 ON READER CARD





CMS Enhancements Inc. allows SCSI disks to be connected to either UNIBUS- or Q-bus-based systems with its CUS-70 (left) and CQS-20 (right) disk controllers. Tape controllers also are available.

Controlling The World

CMS Enhancements' Controllers Span UNIBUS And Q-Bus Worlds

CMS Enhancements Inc. of Tustin, California, offers a complete line of disk and tape controllers to allow connection of SCSI-based devices to either UNIBUS or Q-bus systems.

The CQS-20 and CUS-70 allow a variety of SCSI-based disks to be connected to Q-bus- and UNIBUS-based systems. The CQS-20T and CUS-70T do the same for SCSI tape drive units. Each controller can support up to seven SCSI devices. The disk controllers are fully MSCP compatible. The tape controllers support DEC's TMSCP protocol.

The CUS-70 supports 16-KB sector buffering. Up to 10 commands can reside in its command queue. The controller also performs seek optimization. Standard SCSI bus arbitration is supported as well as all SCSI commands. Data transfer rates of up to 2 MB per second are attainable.

The dual-height CQS-20 also supports SCSI commands. Its command buffer holds up to 16 commands, 10 of which can reside in its command queue. Its block mode DMA interleaves address references with bursts of data. Data can be transferred at up to 2 MB per second.

Both controllers employ error correction code (ECC). Bad blocks can be replaced dynamically to ensure that the host receives error-free data. The CQS-20 allows manual or automatic bad block replacement.

The CUS-70's ROM-based, on-board, menu-driven diagnostics allow for easy execution of configuration, disk formatting and bad block replacement commands. Data reliability and integrity tests also can be performed.

On-board LEDs indicate controller status. The console receives reports of any faults. A comprehensive set of self-diagnostics is executed upon powerup.

Utilities on the CQS-20 provide interactive disk formatting and maintenance operations via the system console. A simple console communications program is loaded into the host from the controller. Default values obtained from the disk drive are used for disk configuration. Drive characteristics are stored and can be retrieved by the controller at startup. Bad blocks, as detected from the disk manufacturer's defect map, are replaced automatically during disk formatting.

The two tape controllers, the CUS-70T and CQS-20T, support a variety of 8mm helical-scan, ¼-inch and ½-inch streaming tape drives.

Many characteristics are shared with the disk controllers. Data can be transferred at up to 2 MB per second. Error-recovery algorithms that present error-free data to the host also are employed. Standard SCSI commands and command queuing are supported.

CMS also manufactures the CXB22/Q and CXB22/U tape backup subsystems, which can be used with the CQS-20T and CUS-70T controllers, respectively. The drives use 8mm VHS video cartridges, which can hold up to 2.3 GB of data each.

In addition to the four SCSI controllers, a fifth new unit, the CQE-30, provides an ESDI interface that's MSCP compatible.

For more information, contact CMS Enhancements Inc., 1372 Valencia Ave., Tustin, CA 92680; (714) 259-9555.

Circle 468 on reader card

—David B. Miller

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Maxport Disk Subsystem Stores 3.3 GB Per Port

EMC Backs Winchesters With Diagnostics And Remote Maintenance

The Maxport series of DSA/MSCP-protocol disk drive subsystems, from EMC Corporation of Hopkinton, Massachusetts, is software and diagnostic compatible with DEC's HSC-50, HSC-70, KDB-50 and UDA-50 disk controllers.

EMC is positioning the subsystems against DEC's RA and SA drives, claiming less cost per megabyte, higher capacities and faster seek times. The Maxport is EMC's first hard-disk product for VAXs. The company also offers disk subsystems for computers from IBM, HP, Wang and Prime.

The drives plug directly onto the VAX controller without operating system revisions or device drivers. There are six Maxport models, each using eight-inch disks:

1. The MRA-600, with a formatted capacity of 622 MB and an average transfer rate of 2.46 MB per second. (The rest of the series was clocked by EMC at 2.8 MB per second.) The MRA-600 is priced at $13,400.
2. The MRA-800, with a capacity of 825 MB, priced at $17,000.
3. The MRA-1600, with a 1.65-GB capacity, priced at $33,600.
4. The MRA-2400, with a 2.5-GB capacity, priced at $50,000.
5. The MRA-3200, with a 3.3-GB capacity, priced at $64,000.
6. The MSA-11000, a preconfigured high-end subsystem, has an 11.5-GB capacity, and is priced at $215,000.

The subsystem cabinet has room for seven trays or 14 spindles. The MRA-600 and 800 are single-spindle systems. The MRA-1600 has two spindles, the MRA-2400 has three spindles in two trays and the MRA-3200 has four spindles in two trays. The full MSA-11000 can comprise seven MRA-1600s or combinations of the others. Because the Maxport can control four spindles per port, the MRA-3200's 3.3-GB capacity is the maximum per port.

The average seek times of each drive were measured at 16 ms. The track density of the disks is 1,089 TPI, the bit density, 19,816 BPI.

Each drive takes up one VAX disk controller port. EMC says a VAX can support up to 13.2 GB of Maxport storage per disk controller.

By storing more data per port, EMC maintains that single- and dual-ported versions of the Maxport cost less per megabyte than comparable DEC subsystems.

"In a comparison between the MRA-2400 and DEC's SA-482, we estimate that overall, the user saves $28,000 — more than $11 per megabyte — for a single-ported system, and $48,000 — or about $17 per megabyte — for a dual-ported system," says Todd Veale, product group manager for Maxport.

Additionally, the drives are configured with a prediction panel that governs diagnostics and automatic formats from a remote dial-in site. The panel runs continuous tests to search for errors and potential errors at the head, track and cylinder levels.

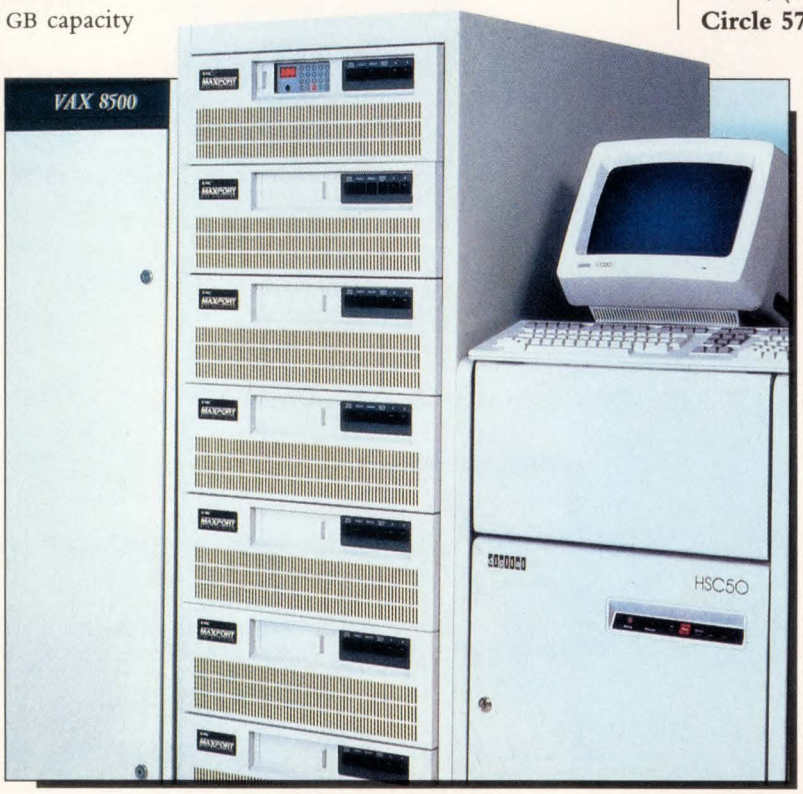
DEC's system-level diagnostics, including error correction and detection code and an automatic bad-block replacement system, are supported.

The diagnostic support, adopted from EMC's offerings in the HP and IBM disk markets, is called the Remote Access Maintenance Program (RAMP). Maxport subsystems have a one-year warranty.

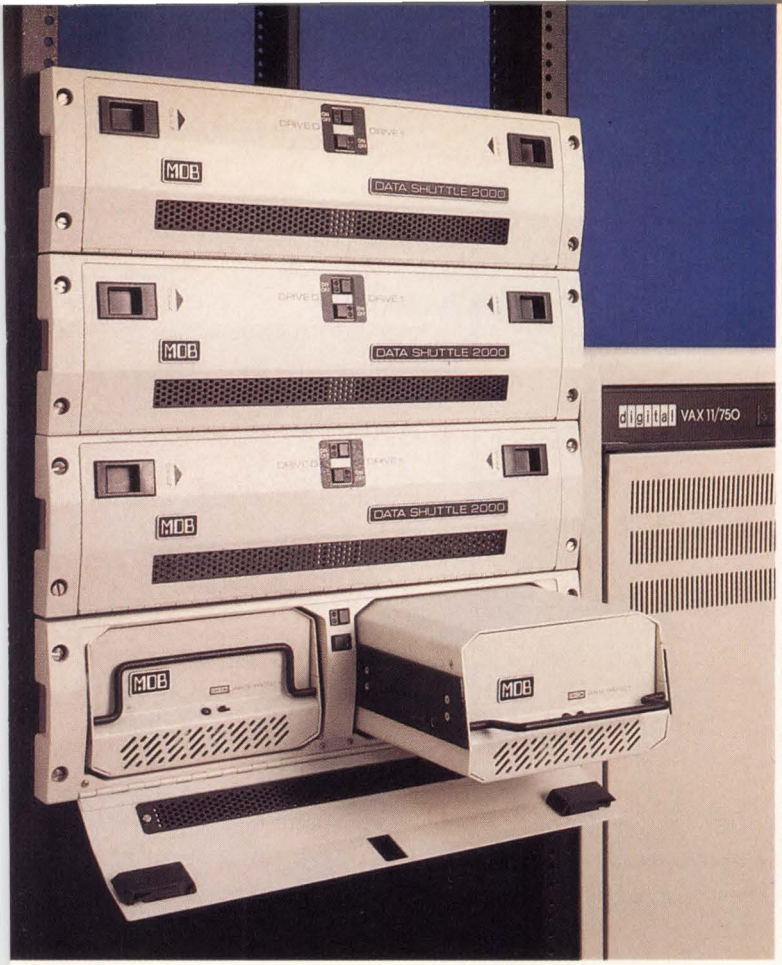
For more information, contact EMC Corp., 171 South St., Hopkinton, MA 01748; (508) 435-1000.

Circle 579 on reader card

—Evan Birkhead



Maxport subsystem in the full 11.5-GB configuration.



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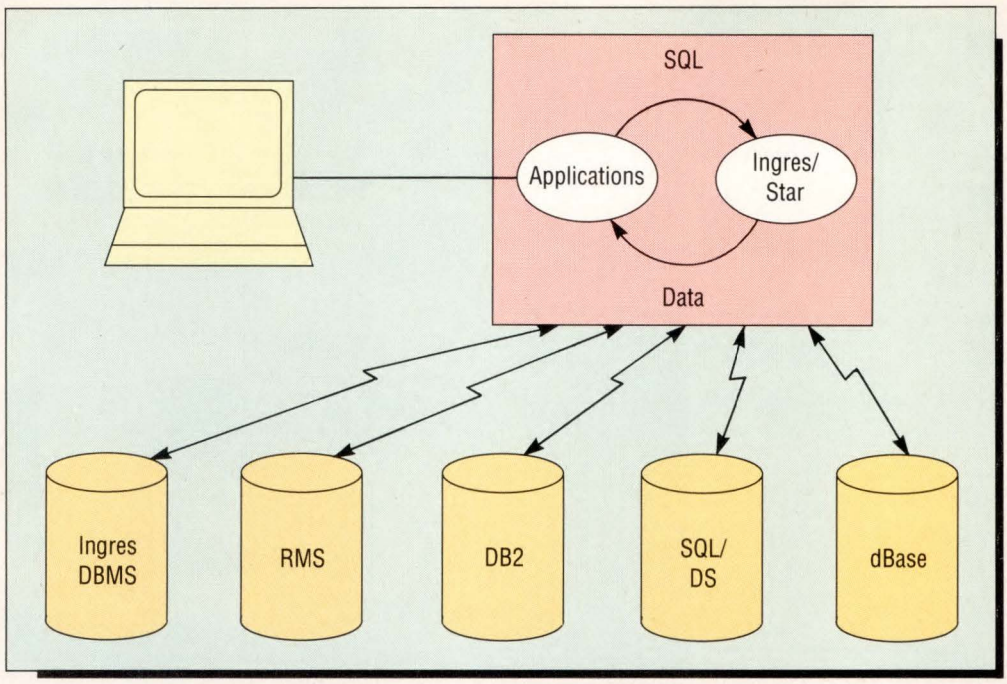

Access to several leading databases is provided by Ingres gateways.

Multiserver Data Manager Keys Ingres Release 6.0

RTI's Newest RDBMS Proves Well-Suited To Clusters

Relational Technology Inc.'s (RTI) strategy for Ingres, its well-known relational database management System (RDBMS), can be described in one word: portability.

RTI, of Alameda, California, considers simple, seamless software interoperability to be integral to success in its target markets: on-line transaction processing (OLTP) and decision support. By designing a system that lets applications written on one machine execute on others — including VAXs, PCs, UNIX-based CPUs, IBM midranges and mainframes — RTI is striving for hardware independence.

Ingres also is optimized to let application development take place across clusters, multiprocessors and networks, including those with CPUs from a variety of vendors.

Because Ingres has been crafted carefully around SQL and includes the most prevalent data exchange protocols, such as DECnet/OSI, SNA, and TCP/IP, transparent transfers are possible among a variety of environments.

Ingres's aptitude for hardware transparency also is evident from its compliance with Novell's NetWare VMS, the X Window System and SAA.

This range is increased by RTI's technology exchange relationships with purveyors of applications software that require access to databases. For instance, Ingres tightly integrates with 20/20, the spreadsheet from Access Technology Inc.; TeamWork, a CASE system from Cadre Technologies Inc.; and Focus, a 4GL application development environment from Information Builders Inc.

With release 6.0, commercially released last summer, RTI has further optimized Ingres for networks and multiprocessing systems, especially parallel processors. The new Ingres model is based on a back-end, multiple-server data manager that's well-suited to VAXclusters.

It also allows a more flexible environment for tuning a computer site. Release 6.0 takes advantage of properties of VMS version 5.0 related to CPU equality and dynamic load balancing.

According to reports from users, release 6.0 provides such benefits as greater throughput, less per-user overhead, enhanced local caching and reduced I/O and CPU times.

Ingres comprises three integrated software product groups: the Ingres/Star Distributed Data Manager, which lets users access information stored on disparate CPUs, operating systems or databases; gateways that link Ingres to dBase and VAX RMS, among others (see Figure); and Ingres/Net, a transparent software layer that provides network protocol support for DECnet, TCP/IP, SNA and others.

Also woven into Ingres are a data dictionary that stores reusable forms, reports, graphs, and code modules, and development tools, including a visual query administrator that easily can be called from inside applications.

A new facility in release 6.0 is Ingres TPA (Tools, Power and Access), which is intended to provide faster, more productive software during the life cycle of a database for both programmers and users.

DEC is a distributor of the ULTRIX version of Ingres.

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

Circle 408 on reader card

—Evan Birkhead

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CIRCLE 189 ON READER CARD

Epoch-1 InfiniteStorage: Optical Storage With A Twist

Epoch's NFS-Compatible Server Backs Hard Disks With Optical Media

If you think optical storage is suitable only for archiving, think again. Epoch Systems Inc. of Marlborough, Massachusetts, has added a plot twist to the optical storage saga by developing a file server that integrates the fast access of on-line magnetic disks with the huge storage capacity of optical disks.

The Epoch-1 InfiniteStorage server allows optical drives to function as on-line storage devices by backing data that spills over from filled hard disks. This allows space on the hard disks for handling more immediate tasks.

This method of storage should help relieve the bottlenecks that have plagued high-performance technical and graphics workstation environments. The InfiniteStorage server is designed to supplant general-purpose workstation-based servers, or minicomputers, superminis and mainframes that are designated specifically for storage.

"File server performance bottlenecks are in the disk and local area network I/O subsystems," says Charles Holland, Epoch's vice president of engineering. "That's where we focused our effort."

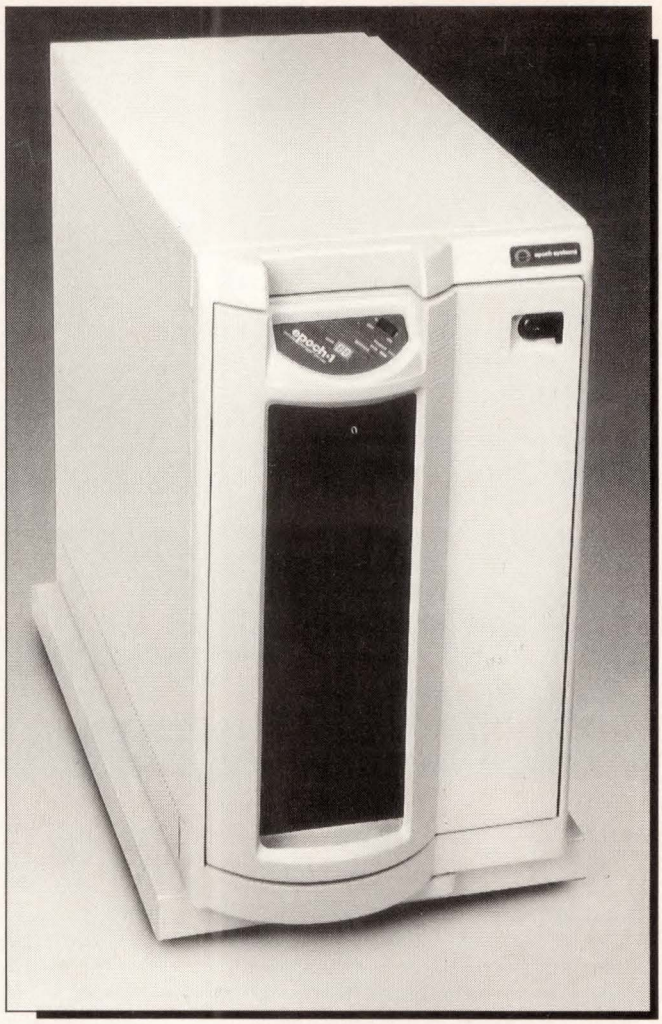
The key to the server is a system software process called Staging. This is an advanced caching algorithm that moves files from magnetic to optical media. Staging sounds like Paging for a reason: it's more similar to Demand Paging than other file transfer capabilities, such as Swapping.

The process is analogous to the function of virtual memory. Optical disks are managed by the system as virtual hard disks. The optical storage system is transparent to the user. To the user, the magnetic disk looks like a limitless (up to 150 GB) resource.

Through a hierarchical architecture, the server finds a balance between active and inactive files. When the magnetic disk reaches its high-water mark at slightly less than 100 percent capacity, the files are staged out to an optical jukebox.

At its maximum configuration, the InfiniteStorage server has 12 MB of system RAM for file caching that helps keep seek times down. This can be layered on up to 7.7 GB worth of Winchester drives. And all of that overflows into an optical library containing up to 150 GB of space on 5¼-inch diskettes.

The server keeps optical files on the operating system so that they can continue to be tracked. This is important for many installations. When archived to optical disk or tape, it's often difficult to keep track of file locations.



Epoch-1 InfiniteStorage server allows optical drives to function as on-line storage devices.

The Epoch-1 is compatible with Sun Microsystems' Network File System (NFS), recently embraced by DEC, which runs with most UNIX workstations. The server features two 68020 processors — a file processor and an I/O processor — to speed input. More bandwidth is available from two SCSI disk channels, two Ethernet LAN interfaces and a VME interface, all on-board.

The Epoch-1 consists of three units. They are the main system unit, an eight-peripheral expansion unit and an optical jukebox that can hold up to 48 600-MB optical cartridges and four drives.

Epoch offers three configurations of these units: the Model 2 for $95,000, the Model 30 for $145,000 and the Model 150 (with 150 GB) for $450,000.

For more information, contact Epoch Systems Inc., 313 Boston Post Rd. W., Marlborough, MA 01752; (508) 481-3717.

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—Evan Birkhead

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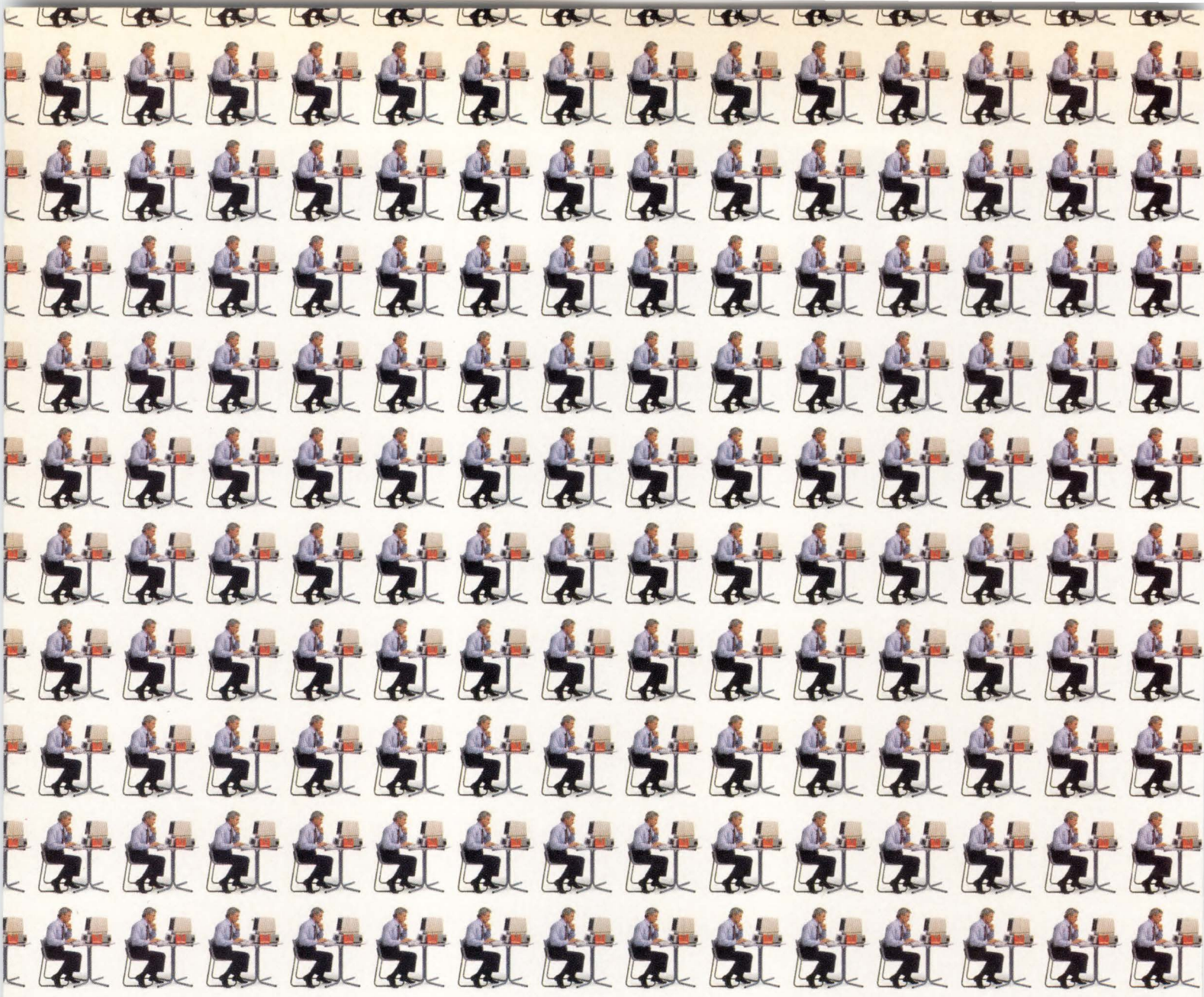

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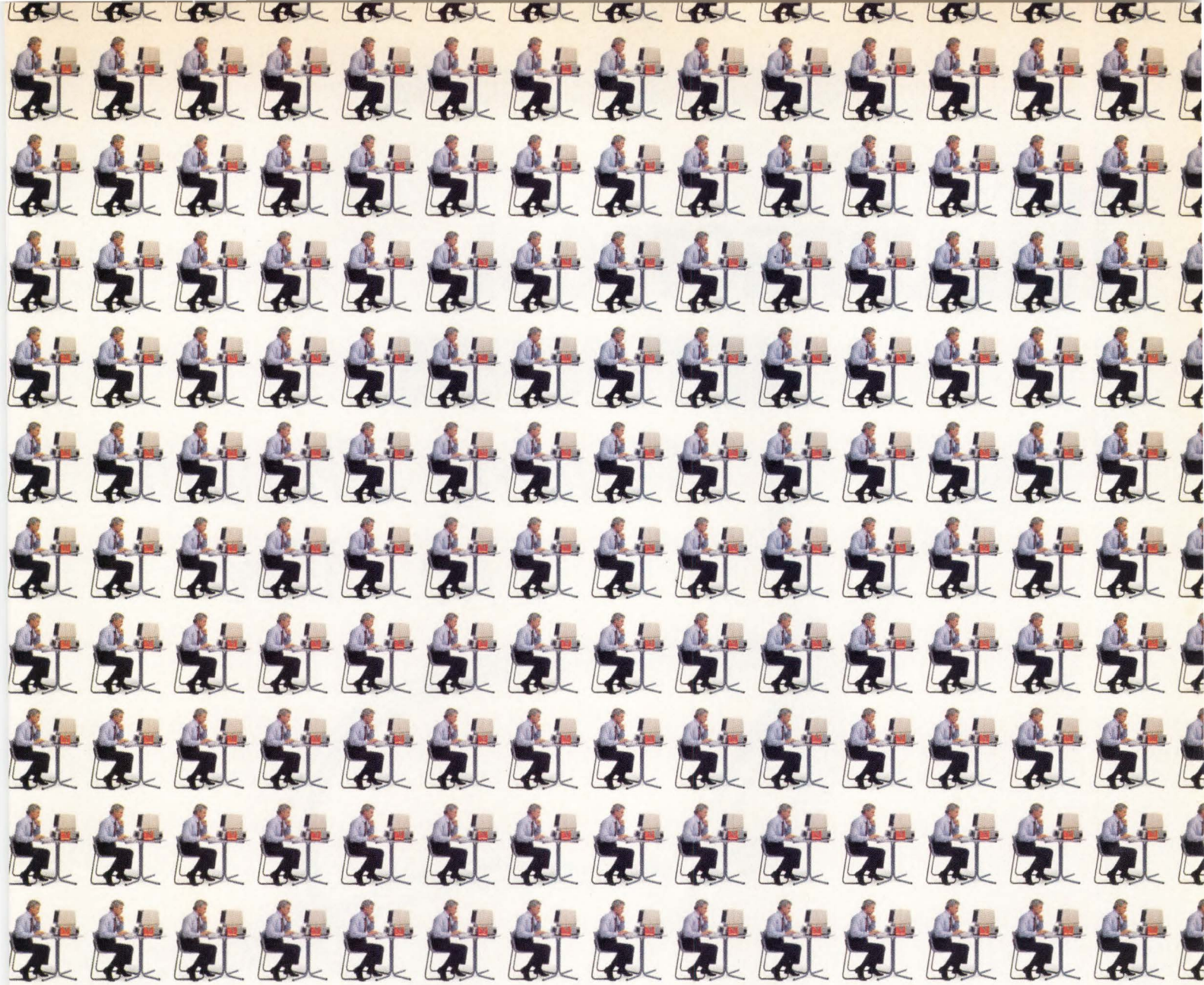

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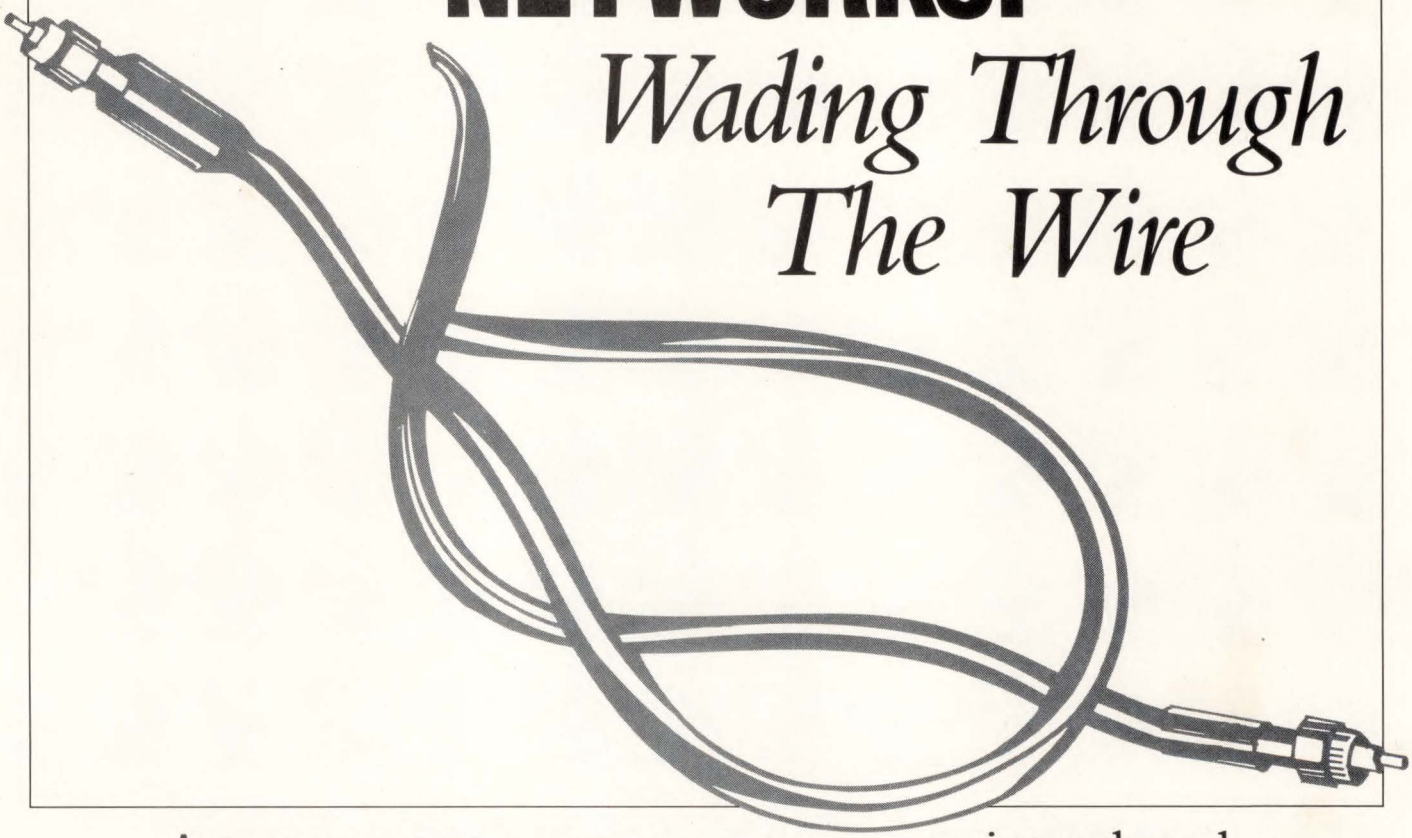
MULTIPROTOCOL NETWORKS: *Wading Through The Wire*



As MULTIPLE PROTOCOLS are introduced, networks become more complex. BY BILL HANCOCK

NETWORKS USED TO BE easy. You'd simply buy the wire, the single network software solution for the system and the controller for the software and wire, load the software through an exhaustive generation procedure, start the product and crash the system. Then you'd repeat the operation with the proper network parameters and enjoy basic networking using a single protocol.

Now there are protocols for each application need. Maintenance Operations Protocol (MOP) downline-loads operating systems to remote machines. Local Area Transport (LAT) allows terminals on certain types of terminal servers to connect to host systems and permits virtual terminal communications. CTERM does the same for other network packages such as DECnet.

There are data-link-level protocols such as Digital Data Communications Message Protocol (DDCMP), High-Level Data-Link Control protocol (HDLC) and Synchronous Data-Link Control protocol (SDLC) (see Figure 1).

There are protocols for internetwork routing, such as Internet Protocol (IP) (see Figure 2), protocols for guaranteed message delivery (transport protocols), protocols for session management (session control, such as NSP) and protocols for network

management, such as Management Information and Control Exchange, (MICE). And there are more on the way.

There's no longer only one protocol on a network. Now the network runs an average of two to four data-link protocols on each system and as many as 12 or more combinations of protocols that are combined or excluded to form a tower of communication called a protocol stack (see Figure 3).

Why So Many?

Why the surge in protocols? For the same reason there's a surge in different computing systems: the need to solve a multitude of networking problems. By writing and incorporating specialized protocols, difficult workarounds are avoided and problems are solved. To perform disk I/O across a network, vendors have developed specialized protocols to handle the various stages and problems of network-based disk access and record or file locking among multiple systems.

The benefit is that some protocols are excellent for the use they were designed for. The down side is that some protocols are being used in areas for which they weren't designed and thus cause performance and implementation problems.

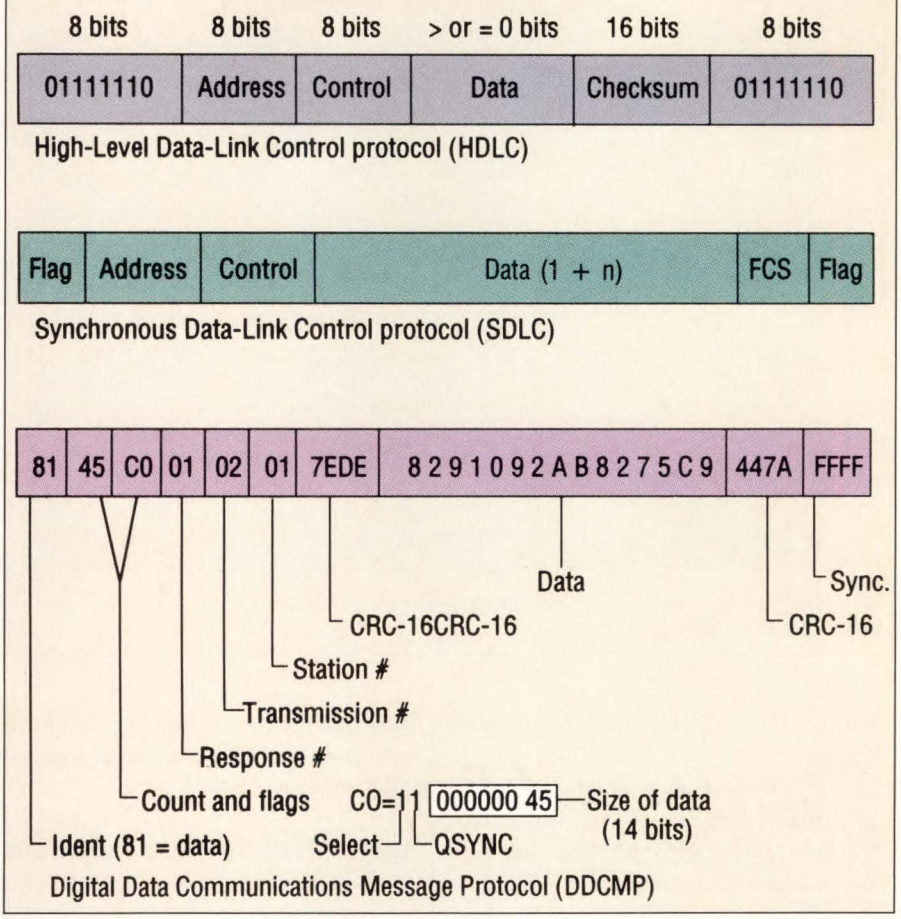
To understand multiprotocol networks, it's necessary to understand the theory behind protocol exchanges. The first question to answer is what type of hardware the network architecture will use and how reliable the network hardware technology will be.

When selecting network hardware technology, the protocol architect must determine how to solve problems and handle errors. There are two basic types of network protocol construction methods: connection-oriented (CONS) protocols and connectionless (CLNS) protocols.

Connection-Oriented Protocols

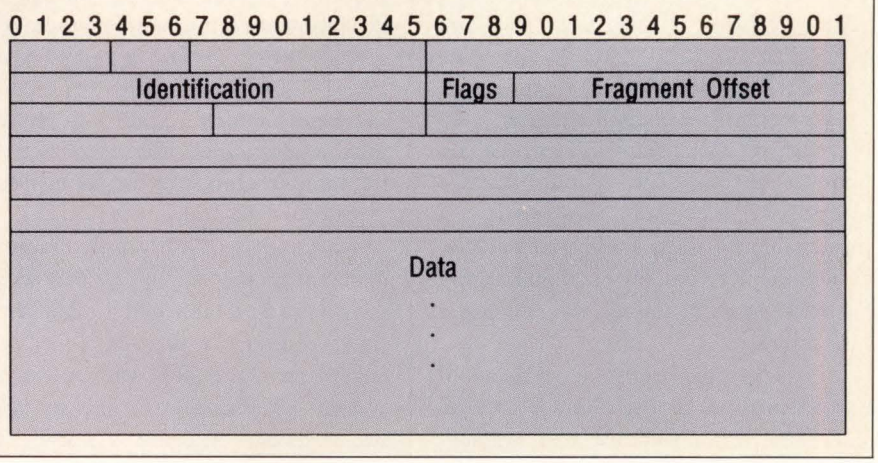
CONS protocols are network protocols architected with the understanding that the communications medium (hardware technology) can't be trusted, that is, the

Figure 1.



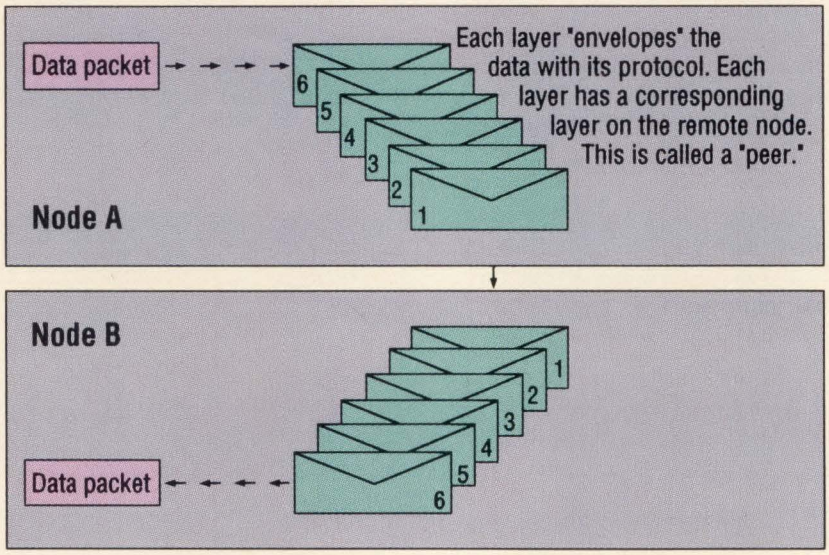
Data-link-level protocols.

Figure 2.



Internet Protocol (IP).

Figure 3.



How a protocol stack is created.

communications medium has many problems.

A typical analog telephone line is a good example of an untrusted medium. Although a telephone line can be installed and used easily, it's frequently plagued with noise and other problems. As a result, the network software can't guarantee that everything placed on the cable will arrive at its destination in pristine condition. There's a much better than average chance that data will be lost during transmission and that many of the network protocol packets that appear on the communications medium will be damaged.

Thus, the network protocol architect must take into account that the network medium inherently is unreliable. He must design a protocol to solve the network problem and ensure a delivery path among the connected machines.

To do this, the CONS concept of networking is applied. Under a CONS network protocol architecture, connection points between two machines are monitored carefully by each end to ensure that the connection operates properly and that packets arrive in sequence and without error.

Connection-Oriented Properties

Connections among systems have properties that must be kept in mind when examining or constructing a CONS protocol.

First, a connection between two entities isn't necessarily a physical connection. A good example of this is a program connecting with a remote program, neither of which is a physical entity. The programs can be on separate machines, which requires a physical medium to connect. Or, they can be on the same machine but use the network architecture to connect.

Second, a CONS protocol suite (a group of protocols) requires that several properties be established. One of these, time, requires that periods of inactivity ensure that the link still exists and works, whether it's seconds or hours between data transfer. Another, sequenced delivery, requires that the CONS suite allows the accurate delivery of the protocols in an uncorrupted way. This means that each packet arrives in order and without error. If a packet is missing, a retransmission must occur. If a packet arrives as a duplicate, it must be discarded.

Another property is flow control. CONS suites must make efficient use of buffers on the connected systems. They must compensate for message arrival speed versus CPU capability, intermediate baud rates and other issues that could cause underflow or overflow of information.

To do this, many CONS protocols contain transmission "windows" that allow a "chunk" (window) of packets to be sent and transmission to be verified before the next chunk is sent. In this way, message flow can be controlled and losses on the network are minimal, somewhat predictable, and correctable.

For a CONS protocol to work, there are several phases of connection. First, a relationship must be established among the communicating entities via a connection request. This usually involves the exchange of basic information required to set up or reject the link, such as:

1. Error recovery mechanisms.
2. Class of service (throughput metrics, message sizes and so on).
3. Naming the remote party (system, program, gateway and so on).
4. Accounting information.
5. Network management information.
6. Signaling and message synchronization techniques (if negotiable).

The data transfer phase begins after the link is established and the two entities are connected. In this phase, data packets are sent between the entities in a sequenced fashion. This transfer can be half duplex (one side at a time) or full duplex (both sides simultaneously) and can involve differing amounts of data, depending on the work involved.

The final phase of a CONS connection is the disconnect or release phase. How this is done depends on protocol restrictions, as some CONS protocol suites can cause data to be destroyed on disconnect. Others allow for total

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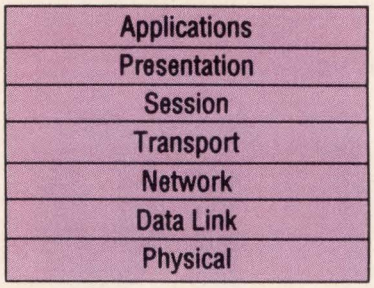
Figure 4.



Open Systems Interconnection (OSI) reference model.

closure and cleanup of all structures before disconnect.

Idle Or Working

During the transfer of data or during idle periods, CONS protocol suites might send HELLO messages periodically to remote systems to make sure they're still connected and so that the remotes will know that a particular sender is still available for service. In some situations, if a host system doesn't hear from a remote for a certain period of time, it sends an INIT or HELLO message to the remote. The remote won't respond if it's overloaded, busy or unavailable. In that case, the host declares the node unavailable and might kill any links it thinks are in progress or notify other nodes of the connection failure.

A good example of CONS protocol suites is the use of DMR-11s between two VAX systems. The DMR-11 is a serial, synchronous communications device that allows speeds up to 1 Mbps between two systems. The DMR, however, has on-board DDCMP protocol that allows packet sequencing and ACK/NAK services in the cards.

As a result, CONS capability exists between two systems. Sequencing errors, synchronization errors and other issues are handled by the boards without interference or assistance from the host systems. Because the boards handle the CONS facility, the connection data delivery is guaranteed at layer two (the Data-Link layer) of the Open Systems Interconnection (OSI) reference model (see Figure 4). In this case, DDCMP may be viewed, by definition, as a data-link CONS protocol.

But DDCMP is too versatile to be used strictly as a CONS protocol or only at layer two. Some implementations of DDCMP can be found in some packages at layers three and four of the OSI model.

CONS suites are useful for networks in which the network hardware medium inherently is unreliable. They also are useful where network nodes themselves might have obscure or difficult-to-configure timing sequences that normally would cause unconfirmed messages to be discarded or ignored as the system was busy or unavailable to the network at the time of data transfer.

Connectionless Protocols

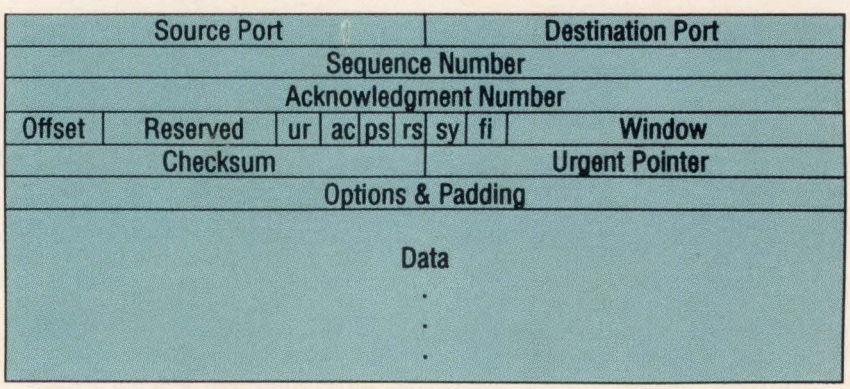
There are times when network hardware media are fairly reliable. This is usually the case in higher-speed networks, such as Local Area Networks (LANs). LAN architectures usually range from 1 Mbps to as high as 10 Gbps. With high data rates, the network medium inherently must be reliable and not as susceptible to noise and other interferences that plague traditional networks. In these cases, a CONS mechanism would induce unnecessary overhead on the network and could degrade the network significantly. CLNS was created to solve this problem.

CLNS suites evolved from networks that have multiple distribution paths. The CLNS relationship from one entity to another is transient at best, with each network operation independent of the other. Thus, CLNS protocol suites don't guarantee delivery or sequencing of data and are usually at the lower layers of the network architecture.

Like CONS, CLNS has connection phases, but only two. The first phase involves the access to the medium being used. This usually is handled by a controller and the appropriate software. The second phase is the transmission of the data which is done as a one-time event.

A good example of a CLNS protocol is the use of the Internet Protocol (IP). IP is used when a Transmission Control Protocol (TCP) packet wishes to connect to other networks (see Figure 5). Because IP doesn't guarantee delivery of data and makes a best effort to deliver data packets, it demonstrates the use of the CLNS service. It also demonstrates

Figure 5.



Transmission Control Protocol (TCP).

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the problem of CLNS: no guaranteed delivery of data. To accomplish this, TCP must provide the mechanisms for proper sequencing and delivery of data.

Some applications, such as bar-code reading, credit card verification and broadcast-oriented data transmissions (such as news wire services) can benefit from CLNS protocol suites. But most functioning network architectures use CONS as the method with some hardware mechanisms supporting CLNS for access to a specific medium, such as Ethernet (see Figure 6).

Which Protocol?

In these days of LAN dominance, networks suffer from protocol schizophrenia: the same functional capability exists in various protocol suites. For instance, at least six different virtual terminal protocols are available for Ethernet access. Only Virtual Terminal Protocol (VTP) is an international standard, but it has a very low usage metric.

Other protocols, such as LAT, are popular because of vendor support and products such as the DECserver line of terminal servers. The problem with LAT is that it only runs on Ethernet. VTP, however, is at a higher level of network protocol. Therefore, it can traverse very different networks and provide terminal support in places LAT doesn't.

Understanding multiprotocol networks begins with understanding the following issues:

1. There are very few agreed-upon international standards that work well and efficiently above OSI layer two.
2. Vendors have developed their own protocol suites based on the network architecture they sell.
3. The approaches of some vendors work well on both CLNS hardware and CONS hardware. Others work well on one or the other, but often not on both.
4. Some vendors lobotomize their protocols or create new ones to solve connectivity problems that arise when they support hardware technologies their network architecture wasn't designed for.
5. When hardware technologies arise that are popular, some vendors adapt (port) their protocol suites to that hardware to take advantage of market demand, regardless of consequence.

This simply means that multiprotocol networks won't disappear for a long time. Because of the politics and functional issues involved, few network architectures will disappear from a lack of international standardization. Although we might want OSI network protocols on our VAXs, there still are many Local Area VAXclusters (LAVc) customers who use Systems Communications Services (SCS) protocol over Ethernet (see Figure 7).

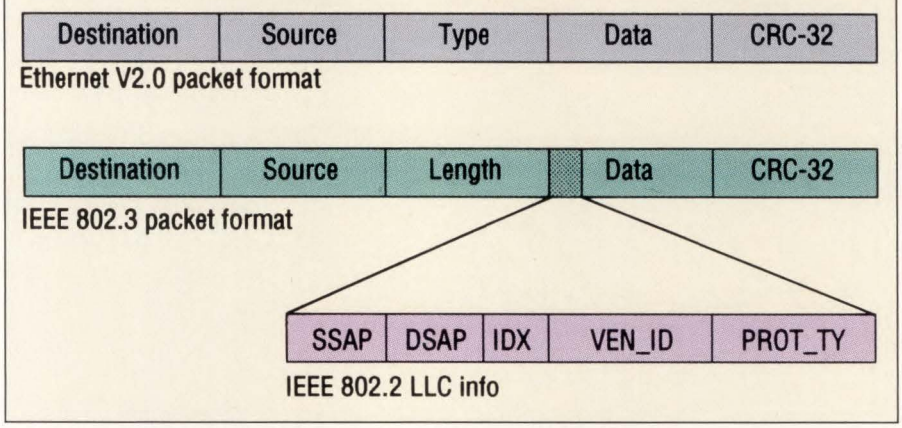
SCS isn't a standard (although it might be if LDDI is approved) and isn't part of OSI. It still will serve LAVc nodes at the same time DECnet generates HDLC packets with OSI upper-layer protocols on the same cable and possibly from the same system.

With this in mind, what will be seen on networks and what will happen to computer networks in the future?

Network technologies will continue to use new protocols for a variety of needs. For example, one company I've worked with has a need to connect dissimilar systems on a network to collect and analyze network traffic. The company could have used an existing network protocol. But it was deemed necessary to create an application-specific protocol to achieve the speed necessary to provide useful statistics in real-time as well as provide a multisegment, multitechnology collection capability.

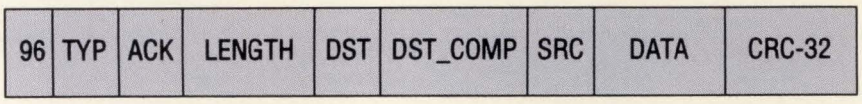
Network architectures are changing to take advantage of internationally standardized network protocols as well. But some of the protocols being standardized might not work in certain environments. Yet everyone is bent toward standards, whether the standards work or not. Eventually, they will, but this forces many network vendors to change

Figure 6.



Ethernet and IEEE 802.3 data-link protocol formats (with 802.2 LLC).

Figure 7.



Systems Communications Services (SCS) protocol format (CI/LAVc).

the way that they look at protocols on a network.

New Philosophies

DECnet-VAX (and other DECnet operating environments) under Phase IV guarantees delivery of data at the Data-Link layer of Digital Network Architecture (DNA). This means that, where possible, the hardware can be tasked with sequencing and retransmission of data.

When DECnet takes the leap to Phase V, the OSI architecture requires that sequencing and retransmissions happen at layer four, the Transport Layer (see Figure 8). This also means that the prescribed layer two protocol, HDLC, will replace DDCMP on ISO-standardized hardware implementations, such as 802.3 CSMA/CD networks and 802.5 Token Ring networks.

Those two simple actions require that DECnet under Phase V (OSI-compliant DECnet) will require large modifications not only to the protocols involved but to the philosophy of DECnet operations. Will this increase the protocols on networks? Yes. HDLC will make its appearance, as will higher-layer protocols. Will DDCMP go away? No. Phase IV nodes will be supported by Phase V nodes and will continue to use DDCMP, as will non-OSI hardware controllers.

There are some nice features about OSI. But there's the problem of multiple protocols on the network and how to manage them. Also with each OSI layer rigidly defined, there will be more "embedded" protocols in an HDLC packet than now experienced in a DDCMP packet.

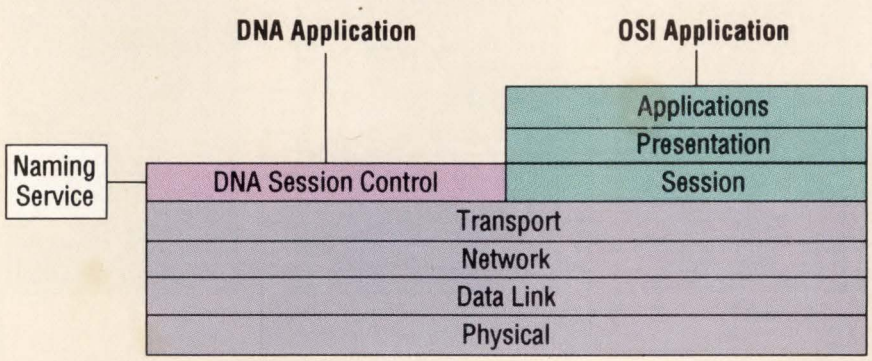
Under OSI, each layer of the network architecture "wraps" a protocol around the previous layer. Other network vendors want buyers to believe that their network architectures do the same. Often, that's hype. Many architectures generate a generic protocol packet in their defined protocol that contains option bits in the protocol that redefine the intent of the packet based on the bit settings in the optional area.

This means that the same basic format is used for all protocol formats, but the data contents of the packet can be user data or predefined network architecture data such as a routing or HELLO message based on bit patterns in the optional field(s). As a result, breaking down some protocol suites with network analyzers and filtering tools on network bridges can be difficult and time consuming.

Bridges Are Your Friends

Often, a network can be interconnected by bridges. A bridge isn't a router. It simply sends protocol messages over a

Figure 8.



Phase V DECnet architecture.

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A BRIDGE CAN BE programmed to send only the packets that truly are destined for a node on an adjoining segment.

connection medium to a remote network of the same or different type, but it doesn't change the basic content of the message being passed along.

In networks such as Ethernet, bridges connect various Ethernet segments into a cohesive, uninterrupted network, from a software point of view. Because bridges function at layer two of the network architecture, the connecting of the segments is transparent to most network architectures. The systems think that the network is one large, continuous segment.

Bridges, however, can be intelligent. A bridge can be programmed to send only the packets that truly are destined for a node on an adjoining segment. If the packet seen on a network is destined for a node on the same side of the network (on the same segment), the packet isn't sent to the adjoining segment and the traffic is reduced on the second segment as a result. Bridges can be smart enough to filter traffic based not only on destination address, but on protocol type, source address and, in some situations, content of data fields.

In a multiprotocol network, bridge filtering can be useful in reducing traffic load and in keeping the wrong messages from propagating over the network. To achieve optimum filtration, however, the network manager must program the bridge with the necessary knowledge. This might be done on a protocol-by-protocol basis. Thus, knowledge of protocol format is imperative if filtration is to be successful. Unfortunately, the more options the bridge looks for, the more time it takes to filter packets, and this can severely decrease overall network throughput as well as cause bridge congestion and packet loss.

Gateways And Translation

Protocol translation is another problem of multiprotocol networks. This usually is accomplished by gateways, and a gateway usually provides two-architecture conversion (see Figure 9).

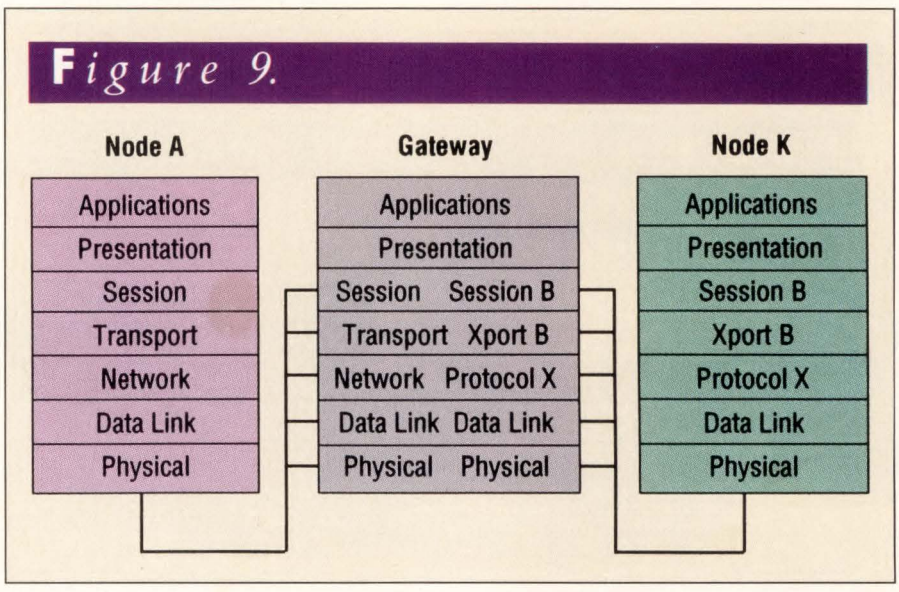
This means that a specific gateway translates between two architectural entities only. An example is a DEC SNA Gateway. The SNA gateway uses DECnet for connectivity to other DECnet nodes on the network on one side of the gateway and SNA for connection to IBM or SNA-compliant nodes, such as Wang or Unisys systems.

The translation isn't DECnet as much as connection to both sides via their respective native-mode architectures, and emulation of a connection type that's suitable to both sides. Starting a connection as logical unit 6.2 (LU6.2) from the IBM side is fairly easy to the DEC side, as the connection looks and feels like a LU6.2 connection.

From the DEC side, however, the connection doesn't look exactly like a standard transparent DECnet-VAX connection. A normal DECnet connection doesn't use program routines such as SNA$ACCESS and SNA$BIND. In this case, a gateway is more like a facilitator than a full translator.

Full translation gateways, however, are beginning to appear. One allows DECnet-VAX connections to appear as a TCP/IP connection to a UNIX or other TCP/IP node in a completely transparent way. Although expensive, it provides true transparent gateway access to multiprotocol applications.

Another problem of multiprotocol networks is network management. Many companies are faced with the problem of how to control and manage the network resource, how to provide meaningful usage statistics, as well as network accounting and other related functions. Providing such capabilities in a multivendor network is difficult at best, and usually involves some heavy-



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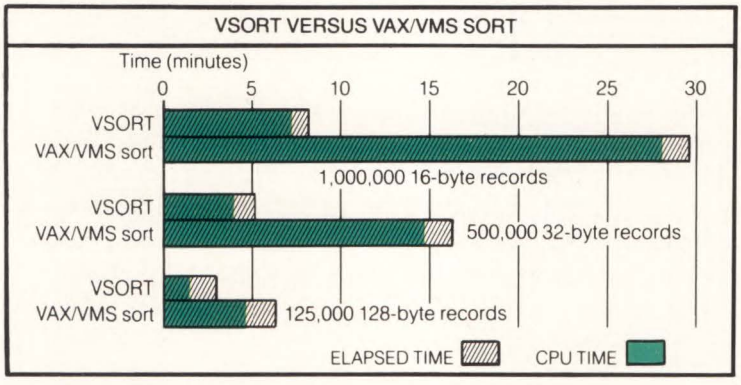

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Because protocol suites are incompatible and because the philosophies of network architectures are different enough to cause serious problems for network management tools, it's virtually impossible to monitor and maintain multiprotocol networks without a lot of tools and training. One or two products might monitor multiple protocols and network packages, but none provides a full multiprotocol management facility.

MULTIPROTOCOL NETWORKS will be here for a long time. The OSI model allows for multiple protocols at each layer of the OSI architecture, so even OSI nodes will be running multiple protocols. Protocols on networks provide specific application services and do so in a connection-oriented or connectionless way. Some provide both types of connections simultaneously, depending on the need. In any case, multiple protocols means multiple vendors providing multiple solutions to multiple nodes on multiple networks.

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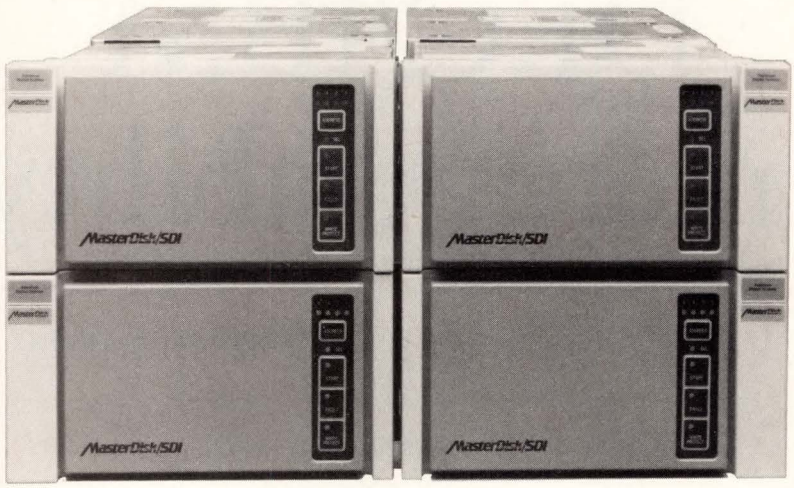

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DEC/IBM Interoperability

TYING TOGETHER the industry giants.

BY ROBERT PHILIPS

FOR THE PAST several years, connecting IBM and DEC networks has become the craze for many *Fortune* 2000 companies that want to maximize their large data processing investments.

In their quest to gain dominance in the information processing arena, these industry giants didn't communicate with each other: neither the executives, the marketing forces nor the computers. But to the joy of the information system manager, both IBM and DEC have realized that each has earned a position in large organizations and each, in specific ways, plays a major role in fostering the success of the enterprise.

To illustrate, remember last summer when DEC introduced its MicroServer, used to route data among Ethernet local area networks (LANs) and as a gateway to link VAXs to IBM mainframes, and when IBM introduced its comprehensive range of enhanced networking and network management software products, including NetView.

"Integrating the enterprise is what our customers demand today. Customers need access to information at any time. They need it from anywhere," says Bill Johnson, vice president of distributed systems at DEC.

"IBM is committed to doing whatever is necessary to give customers what they require to communicate enterprise-wide," says William O. Grabe, IBM's vice president and assistant general manager of marketing for U.S. marketing and services.

It's clear that both IBM and DEC are responding to customer demand. That demand is for multivendor connectivity.

Moving Toward Connectivity

To understand the direction in which multivendor connectivity is headed, it's important to understand the paths that IBM and DEC have taken to get where they are. Let's look at how each responded to the market demands of the early 1960s.

About thirty years ago, DEC began as a developer of computer logic modules. It didn't market the renowned PDP-8 and PDP-11 minicomputers until

1965 and 1970, respectively.

By this time, IBM had established a standard for corporate computing. This standard called for large data centers, housing at least one mainframe computer, most likely a member of the System/360 family. Today, conservative estimates number the installed IBM or IBM-compatible mainframes worldwide as high as 27,000.

But through IBM's period of rapid growth, DEC held its own. In 1977, its 32-bit VAX 11/780 was introduced. This popular VAX series of minicomputers has grown to include many models.

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THROUGH IBM's period of rapid growth, DEC held its own.

answer is perhaps as simple as it is complex. Since its beginning, IBM has been strong in administrative and business environments. DEC has gained precedence in manufacturing, design and engineering (CAD/CAM) departments.

As a result, organizations found themselves with DEC equipment that spoke only to DEC, and IBM equipment that spoke only to IBM. If these resources were to be shared, it meant training personnel and physically moving them from one department to another. This was not a good time saving solution.

Users wanted to maximize their investments. They wanted their IBM and DEC computers to talk to each other without their operators having to learn complex and unfamiliar programming languages. Thus, a new industry was born: connectivity.

Connectivity has many definitions. Perhaps the most descriptive is that it's the physical connection (usually a gateway or network controller) that allows two or more dissimilar environments to communicate. It's the method by which information is transferred between communicating systems over a physical medium. An IBM or compatible computer connected into a large network often has the gateway network controller in the computer room. From there, a combination of wires, fiber optics or satellite links provides the physical interconnect for the network.

Interoperability is an expansion of connectivity. After the physical connection is made, it allows information to be exchanged by transparently transferring files. Interoperability is the intelligent exchange of information and programs via communications between processes. A process translates information from one architecture or set of network protocols to another architecture or set of network protocols. Interoperability is necessary when an exchange of information must occur between systems that are architecturally different or that are using unlike communications protocols.

An example is a number of computer systems networked through OSI protocols exchanging data with a system that speaks SNA. A gateway controller

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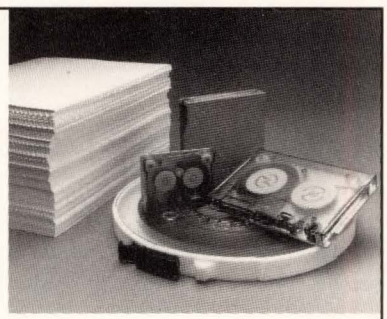

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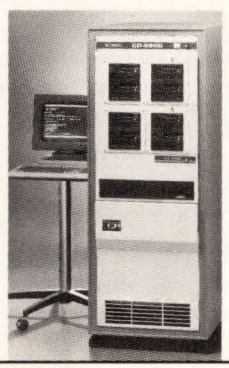

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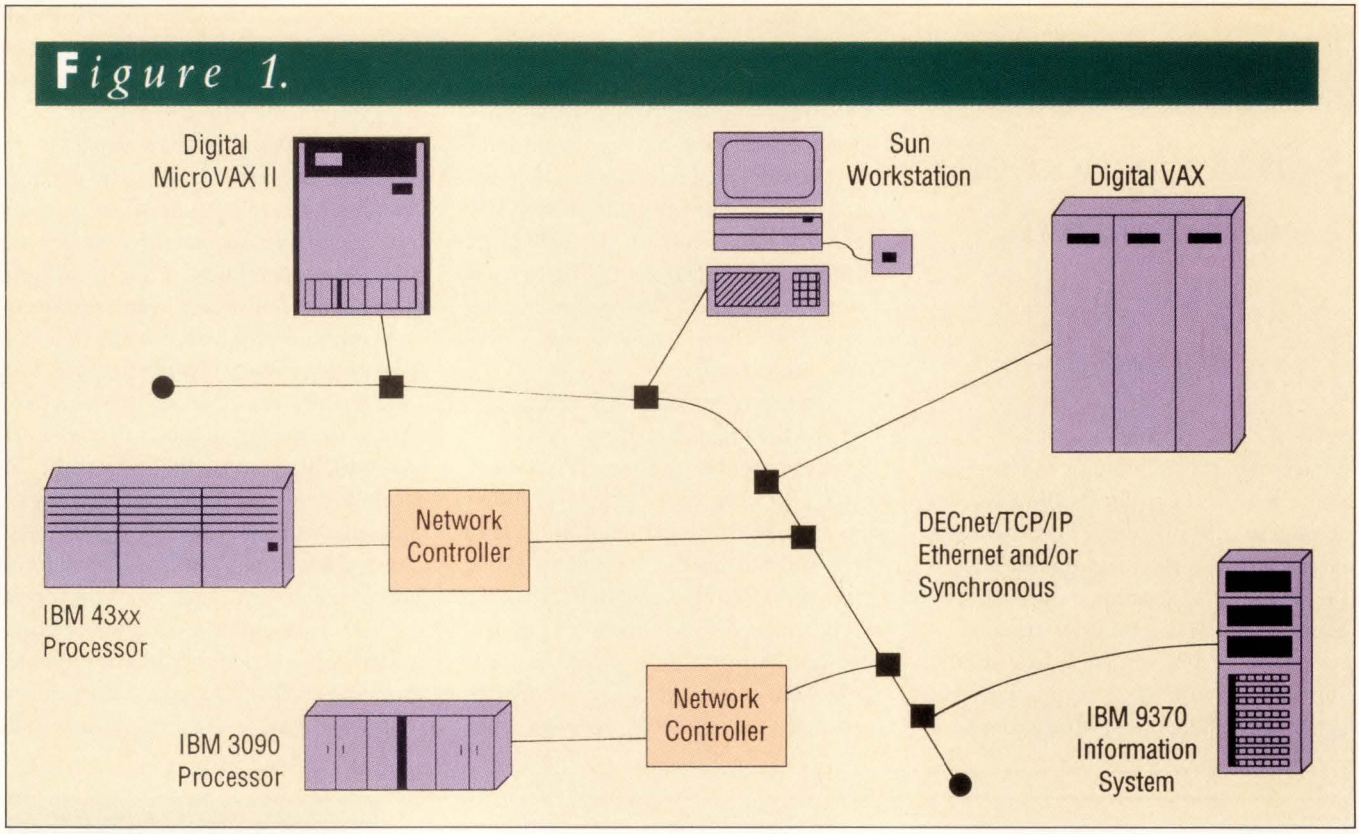

Typical IBM/DECnet environment.

would map the OSI protocols into SNA protocols and back. This is analogous to an interpreter sitting between, say, a person who only speaks German and a person who only speaks Spanish. The interpreter allows a meaningful conversation to take place. This, in human terms, it the essence of interoperability.

Functions And Applications

There are two main approaches to connectivity. One uses a network controller. This is a physical box, typically a microprocessor-based remote communications processor that provides a hardware connection between an IBM block multiplexor channel and a DECnet environment. The connection through the channel is via conventional IBM Bus and Tag cables, with connection to the DECnet environment through a standard DECnet Ethernet or synchronous point-to-point interface (see Figure 1).

The other approach uses the host as the gateway or network controller through an integrated adapter. It appears to be the wave of the future, because it permits more space in the computer room and is designed to be more host-specific. This connectivity software application resides on the mainframe. The computing overhead of the gateway either can be moved into the host if the integrated adapter isn't intelligent or can stay on the adapter if it can be programmed to handle some or all of the gateway functions. Integrated adapters increasingly are popular.

Interoperability can include file transfer, terminal emulation, electronic mail exchange, Remote Spooling Communications Subsystem (RSCS) and program-to-program communications. In addition, the IBM-side user can submit jobs for execution on any node within the DEC network. The DECnet nodes have the same capability to submit and run jobs on the IBM system. When jobs are executed, they generally produce one or more listing files that contain the results. With interoperability, the listings can be routed through the network to the printer closest to the user and in a format understood by that node.

File transfer is considered the base function in connecting DECnet and IBM. File transfer has two sides: those initiated on the IBM system and those initiated on the DEC system, using DCL.

To transfer files between IBM and DEC, the DEC user simply uses the standard COPY command. He also can list directories, delete files and use various DEC system utilities, such as COMPARE or ANALYZE, to examine IBM files. If the DEC user needs access to only certain pieces of data contained in an IBM file, record-level access is supported for sequential, VSAM and partitioned files.

This facility allows the DEC user to change the contents of IBM data sets from user-written programs, standard DEC editors, and DEC utilities from DATATRIEVE. With the exception of the record-level access feature, the IBM user

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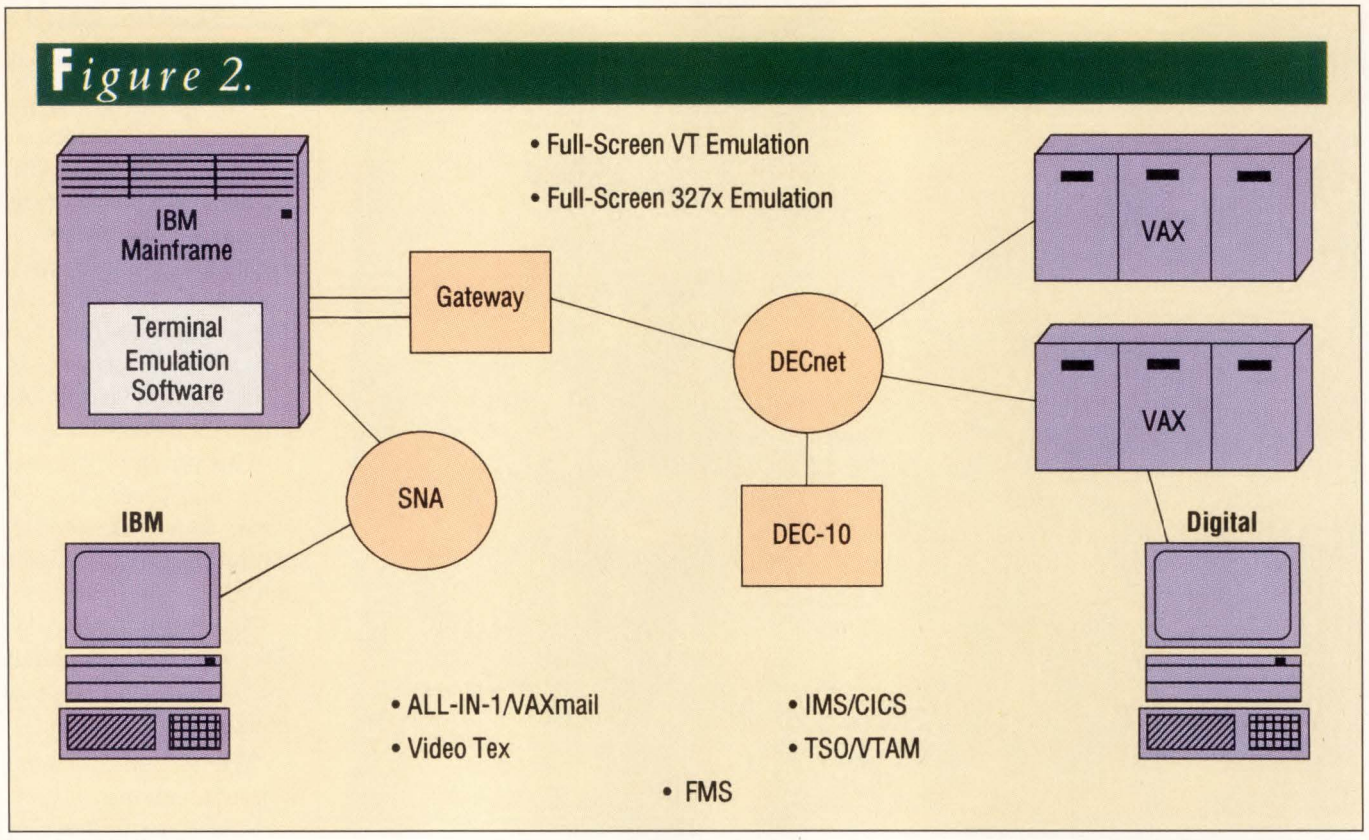

Terminal emulation.

has a symmetric set of functions through ISPC or XEDIT panels. It's best to have bidirectional file transfer with data translation.

Terminal emulation, another interoperability approach, allows users to maximize their terminal hardware investment by allowing any terminal connected to the network access to any IBM or DEC application. Terminal emulation enables the user to talk to any node in the network that speaks the same language. It's best to have the benefit of full-screen operation rather than line mode with scrolling (see Figure 2).

Because many people use electronic mail, Mail is a popular function. The PROFS or VM Note user can send mail to or receive mail from any networked VAX user using VAXmail or ALL-IN-1. This application is transparent to the user.

Connectivity for the RSCS Network provides an easy connectivity solution among all IBM mainframes on an RSCS/NJE network and all nodes on a DECnet network. When an IBM user needs to access information from the DEC side, the DECnet nodes appear as NJE nodes. Conversely, NJE nodes appear as DECnet nodes to the DEC user. After this is done, it allows the user to push files, send user messages and send commands to determine the status of the network.

Program-to-program communications allows programs executed in a DECnet environment to communicate with applications running under MVS or user virtual machines in the VM operating environment. This is fully compatible with the standard DECnet task-to-task subroutine calls. On the IBM side it's implemented through a series of documented subroutine calls from any high-level language. This utility allows DEC and IBM users to create custom networked applications that might, for example, involve distributed database servers or real-time data collection systems.

An appropriate example of the use of program-to-program functions to achieve interoperability is in the use of databases. Users in the DEC community often use different database systems than would be used by the IBM host users. In fact, different DEC nodes might choose different ones to suit their own unique needs.

When you make a decision to integrate these two worlds of computing, a question might be: How can we investigate the different database systems? The computers use different protocols, and there probably are several incompatible database systems installed. The program-to-program facility is the electronic glue that ties together these applications so that they can make inquiries that span the different systems and, sometimes, allow updating capabilities.

Now management, engineering and manufacturing have access to this type of information regardless of the com-

puter architecture, language, data storage format or the network itself. This is a significant capability for the needs of enterprises.

Other uses of the program-to-program capability include bridges from DECnet applications into either Information Management Service (IMS) or Customer Information Control System (CICS), linking manufacturing systems, and automating production facilities across the entire enterprise.

Evaluating Needs

With any computing solution, either connectivity or interoperability, there are criteria that must be addressed. The following is a fairly complete list of criteria for evaluating connectivity needs: network configuration; seamless technology; file transfer; security; features; performance; operation; implementation; support; and network management.

Each organization has a unique network configuration. Consequently, a solution must be specific to an organization's computing environment. It's important to look at the systems to be supported. Do they include one or more mainframes, PC LANS, midrange computers and/or workstations? Will this be a single- or multiple-host connection? Will the method of interconnection be point to point, point to network or network to network?

Companies also demand seamless technology. Seamless means that the technology is stable and won't go down. You don't want a product that modifies your VM or MVS system, you want state-of-the-art technology with minimal impact on your existing system.

It's not only important that you be able to access information from either side, it's also important that you be able to transfer it. File transfer should be bidirectional. If you wish to give only certain people access to specific pieces of this information, security becomes a significant criterion.

If a company has five or six mainframes and more than 100 VAXs, security is a major factor. Does your system support ACF2, RACF and TOP SECRET on the IBM side? Does it support all security systems and proxies on the DEC side? If your enterprise has neither IBM nor DEC security systems, does it support your own in-house security system?

Application features and performance play a key role in connectivity. Performance includes speed (links and sessions), the number of users and system overhead (how much is my system being taxed?). How is performance measured? Under what speeds are performance results calculated? What is meant by simultaneous sessions? Some features include terminal emulation, which can be either full screen or by line, program-to-program communications, corporate electronic mail and distributed databases.

Perhaps the most meaningful criteria, however, are operation and implementation. Now that the connectivity solution is installed, how easy is the system to use? Is it local or remote? Can job tasks and local source code be executed easily? Will it do print queuing? What will facilitate the implementation, and how much downtime is required? Has productivity increased or decreased? What training is required, and who will be responsible for this training?

After the product is purchased and installed, customer support is important. Will the supplier be there when your system displays error messages or if you have a simple question? Many information system managers require around-the-clock technical expertise. It's important that response time be as short as possible.

When the company introduces a new release, there should be vendor commitment to the user for this new product. You also should know the sup-

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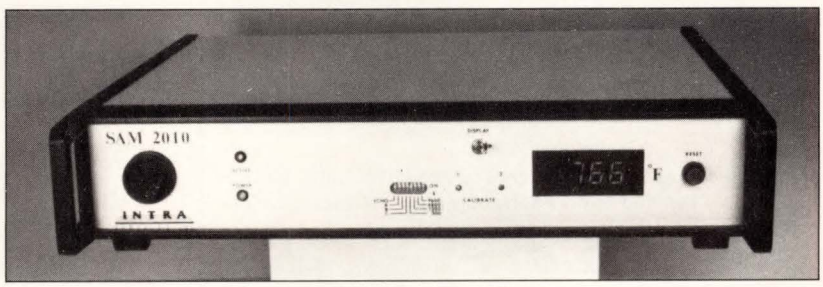

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plier's philosophy toward the research and development of its new products. Are these products designed to enhance your department's productivity and efficiency?

Perhaps the most crucial criteria to consider when choosing a connectivity vendor is network management. Will the system provide the diagnostic tools to let the user know what's going on if there's a problem? Will it show the user how to fix the problem? It's a good idea to have the product support NetView or another vendor's network management product. Some might be only IBM to VAX or IBM to DECnet.

When you're expanding your system's interoperability functions, it's important to consider how your peripheral devices will be affected. Peripherals might include disk drives, terminals and printers. The solution should allow these devices to be shared. If the IBM mainframe is using EBCDIC as its native language, then data translation should allow EBCDIC to speak with ASCII.

The ability to interchange mail from ALL-IN-1 or VAXmail to IBM's VM Note or PROFS is a significant feature, as is bidirectional file transfer. It's important that the user be able to submit jobs in either direction in the network and be able to route the listings to the correct printer.

Last, look at the characteristics of the solution. It's best to use a well-established interface such as SNA (IBM), TCP/IP (used in government and university environments) and/or DECnet. Don't forget that OSI is the emerging standard.

CUSTOMERS WANT connectivity products that will meet and grow with their constantly expanding needs. Their solutions need to be transparent, seamless, reliable, high-performing and applications-oriented. Customers don't want a per-node product that's expensive and performs slowly. Customers want a per-network solution: DEC and IBM connected over a DECnet network in a peer node manner, faster and more cost effective than a per-node approach.

DEC, IBM and third-party connectivity vendors are responding to the needs of the marketplace. Their customers require that DEC's and IBM's networking implementations provide users with reliable, transparent access and use of information among heterogeneous computing systems. There's no doubt that seamlessness and transparency, in combination with connectivity, interoperability and network management, are the foundations of communications networking. *—Robert Philips is product manager for Interlink Computer Sciences Inc. of Fremont, California.*

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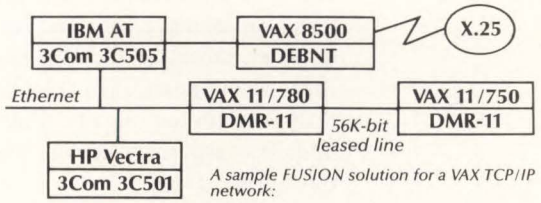

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CONNECTIVITY

DISTRIBUTED FILE SERVICE

By Philip A. Naecker

DFS Allows You To MOUNT A Remote Disk.

Editor's note: This is the fourth in a series on DECnet System Services (DSS). These layered products from DEC combine multiple VAX computer systems into a highly integrated, distributed computing environment (see Jeffrey Schriesheim's "Netting DECnet System Services," April 1988, and Philip A. Naecker's "To Name Me Is To Know Me," June 1988, and "One Doing The Work Of Many," November 1988).

It's a classic problem: You want to run a program that uses data from indexed files on two machines. If the machines are in a VAXcluster or LAVc, you can just MOUNT both disks on the same machine. But, if your machines are on opposite coasts or even on separate clusters, you're out of luck. You end up copying the file from one machine to the other, so that the files both are local on one machine.

But what if the files are very large? Using COPY can anger your network manager and other users of disk space. What if you need files from 20 machines? And what if you need to update those data files? Do you have to copy them, then update, then copy back? If you do that, you run the risk of colliding with other updaters, especially during the long COPY operation.

"Gee," you say, "if I could just MOUNT that remote disk on my own machine, everything would be fine."

With Distributed File Service (DFS), you can do just that: a remote MOUNT that makes remote data appear local. Not only does DFS come close to solving the classic problem we described, it improves the operation of distributed systems in many other ways.

Remote MOUNT

From the outside, DFS is the essence of simplicity. Any user (privileges aren't required) simply does a MOUNT using the DFS$ CONTROL utility. The device mounted can be any mounted disk on any machine in the network that's running the DFS server software (see Figure 1). After the MOUNT completes, the remote disk, or a portion of it, appears local to the user who did the MOUNT. You can do almost every operation on the remote disk that you can on a local disk, including reading and writing files, manipulating directories and renaming files.

Referring to our classic example, if you need files from, say, 20 machines, using DFS you simply MOUNT the 20 disks on any one of the machines (or on another machine, such as your workstation). You then run your program on the file on each of the 20 disks, update the files if you wish and dismount the disks when you're done.

The example also can be run in reverse (see Figure 2). You might want programs on 20 nodes to access the same file or files on a central cluster. This works fine using DFS. For example, you might have developers on 20 nodes share the same CMS library or CAD users share the same symbol files. You'd no longer have to distribute the library to all the users. They'd just MOUNT it remotely and access the file as if it were local. Because there's

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just one copy of the file, you'd save on total disk space. And updates to the one file would be propagated instantaneously to all the other nodes.

Sounds simple, right? So simple, in fact, you might wonder why DEC didn't develop it before now. I suspect the reason is that DFS is a wonder of software engineering that wasn't simple to implement.

DFS supports just about every disk operation you can do on a local disk, so the files can be read using standard RMS calls. Or, you can post QIOs to the disk ACP, map the files as a global section or do just about any kind of I/O you might do in an application program. That includes all normal RMS file I/O such as sequential, indexed and relative. For security reasons, DFS doesn't allow physical or logical I/O. Therefore, you can't map your system page or swap files to it. But these aren't serious limitations.

One significant limitation of the current version of DFS is that users of files on the disk can't request SHARED WRITE access to a file. If you request SHARED WRITE, your request will be converted to EXCLUSIVE WRITE, which means that there can't be multiple concurrent writers to the file while one of them is a writer.

For some applications, this might be a serious limitation. For example, you can't have a central inventory file updated by applications running on all the machines in a network, unless those application programs synchronize their OPENs to the file so that each requests WRITE access just long enough to update the file, then releases that access so that others can read and write. This means that you can't access Rdb databases or CDD/Plus dictionaries on the DFS disk. However, those products provide other methods of remote access.

According to DEC Engineering, DFS limits WRITE access to EXCLUSIVE to be conservative. Because there's no lock manager support between the DFS server and the client, DEC feels it's better to be safe and not allow the reading of possibly inconsistent, partially updated data in the file.

DFS MOUNT Command

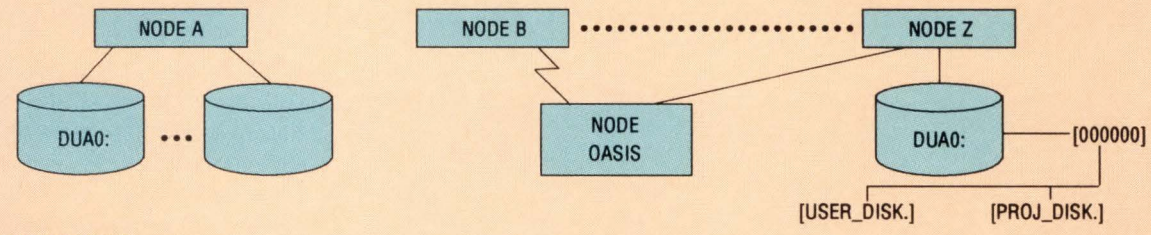
Let's see what happens when you do a DFS MOUNT command. Figure 3 shows standard VMS file access as viewed by DFS. The application, through RMS, talks to the disk driver, not to the disk directly. Thus, if you replace the standard disk driver with a driver that knows how to talk to a remote disk, you can gain the independence from the disk you seek.

This is easier said than done. Figure 4 shows the components that DFS uses to implement access to a remotely mounted disk. Like the rest of DSS, DFS divides the world into two parts: clients and servers. The server node is the one with physical access to the disk. The client node is the one with the remote application that wants to access the disk.

On the client side, things are reasonably standard. A DFS Client Driver (SYS$SYSTEM:DFSCDRIVER) presents a standard file-structured disk interface to VMS. But instead of connecting to a physical disk, the driver connects to the DFS Communications Driver (DFSRRDRIVER), which in turn talks to DECnet. Note that only one DFSRRDRIVER is needed per node, because multiple disks can connect to it simultaneously. Also note that the same communications driver is used at the server side. This will clue you in that a server simultaneously can be a client.

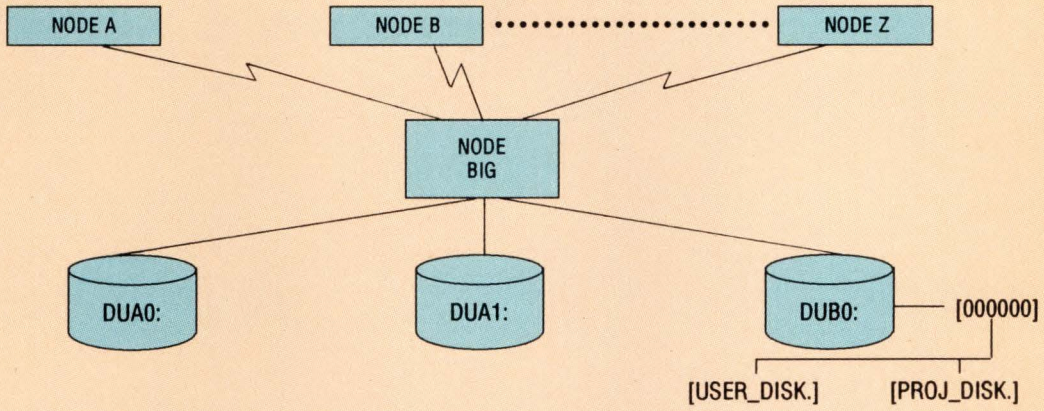
At the server side, the process is reversed. Working up from the bottom

FIGURE 1.



A DFS client can access many DFS servers simultaneously.

FIGURE 2.




```
$ ! On each node A through Z ...
$ DFSCP
DFS > MOUNT BIG_PROJ_DISK PROJ_DISK/SYSTEM
$ DIR BIG_PROJ_DISK:[MY_PROJECT]
```

A DFS server can serve files to multiple clients simultaneously.

of the layering diagram, the DFSRRDRIVER communicates with DECnet and with a DFS Server Driver (DFSSDRIVER) that talks to the disk. Associated with the server and with each disk served is an ACP process. Before VMS version 4.0, there was an ACP for every disk mounted on a VAX. The DFS ACP, like the older ACPs, provides process context for operations that must be performed for the user.

Unlike the old disk ACPs, however, there's only one DFS server ACP on the server system, no matter how many disks or clients are active. In the case of the DFS ACP, it makes QIO calls to the Files-11 eXtended QIO Processor (XQP) to perform functions such as open, close, create and delete files, and perform directory lookups. One nifty aspect of DFS is that the ACP performs these operations while impersonating the remote user.

If the file already is open, the DFS Server Driver doesn't need to talk to the ACP, and it simply accesses the disk directly, like the standard disk driver in Figure 3. As a performance assist, the DFSSDRIVER maintains a cache of file blocks in memory. It wouldn't have to do that if VMS would maintain a disk cache.

From Figure 4 it's clear that DFS functions without any modifications to VMS or the application program. It layers on top of standard DECnet for the communications layer, so the two systems can be connected by any physical medium supported by DECnet. At the Professional Press Lab, we used DFS over both Ethernet and 19.2K baud asynchronous lines, but it works with X.25 networks, over the CI and, in theory, even with 1,200-baud dialup DECnet lines.

File access performance of DFS on the Ethernet is about 90 percent of that of an LAVc. Obviously, file access performance at 1,200 baud is less than sterling, and DEC recommends a minimum of 56K baud for most applications. However, we found that 19.2K baud is tolerable for occasional use, and DFS is able to use the available bandwidth effectively.

Access Points And Volumes

So far, DFS has been described as if a remote MOUNT command made an entire disk available on the remote machine. You certainly could use DFS this way, but DFS provides for more powerful use. DFS offers the concept of Access Points. An Access Point is much like a VMS concealed device in that it describes a portion of a disk's directory hierarchy. It's very different from a concealed device, however, in its distributed nature.

An Access Point definition is stored in the Distributed Name Service (DNS) database, and that definition includes the nodename that services the Access Point. Access Points are defined using the DFS$CONTROL program, which looks like the other DSS utilities described in this series.

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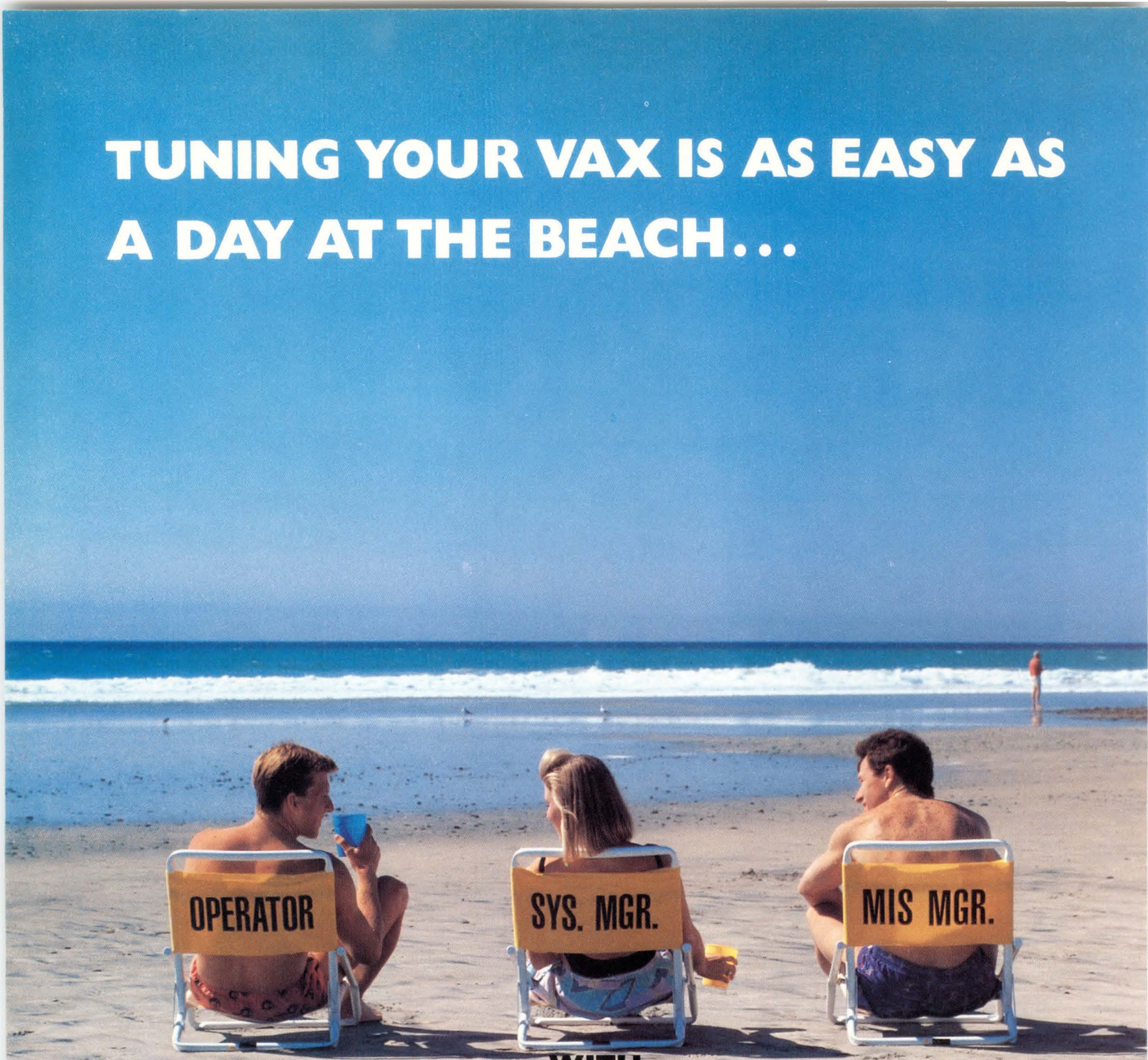

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An Access Point is much like a VMS concealed device . . .

Press network, we defined three Access Points on the central machine, OASIS:

```
DFSCP> ADD ACCESS_POINT
  OASIS_PROJ_DISK PROJ_DISK:
DFSCP> ADD ACCESS_POINT
  OASIS_USER_DISK USER_DISK:
DFSCP> ADD ACCESS_POINT
  EDITORIAL_ROOT DUB0:[EDITORIAL.]
```

To access these "disks" on another machine, say, MIRAGE, a user at that machine might use commands like:

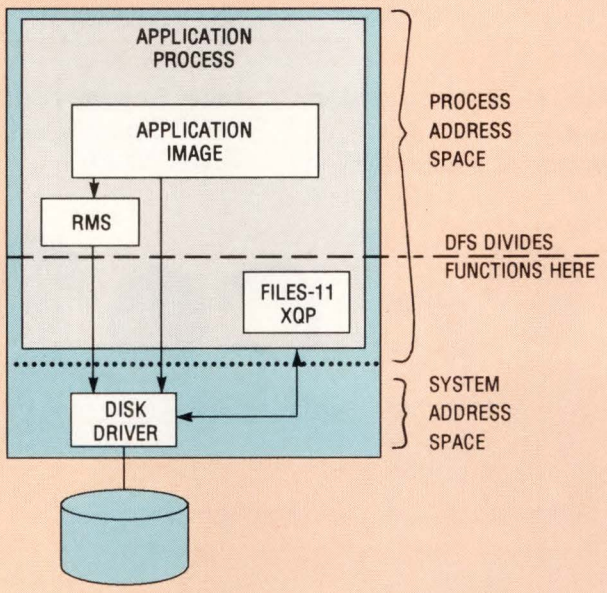
```
DFSCP> MOUNT EDITORIAL_ROOT/GROUP
  EDITORIAL_ROOT
DFSCP> MOUNT
  OASIS_USER_DISK/SYSTEM
  OASIS_USER_DISK
```

That would create disks with the logical names EDITORIAL_ROOT and OASIS_USER_DISK. Note that EDITORIAL_ROOT is an explicit concealed device name reference, while USER_DISK might be an implicit concealed device reference that points to DUB1:[USER_DISK.]. The important point is that DFS can MOUNT a portion of an entire directory hierarchy, or it can MOUNT the entire hierarchy — it doesn't matter.

The MOUNT of OASIS_USER_DISK on MIRAGE allows those users to access files in OASIS_USER_DISK:[PAN.ARTICLES.DFS] as if they were local. They can type them, modify them, rename them or do just about any other operation.

Because the actual definition of the Access Point is maintained in DNS (the ADD ACCESS_POINT command communicates with DNS), the particular

FIGURE 3.



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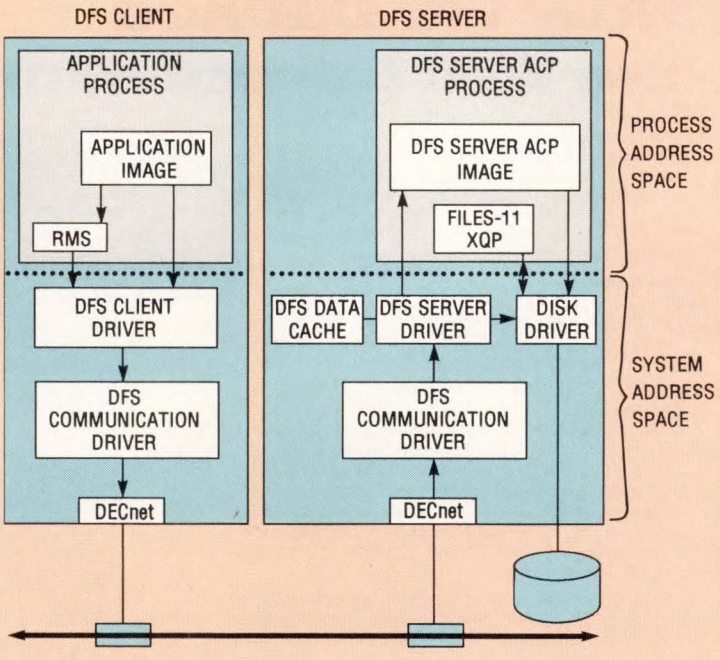
Layering diagram for standard VMS file access.

FIGURE 4.



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Layering diagram for DFS file access.

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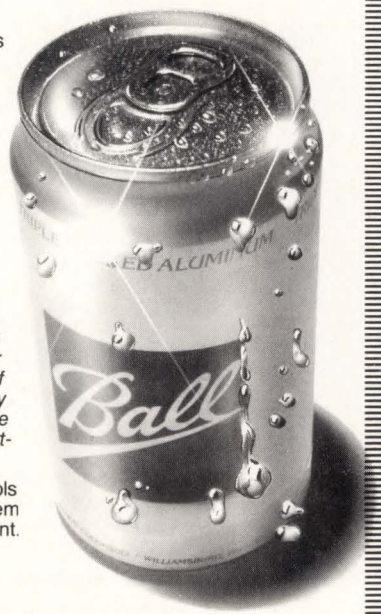

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. . . in DFS the server ACP impersonates a user . . .

node that provides each Access Point can remain unknown to the applications. For example, if one day we decide to move the EDITORIAL_ROOT Access Point from OASIS to BILBO, any application that uses the EDITORIAL_ROOT: device will continue to run unaffected by the move. This provides a remarkable degree of flexibility for the location of data. You can move data anywhere you have the correct combination of disk space and processing power, without moving all the applications with it.

Who Goes There?

Although it requires privileges to MOUNT the disk with either /SYSTEM or /GROUP access on the client machine (/SYSNAM and /GRPNAM, respectively), the access to the remote data doesn't require any privileges. Why?

The reason is simple: Access to the remote disk is entirely under the control of the server system. There's no point in requiring privileges at the client system, because those privileges are valid only in the context of the client. When a file is accessed, however, the user accessing the file must have access to the serving system, typically by an entry in the DECnet proxy database. The server applies standard VMS file access protection to each file that's opened, as on a local disk. However, the "persona" used in the interpretation of the file access is the client user's proxy account on the server node.

The definition of a persona is interesting, but a little complicated, because there's no networkwide definition of a user in VMS. Each system can have its own user authorization data-

bases, and there's no way to associate a username with a particular user, as a username might be used on many different nodes to identify many different people.

Global naming, the solution to this problem, is one of the goals of DNS and Phase V DECnet. The solution might take years to achieve, but after it's solved, a user or any other object that needs to be identified or located will have a unique identifier in the DNS namespace.

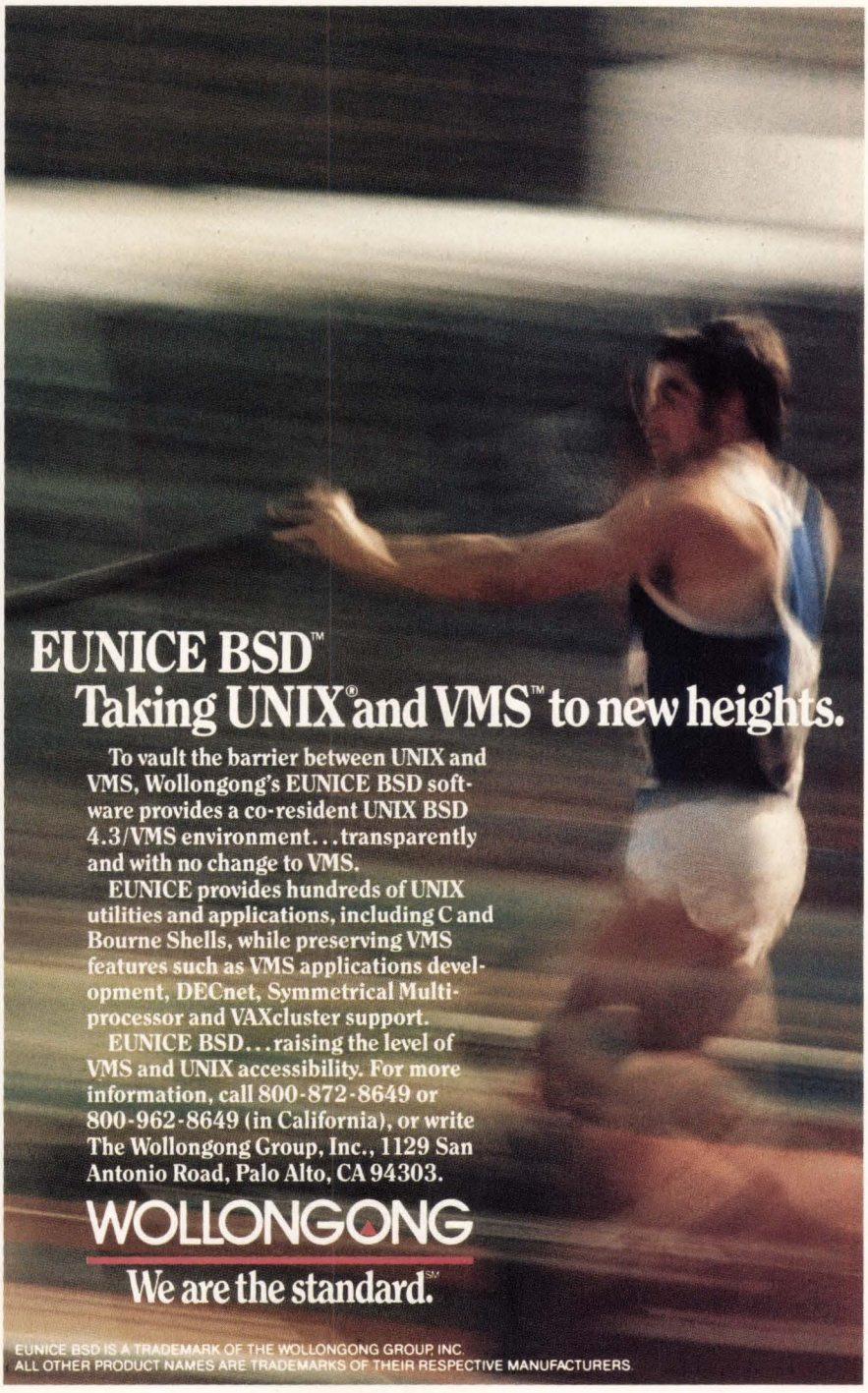
But for the forseeable future, you must be identified by virtue of your DECnet proxy account. The proxy account performs a translation from remote-node::username to local-node::username. DECnet uses these proxies when you perform remote file access by creating a new process for you in the context of local-node::username.

Unlike standard DECnet file access, DFS doesn't create a new process, as it already has the DFS ACP to perform the local file access. Instead, DFS creates a Persona Block that defines you on the local (server) node. The Persona Block contains everything used by VMS to validate file access, including rights identifiers you've been granted, your UIC, and privileges.

These attributes are interpreted in the context of the local (server) node, so your privileges at the remote (client) node have no effect. The DFS ACP uses your Persona Block every time you request access to a file (e.g., open, close) similar to the way VMS disk ACPs used to do the same thing. Whereas the old disk ACPs performed the actual protection checking, in DFS the server ACP impersonates a user and asks the XQP to access the file. In this way, DFS ensures file security for remote file access. You can't access any files via DFS that you wouldn't be able to access if you logged in over the network or did a network COPY.

There's one odd consequence of a client and a server typically having different authorization domains, especially different UICs, usernames and rightslist identifiers. Because these items are interpreted at the server, there's no point in presenting them at the client.

For example, if your proxy log in on the server node has a UIC or rights different from your process on the client, you might be able to access files that appear to be protected against your access, and vice versa. Rightslist identifiers and ACLs are translated at the server node and not expressed on the client. To do so would only confuse things. Therefore, if you do a $ DIR/SECURITY on a DFS disk, you won't see any ACLs or translated (text form)



CIRCLE 159 ON READER CARD

DFS In Action

Let's look at a few examples of how you can use DFS.

Extend Cluster File Systems To The Network

Clusters are wonderful — no doubt about it. They provide a common file system, highly integrated locking mechanisms, a distributed queue manager, redundancy and many other powerful features.

But clusters have limitations. There are limits to the number of nodes you can cluster. A cluster system manager must be concerned about cluster state transitions, as the crash of a single workstation on a large cluster can disrupt the operations on many large nodes with correspondingly large numbers of users. And, because of state transitions, clusters aren't always practical to use with real-time systems.

The common file system of a homogeneous cluster (the best kind) requires a single management domain, a single set of user definitions and highly coordinated system management. If you want to operate your nodes more independently, a tightly coupled cluster with a homogeneous file system might be difficult to implement.

It's also hard to define privileges in an extended cluster. A workstation user might need a privileged account on his machine. However, there's no way within a cluster to prevent access to the common file system by that workstation user. This makes security difficult.

DFS provides a means to connect file systems, whether they're file systems of clusters or of non-clustered nodes. For example, you might have a system that frequently reboots or that needs to have guaranteed response time even in the face of cluster state transitions.

Using DFS, you can provide that system with local access to disks mounted on the cluster. The best way to do this is to add the DFS Access Point on every node in the cluster and use the /CLUSTER_ALIAS qualifier. In this way, each node advertises its ability to service requests for that Access Point, and if one node in the cluster fails, the other nodes service the requests. This reconnection can happen dynamically, so users on the client nodes need never know that a cluster node went down. Users also gain the reliability features of using clusters for file access.

Connect Clusters Together

If you have two or more clusters in your organization, you can connect them together to share files using DFS. You might want to do this just for certain files, such as project files, or you might want to make most of the cluster's files available to the other node.

Perhaps the most popular use of cluster-to-cluster DFS connections is to share library files, such as CMS source code libraries, word processing document boilerplate and CAD symbol libraries. These and similar infrequently used files must remain in tight synchronization, and the best way to do this is to have just a single copy of the files.

But many application programs that use libraries, such as word processing systems and most CAD programs, don't know how to perform file access over the net, so you can use DFS to make the library appear local to the application. You also can share other infrequently used files, such as HELP libraries.

Distribute Or Roll-Up Data

You can have some systems that span a wide geographical area, yet need to share data. You can use DFS to develop an application that would map each node's disks as if they were local, perform some updates and then move on to the next node.

The only limitation is that only one updater can have the file open at a time. But that limitation can be avoided by designing the application with a round-robin update scheme, rolling from file to file and thus from node to node.

UICs on the files. This also means that a file copied on the client using BACKUP loses its ACLs and that a SET FILE/UIC on a DFS disk might not give you the results you expect.

DFS IS A STRATEGIC product for DEC. DFS is directly comparable to the distributed file systems available on Sun and Apollo workstations, but it layers its distribution features on top of the availability features of VAXclusters and supports a wider variety of network connections.

DFS also provides a mechanism for true distributed processing, giving small workstations excellent access to files on larger, remote machines. This feature serves to amplify the power of DEC's one-architecture message, because it allows most applications to be completely independent of a particular machine. An application that runs on an 8800 will run without change on a VAXstation 2000, because DFS can make the disks available to both machines.

DFS also will amplify the power of other DEC products by allowing the sharing of files. For example, using DFS you can distribute DECcalc spreadsheets to widely separated nodes. This allows DECcalc applications in different parts of the country to be synchronized and share their files. The same is true of CMS libraries, ALL-IN-1 applications, TPU section files and a host of other applications. PSCA files can't yet be distributed this way, but you can be sure that DEC is working on that.

DFS, like the rest of the DSS products, is a sticky glue that will hold together the DEC view of computing for a long time to come.

In the final installment in this series, we'll look at DEC's Distributed Queue Services. *—Philip A. Naecker is an independent software consultant based in Pasadena, California.*

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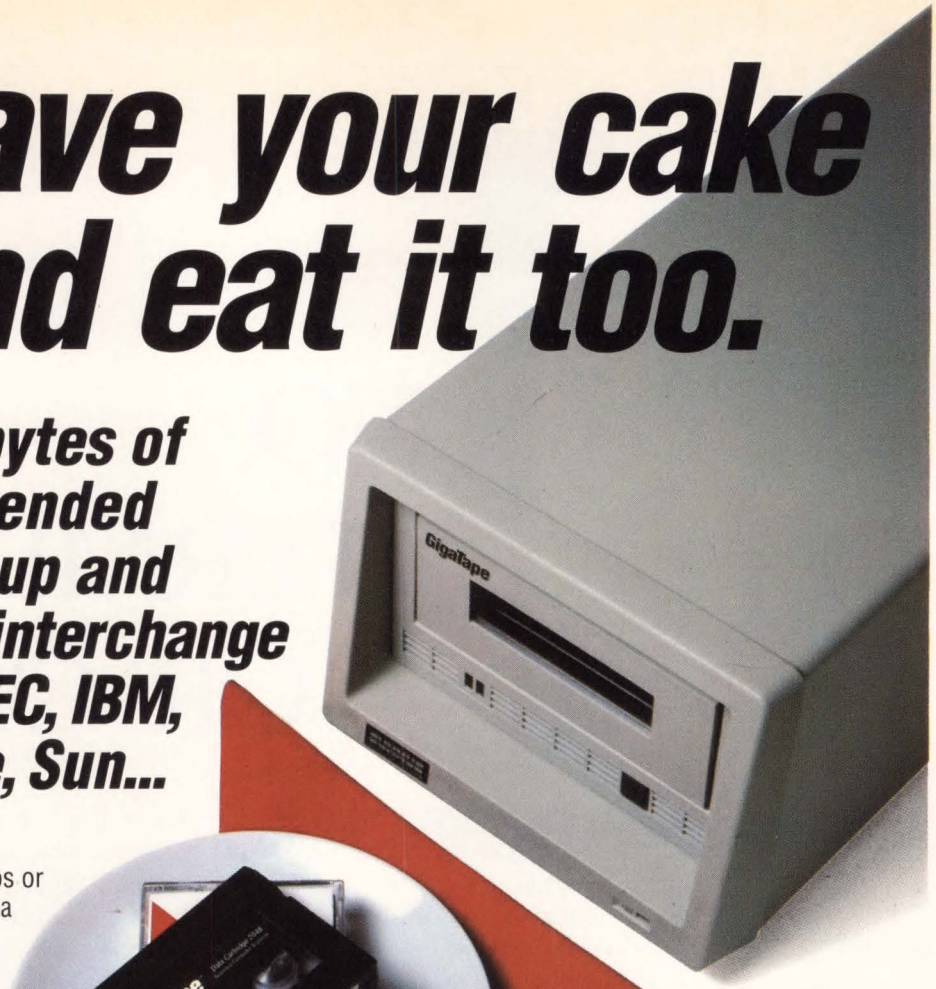

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CIRCLE 140 ON READER CARD

HARDWARE

TWO TERMINALS OR ONE?

Examining The Virtues Of Dual-Session Capabilities.

By Steven Salemi

When DEC introduced its VT330 and VT340 terminals in April 1987, the improved screen resolution and graphics performance were just what users had been hankering for. But another VT330/340 feature — dual-session capabilities — seemed to come out of the blue.

Accordingly, questions arose. What exactly are dual-session capabilities? How are they implemented and how do they work with existing software applications and hardware installations? How does DEC's multisessioning compare to that of third-party terminal vendors? Are dual sessions truly a useful capability or just another bell and whistle?

Nothing New

Users who communicate with VAX systems through DEC's DECserver family of terminal servers might be familiar with multiple-session capabilities. The DECserver 100 and 200 support up to eight multiple computing sessions to different VAX hosts using DEC's Local Area Terminal (LAT) protocol.

Although undoubtedly useful for programmers and others who need to communicate with multiple hosts, the terminal-server solution restricts users to one active, on-screen computing session at a time. Further, depending on specific applications and how they're used, switching sessions can cause the user to lose information created in other sessions.

For example, some applications, such as VAX EDT, enable you to refresh the screen (typing CTRL-W) and save information easily to a disk file (the WRITE command). But other tasks, such as working in VMS at the DCL level, don't. Also, refreshing the video screen and/or reloading applications files (text and especially graphics) every time you change channels slows the network and every user connected to it.

The VT330/340 terminals offer fewer multiple sessions than a DECserver. But they offer superior performance and some important advantages, including the ability to:

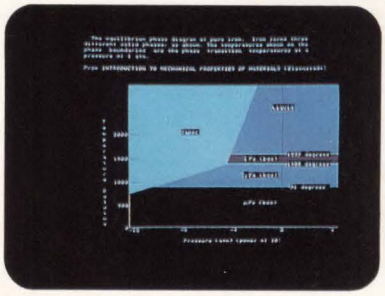
1. Conduct two on-screen computing sessions simultaneously.
2. Pan horizontally and vertically through pages of information without host intervention.
3. Maintain fully independent terminal setup parameters for each session.
4. Allocate terminal resources between sessions.

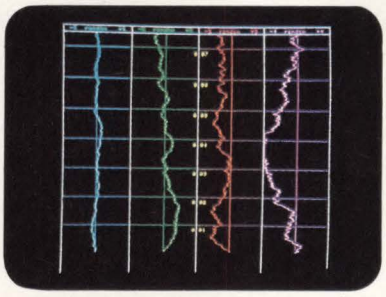
Though simple to operate, DEC's solution mandates new hardware, software and firmware: a new terminal architecture whose characteristics are evident in virtually every aspect of the terminal-to-host relationship.

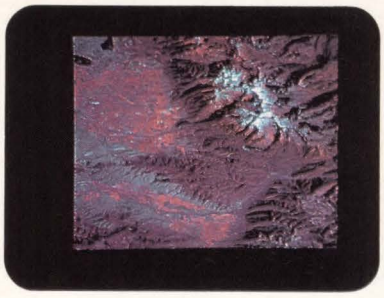
SSU Software/Firmware

DEC's host-based Session Support Utility (SSU) software and terminal firmware employ a proprietary communications protocol, Ter-

Put exactly what you want on screen.







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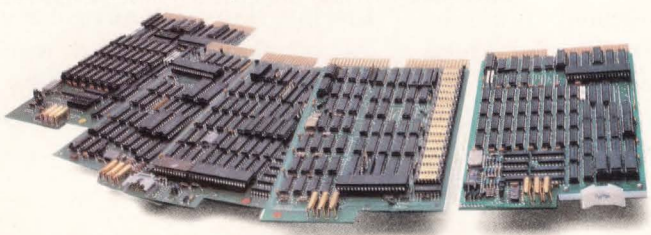
	VCK24	Q & U	1024 × 1024	64 × 85	16 million
	VCX8	Q & U	512 × 512	48 × 80	256
	VCX24	Q & U	512 × 512	48 × 80	16 million
	VCH	Q	512 × 512		256
	VCG512	Q	512 × 512		16
	VCG640	Q	512 × 640		8
	VRC	Q & U		24 × 80 48 × 80	64 64
MONOCHROME	VRH	Q	1024 × 1024	64 × 128	
	VRS	Q	512 × 512	48 × 80	
	VRG	Q	512 × 512	32 × 64	
	VRA	Q & U		24 × 80 48 × 80	

*Q-BUS for LSI-11 and MicroVAX, UNIBUS for PDP-11 and VAX.



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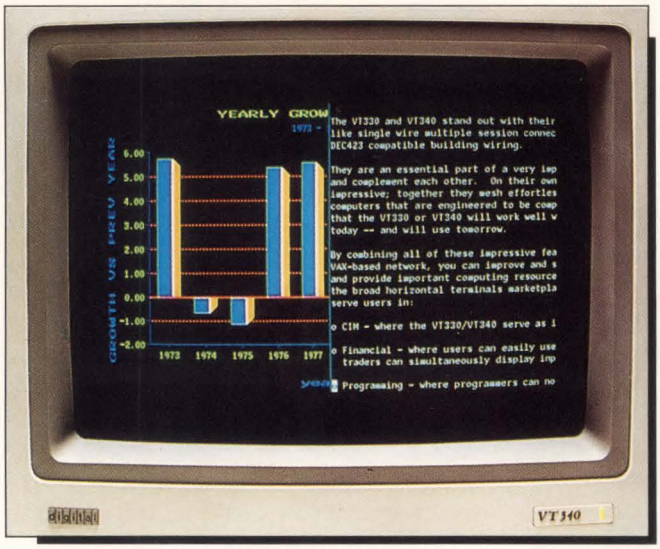
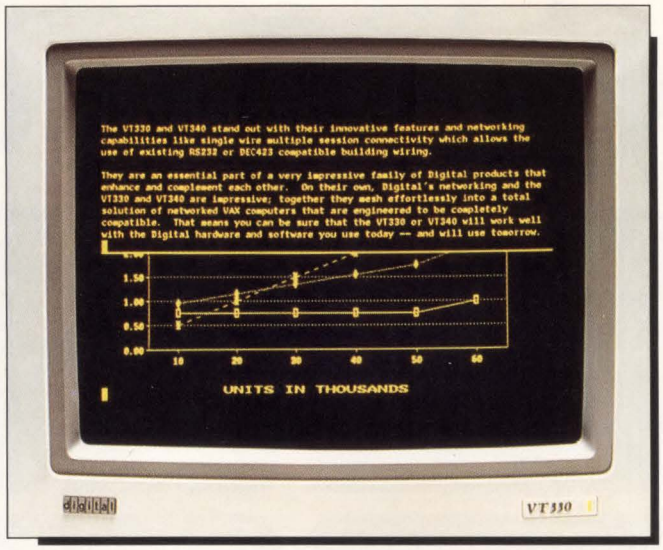


Courtesy Digital Equipment Corporation

Dual sessions on the VT340 color terminal, displaying a vertically split screen.



Courtesy Digital Equipment Corporation

Dual sessions on the VT330 monochrome terminal, displaying a horizontally split screen.

minal Driver Session Management Protocol (TD/SMP), to establish dual-session communications between a single VAX host and the VT330/340 firmware and to let you log into and maintain multiple independent sessions on VMS systems.

Because TD/SMP is a symmetrical protocol, similar versions of the SSU code reside on the VAX/VMS SSU software and terminal firmware. SSU works by enabling the VAX to associate one physical terminal device with two virtual terminal VMS processes. This physical-to-logical connection permits dual-session communications over a single wire.

SSU multiplexes terminal data for the two sessions over a single wire. The protocol is unusual for a communications protocol because it isn't time-sensitive. It's designed to work over especially slow links without introducing time-out errors that would disconnect an infrequently used but still active process.

DEC undoubtedly opted for a single-wire approach so that its customers wouldn't have to rewire existing facilities or change their office wiring in any way. The terminal hardware encourages this, providing the flexibility of three communications connectors: one 25-pin RS232C serial modem/communications connector and two DECconnect RS423 modular jacks.

You can choose the RS232C port or either of the two DECconnect jacks for dual-session, single-wire computing. For dual-session, dual-wire computing, you can plug the wires from both hosts into any of the ports mentioned above. Terminal setup provides the means for enabling single- and dual-session computing and making the corresponding session-to-port assignments. A third DECconnect port is provided for bidirectional printer communications.

Dual-wire connections are valuable for users who wish to communicate with two independent hosts: one, say, over a modem line, and the other via direct serial connections. Dual-wire multiple-session capability is the route that third-party terminal vendors such as C.Itoh Electronics Inc. and Falco Data Products Inc. have chosen, although it adds connectivity costs and a measure of complexity that DEC's solution elegantly sidesteps.

Host-Based SSU Software

The host-based SSU software is a layered product that runs on VAX/VMS version 4.4 or later. A version also is available from DEC for the DECSYSTEM-20/TOPS-20 operating system.

SSU software installs on a VAX host in about a half hour. The terminals plug into existing terminal wiring. Applications run immediately, without modification. The special keystrokes required to use dual sessioning can be learned in about 10 minutes.

SSU is installed using the standard VMSINSTAL procedure. The way multiple sessions are enabled on a terminal line depends on whether or not the system manager has enabled virtual terminals.

VAX/VMS systems version 4.0 and later have virtual terminal capability. On systems that have virtual terminals enabled, you can enable multiple sessions on your terminals without assis-

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Memory is divided equally between two sessions, or devoted entirely to one session if the user chooses single-session mode in setup.

tance from the system manager. On systems that don't have virtual terminals enabled, the system manager must associate multiple-session capability with a given terminal device. With many SSU users, the system manager can create a COM file that associates each terminal device with SSU at system startup.

After the system manager associates SSU with terminal lines, you can enable multiple sessions by typing the ENABLE command at the DCL level. The DISABLE command functions in the same way to disable multiple sessions on the current or specified device. The SHOW command displays the multiple-session status of a given terminal device.

Using Dual Sessions

After they're enabled, the two independent terminal sessions are available to you, provided that dual-session operation has been specified in terminal setup. You now have a variety of choices regarding how to display and manage these two sessions.

Perhaps the most popular choice is two independent full-screen windows. You can flip between sessions using the SESSION SWITCH key, the fourth function key on the top row of DEC's LK201 keyboard. This key previously was devoted to operating a dedicated, integral modem option for the VT240/241.

A new VT300-family feature, the 25th status line, displays a 1 or 2 to indicate the active session, along with page, line and column indicators; printer and modem status; and any messages that have been programmed from the host. The status line can use a full set of character attributes, such as bold, underline, blink and reverse video.

You can have two sessions on-screen at the same time. Pressing CTRL-SWITCH SESSION once divides the screen vertically, with 50 percent of the screen devoted to each session. The vertically split layout can't be modified, although either session or both sessions can be set to 132-column mode in setup, which makes 66 columns of information visible on-screen in each session. Local panning also is available to help you access the remaining information.

In the vertically split screen mode, pressing CTRL-SWITCH SESSION changes the layout to a horizontally split screen, with each session initially displaying 50 percent of the available screen space (12 lines of the 24-line text area). Pressing CTRL-SHIFT-DOWN ARROW or CTRL-SHIFT-UP ARROW moves the horizontal border line to apportion the available screen area between sessions in single-line increments.

Pressing CTRL-SWITCH SESSION a third time returns you to two independent full-screen windows.

The ability to maintain fully independent terminal characteristics for each session is extremely useful. Several setup screens are filled with parameters that can be assigned independently: user-defined key assignments, ReGIS/Tektronix graphics modes, character sets and text format, for example. Only a handful of selections, such as printer and comm port assignments, screen refresh rate, on-line/off-line status and single/dual-terminal operation, must be common to both sessions.

Whenever two sessions are on-screen at the same time, the VT340 terminal automatically chooses a contrasting color and the VT330 chooses a contrasting shade of gray for the session border line.

Local Panning

The VT330/340 terminals have six pages (24 lines per page) of text memory and two pages of graphics memory. Memory is divided equally between two sessions, or devoted entirely to one session if the user chooses single-session mode in setup.

Local memory allows a user working in an active session to pan horizontally and vertically through information that already has been sent to the terminal by the host without requiring the resources of the host. Panning is achieved by using the CTRL-UP ARROW, CTRL-DOWN ARROW, CTRL-RIGHT ARROW and CTRL-LEFT ARROW keys, known as the Local Display Control keys.

After viewing a lengthy directory listing, for example, you can travel back through the listing by as many as 144 lines (in single-session mode) or 72 lines (in dual-session mode) by using the CTRL-UP ARROW key. Try that with VMS alone.

The Digital-proprietary Dragon graphics controller chip used in the VT330/340 (and the VAXstation GPX workstation) gives these terminals the ability to support horizontal panning in two-pixel increments. This capability makes for smooth, precise panning. As in smooth scrolling on a conventional terminal, vertical panning in VT330/340 local memory is done scan-line-by-scan-line.

Cursor Coupling

When using the Local Display Control keys for panning through off-screen memory, there is no communication

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CIRCLE 111 ON READER CARD

from the terminal to the host. And usually there's none from the host to the terminal, either, save for unsolicited messages, such as New Mail on Node Nodename from User Username.

Panning makes it easy to travel a good distance from the active cursor position. Thus, DEC includes cursor-coupling setup features as a kind of automatic panning that lets you keep the text cursor in view whenever communications between terminal and host resume.

With vertical coupling enabled, for example, the arrival of the mail notification message automatically pans you to the current cursor position, allowing the message to be read. Typing a DCL command or performing some other function besides local panning has the same result.

With vertical coupling disabled, however, your view doesn't change significantly with the resumption of host/terminal communications, although the arrival of the mail message may push your view of local memory by a text line or two.

Horizontal coupling performs the same automatic panning in the horizontal direction, and page coupling extends vertical coupling by enabling the terminal to traverse page boundaries, when necessary, to couple the cursor. Page coupling is particularly useful for applications that support page lengths greater than 24 lines of text, such as the VAX/VMS TPU Editor.

Allocating Terminal Resources

In dual-session mode, only one session can be active at a time. You work in the active session, while the other session remains inactive. The Update Method setup option helps you control how the inactive session is managed by the terminal.

Selecting Never for the Update Method in setup means that the inactive session won't be updated (i.e., it won't display any new data from the host) until it becomes the active session. This setting is provided so that new information coming from the host isn't lost to the user.

The second Update Method, When Available, means that the terminal will update the inactive session whenever there are terminal resources available to do so, e.g., during a period of inactivity in the active session. The inactive session continues to be updated by the host, although you might never see information coming from the host.

An example helps emphasize the importance of having this control. With terminal update set to When Available, you can work in VMS in Session 1, the active session, while running a background printing job in Session 2, the inactive session, on a local printer connected directly to the terminal's printer port. The performance in Session 1 won't be as strong as it would if you were using a single-session terminal. Nor will the print job in Session 2 be completed as quickly as it would if it were the only task on the table.

By contrast, however, the same print job running on a conventional, single-session video terminal would tie up the terminal and keyboard completely, preventing you from getting any other work done until the print job was finished.

Companies Mentioned In This Article

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Backward compatibility, always a concern for DEC, is preserved . . .

CRITICS OF THE VT330 and VT340 have voiced their preference for PC-style overlapping windows or similar technical exotica, but DEC opted for a more conservative approach to evolve its profitable terminals business and meet the needs of its customers.

Backward compatibility, always a concern for DEC, is preserved with the VT330/340 dual-session architecture. The VT300 family is fully compatible with the VT100 and VT200 families, and even the VT52. The many existing VT applications will run in the dual-session environment without modifying a line of code.

Comparing DEC's smooth, controlled evolution of multitasking capabilities with the chaos and uncertainty that characterize the PC windowing environment and its need for specially written software and dedicated hardware sheds much light on the wisdom of DEC's approach.

—Steven Salemi is president of Bottom Line Communications Inc., Concord, Massachusetts. He has written extensively about DEC hardware, software and services.

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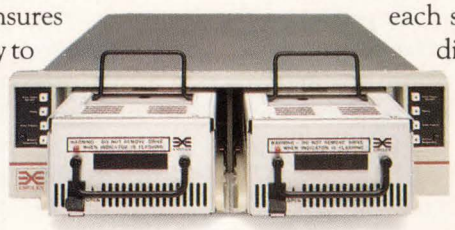

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Networks, Defaults And Diesels

DCL DIALOGUE

Kevin G. Barkes

Thanks to our involved readership, we're kicking off 1989 with a pair of useful utilities, a refresher course on English pronunciation and a unique method of referring to our favorite command language.

Extended Capability

K. L. Wickham of the RML/Radiochemistry Unit of Idaho National Engineering Laboratory of Idaho Falls, Idaho, has provided a simple command file that demonstrates a straightforward method of executing DCL commands over a network link.

RMTCMD.COM was developed to solve the limitations of the PRINT/REMOTE command when using printers on other nodes (see Figure 1). It then was generalized to handle any command a user might want to execute remotely.

Wickham notes that the command file must be present in the user's SYS$LOGIN directories on all nodes that will be using it. It also assumes that proxy log ins have been set up so that a username and password don't have to be specified in the DCL command procedure.

A typical example of its use for remote printing is:

```
$ COPY LETTER.TXT NETVAX::LETTER.TXT
$ @RMTCMD NETVAX::
  "PRINT/QUEUE=LASER/DELETE
   LETTER.TXT"
```

"The DCL command procedure consists of two sections," explains Wickham, "a local section and a remote section, with a test at the top to determine which section is to be executed.

"On the local node, the procedure opens a file named "node::TASK=RMTCMD" that causes the command procedure to start executing on the remote node. The command to be executed is written across the network link, and any reply is displayed on the terminal.

"On the remote node, the procedure opens a file with the logical name SYS$NET and reads the command into the symbol COMMAND. The logical SYS$OUTPUT is redefined to be the network link, and the contents of the symbol COMMAND are executed."

This is a useful procedure, and a good example of using DCL over a network.

Another SET DEFAULT?

Regular readers of this column know that I've sworn off SET DEFAULT utilities and that I promised not to use any for a long, long time.

However, Jeff English of Texas Instruments in Plano, Texas, sent a variation on the theme that's quite clever. Technically, it isn't really a SET DEFAULT routine.

DIRSYM.COM permits you to quickly define global symbols for moving to various directories (see Figure 2). After the symbols are defined, you only need to enter the symbol name to move to the specified directory.

The symbol name is created from the name of the directory. It optionally can be prefixed with a unique identifier to handle situations in which identically named subdirectories exist within other subdirectories, such as [user.source.test] and [user.exe.test].

"The idea for this procedure came from the task of constantly moving about my source directories," English explains. "I have several project directories that contain the source for each project. Each project has basically the same set of subdirectories, such as .INC, .PAS and .OBJ.

"My LOGIN.COM calls DIRSYM once for each project, passing a different prefix each time. I enter MPAS to move to the .PAS directory of project "Master", TPAS to move to the .PAS directory of project "Test", and so on."

DIRSYM works by passing to it the pathname of the parent directory, a prefix, an optional NOECHO parameter to inhibit the display of symbols as they're assigned, and an optional command that can take the place of SET DEFAULT.

That's why this isn't merely another set default procedure. By changing the command defined for "SCmd" at the top of the file, other functions can be performed. For example:

```
SCmd := "DEFINE 'DirSymbol' 'GoDirName'"
```

causes a logical to be defined equal to the pathname of each subdirectory.

You Say Tomato...

My reference to the apparently inconsistent pronunciation of DEC (DECK) and DECUS (DEE KUS) prompted a torrent of comment.

Kelvin Smith, data processing manager at Financial Computer Systems of Stamford, Connecticut, explained it best.

"If a word has two syllables, the sound of the first vowel depends on whether it's followed by one or two consonants (or consonant clusters that are inseparable, such as sh). If there's only one consonant, it's pronounced

with the following syllable. The first syllable is pronounced as if the whole word ended after the vowel, with a long vowel sound. Thus, DECUS is split as DE-CUS and pronounced DEE-KUS."

I was unable to meet Kelvin last October at the DEE-KUS Symposium or at DEX-PO ("note the two consonants," he points out: "the first belongs with the first syllable, the second with the last") to discuss the finer points of linguistic acrobatics.

Oh well, it's all Latin to me. (LAY-TIN? Oops, better keep moving.)

Speaking of fractured phonetics, I have a client who insists on pronouncing DCL (DEE-SEE-EL) as DEE-SUL (as in diesel).

"And why not?" he proclaims. "It's a syllable shorter, and DCL is a lot like a diesel engine: simple, powerful, slow, somewhat dirty but more than capable of getting the job done."

I hope this fellow never discovers frame checking sequences in DECnet.

For a listing of all DEC-related public bulletin board systems in the U.S., send a self-addressed, stamped envelope to BBS List, Kevin G. Barkes Consulting Services, 4107 Overlook St., Library, PA 15129.

The list also is available on-line from the author's SYS$OUTPUT bulletin board system, at (412) 854-0511. Or, ask your local FidoNet sysop to file request DECBBS.LST from 1:129/38.

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

FIGURE 1.

```
$! RMTCMD.COM
$!
$       IF F$MODE() .EQS. "NETWORK" THEN GOTO REMOTE
$ LOCAL:
$       OPEN/READ/WRITE RMT$NET 'P1'"TASK=RMTCMD"
$       WRITE RMT$NET P2
$ RDREPLY:
$       READ/END_OF_FILE=CLSRMT RMT$NET RESULTS
$       WRITE SYS$OUTPUT RESULTS
$       GOTO RDREPLY
$ REMOTE:
$       OPEN/READ/WRITE RMT$NET SYS$NET
$       READ/END_OF_FILE=NOCMD RMT$NET COMMAND
$       IF COMMAND .EQS. "" THEN GOTO NOCMD
$       DEFINE/USER SYS$OUTPUT RMT$NET
$       'COMMAND'
$       GOTO CLSRMT
$ NOCMD:
$       WRITE RMS$NET "NO COMMAND RECEIVED - RMTCMD"
$ CLSRMT:
$       CLOSE RMT$NET
$       EXIT
$!
$! Command procedure to execute commands on remote nodes.
$! The command file must be present in the user's SYS$LOGIN directory
$! on all nodes.
$! Command form:
$!      @RMTCMD "NODE::" "COMMAND STRING"
```

FIGURE 2.

```
$! DIRSYM.COM
$! Comments at bottom of file.
$ START:
$       IF P4 .EQS. "" THEN ChgDir := SET DEFAULT
$       IF P4 .NES. "" THEN ChgDir := 'P4
$!
$       WS      := WRITE SYS$OUTPUT
$       FileExt := *.DIR
$       SCmd    := "'DirSymbol' == ChgDir + "" "" + GoDirName"
$       IF P3 .EQS. "NOECHO" THEN GOTO GET_DIRECTORY
$       WS ""
$       WS "> > >  Directory Symbol Generation  < < <"
$ GET_DIRECTORY:
$       IF P1 .NES. "" THEN GOTO DIRINPUT
$       WS ""
$       WS "Type in the pathname of the directory to define the symbols"
$       READ/PROMPT="-> " SYS$COMMAND DirName
$       DirName = F$EDIT ( DirName, "TRIM, UPCASE" )
$       GOTO GET_PREFIX
$ DIRINPUT:
$       DirName = F$EDIT ( P1, "TRIM, UPCASE" )
$ GET_PREFIX:
$       IF P2 .NES. "" THEN GOTO PFXINPUT
$       WS ""
$       WS "Type in the prefix for the symbols"
$       READ/PROMPT="-> " SYS$COMMAND Prefix
$       Prefix = F$EDIT ( Prefix, "TRIM, UPCASE" )
$       GOTO DO_COMMAND
$ PFXINPUT:
$       Prefix = F$EDIT ( P2, "TRIM, UPCASE" )
$ DO_COMMAND:
$       FindString = DirName + FileExt
$ LOOP:
$!   -- Locate each subdirectory within the specified directory
$       Dirs       = F$SEARCH ( FindString )
$       IF Dirs .EQS. "" THEN GOTO FINISHED
$       SubDirName = F$ELEMENT ( 1, "]", Dirs )
$       SubDirName = F$ELEMENT ( 0, ".", SubDirName )
$       DirSymbol  = Prefix + SubDirName
$!   -- Create path name to the subdirectory
$       GoDirName = F$ELEMENT ( 0, "]", Dirs )
$       GoDirName = GoDirName + "." + SubDirName + "]"
$!   -- Execute the set symbol command for moving to the subdirectory
$       'SCmd'
$       IF P3 .EQS. "NOECHO" THEN GOTO LOOP
$       MsgLine := 'DirSymbol'" --> "'GoDirName'
$       WS MsgLine
$       GOTO LOOP
$ FINISHED:
$       EXIT
$!                          Jeff English
$!                          Software Design Engineer
$!                          Texas Instruments
$!                          PO Box 869305  MS 8408
$!                          Plano, TX  75086
$! FUNCTION:
$!    Define symbols which will automatically set the current
$!    directory.  The symbols are created by prefixing all
$!    subdirectory names, within the specified directory, with the
$!    selected prefix.       Entering the symbol will automatically
$!    set the current directory to that subdirectory.
$!
$! PARAMETERS:
$!    P1  =  Pathname of directory to search for subdirectories
$!    P2  =  Prefix to attach to the subdirectory names
$!    P3  =  NOECHO if echoing of symbols is to be suppressed
$!    P4  =  Alternate directory change command
$!           (Could be any other command)
$!
$! NOTES:
$!    (1) The default directory is the current directory
$!    (2) The default prefix is null
$!    (3) The default mode is to ECHO all symbols
$!    (4) The default command executed is "SET DEFAULT"
$!        (This command can be any command line statement)
```

WORKSTATIONS

Evan Birkhead

The Secret Of Success

Editor's note: This is the debut of Workstations, a monthly column dedicated to the technologies and issues behind one of the industry's hottest areas. In coming months, this space will feature trends analyses, technical updates and Lab reviews of workstations. The hardware and software strategies of DEC, its partners and its competitors will be covered.

It's January 6, 1992. We're watching the rain from inside a lifeless college tavern in Santa Clara, California. We've been hired by a start-up computer firm to propose a new workstation architecture.

Grabbing cocktail napkins, we start sketching a bus, a storage interface, a network topology and some server ideas. In our operating system — a powerful, real-time derivative of OSF-compatible UNIX — we want the flexibility to support software engineers, accountants, number-crunchers, researchers, CAD shops, factory floors, Wall Street, offices, universities and more.

We'll need a comprehensive RDBMS built into the operating system. It will be tightly integrated with an object-oriented CASE system and an expert system shell that ensures a crisp user interface.

We begin to discuss hardware, which fuels a loud debate. We definitely want multiprocessors. But do we go with Intel's new 686? The enhanced SPARC? The improved RISC? Do we need built-in array processors? We'll need to do floating point. Heck, we'll need erasable optical, stereo sound, voice synthesizers, music chips and touch screens.

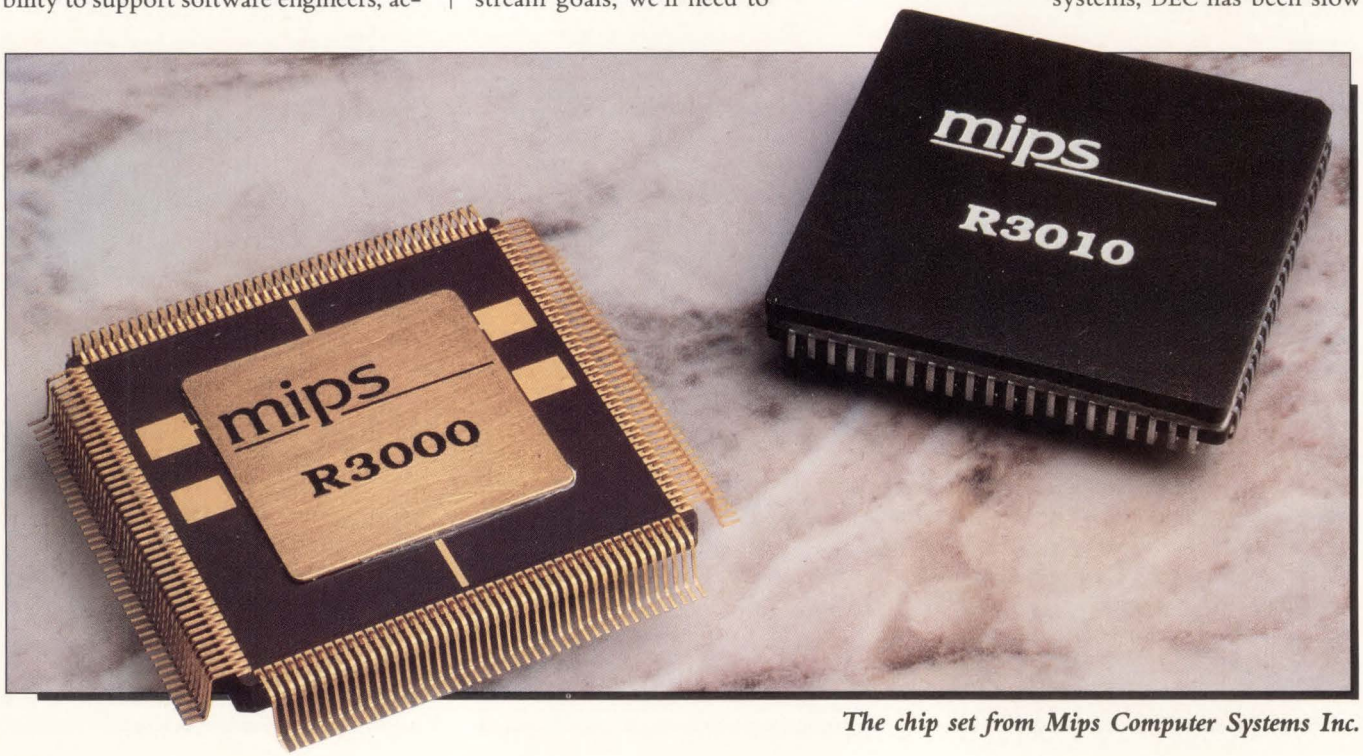
We agree that the secret of success is in software portability, communications and networking. For such mainstream goals, we'll need to support diverse protocols: DECwindows graphics, OSI networks, SQL applications and NFS file sharing. We can't survive without them.

VAXstation Futures

The way things are going, you won't be able to compete in 1992 without adhering to DECwindows, OSI, SQL and NFS. When Steve Jobs, co-founder of Apple, put his reputation and imagination to the test in the workstation world, he faced tough design decisions. But his planning began around 1986, during the primordial era of workstations. The emergence of standards is clearing the picture a bit.

Like Jobs' company, Next Inc., DEC entered the workstation market too late to be a pioneer. But that doesn't mean it can't be an innovator.

As with its personal computer systems, DEC has been slow



The chip set from Mips Computer Systems Inc.

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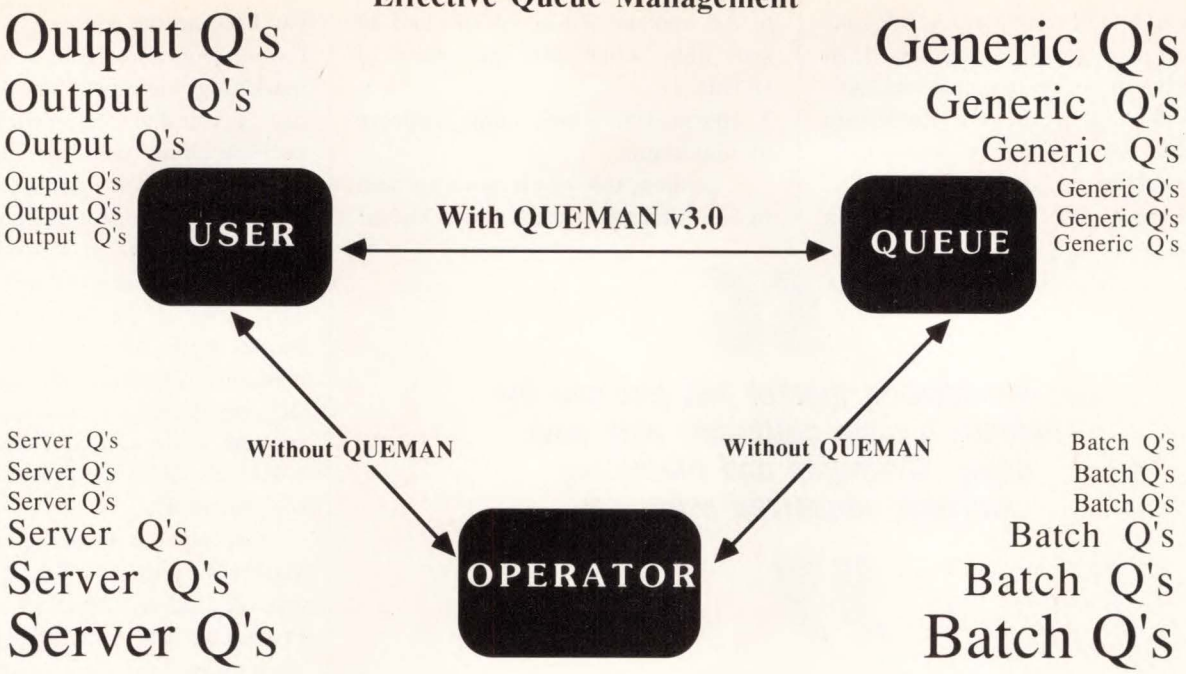

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on the take with workstations. But contrary to its desktop predecessors, such as the Rainbow, Professional and VAXmate, the VAXstation is a mainstream machine. Some of its more marketable advantages are:

1. A choice of TCP/IP and DECnet on VMS and ULTRIX. DEC has embraced UNIX to such an extent that the announcement of an all-ULTRIX VAXstation is expected.
2. In all likelihood, this new workstation will employ a Reduced Instruction Set Computer (RISC) processor from Mips Computer Systems Inc. This processor is widely held as the industry's most powerful. Ardent Computer Systems, Prime Computer and Silicon Graphics Inc. all use Mips Computer technology in their workstations.
3. As a VAX, the VAXstation has the ability to play in VAXclusters. VAXstation menus allow you to create emulated VT200 and Tektronix 4014 windows.
4. Another advantage is the X User Interface (XUI) toolkit, the graphical and programming interface component of DECwindows. XUI will coexist on UNIX platforms, Macintoshes and Presentation Manager-OS/2. Although prevalent, the standardization of DECwindows isn't yet a given. For example, Silicon Graphics, purveyor of a popular series of graphics workstations, doesn't yet offer X-compatible machines.
5. ULTRIX 3.0, which includes an ULTRIX-to-VMS connection.
6. An implementation of NFS and an SNA link, which also are parts of ULTRIX 3.0.
7. DECnet/OSI, which might yet prove its importance.

Of these, DEC's best move has been to establish itself as the X leader. The interoperability that X compatibility provides augments everything people like about workstations: they exploit the network, they're easy to use and they increase productivity.

> ***"The workstation market has become the industry's most cutthroat, with new deals, strategies and marketing concepts conceived every day."***

Chess Game

Dr. George Schussel, president of Digital Consulting Inc., highlights five pivotal technologies for the next decade. Four are software technologies: standards, AI/expert systems, distributed databases and CASE. The fifth is workstations. Schussel believes that, in the near future, mainframes and minicomputers will maintain databases that support workstation applications.

Mainframes, he adds, don't have the power for complex applications that are emerging, including CASE and software re-engineering. "All of the goodies aren't going to happen on shared access systems," he explains.

With workstations tied into mainframes and distributed databases, Schussel predicts that the metric for rating workstation performance will become dollars, not mips. "In fact," he says, "it's already happening."

To continue its momentum, DEC will have to play chess with smaller companies that have proved their big-league caliber. The workstation market has become the industry's most cutthroat, with new deals, strategies and marketing concepts conceived every day. Specifically, DEC must capitalize on two key pieces of its low-end strategy.

First, for long-term sales, connectivity with PCs must be enhanced and confidently marketed. Workstations and PCs will increasingly work together. The goals of DEC's co-development project with Tandy Corporation are nebulous. VAX/VMS Services for MS-DOS has its merits, however, and DEC currently is working on a sister program tentatively called VAX/VMS Services for the Macintosh.

Second, DEC must capitalize on the market opportunity it has created in the up-and-coming On-Line Transaction Processing (OLTP) marketplace, which predominantly is workstation oriented. Many feel that OLTP is the RDBMS of the future, and that DEC, with its head start on Wall Street, must win this symbolic war with IBM and the other workstation vendors.

VAXstation History

When DEC began 30 years ago, it had the fastest components in the industry. But it has fallen behind since then. Despite the fact that the VAXstation 2000 was the first 32-bit color workstation priced under $8,000, DEC wasn't really a player in the mips benchmarking race until it purchased five percent of aptly named Mips Computer Systems in September.

The first VAXstations and VAXservers, based on the MicroVAX II chip set, were announced in February 1987 on the heels of the VAXstation II/GPX. At the time, workgroup computing was a revolutionary concept for DEC. Now, it's integral to its corporate strategy.

Six new VAXstation 2000 configurations, including color systems, were introduced the following June, allowing DEC to do battle in the major leagues with Sun, Apollo and Apple. They were followed in September by the higher-performance VAXstations 3200 and 3500, and the upgrade of the VAXstation

1989 digital review TARGET AWARDS NOMINEE

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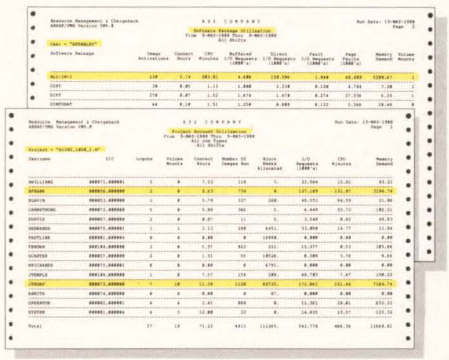

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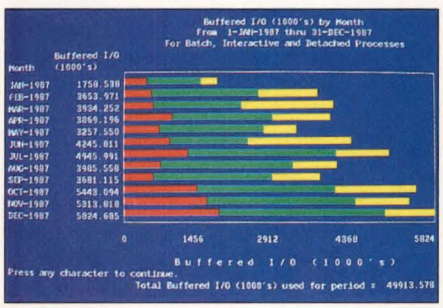

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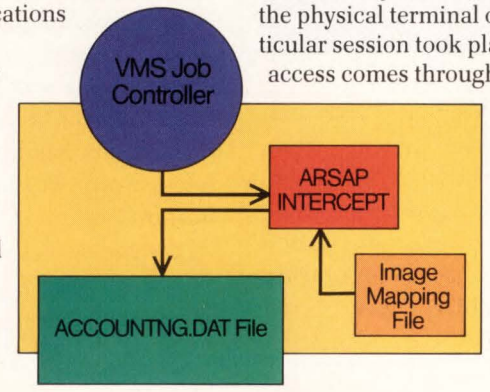

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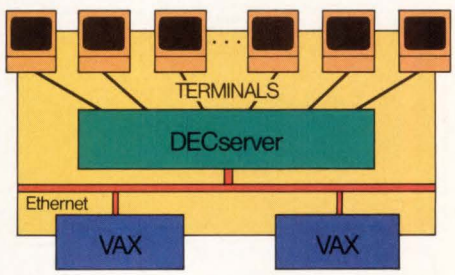

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II/GPX. These new CMOS systems incorporated DEC's proprietary 78034 microprocessor and the 78134 floating point unit.

The VAXstation 8000, first shipped in February 1988, was aimed at the 3-D graphics superworkstation market and often competes with systems from Stellar, Silicon Graphics and Ardent. An AI VAXstation series based on the VAXstation 2000, 3200 and 3500, with licenses for PROLOG, VAX LISP and VAX OPS5, was introduced in March 1988.

Today, the VAXstation line is available at all price levels and in a variety of configurations. From high to low end, the current picture, with approximate prices, looks like this:

- The VAXBI-based VAXstation 8000, about $80,000
- The VAXstation 3500, from $50,000 to $60,000
- The VAXstation 3200, from $18,000 to $35,000
- The VAXstation II/GPX with a variety of configurations, from $20,000 to $60,000
- The VAXstation 2000 series, from $5,000 to about $18,000

DEC has surged to the number two spot among workstation vendors behind Sun Microsystems. Though recent changes to the VAXstation have been turbulent, DEC seems to have gained some measure of stability by securing the Mips chips. (DEC also went to Evans & Sutherland for help with the VAXstation 8000.)

DEC is at a disadvantage because of the breadth of its product line. The serious competition — Sun Microsystems, Silicon Graphics and Apple Computer, among others — has the edge in the short run. Each has only one machine to worry about, not a mammoth Enterprise Network.

Additionally, Intel's impending 486 chip will stir things up a bit. Reports indicate that the 486 will bring supercomputer processing speeds to the PC/workstation level.

FOR 1992, UNIX (whether OSF or AT&T) looks like the operating system of destiny. But what factors will affect the chips, the protocols and the rest of the workstation outlook?

Leaving the tavern, we decide it's going to be tough, but we can't lose hope. Like DEC, we've gotten to the party late. But with the right moves we can succeed. The rain lets up and we shake hands, having learned the lesson Jobs learned: We can't succeed without imagination. ■

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LET'S C NOW

Identifier Scope And Life, Part 2

Rex Jaeschke

Editor's note: This is the second of a two-part series that covers C's storage class keywords. In this installment, Mr. Jaeschke looks at the ***static*** *and* ***extern*** *keywords as they apply to data and functions. He also summarizes storage duration and linkage in a simple table (see Figure). Some of the terminology used in this article was defined in the first installment published in December 1988.*

Automatic objects are useful for certain kinds of things. However, sometimes it's necessary to have a variable that retains its value across function calls. Also, for objects whose values never change, it's expensive to keep creating and initializing them every time their parent block is entered, especially for arrays with lengthy initialization lists. For these situations, **static** class objects are more appropriate.

Objects with the keyword **static** in their declarations have static storage duration. Their linkage can be internal or none, depending on whether the declaration is internal or external to a function definition. Let's begin by looking at static internals, that is, those **static** declarations inside a function and having no linkage.

```
#include <stdio.h>

main()
{
        static int si;
        static int sj = 100;

        printf("si = %d, sj = %d\n", si, sj); }
```

The output is:

```
si = 0, sj = 100
```

As you would expect from an object with static storage duration, its default initial value is zero. Consider the following object declarations and initialization lists:

```
#include <stdio.h>

main()
{
        int g(void);

        static int sk = 123;
        int j = sk + g();

        printf("sk = %d, j = %d\n", sk, j);
}
```

FIGURE

Class	Linkage	Storage Duration	Default Value
auto	none	block+	undefined
register	none	block+	undefined
static internal	none	program	0
static external	internal	program	0
external define	external	program	0
external declar	external	program	–
extern	intern/extern	program	–
static function	internal	–	–
extern function	external	–	–

A summary of the scope and life of all of the object and function classes.

```
g()
{
        return 321;
}
```

The output is:

```
sk = 123, j = 444
```

In this example, **sk** is initialized with a compile-time constant expression. This is a requirement because the initialization can be done at compile time. However, the initialization of the automatic object **j** is done at run time and so can involve any run-time calculable expression of compatible type. As shown, this expression involves a function call. The following program shows the subtle difference between initializers for **static** and automatic objects:

```
void f()
{
        static int s1 = 10;                    /* OK */
        int ai = s1;                           /* OK */
        static int s2 = ai;                    /* error */

        /* ... */
}
```

As the value of the expression **s1** can be computed at run time, it's permissible as an initializer for **ai**. However, **s2** must

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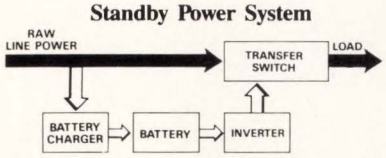

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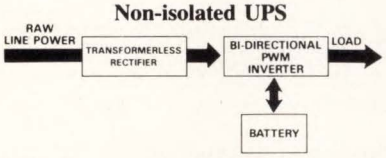

Advantages:
- Moderate cost
- Brownout protection
- High line protection
- No break system

Disadvantages:
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- Poor isolation
- Inverter on continuously
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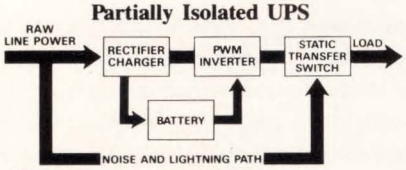

Advantages:
- Brownout protection
- High line protection
- Partial no-break system
- Separately derived neutral

Disadvantages:
- Break in transfer to line
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- Non-linear load
- Poor efficiency
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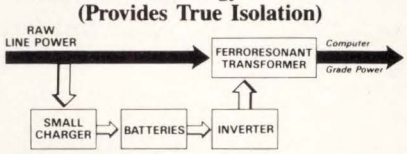

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have a constant initializer, and the value of the expression **ai** is not known until **f** is executed at run time. Hence, a compilation error results.

Objects of static storage duration exist for the life of the program, so they retain their value across function calls, for example:

```
#include <stdio.h>

main()
{
        int i;
        void test(void);

        for (i = 1; i <= 5; i++)
                test();
}

void test()
{
        static double sd = 0;

        printf("sd = %.2f\n", sd++);
}
```

It produces the output:

```
sd = 0.00
sd = 1.00
sd = 2.00
sd = 3.00
sd = 4.00
```

All the internal **static** objects defined above have no linkage. They are local to their parent and subordinate blocks. On the other hand, an external **static** object has internal linkage and can be accessed by name from anywhere in the same source file in which it's declared, for example:

```
#include <stdio.h>

static i1 = 100;   /* int type implied */
static int i2;
main()
{
        void f(void), g(void), h(void);

        printf("main> i1 = %d, i2 = %d\n", i1, i2);
        f();
        g();
        h();
}

void f()
{
        printf("   f> i1 = %d, i2 = %d\n", i1, i2); }

void g()
{
        int i1 = -100;

        printf("   g> i1 = %d, i2 = %d\n", i1, i2);
}

void h()
{
        static int i2 = 12345;

        printf("   h> i1 = %d, i2 = %d\n", i1, i2);
}
```

The output is:

```
main> i1 = 100, i2 = 0
   f> i1 = 100, i2 = 0
   g> i1 = -100, i2 = 0
   h> i1 = 100, i2 = 12345
```

The **static** externals **i1** and **i2** are accessible by all four functions. However, the automatic variable **i1** in **g** hides the external **static** by the same name, while **g** is executing. Similarly, the **static** internal **i2** in **h** hides the external **static i2** within that function.

Because a **static** external has internal linkage, it can't be accessed from other source files, for example:

```
/* source file main.c */

#include <stdio.h>

static double d[] = {1.2, 2.3, 3.4};

main()
{
        void sub(void);

        printf("main> d = %.2f, %.2f, %.2f\n", d[0], d[1], d[2]);
        sub();
}

/* source file sub.c */

#include <stdio.h>

static int si = 32767;
static double d[] = {9.8, 8.7};
void sub()
{
        printf("sub> si = %d\n", si);
        printf("sub> d = %.2f, %.2f\n", d[0], d[1]);
}
```

The output produced by this program is:

```
main> d = 1.20, 2.30, 3.40
sub> si = 32767
sub> d = 9.80, 8.70
```

The **static** array **d** isn't seen outside **main.c**. Similarly, the **static** externals defined in **sub.c** are local to that file. Therefore, different **static** external variables having the same name can coexist, provided each is in a different source file.

All these **static** external examples have the object being declared at the start of the source file so its name is seen by the whole source file. However, if the object is defined after

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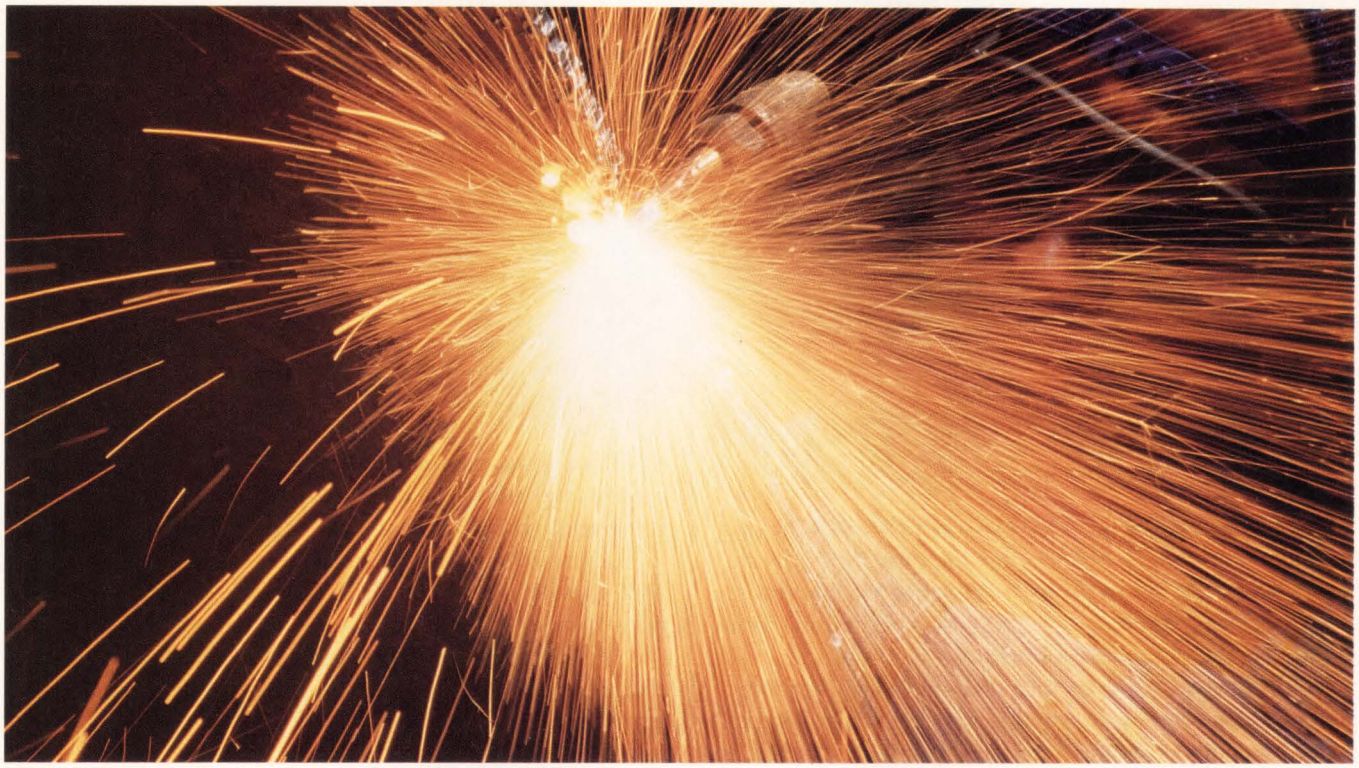

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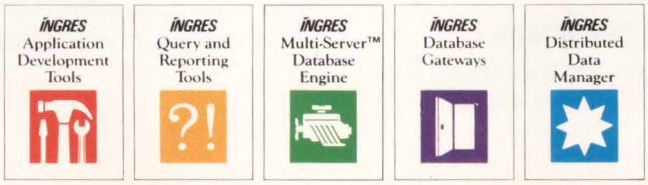

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it's needed, you have to use a different approach. The following program shows the solution:

```
#include <stdio.h>

extern int k;       /* tentative declaration */

main()
{
        void f(void);

        printf("main> k = %d\n", k);
        f();
}

static int k = 123;                          /* actual declaration */

void f()
{
        printf("   f> k = %d\n", k);
}
```

The output is:

```
main> k = 123
f> k = 123
```

As **k** is defined after **main**, **main** can't access **k**, because all variables must be declared before their use. And you can't declare **k** as **static** in two places, because that would cause the compiler to see two definitions for objects of the same name. So you use the **extern** class keyword.

This indicates to the compiler that somewhere "out there," there's a definition for an external **int** object called **k**. And when the compiler comes across its definition, it's able to resolve the forward reference and **k** has internal linkage. (Although the **extern** keyword is permissible in such situations, by placing the definition of **k** ahead of **main**, the forward reference becomes unnecessary. Most often, **extern** is used with identifiers having external linkage.)

Actually, we have been dealing with objects of static storage duration, possibly without knowing it, for many columns now. When a literal string is seen by the compiler, it allocates space for it and a trailing '\0', and initializes that space with the characters in the string. A literal string is an array of **char** having **static** class, that is, the array space is allocated and initialized prior to program execution.

Whether or not a literal string is a **static** internal or **static** external object is irrelevant, because the sharing of like literal strings is implementation-defined. For example, if the same literal string occurs multiple times within a source file, whether or not all of them actually refer to the same **char** array, or to unique arrays, is implementation-defined. This is regardless of whether all occurrences are outside or inside a function definition or are in both places.

The extern Class And Global Definitions

The concept of global variables that can be shared among functions in separate translation units is supported in almost all languages and is well-understood. However, it can take some practice to implement this external linkage in C, because there's a lack of symmetry in the use of class keywords.

Global objects have external linkage, so if they're used solely to resolve internal references as shown in the next example, they're overkill. External statics should be used instead.

```
#include <stdio.h>

int gi;             /* global definition */

main()
{
        void f(void);

        gi = 876;
        f();
}

void f()
{
        printf("gi = %d\n", gi);
}
```

If an object declaration occurs outside a function and it contains no class keyword, it's an external definition. That is, it causes the compiler to allocate space for it and to initialize it. Such objects have static storage duration. There's no implied class keyword when one is omitted here, as there is when **auto** is assumed for classless internal declarations.

If these two functions resided in separate source files, a change would have to be made to ensure that **f** could access **gi**, as follows:

```
/* source file main.c */

int gi;

main()
{
        void f(void);

        gi = 876;
        f();
}

/* source file f.c */

#include <stdio.h>

extern gi;          /* tentative definition */

void f()
{
        printf("gi = %d\n", gi);
}
```

In this case, the **extern** keyword is used to provide external linkage. (In the previous section, it was used to resolve a forward reference to a **static** external.) Because the compiler doesn't find a definition for a **static** external or a global object, it treats the **extern** as being a reference to a global object

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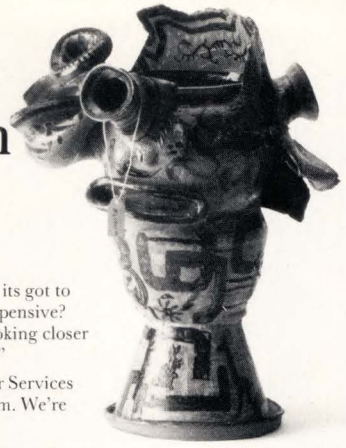

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defined in some other source file.

In the following version of function **f**, function **g** also is called, and this function needs to access **gi** as well. The functions could be written as:

```
/* source file f1.c */

#include <stdio.h>

void f()
{
        void g(void);
        extern gi;

        printf("gi = %d\n", gi);
        g();
}

void g()
{
        extern gi;

        printf("gi = %d\n", gi);
}
```

In this example, the **extern** declaration is at block level 1 instead of level 0. These declarations don't cause storage to be allocated. They simply declare that an external object is defined elsewhere. The linkage of that identifier will be determined by the compiler based on whether or not it finds a corresponding definition in its source file. In this case, it doesn't.

By placing the **extern** declaration inside a function definition, its scope has been reduced from source file-wide to just its parent and subordinate blocks. That's why **gi** must be declared inside both functions. If 20 functions in the same source file needed access to **gi**, it would be messy to declare it in each function. The proper solution is to declare it once, at the top of the source file at block level 0. And if functions in other source files also need to access **gi**, the **extern** declaration should be placed in a user-written header so it can be included as needed.

ANSI C requires that there be exactly one definition for each global object. That is, its declaration must not contain a class keyword. All other declarations of that object *must* contain the **extern** keyword. Note, though, that there are several global definition/reference models in existence, which differ from that defined by ANSI C. For example, VAX C permits the **extern** keyword to be omitted from all references simply because the linker doesn't differentiate between global definitions and references. If you use other than the ANSI C model, you should be aware of the consequences.

Also note that a data declaration containing the **extern** keyword can't have an initialization list. Only defining instances of objects can be initialized.

Function Classes

The storage duration of all functions is, of course, **static**. Space is allocated permanently for all functions linked into a pro-

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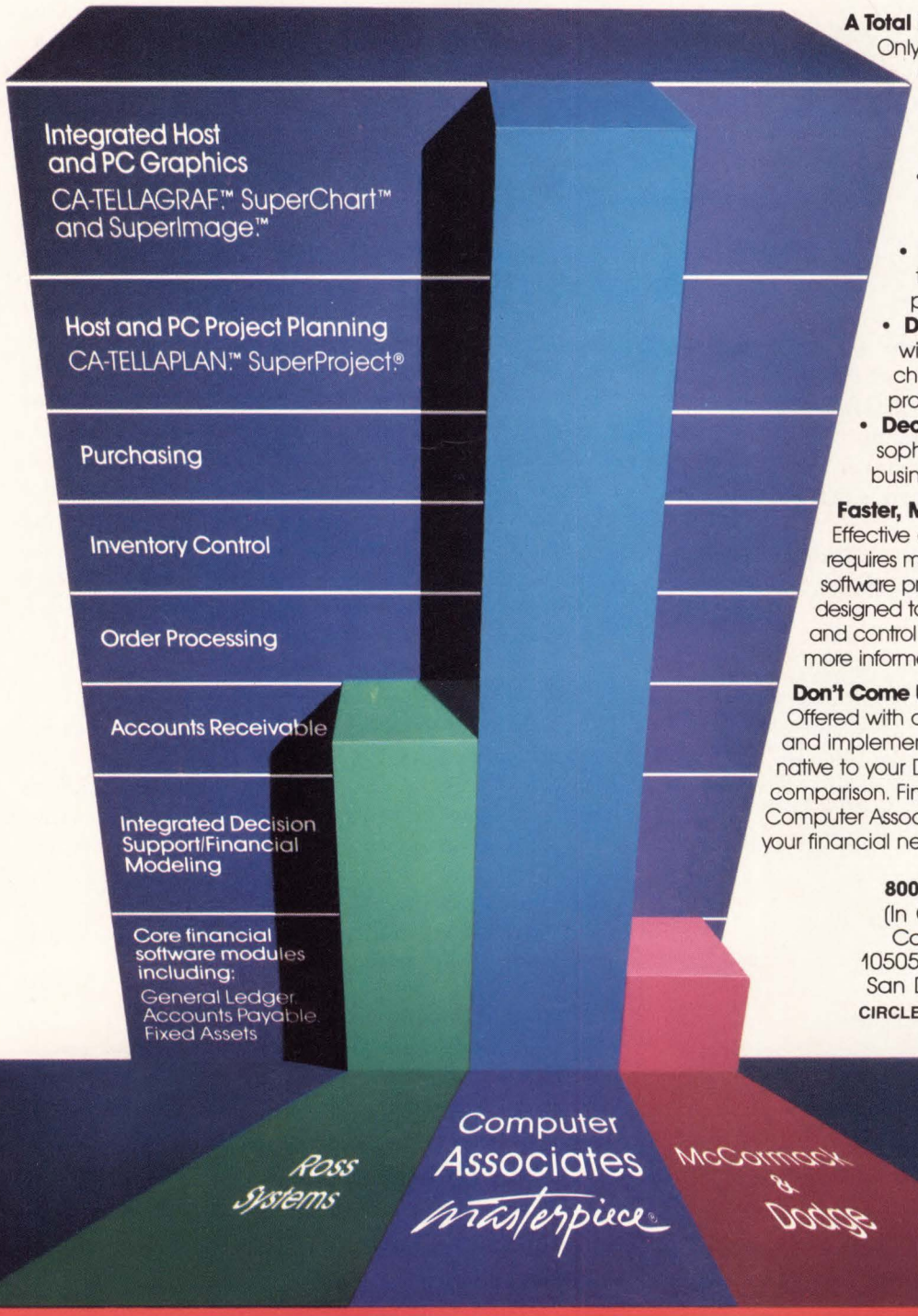

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gram whether or not those functions are called. However, there are two types of function linkage: internal and external. A function with external linkage causes a global symbol to be exported to the linker, so that function can be invoked from any translation unit, provided the function is declared properly. Consider the following example:

```
extern main()
{
        extern void f(void);

        f();
}

extern void f()
{
        /* ... */
}
```

Both function definitions and the declaration of **f** contain the class keyword **extern** to indicate these functions have external linkage. Because this is the default linkage for functions, the keyword is used rarely in this context. As stated earlier in this series, if a class is specified and a type isn't, **int** is assumed. So in this example, **main** is declared implicitly as returning an **int** value.

A function with internal linkage can be called only from functions defined in the same source file as that function's definition, as follows:

```
static int data[100];                          /* private data */

extern unsigned getmem(unsigned size)
{
        extern void sub1(void), sub2(void);

        /* ... */

        sub1();
        sub2();

        /* ... */
}

static void sub1() /* private function */
{
        /* ... */
}

static void sub2() /* private function */
{
        /* ... */
}
```

Here, **getmem** has external linkage and is the means by which the user program gains entry to this source file. In turn, **getmem** uses two service routines, **sub1** and **sub2**, to do its job. Because **sub1** and **sub2** are designed to be called only by **getmem**, there's no reason to make their names public. Therefore, they're defined using the **static** keyword. As such, their names aren't exported to the linker. All references to them are resolved by the compiler.

Note that once again in **getmem**, you declare **sub1** and **sub2** using the **extern** keyword. This forward reference is resolved by the **static** function definitions later in the source file. If the function definitions didn't contain the keyword **static**, or they weren't defined in the same file, the compiler would treat the **extern** declaration as a reference to an **extern** function.

Because a **static** function is private to its parent source file, many **static** functions having the same name can coexist, provided each is defined in a different source file. In this example, the **static** external array **data** also is private to this source file, and this is the principal means of communication between **getmem** and its slave routines.

The value of private data and functions should be obvious. They permit you to use whatever names for these things you wish without worrying about name conflicts with other translation units. Therefore, they're particularly useful when writing self-contained library modules.

Some languages provide more linkage capability than does C. For example, they permit functions to be nested, such that a function can be called only by its parent function. They can also permit a function to be private to functions outside the source file in which the private function is defined. C doesn't support these things. It provides an all-or-nothing approach to function linkage.

Preprocessor Macro Scope

The preprocessor translates your C program into another C program by (among other things) replacing macros with their expanded definitions. As such, the preprocessor knows nothing about linkage and storage duration. Yet, such macros do have a scope in the sense that a macro is usable only after its definition, and it remains visible through the end of the source file in which it's defined. (If a header containing a macro definition is included, the included header is deemed to be part of the same file as the source that included it.)

Prototype Identifier Scope

As you learned in a previous column, you're permitted optionally to put identifiers in the argument list of a function prototype. For example:

```
double calc(double arg1, int arg2[]);
double calc(double, int []);
```

are equivalent. The value of using the names is to make the declarations easier to read, particularly for complex data types, and to make it easier to generate prototypes from function definitions using a text editor.

These identifiers have their own scope. They are seen only from the point of their usage through the end of their parent

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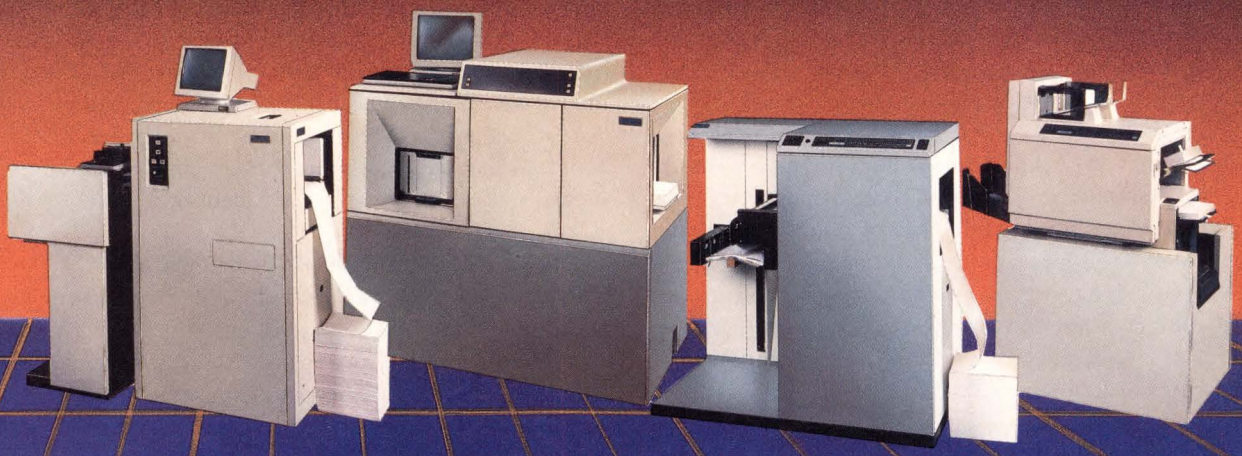

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prototype, that is, the same identifier can't appear more than once in a prototype, and it never conflicts with any identifier of the same name outside the prototype. These identifiers have no linkage, and because they cause no storage to be allocated, they have no storage duration.

A prototype argument list exists only to specify the types of each argument expected. Each type declaration must contain no class keyword, because linkage of function arguments is predefined and can't be changed. (However, the **register** keyword can be used in the formal argument list corresponding to the prototype.)

So although you can chose these dummy identifier names at leisure, you should be aware that these names are tokens and as such are seen by the preprocessor when it's looking for macro calls. Therefore, you must not use a dummy identifier name that exactly matches a currently defined macro name. (A conflict is easy to avoid if you use uppercase names for macros and lowercase names for all other identifiers.)

Consider the following example:

```
#define ABC 10
#define xyz (ABC / 2)

void sub(int ABC, double xyz[]);
```

The output from the preprocessor is as follows:

```
void sub(int 10, double (10 / 2)[]);
```

This generates a compilation error, because these aren't valid declarations. And although it should be easy to avoid such conflicts, don't forget that either or both of the macro definitions and prototypes can be in headers that are included. So unless you write your prototypes with care, you can run into trouble when you use them in the scope of other headers. And if you purchase or otherwise obtain headers from other sources, check out the naming conventions they used for macro names and prototype argument identifiers.

Linkage And Storage Duration Attributes

The Figure summarizes the scope and life of all the object and function classes. The storage duration block + refers to an identifier declaration's parent block and subordinate blocks.

Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia 22091 or via the uucp address uunet!aussie!rex.

—Rex Jaeschke is an independent consultant, author and lecturer. He is the C language editor of DEC PROFESSIONAL, *and our representative on the ANSI C Standards Committee.*

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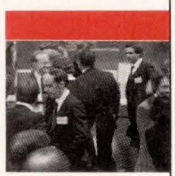

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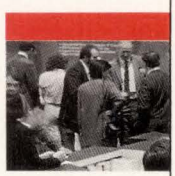

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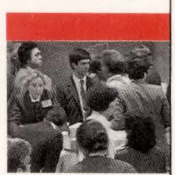

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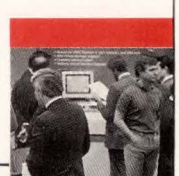

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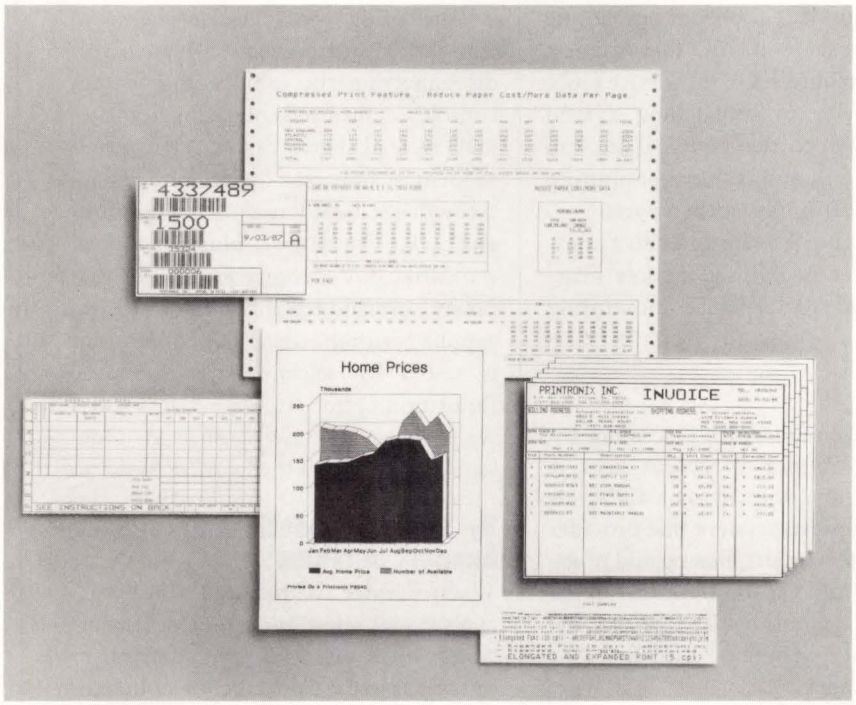

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It seems as if everyone, everywhere, has maintenance (or the lack of it) on his mind.

In the computer industry, maintenance has been a concern for a long time. Since the beginning of commercial data processing sites, when you thought of computers you thought of maintenance, from preventive to corrective to field change orders (FCOs).

Wasn't it the computer industry that introduced such descriptive maintenance terms as downtime, crash and deep-ended? Now two new terms are sweeping the industry: remote and predictive.

Remote diagnostics and performance monitoring tools are teaming up to provide predictive maintenance. This means that potential problems are diagnosed and corrected before they become major trouble spots or cause system downtime. In many instances, the customer never knows the problem existed, because the system continues operating without interruption. Finally, zero downtime is achieved.

The last quarter of 1988 saw many new diagnostic and monitoring tools introduced by major DEC-market service suppliers. This trend will continue throughout 1989. These versatile software packages are aimed at aiding the service provider or self-maintainer to locate, analyze and correct system errors quickly, before they become problem areas or bottlenecks.

Remote diagnostics and/or site monitoring tools can be tremendous aids to the field engineer, especially when it comes to troubleshooting intermittent faults, the kind that "pop up" only every few days. Combined with an AI program, these tools not only locate and diagnose problems, they suggest probable solutions. Or, the service tools, if used prior to dispatching a field engineer (FE) to the troubled site, can identify a failing unit, thus permitting the FE to bring the needed parts.

Following is an insight into a number of recently released remote diagnostics and performance monitoring tools.

R_X LINK

R_X LINK, announced in December by Electronic Service Specialists (ESS), a Bell Atlantic Company, is a full-scale remote diagnostic system that provides total monitoring, diagnosing and problem-resolving capabilities. It can be leased on a monthly basis by any independent service supplier or self-maintainer.

R_X LINK is designed to offer prompt delivery of diagnostic tools, expert analysis assistance and delivery of spare parts to its subscriber base. The system includes a Remote Diagnostic Unit (RDU), which is a PC XT clone with an auxiliary board and ESS firmware. This RDU resides on-site connected to the console port of the target computer system. At the other end, the RDU is linked to the ESS Diagnostic Support Center's (DSC) host computer (see Figure 1).

When a subscriber site requires service, R_X LINK is activated by depressing a function key on the RDU. This, in turn, automatically initiates a connection to the DSC over standard voice-grade telephone lines. From this point, the subscriber is walked through the problem to a solution, usually identifying a field replaceable unit (FRU). If the FRU is unavailable on-site, it's shipped from depot stock.

Installing the RDU on-site is a straightforward procedure. It involves disconnecting the cable going to the console terminal and connecting it to the RDU instead. Next, the RDU's internal modem is connected to a telephone line through a standard modular phone cord and jack. The RDU is plugged into a standard 110V receptacle. (Both the power cord and telephone line cord are supplied with the unit.) The connection is tested by selecting the Terminal Emulation option from the RDU's software menu. It's now connected. One keystroke activates the R_X LINK system.

R_X LINK Diagnostic And Support Services

When service is required, the DSC analyst will select and run a variety of diagnostic tools, send graphic pictures or screens to the subscriber or switch to voice mode to discuss the problem. (The RDU includes a wireless telephone for operator and analyst voice communications.) Both data and voice modes are used to formulate a solution to the problem.

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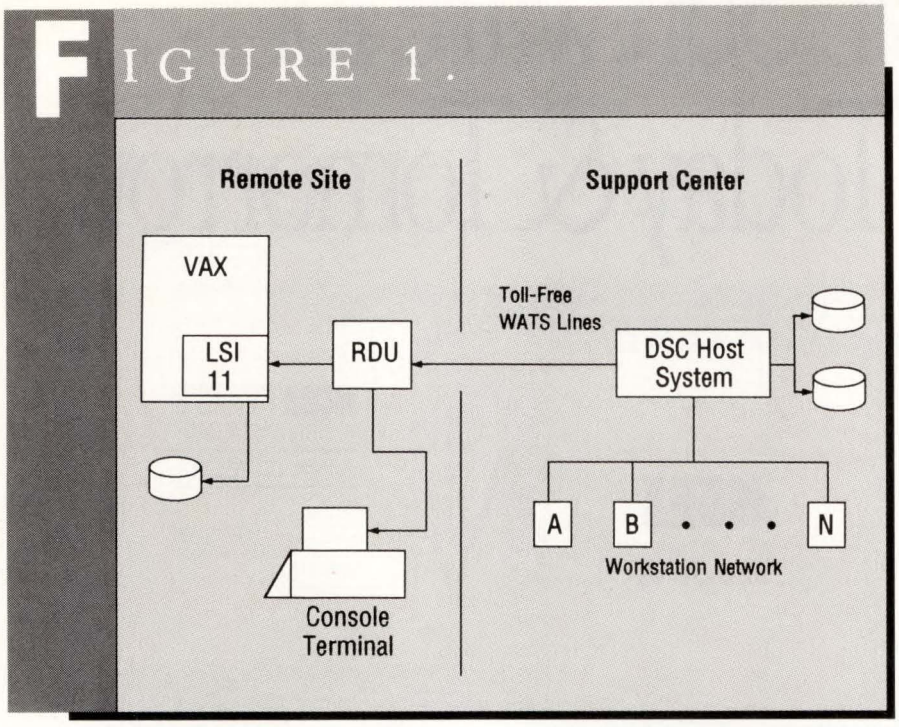

The R_X LINK service tool.

The RDU periodically can interrogate the system error log for any device error statistics (this is done without interfering with the operating system) in conjunction with the threshold and reporting parameters set up by the analyst. The program operates automatically, with the RDU initiating a call-back to the analyst when a threshold is exceeded and reporting on the gathered data.

Additionally, there are tools to analyze and decode the machine's crash dump data. The RDU captures this binary data and reports back to the DSC host computer. The data is translated into a more meaningful form for the analyst.

One of the unique qualities of the R_X LINK support system is that it can be used with any of the diagnostic packages now running on VAX or PDP systems. And because the diagnostic isn't downloaded, this doesn't violate any purchasing or licensing agreements.

System Components

RDU — The RDU is the on-site computer, performing tasks and communicating the results back to the DSC host computer. It provides the following capabilities to the DSC host computer:

1. Downline loading of concurrent tasks.
2. Multitasking.
3. Off-line running of diagnostics.
4. Call-back on significant events.
5. Error-free data transfer between the DSC and RDU.
6. Full ASCII keyboard and monochrome graphic CRT.
7. Cordless telephone for voice-mode operation.

For reliability purposes, the RDU doesn't contain magnetic media. The R_X LINK multitasking operating system (OS) is resident in firmware and is responsible for running all system functions. Upon powering up, the firmware is activated. Major OS kernels provide for supervision and overseeing of all operations: downloading and communications with the host computer, memory allocation and relocating of RAM-based tasks, initializing tasks and assigning priorities, and modem operations (see Figure 2). The OS also provides the user-to-firmware interface and the various device drivers and utilities.

The firmware in the RDU contains only enough code to communicate to the host, check its own system integrity and accept the downloaded tasks that turn it into a diagnostic tool. Each RDU is tailored by the host computer at connect time to address specific site problems. Thus, the RDU can be configured to support different computer manufacturers without the need for firmware changes.

The resident RAM section of the RDU provides additional software that allows the RDU to be controlled from the DSC host keyboard (allowing the analyst to use it as a terminal), alert an operator that data is coming over the line (beep), accept test and graphics data (screens), and monitor the target machine for condition thresholds, then report them to the DSC (monitors).

Loaders software allows the RDU to talk to a target machine via a set of parameters. This establishes a standard interface for communicating. The remainder of the RDU is isolated from the target machine's architecture. The Dialer program is responsible for watching the Monitor task for a change in status (or a threshold condition) and then activating (dialing) the host computer link.

The Diagnostic section of the RAM receives a battery of downloaded test programs from the host, then disconnects. This minimizes use of the phone line, because the RDU has been on-line only long enough to receive the diagnostics required. This usually takes an average of about 10 seconds per module. It runs the tests, then reconnects to the host and dumps the results (see Figure 3).

Diagnostic Support Center And Host Computer — This is the hub of all remote diagnostic activity. The host system is responsible for providing the following:

1. Storage of current diagnostic tools.
2. Historical record-keeping of symptoms/solutions.
3. Automatic call-routing to the appropriate analyst.

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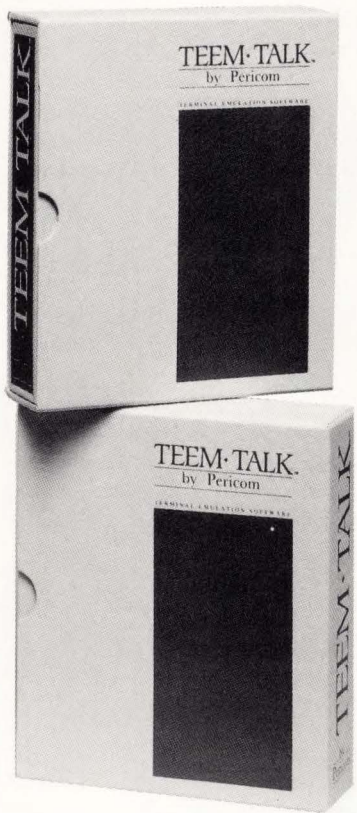

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So TEEM·TALK™ is a range of products like nothing else available – and to make it easy to use we've installed a simple copy protect routine and offer flexible purchase arrangements including site licences and special discounts for educational users.

TEEM·TALK™ is only available from Pericom INC.

After all, it makes a lot of sense to buy terminal emulation software from a company that knows something about emulating terminals. Right David? Phone us now on our direct hot-line for a TEEM·TALK™ brochure and register for your demonstration package.

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4. On-line documentation and help for the analyst.
5. Storage of graphic screens for downloading.
6. Interanalyst information exchanges and mail.
7. Connection into the depot parts-ordering system.
8. Subscriber billing and record-keeping activities.

The DSC system makes available a specific set of diagnostic tools, based on the initial information received from the RDU at connect time. The tools are targeted to the specific computer connected to the RDU. Employing these tools, the analyst at the DSC can extrapolate a solution based on information obtained from the diagnostic modules. All of the pertinent data is saved and archived and valid decision paths are entered into the knowledge base.

At the host, diagnostic procedures can be automated so that, if the analysts generally run the same test or sequence of tests to diagnose a specific symptom, these tests can be selected and executed automatically. AI software will be used in the near future to back up analysts in finding solutions and building decision trees. This area of the system will grow as system use grows.

The DSC computer system consists of a host computer; LAN network; file server (with backup and redundant file servers), which provides the analyst with the latest diagnostics and software; development workstations for research and development and system supervision; and analyst workstations (WS), which are the workhorses of the system.

Most of the problem-solving activities are performed at these workstations. They're completely menu-driven, with features such as windowing, multiple linkup to other WS screens and continuous status monitoring of all processes occurring during the diagnostic procedures and file transfers. Further, they can "echo" screen data between the DSC and RDU. The analyst also can display pertinent data about the remote site computer continuously on the bottom of the screen.

Connection between the support center and the remote site is via a toll-free WATS line activated by a function key on the RDU. The analyst at the center can switch between voice and data modes to talk to a site operator or to transmit data, respectively.

The major benefit the R_X LINK support system provides to the service vendor or self-maintainer is the timely access to an expert analyst familiar with a specific target machine or installation. The analyst's experience and knowledge, plus the use of diagnostic tools, documentation library and historical records, aid in directing the subscriber to the

Behind DEC's New Warranty Program

Last October, when DEC did away with its free, one-year, on-site warranty in favor of what it referred to as its new expanded warranty program, the accompanying price hike drew all the attention. But there could be a lot more here than just increasing profit margins.

True, prices increased an average six to nine percent for customers who choose the same level of warranty previously offered for free. Prices went up even more when this level of warranty is selected for add-on options: DEC announced an additional two percent price increase for options purchased separately.

But there are other items in the warranty restructuring that could have a long-term effect on the DEC-based service market. One of these is extremely important to the third-party maintenance (TPM) industry.

DEC announced its old one-year warranty policy less than two years ago. I believe it was an attempt to lock in service on new products and draw out the time it would take TPMs to compete for the service business.

In practice, however, it had the opposite effect. Typically, TPMs need a ramp-up time to become familiar with new systems: training, experience and parts inventory take time to acquire. DEC's one-year warranty policy allowed for this start-up time. It helped the competition! As the new products came out of warranty, the TPMs were capable and ready to bid against DEC's field service for the maintenance contract.

Now, with most customers forced to purchase service up-front, DEC has the upper hand. Here's how it works.

Under the old warranty program, say I have a site with a brand-new 6200 and three older VAXs. Up to now, I've had TPM service on the older systems and DEC's warranty on the new system. This situation was likely to last for the first year that I owned the new 6200 machine. Then, when it came off warranty, I'd put out a bid to DEC and my TPM for service.

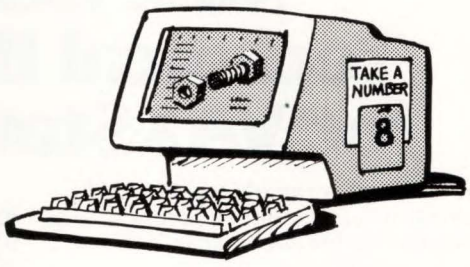
The same scenario under DEC's new warranty program looks like this. On installation of a new product line, I must make a service decision immediately. I ask my TPM to bid on the maintenance of the new equipment. But the TPM can't! I must turn to DEC, which now gains a foot in my service door. DEC's pitch is that it can service my whole account, new and old systems alike. This provides a single point of maintenance, no hassles with multiple vendors and no finger pointing. And, I can buy extended service for up to three years at a big savings. I'm tempted, aren't you?

Sure, the price increase is important to DEC, whose profit margins have been under pressure. But DEC could have accomplished the same end by increasing basic list prices across the board, while leaving the one-year warranty intact. It's possible that eliminating the one-year waiting period before customers shop for a service contract is a more important strategic move.

Three Things You Shouldn't Have To Share At The Office

Chair

Coffee Cup



Graphics Terminal

In the workplace you would never think of sharing your coffee mug or your chair. So why are you still trotting down the hall to find out if there is a terminal available for your mainframe graphics applications? With TGRAF and your desktop computer there's no need to share a terminal; you can have powerful graphics terminal emulation right at your desk, inexpensively.

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TGRAF will transform your desktop computer* into a power-packed Tektronix graphics terminal.** With TGRAF you won't have to leave your desk to run your host-based business, scientific, and CAD software. Plus, you'll have the additional benefits of a PC relative to a terminal: file transfer, hot-key between DOS and your host, simplified setup with local help files, and more.

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Grafpoint provides you with graphics terminal emulation software that communicates through RS-232 or Local Area Networks giving your desktop computer the flexibility to communicate over a serial line or a variety of LANs.

With TGRAF's comprehensive Tektronix graphics terminal emulation and Grafpoint's superior customer support service, you can forever put the terminal sharing blues behind you. Call Grafpoint for the name of your local distributor and order a no-risk 30-day evaluation copy.

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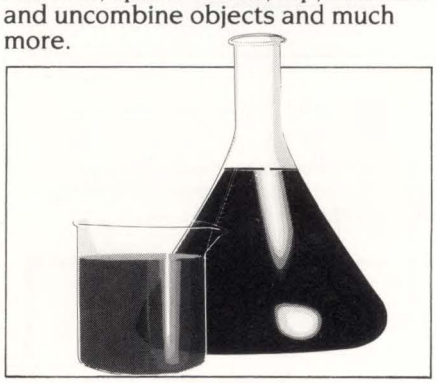
MASS communications

LATE BREAKING NEWS FROM MEC

MEC Releases Technical Illustrator for VAXStation 2000!

The most powerful object-oriented illustrator for the IBM PC is now available for the VAX*Station* 2000. Design teams working in the VAX/PC environment can use MASS-11 Draw to create sophisticated technical illustrations, edit and improve graphics prepared with spreadsheets and CAD programs and produce typeset-quality composite documents more efficiently than ever before.

MASS-11 Draw for the VAXStation offers the same powerful editing tools available on the PC version, including editable freehand drawing; paragraph text; interactive text editing, stretching and rotating; zoom and pan; symbols libraries; tracing features; spline curves; flip; combine and uncombine objects and much more.



Now VAXStations can produce sophisticated freehand drawings in 100 shades of black.

MASS-11 Draw can import and improve HPGL, Lotus.PIC, Macintosh.PICT, MDL metafiles, Tektronix 4010/4014, DXF and CGM files. It can output to Encapsulated PostScript, HPGL and formats compatible with page makeup and technical publishing systems, including Interleaf TPS.

MASS-11 Draw supports a wide variety of printers including HP Laserjets, PostScript, LNO3+, Talaris and QMS (QUIC), HP plotters, and QMS Smartwriters.

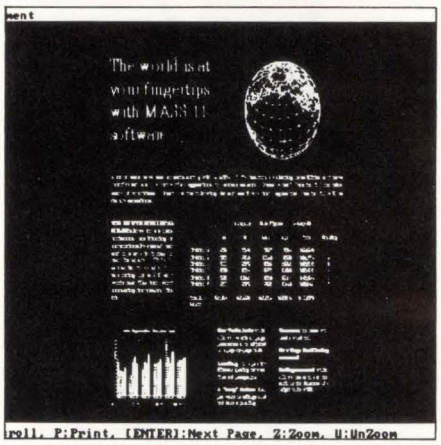
MASS-11 GP 5.0 Incorporates Tektronix Users into World of Corporate Electronic Publishing

The latest version of MEC's Graphics Processor for the VAX allows Tektronix users to include their files in a MASS-11 word processing document or print them directly on a wide variety of laser printers or HP plotters, including the 7447, 7470, 7475A, 7550, 7580, and 7586.

MASS-11 GP can also translate graphics formats from HPGL, Lotus.PIC, Macintosh.PICT, Molecular Design Limited metafiles, CGM and DXF.

Page Preview Heads List of Enhancements in MASS-11 WP Version 8.0

MASS-11 WP, the leading independent word processing software in the VAX/PC environment, is now an even more powerful tool for corporate electronic publishing.



You can see exactly what your page will look like before you print it, right on your PC screen.

Page Preview lets PC users see the full page of text and graphics integration on-screen, correct line and page endings with proportional spacing and correct point sizes. An entire document can be previewed without returning to the editor. To enhance hardware performance, VAX users will see the graphic depicted as a bounding box.

By referencing the graphics at print time, MASS-11 WP provides a *live link* to graphics files so that if the graphic is changed, it's changed in the document automatically. The *live link* also saves space on your system since the graphic is not stored multiple times in multiple documents and backups.

Other features for electronic publishing include horizontal and vertical rulers in inches or centimeters, total control over line spacing (leading), the ability to hold headings with the text that follows, document scaling, and enhanced macros.

And, as always, Version 8.0 of MASS-11 *will be released simultaneously for both the* VAX *and* PC, *ensuring compatibility between systems.*

GET THE REST OF THE STORY

For more in-depth information (including prices) on the latest MEC products, call **1-312-882-0111.** Or fill in the coupon and mail to:
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- ☐ MASS-11 GP 5.0 for the Vax
- ☐ MASS-11 WP 8.0 for the VAX or PC

Please send me more information about other MASS-11 products. My primary interest is:
- ☐ Corporate electronic publishing
- ☐ Office Automation
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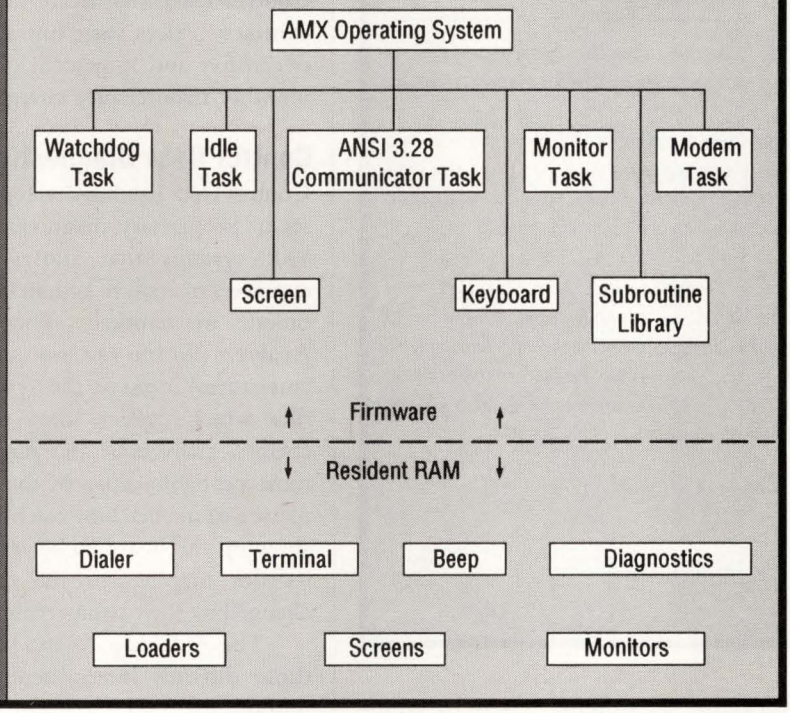
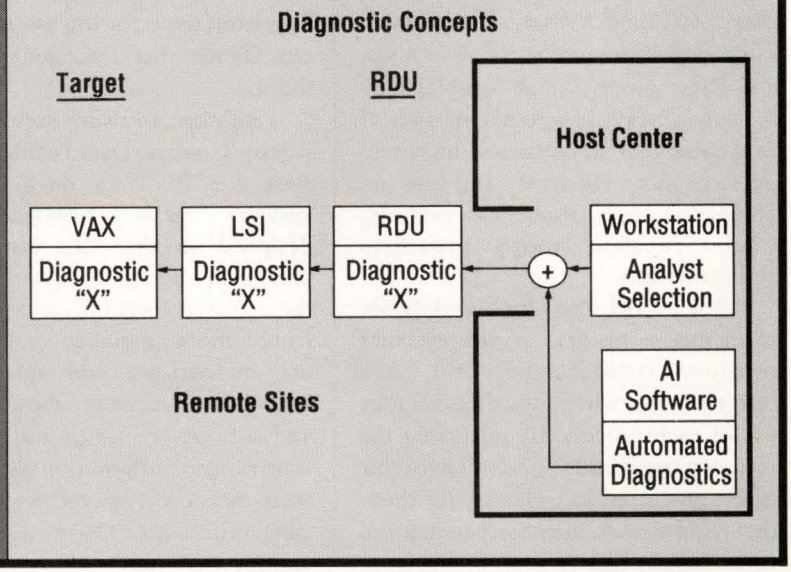
FIGURE 2.



The RDU concept.

FIGURE 3.



Diagnostic modules are downloaded to the RDU, LSI and VAX at the subscriber site. They reside in the host computer at the DSC. Communication to the modules is in standard fashion. The RDU diagnostic module polls for a status change and reports the event to the DSC workstation analyst.

source of the problem. The service is available around-the-clock, seven days a week.

The R_X LINK system is leased on a quarterly basis for $295 per month. There's also a usage (connect time) charge of $75 per hour. Usage is billed at half-hour increments for the first connection and fifteen-minute increments thereafter.

ProAct Service Series

The ProAct Service Series of software from Control Data Corporation (CDC) is another set of VAX system monitoring tools. This management and monitoring toolset provides the capability to detect a wide variety of events and conditions that might affect the performance and integrity of the target system. The ProAct Service Series provides notifications of out-of-limit conditions and can be programmed to take predefined actions in response to a specific occurrence or critical condition. These tools run on either a single VAX standalone system or on network/cluster configurations.

The ProAct 1000 provides early warning of hardware deterioration. If preset thresholds indicate out-of-limit conditions, the software triggers and executes programmed procedures specified for the event. Thresholds are programmable for site customization, as are the programmed action responses. Through its DECtalk interface, immediate feedback of system events is provided as they occur. DECnet data monitoring is another ProAct 1000 feature. It analyzes the received information and creates chronological records of system/network performance.

A unique feature of the ProAct software is its ability to warn a system manager of an attempt to breach system security as it occurs. Although other monitoring systems record and store this type of data for future retrieval, ProAct lets you know of the attempted access while it's in progress.

ProAct 2000 is a VMS system per-

Tool Tests UNIBUS And Q-bus DMA Backplane Wiring

The Buzz Grant card, a new product from Alpine Image Systems Inc., provides the technician with a plug-in tool for examining backplane slot wiring quickly for Direct Memory Access (DMA) compatibility.

This service tool is aimed at technicians and others familiar with Unibus and Q-bus systems who need to know how a slot is wired when adding a new peripheral device, troubleshooting or reconfiguring a system. By plugging this standalone test board into a backplane slot, you can ascertain instantly whether DMA devices will operate properly from the target location (slot).

The Buzz Grant card features on-board battery power (it works with system power turned off) and both visual and audible indicators for hands-free operation. An on-board self-test verifies proper operation of the card. The board is 11 x 4½ inches and comes with an antistatic jacket (for field use) and a user manual. A one-year limited warranty and money-back guarantee also are included in the $189 price. The product is available now.

For more information on the Buzz Grant card, contact:

Alpine Image Systems Inc.
Test Products Group
2518 Palmdale Ct.
Santa Clara, CA 95051
(408) 244-3474.

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formance monitoring tool. It contains many of the features of the ProAct 1000, plus it gathers statistical information on a networkwide basis. It also is capable of collecting averaged system performance data from each CPU at predetermined intervals.

Reports are generated on system use of memory, I/O and CPU resources. The data can be displayed in tabular form or as color graphic displays. This information can be used to track, compare and correlate information on system performance on either a local or network basis. Additionally, multiple systems or nodes can be grouped according to departments or special interests for reporting purposes.

ProAct 4000, the newest member of the family, is a dynamic system tuning tool designed for VAX/VMS versions 4.0 or later. This package monitors system performance continuously and attempts to improve it by adjusting systemwide parameters or specific processes.

The adjustments are made without affecting the running system by sampling performance, then changing SYSGEN and PROCESS parameters based on the samples. System sampling times vary based on mode requirements: Normal mode, which samples performance every 90 seconds; Worry mode, which samples performance every 30 seconds; and Panic mode, which samples performance every six seconds. As a result of the automatic adjustments, the system operates more efficiently and jobs are completed faster, using less memory, while running more processes simultaneously.

The ProAct 4000's built-in database maintains a history of the system's memory requirements and uses historical data when adjusting memory use of each process. By analyzing the memory needs and page-fault behavior of all processes and identifying those that require more memory pages, it can take unused pages away from memory-rich processes and transfer them to memory-poor processes. This decreases both soft and hard page faults, resulting in better overall system performance.

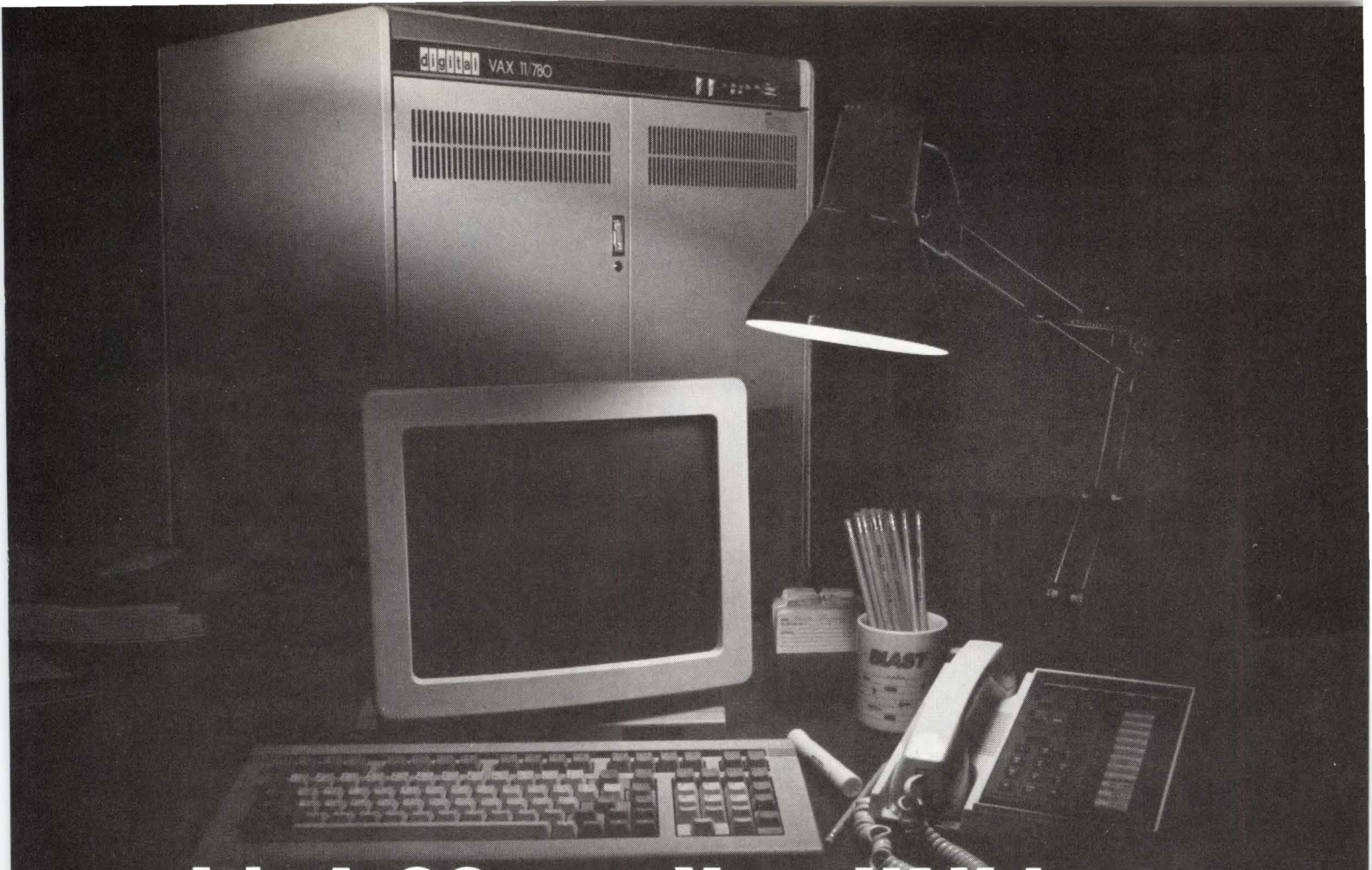
On the horizon is the ProAct 3000. This module is slated to be an environmental monitoring tool. All ProAct Service tools are available as options to Control Data's hardware maintenance contracts. Prices vary, but average between five and 15 percent of the basic monthly maintenance charge.

Control Data Diagnostic Tools

Control Data also has developed its own set of proprietary diagnostic tools for VAX systems that allows customer engineers to analyze system faults either on-site or remotely. The Autosnap Analyzer (for the VAX 8600 and 8650 architectures) looks at the "snap dump" file, which collects data on system crashes, analyzes it and pinpoints the most probable cause of the failure. A picture of the machine can be displayed showing the board to be replaced and its slot number, or the FRU to be changed by the customer engineer (CE).

The Autosnap Analyzer identifies those difficult intermittent problems without the need to recreate the failure or wait for a reoccurrence. The VAX's snap dump data file, created at the time of the failure, is captured and can be analyzed even after the problem has occurred. Autosnap also decodes information from the error log to identify system failures that don't generate a snap dump.

Another software service tool in use by Control Data is the Info Data Base for DEC, an on-line support system. This is a technical database designed so that CEs can look up previously addressed VAX problems and their proven solutions. It also contains troubleshooting guidelines, basic product information and specifications, historical information about hardware and software revisions and FCOs, installation/reconfiguration data and pictures, diagnostic data and error codes for DEC processors. Order numbers for various DEC publications, diagnostics and software also are included in the database.



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One simple, built-in scripting language lets you quickly create totally automated operations. Your VAX, PC or MAC manages each session, dialing out (and redialing remote computers), managing modems, logging on, executing commands, and transferring data according to your scripts. If you want to hook into your application, that's easy, too. And VT-100/220 emulation is included.

Running on both ends of the link, BLAST's unique "protected pipelining protocol" delivers fast, error-free data through noisy phone lines, satellite-routed calls or X.25 networks.

No add-on boards or extra hardware are needed, and any dial-up modem can be used, even the new, high-speed 9600 and 19.2 or V.32 modems.

Discover why Blast has been chosen by EXXON, the USDA, Bankers Trust, Blue Cross, H & R Block and others for connecting hundreds of remote sites, with one software package!

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Another tool introduced by Control Data is used exclusively to troubleshoot peripheral subsystems on Q-bus and UNIBUS systems. The Field Diagnostic Processor (FDP) is a portable LSI, self-contained DEC-based system. It can test, diagnose and verify repairs to peripheral units. The VAX system remains on-line while troubleshooting, and repair of the subsystems are performed off-line. The FDP also can act as a processor in determining intermittent failures between the user's processor and I/O unit.

Snap File Analyzer

TRW's Technical Training Center introduced its Snap File Analyzer (SFA) service tool a few months ago (see "TRW Tool Eases Examinations of ERRSNAP.LOG Data," November 1988, p. 24). The SFA is a menu-driven remote or on-site tool for decoding and analyzing the data contained in the error snap log file (ERRSNAP.LOG) of VAX 8600 and 8650 processors. It provides an analysis of what has occurred, and pinpoints the failing boards or FRUs.

The SFA includes a decoder that translates the error snap log into plain-English text and employs an AI module to provide tabular or graphical data on the probability of a given FRU causing the problem. TRW sells the SFA (priced at $2,600 per processor) to service vendors and self-maintainers.

Maxport

EMC Corporation, a supplier of disk subsystems to the VAX market, includes both remote and predictive diagnostic and monitoring tools in its new Maxport series of high-capacity magnetic disk subsystems (see "Maxport Disk Subsystem Stores 3.3 GB Per Port," p. 30).

Using an EMC proprietary remote service port, the installed Remote Access Maintenance Program (RAMP) permits the company's technicians to dial in for troubleshooting. Through RAMP, the problem is diagnosed down to the component level, and the appropriate FRU can be dispatched. RAMP also provides continued factory support, if needed, to CEs on-site.

The Maxport series also contains an on-line prediction panel that runs diagnostics continuously to monitor subsystem activity. These programs are capable of detecting errors down to the head, track and cylinder levels. Automatic formatting is an additional function supplied with the prediction panel.

Don't Forget DEC

DEC has been busy enhancing its remote and predictive maintenance capabilities. Improved on-line monitoring tools to spot potential problem areas are embedded into new products. DEC's centralized customer support centers have a portfolio of remote service tools, including hardware and system diagnostics, AI-based and expert system software, performance monitoring tools and database information systems. These

DEC's centralized customer support centers have a portfolio of remote service tools, including hardware and system diagnostics . . .

technologies, plus experienced analysts at the centers, combine to identify, analyze and resolve potential problems before they become system-down calls.

Three of DEC's latest service tools are VAXsimPlus, SPEAR and STARS. The VAXsystem Integrity Monitor (VAXsim) is embedded in the customer's system and provides an early warning of potential trouble before an actual failure occurs. It runs continuously and can monitor a single system, VAXcluster or remote network node from a central location.

It compares the number of errors on a device against a preprogrammed threshold. When this threshold is exceeded, it notifies the operator via VMS Mail or, using a color monitor, provides a constant graphic indication of the system's status, changing color when a problem is detected.

Once a warning has occurred, the VAXsim data is transmitted to DEC's customer support center. An AI knowledge-based system, called SPEAR, is employed to analyze the out-of-tolerance information and to suggest solutions.

Using the information gathered by VAXsimPlus, SPEAR provides a conclusion to be used by field service to correct the problem. The analysis part of

Companies Mentioned In This Article

Control Data Corp.
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Minneapolis, MN 55425
(612) 851-4131
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Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
(508) 897-5111
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Hopkinton, MA 01748
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It's not an illusion. Perceptics Corporation, the leader in VAX/VMS optical storage subsystems, has the solution to your data storage needs. The Perceptics LaserSystem and LaserStar subsystems offer true magnetic disk emulation, and can give you hundreds of gigabytes of on-line storage from one subsystem.

The reality is that no one in the industry can give you a more proven product with these features and this much storage capacity. Perceptics has over 500 optical subsystems in use worldwide and is a leader in optical disk jukebox subsystems. The Perceptics subsystems allow the optical storage device to be used as a "plug and play" peripheral.

LaserSystem is a complete, integrated, ready-to-use optical disk subsystem, including write-once read-many (WORM) optical disk drive, SCSI host adapter and industry standard LaserWare optical disk software. Media, installation, and on-site maintenance services are also available.

LaserSystem stores up to 2.4 gigabytes of data on a removable cartridge and features true magnetic disk drive emulation, so existing software and applications require no modification to access the massive storage capacity of optical disks.

LaserStar extends the emulation features of LaserSystem to the optical disk jukebox, allowing on-line access of up to 338 gigabytes of data, using the same VAX/VMS transparent file system as LaserSystem.

Applications include:

- CAD/CAM Storage and Retrieval
- Records Management
- Medical Imaging
- Seismological Data Storage
- Large On-Line Database
- Satellite Image Storage

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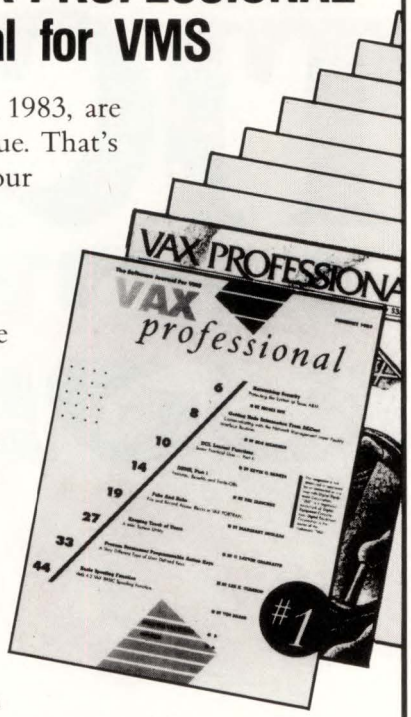

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VAXsimPLUS and SPEAR team up to provide an event file, analysis of the data collected, a suspect list of replacable units and a suggested solution. Through a series of color-coded block diagrams shown on a CRT or VMS mail, these service tools provide a method to focus on the problem down to the component level.

Another remote service tool from DEC is the Storage & Retrieval System (STARS). STARS is an informational database that uses an English-like (not keyword) inquiry method for access. It contains approximately 60,000 technical articles with the information divided by product type.

Articles can be looked up by inquiry, then by subinquiry. DEC's customers have access to STARS via a toll-free dial-in number. It's available around-the-clock. STARS, like VAXsimPlus and SPEAR, is supplied free of charge to all of DEC's system warranty or standard service contract customers.

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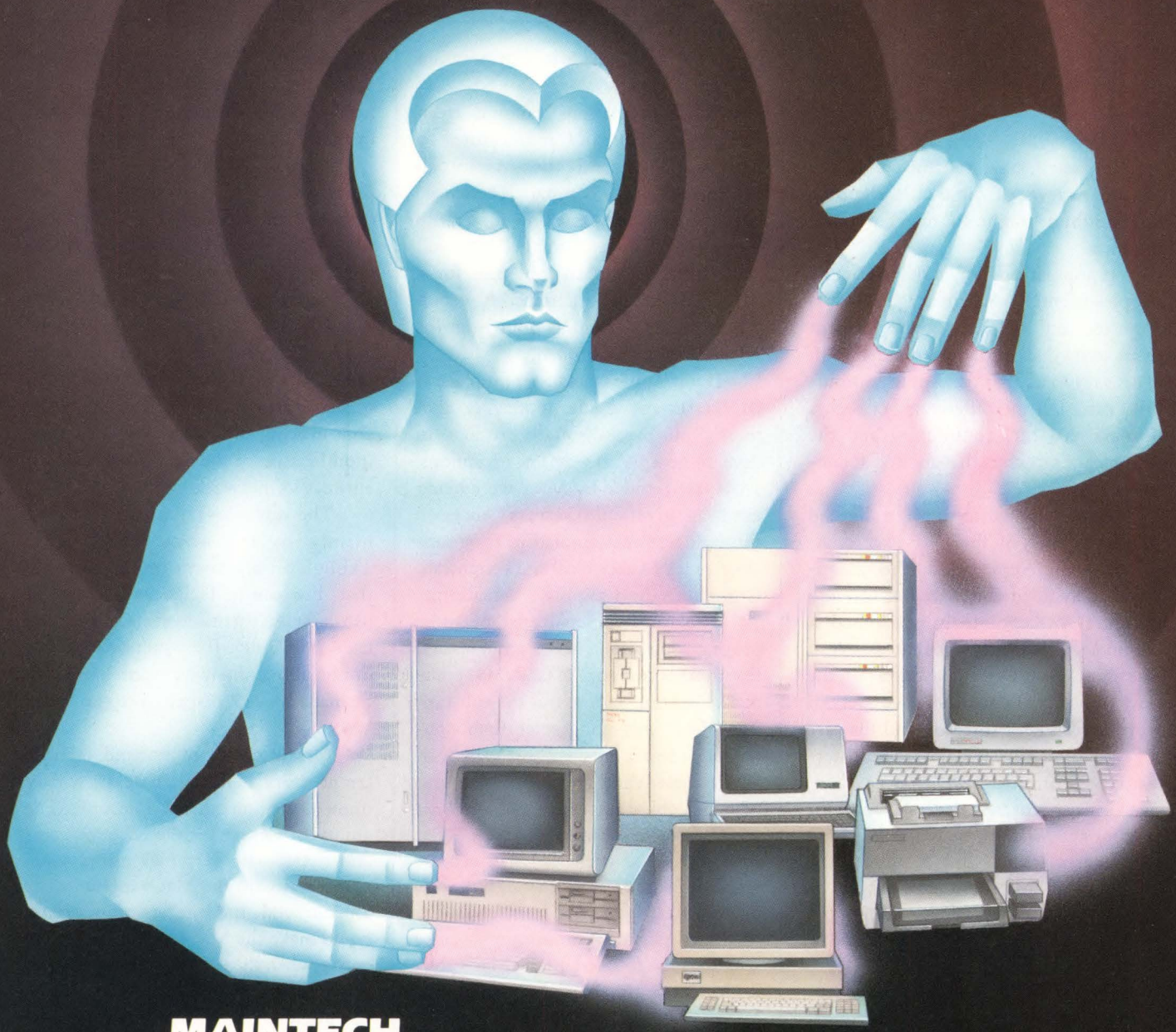

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CIRCLE 120 ON READER CARD

THE MAC CONNECTION

Ashley D. Grayson and Eric Baldwin

Apple-DEC At DEXPO West

We went to DEXPO West '88 and, like the blind men of Hindustan, have returned with individual views of the Apple elephant that might or might not match popular opinion.

If popular opinion is shaped by the Apple-oriented magazines, DEXPO was deserted and the few people present were crowded into the Apple booth. This says to us that the Apple community can't tell the difference between a professional MIS community and the throngs of browsers that abound at consumer shows.

Apple seems to have a limited understanding of the VAX user community. The Apple booth, though appropriately filled with Mac IIxs tied into a central VAX, pointedly was aimed at an end-user community that wasn't at the show. Apple's emphasis was on the joys of electronic mail, the wonders of commercial Mac software and the ease of moving icons, as opposed to entering VMS commands.

This approach is understandable for a company whose experience has been end-user-oriented. But to ignore the necessity of VMS commands in front of an audience of VMS experts connotes a serious conceptual flaw in Apple's positioning strategy.

Since the announcement of the Apple/DEC cooperative agreement, rumors have abounded as to what that agreement will produce. Apple has hinted from the start that a breakthrough connectivity product is under development, but no details have been released. Although the recent Mac Expo in Boston was held concurrently with an Apple/DEC developers' conference, no Apple/DEC news made its way between the two events.

Still, speculations ranging from shared protocols and architectures to merging VMS and the Macintosh System and Finder continue. There have been demands for some time for a more innovative front end to the VAX, and DEC users have been lobbying for a Mac-like graphic interface. A group within DECUS even is lobbying for what it calls a Vaxintosh.

But if Apple's lackluster presence at DEXPO is any guide, it may be that there's no breakthrough product in development. With very few exceptions, VAXs front-ended by Macs were being used as giant file servers, accessed through terminal emulation programs like Apple's MacTerminal and Peripherals, Computers And Supply's VersaTerm.

The most sophisticated of these programs displayed ReGIS graphics and featured automatic ICON/VMS command line translation, but the substantive effect was no greater than connecting a smart terminal to a VAX host. While the advantages to the Mac user of being able to access VAX networks are obvious, the question arises: What does the VAX user do that can be enhanced significantly through the addition of a Mac at the front end?

Apple's most common answer to that question is based on the Mac's ability to merge a variety of informational formats into a single document for presentation purposes. For a business that requires complex printed documents drawn from a wide variety of data created or stored on the VAX, a Mac running Pacer's pcLink or White Pine's Reggie, capable of accessing VMS files and capturing ReGIS graphics, can be a solution.

But this isn't the only solution, and in some specialized cases it's not even the best solution. The Mac screen, for example, doesn't have the high resolution necessary to display real CAD/CAM output.

Odesta's Helix VMX for the Mac proposed another answer: the Mac as a development engine for VAX applications. This seemed to excite the Apple personnel more than any other third-party offering. Helix VMX is a database that allows the user to write applications on the Mac and run them unmodified under VMS on the VAX, using the VAX's greater sorting and processing power and making the data and real-time modification of the data available to an entire VAX network.

The advantage here still accrues mainly to the Mac-oriented user. Though an argument might be made that, because of Helix VMX's ease of use, it facilitates the creation of limited-use and quick-fix applications, it's doubtful that many Mac purchases will be made by VAX managers to run Helix VMX.

Oracle, on the other hand, is a different story. The database is widely implemented on other architectures. The ability of Oracle for the Mac to access and manipulate data files under VMS, combined with the Mac's usefulness as a front end and presentation driver, could make the Mac an attractive alternative when the next personal computer purchase is considered. But in the end, the purchase of a Mac for a VAX network must be considered on the basis of the Mac's utility separate from the network.

While Mac users now can attach to VAX networks, joining their VAXmate and PC brethren, and while VAX networks can use the Mac's presentational strengths as a desktop publishing environment, the greatest benefits of the

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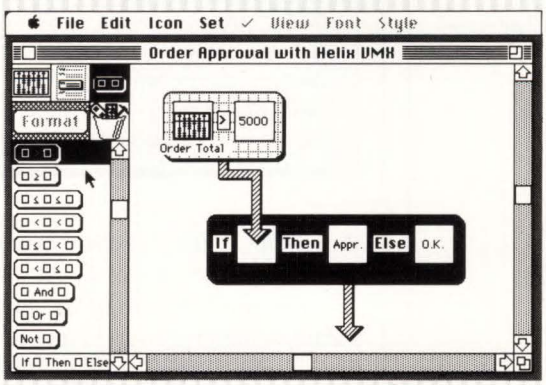

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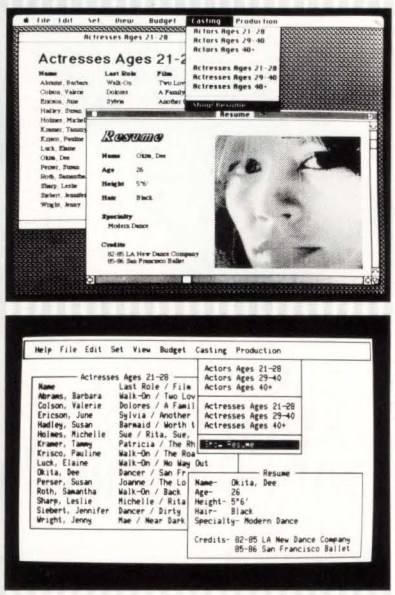

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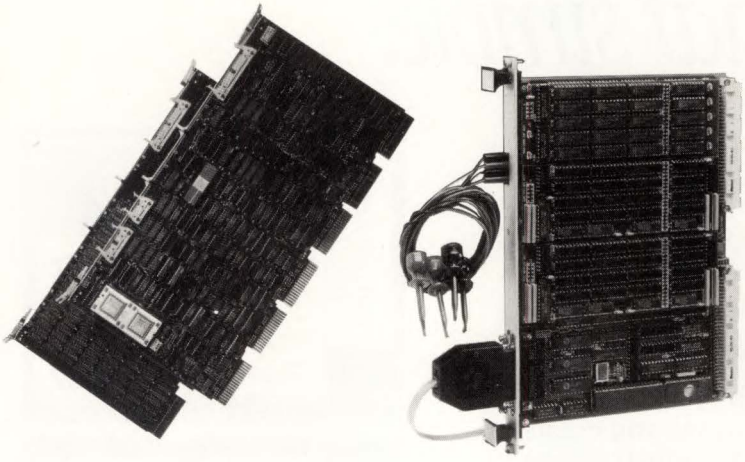

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Apple/DEC "deal" probably lie in the arena of public relations.

Or so it seems to us. Is Apple offering something important to the DEC community that we missed? Write and tell us what you think. We'll report your responses in the Letters column.

—Ashley D. Grayson is president of ADG, a high-technology consulting company in San Pedro, California. Eric Baldwin is a freelance writer specializing in computer technology.

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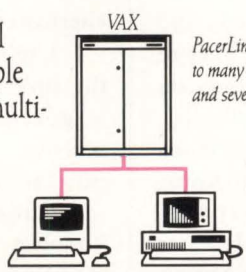
And PacerLink makes it easier for all micro users to interact with the VAX. Mac users see their icon-based, mouse-driven interface, while PC users get a familiar, menu-driven structure. Everyone can begin working without additional training.



PacerLink connects Macs and IBM PCs (and compatibles) to many hosts, including DEC VAX (VMS and ULTRIX) and several UNIX systems.

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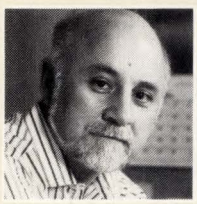
from the lab



Cluster Chronicles: What Price Performance?

Dave Mallery

Currently, Professional Press is running a six-node LAVc. We have about 150 ports on our terminal service network, stretching from Lexington, Massachusetts, through Spring House, Pennsylvania, across to Pasadena, California, and up to San Bruno. The machines serve up an aggregate of about 5 GB, with another gigabyte coming on-line every six months or so.

On any afternoon, you'll find more than 75 interactive users on-line. They're doing everything from circulation data entry to word processing in editorial, with a wide variety of other applications in between. Circulation runs two shifts, six days per week. ARIS users are on literally 24 hours per day, seven days per week, coming in on lines in Spring House, Pasadena, San Bruno and, soon, Lexington.

The entire cluster tends to stay up. We can bring a node off-line for service or swapping without coming down. Even sporadic hardware problems tend to isolate a single node and leave the cluster up.

Frankly, cluster performance leaves much to be desired. Sometimes it's acceptable, mostly it's just on the bad side of slow. It's seldom terrible, however. Whenever it's terrible, it means that some over-zealous batch processor thought he or she could "slip one in."

This is infuriating because we started this adventure a year ago with a single .75 mips 750, and today we are running an aggregate of about 6 mips. The performance on the whole, however, is so lackluster that I'm often driven to my Digital Price List for alternatives.

Unfortunately, the alternatives are staggeringly expensive, both in price and space.

Currently, our "mipless wonder," the 8250 (never have so many paid so much for so little!), is dual-ported with our old faithful 750. The best summation of our LAVc experience to date is that in an LAVc, a node had better be a file server or a satellite, but not both. Whenever we start to run both serving and multiple users on a node, the serving kills the response time for the interactive users all over the cluster.

We found a special worst-case example with a software package we run that sequentially does huge, multisector reads through a file. If this job is run on a satellite, the serving node's interrupt stack utilization rises to the 70 percent arena, leaving no processor power for anything. Interestingly, the server isn't really processing interrupts, rather, the

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Companies Mentioned In This Article

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MSCP file-serving code is executing on that stack. If you run that job on the same machine with the disk, the problem goes away.

So, managing a LAVc is a full-time juggling act. You have to localize batch jobs with the data while you keep interactive users out on diskless satellites. There's a definite upper boundary of performance that you approach. As long as we localize our batch processing with the files involved, our Ethernet use isn't unreasonable. We should be able to support several more satellite nodes without resorting to alternate methods.

The Price List

All of this leads to the CI cluster argument and the price list. Here's where the big price bite happens. A simple 4-mips 6210 with a CI interface and an HSC will set you back a cool $250,000 — with no disks! If you've been shopping recently, you know you can buy about 20 mips of 3xxx VAXs for the same price. That's a lot to pay for some I/O bandwidth!

The other alternatives that appear include 3xxx servers. The tried-and-true 3500 server package with a single RA70 lists at about $52,000. This box includes a KDA50, so it could replace the 750 as the dual-port partner of the 8250 in the cluster and provide much greater mips performance for batch work.

Coming in at a much smaller price is the new 3300 server configuration. This box, with the new RF30 integrated disk, can have a KDA50 added (not according to the documentation, but it does have a Q-bus!). This should fall in the vicinity of $30,000. The CPU of the new 33/34xx series seems to have been downgraded, at least through the omission of cache memory if not also in clock speed. So you must balance the desired CPU speed against the $20,000, enough for another MicroVAX II satellite or three nice workstations.

I mention the workstations because the best way to get some performance at Professional Press is to sneak into someone's workstation via one of the several back doors (especially if the person is absent). The four back doors that work here are LAT, Xyplex, Mobius and, when all else fails, the serial port. Something tells me that these back doors are going to slam shut on us at some point in VMS version 5.X.

The summary of our cluster Odyssey to date is that the LAVc allows you to keep swimming but really is a bit of a boat anchor. It provides capacity for a large number of users and acres of disks, but it suffers greatly from the burden of squeezing all that through such a thin (literally) wire. It requires lots of load balancing and is adequate, at best.

If I had my money back, no editorial mission and a clean slate, I'd seriously consider a single, large 62xx engine. Unfortunately, money doesn't come in huge lumps, and cumulative growth is the only available path. What we need is a wizard.

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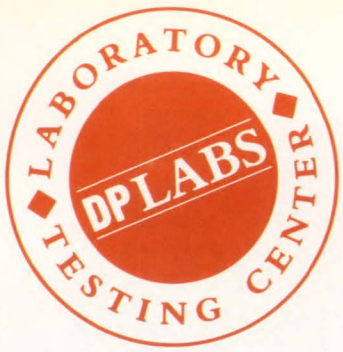

from the lab

NBS Southern's 3840 Laser Printer

David B. Miller

The NBS Southern 3840 from NBS Southern Inc. of Largo, Florida, is a 40-page-per-minute laser printer with a resolution of 240 x 240 dpi. Our test model had the 300 x 300 dpi option.

Two bit maps allow one page to be loaded while another page is printing. Because it's a page printer, data for an entire page must be loaded before printing can take place.

A single forms overlay buffer can store forms data, allowing the printer to integrate the forms data with text sent from the host.

Two 250-sheet cassette trays are standard. Our model sported the optional high-capacity hopper, which holds 1,500 sheets. The optional face-down paper stacker also was included.

The 3840 is 47 inches high, 30 inches deep and 40 inches wide, and it weighs 430 pounds. As with other printers of this size, you need plenty of room to allow the front covers to open to do general maintenance and to pull out the paper feeder in the event of a paper jam.

Operation is simple. Toner and paper are easy to load. A control panel with a 40-character display is used to set up operating parameters. Modifiable parameters include top, bottom and side margins, number of copies, font style, type of interface and paper handling options. Default parameters as well as custom operating configurations can be saved and loaded to and from standard 5¼-inch floppy disks.

A disk drive is housed behind the front panel. NBS supplies a set of disks including a system disk with default parameter settings, a few fonts and diagnostics. Other disks in the set contain more fonts. Operating configurations can be downloaded from the host, as well. A copy of our configuration settings is shown in Figure 1.

Other than replacing expendables, minimal maintenance is required. Operator maintenance is limited to cleaning and inspecting the paper path, the fade lamp and filters, and the charger wire, transfer wire and detach wire. NBS recommends maintenance by service personnel every 500,000 pages.

A 50-pin Winchester coupler connects the printer to a host. We placed the printer one floor below our VAXcluster. Rather than use a long-line option, we

FIGURE 1.

```
#1 - PAPER INPUT (upper or lower cassette) ..... LOWER
#2 - UNITS (in., mm., pel.) ..... in
#3 - ESCAPE CODE (decimal) ..... 27
#4 - ESCAPE (enabled or disabled) ..... ENABLED
#5 - PRINT UNUSED CONTROL CODES AS SPACE (yes or no) . NO
#6 - DELETE UNUSED CONTROL CODES? (yes or no) ..... NO
#7 - INTERFACE (7 or 8 bits) ..... 7
#8 - PAPER INSTRUCTION (active or inactive) ..... ACTIVE
#9 - CHANNEL 1 CMD TO (channel 1 or top of page) ..... TOP OF PAGE
#10 - MANUAL FORMFEED (channel 1 or top of page) ..... TOP OF PAGE
#11 - WRAP AROUND or TRUNCATE LINES ..... TRUNCATE
#12 - LINE COUNTER RESET (enable or disable) ..... DISABLE
MARGINS
LEFT MARGIN ..... 0.40 in
RIGHT MARGIN ..... 0.16 in
TOP MARGIN ..... 0.40 in
BOTTOM MARGIN ..... 0.16 in
FONT SELECTED ..... 3842
NUMBER OF COPIES ..... 1
RESOLUTION ..... 300 DPI
FIRMWARE REVISION LEVEL ..... 50611506-003
DISK DIRECTORY
AUTO  COM  153  FNT  DEFAULT  PAR  MICROCOD  BIN  158  FNT
163   FNT  3165 FNT  3146     FNT  3154      FNT  3156 FNT
3157  FNT  3160 FNT  3162     FNT  3286      FNT  3294 FNT
3296  FNT  3300 FNT  3302     FNT  3841      FNT  3842 FNT
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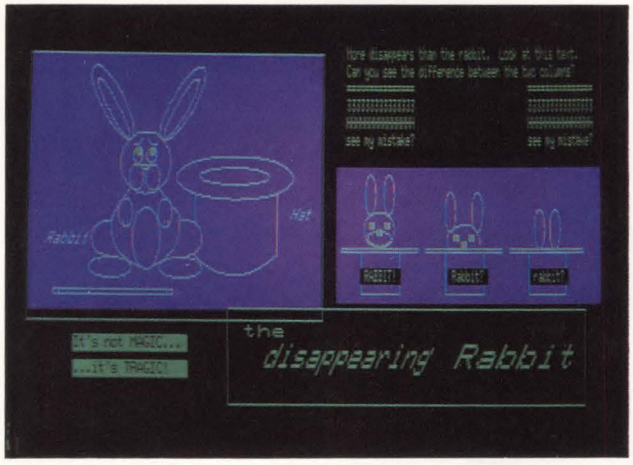
This hardcopy report displays the 3840's parameters that can be changed from the front control panel. The changeable parameters include everything above the line displaying the resolution factor.

The Disappearing Rabbit. It's Not Magic. It's Tragic.



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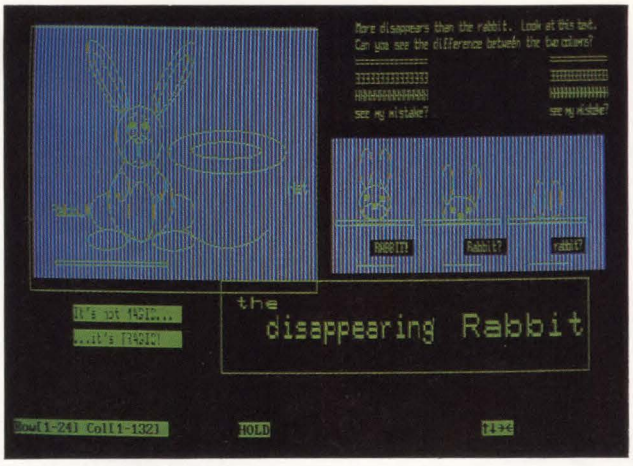

▲ SmarTerm® 240 v. 2.0b

Stop Pixel Dropout

The disappearing rabbit trick is only enchanting if you're a magician. If your're a person who depends on consistent and accurate performance from your VT Emulator, it could spell tragedy.

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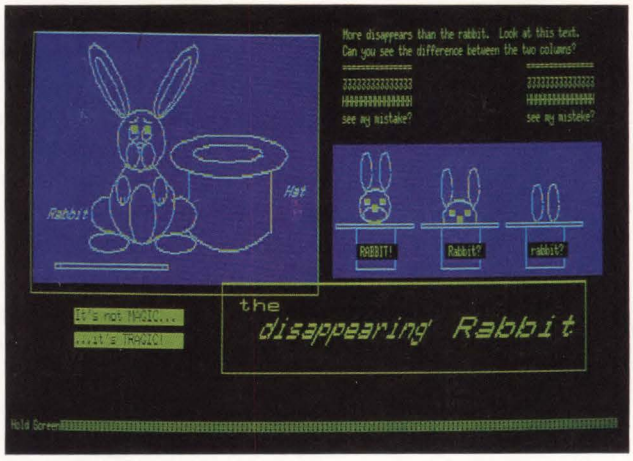

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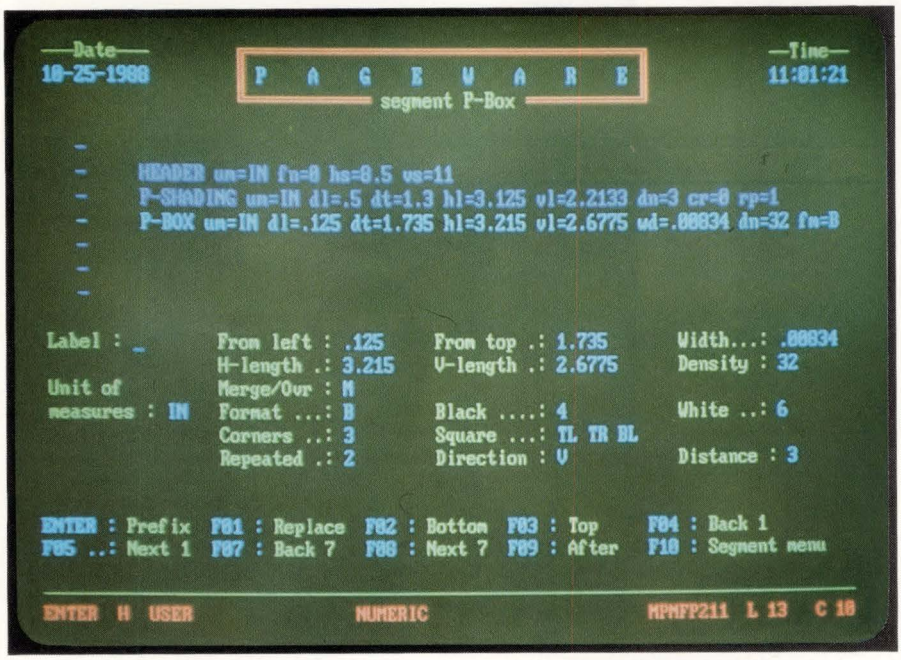
CIRCLE 181 ON READER CARD



Screen 1: This Pageware screen highlights the definition of a segment box, a part of a form that can be overlaid onto text coming from your host.

NBS Southern 3840 Laser Printer

PLATFORMS: A variety of computer systems, including VAX

PRICE: $39,950

NBS SOUTHERN INC.

HEADQUARTERS:
11451 S. Belcher Rd.
Largo, FL 34643
(800) 327-5602

FOUNDED: 1975

PRODUCT LINE: Non-impact printing systems

OWNERSHIP: Public. A subsidiary of National Business Systems Inc.

CIRCLE 447 ON READER CARD

hung the printer off our Ethernet using a Xyplex Network Printer Controller.

The Xyplex unit provides two parallel printer ports, which are Centronics- and Dataproducts-compatible, and four RS232 serial ports. It lets you put terminals, printers and other devices wherever your Ethernet cable can go.

Getting Into Form

The printer's speed is impressive. But it can do much more if you have an XT- or AT-compatible microcomputer with at least a 20-MB hard drive, 640 KB of RAM and an empty backplane slot.

Optional forms definition software, called Pageware, can be loaded onto the PC's hard drive. In addition to the forms software, Pageware includes a driver that resides in the PC's memory. It detects a string embedded in the host data that triggers the loading of a form.

NBS supplies a board that uses an empty slot in the PC to handle the data coming from the host and to integrate it with the forms you create with Pageware. It's important not only to have the empty slot, but also that no other board uses interrupts 3 and 4 on the PC's bus, because Pageware needs them to operate properly. Because two cable connections are required, you'll also need two openings in the back of your PC's case.

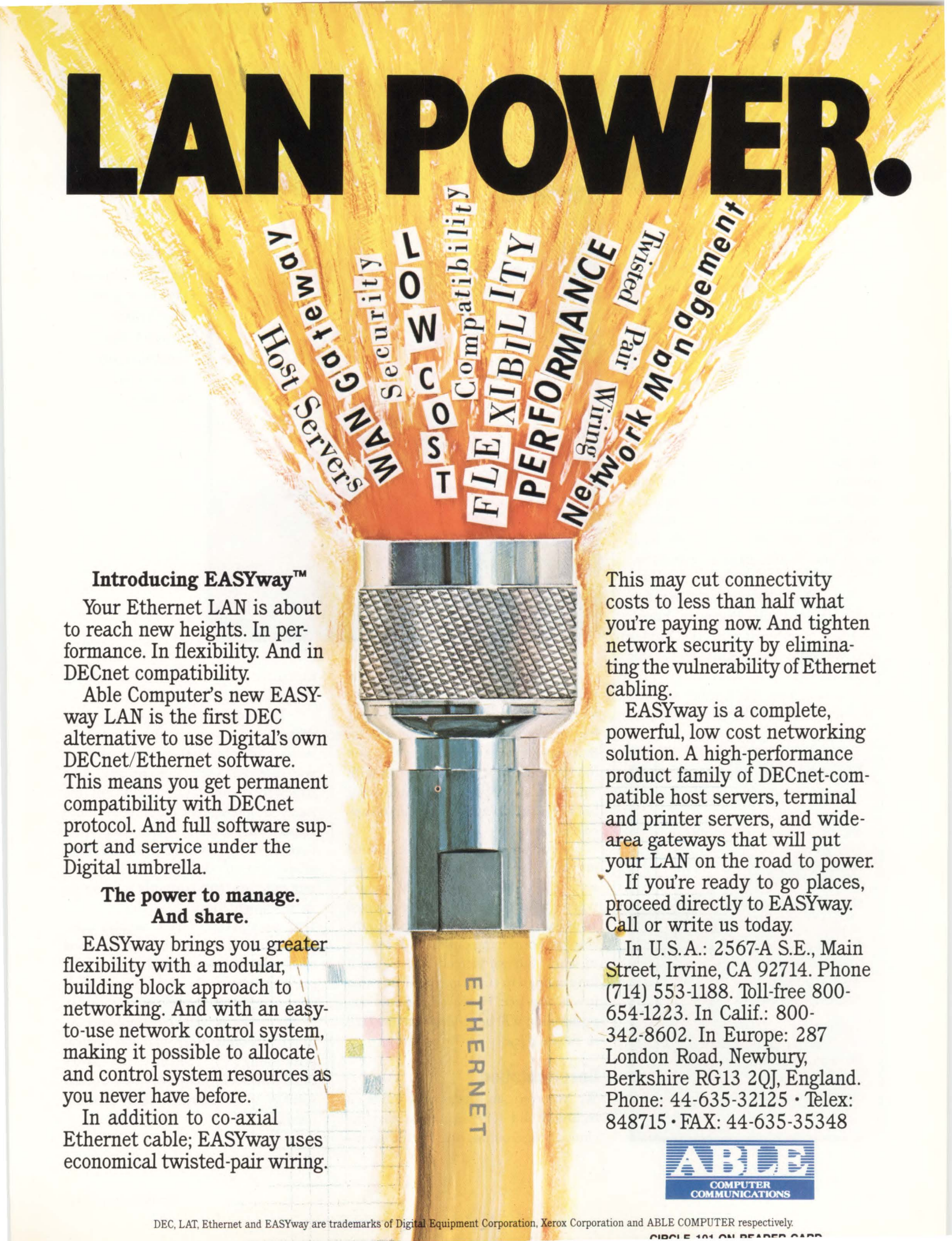
With Pageware, you create pieces of forms, called segments. In any segment, you can define boxes, draw lines, control shading, import graphics and so on. You control line width, figure size, figure placement and whether the contents should be repeated and in what direction. A Pageware screen that defines a segment is shown in Screen 1.

Segments are combined, rotated and positioned to form logical pages. One page or several pages are combined to create a print job. Job definitions are saved to your PC's hard disk for later use. In addition to the form's image, other information, such as margins, orientation and what paper tray to use, is included.

To use the form as defined by a print job, host data is preceded with a predefined initial escape sequence. When the escape string is detected by the PC-resident PGWRDRVR.EXE driver, the board triggers Pageware to load the form from the PC's hard disk into the printer's overlay buffer and integrate the form with the host's data.

The Pageware software comes on 16 floppy disks. In addition to the Pageware driver, the floppies contain software to control job composition, segment creation and management, pattern definition and editing, environment definition and additional fonts not found on the disks sent with the printer. In-

LAN POWER.



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COMPUTER
COMMUNICATIONS

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CIRCLE 101 ON READER CARD

stallation requires running a program provided on each floppy.

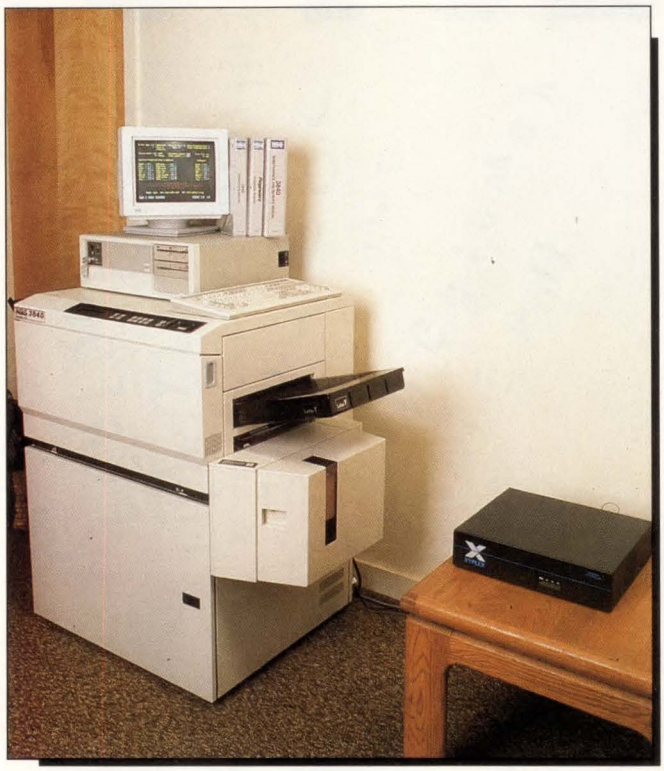
Although you can create and manipulate segments with Pageware, any graphic image you want to include in a form must be generated by another software package. Pageware supports Publisher's Paintbrush from Z-Soft Corporation. You create and modify all images with the graphics software and store them on the PC's hard disk before using the images with Pageware.

We initially had trouble printing through the Pageware board. It turned out that the Xyplex box caused the problem. Characters weren't being held long enough when data strobe was high, causing the printer to lose characters and make up the loss by duplicating characters. Xyplex plans to incorporate a fix in the next revision of its firmware.

Jerry Penhollow of NBS Southern, who designed the Pageware board, modified it to work with the Xyplex box. We could print regular text at this point.

Getting past that hurdle, we later ran into a roadblock when trying to create forms with Pageware. A new Pageware board did the trick. We weren't sure whether the old board was bad from the start or whether the fix that made it work with the Xyplex box interfered with its ability to work with Pageware. In any case, we could print both regular text and forms with no apparent problems.

Another problem we encountered involved the absolute positioning of host text. The 3840 acts like a line printer when host data is sent to it. We received an updated system disk that included the absolute positioning capability. It seemed to work, but we weren't able to test it long enough to confirm confidently that it was bug-free. However, absolute text positioning will be refined and included in future releases of the product.



We used an AST Premium/286 to run Pageware on the NBS Southern 3840 laser printer. The Xyplex Network Printer Controller sits on the table to the right.

Documentation

We received an operator's guide, a technical and service manual that included programming and interfacing information, and a manual describing Pageware.

The programming information was sparse, and some of the commands weren't available in the firmware release we received with our printer. The Pageware manual was good, but the many sample screens might make more sense if they contained live data rather than fields filled with Xs, Ds and other characters to denote character and numeric data. NBS currently is updating its documentation.

THE 3840'S SPEED, forms overlay capability and large number of standard fonts might be all you need to meet your printing demands. Combined with Pageware, it can satisfy your complex forms needs, as well. The implementation of absolute horizontal and vertical positioning will enhance the 3840's capabilities and help provide a robust solution to your large-volume printing needs.

Companies Mentioned In This Article

AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333
CIRCLE 449 ON READER CARD

Xyplex Inc.
100 Domino Dr.
Concord, MA 01742
(508) 371-1400
CIRCLE 450 ON READER CARD

Z-Soft Corp.
450 Franklin Rd., Ste. 100
Marietta, GA 30067
(404) 428-0008
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MDBS III®

– VS –

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OPERATION: Embedded SQL fetch program—"SELECT* into empno, ename, job, mgr, hiredate, sal, comm, deptno"

HARDWARE: Standard IBM AT with 640 K RAM.

No. of Records	ORACLE	MDBS III
1,000	*	16.43 sec.
2,000	*	32.68 sec.
4,000	*	65.31 sec.
10,000	*	165.71 sec.

* Although ORACLE's license agreement prohibits us from disclosing actual benchmark timings, we *can* say that the phrase *"over 10 times faster"* was heard many times in and around the **mdbs** testing center that day.

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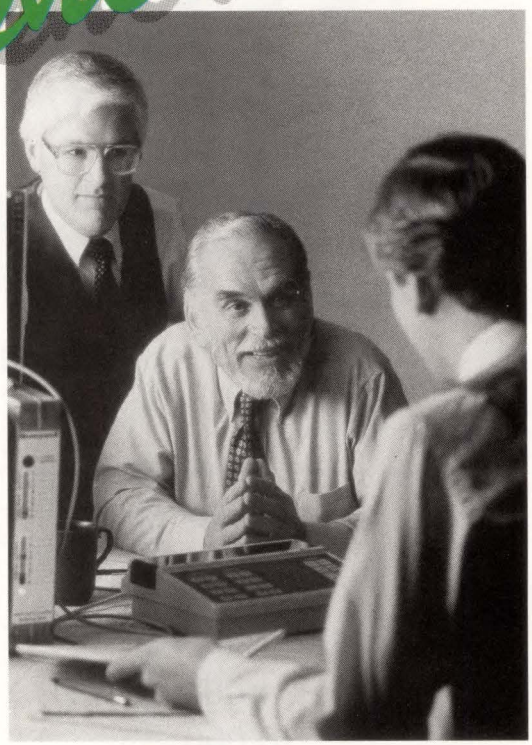

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These one-day, seminar/displays are so popular because they give you just what you need to know without wasting your time or money. You don't travel, there's no admission fee, the seminars and table-top displays from major manufacturers are all targeted to your interests (no searching through aisles), and the atmosphere is informative and hands-on, but congenial, with refreshments served. In a few hours you'll have the latest story on the newest and best in disk and tape drives, controllers, terminals, printers, test equipment, etc.

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CIRCLE 102 ON READER CARD

Access Technology's 20/20

Evan Birkhead "We're going to connect to the world" is the philosophy that's propelled 20/20, Access Technology Inc.'s ubiquitous VAX spreadsheet, into the mainstream. When our Lab last tuned in, Access of South Natick, Massachusetts, had released a 20/20 ALL-IN-1 interface and an add-on module called the Database Connection, a read-only facility that tapped into VAX Rdb, DBMS and RMS.

Since that time, 20/20 has perfected its ALL-IN-1 tools, released a feature-rich version 2.3 and added to the list of databases readable through the Database Connection.

The newly accessible databases are DEC's DATATRIEVE, Cognos' PowerHouse, Relational Technology's Ingres, Oracle Corporation's Oracle and Informix Software's Informix.

Additionally, V2.3 provides:

1. A WP Connection that imports files from WPS-Plus, Mass-11, WordPerfect and WordMarc.
2. READ/WRITE with all types of Lotus 1-2-3 files, called from the 20/20 command line.
3. READ/WRITE of Microsoft PC Excel data files.
4. An Audit function that charts the contents of cells, making errors in formulas and macros easier to spot.
5. Stronger Import/Export (now with DIF) and Querying functions.
6. An additional Graphics function for scatter plotting.
7. More and faster ways to move about the worksheet. For example, PF2 is the Home key, returning you to Cell A0. PF3 is the End key, which goes to the bottom right-hand corner of the spreadsheet. Hitting PF1 twice and then an Arrow key takes you to the end of a row or column.

Using 20/20

The basic premise of 20/20 is to set up tailored spreadsheets by entering Labels, Numbers or Formulas into cells. A cell is the unit at the intersection of a row and a column on the spreadsheet.

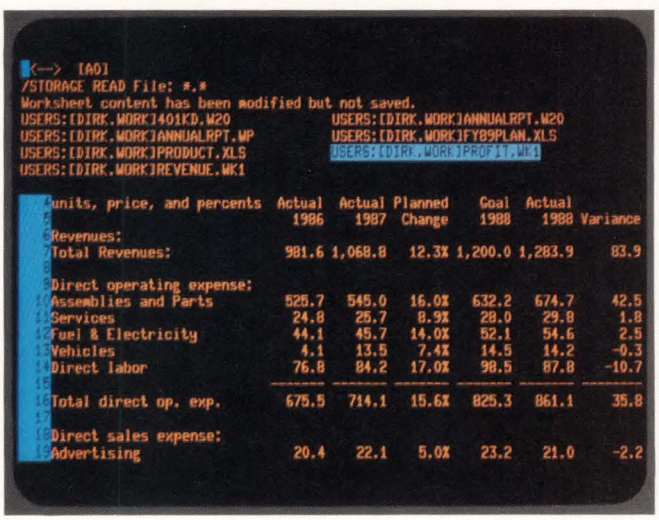
Cells can be redesigned to any size on the chart using the menu commands. You can move from cell to cell using Arrow keys, the PF1 (Page) key or the ways described above. There is a variety of rules specified in FORMATs for each type of information.

A short explanation of each command appears when that command is highlighted, and additional information is available by hitting the Help or List (Select) keys at the Ready prompt.

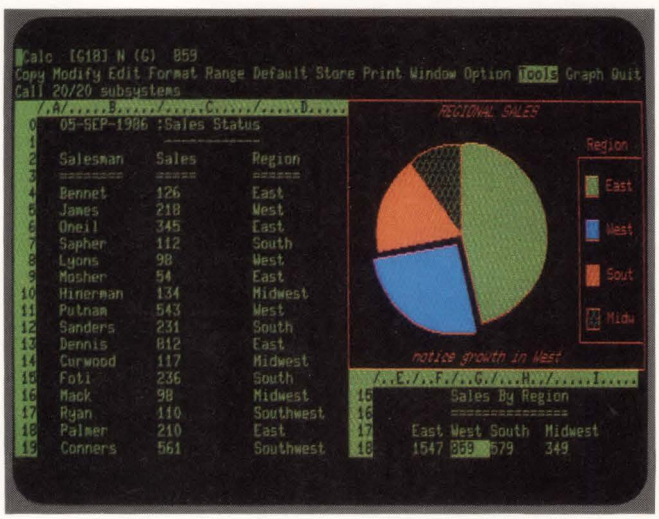
You can move backward through the command tree one branch at a time by hitting the BKO (F12) key. A Status line at the top of the screen tells you what's stored in the cell your cursor is on.

The descending tree of menu commands guides you through every function (see Figure 1, p. 132). For example, spreadsheets are stored and extracted by typing /SW (for STORAGE at the top level and WRITE at the first descending level) or /SR (STORAGE READ) at the Ready prompt (see Screen 1). Macros that execute frequently used or complex commands are written from the versatile OPTIONS tree.

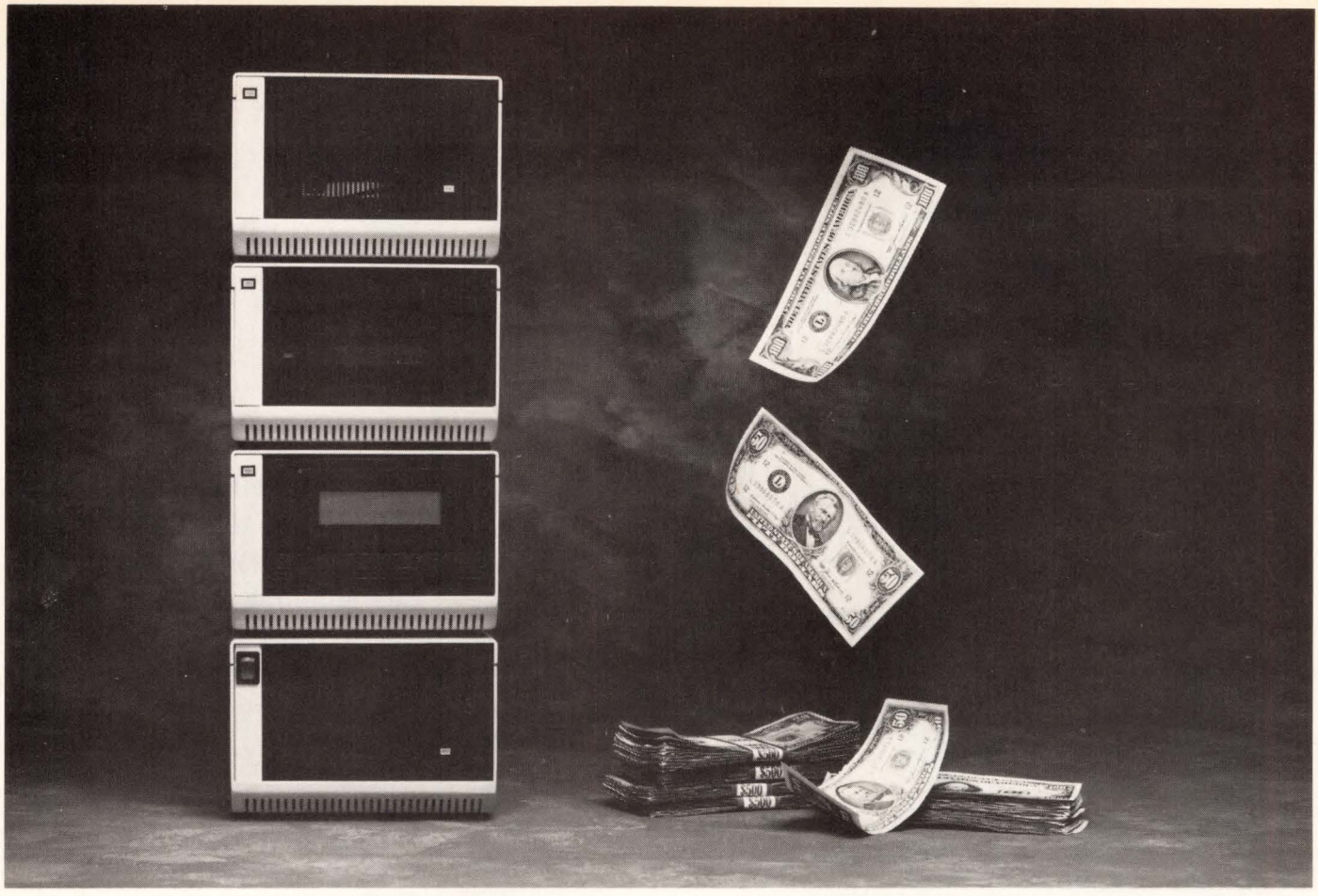
Arithmetic formulas can be entered into cells, rather than characters or numerics. These formulas can be repeated for other cells using the /COPY command. Likewise, Titles can be frozen to be repeated at the top of successive



Screen 1: Accessing files from Lotus 1-2-3.



Screen 2: Striking / brings up 20/20's top command line.



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CIRCLE 160 ON READER CARD

20/20 Version 2.3

PLATFORMS: VAX/VMS, MS-DOS and many UNIX machines

PRICE: From $600 on the VAXstation 2000 to $13,500 on the VAX 8800. The Database Connection module ranges from $250 to $5,400. The WP Connection ranges from $200 to $4,100

ACCESS TECHNOLOGY INC.

HEADQUARTERS:
6 Pleasant St.
S. Natick, MA 01760
(508) 655-9191

FOUNDED: 1980

PRODUCT LINE: Spreadsheet with graphics capabilities, plus connections with major word processing and database systems

REVENUES: $18.3 million, FY 1987; $25 million, FY 1988 (projected)

OWNERSHIP: A division of CompuServe Inc., a subsidiary of H & R Block

BRANCHES: Marlow Bucks, England; Paris, France; Dusseldorf, West Germany; Brussels, Belgium; and Monterey, California. Approximately 20 international distributors

CIRCLE 440 ON READER CARD

pages using /WT (WINDOWS TITLES).

For calculating new answers to formulas, you either can have 20/20 automatically recalculate for you, or you can control recalculations more safely using the Space Bar. For Iterative calculations, 20/20 tells you which cells are referenced circularly by changes you've made.

20/20 also offers a variety of ways to do Windows, Graphs and Import/Exports from other software packages, pulled in in ASCII format using STORE.

Connections

Access has been adding functionality to the 20/20 TOOLS menu. From here, users can get a list of all attributes of a specified cell with /TAL (TOOLS AUDIT LIST). This helps earmark all errors and bugs.

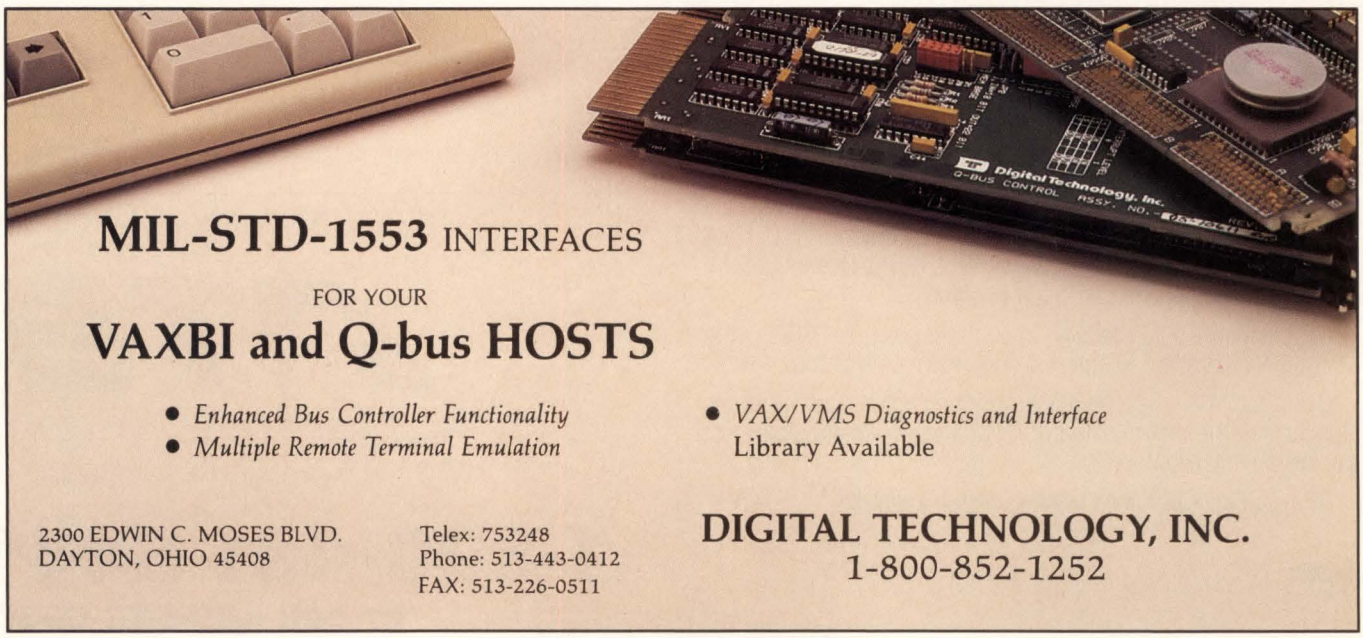
TOOLS also accesses the Database and WP Connections (see Screen 2). With the Database Connection, for example, typing /TDSCA (TOOLS DATA SORT COLUMNS ASCENDING) does a database query that sorts a column alphabetically to be brought into 20/20. Then /TDE (TOOLS DATA EXTRACT) moves data within a file.

With the WP Connection, you might follow this chain: /TWSI (TOOLS WP SETUP IMPORT) to choose a word processor, specify a document or part of a document and configure your interface options. Then /TWR (TOOLS WP RUN) executes your word processor. The Mass-11 files I pulled in were called from Editorial directories scattered across our Local Area VAXcluster (LAVc).

> ***"For Iterative calculations, 20/20 tells you which cells are referenced circularly by changes you've made."***

Anatomy Of Success

More than 30,000 licenses of 20/20 have been sold, running on more than 20 hardware platforms. Consider Access'



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

THE ONLY VAXBI BUS BACKUP DEVICE YOU CAN BUY.

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

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

Now, somebody does. Presenting MegaTape's new MT-750 VAXBI subsystem. A breakthrough that lets high-end VAX users enjoy all the advantages of MegaTape without bus adapters or other bottlenecks. The result is far greater capacity and convenience than 9-track streamers—at a fraction of the cost.

Each MT-750 cartridge holds 630 MB, formatted. Enough to back up an entire RA-81 or RA-82 in a single quick operation. The controller takes full advantage of the BI bus speed, and it's even TMSCP compatible, so all existing software works unchanged.

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CIRCLE 123 ON READER CARD

strategies, and you'll understand why the product's success has snowballed. Besides accurately reading trends in the software market, such as the value of connecting to other software utilities, Access understands spreadsheet users.

Much of 20/20's success can be attributed to properties inherent in the software, while some of the credit goes to Access' industry foresight.

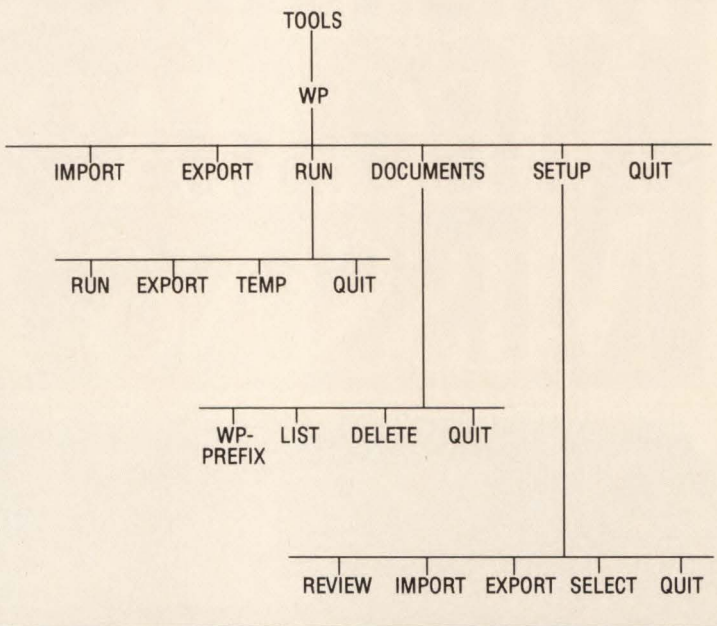
1. Although 20/20 sells itself on its immense size (up to 1,000 rows and 1,000 columns) and profusion of capabilities, its best feature is that it looks and feels like PC software. Access' commands are available easily by striking the / key, and its unambiguous structure is easy for even the least technical user to adapt to.
2. Reviewing 20/20's evolution is like reading a textbook on minicomputer software marketing. 20/20 has benefited from DEC's Digital Distributed Software (DDS) program for more than three years and from technology exchange relationships with Microsoft, Cognos and others. It has a list of approximately 30 value-added resellers (VARs) and hardware vendors.

Recently, Access was purchased by CompuServe Inc. Under this agreement, Access will benefit from CompuServe's deep pockets but will continue to operate independently.

3. Besides linking with applications packages, 20/20 is available for a wide range of operating systems and platforms. These include IBM VM/CMS, Data General's MV, Wang VS and MS-DOS. In addition, 20/20 has been optimized for several UNIX-based workstations and superminis, including those from Sun, Apollo, Gould and Pyramid.
4. Access Technology offers a new training module called 20/20CBT (Computer-Based Training) that interactively teaches command functions and shortcuts to new users and provides refresher courses for advanced users.

There are few software packages that are as much fun to learn as 20/20 or that solve as many problems.

FIGURE 1.



A typical 20/20 command tree, this one for the WP Connection.

Companies Mentioned In This Article

Cognos
2 Corporate Place, I-95
Peabody, MA 01960
(508) 535-7350
CIRCLE 437 ON READER CARD

CompuServe Inc.
5000 Arlington Center Blvd.
P.O. Box 20212
Columbus, OH 43220
(614) 457-8600
CIRCLE 438 ON READER CARD

Digital Equipment Corp.
146 Main St.
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(508) 897-5111
CIRCLE 400 ON READER CARD

Informix Software Inc.
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Menlo Park, CA 94025
(415) 322-4100
CIRCLE 439 ON READER CARD

Microsoft Corp.
16011 N.E. 36th Way
Redmond, WA 98052
(206) 882-8080
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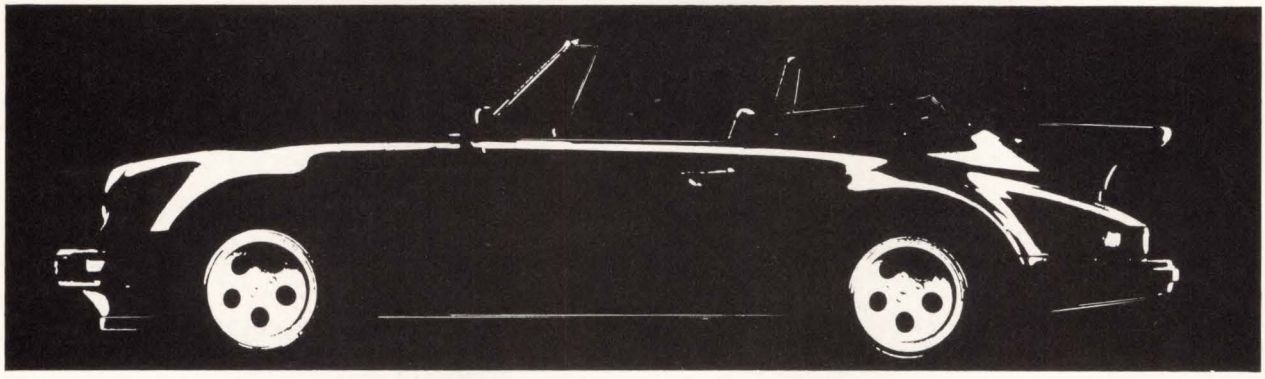
IN ORDER MANAGEMENT SOFTWARE:



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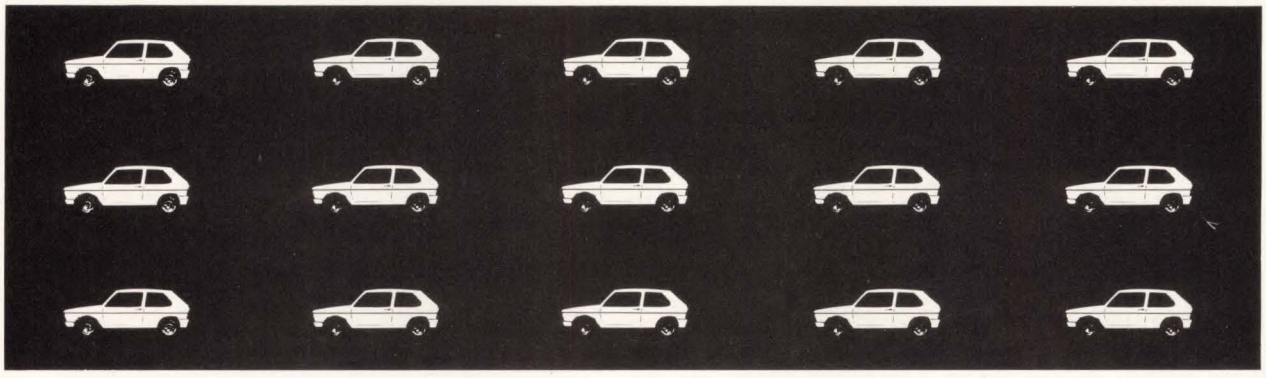

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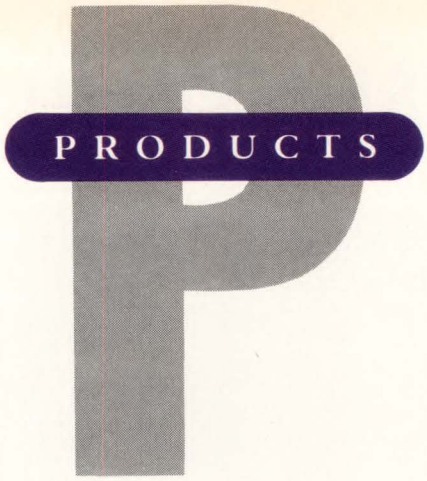


Summus Provides Data Distribution

Summus Computer Systems has a software package that allows interchanges of 2 GB of backed up or archived data among different types of CPUs with host-specific adapters. The GigaTape Interchange Utility, in combination with helical-scan technology, allows data distribution through cartridge exchange or network interface among DEC, IBM, Apple and other systems.

Two file-formatting options provide flexibility in handling data. The Summus proprietary format combines the gigatape 8mm tape subsystem with the interchange utility for maximum efficiency, packing more user data in each cartridge. Or, users can use ANSI-standard formatting with the GigaTape utility to interchange data among system types.

Prices for the GigaTape Interchange Utility start at $295.

For further information, contact Dave Meitzen, Summus Computer Systems, P.O. Box 219270, Houston, TX 77218; (800) 255-9638; in TX, (713) 492-6611.

Circle 502 on reader card

TekDB Provides Source-Level Debugger

Tektronix Inc. has a new approach to software development and hardware/software integration: the TekDB Monitor. By integrating logic analysis with C source-level debuggers and an embedded debug monitor, Tektronix provides a high-performance, economical development environment.

The product provides three basic functions: download of object code into the target environment, program control and C source-level debugging.

The TekDB Monitor and source-level debugger range from $2,500 to $7,000, depending on host-computer configuration.

For additional information, contact Roger Crooks, Tektronix Inc., Logic Analyzer Div., P.O. Box 12132, Portland, OR 97212; (800) 245-2036; in OR, (503) 629-1960.

Circle 411 on reader card

RDM Applications Port To VAX

Interactive Technology Inc. has announced the RDM Complete Strategy for Application Development. With RDM's table-driven interface, no programming code is needed to build applications complete with forms, reports, data processes, menus and more. Standalone, integrated, distributed and networked systems are created and modified through a fill-in-the-forms approach. Applications run on and port to the VAX, PDP-11 and IBM PC without change or rewrite.

The RDM Complete Strategy for Application Development features ProRDM, a programmer's interface for special feature programming in embedded applications. A library of the more than 150 PASCAL procedures, ProRDM extends the flexibility and versatility of RDM to special routines and equipment interface programs.

For more details, contact Rebecca Stone, Interactive Technology Inc., 460 Park Plaza W., 10700 S.W. Beaverton Hillsdale Hwy., Beaverton, OR 97005; (503) 644-0111.

Circle 504 on reader card

PASCAL-2/VMEPROM Link 10 For PASCAL

Oregon Software Inc. and W. Moor AG have announced a new software library, the PASCAL-2/VMEPROM Link 10 (VMS). The product allows the user to connect the VMEPROM or PDOS kernel commands to existing application programs written in PASCAL. With the use of VMEPROM or PDOS, the user is VME hardware-independent.

The complete tool consists of the library, the PASCAL-2 cross-compiler and the optional PASCAL-2 native compiler. By developing in the VMS environment (MicroVAX, MicroVAX 3500), the user has access to many powerful development tools. Updates and support are provided by the Realtime Systems (RTS) department of W. Moor AG.

For more information, contact JoAnn Bertram, Oregon Software Inc., 6915 S.W. Macadam Ave., Portland, OR 97219-2397; (503) 245-2202.

Circle 505 on reader card

DEC Introduces VAX Decision Expert

DEC has introduced VAX Decision Expert, an expert system shell based on the DECwindows program. The product doesn't require knowledge of AI programming and provides everything required to develop expert system solutions in a single, easy-to-use package.

VAX Decision Expert has both a development and a delivery environment with a built-in user interface. In the development environment, knowledge can be represented graphically in three ways: decision trees, and/or trees and IF-THEN rule tables. It provides for both forward chaining and goal direction reasoning and is entirely menu driven. Its menu-based end user environment allows users to enter and access knowledge easily.

To learn more, contact Tom Madden, DEC, 290 Donald Lynch Blvd., Marlborough, MA 01752; (508) 490-8513.

Circle 506 on reader card

IBI Interfaces Focus And Britton Lee

Information Builders Inc. (IBI) announced availability of an interface between Focus for VAX and Britton Lee's Shared Database Systems. All of Focus' reporting, graphics, spreadsheet and data analysis facilities now can access data stored on Britton Lee systems. With the Focus Interface to Britton Lee, tables now can be joined relationally to other Britton Lee, DBMS, Rdb, RMS, Ingres, Oracle, Sybase and Focus files.

Existing Britton Lee data automatically is linked to the Focus language through a sophisticated dictionary utility, AutoSQL. AutoSQL creates a schema allowing Focus to retrieve Britton Lee data directly through efficient, optimized SQL calls.

Prices range from $420 for the VAXstation to $14,000 (or $400 per month rental) on the VAX 8840.

Learn more by contacting Barry Cress, Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433.

Circle 507 on reader card

Online Calculator Performs 20 Functions

Dietrich Software has announced Online Calculator release 88.1. The Online Calculator software facility emulates a scientific desk calculator on the keypad of a VT1xx or VT2xx terminal. It runs on VAX or MicroVAX computers as a DCL command with standard help files.

The calculator appears on the screen and performs more than 20 math functions in decimal, octal or hex mode. Results are displayed on a 15-digit LED window and are logged to a 500-line scrolling "tape" window that can be opened and closed with a single key. Up to 20 levels of parentheses and three additional memory registers are available. Help screens are included.

The package requires VMS or MicroVMS version 4.0 or later. A single-CPU license is $150 for any size CPU.
For more information, contact Dietrich Software, 200 Oakbriar Farm Dr., Ballwin, MO 63021; (314) 394-9945.

Circle 508 on reader card

Target->Office Features Complete Menu System

Target Systems Corporation has introduced Target->Office, its Integrated Office Automation solution for the VAX/VMS system. Complete VAXcluster, DECnet and LAVc support is included.

Time, meeting, event and phone book management, user support problem tracking, videotex news and information, complete menu system with authorization and unlimited options are some of its capabilities. Target Systems' sales and marketing software can be included for a total office automation/sales and marketing solution.

Pricing is on a CPU basis.
For more information, contact Target Systems Corp., 33 Boston Post Rd. W., Marlboro, MA 01752; (617) 460-9206.

Circle 509 on reader card

Nemonix Offers Memory Upgrades

Nemonix Inc. introduced four memory upgrade alternatives for VAXstation 2000 and MicroVAX 2000 users. The memory is available in 4-, 8-, 12- and 16-MB arrays and is fully compatible with the newly released color graphics workstations.

The NX2000 4-MB and 8-MB memory products use 1-MB ZIP technology while the NX2000 12-MB and 16-MB arrays incorporate 1-MB SOJ technology, designed in a daughterboard format. The 12-MB array offers an economical alternative by upgrading the user to 14 MB of total memory (2 MB are resident in the MicroVAX 2000).

Nemonix products come with an Exclusive Customer Protection Plan, which includes a life-time warranty, 24-hour replacement, trade in/up policy, memory diagnostic and 5-day trial evaluation.
For more information, contact Peter Cholakis, Nemonix Inc., 106 South St., Hopkinton, MA 01748; (800) 435-8650; in MA, (508) 435-8650.

Circle 510 on reader card

Systems Union Offers Interface For Solomon

Systems Union Inc. announced the availability of an interface option to the Solomon general-ledger accounting software system from TLB Inc. The interface allows users of the Solomon package to transfer account balances or move files from one or more Solomon databases to take advantage of the superior consolidation and currency reporting facilities available in SunAccount.

SunAccount is a menu-driven combined ledger accounting and reporting package that automatically translates and consolidates multicurrency accounts into a single base currency. In addition to handling currency conversion, SunAccount includes facilities to handle exchange rate recording, calculating gains or losses on exchange, and managing currency exposure. SunAccount is available on a wide range of hardware systems, including VAX.
To learn more, contact Systems Union Inc., 244 E. 48th St., New York, NY 10017; (212) 753-7777.

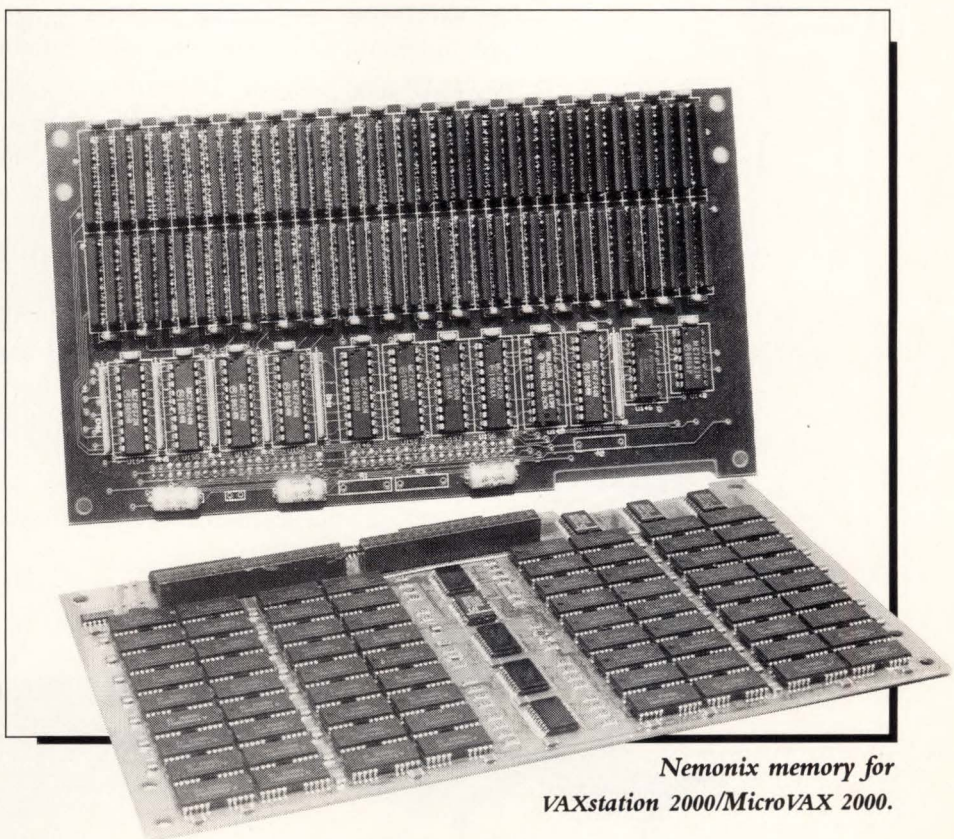
Circle 511 on reader card

Introl Assemblers Simplify Development

The Assembly Language Development Package from Introl Corporation is a set of software tools designed to simplify and expedite the development of assembly language programs for microprocessor and microcontroller systems. These Assembler Packages fully support all features of the target processor.

The package includes a relocating macro assembler, an object module linker, a hex file conversion utility and a library manager utility. Introl Assemblers are powerful and full featured. Conditional assembly macro substitutions, file inclusion, listing control and symbol cross-reference listings are supported.

Introl software is functionally identical regardless of the host development system. Introl assembler development systems are



Nemonix memory for VAXstation 2000/MicroVAX 2000.

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... the new MAP-4000 Application Accelerator does just that! Its three boards plug directly into the back-plane of your MicroVAX, transforming it into a formidable math engine.

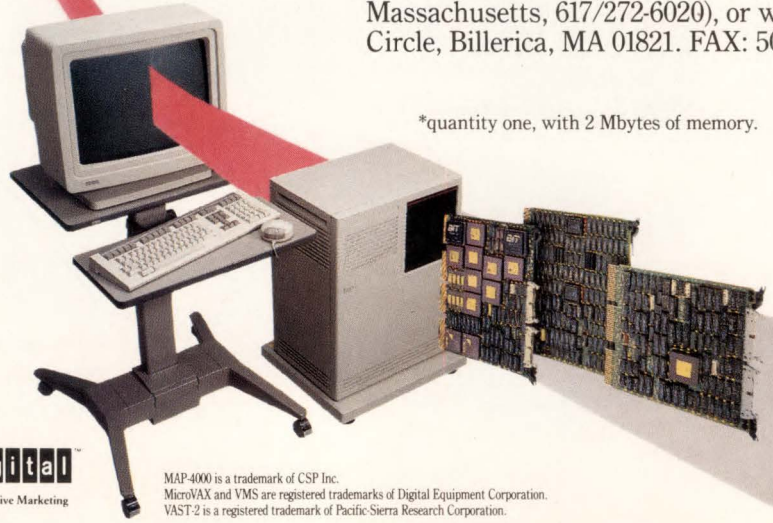
MAP-4000's global optimizing FORTRAN-77 compiler and extensive VMS-like debugging software help get your program up in a hurry, and its VAST®-2 pre-processing compiler transparently optimizes your code with automatic calls to our Scientific Subroutine Library of over 500 functions.

The MAP-4000 performs a 1024 Complex FFT with bit reversal in 1.4 milliseconds. You get 40 MFLOPS single-precision or 20 MFLOPS double-precision performance, and your application will run 10 to 100 times faster, depending on the amount of vectorizable code.

MAP-4000's basic configurations include either 2 or 8 Mbytes of memory. Up to 40 Mbytes of additional memory are available, and there's address space for up to 1/4 gigabyte for future expansion. MAP-4000 prices start at $18,995* —that's $475/MFLOPS!

Find out about the MAP-4000 advantage. To receive your free 12-page brochure, call 1 800 325-3110 (in Massachusetts, 617/272-6020), or write CSPI, 40 Linnell Circle, Billerica, MA 01821. FAX: 508/663-0150.

*quantity one, with 2 Mbytes of memory.



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available for the VAX and MicroVAX. To find out more, contact Introl Corp., 647 W. Virginia St., Milwaukee, WI 53204; (414) 276-2937.

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Fastpath Provides Open-Bus Architecture

IBM will expand the application capabilities of its ES/9370 and 4381 mainframes by offering Intel Corporation's Fastpath 9770 Connectivity Control Unit as an integrated feature.

Intel's Fastpath Connectivity Control Unit fits into IBM's ES/9370 rack and provides an industry-standard open-bus architecture for all System/370 class processors. This open-bus architecture makes it possible for these processors to connect to devices found in multivendor processor or networking environments.

Among the connections supported by Intel's Fastpath 9770 are simultaneous high-speed connections to up to four VAX or Sun Microsystems Workstations III and IV for functions like mail bridging, tape archiving and terminal emulation.

For more information, contact Phyllis Stern, Intel Corp., Systems Interconnect Operation, 2402 W. Beardsley Rd., Phoenix, AZ 85027; (602) 869-3778.

Circle 514 on reader card

DEC Announces Enhanced Nexpert Object

DEC announced an enhanced version of Nexpert Object, an expert system development tool written in C for VAX systems. The product offers excellent integration and price/performance when teamed with VAXstation workstations or a full range of VAX computers.

Developed by Neuron Data, Nexpert Object is a highly graphics-oriented expert system tool that integrates features of higher-priced tools and innovative artificial intelligence functions. It's a powerful combination of sophisticated knowledge representation, inferencing technology and ease of use. Enhancements in version 1.1 create more flexibility in creating, testing and modifying Nexpert applications.

Nexpert Object on a VAXstation workstation can be purchased for $8,000.

Additional details are available from Tom Madden, DEC, 290 Donald Lynch Blvd., Marlborough, MA 01752; (508) 490-8245.

Circle 506 on reader card

Snap-SMS Supports Real-Time Applications

FFT Systems Ltd. announced a high-speed shared memory system for multivendor computers. The Snap-SMS allows conventional mini- or microcomputers, such as the MicroVAX, IBM PC-AT and VME-based computers to share a common physical memory. It features a data access rate of 88 MB per second.

The system supports high-performance real-time applications in which the system work load is distributed among several processors that need to share and exchange data without any overhead. It's equally suited to applications in which a single but highly accessible database is required. As part of the Snap range of distributed processing products, the Snap-SMS shared memory system integrates a wide range of computing components.

For more information, contact Adrian Lin-

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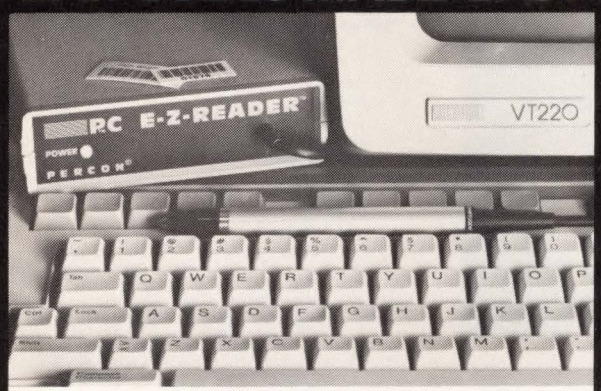

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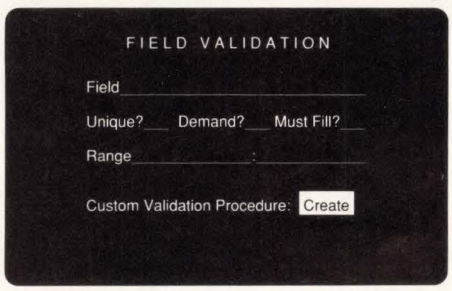

With System 1032 Application Facility

System 1032/AF automatically generates most of your application code from menu selections. Yet you can add custom procedures wherever you need something special.

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coln, FFT Systems Ltd., 2 Venture Rd., Chilworth Research Centre, Southampton, Hampshire, UK SO1 7NP; (0703) 760611.

Circle 515 on reader card

Eigen Package Includes 60 Utilities

Eigen Corporation has announced a release of its VAX/VMS System Management and Program Debugging Utilities. The new release runs under VMS version 5.0 and VMS version 4.4+. The Eigen Utilities package includes more than 60 utilities for use in all aspects of VAX/VMS application and system programming, as well as system management.

Some of the key utilities are an UNDELETE command, a Detached Process Debugger and the SAVE_DIRECTORY command to restore corrupted directories, and the EXECUTE command to execute a series of commands across multiple nodes in a DECnet network.

The package is sold on a per-CPU basis for $500 for the MicroVAX II, $1,100 for the MicroVAX III, $1,550 for the VAX 11/780 to 8650 and $1,800 for the VAX 8700 and above.

For further information, contact Robert Zampardi, Eigen Corp., 82 Wall St., Ste. 1105, New York, NY 10005; (212) 749-7513.

Circle 516 on reader card

Logicraft Delivers 386Ware Plus

Logicraft Inc. is delivering limited production quantities of a super fast version of the 386Ware DOS server. 386Ware enables a number of concurrent users on a VAX or VAXcluster to run IBM PC software.

386Ware Plus is powered by a 20 MHz, 80386 microprocessor along with 70-nanosecond RAM memory chips. Benchmarks have shown that 386Ware Plus is 25 percent faster than traditional 386Ware.

The four-user 386Ware Plus is priced at $11,995, the eight-user at $18,995.

More information is available from Logicraft Inc., 22 Cotton Rd., Nashua, NH 03063; (603) 880-0300.

Circle 513 on reader card

VIpack Analyzes Turbomachinery Blading

Northern Research and Engineering Corporation (NREC) announced the release of VIpack 2.0. This software system features an interactive-graphics format for advanced mechanical analysis of axial turbomachinery blading. Available for the VAX, IBM mainframe and PC systems, VIpack 2.0 simplifies data input and output of results.

VIpack increases engineering productivity by quickly and comprehensively addressing a full range of engineering questions that arise in blade stress and vibration. VIpack is used by mechanical engineers in aerospace, industrial machinery and petrochemical industries for design and analysis or airfoil-type blades used in axial-flow compressors, fans, and steam and gas turbines.

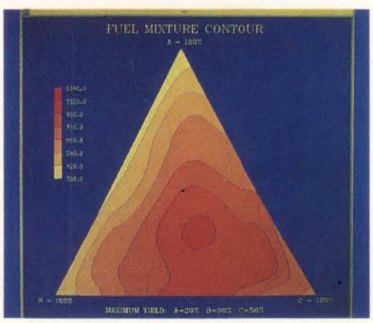
VIpack/PC is priced at $18,000. This software provides the same level of functionality as the VAX version, priced at $42,000.

To find out more, contact Frank Hines, NREC, 39 Olympia Ave., Woburn, MA 01801; (617) 935-9050.

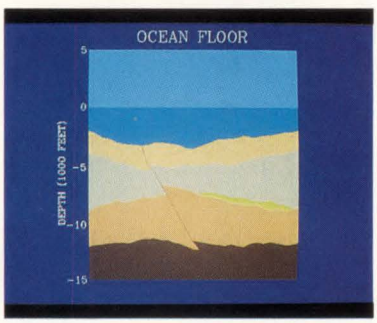
Circle 519 on reader card

Alis Interfaced To Oracle

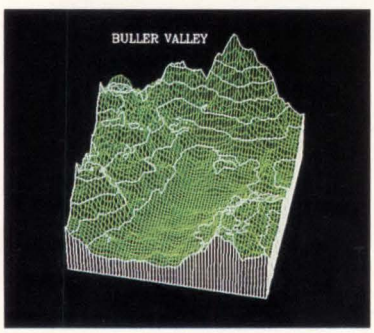
Oracle Corporation announced an interface between Oracle's RDBMS and Alis, Applix



Contours
Scientific contours are easily drawn with color fill capabilities to quickly see the relative distribution of data points. Labeling is accomplished during program set-up, allowing all graphs to be drawn automatically.



X, Y Graphs
Two-function graphs are easily generated even with large data bases. High quality presentation graphs are available by using GRAFkit's curve fitting and color fill capabilities.



3D Surface
The 3D surface application plots a perspective of a function of two variables with hidden lines removed.

GRAF KIT™

EXPANDING THE POWER OF GKS

GRAFkit™ expands the graphics capability of workstations and departmental computers in VMS, Ultrix, and Unix environments. It is an economical solution that gives the user superior performance and versatility. And GRAFkit has been enhanced to include advanced graphics routines from the National Center for Atmospheric Research (NCAR), a pioneer in graphics development for twenty years.

Ultrix and VMS are registered trademarks of Digital Equipment Corp. Unix is a registered trademark of Sun OS.

The high level applications included in GRAFkit are:

- X, Y Graphs
- X, Y, Z Graphs
- Contours
- Histograms
- Scatter Diagrams
- Streamlines
- Vector Graphs
- 3-D Solids
- 3-D Surfaces
- Cartographic Maps
- Map Data Overlays

GRAFkit includes a Graphical Kernel System (GKS) foundation which organizes graphic data in an ANSI/ISO approved format. The GRAFkit GKS also features an ANSI/ISO approved Computer Graphics Metafile (CGM) which stores data device-independently. GRAFkit's applications are completely functional with any standard conforming GKS software, however, the GRAFkit GKS provides support for more than 100 devices.

For increased technical graphics capabilities on workstations or larger departmental computers, GRAFkit is the solution.

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Inc.'s integrated OA software system. The companies have established a joint marketing effort to offer the benefits of a next-generation, easy-to-use OA system with sophisticated database management functions.

Alis combines the advantages of graphics-based integrated PC applications with the benefits of communications-based office automation systems and the presentation-quality output of desktop publishing systems. Its open architecture facilitates customization to suit specific applications required by VARs, OEMs and systems integrators. The interface to Oracle will allow users to run Oracle database queries using SQL from within the Alis environment.

Learn more by contacting Lisa Sheeran, Oracle Corp., 20 Davis Dr., Belmont, CA 94002; (415) 598-3706.

Circle 409 on reader card

SearchQuick Features Broad Applications

Data Retrieval Corporation released SearchQuick, a powerful, easy-to-use, automatic document search and text retrieval system that can be running within two hours. Designed for use on the VAX, it has broad applications in any industry that requires instant access to information in free-form and fixed-field (textual) databases.

Potential applications include litigation support, competitive intelligence, document assembly, research articles and reports, and personnel skills databank.

SearchQuick modules are priced from $7,000 to about $35,000, depending on the size of the computer system and the number of databases the system will support.

To find out more, contact Kelly Keyes, Data Retrieval Corp., 8989 N. Deerwood Dr., Milwaukee, WI 53223; (414) 355-5900.

Circle 517 on reader card

VRS Consulting Offers PowerHouse Training

VRS Consulting Inc. offers beginning, intermediate, advanced and expert PowerHouse training courses. The company has an experienced staff working within a range of PowerHouse applications using Quick, Quiz, QTP and PowerHouse Dictionary. The classes are modularized to clients' specific needs.

The training center for instruction in the Cognos Inc.-marketed PowerHouse products offers quality instruction. The instructors have presented technical papers at local, regional and international trade shows and conferences. VRS Consulting is an approved value-added source for Cognos.

For further information, contact Catherine Colliard, VRS Consulting Inc., 4676 Admiralty Way, Ste. 206, Marina del Rey, CA 90292; (213) 827-7890.

Circle 520 on reader card

FDX 9624 Features Instant Screen Response

Fastcomm Communications Corporation has a high-speed modem, the FDX 9624. The FDX 9624 is a full-duplex, 9,600-bps modem designed for interactive and rapid file transfer applications. It features no interactive delay, instant screen response, sharp characters and compatibility with V.22bis, Bell 212A and Bell 103 modems.

Based on CCITT Recommendation V.32, the FDX 9624 can provide greater throughput than symmetrical V.32 modems. It allows data to travel at 9,600 bps in one direction and 1,200 bps in the other, without

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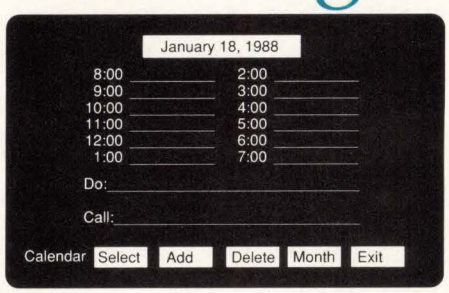

With System 1032 Application Facility

One keystroke builds a standard application from any System 1032 database you indicate. You then extend this prototype into a full-fledged system by filling in specification menus.

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Macintosh II to Ethernet, Now.

Speed. Access. Power. The EtherPort II from Kinetics.

As always, the best-connected Macintoshes begin with Kinetics.

The EtherPort II:

- Connects your Macintosh II directly to Ethernet.
- Provides full EtherTalk compatibility.
- Includes Macintosh O/S and A/UX drivers.
- Supports TCP/IP, DECnet, OSI and EtherTalk connections to VAX, UNIX, PC or Macintosh environments.

You can also connect your Macintosh SE to Ethernet with the Kinetics EtherPort SE.

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For more information, call 800-433-4608 outside California, 415-947-0998 in California.

Kinetics, Inc. 2540 Camino Diablo Walnut Creek California 94596

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using echo cancellation. This results in less vulnerability to line noise.

The FDX 9624 is priced at $899. For more information, contact Traci Vasilik, Fastcomm Communications Corp., 12347-E Sunrise Valley Dr., Reston, VA 22091; (800) 521-2496; in VA, (703) 620-3900.

Circle 521 on reader card

FORTRAN V1.1 Adds Speed And Features

Language Systems Corporation is shipping a new version of its Language Systems FORTRAN that includes increased speed and additional extensions beyond the FORTRAN standard. Language Systems FORTRAN version 1.1 is a full ANSI-Standard FORTRAN 77 and is based in the Macintosh Programmers Workshop (MPW) environment.

The Language System FORTRAN compiler includes extensions such as Do-While, Implicit-None, structures and EN engineering number formatting. In addition to the extensions that support Apple's Sane, many extensions are compatible with VMS FORTRAN that runs on VAX minicomputers.

The product, including MPW environment, costs $345. The software requires a Mac Plus, SE or II with hard disk.

For additional information, contact Drew Steis, Language Systems Corp., 441 Carlisle Dr., Herndon, VA 22070; (703) 478-0181.

Circle 522 on reader card

CallBack Tracks And Integrates Contacts

Abend Associates announced CallBack, a relational personal information manager.

Abend Associates' CallBack tracks and integrates contacts, deals and market information to identify potential deals the user otherwise might miss.

CallBack uses keywords — words or phrases that represent various aspects of your business — to identify important groups or individuals. As your market changes, CallBack allows you to cross-reference multiple keywords to identify new business opportunities. Through the use of option screens, CallBack allows each user to update the factors most important to his particular market.

CallBack will run anywhere Oracle's RDBMS will, from PCs to workstations, minicomputers and mainframes.

Obtain more information by contacting Scott Landman, Abend Associates Inc., 35 Fort Ave., Cranston, RI 02905; (401) 467-3890.

Circle 524 on reader card

AOK.abc 2.4 Features Third Dimension

AOK Software Products Inc. announced release 2.4 of the AOK.abc Spreadsheet. In release 2.4, AOK.abc's features include intelligent interpretation of the arrow keys input to eliminate unnecessary repainting; pie charts and bar/comparison bar charts generated with a third dimension to provide a better visual effect; and the processing of RECALC, MOVE, COPY and RANGE commands without screen repainting.

All users with a maintenance agreement will receive the release 2.4 update. AOK.abc is a fully Lotus-compatible spreadsheet for VAX/VMS users.

For further information, contact Brian Danaher, AOK Software Products Inc., 1305 Wiley Rd., Ste. 102, Schaumburg, IL 60173; (312) 884-7123.

Circle 523 on reader card

DECUS Canada Symposium: February 20-24, 1989: Your Personal Invitation

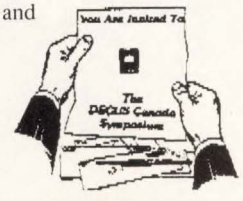
By: Marcus Schack, DECUS Canada Board of Directors
Anne Murakami, DECUS Canada Symposium Coordinator

Vancouver, the city of contrasts, the gateway to the Pacific. Whatever you are looking for, chances are you will find it here.

This year's program will take place at the Hyatt Regency Hotel, known as the "Jewel of the Pacific". The Hyatt is conveniently located in the heart of Vancouver's beautiful downtown district. All our seminars and sessions will be held in the Hyatt Regency. As one of Vancouver's finest hotels, you can take advantage of the other facilities such as pool, sauna, exercise and weight rooms.

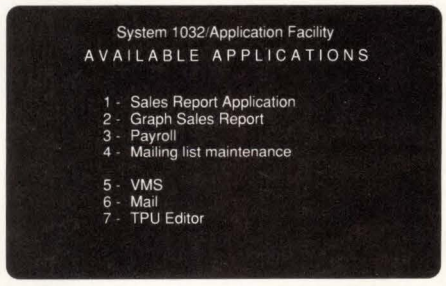
A full program is being organized, so plan to take in the full week's events. One day seminars (PSS) are scheduled for both Monday, February 20 and Friday, February 24 with sessions scheduled for Tuesday, Wednesday and Thursday.

For a copy of our Program Update and Registration Form, or further information, please call Anne Murakami at (416) 597-3462 or Marcus Schack at (604) 985-3177.



CIRCLE 217 ON READER CARD

Unlock VAX Resources



With System 1032 Application Facility

System 1032/AF integrates everything on your VAX: VMS services, 4GL, existing 3GL modules. Integrate at the menu level or invisibly weave everything together inside an application.

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CIRCLE 155 ON READER CARD

Lyddia Takes Database From Graphics To Code

Several major trends in database design have been integrated in a CASE product from Cascade Software Systems Inc. The software, called Lyddia, uses simple graphics to define data elements. It can draw an E-R diagram or print a data requirements document automatically. It generates code for the database in various languages, including DB2, Focus, Informix, dBASEIII Plus and Clipper. Lyddia runs on an IBM PC or compatible.

Lyddia is attractive for relational database management, including SQL. Data requirements can be defined by users and analysts interactively without introducing technical terms. Normalization is automatic and prototype source code for the entire database can be created in minutes.

The product is priced at $895.

More information can be obtained by contacting Jean Chiniara, Cascade Software Systems Inc., 33 Bedford St., Lexington, MA 02173; (617) 439-4410.

Circle 525 on reader card

Visible Systems Offers Multiuser CASE Tool

Visible Systems Corporation announced the release of version 3.0 of the Visible Analyst Workbench. This CASE tool now is multiuser on Novell Netware LANs. Version 3.0 requires Novell Netware V1.0+ (for multiuser LANs) and DOS 3.1+.

Version 3.0 enhancements reside in four areas: multiuser operation and communications, project administration, reporting capabilities and user interfaces. Large project teams can concurrently access the same project. File and Record Locking automatically prevents record clashes and other network-related problems. A USER function allows the project leader to assign access rights only to team members.

The product is priced at $595 per module.

For complete information, contact Stewart B. Nash, Visible Systems Corp., 49 Lexington St., W. Newton, MA 02165; (617) 969-4100.

Circle 526 on reader card

CrossComm Adds T1 Option To ILAN

CrossComm Corporation has unveiled a unique T1 option for the ILAN network integration system. With this option, any Ethernet, StarLAN, fiber backbone or remote serial link can interface with up to three T1 links for high-speed communication.

The ILAN Node allows file servers, multiplexers, CAD systems and other high-speed equipment to be integrated effectively into large corporate networks.

The option provides two interfaces for connection to T1 links. A DSX-1 interface using an RJ45 connector eliminates the need for expensive Data Service Units (DSUs) by providing direct connection to a 1.544 Mbps T1 Channel Service Unit (CSU). A balanced RS-422 connection operates at data rates up to 2.048 Mbps for direct serial-line connections.

To find out more, contact CrossComm Corp., 133 E. Main St., Marlborough, MA 01752; (508) 481-4060.

Circle 528 on reader card

Cognos Introduces PowerHouse Architect

Cognos Inc. introduced PowerHouse Architect for the VAX, a developer productivity tool for development and maintenance of PowerHouse applications. PowerHouse Architect is a set of screen-driven utilities for PowerHouse. It offers extensive cross-referencing facilities and three levels of automatic documentation for single files or full applications.

The product will generate a fully functional prototype of an application, including menus, data entry and modification screens, and reports. It reduces application maintenance time by as much as 25 percent. Standardized applications and documentation also result in time savings in code reviews and staff training.

For more information, contact Laura Dierker, Cognos Inc., 3755 Riverside Dr., Ottawa, ON K1G 3Z4; (613) 738-1440.

Circle 529 on reader card

Emulex Offers Magnetic Disk And Tape Emulation

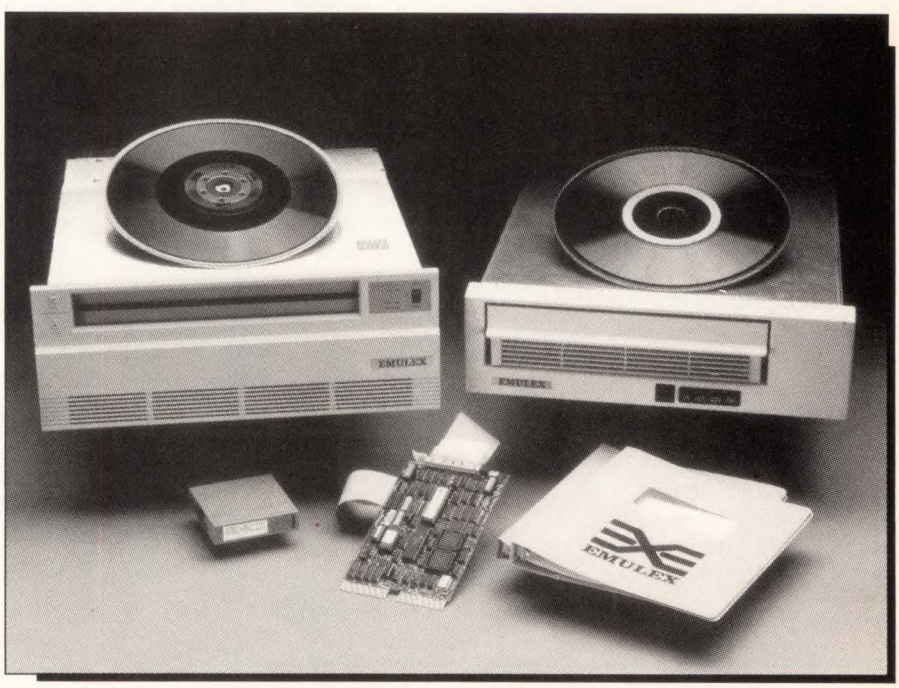
Emulex Corporation has introduced two software drivers for its LX400 series of optical disk subsystems that give VAX/VMS users a selection of disk and magnetic tape emulations. The new OD (disk) and OT (tape) drivers offer both magnetic disk and tape emulation in software.

The OD driver is suited for applications that require random access to data. With this driver installed, the LX400 appears to be a huge read/write disk treated the same way as any other magnetic disk on the system. The OT driver makes the LX400 appear as a standard magnetic tape drive. It's targeted for general archival applications requiring multivolume support for efficient disk usage.

Optical disk subsystems in the LX400 series are priced at $20,340 for Q-bus and $20,710 for UNIBUS systems. The OD and OT drivers are included in the price.

For further information, contact Katrina Adney-Leslie, Emulex Corp., 3545 Harbor Blvd., Costa Mesa, CA 92626; (714) 662-5600.

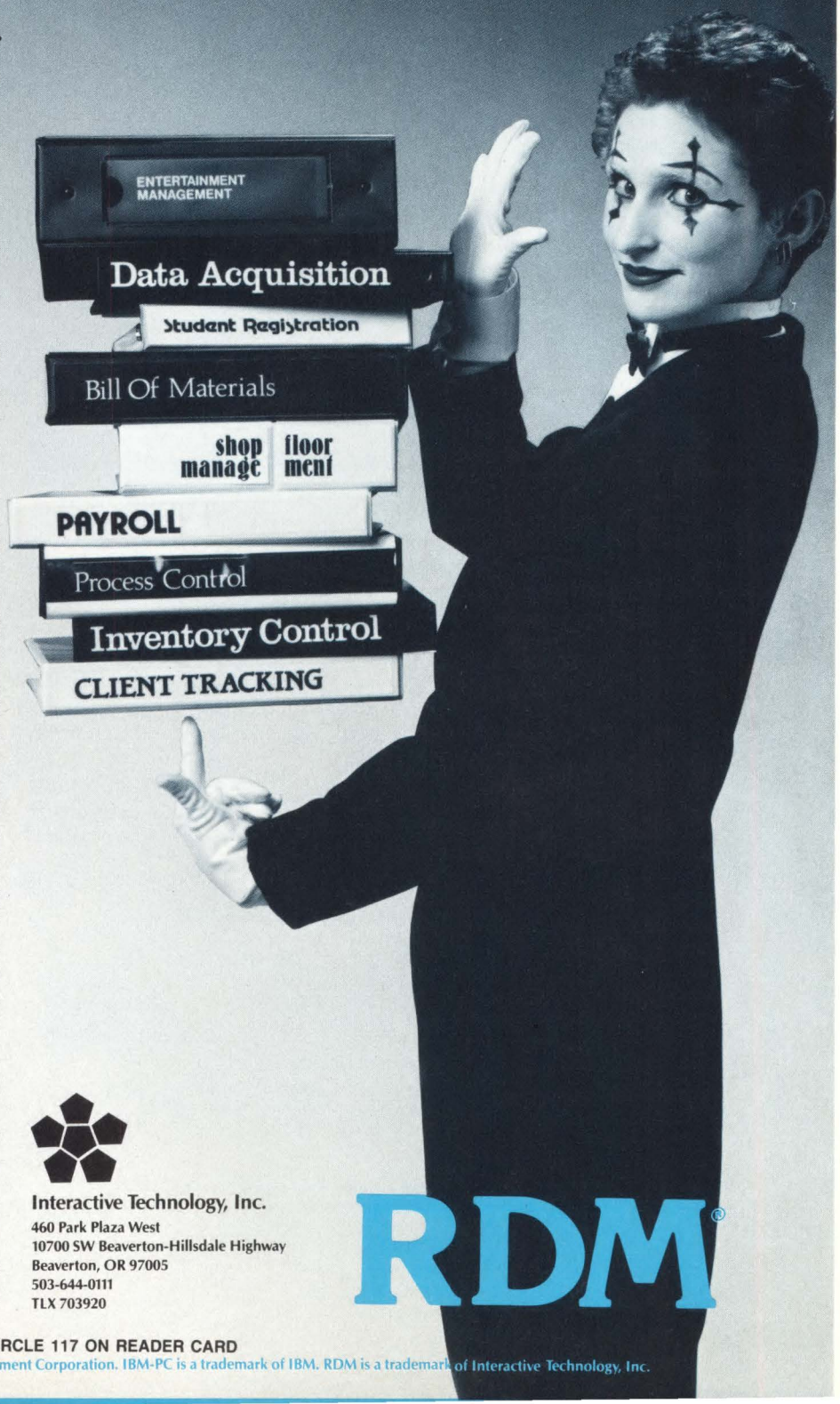
Circle 403 on reader card



Emulex's OD and OT software drivers work with LX400 subsystems.

MORE THAN A DATABASE FOR THE DEPARTMENT COMPUTER

Over the noise of corporate issues, your department's computing needs are not always heard. In the stack of things to do, they often wait at the bottom of the pile.



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RDM's table-driven technology is a generation beyond conventional database development. **RDM** supplies all the parameters that shape standard application components. You add your own custom-designed specifics. **RDM** eliminates the need to code and recode routine application features.

RDM is nonlanguage, fill-in-the-form application development. With no programming code to analyze, the learning curve is short and productivity increases. With or without software development specialists, you create the entire application: data input forms, summaries and reports, command menus, on-line help files and processes to validate and manipulate data. You'll implement even the most procedural tasks — without procedural language syntax.

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Natural 1.4 Provides 4GL Technology

Software AG of North America Inc. announced 4GL development, performance and security capabilities for Natural, its 4GL application technology for VAX computers. Natural 1.4 provides VAX users with a fully functional 4GL technology for the rapid development of large-scale, high-volume applications.

Natural 1.4's functionality includes the ability to call a Natural program from a 3GL environment and in-line DCL support. Natural Professional is an integrated interactive test facility that enhances application development within the Natural environment. Natural Security provides comprehensive integrated security to the Natural environment.

Natural 1.4 is priced from $6,250 to $50,000. Natural Security costs from $3,130 to $25,000, Natural Security from $1,560 to $12,500.

To learn more, contact Dan Villanueva, Software AG of North America Inc., 11800 Sunrise Valley Dr., Reston, VA 22091; (703) 860-5050.

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2.5 Gigabytes Unattended Backup

Digi-Data's GIGASTORE™ provides 2.5 Gigabytes of data storage on a single T-120 VHS video cartridge. That permits backup of your largest disk drive on off-hours without an operator.

Utilizing true read-after-write coupled with very powerful error correction, GIGASTORE gives you an unsurpassed error rate of 1 in 10^{23} bits. In addition, you get a high speed search capability not available in most 9-track drives.

GIGASTORE can be provided with an interface for DEC computers, such as VAX and Micro Vax, for operation under VMS. It is also available with an IBM PC interface, operating under MS/DOS.

Call Digi-Data, an organization with a 25 year history of manufacturing quality tape drives, at (301) 498-0200.

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Primavera Adds More Than 100 Features

Primavera Systems Inc. is shipping version 3.0 of Primavera Project Planner and Primavision for the VAX. The update, free of charge to all registered users, has more than 100 new and improved features.

Highlights include a scheduling capacity increased from 10,000 to 32,000 activities, expanded query capabilities and enhanced resource planning and control. Version 3.0 has unlimited resource capabilities, making it suitable for research and development and engineering projects. Primavera supports VMS versions 4.7 and 5.01.

Pricing for Primavera Project Planner and Primavision is $4,000 for the MicroVAX 2000, $12,000 for the MicroVAX II and $30,000 for the VAX 8900 series.

To find out more, contact Diane Dempster, Primavera Systems Inc., Two Bala Plaza, Bala Cynwyd, PA 19004; (215) 667-8600.

Circle 530 on reader card

DLC Develops Multilingual Software

Digital Linguistix Corporation (DLC) has developed a multilingual, multicurrency financial software system. Providing true foreign currency translation and revaluation capabilities, the fully integrated International Business System (IBS) system enables users to penetrate and adapt to any country's language, regional dialects and currencies, conforming to all accounting and financial reporting requirements.

The system generates screens, reports, forms and financial statements from a single common database, with no duplication of files or records. Companies instantaneously can communicate accounting and business information in customer-specific languages and currencies.

Supporting SMA/Pick-based systems like IBM and DEC, the IBS system is hardware independent.

To find out more, contact Peter R. Schuddekopf, Digital Linguistix Corp., 136 Madison Ave., New York, NY 10016; (212) 684-5220.

Circle 535 on reader card

Make Connections with WordPerfect® for Ultrix

Files created with WordPerfect for Ultrix transfer to WordPerfect for other systems.

WordPerfect for Ultrix lets you easily convert data to other programs.

A large base of WordPerfect users ensures you're not alone.

WordPerfect® word processing software for Ultrix systems was recently released by WordPerfect Corporation. With WordPerfect on Ultrix systems, VAX users will enjoy even more connectivity with WordPerfect than ever before. Not only can WordPerfect files transfer to VMS systems, but to many other mini, mainframe, and micro computers.

Refined Word Processing
WordPerfect connects you to an unrivaled feature set including the integrated Speller, Thesaurus, Math, Columns, Footnotes, Endnotes, Merge, Macros, and more.

Ultrix systems have rarely experienced the variety of features WordPerfect offers.

Document Portability
Connect across computer platforms by sharing documents with other WordPerfect users on IBM, Macintosh, Apple II, Atari, Amiga, and Data General computers. If you've learned WordPerfect using any one of these computers, you will find it simple to use WordPerfect on any of the others as well.

Along with WordPerfect for Ultrix systems, WordPerfect has recently been released for a wide variety of UNIX systems. To date, these include versions for the AT&T 3B2, the AT&T 6386 WGS, the Pyramid, the Sun3, the Sun 386i, the HP 9000 Series 300, the NCR Tower 32, as well as SCO XENIX System V 386 and Microport System V 386.

Industry Standard
With over two million licenses sold, WordPerfect connects you with a large base of users. WordPerfect has become the best selling word processing program among individuals, businesses, and government agencies throughout the world. You are likely to find WordPerfect experts within your own company. And if you use temporary help, chances are they've had WordPerfect training.

Document Conversion
Connect WordPerfect with other application programs using WordPerfect's Convert utility. DCA document conversion allows data exchange between WordPerfect and other applications with DCA capability. In addition, WordPerfect can directly read and write ASCII files.

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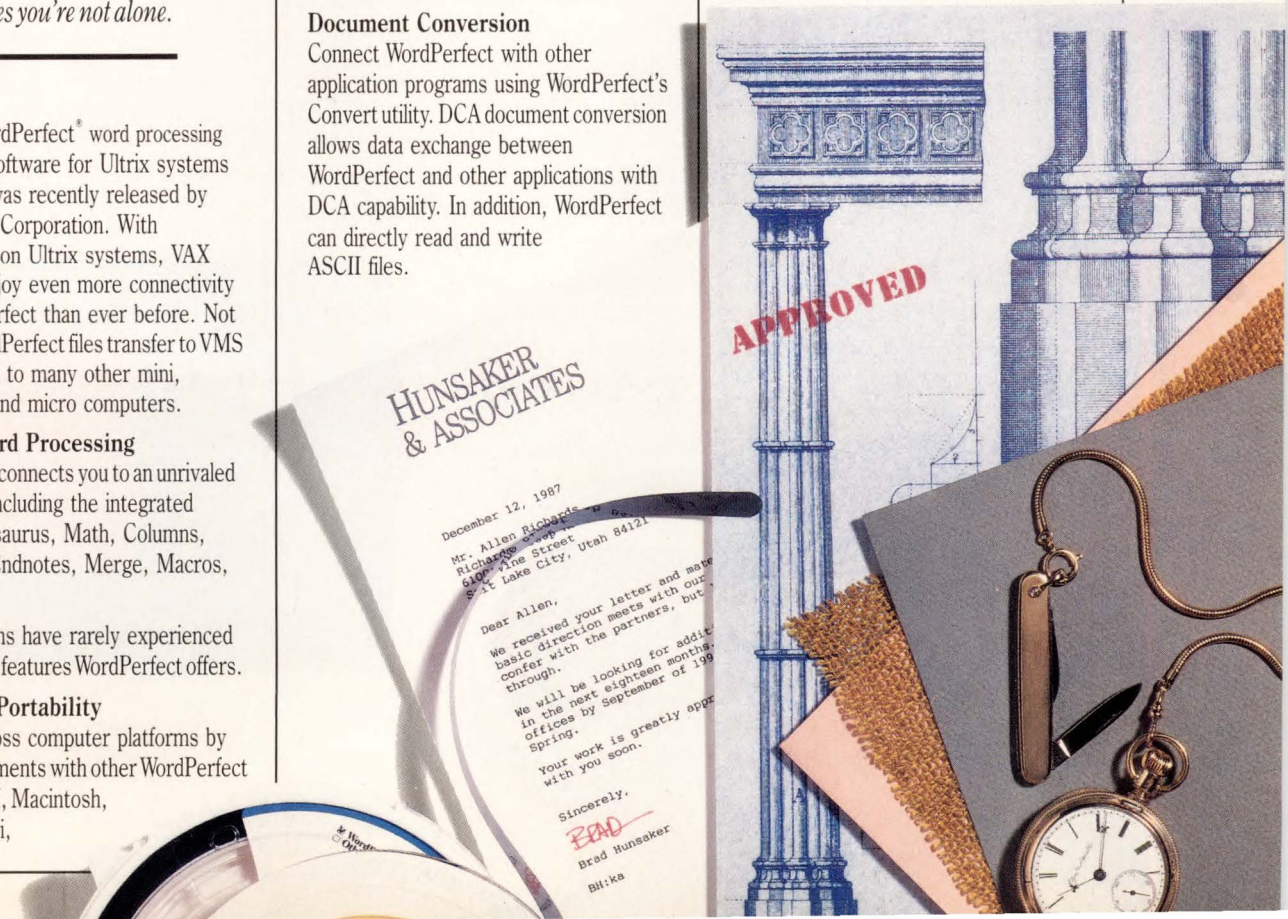

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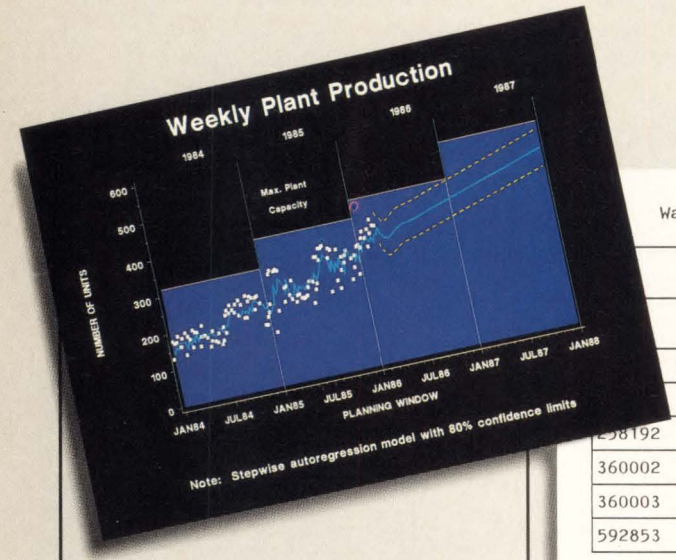
The Data Analysis Tool You Won't Outgrow.



Warehouse Inventory Report - 16JAN87

	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
258192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
360003	15985	500	TUE, FEB 10, 87
592853	469120	20000	WED, FEB 18, 87

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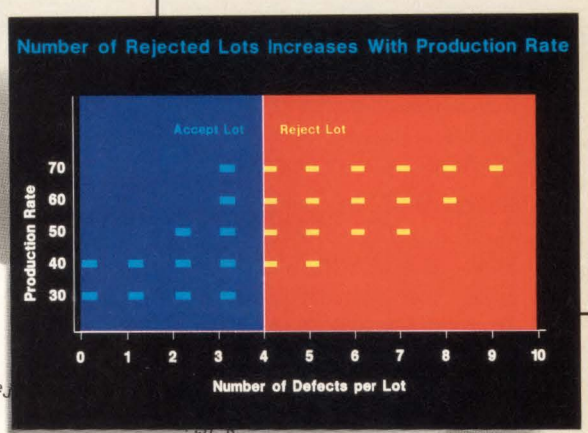

Lots Re... Production Rate

Rate	Lots Tested	Rejected Lot Statistics Lowest	Highest	Mean	Percent
30	4	1	4	2.5	0
40	6	1	6	3.5	33
50	6	3	8	5.5	66
60	6	4	9	6.5	83
70	7	4	10		

* Computer Intelligence, January 1986.

The SAS System runs on Digital Equipment Corp.'s VAX™ series minicomputers and workstations under VMS,™ as well as other mainframes, minicomputers, and personal computers.

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CIRCLE 135 ON READER CARD

Allen-Bradley Announces Alliance With DEC

Allen-Bradley Company announced an alliance with DEC that's important in integrating the industrial control and information management environments. In cooperation with DEC, Allen-Bradley has developed a new generation of industrial control systems, the Pyramid Integrator. This modular system of hardware, software and communications products includes the PLC-5/250 Programmable Controller; CVIM vision module, an advanced configurable vision module; and a MicroVAX Information Processor module.

The product is a modular, field-expandable, industrially hardened product. All modules are the next generation of Allen-Bradley products, representing improved cost/performance and migration from the current product lines.

The Pyramid Integrator will be available for delivery to selected customers in the second quarter of 1989.

For more information, contact Rob Spademan, Allen-Bradley Response Center, Dept. PC/122-508, P.O. Box 92846, Rochester, NY 14692; (216) 646-3173.

Circle 534 on reader card

Foresight Prototypes Real-Time System Design

Athena Systems Inc. has announced Foresight, a tool that enables systems to perform interactive, animated simulations of embedded real-time system designs under various operating conditions. This graphics-based package can reduce development costs of complex real-time embedded systems by allowing engineers to test assumptions and uncover design errors before software and hardware implementation efforts begin.

Foresight is an integrated set of graphics-based software tools that enables engineers to build working prototypes or executable models that include the logic and timing behavior of the embedded real-time system. Engineers can present test cases to the Foresight model and view the flow of data and the outputs as they would occur in the final system.

Foresight is priced at $23,680 for a 10-user license. The package runs on UNIX with the X Window System windowing environment.

For more information, contact Pete Heller, Athena Systems Inc., 139 Kifer Ct., Sunnyvale, CA 94086; (408) 730-2100.

Circle 538 on reader card

Cincom Upgrades Control:Manufacturing

Cincom Systems Inc. announced Control:Manufacturing release 6.3. The release offers systemwide enhancements, functional enhancements and an advanced module, Project Cost Control (PCC). Control:Manufacturing is a manufacturing information management system that encompasses 15 integrated modules. The system provides support for planning, operational and financial activities.

Enhancements and features include on-line documentation, with the capability to access all function, database and report documentation on-line; on-line message text maintenance, with the capability to add and maintain all error and warning message text

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SERVICE - Maintained by The Hewlett-Packard Company.
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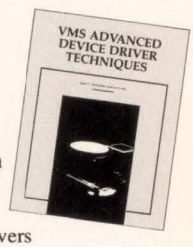
* Model # indicates 300, 600, 900, 1200, LPM
**Special ends 2/15//89

CIRCLE 185 ON READER CARD

Introducing . . .

VMS Advanced Device Driver Techniques

By Lee Leahy and Jamie Hanrahan



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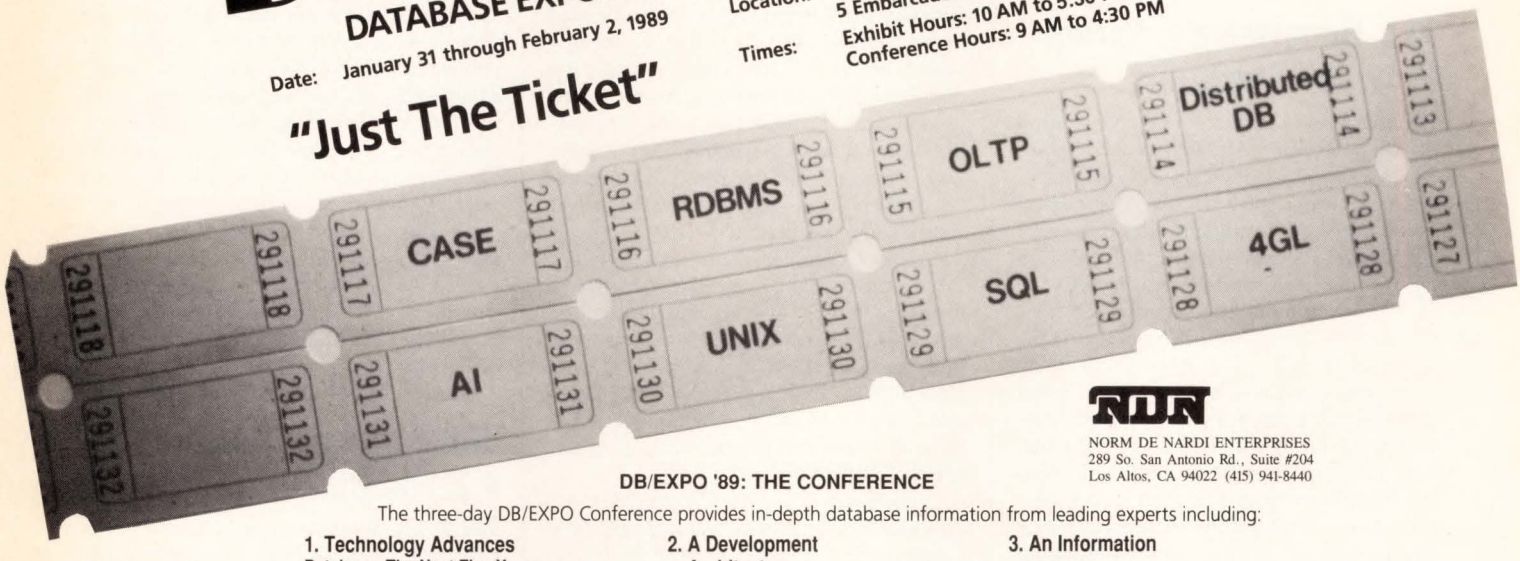
Times: Exhibit Hours: 10 AM to 5:30 PM
Conference Hours: 9 AM to 4:30 PM

"Just The Ticket"



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Database Architecture and Performance, Colin J. White (Editor /publisher *InfoDB*)

The Role of Distributed Database, C.J. Date (Codd & Date)

Database Directions, Panel discussion chaired by Sharon Weinberg (Codd & Date)

2. A Development Architecture

Understanding the CASE Marketplace, Vaughan P. Merlyn (CASE Research)

Using CASE: Customer Experiences, Linda Nadeau (Knowledgeware)

New Development Technologies, panel discussion chaired by Paul Winsberg

AI and Database Dr. Larry Harris (AI Corp)

3. An Information Architecture

Micro DBMS's: Host Compatibility and Connectivity, Richard Finkelstein (Performance Computing)

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on-line; and the fiscal calendar facility, a common component for PCC and other financial components. Release 6.3 is available on the VAX platform.

The price range for the PCC module is approximately $45,000 to $80,000, depending on hardware platform and configuration.
For additional information, contact Ronald R. Hank, Cincom Systems Inc., 2300 Montana Ave., Cincinnati, OH 45211; (513) 662-2300.

Circle 537 on reader card

The Renaissance Series Provides Flexibility

Ross Systems announced a new generation of software called The Renaissance Series. Based on Ross' MAPS financial management and accounting software, The Renaissance Series integrates "mainframe-class" financial software with business productivity tools in an operating environment on the VAX.

At the center of The Renaissance Series' design is a framework that enables true integration of applications into a single operating environment. The Renaissance Series gives users the flexibility to access information easily throughout a VAX computer system, not just information within the Ross product line. Features include a comprehensive accounting office environment that enables users to access critical information in all VAX applications quickly and easily.

Prices begin at $23,000, depending on CPU.
To learn more, contact Laura Olson, Ross Systems, 1860 Embarcadero Rd., Palo Alto, CA 94303; (415) 856-1100.

Circle 542 on reader card

CompuServe Accesses VAX Data Sources

CompuServe Data Technologies announced access to Ingres, Oracle, RDB and DBMS-32 data. Using the System 1032/End-User Facility (EUF), users can query and report on VAX data in these sources as well as data in System 1032 and RMS.

System 1032/EUF takes a PC-like, window-based approach to reporting, querying and updating data. It relieves programmers from building applications for every information need. Through a single front end, non-programmers can access and join up to 32 System 1032, Ingres, Oracle, RDB, DBMS-32 and RMS files in a relational data view. The product is an add-on module to System 1032 4GL/DBMS.

System 1032/EUF with access to System 1032 and RMS data costs $300 for a VAXstation to $18,000 for a VAX 8840. Access to additional VAX data sources ranges from $75 to $4,500 for each, depending on hardware.
For more information, contact Leslie Scott, CompuServe Data Technologies, 1000 Massachusetts Ave., Cambridge, MA 02138; (617) 661-9440.

Circle 438 on reader card

Easyway Product Creates Multiple Server Links

Able Computer Inc. has introduced its Easyway LAN Repeater, which can be used in any Easyway network to increase the distance between the host computer system and distributed terminal servers. It also can be used to create multiple server links, increasing the configuration flexibility of the Easyway network, even when the distance between the host computer and terminal server isn't a major restriction.

Able Computer's family of Easyway LAN products combines low-cost, high-performance twisted-pair wiring technology with full Ethernet/LAT compatibility and direct connectivity to Q-bus, UNIBUS and VAXBI bus. The Easyway product series gives users a modular, building-block approach to networking with an easy-to-use network control system.

The product is priced at $850.
To find out more, contact Paul Singh, Able Computer Inc., 2567A S.E. Main St., Irvine, CA 92714; (714) 553-1188.

Circle 541 on reader card

6200 Series Provides Total Storage Solution

Micro Technology Inc. has introduced its 6200 series of high-capacity storage arrays, which features built-in 8mm 2.3-GB tape cartridge backup. The 6200 series is designed to provide users of DEC DSA-based controllers and servers and users of MicroVAX with a total storage solution in a compact 5¼-inch form factor.

The 6200 series is available in capacities ranging from 565 MB to 20 GB. The product provides a one-to-one ratio of backup capacity to on-line storage.

Prices for the 6200 series range from $23,000 to $388,000.
Find out more by contacting Tom Raimondi, Micro Technology Inc., 1620 Miraloma Ave., Placentia, CA 92670; (800) 999-9MTI; in CA, (714) 632-7580.

Circle 545 on reader card

LaserStor Features SCSI Interface

Storage Dimensions introduced an extensive line of high-capacity, high-performance optical- and hard-disk storage subsystems for Macs. Called MacinStor, the product line ranges from 45 MB to over 800 MB in capacity.

The MacinStor product family includes LaserStor, an 800-MB write once, read many (WORM) optical drive, internal hard-disk subsystems for the Mac SE, II and IIx, and two classes of external hard-disk subsystems: zero-footprint models designed to fit underneath the Mac Plus and SE, and high-capacity models.

The LaserStor subsystem is designed for data-intensive applications, such as desktop publishing, CAD/CAM, image processing, database distribution and document storage and retrieval. LaserStor features a SCSI interface and one 800-MB media cartridge. The plug-and-play subsystem has a one-year warranty and FCC and UL approvals.

Prices for the MacinStor family range from $1,249 to $7,999.
For additional information, contact Greg Brashier, Storage Dimensions, 2145 Hamilton Ave., San Jose, CA 95125; (408) 879-0300.

Circle 546 on reader card

WordPerfect Offers 4.2 For ULTRIX

WordPerfect Corporation announced WordPerfect 4.2 for ULTRIX systems. WordPerfect 4.2 for ULTRIX running on VAX computers requires 547K memory for the first user on the system and 182K for each subsequent user.

WordPerfect 4.2 for UNIX systems is fully compatible with the corresponding PC version and includes such features as snaking and parallel columns, line numbering, macros, table of authorities and a rectangular block/move feature. WordPerfect for UNIX systems contains a 115,000-word speller and a thesaurus with more than 10,000 headwords. The program also allows users to open as many as nine documents simultaneously.

The price of WordPerfect 4.2 for ULTRIX systems ranges from $995 to $19,000, depending on the machine.
For more information, contact Rebecca Mortensen, WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; (801) 227-4069.

Circle 547 on reader card

Digicalc II Features User-Defined Logic

Timeline Inc. has announced Digicalc II, a multidimensional, intelligent spreadsheet for VAX systems. Digicalc II has integrated graphics and a link to PC products such as Lotus 1-2-3.

Digicalc II is a completely redesigned version of Digicalc. Written in C, it's up to five times faster that Digicalc and uses one-fifth of the disk space. New features include user-defined logic; use of tables to store relationships, equations, formats and commands; and implementation of two standard user interfaces (keypad commands similar to EDT and slash commands similar to Lotus). Digicalc II is optimized for use in business applications.

The product is priced between $5,000 and $12,000, depending on CPU. The price includes graphics and PC link.

To find out more, contact Lawson Abinati, Timeline Inc., 3055 112th Ave. N.E., Ste. 106, Bellevue, WA 98004; (206) 822-3140.

Circle 548 on reader card

Versatec Enhances 8500 Series Plotters

Versatec has announced productivity enhancements for the 8500 series of electrostatic plotters. The automatic media cutter cuts electrographic media via a dedicated operator panel control key or under program control. This option cuts ANSI-standard or user-defined page sizes. The media cutter enables each drawing to be cut automatically to specified length. Multiple copies are cut automatically and uniformly, without requiring the plotter to stop between drawings.

The automatic media winder option is ideal for those who need to plot in a remote environment or with unattended operations. The media winder mounts on the front of the plotter and can accept a 500-foot-long roll of electrographic media.

The media cutter is priced at $995, the media winder at $1,495.

For more information, contact Versatec, 2710 Walsh Ave., Santa Clara, CA 95051; (800) 538-6477; in CA, (800) 341-6060.

Circle 549 on reader card

ANC-208 Features Two AUI Ports

American Network Connections Inc. (ANC) has announced a LAN intra-connection product, the ANC-208 10-Segment Ethernet Repeater. The ANC-208 provides a repeater-interconnection between two Standard Ethernet (10Base5) coaxial segments and eight Thin Ethernet (10Base2) coaxial segments. The product is fully compliant with the Ethernet V2/IEEE 802.3 repeater specifications for CSMA/CD 10-Mpbs operation.

The ANC-208 has two AUI ports and eight BNC-type ports. Preamble bits for each packet received are amplified, retimed and regenerated, then a new packet is transmitted out on all ports with the data un-

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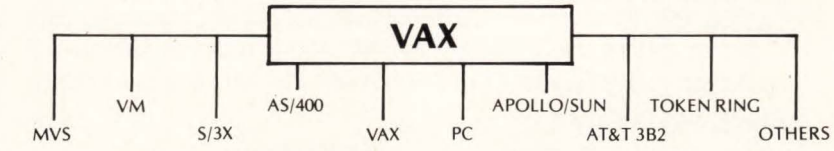

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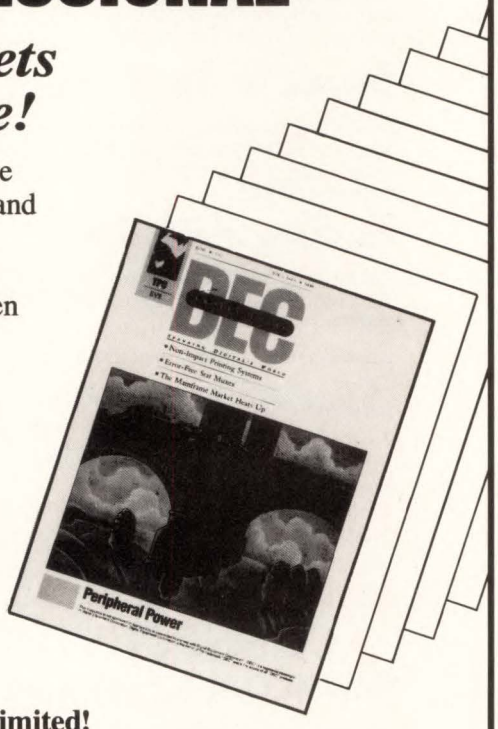

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changed. Collision detection, jam generation, collision fragment extension, automatic segment isolation, and reconnection are provided.

The ANC-208 is priced at $2,495. To learn more, contact Stephen M. Loring, ANC Inc., 179 E. Tasman Dr., San Jose, CA 95134; (408) 922-1600.

Circle 550 on reader card

RACS Series Attaches To DSA Controllers

Exsys Storage Systems has added SMD disks to round out its line of RA-compatible ESDI disk drives. The Exsys RACS series of SMD drives can be attached to all DSA controllers.

Like the ESDI product, the SMD product comes with a built-in disk exerciser and formatter. The features allows new drives to be tested, exercised and formatted at the customer site without any additional equipment or service personnel.

The RACS series allows one to four SMD drives with transfer rates up to 2.75 MB per second. It also allows formatted capacities from 600 MB to over 2 GB to be connected to a single DEC controller port when used in a disk array configuration. Using high-performance eight-inch SMD disk drives, such as the CDC Sabre Series, the RCS series offers reliability and greater capacity than DEC's RA 90.

For more information, contact Exsys Storage Systems, 1340 Tully Rd., San Jose, CA 95122; (408) 292-0343.

Circle 551 on reader card

Cumulus Introduces Letter-Quality Terminal

Cumulus Technology has introduced a letter-quality alphanumeric terminal designed for DEC users. The DCT achieves display quality through optical ergonomic features including a 15-inch flat-face, soft-white display screen, a 75Hz refresh rate that eliminates flicker and large characters that enhance readability.

User functionality is enhanced by built-in desktop accessories. A keystroke activates a calculator, calendar, personal file systems and notepad. The DCT includes a battery-operated clock, eight pages (16K) of display memory, 16K of non-volatile memory, a 80/132 column display, a keyboard that emulates the DEC keyboard, and dual communication ports. The product is compatible with the VT-320 terminal.

The DCT is priced at $649 for single purchases, including a five-year warranty. To find out more, contact Robert Alan David, Cumulus Technology, 1007 Elwell Ct., Palo Alto, CA 94303; (415) 960-1200.

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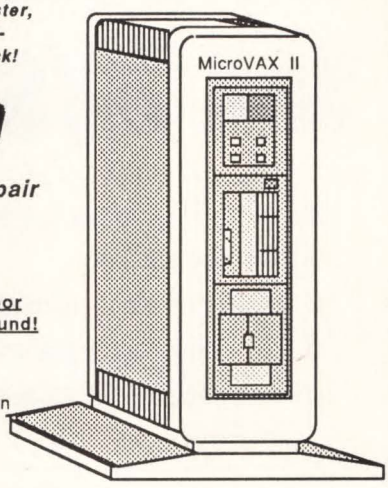

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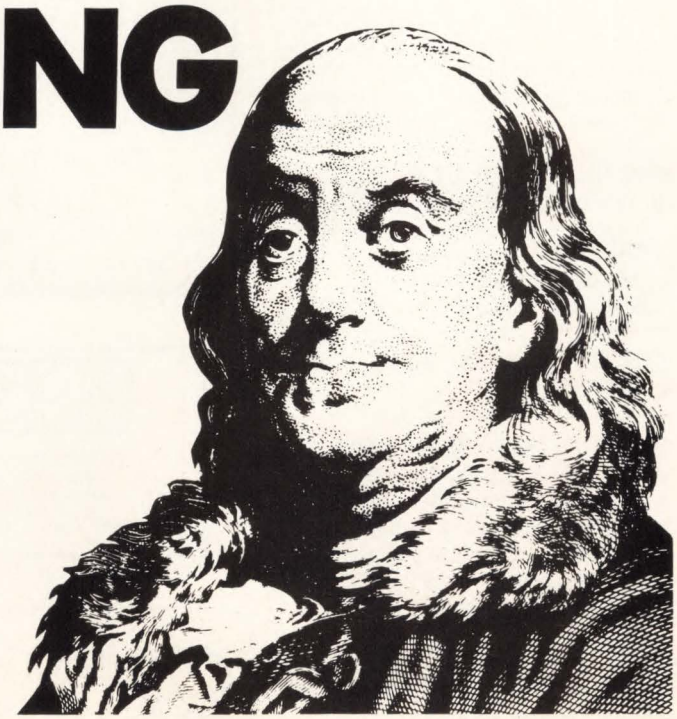

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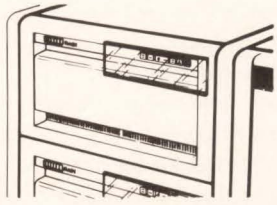

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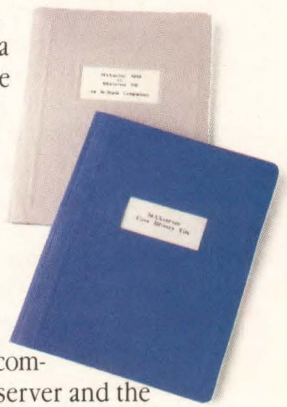

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BACK END

John C. Dvorak

Saint Silicon And The NeVeR Computer

He's regarded as the high priest of weirdness. His name is Jeffrey Armstrong, a.k.a. St. Silicon. His attempts to convert the world into peculiar worshipers of the glowing tube have attracted worldwide attention. He recently decided to compete with Steve Jobs' NeXt Inc. with a machine and company of his own. Recently, I spoke to St. Silicon in a hotel bathroom and talked him into revealing his marketing thrust.

Dvorak: What's the name of your new company?
St. Silicon: We're the NeVeR Computer Company. I'm the acting "I can't CEO" of the firm.

Dvorak: What's so special about your new machine?
St. Silicon: It's revolutionary. Our model is the corporate power structure. The cursor sits at the top of the screen and does nothing while all the work is done below. This isn't just any cursor, but one shaped like a Sculley and Crossbones. We don't have an interface, we have an "in-your-face." I mean that literally. We use "eye-cons." The muscles in your face and your eyeballs control all cursor movement and computer activity.

Dvorak: Is the machine easy to use?
St. Silicon: It's Virgonomically perfect.

Dvorak: Virgonomic?
St. Silicon: Yes. Our chief designer, Lisa Cray, is a Virgo.

Dvorak: How about I/O?
St. Silicon: We have no I/O ports. Our machine is so expensive that we have "what U/O ports." These keep track of what you owe and shut down the machine if you don't pay. For mass storage we use a new six-sided cubic floppy that comes equipped with a seeing-eye-oh dog. Most interaction isn't done with a mouse, but with our new rat.

Dvorak: Any bundled software?
St. Silicon: Yes, Boswell's dictionary of the English language. It will be all pictures. Also we have the complete text of Goethe's *Dr. Faustus*. And we have a special new graphical in-your-face.

Dvorak: Oh really? What's it called?
St. Silicon: We call it WYGIWYG: what you get is what you get.

Dvorak: That sounds pretty peculiar. I understand that Steve Jobs' company has emphasized the use of robots to make its computers. Do you have any similar plans?
St. Silicon: We're taking it one step further. Our NeVeR computer is built by robots that were built by robots. This makes the machine doubly perfect. While NeXt has Jobs, our machine is Jobless. In fact, for every machine built, there are 7½ jobs lost.

Dvorak: Steve Jobs is only marketing his machines to schools. Do you have any such unusual marketing plans?
St. Silicon: Yes, we intend to market our machine only to third-world countries and ghettos. We got this idea from our wackademic advisory council.

Dvorak: Any thoughts on the price of this new machine?
St. Silicon: Yes, we may give the new machine away.

Dvorak: Give it away? Then how are you going to make money?
St. Silicon: We're going to use a pay-per-minute party phone line for service. We expect the NeVeR party line to be a big winner.

Dvorak: What's the primary operating system?
St. Silicon: Eunuchs. It's a new Mach Turtle version developed at Carnegie-Felon by some ex-cons.

Dvorak: This sounds like a bunch of malarkey. Who's financing this thing?
St. Silicon: H. Ross Tarot. He's a card.

Dvorak: And what's the slogan of this company?
St. Silicon: The NeVeR computer for the ReSt of us. NeVeR will be here NeXt. The future is coming soon.

Dvorak: Where will it be announced?
St. Silicon: It will be announced in San Francisco at the primate section of the city zoo.

Before I could ask another question, St. Silicon gave me a copy of his Binary Bible and ran out of the room claiming he had just spoken his 150,000th pun and had to get to the Guinness people while he could still remember them all. Or maybe he just wanted to go have a Guinness, I couldn't tell.

Yes, this guy is for real, and this was an actual interview. I've known Armstrong for years, and if you get the chance to see his silly comedy act, I advise you give it a listen — especially if you like puns. Personally, I hate them. ■

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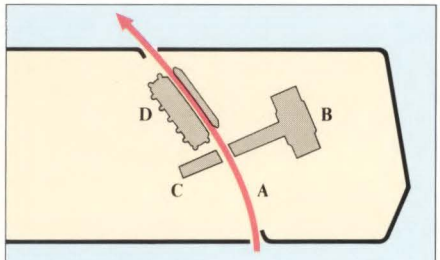

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